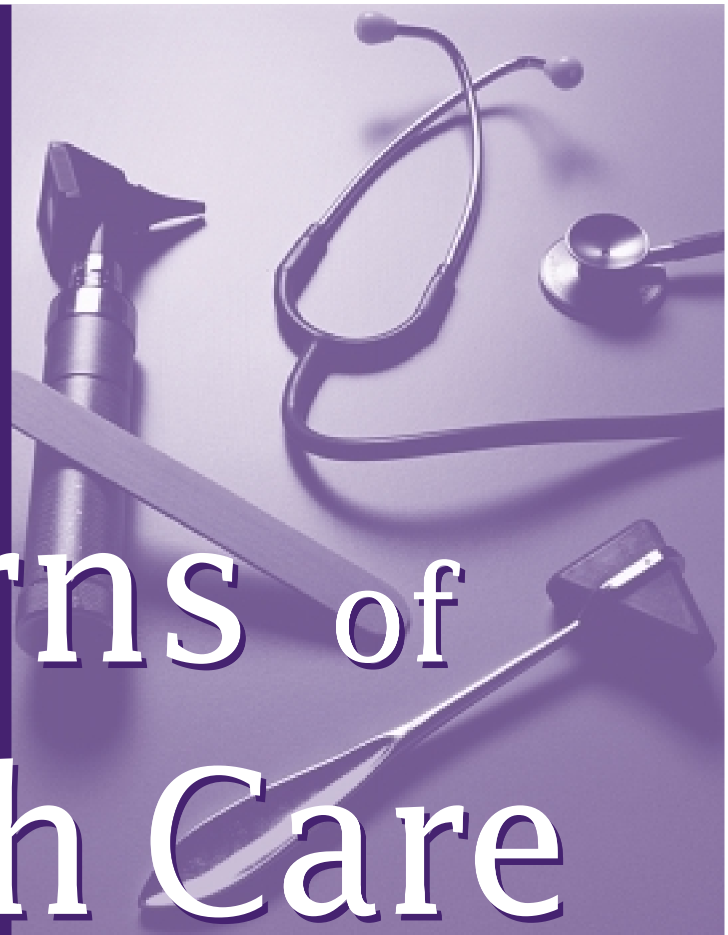
The ICES Practice Atlas

2nd Edition



Patterns of Health Care in Ontario

ICES

INSTITUTE FOR CLINICAL EVALUATIVE SCIENCES IN ONTARIO

Patterns of Health Care in Ontario

The ICES Practice Atlas
2nd Edition

Editors

Vivek Goel
J. Ivan Williams
Geoffrey M. Anderson
Paula Blackstien-Hirsch
Cathy Fooks
C. David Naylor

ICES Institute for Clinical Evaluative Sciences in Ontario

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Contributors

Practice Atlas Contributors

Geoffrey M. Anderson
Institute for Clinical Evaluative Sciences
Clinical Epidemiology Unit, Sunnybrook Health Science Centre
Canadian Institute for Health Information
Department of Health Administration, University of Toronto

Tami Axcell
Institute for Clinical Evaluative Sciences

Antoni S. H. Basinski
Institute for Clinical Evaluative Sciences
Clinical Epidemiology Unit, Sunnybrook Health Science Centre
Departments of Preventive Medicine & Biostatistics and Family & Community Medicine, University of Toronto

Susan E. Bronskill
Institute for Clinical Evaluative Sciences

Ralf Buhrmann
Department of Opthalmology, Dana Centre for Preventive Ophthalmology, Johns Hopkins University

Judy A. Carter
Institute for Clinical Evaluative Sciences

Ben Chan
Institute for Clinical Evaluative Sciences
Departments of Health Administration and Preventive Medicine & Biostatistics, University of Toronto

Marsha M. Cohen
Institute for Clinical Evaluative Sciences
Clinical Epidemiology Unit, Sunnybrook Health Science Centre
Department of Health Administration, University of Toronto

Peter C. Coyte
Department of Health Administration, University of Toronto
Institute for Clinical Evaluative Sciences

Donald P. DeBoer
Institute for Clinical Evaluative Sciences

Paul T. Dick
Division of General Pediatrics, Hospital for Sick Children
Department of Pediatrics, University of Toronto

William Feldman
Division of General Pediatrics, Hospital for Sick Children
Departments of Pediatrics and Preventive Medicine & Biostatistics, University of Toronto

Cathy Fooks
Institute for Clinical Evaluative Sciences

Vivek Goel
Institute for Clinical Evaluative Sciences
Department of Preventive Medicine & Biostatistics,University of Toronto
Clinical Epidemiology Unit, Sunnybrook Health Science Centre

Paula Goering
Health Systems Research and Clinical Epidemiology Unit, Clarke Institute of Psychiatry
Department of Psychiatry, Faculty of Nursing, Institute of Medical Sciences, University of Toronto

Roderick P. Hernandez
Institute for Clinical Evaluative Sciences

Karey Iron
Institute for Clinical Evaluative Sciences

Neill A. Iscoe
Toronto Sunnybrook Regional Cancer Centre
Clinical Epidemiology Unit, Sunnybrook Health Science Centre
Institute for Clinical Evaluative Sciences
Department of Medicine, University of Toronto

Laurence H. Klotz
Department of Surgery, Division of Urology, Sunnybrook Health Science Centre
Toronto Sunnybrook Regional Cancer Centre
Department of Surgery, University of Toronto

Daryl S. Kucey
Department of Surgery and Clinical Epidemiology Unit, Sunnybrook Health Science Centre
Department of Surgery, University of Toronto
Institute for Clinical Evaluative Sciences

Elizabeth Lin
Health Systems Research and Clinical Epidemiology Unit, Clarke Institute of Psychiatry
Department of Psychiatry, University of Toronto

Warren J. McIsaac
Institute for Clinical Evaluative Sciences
Family Medicine Centre, Mount Sinai Hospital
Department of Family Medicine, University of Toronto

C. David Naylor
Institute for Clinical Evaluative Sciences
Department of Medicine and the Clinical Epidemiology Unit and Health Care Research Program, Sunnybrook Health Science Centre and the University of Toronto

Alan Ruth
Institute for Clinical Evaluative Sciences
Department of Health Administration, University of Toronto
President, HEALTHCOR

Carol Sawka
Division of Medical Oncology, Toronto Sunnybrook Regional Cancer Centre
Clinical Epidemiology Unit, Sunnybrook Health Science Centre
Institute for Clinical Evaluative Sciences
Department of Medicine, University of Toronto

Marc-Erick Thériault
Institute for Clinical Evaluative Sciences

Teresa To
Institute for Clinical Evaluative Sciences
Department of Preventive Medicine & Biostatistics, University of Toronto
Clinical Epidemiology Unit, Sunnybrook Health Science Centre

Michelle Tran
Institute for Clinical Evaluative Sciences

J. Ivan Williams
Institute for Clinical Evaluative Sciences
Clinical Epidemiology Unit, Sunnybrook Health Science Centre
Department of Family & Community Medicine, Graduate Department of Community Health, Institute for Medical Science, Graduate Department of Nursing Science, University of Toronto

Wendy Young
Institute for Clinical Evaluative Sciences

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Hy Eliasoph, Joint Policy & Planning Committee Secretariat

Dr. Robin J. Fairfull-Smith, Ottawa General Hospital

Theresa Firestone, Ontario Ministry of Health

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Dr. John Deadman, Chair, Section on Psychiatry

Dr. Fraser Fellows, St. Joseph's Hospital, London

Dr. George Hiraki, Toronto

Dr. Arnold Kravetz, Chair, Section on Ophthalmology

Dr. Leo Mahoney, Chair, Committee on Breast Cancer Screening

Dr. Verna Mai, Chair, Committee on Population Health

Dr. Michael McGuigan, Chair, Committee on Drugs and Pharmacotherapy

Dr. Raymond Osborne, Toronto-Sunnybrook Regional Cancer Centre

Dr. Duncan Paterson, Barrie

Dr. Christopher Patterson, Chair, Section on Geriatrics

Dr. Robin Richards, Chair, Section on Orthopaedic Surgery

Dr. Ronald Smuckler, Chair, Section on General and Family Practice

Dr. Ann Spence, London

Dr. Wilfred Steinberg, Toronto

Dr. Wayne Tanner, Chair, Section on Cardiovascular Surgery

Dr. Robert Williams, Chair, Committee on Hospitals

Dr. Ian Wilson, Chair, Committee on Child Welfare

Dr. James Wright, Hospital for Sick Children

ICES External Coordinating Committee (ECC)

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ICES Technical Team

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Mohammed Agha, Research Coordinator

Don DeBoer, Senior Biostatistician

Rod Hernandez, Programmer

Eileen Lee, Statistician

Doug Manuel, MSc Student, University of Toronto

Marc-Erick Theriault, Programmer/Analyst

Michelle Tran, Programmer/Analyst

Claus Wall, Manager

Keyi Wu, Programmer/Analyst

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Atlas Electronic Edition Team

Paula Blackstien-Hirsch

Don DeBoer

Dr. Vivek Goel (Chair)

Karey Iron

Lawrence Stevenson

Claus Wall

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Foreword

It wasn't hard for me to accept the editors' invitation to write this foreword. As the President of the Board of Directors of the Institute for Clinical Evaluative Sciences in Ontario (ICES), I have been delighted to oversee the development of this dynamic research organization. The release of the second edition of the ICES *Practice Atlas,* Patterns of Health Care in Ontario, marks the institute's continuing contribution to the Canadian experiment called medicare.

The response to the 1994 publication of the first ICES Practice Atlas was overwhelming. ICES heard from hospital administrators, clinical managers, community physicians, District Health Council planners and consumers from across the province. Whenever possible, ICES responded to requests for speakers, further data analyses, technical assistance with methodology and general support for those following up on the specific findings for their institution or community.

Did the first ICES *Practice Atlas* make a difference? At the provincial level, the Ontario Ministry of Health and the Ontario Medical Association established a working group to address regional variations in hysterectomy rates. The College of Physicians and Surgeons of Ontario and the Joint Policy and Planning Committee of the Ministry of Health and the Ontario Hospital Association sponsored a project to promote higher rates of outpatient tonsillectomy and adenoidectomy. At the local level, hospitals used the ICES *Practice Atlas* to assess their patterns of practice, and many instituted internal reviews and audits. Some common, problematic issues concerning the diagnostic and procedure codes, such as those for appendectomy and breast-conserving surgery, were identified and communicated to all hospitals to improve the quality of future data.

I anticipate that the response to the second edition of the ICES *Practice Atlas* will be even stronger. Like the first edition, this new edition provides basic information about the operation of the Ontario health care system. Readers will again have details about the health of their community, the amount of surgery being provided to residents of Ontario, differences in length of stay for common admissions to Ontario hospitals, patterns of drug prescribing for the elderly and trends in provincial health expenditures over the last decade.

New information contained in the second edition is the direct result of feedback from stakeholders about the first edition and, I believe, meets the needs of our changing times. The Ontario health care community is in the middle of a major financial transition. Restructuring is under way across the province, and comparative information about communities and institutions plays a vital role in the discussions.

In addition to updating the information provided in the first edition of the ICES *Practice Atlas,* the 1996 edition covers new topics, such as physician billing patterns, the impact of length of stay on hospital readmissions and small area rate variations for common medical conditions considered sensitive to ambulatory care. Utilization and expenditure trends in mental health and pediatric services are an exciting addition to this edition. Another innovation in this edition is the provision of tabular information on diskette. Users can extract and compile information as desired.

The challenges faced by health care providers increase annually. With the release of this new ICES *Practice Atlas,* ICES continues to play a crucial role in helping health care managers and professionals deliver high quality health care. "You can't manage what you can't measure" may be an overworked phrase; however, the need for management and measurement has never been stronger.

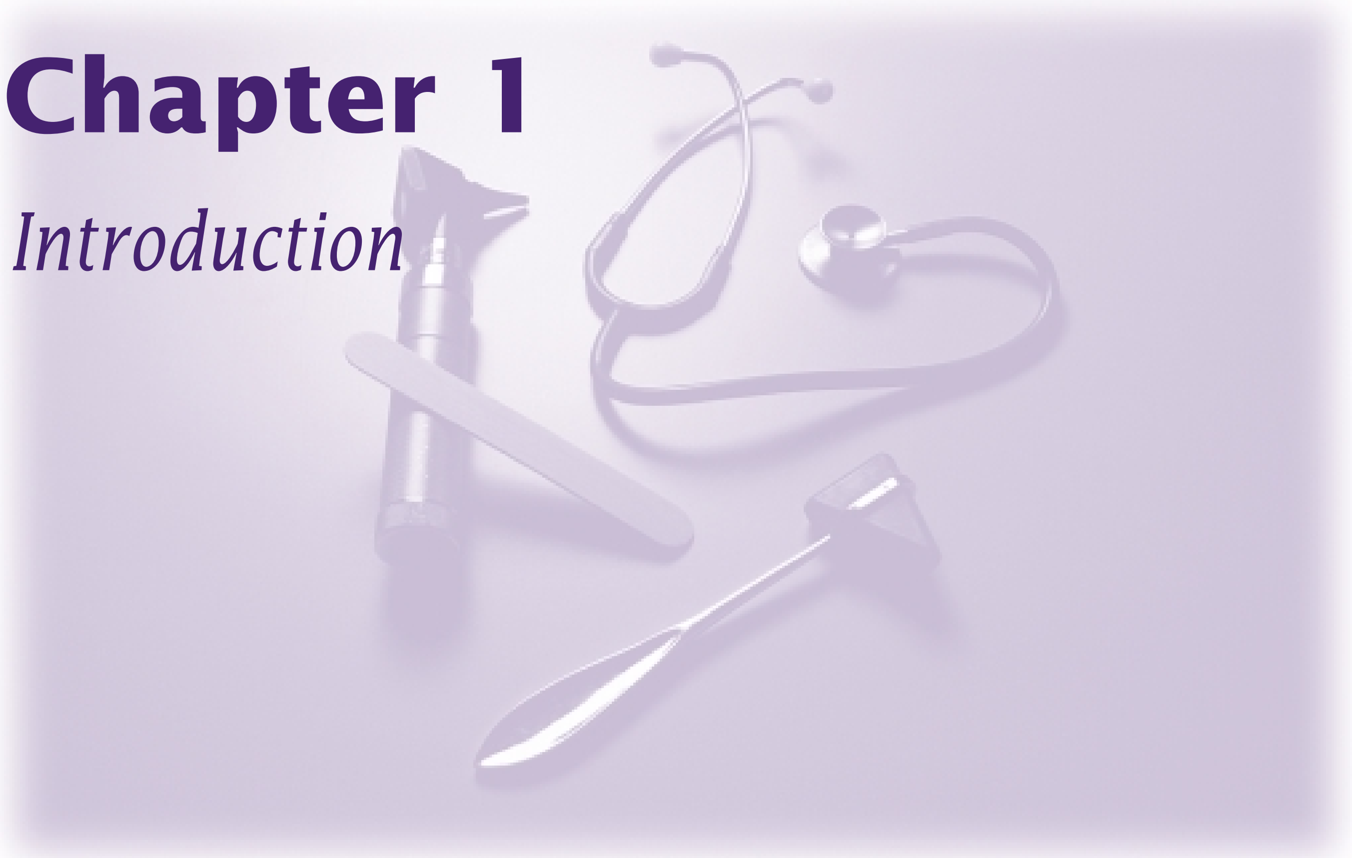
It is up to all of us to respond to the information presented here and to act collectively to maintain high quality health care in Ontario.

Dr. John Evans

President, ICES Board of Directors and
Chair, Torstar Corporation

Chapter 1

Introduction



The first edition of *Patterns of Health Care in Ontario*: *The ICES Practice Atlas* was released in May 1994. It was the first comprehensive attempt to compile quantitative information on the health status and health care utilization patterns of Ontario residents in a single volume. This Atlas updates data from the first edition, expands on some sections and includes several new areas of investigation. We hope it will attract interest throughout the health sector and will continue to generate discussion. It is our conviction that these data are more important than ever in charting a course for health reform.

Ontario's health care system continues to undergo profound change with demands to restructure while maintaining or improving health outcomes. Constant or decreased funding, combined with population growth and aging, emerging new technologies and prescription drugs, and inflation, have resulted in reduced real dollars for health care. For the system to operate more efficiently, we need better management and accountability. The Ontario health care system, a $17.7 billion enterprise, suffers from a lack of regular accounting for its activities. The Atlas offers some of the data required to engage in needed debate.

The unfortunate truth is that our health care system is not really a system; rather, it is a collection of disparate parts, each managed separately. Often a “silo” mentality pervades the system as different components such as physicians, private laboratories, hospitals, home care agencies and public health units work independently, and sometimes at cross purposes. This continues to lead to problems for implementing change and achieving efficiencies.

In the first Atlas, we proposed that a Council be established to help coordinate responses to emerging data on health care spending, health status and health care service utilization. Subsequently termed the “Quality Council,” such a group would bring together stakeholders from across the health care system to facilitate the delivery of quality health care. We stressed the need for multiple players because we felt it was futile to make changes in one sector without examining the impact on others. For example, shortening hospital stays may lead to increased demands on home care services and family members. Changes to reimbursements for community physicians may increase demand on hospital emergency rooms.

We also felt that changes had to occur through partnerships of stakeholders. For example, expenditures on the Ontario Drug Benefit program are based on drug prescriptions ordered by physicians. Yet there are few opportunities for physicians to review and potentially change their prescribing habits on the basis of new clinical evidence. Therefore, successful reform of the program would require the involvement of physicians, pharmacists, government and the recipients of services. Thus, a forum involving providers, payers and patients is needed to discuss changes and take action. As yet, such a forum does not exist in Ontario at the provincial or regional level. We will return to this discussion in the concluding section of the Atlas; readers can judge whether the need for a Quality Council still exists. We believe it does.

New Material in the Second Atlas

In this Atlas, the measures for health status assessment are expanded, and a detailed set of community health indicators is included. The section on overall utilization of health services updates data on use of hospital services, Ontario Health Insurance Plan (OHIP) expenditures, and use of the Ontario Drug Benefit (ODB) program by the elderly. These analyses are presented at the provincial and regional levels. There are also chapters that offer indepth analyses of OHIP billings and the utilization of selected drugs.

Three new procedures have been added to the chapter on geographic variations in surgical rates by site of patient residence—laparoscopic cholecystectomy, lens extraction, and dilatation and curettage (D&C). Also, we have added two medical conditions that are sensitive to the use of ambulatory care—asthma and congestive heart failure. The findings suggest that there is variability in medical admissions to hospital for these conditions which raises the issue of access to primary care. Last time, we presented this data at the county level. This time, we have used the District Health Council (DHC) boundaries to make the information more useful for planning exercises.

At the hospital level, data on day surgery procedures and length of stay are updated in this edition. Smaller hospitals, which were not included in the first Atlas, are now shown. Where possible, we have tried to reflect hospital mergers up to March 1995. In the tables, the new hospital name is shown if the merger occurred within the time frame of the data. Information on hospital readmission rates has been included as a new feature, which allows some examination of the impact of changes in hospital practice. There is also a new chapter on patient origin and hospital market share that provides detailed case studies demonstrating the use of these data in hospital and regional planning. As well, new sections have been added on mental health and pediatric health care utilization.

Finally, an electronic edition of the data is available for the first time. These diskettes serve several purposes. They allow us to provide more detailed data at the local level than is possible in the print version. For example, we can provide data for several years by region that would otherwise take up many pages of print. The electronic edition also enables users to customize tables. For example, information on a specific region or hospital can be pulled into a single table. The data can then be exported to a word processor for reports, to spreadsheets for further analysis or to graphic or mapping software for presentation.

Some Caveats

It is important to reiterate some of the messages about data quality from the previous Atlas. For virtually all of the analyses presented, ICES relies on data generated by other organizations. Most often, these data are compiled for administrative purposes. The quality of the data can be variable and errors in data can arise for a variety of reasons. We include an appendix to the Atlas that summarizes Canadian studies that have examined the quality of hospital discharge data. The overall message of the appendix is positive. Although problems do exist with data quality, the vast majority of data fields and data records include fairly accurate information. To further ensure data quality for this Atlas, we took the precaution of providing hospitals with summaries of their own data at an early stage in the development of this edition. Many hospitals responded with corrections or clarifications and in two sections of the Atlas, we changed our methodology based on their feedback. We are grateful to all of those who assisted in assessing the data that we present in this edition.

Examining and using data leads to improved data quality. This was one of the goals of the first Atlas and is also reflected in the experience of other data sources such as cancer registries. Registries that are used by epidemiologists for research projects are better from a data quality perspective than those where data are collected and enumerated in summary reports. In Ontario, separation data from hospitals have been used for years by researchers and Ministry of Health officials to provide aggregate data on provincial trends, and by individual hospitals to study trends within their own institutions. However, the release of the first edition of the Atlas was the first time that comprehensive hospital-specific data were broadly released with hospital names identified. Anecdotally, we know that publication of these data has led to a re-examination of data management methods, given more weight to the important work of health records staff and raised policy questions at the local level. However, we caution that the data presented here may not yet reflect changes that have taken place as a result of the first edition.

The most recent data presented in this edition are from the 1994/95 fiscal year, with only about nine months of data that represent activities that occurred after the release of the first Atlas. Changes to practice take time to occur, and therefore, we have not yet undertaken a systematic impact evaluation of the first edition. We will do so for the second. More generally, the health care system in Ontario is changing rapidly, and the 1994/95 data may not accurately reflect current health care delivery provided in 1996/97.

Follow-up to the First Atlas

A number of initiatives were undertaken following the release of the first *Practice Atlas*. ICES participated in six regional workshops with the Joint Policy and Planning Committee (JPPC) to review utilization data and discuss local action. We also worked with individual hospitals across the province to conduct local clinical audits and quality management activities. A Provincial Working Group on Hysterectomy Rates was established by the Ontario Ministry of Health, the Ontario Medical Association and ICES to examine the differences in rates across Ontario, and a final report is expected soon.

Furthermore, District Health Councils across Ontario report using the Atlas data in their planning exercises and Atlas methodologies have been adopted by the JPPC in their projects on utilization management.

ICES also conducted a number of research projects to follow up the results of the first Atlas. In partnership with staff at the Toronto-Sunnybrook Regional Cancer Centre, ICES is developing a decision aid for women diagnosed with breast cancer who are trying to choose between the surgical options of lumpectomy or mastectomy. As well, we are working with orthopedic surgeons and other researchers to review high– and low–rate areas for hip replacement surgery, and to refine our understanding of waiting lists for surgery. ICES also created *informed*, a newsletter for medical practitioners which summarizes the latest in health services research relevant to clinical practice. We have also established a FAX-on-demand service to provide supplementary documents of interest to *informed* readers.

Next Steps

The bulk of this publication consists of descriptive data on patterns of health care. It cannot provide definitive information about the performance of our health care system or long term patient health outcomes. Rather, it should be thought of as a screening test potentially indicating directions for further investigation. In medical practice, those who are found to have a positive screening test, such as a high cholesterol level, require further investigation to establish whether they are truly at risk and to help define a course of action. Similarly, those regions or institutions identified as outliers for a particular measure may require further discussion locally to identify the reasons for the observed rate and, if appropriate, to help facilitate change. Potential responses could include examination of local primary care and specialty resources, the relationship between treatment facilities and geography, patient preferences, availability of educational information, and the local clinical culture.

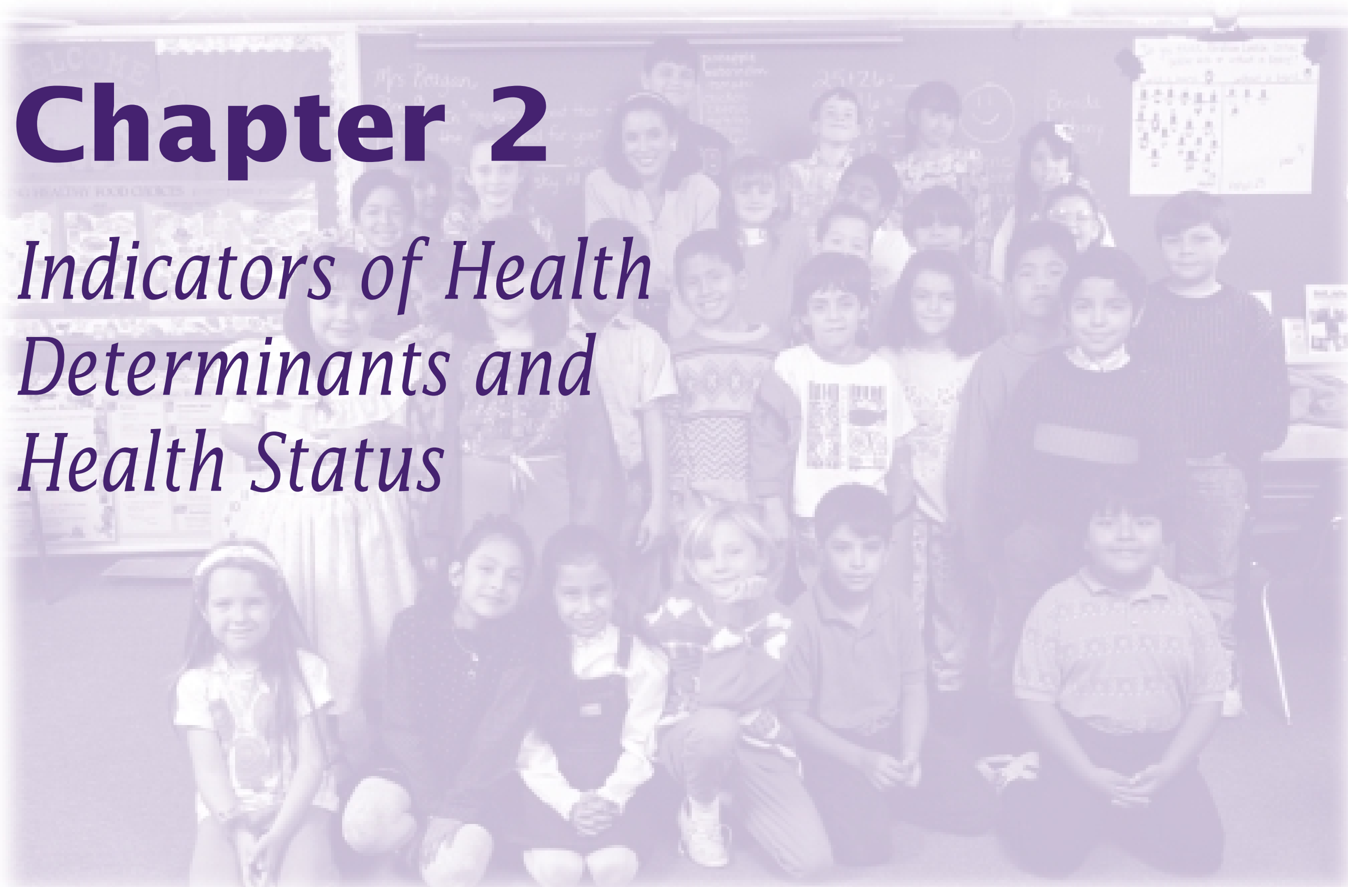
Local investigations can be difficult and time consuming, but standardized templates are available that can easily be applied in a variety of settings. For example, Interqual's Intensity-of-Service, Severity-of-Illness, and Discharge (ISD)® criteria— previously used by ICES and Toronto East General and Orthopaedic Hospital and now by the JPPC, and other hospitals in Ontario—provide a reasonable method for abstracting primary data regarding the efficiency of hospital care.

Follow-up of these screening tests should not be a sporadic activity, but an ongoing process of modern health care management. Regular reviews of outlier cases at the local level, and of random samples of all cases, are an important starting point for total quality management. Some activities are more appropriately undertaken at a system-wide level. For example, in Chapter 5 we describe some of the recent changes to cardiac services in Ontario. These changes were catalyzed, in part, by the development and interpretation of descriptive data on access to cardiac procedures, and guided subsequently by analyses focussed on benchmarks for regionalized cardiac services.

This case highlights several features that are important for a successful program of data-driven and evidence-based planning and management. First and foremost, there is active participation of involved clinicians from across the province. This group has worked together to identify indications for procedures and their urgency, methods for waiting list development, and a funding formula based on the complexity of the cases undergoing surgery. It has also developed a data system to capture information on all cases referred for procedures in the province. This additional "window" on cardiac services in Ontario provides a much better view than from hospital discharge abstracts alone. The new database not only provides enhanced information on who needs and gets services, but also on how long they wait for procedures and surgical outcomes by centre.

These data have prompted the Ministry of Health to allocate resources for cardiac services on the basis of population needs. The exercise has not been easy, quick or inexpensive. It has required several years of dedicated commitment by many individuals, as well as resources from the Ministry. However, we are certain that over the long term, this initiative will be cost-effective, resulting in improvements to quality, efficiency and accessibility of health services.

The purpose of publishing the Atlas is to contribute to our understanding of Ontario's health care system. It is not meant to be a consumer's guide to health care, although we do believe that better informed consumers are part of the health care reform equation. We view the differences in patterns of care found herein as "natural experiments" which yield information to improve the system, rather than to provide a reason to point fingers or lay blame. There will be much public debate about integrating health care, merging local hospitals and redesigning primary care services. The Atlas may serve as one source of information in these planning endeavours. In the coming months, we hope to continue to work with you to assess and improve the delivery of health care in Ontario communities. We look forward to your feedback.



Chapter 2

Indicators of Health Determinants and Health Status

Introduction

Health care planners and public health personnel undertake community health assessments to set priorities for specific health needs and services, to define problem areas and to evaluate the effectiveness of local programs and services. Such information can also be used to compare the health of one population with that of another. Ideally, such assessments should reflect a combination of the indicators of community and social determinants of health and of health status.

A comprehensive approach to community health assessment includes both measures of health for individual members of a community and measures that describe the community as a whole. However, the definition and measurement of individual and community health are far from straightforward. One basic issue is the conceptual definition of health. The most fundamental definition is the absence of physical illness. With such a definition, the measurement of a community's health would focus on healthy people. However, there are few routinely collected population-based data sources that provide such information.

The limitations of defining health as merely the absence of disease have been widely recognized. Health is now commonly defined as the state of complete physical, mental and social well-being, not just the absence of disease, and as "a resource for living [or] . . . the extent to which an individual or group is able to realize aspirations, to satisfy needs and to change or cope with the environment."[1,2] This definition includes not only the notion of health risks and illness prevention but also draws on the broader determinants of health — elements of the social or physical environment and individual genetic components that may affect the health of a population.

In the first edition of the ICES *Practice Atlas,* we presented profiles of health status and disease measures from administrative and survey data sources.[3] Age/sex-specific morbidity and mortality rates for regions across the province were calculated for the leading causes of self-reported health problems, disability, hospitalization and death using hospital separations data from the Canadian Institute for Health Information (CIHI), Vital Statistics data and the 1990 Ontario Health Survey (OHS). We highlighted the full spectrum of illness, from mild illness to hospitalization and, finally, death. In addition to these disease-based indicators, a measure of subjective health status — rates of self-reported fair or poor health according to responses from the OHS — was presented.

In this chapter, the "illness" indicators found in the first edition of the ICES *Practice Atlas* are updated, as is information pertaining to the broader definition of health and its determinants. We present information for Ontario and its health planning regions using various community health indicators. More detailed information is presented by District Health Councils (DHCs) and Public Health Units (PHUs) in the electronic version of the Atlas. First, however, we examine the health of the Canadian population in an international context and compare the health of Ontario residents with that of other provinces on the basis of standard international health indicators.

Canada and Other Countries

To compare the health of Canadians with that of residents of other countries, we provide a selection of global indicators extracted from existing publications. The first indicator, the Human Development Index (HDI), was developed by the United Nations Development Programme in 1990 to provide a global assessment of human progress and the achievement of well-being in 174 different countries.[4-6] The HDI is derived from three factors: life expectancy at birth for the total population, educational attainment, and income. An index is derived for each indicator by taking an average of the country's relative performance on each factor on a scale from 0 to 1. The index value on the scale indicates the distance a country has to go to reach the goal for the indicator set by the Human Development Programme. The goal for life expectancy at birth is 85 years, and the threshold for income is an average Gross Domestic Product (GDP) per capita at a purchasing power parity of $5,120 (US) in 1992. The HDI assigns sharply diminished utilities for values beyond this amount, on the basis that people do not need an infinite income for a decent standard of living. The thresholds for education are universal adult literacy and a mean of 15 years of schooling. The Human Development Programme used the UNESCO index for educational attainment to estimate mean years of schooling. Adult literacy is given a weight of two-thirds, and mean years of schooling has a weight of one-third in deriving the index score.

The United Nations Development Programme has produced reports since 1990 and has calculated HDI values back to 1960. Canada was tied with Norway for highest HDI in 1960 (0.865) and had the highest scores in 1970 (0.887), 1980 (0.911) and 1992 (0.932). Exhibit 2.1 displays the 1995 HDI ratings based on 1992 data for the major regions of the world.[6] The industrialized countries had the highest average rating, and of these, Canada held the highest rating at 0.950, followed by the United States (0.938), Japan (0.937), the Netherlands (0.936) and Finland (0.934). When the HDI was adjusted for sex imbalance, Canada ranked ninth in the world. This drop was due primarily to an inequitable income distribution between men and women. The Scandinavian countries held the highest rank for this sex-adjusted HDI.

The second set of international indicators is based on data from the Organization for Economic Cooperation and Development (OECD) and Statistics Canada. The population and demographic characteristics of the OECD countries are displayed in Exhibit 2.2.[7] The populations of the countries in 1995 ranged in size from Iceland (266,900) to the United States (261,638,000). Thirteen countries had a population smaller than that of Ontario (11.0 million).

Low rates of population growth are evident in all industrialized countries. Only five countries, including Canada, had total growth rates greater than 10 per 1,000. Canada was one of five countries with population increases, achieved through a net migration of five per 1,000 or more. Germany and Italy had more deaths than births and experienced negative rates of natural increase. The total fertility rate, defined by the number of births per woman of child-bearing age, was low as well. Only four countries had rates above or at the level required for population replacement in 1995. Women in industrialized countries are generally following two trends: they are having smaller families, and they are delaying having children until they are older. There is a consensus among demographers that the total fertility rates will probably continue to decline, particularly in an economic era of recession and the downsizing of the workforce in the public and private sectors.[8] The direct societal costs of providing for and educating the young are high, as are the indirect costs to the family. Educational and support services for children and youth are currently being restructured, so there could be reductions in the percentage of the GDP used for these services.

Exhibit 2.1: ***Canadian and International Indicators and Human Development Index, 1995***

World Region	Life Expectancy at Birth (Years)	Adult Literacy Rate (%)	Combined Levels of Educational Enrolment (%)	Real Gross Domestic Product per Capita, 1992 (US$)	Human Development Index
Canada	77.4	99.0	100	20,520	0.950
Industrialized (OECD) Countries *	76.1	98.3	80	15,291	0.916
Caribbean and Latin America	68.4	85.5	68	5,732	0.823
Southeast Asia and Pacific	63.5	85.6	58	3,016	0.651
East Asia	68.6	80.3	56	2,308	0.621
Arab States	61.9	52.2	54	4,321	0.644
South Asia	60.0	48.1	50	1,629	0.453
Sub-Saharan Africa	50.8	54.9	42	1,346	0.389
World	62.8	76.0	58	5,410	0.759

* See Exhibit 2.2 for the list of industrialized (OECD) countries

Data Source: United Nations Development Programme Human Development Report, 1995

Exhibit 2.2: *Main Demographic Indicators for the Industrialized (OECD) Countries, 1995*

Country	Population as of 1 Jan 95 (thousands)	Birth Rate per 1,000	Death Rate per 1,000	Rate of Natual Increase per 1,000	Net Migration per 1,000	Total Growth Rate * per 1,000	Total Fertility Rate	Life Expectancy** Women	Life Expectancy** Men	Infant Mortality Rate per 1,000 Live Births	Percent of Population 65 Years and Over ✢✢✢
Australia ***	17,938.5	14.5	7.1	7.4	3.5	10.8	1.87	80.9	75.0	5.8	11.4
Austria	8,039.9	11.5	10.1	1.5	1.6	3.1	1.45	79.7	73.3	6.3	15.2
Belgium ***	10,180.0	11.5	10.3	1.1	1.8	3.0	1.55	79.8	73.0	7.6	14.9
Canada ✢	29,413.1	13.2	7.2	6.0	5.9	10.4	1.66	81.2	75.0	6.3	11.6
Denmark	5,215.7	13.4	11.8	1.6	2.0	3.7	1.81	77.8	72.5	5.5	15.6
Finland	5,098.8	12.8	9.4	3.4	0.7	4.1	1.85	79.5	72.1	4.7	13.6
France ✢	58,207.8	12.2	9.0	3.3	1.0	4.3	1.66	81.8	73.6	6.4	14.1
Germany	81,552.5	9.4	11.0	-1.5	4.2	2.6	1.26	79.6	73.3	5.6	15.4
Greece	10,442.4	9.8	9.4	0.5	2.7	3.1	1.38	79.9	74.9	8.3	13.9
Iceland **	266.9	16.6	6.8	9.8	-3.0	6.9	2.11	80.7	76.9	4.8	10.8
Ireland	3,576.6	13.4	8.6	4.8	-2.7	2.1	1.86	77.9	72.3	5.9	11.2
Italy	57,427.5	9.5	9.7	-0.2	2.1	1.9	1.19	81.2	74.7	6.5	15.4
Japan	125,000.0	9.9	7.0	2.9	0.1	2.5	1.50	83.0	76.6	4.2	12.6
Luxembourg	406.6	13.6	9.4	4.2	9.9	14.1	1.72	79.1	72.6	5.3	13.6
Mexico	90,812.7	25.6	4.6	21.0	-3.2	18.0	2.90	75.8	69.4	30.3	NA
Netherlands	15,422.8	12.7	8.7	4.1	1.2	5.3	1.56	80.0	74.0	5.6	12.9
New Zealand	3,577.2	16.2	7.6	8.5	6.2	14.9	2.04	78.9	73.1	7.1	11.1
Norway	4,384.4	13.8	10.1	3.7	1.7	5.4	1.87	80.6	74.9	5.2	16.4
Portugal ✢	9,912.1	11.0	10.0	1.0	1.5	2.5	1.44	78.2	71.2	8.7	13.0
Spain	39,169.6	9.2	8.6	0.6	0.7	1.3	1.22	80.9	73.3	7.2	14.0
Sweden	8,816.4	12.8	10.5	2.3	5.8	8.1	1.89	81.3	76.1	4.9	17.7
Switzerland	7,021.2	11.9	8.8	3.0	4.5	7.5	1.49	81.6	75.1	5.1	15.0
United Kingdom ✢✢	58,276.0	13.1	11.3	1.8	1.3	3.2	1.74	78.9	73.6	6.2	15.8
United States	261,638.0	15.2	8.8	6.3	2.8	7.5	2.04	78.9	72.1	7.9	12.7
Average		12.5	9.2	4.0	2.2	6.1	1.71	80.1	73.8	6.1	13.4
Ontario	11,008.4	13.4	7.1	6.3	5.7	12.0	1.64	81.2	75.3	6.2	12.0

NA - Not available
* Growth rates were furnished by country and may include post-census adjustments
** Life expectancy values were for most recent year available
*** Total fertility rates - 1993
✢ Infant mortality rates - 1993
✢✢ Demographic data - 1993
✢✢✢ OECD Health Systems:The Socio-economic Environment Statistical Reference, Vol II, Health Policy Studies, No. 3, 1993, Table A1.1.5

Data Source: Dumas J, Belanger A, Smith G. Report on the Demographic Situation in Canada 1995, Demography Division, Statistics Canada

Life expectancies have improved dramatically for Canadian men and women over time. The life expectancies at birth for men (75.0 years) and women (81.2 years) in 1995 were above the OECD average of 73.8 years for men and 80.1 years for women. The infant mortality rate is also considered to be a good indicator of the level of socioeconomic development for international health comparisons. In industrialized countries, infant deaths within the first year of life are usually caused by congenital anomalies in the first days of life, and by infectious and communicable disease later in the first year. The average infant mortality rate in the OECD countries (6.1 deaths per 1,000 live births) was low and is continuing to drop.

Concerns are often expressed about the impact of aging on the cost of health care. The percentages of the population older than 65 years for 1991 are displayed in the last column of Exhibit 2.2. In Canada, 11.6% of the population was 65 years of age and older in 1991. This was below the OECD average of 13.4%.

All of the OECD countries are in the process of reorganizing and restructuring the financing of health services and are striving to control costs while ensuring equity and quality of care. Canada is noted for its relatively high expenditures on health care and its above average performance on basic health outcomes. Exhibit 2.3 displays the average per capita GDP, total health expenditures per capita and total health expenditures as a percentage of GDP in US dollars for the OECD countries in 1992.[9-11] Canada's GDP per capita was $19,100 — $2,758 above the average for OECD countries — and its per capita expenditure on health care was $1,948 — $563 above the average.

Health care expenditures as a percentage of GDP are often used to compare the relative amount of resources spent on health care.[9,10] Canada's rate of expenditure in 1992 (10.2% of GDP) was second only to that of the United States (14.0% of GDP). However, in 1992 expenditures as a percentage of GDP in Canada were at an all-time high due to the recession and on-going growth in health expenditures. Since then, not only have jurisdictions in Canada put a cap on health care spending, but there has also been some economic recovery resulting in a greater GDP.

Countries vary in terms of the share of health care expenditures that are covered by public funds.[11] The public share of total health care spending in Canada was 72.1% in 1992. In 1991, the federal government paid for 24.6% of health care expenditures, the provinces paid 46.0% of the costs, private sources contributed 27.8% and the remaining 1.6% came from other sources.[12]

Canada and the Provinces

The variations in demographic and health characteristics across Canadian provinces and territories are as noteworthy as the variations among countries. In this section we present a demographic profile of the provinces along with key health status indicators developed by Statistics Canada (Exhibit 2.4).[7]

The population in Canada was estimated to be 29,413,100 on January 1, 1995. Ontario, with an estimated population of 11,008,400 residents, represents 37.4% of the Canadian population.

The baby boom resounded in Canada after World War II when total fertility rates in Canada went from about 3.0 in 1946 to a record high of 3.9 in the early 1960s. The baby bust followed, with the total fertility rate falling to 1.58 in 1987. The total fertility rate increased to 1.71 in 1990 and dropped to 1.66 in 1993. Among the provinces in 1993, Newfoundland had one of the lowest total fertility rates (1.31) in the world. Ontario's fertility rate (1.64) is well below 2.1, the population replacement level. Saskatchewan and Manitoba (1.95 and 1.94, respectively) came close to the replacement rate, and only the Northwest Territories exceeded it (2.67).

There were some variations in mortality rates among provinces in 1993, but they tended to reflect the age composition of the provinces rather than differences in mortality. When one looks at life expectancy at birth for men and women, the figures for Ontario were very close to the national average of 81.2 years for women and 75.0 years for men.

In 1994, an estimated 11.9% of Canadians were 65 years of age and older. The proportion of people in this age group varied from 9.5% in Alberta to 14.4% in Saskatchewan. The proportion in the Yukon and Northwest Territories was much lower.

Ontario had a substantial increase in population (5.7 per 1,000), largely because of net international migration, exceeded only by that of British Columbia (18.4 per 1,000). Newfoundland (–11.2 per 1,000), Manitoba (–1.0 per 1,000) and Saskatchewan (–2.6 per 1,000) had negative flows of migration. The net flows for the other provinces were less than 1%.

Canadian population trends in the future will be determined to a large extent by the balance between natural growth and immigration. The implications of these trends for health care planning have to be considered. For example, fewer births will imply less need for maternity, neonatal and pediatric services. On the other hand, immigrants tend to be young adults, and their demand on health care services may be lower than average. In turn, health care service delivery will require sensitivity to specific cultural and ethnic needs.

Data on health care expenditures are available from the summary report on National Health Expenditures in Canada, from 1975 to 1994.[12] The 1994 data showed that health care expenditures per capita for Canada were $2,478, 9.7% of the GDP. The variations among provinces were relatively minor, except for the Yukon and Northwest Territories. However, when put into the context of the GDP, the variations in expenditures were more marked. In Ontario, total health expenditures per capita were $2,614 and 9.5% of the GDP in 1994.

Ontario and its Regions

To assess the health of people in Ontario, we include indicators based on a framework proposed by the MOH.[13] The Community Health Framework Project was developed by the MOH as part of a move toward a more coordinated,

Exhibit 2.3: ***Expenditures by OECD Countries on Health Care - 1992 and Growth from 1982 to 1992***

Country	Gross Domestic Product (GDP) per Capita, 1992 * (US$)	Health Care Expenditures per Capita, 1992 ✢ (US$)	Health Care Expenditures as a % of GDP, 1992 **	% of Health Care Expenditures Which are Publicly-funded *	Annual Real Growth Rate in per Capita Health Care Expenditures, 1982 - 1992 ***
Australia	16,800	1,327	7.9	67.6	2.4
Austria	18,100	1,593	8.8	65.2	3.1
Belgium	18,200	1,492	8.2	88.9	2.7
Canada	19,100	1,948	10.2	72.1	4.1
Denmark	17,800	1,157	6.5	82.0	1.6
Finland	14,500	1,363	9.4	79.3	4.3
France	18,600	1,748	9.4	74.8	3.2
Germany	20,400	1,775	8.7	71.5	2.4
Greece	6,300	340	5.4	76.1	3.3
Iceland	17,100	1,454	8.5	85.2	1.9
Ireland	12,400	880	7.1	76.1	1.7
Italy	17,500	1,488	8.5	75.2	4.4
Japan	19,700	1,359	6.9	71.2	4.3
Luxembourg ✢✢	21,800	1,613	7.4	91.4	3.7
Netherlands	17,000	1,462	8.6	76.6	2.2
New Zealand	14,400	1,109	7.7	79.0	1.7
Norway	17,600	1,461	8.3	94.8	4.3
Portugal	9,800	686	7.0	69.8	3.6
Spain	12,900	903	7.0	80.5	4.5
Sweden	16,700	1,319	7.9	85.6	0.1
Switzerland	22,300	2,074	9.3	67.9	2.4
Turkey	3,700	152	4.1	65.7	NA
United Kingdom	16,300	1,157	7.1	84.4	3.8
United States	23,200	3,248	14.0	45.7	5.1
Unweighted Average	16,342	1,385	8.1	76.1	3.1
Ontario(US$) ****	20,959	2,058	9.8	74.1	3.8

NA - Not Available
✢ Derived by multiplying GDP per capita by % GDP spent on health care
✢✢ Data on percentage of health costs which are publicly-funded are for 1990

Data Source:

* *OECD. The Reform of Health Care Systems: A Review of Seventeen OECD Countries. Health Policy Studies No. 5,1994. Table 4*
** *OECD. New Directions in Health Care Policy, Health Care Policy Studies No.7, 1995. Table 1*
*** *OECD. Internal Markets in the Making: Health Systems in Canada, Iceland and the United Kingdom, Health Policy Studies No. 6, 1995. Table 1.2*
**** *Health Canada. National Health Expenditures in Canada, 1975-1994*

community-based model of health care delivery in Ontario. In February 1995, a consultation draft of one component of the project — a model for a Community Health Profile (CHP) — was released. It provides a standard tool for the assessment of health status and the identification of health issues in Ontario communities so that informed decisions about health care services and healthy public policy can be made. The CHP serves as a foundation for community health assessment and may provide consistency in inter-community comparisons.

The CHP identified 64 health indicators extrapolated from many sources, including the 1992 Health Canada User's Guide to 40 Community Health Indicators [14] and other community health profile reports. The final selection of indicators was based on the availability of data at the community level; adequate documentation about the indicator; the validity, comprehensiveness and practicality of the indicator in its measurement at the community level (county, PHU or DHC); and the ability to assess the broad definition of health, including disease burden, health behaviours, social issues and wellness.

Exhibit 2.5 outlines the indicators

Exhibit 2.4: ***Recent Demographic Indicators for the Canadian Provinces and Territories***

Indicator	Year	Newfound-land	PEI	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon	NWT	Canada
Population (thousands) *	1994 1995	583.0 578.8	132.5 133.9	921.6 928.8	746.1 750.6	7,262.1 7,302.8	10,877.1 11,008.4	1,126.8 1,132.9	1,011.5 1,014.6	2,703.6 2,729.6	3,626.2 3,718.9	29.6 29.7	64.3 65.4	28,973.2 29,413.1
Birth Rate per 1,000 **	1994	10.9	12.5	12.2	11.8	12.5	13.4	14.7	13.8	14.7	12.8	16.4	24.2	13.2
Mortality Rate per 1,000 **	1994	6.9	8.9	8.2	7.8	7.4	7.1	8.3	8.2	5.9	7.4	4.0	3.5	7.2
Total Fertility Rate ***	1993	1.3	1.7	1.6	1.5	1.6	1.6	1.9	2.0	1.8	1.6	1.9	2.7	1.67
Rate of Natural Increase per 1,000 *	1994	4.0	3.6	4.0	3.9	5.2	6.3	6.3	5.6	8.8	5.4	12.3	20.7	6.0
Total Growth Rate per 1,000 *	1994	-7.2	5.8	3.9	3.6	5.6	12.0	5.4	3.0	9.6	25.2	2.1	16.6	10.4
Percent of Population 65 Years and Over ****	1994	10.0	13.0	12.7	12.3	11.7	12.0	13.5	14.4	9.5	12.8	4.4	2.7	11.9
Total Age Dependency Ratio (%) ✣	1994	54.9	64.6	57.5	57.1	54.2	56.3	64.8	73.0	57.9	56.7	47.4	67.1	56.9
Life Expectancy at Birth (in years) **:														
Women	1993	80.1	82.8 ✣✣	80.6	80.9	81.1	81.2	80.9	82.0	81.2	81.6	NA	NA	81.2
Men	1993	74.1	74.2	74.2	74.4	74.2	75.3	74.7	75.6	75.6	75.5	NA	NA	75.0
Infant Mortality Rate per 1,000	1993	7.8	9.1	7.1	7.2	5.7	6.2	7.1	8.0	6.7	5.7	7.9	9.6	6.3
Total Health Expenditures:														
$ per Capita ✣✣✣	1994	2,259	2,299	2,231	2,389	2,263	2,614	2,547	2,352	2,400	2,631	3,231	5,604	2,478
% of GDP ✣✣✣	1994	13.5	12.7	11.3	12.1	9.9	9.5	11.5	10.3	7.9	9.7	10.6	18.4	9.7

NA - Not available
* Revised postcensal data based on 1991, as of September 18, 1995
** Preliminary
*** Number of births per woman (15 - 49 Years)
**** Final postcensal data based on 1991, as of September 18, 1995
✣ Preliminary postcensal data based on 1991, as of September 18, 1995
✣✣ Abridged life table estimates. Life Tables, Canada and the Provinces, 1990-1992, Statistics Canada
✣✣✣ Health Canada. National Health Expenditures in Canada, 1995

Data Source: Statistics Canada, Demography Division, Report on Demographic Situation in Canada, 1995

Exhibit 2.5: ***Selected Community Health Profile Indicators, Ontario Ministry of Health, 1995***

Indicators	Source and Year
Demographic:	
Population by Age and Sex	Census, 1991
Population Projections, 1991 - 2011	Statistics Canada, 1990 **
Distribution of Dependent Age Groups	Ministry of Trade and Finance, 1994
Household Type	National Population Health Survey, 1994
Pineo-Porter SES Scale *	National Population Health Survey, 1994
Major Daily Activity *	National Population Health Survey, 1994
Single-Parent Families	Census, 1991
Population by Home Language	Census, 1991
Economic:	
Education Level of Population 15 and Over	Census, 1991
Unemployment	Census, 1991
Average Family Income	Census, 1991
Population Below Low-Income Cutoff	Census, 1991
Households Paying 30% or More of Household Income on Housing	Census, 1991
Social:	
Violent Crime Rate	Canadian Centre for Justice Statistics, 1994
Well-being Index	Ontario Health Survey, 1990
Teenage Fertility	Canadian Institute for Health Information, 1994
Physical:	
Number of Hours of Moderate/Poor Air Quality	Ministry of Energy and Environment, 1994
Health Related Practices:	
Participation in Physical Activity	National Population Health Survey, 1994
Body Mass Index	National Population Health Survey, 1994
Number of Alcoholic Drinks per Week	National Population Health Survey, 1994
Cigarette Smoking Status	National Population Health Survey, 1994
Breast Cancer Screening	National Population Health Survey, 1994
Cervical Cancer Screening	National Population Health Survey, 1994
Health Status:	
Restriction of Activity Due to Disability	National Population Health Survey, 1994
Self-perceived Health	National Population Health Survey, 1994
Health Utility Index *	National Population Health Survey, 1994
Lost Work Time Due to Injury	Workers' Compensation Board, 1994
Suicide Mortality Rate	Vital Statistics, 1992
Motor Vehicle Injury Mortality Rate	Vital Statistics, 1992
Infant Mortality Rate	Vital Statistics, 1992
Low Birth Weight	Canadian Institute for Health Information, 1994
Life Expectancy	Vital Statistics, 1992
Standard Mortality Ratio (SMR) *	Vital Statistics, 1992
Chronic Health Problems	National Population Health Survey, 1994
Leading Causes of Hospital Separations	Canadian Institute for Health Information, 1994
Leading Causes of Hospital Patient Days	Canadian Institute for Health Information, 1994
Leading Causes of Death	Vital Statistics, 1992
Loss of Life Potential	Vital Statistics, 1992

* Indicators added to MOH Community Health Profile
** Perrault J. Population projections for Canada, Provinces and Territories 1989 - 2011, Statistics Canada, 1990

presented here and their respective data sources. The indicators are presented by Ontario Ministry of Health Planning region. The North West and North East health planning regions are aggregated to be consistent with the National Population Health Survey data, which combines these regions. A more comprehensive selection of indicators is available by DHC and PHU in the electronic edition of the Atlas.

We present selected indicators in five categories: population trends; demographic, economic, social and physical factors; health-related practices; health status indicators; and leading causes of morbidity and mortality. Each of the following sections includes the data source used, the methods for calculating the indicators and the findings.

Population Trends

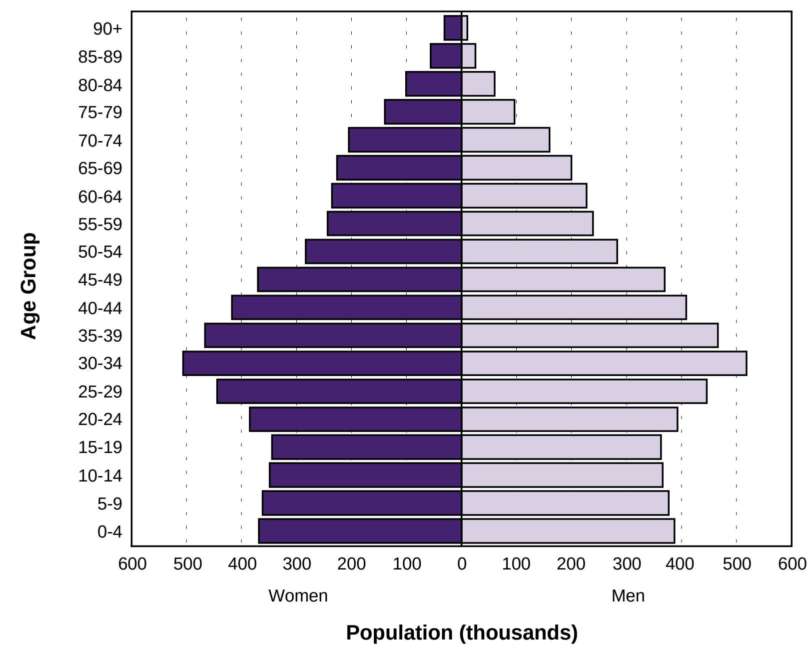
The age structure of a population and population projections are important for long-term planning. This forecasting requires assumptions about fertility rates over time, changes in age-specific mortality patterns, life expectancies at various ages and the number of immigrants each year.

Statistics Canada provides different projections based on high, medium and low estimates of these variables.[15] We present projections based on the medium estimates. The age-dependency ratio is the number of people who are in age groups not usually in the workforce, divided by the number of those who are in age groups typically in the workforce. This ratio can be calculated for seniors, as well as for children and adolescents typically too young to be in the workforce, or for both groups.

We used adjusted intercensal population estimates from the Ministry of Trade and Finance to depict Ontario's age and sex population distribution in 1994, population projections for Ontario and proportions of dependent age groups for Ontario and its regions.

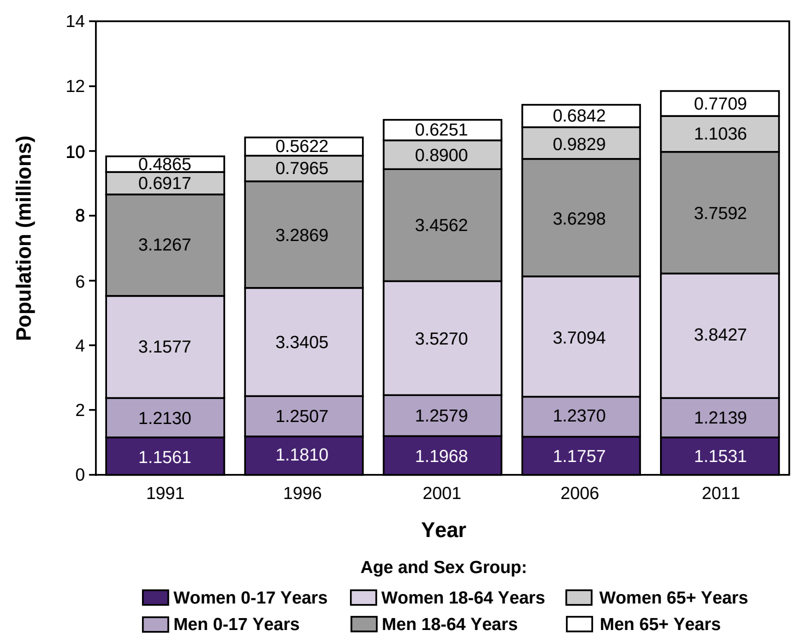
The population in Ontario is projected to grow from 9.8 million in 1991 to 11.8 million in 20 years. (Exhibits 2.6 and 2.7) In 1994, there was little

Exhibit 2.6: ***Ontario Population Distribution by Age and Sex, 1994***



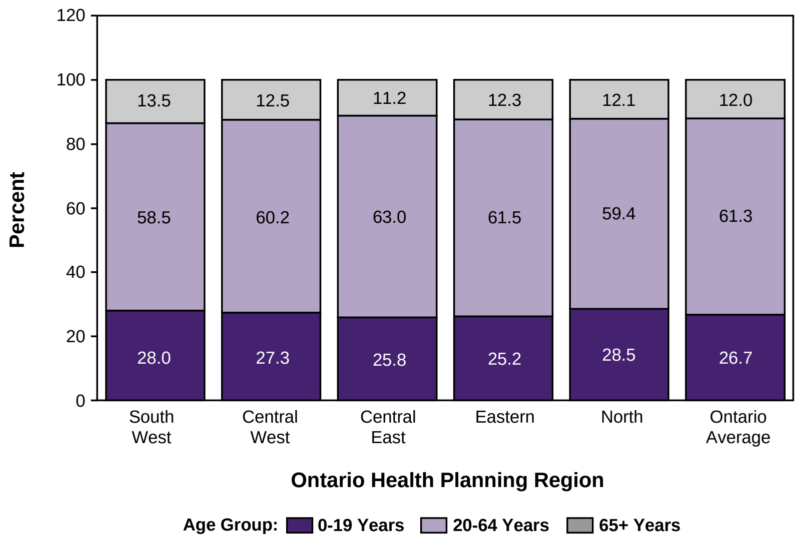
Data Source: Ministry of Trade and Finance Intercensal Population Estimates

Exhibit 2.7: ***Population Projections (millions) by Age and Sex in Ontario, 1991–2011***



Data Source: Perrault J: Population Projections for Canada, Provinces and Territories, 1989-2011, Demography Division, Population Projections Section, Statistics Canada, Ottawa, 1995

Exhibit 2.8: ***Population Distribution by Age Group and Ontario Health Planning Region, 1994***



Data Source: Ministry of Trade and Finance Intercensal Population Estimates, 1994

variation in the age-dependency ratio among regions (Exhibit 2.8). If the total fertility rate and rate of growth through immigration remain at current or lower levels, the number of children and youth should remain relatively stable, at 2.4 million, over the 20 year interval. However, the number of people 65 years of age and older is expected to increase from about 1.2 million to 1.9 million during the same period.

There is recurrent speculation concerning the impact of the increase in the elderly population on future pension plans and health care costs. Based on examination of costs in Canada from 1960 to 1990, economists have determined that the aging of the population alone will not pose an impending crisis for the health care system and expenditures. The extent, patterns and intensity of medical, hospital and residential care services for the aged will also be important factors when considering future health care utilization and costs. [16]

Demographic, Economic, Social and Physical Indicators

Demographic, social and economic indicators are presented in Exhibit 2.9. Part B of the Census, which is based on a sample of 20% of the population, was used to calculate indicators such as highest education level attained, proportion of individuals and families with low income, home language, employment status, family income, and the percentage of those spending more than 30% of their income on housing. We present percentages by health planning region with the use of the adjusted 1991 Census population estimates as the denominator. These variables are not presented by age and sex because these breakdowns are not available through the standard Census data files.

The National Population Health Survey (NPHS) is the first of a series of national health surveys planned by Statistics Canada and the provinces to improve the availability of population health information. [17] The survey was conducted in 1994 and 1995 by Statistics Canada. The national sample excludes people living on Indian reserves, on Canadian Armed Forces bases, in remote areas and in institutions. The survey was conducted in two parts. The first was a comprehensive questionnaire for every resident of sample households and was administered by a trained interviewer. In Ontario, this section included 17,221 respondents. Sample weights were assigned to represent the entire Ontario population. The second part was a self-completed questionnaire given to one person 12 years of age or older in each sample household, resulting in an Ontario sample of 5,187. The lowest geographic level of aggregation in the survey is the health planning region, with the North West and North East regions combined. We observed Statistics Canada's requirements for suppression of data based on small numbers or statistics with a high coefficient of variation.

Therefore, many indicators cannot be broken down by age and sex, even at the regional level.

Three demographic indicators from the 1994 National Population Health Survey are presented in Exhibit 2.9: household type, which allows examination of changing family structures; Pineo-Porter-McRoberts socioeconomic scale, which is based on a person's occupation; and major daily activity.

The Pineo-Porter-McRoberts scale consists of 16 occupational classes. We grouped these classes into three levels. The first level (classes 1 to 6) includes those who are self-employed, professionals, managers, semi-professionals and technicians. Level 2 (classes 7 to 11) includes supervisors, foremen and forewomen, tradespeople, and skilled clerical, sales and service personnel. Level 3 (classes 12 to 16) consists of semi- and unskilled clerical, sales and service personnel, manual workers, and farm labourers. [17,18] The proportion of people who fall within these three occupational levels are presented. The denominator for the proportions is the number of people currently working in each region.

Violent crime data for 1994 are presented as an indicator of the social environment. Violent crime, as defined by the Canadian Centre for Justice Statistics (CCJS), includes homicide, murder, manslaughter, infanticide,

Exhibit 2.9: ***Demographic, Social and Economic Indicators by Ontario Health Planning Region***

	South West (%)	Central West (%)	Central East (%)	Eastern (%)	North (%)	Ontario (%)
Household Type: (Ages 12+) *						
Couple with Children	53.4	53.5	60.2	50.8	49.2	55.8
Couple Alone	24.1	24.3	17.4	23.4	26.7	21.2
Single Parent	8.0	8.3	8.5	8.6	9.1	8.5
Single Alone/with Others	13.5	12.4	12.2	15.8	13.2	13.1
Pineo-Porter SES Scale: (Ages 12+) *						
Level 1	24.8	33.7	33.4	36.6	30.2	32.6
Level 2	23.2	23.2	21.4	18.0	26.5	21.9
Level 3	52.0	43.1	45.2	45.4	43.2	45.6
Major Daily Activity: (Ages 12+) *						
Working for Pay	48.8	52.5	53.4	47.1	46.5	51.0
Caring for Family	12.9	13.2	12.6	10.4	15.1	12.6
Going to School	10.4	10.3	10.9	13.3	8.2	10.9
Retired	18.1	13.5	12.4	15.0	16.8	14.1
Other	* 5.4	5.2	6.1	8.1	7.8	6.2
Home Language: **						
English	94.0	92.3	81.8	84.5	83.6	86.1
French	0.6	0.7	0.5	11.0	12.7	3.1
Other	5.4	7.0	17.7	4.5	3.7	10.9
Education: (Ages 15+) **						
High School Incomplete	36.8	35.0	31.6	29.5	40.7	33.4
High School Complete	15.2	14.6	13.7	14.6	13.8	14.3
Some Post Secondary Education	39.4	40.5	41.0	41.5	38.5	40.5
University Degree	8.6	10.0	13.8	14.4	7.0	11.9
Unemployment: (Ages 25+) **						
Men	8.5	7.2	7.4	6.3	8.7	7.4
Women	7.4	7.2	7.8	6.8	8.5	7.5
Total	7.6	7.2	7.6	6.5	8.6	7.5
Family Income: **						
Under $20,000	12.6	11.3	11.8	12.1	15.3	12.1
$20-34,999	19.6	17.3	15.3	16.9	19.7	16.9
$35-49,999	22.3	20.9	18.2	19.9	21.0	19.8
$50,000+	44.9	50.0	54.2	50.6	43.5	50.7
Low Income Level: **						
Families	9.4	9.8	11.6	9.9	11.3	10.7
Individuals	31.5	33.9	30.5	33.1	36.1	32.1
Paying >30% of Income on Housing: **						
Owners	12.0	16.2	20.2	13.1	12.0	16.3
Renters	29.2	29.9	30.1	26.5	30.0	29.4
Violent Crime Events: ***	1.0	1.0	1.1	1.2	1.7	1.1
Low Well-being (Age/Sex-adjusted) ✢	13.3	14.0	14.5	13.8	14.4	14.0
Teenage Fertility Rate (15-19 Years) ✢✢	4.0	2.3	2.0	2.6	2.7	2.4

Data Source:
** National Population Health Survey, 1994*
*** Census, 1991*
**** Canadian Centre for Justice Statistics, 1994*
✢ *Ontario Health Survey, 1990*
✢✢ *Canadian Institute for Health Information (CIHI), 1994*

attempted murder, assault, rape, abduction and robbery. Comprehensive crime statistics for 116 municipal police forces, 189 Ontario Provincial Police (OPP) detachment offices (both urban and rural), five Royal Canadian Mounted Police (RCMP) detachments and two railway police forces were obtained from the CCJS. Each municipal force was matched to the county and, ultimately, to the health planning region where it was located. Population rates were then calculated for all violent crimes reported in each region. The data are not based on the residence of the perpetrator or victim, or even the location of the crime, but on the location of the force or detachment reporting the crime. No cases of violent crime were reported from the RCMP, and only 44 events were reported from the railway forces. These cases were not included because they could not be assigned to a specific region.

As a social indicator, we present a measure of self-reported overall well-being taken from responses to the 1990 Ontario Health Survey (OHS). The well-being scale, developed by H.J. Dupuy, comprises seven indicators: energy, control of emotion, state of morale, interest in life, perceived stress, perceived health status and satisfaction with relationships.[19] Age/sex-adjusted percentages of low well-being by health planning region are presented with the use of the weighted population from the OHS as the standard. As well, teenage fertility rates, derived from CIHI data, are also presented as a social measure. This is calculated as the number of births to women 15 to 19 years of age, divided by the number of women in this age group.

As Exhibit 2.9 shows, the demographic characteristics of the five health planning regions were relatively similar, except for language spoken at home. In this regard, a higher proportion of French speaking people were found in the North and Eastern regions and almost a fifth of the population in the Central East region spoke neither English nor French at home. The indicators suggest that the relative socioeconomic status was highest in the Eastern regions of the province and lowest in the North. The Central East region had a large proportion of residents with an annual family income of more than $50,000; however, a relatively large proportion of low-income families and those paying 30% or more on housing was also observed. This phenomenon may reflect the high cost of living in the Greater Toronto area.

The above-noted indicators can influence not only health status, but also health care utilization. For example, cultural and linguistic aspects and the literacy skills of a population can be barriers to access and use of appropriate health care services. Local planners have to assess such factors in the planning and evaluation of health care services. Many of these data are presented by PHU and DHC in the electronic version of the Atlas.

Environmental factors also play a role in determining the health of a population. An index of air quality for each monitoring station was provided by the Ministry of the Environment and Energy.[20] The Air Quality Index (AQI) is a measure of the concentration of pollutants that have adverse environmental effects. It is given on a scale of 0 to 100+ and is calculated every hour from 30 monitoring sites in 24 cities or areas across Ontario. The Ministry provided information regarding the number of hours per year that the AQI was very good (0 to 15), good (16 to 31), moderate (32 to 49), poor (50 to 99) or very poor (100+). These data represent air quality at a specific geographic point, not for an entire region.

The number of hours that the AQI is higher than 31 (moderate, poor or very poor conditions) and the number of days when the AQI exceeded 31 for more than one hour in 1994, are presented for each monitoring station in Exhibit 2.10. The monitoring station in Fort Frances in the North West region reported 585 hours of poor air quality and 160 days when the AQI was greater than 31 for at least one hour. Conversely, Ottawa reported zero hours of poor air quality. It is not possible to extrapolate air quality in a given region from the assessments at any of these monitoring stations, since a single source of emissions can drastically affect the levels observed at a given station.

Health-related Practices

The NPHS was used to describe health-related practices across areas in Ontario. We present the proportion of the population 12 years of age and older reporting the following health-related practices: regular participation in physical activity 12 times or more per month; Body Mass Index for people 20 to 64 years of age only; number of alcoholic drinks consumed one week before the survey; smoking status; utilization of mammography in the two years before the survey for women aged 50 to 69; and Pap smear utilization for women aged 16 and over. Percentages are presented by health planning region but not by age because of the small cell frequencies involved. The weighted NPHS population was used as the denominator in the percentage calculation. Data for similar health-related practices at the PHU and DHC level from the 1990 OHS are presented in the electronic edition of the Atlas.

As Exhibit 2.11 shows, there is little variation among health planning regions for these values for both men and women. Since the NPHS sample size for each region is about 1,000, confidence intervals for these estimates were quite wide, particularly for estimates in subgroups of the population. This statistical instability may be the reason for much of the variation seen.

Only about half the Ontario adult population reported participating in physical activity 12 or more times per month. While even modest and intermittent physical activity is beneficial, a strong relationship between exercise and the prevention of heart disease and osteoporosis has been demonstrated for participation in physical activity 12 or more times per month. In addition to disease prevention, regular exercise can also result in improved well-being, mental health and self-confidence.

About a quarter of the adult population was found to be overweight on the basis of the Body Mass Index, which defines ranges for underweight, healthy weight and overweight according to height. Furthermore, another 17% of women and almost a third of men had some excess weight according to this index. As a result, less than half of the women and about a third of the men had an acceptable weight. This finding raises concern, since obesity is linked to many health problems such as diabetes and heart disease.

Although moderate levels of alcohol consumption may have some health benefits, higher levels of consumption have overwhelmingly negative consequences. High levels of alcohol consumption can have a major social toll on individuals, their families and their work. Physical effects of increased alcohol use include organ damage affecting various systems such as

Exhibit 2.10: ***Number of Hours and Days with Moderate, Poor or Very Poor Air Quality by Monitoring Site, Health Planning Region and District Health Council in Ontario, 1994***

Monitoring Site	District Health Council	Number of Hours AQI >31 *	Rank	Number of Days at Least 1 Hour AQI >31 *	Rank
South West					
London	Thames Valley	42	20	15	21
Sarnia	Lambton	41	21	16	18
Windsor College	Essex County	135	4	41	5
Windsor University	Essex County	54	17	11	25
Central West					
Burlington	Halton	106	8	28	13
Hamilton Downtown	Hamilton-Wentworth	205	2	51	4
Hamilton East	Hamilton-Wentworth	59	16	23	15
Hamilton Mountain	Hamilton-Wentworth	60	15	20	16
Hamilton West	Hamilton-Wentworth	92	11	28	11
Kitchener	Waterloo Region	44	19	16	19
Niagara Falls	Niagara	21	26	12	24
Oakville	Halton	118	7	35	9
St. Catharines	Niagara	64	13	18	17
Central East					
Etobicoke West	Metropolitan Toronto	99	9	38	7
Etobicoke South	Metropolitan Toronto	99	10	30	10
Mississauga	Peel	73	12	35	8
North York Central	Metropolitan Toronto	40	22	16	20
Oshawa	Durham Region	60	14	25	14
Scarborough	Metropolitan Toronto	44	18	7	27
Toronto Downtown	Metropolitan Toronto	18	27	6	29
Toronto West	Metropolitan Toronto	28	25	14	22
York	York Region	132	5	39	6
Eastern					
Cornwall	Eastern Ontario	127	6	59	3
Kingston **	Kingston, Frontenac and Lennox & Addington	172	3	63	2
Ottawa	Eastern Ontario	0	30	0	30
North					
North Bay	Nipissing/Timiskaming	14	28	6	28
Sault Ste. Marie	Algoma	39	23	28	12
Sudbury	Manitoulin-Sudbury	10	29	8	26
Fort Frances	Kenora-Rainy River	585	1	160	1
Thunder Bay	Thunder Bay	29	24	12	23

* AQI - Air Quality Index defined by Ontario Ministry of Energy and the Environment
** Reported approximately 50% of hours

Data Source: Ontario Ministry of Energy and the Environment, 1994

Exhibit 2.11: *Selected Health-related Practices for People 12 Years and Over by Sex and Ontario Health Planning Region, 1994**

	South West		Central West		Central East		Eastern		North		Ontario	
	Women (%)	Men (%)	Women (%)	Men (%)	Women (%)	Men (%)	Women (%)	Men (%)	Women (%)	Men (%)	Women (%)	Men (%)
Physical Activity												
At Least 12 Times per Month	47.6	57.1	53.7	52.3	46.8	52.3	52.7	62.0	57.3	49.9	49.8	54.2
4-11 Times per Month	19.1	20.3	19.5	18.4	19.8	19.5	23.0	13.6	16.0	18.2	19.8	18.4
0-3 Times per Month	28.5	16.8	23.2	17.2	27.6	20.7	23.3	17.5	23.6	18.7	26.0	18.9
Body Mass Index: (20 - 64 Years Only)												
Insufficient Weight (<20)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	12.1	3.6
Acceptable Weight (20-24)	45.9	33.9	49.2	35.6	45.3	40.6	41.2	37.8	46.3	27.0	45.6	37.2
Some Excess Weight (25-27)	15.6	32.0	16.7	34.9	16.3	30.8	19.0	31.2	16.6	34.0	16.7	32.1
Overweight (28+)	25.7	31.9	18.3	24.8	20.6	24.1	24.9	26.3	23.4	36.4	21.6	26.6
Alcohol Consumption:												
No Drinks in Past Week	36.1	30.7	38.1	29.4	35.7	27.8	34.8	27.1	40.8	32.4	36.4	28.8
1-11 Drinks in Past Week	30.1	30.2	36.2	36.1	30.3	39.2	32.8	37.4	36.2	35.8	32.2	36.8
12+ Drinks in Past Week	NR	15.2	NR	13.7	NR	11.9	NR	11.9	NR	13.6	2.3	12.8
Smoking Status:												
Current Daily/Occasional	27.2	26.4	28.5	31.9	24.2	26.4	29.3	28.2	30.9	30.4	26.6	28.1
Former	28.0	34.5	28.0	31.1	20.4	35.7	26.6	33.3	30.4	35.0	24.4	34.3
Never	44.8	39.2	43.5	37.1	55.4	37.9	44.0	38.5	38.7	33.6	49.0	37.7
Mammogram in Past:												
Two Years (50 - 69 Years Only)	59.3		56.5		56.7		64.6		50.9		57.5	
Pap Smear Ever	77.6		78.1		69.8		77.0		78.6		74.1	

NR - Not Reportable due to sample size
* Indicators may not add to 100 due to non-reportability of "not stated" categories

Data Source: National Population Health Survey, 1994 cirrhosis of the liver, peripheral neuropathy and several forms of central nervous system damage. Finally, the role of alcohol in traffic accidents, fires, domestic violence and other crimes also has tremendous societal effects. The Ontario population was split into thirds in terms of consumption: about one-third reported no alcohol consumption, one-third reported moderate consumption of one to 11 drinks a week. About 13% of men and 2% of women reported high consumption of 12 or more drinks a week.

About a quarter of the Ontario population consisted of current smokers. A quarter of all women and almost a third of men were former smokers, which reflects the continuing trend toward smoking cessation. As a result, half the women and about a third of men had never smoked.

Mammography every two years in women 50 to 69 years of age has been shown to reduce the risk of death from breast cancer. In 1994, about 57% of Ontario women 50 to 69 years of age reported having had a mammogram in the last two years. This rate has increased substantially, from 36% observed in the 1990 OHS. This increase may be, at least in part, due to the Ontario Breast Screening Programs, as well as to increased publicity and awareness among women and their physicians of the benefits of regular mammography in this age group.

Regular Pap smears are known to reduce the risk of cervical cancer. In 1994, three-quarters of Ontario women reported having had a Pap smear at some time. Of the remaining 25%, half did not answer the NPHS question and half reported that they had never had one. We have shown that there are identifiable characteristics common to women who report never having had a Pap smear, including being a recent immigrant and speaking neither English nor French in the home.[21] Efforts to improve public education about, and utilization of, Pap smears are under way in Ontario through the Collaborative Cervical Screening Group.

Health Status Indicators

This section presents subjective measures of self-reported health from the NPHS and objective measures from other data sources for each health planning region and for the entire province by sex. These indicators provide a picture of the health or illness of the specified populations (Exhibit 2.12). Sex-specific percentages of restricted activity are presented for those aged 12 and over who responded that they had some restriction of activity due to a chronic health problem. Similarly, the proportion of those aged 12 and over who described their health as fair or poor are presented.

The Health Utility Index (HUI) is a provisional summary index of individual health status being developed by McMaster University's Centre for Health Economics and Policy Analysis.[22] The index comprises eight weighted attributes: vision, hearing, speech, mobility, dexterity, cognition, emotion, and pain and discomfort, combined to create a summary value from 0 (death) to 1 (complete health). For instance, a person who is near-sighted, but otherwise in perfect health for the seven other attributes of health, receives a score of 0.95, or 95% of complete health. The HUI was included in both the Ontario Health Survey and the National Population Health Survey. For presentation we have used the proportion of the population with a score of 0.95 or greater as an indicator of health status.

Workers' Compensation Board (WCB) data provide an estimate of lost work time due to accidents during a given year as an indicator of health and health risks for those in the labour force. The rate of claims for lost time injuries occurring in 1994 for workers 15 to 64 years of age is calculated with total labour force participants as the denominator. This population based denominator is different from that routinely used by the WCB, which is based on number of hours worked, calculated from payroll estimates provided by employers.

The incidence of low birth weight was derived from 1994 CIHI data and was defined as the number of live births, in which the infant weighed less than 2,500 g, divided by the number of live births. In addition, three specific mortality indicators based on 1992 Vital Statistics data are presented because of their social importance: infant mortality, suicide and motor vehicle mortality. The standardized mortality ratio (SMR) is also presented to provide a summary measure of relative mortality.[23] This indicator adjusts for differences in age distributions among regions and represents the ratio of the observed mortality in a region to that expected on the basis of provincial rates. Thus, a ratio of less than one means that mortality rates are less than the provincial average.

Finally, life expectancy at birth, life expectancy at age 15 and health-adjusted life expectancy at age 15, based on information from 1992 Vital Statistics and the NPHS, are presented as indicators of health status across Ontario regions. Life expectancy gives a cross-sectional view of the mortality of a population during a particular period of time. For example, life expectancy at birth for Ontario from 1988 to 1992 would be the average lifespan of a baby subject to the age-specific mortality rates of 1988 to 1992 throughout his or her entire life. In this chapter, life expectancy is derived from abridged life tables calculated with the use of a modified approach by Chaing.[24] Age-specific death rates were calculated for the 19 traditional age groups (0, 1 to 4, 5 to 9, and so on up to 85 years or older) on the basis of Registrar General mortality files from 1988 to 1992 and the 1990 population. The five years of data are combined in order to compensate for the small numbers at regional and local levels.

Health-adjusted life expectancy is a method of combining life expectancy with an index of health to give an overall single measure of mortality and morbidity. We used the Sullivan

Exhibit 2.12: ***Health Status Indicators by Sex and Ontario Health Planning Region***

	South West		Central West		Central East		Eastern		North		Ontario	
	Women (%)	Men (%)	Women (%)	Men (%)	Women (%)	Men (%)	Women (%)	Men (%)	Women (%)	Men (%)	Women (%)	Men (%)
Restriction of Activity Due to Chronic Health Problem (12+ Years) *	23.5	21.6	23.3	23.7	19.8	18.5	20.1	20.3	29.7	27.4	21.8	20.9
Fair/Poor Health Status (12+ Years) *	13.8	7.7 ✢✢	11.8	9.6	10.6	8.9	11.3	8.4 ✢✢	14.4	13.9	11.6	9.1
Health Utility Index >.95 (12+ Years) *	49.6	56.8	54.1	55.0	52.3	56.4	50.7	59.3	48.3	54.4	51.0	56.4
Claims for Lost Work Time Injuries in 1994 (15-64 Years) **	1.7	3.2	1.4	3.1	1.4	3.0	1.3	2.2	1.5	2.7	1.5	2.9
Low Birth Weight (<2,500 g) ***	6.0	5.3	6.0	5.4	6.4	5.9	5.8	5.3	5.6	5.0	6.1	5.6
Age-adjusted Standard Mortality Ratio (SMR) ✢	1.06	1.05	1.02	1.00	0.94	0.93	1.03	1.01	1.04	1.16	1.00	1.00
Suicide Mortality ✢	0.2	0.3	0.2	0.2	0.2	0.4	0.1	0.4	0.2	0.6	0.2	0.4
Motor Vehicle Accident Mortality ✢	1.0	1.8	0.7	1.7	0.8	1.6	1.1	2.2	1.7	2.8	0.9	1.9
Infant Mortality ✢ (Both Sexes)	0.6		0.5		0.6		0.6		0.7		0.6	
Life Expectancy at Birth (Years) ✢✢✢	80.4	74.3	80.9	74.8	81.5	75.5	80.0	74.2	79.2	73.0	80.9	74.8
Life Expectancy at Age 15 (Years) ✢✢✢	66.2	60.2	66.6	60.8	67.2	61.4	65.8	60.2	65.1	58.8	66.6	60.7
Health-adjusted Life Expectancy at Age 15 (Years) ✢✢✢	59.8	54.9	59.2	55.4	60.6	56.1	59.0	54.5	57.7	52.8	59.8	55.2

✢✢ Interpret with caution due to sampling variability

Data Source:
** National Population Health Survey, 1994*
*** Workers' Compensation Board (WCB), 1994*
**** Canadian Institute for Health Information (CIHI), 1994*
✢ *Vital Statistics, 1992*
✢✢✢ *Vital Statistics, 1990 and Ontario Health Survey 1990; Doug Manuel, University of Toronto*

method[25] to combine the age-specific years lived in each group with a weight corresponding to the age-specific Health Utility Index (described previously in this chapter). The result is a measure, not only of the length of life, but of the quality of years lived.

As Exhibit 2.12 shows, health status measures were relatively consistent among the provincial regions for men and women. Overall, women had a lower perception of their health status than men, whereas men were twice as likely to lose work time because of injury than women. Men living in the North had a higher rate of death and a higher proportion of deaths due to motor vehicle accidents than the provincial rate.

Comment

We lack a good, comprehensive measure that gives a holistic view of population health among the regions of the province. In examining the health behaviours and health status indicators individually, there are minor variations among the health planning regions. However, in scanning across the indicators, it becomes clear that the health status of residents living in the Northern areas of Ontario is lower than for those in the South.

Although the regional variations in health behaviours and health status indicators are relatively small, the variations by DHC or PHU within each region are much larger. Some of this data is available in the electronic version of the Atlas.

There is a considerable body of international research describing the relationship between the broad social determinants of health and indicators of health status. Ontario in the 1990s is no exception. Using Census and CIHI data at the DHC level, a moderate relationship was observed between low family income and low birth weight (Spearman rank correlation coefficient = 0.44, $p < 0.0106$). However, such data alone cannot resolve whether the disparities observed are due to socioeconomic factors themselves. The regions that have lower family incomes may have more people with poor nutrition resulting in low birth weight infants. Alternatively, these regions may have poor access to health care services for prevention and treatment, such as prenatal care and specialized services. Integration of the data on health determinants, utilization and health status will help to better understand this issue. The major challenge ahead is to identify, develop and evaluate interventions that can improve population health through addressing such determinants of health.

Leading Causes of Morbidity and Mortality

Examination of specific causes of morbidity and mortality may provide insights into future planning of primary prevention strategies and health service management. The traditional source of morbidity data is hospital discharge abstracts. In addition, we provide a subjective measure of morbidity outside the hospital sector from the NPHS — leading causes of self-reported health problems. We provide this information only at the provincial level as the cell sizes at the regional level are too small to be reportable.

Age/sex-specific rates per 100,000 for leading chronic health problems as defined by the NPHS are presented. The survey design does not allow a primary chronic health problem to be assigned to each respondent. Thus, the numerators of the rates include the number and type of health problems, whereas the denominators reflect the number of respondents. Rates are calculated for the age groups 12 to 19, 20 to 44, 45 to 64, and 65 and older, with the weighted survey population as the denominator.

Exhibit 2.13 shows that allergies, migraines, asthma and back problems were the most prevalent causes of self-reported morbidity in people of both sexes, 44 years of age and younger. The estimates of food allergies and migraines for teenage boys, and migraines for girls, were qualified due to a high coefficient of variation or sampling variability. The associated causes of these problems are often unknown. Although these problems may not result in hospitalization, they

Exhibit 2.13: *Age/Sex-specific Rates per 100,000 Population for Leading Chronic Health Problems in Ontario, 1994*

Age Group	Cause of Health Problem (Women)	Rate	Cause of Health Problem (Men)	Rate
12 - 19 Years	Other Allergies *	21,619	Other Allergies *	23,969
	Asthma	10,861	Asthma	9,307
	Food Allergies	7,603	Food Allergies	5,503**
	Migraine	5,954**	Migraine	5,052**
20 - 44 Years	Other Allergies *	23,466	Other Allergies *	18,440
	Migraine	14,503	Back Problems	12,582
	Back Problems	13,882	Food Allergies	5,342
	Asthma	8,302	Other Conditions	5,290
45 - 64 Years	Arthritis/Rheumatism	25,094	Back Problems	22,184
	Back Problems	20,891	Arthritis/Rheumatism	15,841
	Other Allergies *	19,972	High Blood Pressure	13,940
	High Blood Pressure	15,740	Other Allergies *	13,497
65+ Years	Arthritis/Rheumatism	48,830	Arthritis/Rheumatism	36,082
	High Blood Pressure	32,683	High Blood Pressure	24,968
	Back Problems	19,310	Heart Disease	21,000
	Cataracts	18,038	Back Problems	18,329

* Allergies other than food allergies
** Interpret with caution due to sampling variability

Data Source: National Population Health Survey, 1994 may be associated with a high level of physician service and drug utilization. For those 45 years of age and older, arthritis or rheumatism, high blood pressure and back problems were the leading self-reported health problems. These conditions are also associated with a high degree of health service utilization. Use of these self-reported data provides a picture of the most common health problems in the population that is different from that obtained from other data sources.

Exhibits 2.14 and 2.15 provide the leading causes of hospitalization and days of stay by age and sex in Ontario. For the following discussion, it is beneficial to view Exhibits 2.14 (leading causes of hospitalization) and Exhibit 2.15 (leading causes of hospital days of stay) together.

Considering the number of hospital admissions helps to assess how many people have a condition (although we do not account for multiple admissions involving the same person). Similarly, patient days in hospital helps assess the burden on the health system from a condition. The primary cause of hospitalization and the number of days of stay from CIHI data were used to calculate age/sex-specific rates for 1994 by diagnosis. The diagnoses are classified into the 17 broad chapter headings defined by International Classification of Diseases (ICD-9).[26] Rates are reported per 100,000 population, with the Statistics Canada 1994 adjusted intercensal population as the denominator. Five age groups were used: 0 to 9 years, 10 to 19 years, 20 to 44 years, 45 to 64 years and 65 years and older. The electronic edition of the Atlas provides counts and rates for separations by ICD-9 chapter heading, age, sex and DHC.

Respiratory illnesses were the leading cause of hospitalization and patient days in the youngest age group. A third of these hospitalizations were due to acute respiratory infections whereas a quarter were due to asthma. (Chapter 11 describes this in further detail.) These diseases accounted for equal proportions of patient days. In younger children, more than 50% of hospitalizations for digestive diseases were due to noninfectious enteritis or colitis. Fractures accounted for 30% of all hospitalizations for injuries in this age group.

Asthma was the cause of 25% of the hospitalizations due to respiratory illness in the 10 to 19 year age group for both sexes, whereas appendix-related illness made up more than 50% of the admissions for digestive illnesses for teenage boys. About 30% of all injuries were caused by fractures. Psychoses were responsible for about 20% of the admissions for mental disorders in this age group and accounted for the large rate of patient days for this category.

Various diseases accounted for hospitalizations for young adults aged 20 to 44 under the digestive, genitourinary and musculoskeletal broad chapter headings. For men of this age group, about 30% of the hospitalizations for injuries were associated with fractures and accounted for about one-third of patient days. Psychoses caused about 50% of hospitalizations due to mental disorders and accounted for long patient stays in both sexes. Neoplasms were a major cause of hospitalization in those older than 44 and were more significant in women than in men aged 45-64. This figure decreased with age. Breast cancer caused about 17% of hospitalizations for neoplasms in women in this age group and for those 65 and older. Rates of colorectal cancer and lung cancer increased with age (6% of neoplasm hospitalizations in those 45 to 64 years, 14% in those 65 and older for colorectal cancer; 7% in those 45 to 64, and 10% in those older than 65 for lung cancer). For those 65 and older, 18% of admissions for neoplasms were due to prostate and 12% were due to colorectal cancer.

In men 45 to 64, fractures caused about 30% of hospitalizations due to injuries and accounted for about one-third of hospital days. Ischemic heart disease was responsible for most of the hospitalizations for circulatory illnesses in this age group. This disease accounted for 57% of circulatory disease hospitalizations in men and 40% in women.

With age, cerebrovascular and other heart disease became a more prevalent cause of hospitalizations due to circulatory diseases in men and women. In women 65 and older, fractures accounted for about 65% of hospitalizations for injuries. In men 65 years and over, almost a third of respiratory illnesses were due to chronic obstructive pulmonary disease or pneumonia. In this age group, these illnesses accounted for almost 80% of the patient days of stay due to respiratory illness.

Exhibit 2.16 shows provincial age/sex-specific rates of mortality and proportions of premature death by cause according to the ICD-9 broad chapter headings. External causes are assigned as a separate group for mortality rates because these reflect the primary cause of death on the death certificate. For example, if a person died from cerebral laceration and contusion as a result of a motor vehicle accident, the primary cause of death would be coded as motor vehicle accident. Classification in this way provides a more comprehensive assessment of mortality for purposes of public health programs and policy-making.

Exhibit 2.17 shows the “loss of life potential” (LLP) as a measure of premature death for a given population due to a particular cause.[23] The indicator is derived by subtracting the average life expectancy for each age and sex group (1 to 9, 10 to 19, 20 to 44, and 45 to 64) from the mean age of death for each group. This represents the years of life lost. The LLP is calculated by multiplying this value by the number of deaths in each age and sex group by cause. The age/sex-specific LLP is expressed as a percentage of the total for each group. The mortality indicators are presented in the electronic edition by DHC.

As shown, the leading causes of death and LLP were similar across age and sex, except in the youngest

Exhibit 2.14: *Age/Sex-specific Rates per 100,000 Population for Leading Causes of Hospitalization in Ontario, 1994*

Age Group	Cause of Hospitalization (Women)	Rate	Cause of Hospitalization (Men)	Rate
0 - 9 Years	Diseases of the Respiratory System	1,814.5	Diseases of the Respiratory System	2,754.1
	Diseases of the Digestive System	517.7	Diseases of the Digestive System	706.1
	Injuries and Poisonings	444.5	Injuries and Poisonings	590.3
	Symptoms, Signs and Ill-defined Conditions	446.1	Symptoms, Signs and Ill-defined Conditions	551.0
10 - 19 Years	Complications of Pregnancy, Childbirth and Puerperium	1,800.2	Injuries and Poisonings	838.6
	Diseases of the Respiratory System	708.0	Diseases of the Respiratory System	485.5
	Injuries and Poisonings	529.2	Diseases of the Digestive System	448.2
	Mental Disorders	488.7	Mental Disorders	279.0
20 - 44 Years	Complications of Pregnancy, Childbirth and Puerperium	7,927.5	Diseases of the Digestive System	783.4
	Diseases of the Genitourinary System	1,070.7	Injuries and Poisonings	747.5
	Diseases of the Digestive System	951.1	Mental Disorders	629.7
	Mental Disorders	711.0	Diseases of the Musculoskeletal System	411.5
45 - 64 Years	Diseases of the Digestive System	1,602.0	Diseases of the Circulatory System	2,813.4
	Neoplasms	1,492.6	Diseases of the Digestive System	1,749.6
	Diseases of the Circulatory System	1,386.6	Neoplasms	1,116.7
	Diseases of the Genitourinary System	1,039.7	Injuries and Poisonings	815.9
65+ Years	Diseases of the Circulatory System	6,714.1	Diseases of the Circulatory System	9,414.9
	Diseases of the Digestive System	2,946.5	Neoplasms	4,090.9
	Neoplasms	2,524.7	Diseases of the Digestive System	3,690.0
	Injuries and Poisonings	2,481.7	Diseases of the Respiratory System	3,222.2

Data Source: Canadian Institute for Health Information (CIHI), 1994

Exhibit 2.15: *Age/Sex-specific Rates per 100,000 Population for Leading Causes of Hospital Days of Stay and Accompanying Average Lengths of Stay (ALOS) in Ontario, 1994*

Age Group	Cause of Hospital Stay (Women)	Rate	ALOS	Cause of Hospital Stay (Men)	Rate	ALOS
0 - 9 Years	Diseases of the Respiratory System	4,544.1	2.8	Diseases of the Respiratory System	6,827.0	2.8
	Conditions Originating in the Perinatal Period	3,507.3	9.4	Conditions Originating in the Perinatal Period	4,268.0	7.9
	Congenital Anomalies	1,612.4	5.2	Congenital Anomalies	2,359.0	4.8
	Injuries and Poisonings	1,504.2	3.3	Injuries and Poisonings	1,927.0	3.5
10 - 19 Years	Complications of Pregnancy, Childbirth and Puerperium	4,771.0	2.8	Injuries and Poisonings	2,968.0	3.2
	Mental Disorders	4,705.0	8.4	Mental Disorders	2,362.0	8.0
	Injuries and Poisonings	1,819.0	3.4	Diseases of the Digestive System	1,599.0	3.8
	Diseases of the Digestive System	1,550.0	3.6	Diseases of the Respiratory System	1,151.0	2.4
20 - 44 Years	Complications of Pregnancy, Childbirth and Puerperium	22,185.0	2.9	Mental Disorders	5,799.0	8.2
	Mental Disorders	7,739.0	9.8	Injuries and Poisonings	3,439.0	4.0
	Diseases of the Genitourinary System	3,651.0	3.5	Diseases of the Digestive System	3,162.0	3.8
	Diseases of the Digestive System	3,594.0	3.7	Diseases of the Circulatory System	1,625.0	4.9
45 - 64 Years	Neoplasms	11,377.0	7.1	Diseases of the Circulatory System	17,966.0	6.1
	Diseases of the Circulatory System	9,384.0	6.3	Neoplasms	10,376.0	8.7
	Mental Disorders	8,278.0	12.2	Diseases of the Digestive System	8,191.0	4.4
	Diseases of the Digestive System	7,541.0	4.5	Injuries and Poisonings	5,569.0	6.0
65+ Years	Diseases of the Circulatory System	63,532.0	8.4	Diseases of the Circulatory System	82,898.0	7.8
	Injuries and Poisonings	30,920.0	10.8	Neoplasms	42,265.0	9.1
	Neoplasms	27,901.0	9.9	Diseases of the Respiratory System	28,281.0	8.5
	Diseases of the Digestive System	21,088.0	6.6	Diseases of the Digestive System	23,106.0	5.4

Data Source: Canadian Institute for Health Information (CIHI), 1994

Exhibit 2.16: ***Age/Sex-specific Rates per 100,000 Population for Leading Causes of Death in Ontario, 1992***

Age Group	Cause of Death (Women)	Rate	Cause of Death (Men)	Rate
0 - 9 Years	Conditions Originating in the Perinatal Period	14.4	Conditions Originating in the Perinatal Period	19.2
	Congenital Anomalies	12.6	Congenital Anomalies	15.6
	Symptoms, Signs and Ill-defined Conditions	7.1	Symptoms, Signs and Ill-defined Conditions	8.0
	External Causes	5.0	External Causes	7.6
10 - 19 Years	External Causes	10.3	External Causes	28.2
	Neoplasms	3.9	Neoplasms	5.7
	Diseases of the Nervous System	1.4	Diseases of the Nervous System	2.0
	Symptoms, Signs and Ill-defined Conditions	1.2	Symptoms, Signs and Ill-defined Conditions	1.7
20 - 44 Years	Neoplasms	22.7	External Causes	57.3
	External Causes	15.5	Infectious and Parasitic Diseases	19.8
	Diseases of the Circulatory System	6.1	Neoplasms	19.2
	Symptoms, Signs and Ill-defined Conditions	3.2	Diseases of the Circulatory System	15.0
45 - 64 Years	Neoplasms	266.5	Neoplasms	323.1
	Diseases of the Circulatory System	103.6	Diseases of the Circulatory System	292.0
	External Causes	23.4	External Causes	58.7
	Diseases of the Digestive System	21.0	Diseases of the Digestive System	44.2
65+ Years	Diseases of the Circulatory System	2,692.1	Diseases of the Circulatory System	3,562.4
	Neoplasms	1,276.4	Neoplasms	2,332.1
	Diseases of the Respiratory System	483.9	Diseases of the Respiratory System	886.7
	Endocrine, Nutritional and Metabolic Conditions	199.9	Diseases of the Digestive System	271.2

Data Source: Vital Statistics, 1992

Exhibit 2.17: ***Age/Sex-specific Percentages for Leading Causes of Loss of Life Potential (LLP) in Ontario, 1992***

Age Group	Cause of LLP (Women)	(%)	Cause of LLP (Men)	(%)
0 - 9 Years	External Causes	32.1	External Causes	46.1
	Congenital Anomalies	16.4	Neoplasms	13.8
	Neoplasms	15.7	Congenital Anomalies	13.2
	Diseases of the Nervous System	9.0	Symptoms, Signs and Ill-defined Conditions	7.8
10 - 19 Years	External Causes	48.7	External Causes	64.3
	Neoplasms	18.7	Neoplasms	13.1
	Diseases of the Nervous System	6.6	Diseases of the Nervous System	4.5
	Symptoms, Signs and Ill-defined Conditions	5.7	Symptoms, Signs and Ill-defined Conditions	4.1
20 - 44 Years	Neoplasms	36.9	External Causes	43.5
	External Causes	27.6	Infectious and Parasitic Diseases	14.2
	Diseases of the Respiratory System	10.2	Neoplasms	13.5
	Symptoms, Signs and Ill-defined Conditions	5.7	Diseases of the Circulatory System	10.2
45 - 64 Years	Neoplasms	54.7	Neoplasms	37.1
	Diseases of the Circulatory System	20.7	Diseases of the Circulatory System	33.8
	External Causes	5.2	External Causes	7.5
	Diseases of the Digestive System	4.2	Diseases of the Digestive System	5.2
65+ Years	Diseases of the Circulatory System	43.9	Diseases of the Circulatory System	42.2
	Neoplasms	28.3	Neoplasms	31.1
	Diseases of the Respiratory System	8.0	Diseases of the Respiratory System	9.7
	Endocrine, Nutritional and Metabolic Conditions	3.7	Endocrine, Nutritional and Metabolic Conditions	3.4

Data Source: Vital Statistics, 1992

age groups, in which external causes such as motor vehicle accidents accounted for most of the LLP. For those younger than nine, and from 10 to 19, the leading causes of death were identical for both sexes; however, there were more deaths among boys and young men than among girls and young women. Motor vehicle accidents accounted for about 36% of deaths due to external causes in those younger than nine and more than 50% for those 10 to 19. Suicide accounted for about 10% of the externally caused deaths among girls in both age groups, about 8% among younger boys and 4% among the older ones. More than 30% of the deaths from cancer in the 10 to 19 age groups were due to cancer of the lymphatic and hematopoietic tissue.

In men 20 to 44 years, motor vehicle and other accidents were responsible for 66% of deaths due to external causes, followed closely by AIDS, which was responsible for 93% of infectious and parasitic disease deaths. Lymphatic and hematopoietic tissue neoplasms accounted for 25% of deaths from cancer in this age group.

Breast neoplasms accounted for about 28% of deaths from cancer among women 20 to 44, 25% in those 45 to 64, and 16% in those 65 and older. Lung cancer followed, accounting for about 35% of deaths from cancer in men aged 45 to 64, and 65 and over, followed by colorectal cancer (about 10% of deaths from cancer in both age groups) and prostate cancer (15% of deaths from cancer in the 65 and over age group). Cerebrovascular disease accounted for 36% of deaths for women 20 to 44, and ischemic heart disease accounted for 64% of deaths due to circulatory disease for men in this age group. Ischemic heart disease was the cause of 60% of deaths from circulatory disease among women and 73% among men in the 45 to 64 age groups. Similarly, 54% of such deaths among women and 63% of such deaths among men in those 65 and older were seen. Cerebrovascular diseases played a more important role with increasing age, while diabetes accounted for about 80% of the deaths due to endocrine, metabolic and nutritional diseases.

Comment

We have not attempted to quantify the total impact or costs of disease in Ontario; however, one can note the major trends. In terms of illness episodes in the community, the major health problems are asthma, migraines and allergies in younger people and arthritis and rheumatism, back problems, high blood pressure and heart disease in middle-aged and older people. Allergies and musculoskeletal diseases are often chronic and may be disabling, but they seldom lead to fatal consequences. Medical care serves to maintain health status and quality through the control of symptoms and pain. Asthma and conditions related to cardiovascular diseases are related to mortality and effective medical care is required to maintain health status and quality of life.

The picture changes when one reviews the impact of diseases on hospital morbidity and mortality. In the younger ages, mental health conditions impact largely on hospital resources and may have fatal outcomes. In the older ages, cardiovascular diseases have an enormous impact on hospital use, relative to cancer and injuries. Management of cardiovascular disease extends for years, whereas much less hospital care is needed for patients with cancer and victims of injuries.

Cardiovascular diseases, neoplasms, injuries and respiratory diseases are leading causes of death and LLP. As deaths from cardiovascular and respiratory diseases tend to occur at the oldest ages, their relative impact on life expectancy is not as great as deaths from injuries and neoplasms in young and middle-aged adults.

The Cancer Bureau of Health Canada estimated that the direct cost of illness in 1993 was $7.8 billion for cardiovascular conditions, $3.5 billion for cancer, $3.4 billion for injuries and $4.0 billion for respiratory disease, with hospital care accounting for 80% of the costs.[27] The costs of nonfatal diseases are important as well: $3.7 billion for digestive disorders, $3.3 billion for mental disorders, $2.7 billion for musculoskeletal problems and $2.4 billion for diseases of the genitourinary system.[27] Health care is about maintaining health status and quality of life as well as prolonging life. The obvious challenge is to find the most efficient patterns of care for managing the burden of these various illnesses in Ontario society.

Comments on Community Health Assessment

This chapter presents a basic introduction to the assessment of community health through the use of the Community Health Profile.

For those who want to create profiles for their own communities, we can make available a more comprehensive profile of indicators at the DHC and PHU level for several years in electronic format. It is important to consider many different measures in examining the health of a population or the impact of a condition. The data in electronic format allows this flexibility. For example, one can examine the impact of musculoskeletal conditions across a variety of measures. Although these conditions do not have much of an impact on mortality rates or LLP, they do account for a significant number of hospital days and, more importantly, are the most commonly reported chronic health problems in the elderly.

The use of a static framework for measuring community health may be limiting. Although the CHP is comprehensive, it is by no means exhaustive. Updating frameworks with new sources of information is necessary to add pieces to the community-health puzzle. For example, data from the 1994 NPHS updated those from the 1990 OHS.

The indicators provide a cross-sectional view of community health at a particular point in time. The chosen time frame may be limited as a result of data availability, and therefore, the indicators may in fact reflect different time periods. For example, Census data are collected every five years and population-health survey data are only collected sporadically at the local level. This limitation could be important when significant political and economic events occur between data collection time frames.

Each data source found in this chapter has its own limitations. This issue is of great importance when analysing data and interpreting output. For example, data such as those from CIHI or the Canadian Centre for Justice Statistics are not collected for research purposes and may not adequately answer questions regarding community health. Limitations of survey data may include proxy and self-report biases. Further, because survey data are typically collected from a sample of the overall population, there may be caveats as a result of small cell frequencies. Some data are limited by the geographic levels at which they are collected. This may impede community profile development for small regions.

Health is a multi-faceted concept, and its measurement is complex. However, the measurement of community health is crucial at this time because of the necessity for needs-based planning and evaluation due to fiscal restraint. Some data are difficult to acquire, some are not easily processed, and others are not provided at a community level. Because data needed to evaluate the community health indicators must be gathered from many ministries, some coordination in terms of data definitions and presentation methods would be helpful.

If the broader determinants of health are to be considered in community-level planning, then appropriate data will have to be collected and made available. For example, the data on the physical environment do not provide a comprehensive level of exposure for the whole community. In addition to the traditional illness-based measures, those that represent the health of all people in a community are desirable. Repetition of expensive population-based health surveys at the local level, like the OHS, is necessary to allow a more comprehensive assessment of community health.

Furthermore, local agencies such as DHCs, hospitals and PHUs need the capacity to access, analyse and interpret such data regularly to incorporate them into planning and evaluation. We hope that the presentation here and in the electronic edition facilitates this process.

In the remainder of this volume we examine measures of health services utilization. This chapter provides a window on some of the determinants of health and health status. The indicators of health that can be derived from routinely collected data do not fully reflect the impact of health services on the health outcomes of the population. For example, changes in quality of life as a result of cataract surgery will likely not be captured with the measures described here. While these data represent the best we can do currently, the challenge is to develop community health information systems to meet the information needs for health system restructuring and renewal.

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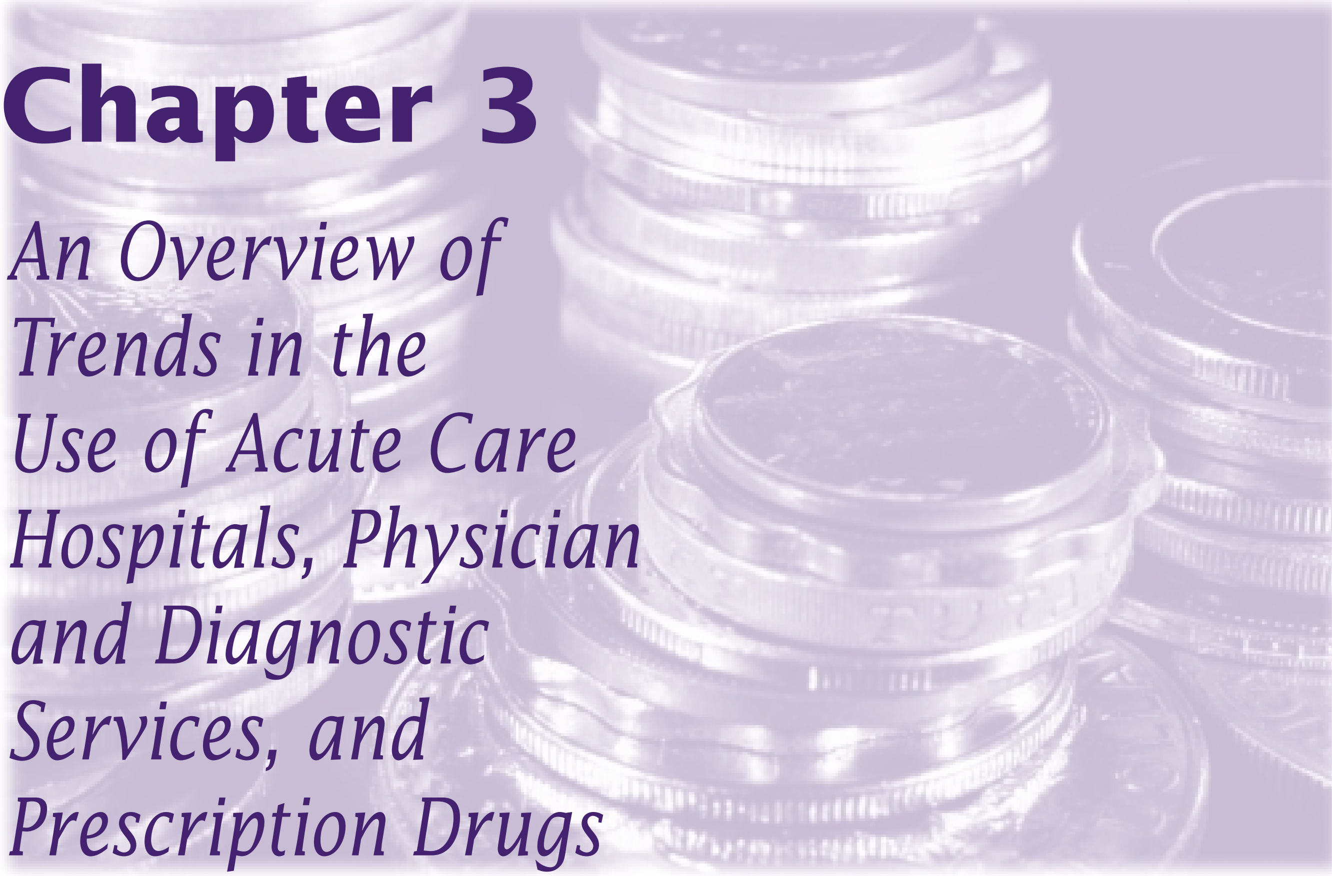


Chapter 3

An Overview of Trends in the Use of Acute Care Hospitals, Physician and Diagnostic Services, and Prescription Drugs

Introduction

The Ontario Ministry of Health (MOH) provides funding for a range of health care services. In 1984/85, the total MOH budget was $8.4 billion; it had more than doubled to $17.7 billion by 1994/95 (Exhibit 3.1). The increase was marked by rapid growth in the seven-year period between 1984/85 and 1991/92, when MOH expenditures increased at an average rate of 11% per year. Expenditures levelled off in the three-year period from 1991/92 through 1994/95, increasing by a total of less than 2%.

Along with changes in overall expenditures, there has been a shift in spending among MOH programs. Funding for acute, chronic and psychiatric hospitals decreased from 47% of total spending in 1984/85 to 41% in 1994/95. The second largest component of MOH spending, funding for the Ontario Health Insurance Plan (OHIP), decreased from 29% to 28% of the total budget over the same time period. OHIP provides coverage for fee-for-service payments to physicians and to other practitioners, including chiropractors, optometrists, podiatrists, osteopaths, physiotherapists, dentists, midwives and commercial laboratories. Along with fee-for-service payments, OHIP provides payments to providers under some Alternate Funding Plans and is also responsible for payments for medical and hospital treatment received by Ontario residents outside the province.

Expenditures on the Ontario Drug Benefit (ODB) program more than tripled between 1984/85 and 1994/95. This program provides drug coverage to the elderly, those on social assistance, those receiving home care and residents of long-term care facilities. It also covers selected drugs for certain diseases under the Special Drugs Program. The recently established Trillium program covers all provincial residents whose drug costs are very high in relation to their incomes, who do not have private insurance or who have exhausted their private insurance for drug benefits. Costs of the ODB increased from about 3% of the MOH budget in 1984/85 to more than 5% in 1994/95.

This chapter provides an overview of trends and costs for three large MOH programs: (1) acute care hospitals, (2) physician and laboratory services provided under the fee-for-service component of OHIP and (3) ingredient costs for prescription drugs for the elderly under the ODB program. The analyses draw on administrative data routinely collected by the provincial government. Given the universal nature of the programs, these data provide a comprehensive overview of services received by residents of Ontario. However, these data were collected primarily for administrative purposes and lack the clinical detail to draw definitive conclusions about the quality or impact of the care provided. The goal of this chapter is to outline broadly some important trends in the major components of MOH-funded health care in Ontario.

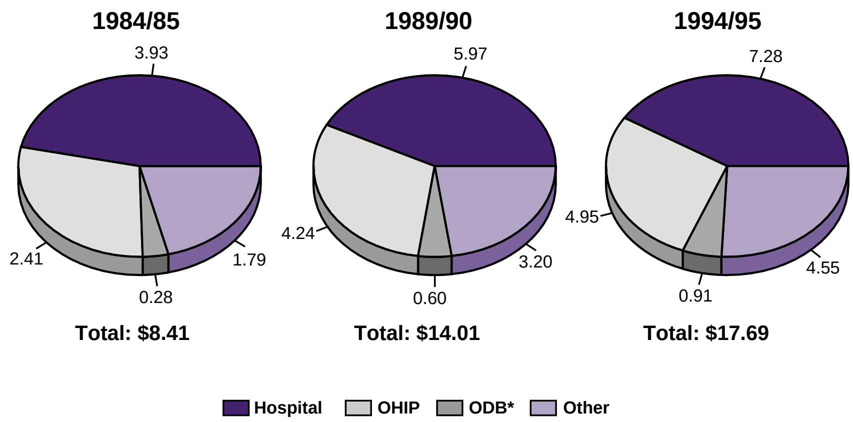
Overview of Acute Care Hospital Utilization

In terms of both resource consumption and the delivery of high-technology services, acute care hospitals play a central role in the Ontario health care system. The analysis in this chapter examines trends in acute care hospital utilization over the last decade with the use of three commonly accepted measures. The main measure is separations, a count of the number of cases that have been treated in acute care hospitals. This count includes discharges, deaths, sign-outs and transfers. Separations provide a basic measure of how often hospitals are used. Another measure used in the analysis is patient days, a count of the number of days of hospital care provided to patients during a year. Patient days (sometimes referred to as bed days) provide a summary measure of how much hospital care was used during a year. Dividing the count of patient days by 365 results in bed years, an aggregate measure of the number of hospital beds that were filled during a year. The final measure used in this analysis, the average length of stay, is the amount of time spent in hospital per separation. These three measures are linked mathematically, with total patient days being the product of separation rates and average lengths of stay.

The analysis of trends in acute care hospital utilization begins with trends in overall inpatient acute care hospital use between 1984/85 and 1994/95. Next, trends in day surgery are described.

Comprehensive reporting of day surgery was not mandatory in Ontario until 1991, and the analysis of trends in day surgery is therefore limited to the period 1991/92 through 1994/95. The analysis then moves to a description of the types of inpatient care provided. More specifically, the analysis separates inpatient acute hospital care into three categories: obstetrical cases and newborns, medical cases, and surgical cases. The analysis ends with a description of use among age groups in the province.

Exhibit 3.1: ***Ontario Ministry of Health Total Operating Expenditures, 1984/85, 1989/90 and 1994/95 ($ billion)***



*ODB includes all Ministry of Health drug benefit expenditures but excludes drug benefit expenditures by the Ministry of Community and Social Services.

Data Source: Ontario Ministry of Health

Data Source and Methods

Measures of hospital utilization were calculated with the use of data on hospital separations from the Canadian Institute for Health Information (CIHI). These data are collected by trained health records staff in Ontario hospitals, who abstract information from patient records. The data are forwarded to CIHI and then to the MOH. On the basis of the discharge information, CIHI creates additional variables, which are added to the databases. Variables used in this chapter include days of care, calculated by subtracting the admission date from the discharge date, and the Case Mix Group® (CMG) and Major Clinical Category® (MCC), calculated with the use of an algorithm that accounts for the patient's age, the most responsible diagnosis and complication diagnoses.

The analysis uses inpatient separation data from CIHI for 1984/85 through 1994/95. The analysis uses day surgery separation data from CIHI for 1991/92 through 1994/95.

The population figures for 1986/87 and 1991/92 were drawn directly from census data that Statistics Canada has adjusted to account for underreporting. The population figures for all other years are based on straight-line interpolations of population changes during noncensus years. The 1991 Statistics Canada population estimate was used to standardize the days of care and separation rates for age and sex.

Acute care and day surgery separation rates were calculated by dividing the total number of eligible separations (i.e., discharges, sign-outs, deaths and transfers) per year by the total population. Separations were excluded if they had an invalid sex, age or Ontario residence code. Patients with a calculated age of 100 years or older were also excluded. Major Clinical Categories® were used to identify the obstetric and newborn separations. The remaining separations were divided into the medical and surgical categories on the basis of the medical or surgical classification system used for Case Mix Groups®.

Inpatients who had an invalid days-of-care code or who stayed in an acute care bed for more than 730 days were included in the calculation of separation rates but excluded from the patient-day calculations. The days-of-care rates were calculated by dividing the total days of care by the total population, whereas the average lengths of stay were calculated by dividing the total days of care by the number of eligible inpatient separations.

Findings

The total number of inpatient separations was 1.6% lower in 1994/95 than it was in 1984/85 (Exhibit 3.2). However, the size of the Ontario population has increased, and the proportion of the population that is elderly has grown over that period. Age/sex-adjusted separation rates take into account these demographic changes. In 1994/95, the age/sex-adjusted inpatient separation rate in Ontario was 119.3 per 1,000 population, about 22% lower than the 1984/85 figure of 152.4 per 1,000.

In 1984/85, just over 11 million inpatient days of care (about 30,000 bed years) were provided in the province. By 1994/95 the number of inpatient days had decreased to 8.2 million, or about 22,500 bed years. Once demographic changes are taken into account, the decrease is even more dramatic. The age/sex-adjusted rate of patient days per 1,000 population decreased by more than 40% between 1984/85 and 1994/95. This decrease was the product of a decreasing separation rate combined with a sharp decrease in average length of stay. In 1994/95, the average patient stayed in hospital for 6.26 days, about 25% less than the average length of stay in 1984/85.

The number of day surgery cases in Ontario increased by more than 25% between 1991/92 and 1994/95, with just over 750,000 operations performed as day surgery in 1994/95 (Exhibit 3.2). The age/sex-adjusted day surgery rate increased by about 20% during that period.

Although rates of inpatient separations and patient days have decreased every year since 1985/86, they have decreased most rapidly in the last few years. Inpatient separation rates were 12% lower and rates of inpatient days of care were almost 25% lower in 1994/95 than in 1991/92. From 1991/92 to 1994/95 there was steady growth in day surgery, and there were just slightly more total cases (i.e., inpatient separations plus day surgery cases).

There have been different trends in utilization between 1984/85 and 1994/95 for different types of inpatient cases. The separation rate for obstetrics and newborns has remained very stable in Ontario, but the rate of patient days for this category of care decreased by more than 40% as a result of substantial decreases in the average length of stay (Exhibits 3.3 and 3.4). The medical case separation rate decreased by 24% and the rate of patient days

Exhibit 3.2: ***Trends in Hospital Utilization for Inpatient Acute Care and Day Surgery in Ontario, 1984/85 – 1994/95***

	Inpatient Acute Care					Day Surgery*	
Year	Number of Separations (thousands)	Age/Sex-adjusted Separation Rates per 1,000	Total Patient Days (thousands)	Age/Sex-adjusted Patient Days per 1,000	Average Length of Stay in days	Number of Cases (thousands)	Age/Sex-adjusted rate per 1,000
1984/85	1,333.7	152.4	11,043.0	1283	8.28		
1985/86	1,390.3	155.9	11,400.5	1295	8.20		
1986/87	1,406.5	150.5	11,561.4	1254	8.22		
1987/88	1,425.6	148.7	11,690.0	1234	8.20		
1988/89	1,406.8	143.5	11,254.4	1161	8.00		
1989/90	1,422.7	141.1	10,926.3	1093	7.68		
1990/91	1,418.4	137.6	10,567.1	1032	7.45		
1991/92	1,419.7	135.6	10,094.5	964	7.11	602.6	57.6
1992/93	1,364.2	127.9	9,126.5	852	6.69	652.4	61.1
1993/94	1,331.9	122.7	8,670.7	791	6.51	692.3	63.6
1994/95	1,312.3	119.3	8,213.0	734	6.26	760.8	68.8

** Day surgery data were not collected before 1991/92*

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

by 40%. The separation rate for inpatient surgery decreased by 30%, while the rate of patient days for surgical care decreased by 48%.

Separation rates and rate of patient days among patients 20 to 64 years of age began decreasing before they did among the younger and older populations. However, starting in 1986/87, separation rates decreased for all age groups (Exhibits 3.5 and 3.6). Both the under 20 and the 20 to 64 year age groups experienced about 24% reductions in separation rates and around 45% reductions in rates of patient days between 1984/85 and 1994/95. In proportional terms, these reductions were larger than those in the elderly; those 65 and older experienced a 15% reduction in separation rates and a 38% reduction in rates of patient days. Although there was a substantial reduction in the rates of use by the elderly, there was substantial growth in the size of that population. As a result, the 1.31 million elderly people in Ontario in 1994/95 used about 14% fewer hospital beds than the 0.93 million elderly in 1984/85.

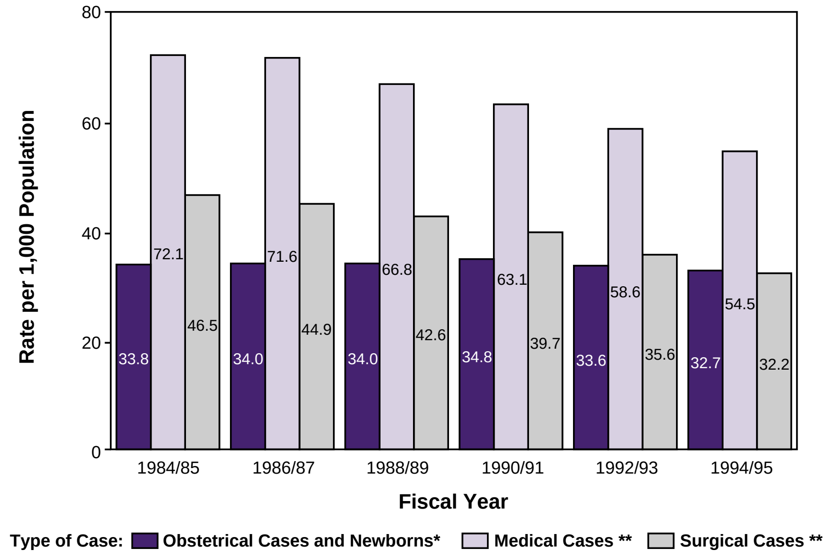
Comment

In 1994/95, Ontario hospitals treated about the same number of inpatient cases as they did in 1984/85. However, this apparent overall stability of the acute care hospital system masks large decreases in hospital utilization for Ontarians, measured in terms of separation rates or rates of patient days, and major shifts in hospital operation, measured in average lengths of stay and day surgery rates.

Taking into account population growth and aging, an Ontario resident was 22% less likely to be treated in hospital in 1994/95 than in 1984/85. The observed changes in overall rates of use, particularly the rapid changes in the last five years, are the result of changes in the types of care provided and hospital use among age groups.

The analysis shows that rates of use have decreased for all age groups but that, in proportional terms, the

Exhibit 3.3: ***Trends in Age/Sex-adjusted Inpatient Separation Rates per 1,000 Population by Type of Case in Ontario, 1984/85 – 1994/95***

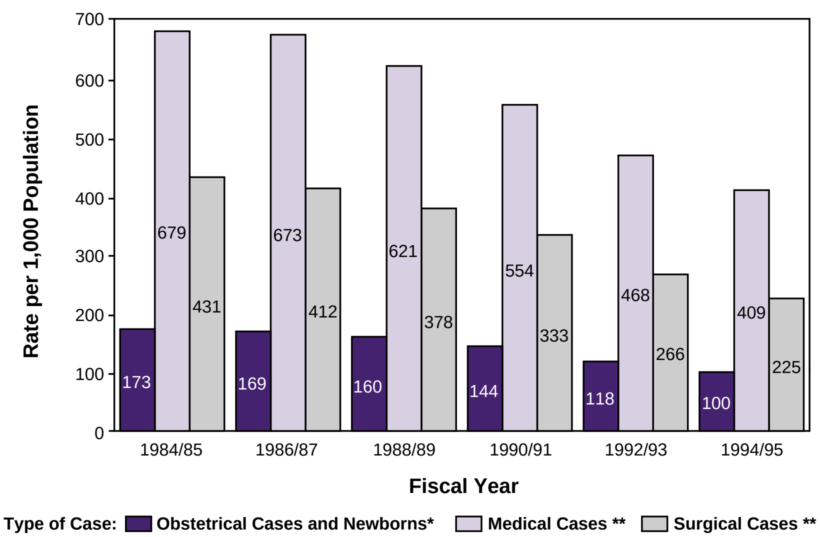


* Major Clinical Categories: Pregnancy and Childbirth, and Newborn and Other Neonates with Conditions Originating in the Perinatal Period are included.

** Defined by CMG medical or surgical indicator for all other cases

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 3.4: ***Trends in Age/Sex-adjusted Inpatient Days of Care per 1,000 Population by Type of Case in Ontario, 1984/85 – 1994/95***

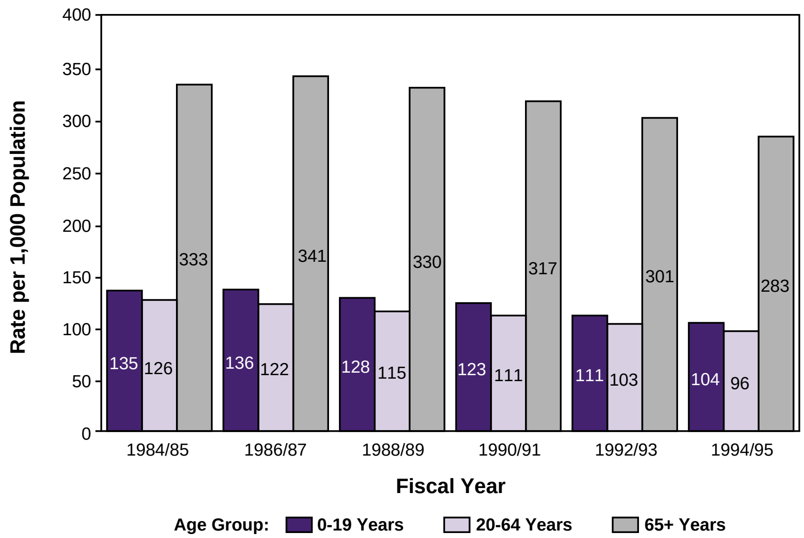


* Major Clinical Categories: Pregnancy and Childbirth, and Newborn and Other Neonates with Conditions Originating in the Perinatal Period are included.

** Defined by CMG medical or surgical indicator for all other cases

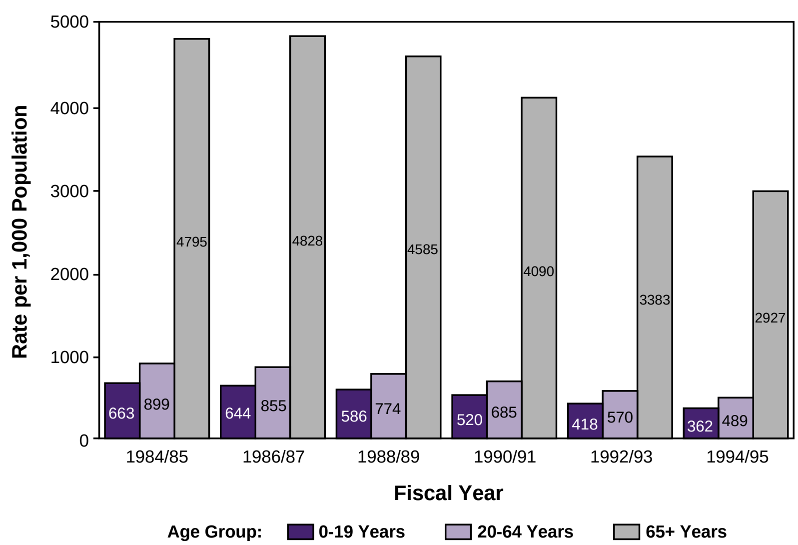
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 3.5: ***Trends in Inpatient Separation Rates per 1,000 Population by Age Group in Ontario, 1984/85 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 3.6: ***Trends in Inpatient Days of Care per 1,000 Population by Age Group in Ontario, 1984/85 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

decreases have been smaller in the elderly than the non-elderly. The smaller proportional decreases in inpatient utilization by the elderly, combined with the fact that they are the fastest growing segment of the Ontario population, means that an ever-increasing proportion of inpatient care is being provided to them. This shift has important consequences for hospitals and for the elderly, and it needs to be carefully monitored. The analysis did not examine the distribution of changes in hospital utilization across other important demographic characteristics such as income, ethnic background, place of residence or education. These aspects of utilization deserve further research. Until we have a more complete analysis, we will not know the impact of the huge changes in hospital utilization on the equity of health care delivery in Ontario.

The analysis shows that the decreases in separation rates were limited to medical and surgical cases and that there was no decrease in obstetrics or newborn cases. The decrease in inpatient surgery was counterbalanced by an increase in day surgery. Although analyses of trends in the rates of some common procedures are provided in Chapter 5, a more comprehensive analysis is required to determine how the decrease in inpatient surgery has changed the mix of surgical care provided in the province. Given the lack of comprehensive data on medical outpatient care provided by hospitals, it is difficult to determine whether the decrease in inpatient medical care was counterbalanced by increased hospital-based outpatient care. The large decrease in inpatient medical and surgical care in recent years has changed not only where care is provided but also the type of care provided. The impact of this shift on quality of care, patients, families and community services needs to be examined more closely.

The increase in day surgery rates and the decrease in lengths of stay for inpatients mean that Ontario hospitals now care for patients far more quickly than they did a decade ago. This change, combined with a relatively steady number of overall cases, means that far fewer hospital beds are filled now than a decade ago. Our calculations show that there were approximately 7,500 fewer beds filled in Ontario hospitals in 1994/95 than in 1984/85. This is equivalent to the closure of 30 acute care hospitals each with 250 beds.

We know that there has been a rapid increase in day surgery, and there is some evidence of an increase in other hospital-based outpatient services. These shifts may have important effects on other services in the community. A careful examination of the changing role of acute care hospitals and the impact of this changing role on the community should be a central component of any effort to restructure a system that has changed dramatically over the last few years.

OHIP Physician Fee-for-service Expenditures

Introduction

Approximately 95% of OHIP physician expenditures are paid on a fee-for-service basis; the rest are paid through other means such as salaries, capitation payments or sessional fees. Services billed to OHIP on a fee-for-service basis include:

- physician assessments and consultations in private offices and hospital outpatient settings;
- physician visits and consultations for inpatients in acute and long-term care;
- technical and professional components of diagnostic and therapeutic procedures performed on outpatients in hospitals and in physicians' offices and laboratories;
- surgical procedures performed on inpatients and outpatients;
- laboratory services performed on outpatients in private laboratories and in physician offices.

The following physician services are excluded from fee-for-service payment:

- diagnostic procedures performed on inpatients and emergency department patients, such as radiological procedures, pulmonary function tests and cardiac stress tests;
- hospital laboratory services for both inpatients and outpatients, as well as outpatient tests performed by public health laboratories and certain ambulatory facilities under special contractual arrangements with the Ministry of Health; and
- visits and assessments in provincial psychiatric hospitals.

Data Source and Methods

We used data from the National Physician Database (NPDB) provided to ICES by CIHI. The NPDB contains quarterly summaries of claims submissions for each physician and each fee code, as well as yearly summaries of claims submitted for services provided to population groups, broken down by five-year age/sex groups. The analyses were based on data from fiscal years 1989/90 to 1994/95. OHIP payments for out-of-province services to Ontario residents have been excluded from this study. The data also exclude payments to physicians remunerated through Alternate Funding Plans.

The NPDB records the amount billed by physicians. It reflects fee increases implemented in 1991/92 and 1992/93, as well as temporary fee decreases in 1993/94 and 1994/95 required by Social Contract legislation.

The data do not include: 2% retroactive payments on billings made between 1989/90 and 1992/93; retroactive payments due to delayed implementation of price increases in 1991/92 ($74.1 m) and 1992/93 ($14.2 m); utilization adjustments in 1993/94 ($16.0 m) and 1994/95 ($178.6 m) which exceeded the negotiated ceiling for physician services; and, utilization adjustments due to billings over the negotiated thresholds for 1991/92 ($33 m), 1992/93 ($23 m), 1993/94 ($15 m) and 1994/95 ($17 m).

Physician services were divided into seven categories: assessments and consultations, hospital visits, psychotherapy and counselling, laboratory medicine, diagnostic and therapeutic procedures, surgical procedures and special premiums. The assessments and consultations category refers to assessments and consultations in hospital outpatient departments, emergency departments and private physicians' offices. The hospital visits category refers to physician visits and consultations for inpatients in hospitals and other institutions.

Psychotherapy and counselling services include psychotherapy, counselling, hypnotherapy, certification of mental illness and assessments under the Mental Health Act as described in the OHIP Schedule of Benefits. Consultations by psychiatrists, however, are listed under either assessments and consultations or hospital visits, depending on where the service was provided. Laboratory medicine refers to all services billed by private laboratories and includes all L-series fee codes in the Schedule of Benefits. Surgery includes all fee codes listed in the Surgical Procedures and Obstetrics sections of the Schedule of Benefits and the associated billings by anesthestists and surgical assistants. The diagnostic and therapeutic procedures category includes diagnostic radiology, nuclear medicine, pulmonary function studies and services listed in the Diagnostic and Therapeutic Procedures section of the Schedule of Benefits. By convention, laboratory services provided in private physicians' offices were included in this category. The special premiums category refers to special visit bonuses, premiums for procedures performed outside of regular office hours and remuneration for responsibilities detaining the physician from other duties (e.g., accompanying a patient in an ambulance).

Billings may be affected by a variety of factors, including price changes, population growth and the aging of the population. The contribution of each of these factors to growth in billings can be examined sequentially. Price-adjusted billings measure utilization changes independent of price fluctuations, and they represent what the cost of OHIP services would have been if prices had not changed. We constructed a standard price file, based mainly on prices during a reference year, 1994/95. For fee codes in continuous use from 1989/90 to 1994/95, the standard price was calculated as the 1994/95 billings divided by the number of services. For each year, the price-adjusted billings for each fee code were calculated by multiplying the number of services by the standard price. The total of price-adjusted billings was the sum for all fee codes.

During the study period, numerous fee codes were added, substituted or split into multiple codes. These changes required special adjustments to the 1994/95 standard price file. In the case of new fee codes, if the code was for a new service, reflecting an emerging technology or standard of care, then the standard price was the 1994/95 billing divided by the number of services. The introduction of such a new code, therefore, would increase both unadjusted and price-adjusted billings. In the case of new fee codes that represented a bonus for services already being routinely performed, the code was considered to represent a price change, and the standard price was set at zero. For fee code substitutions and splits, we also applied the criterion of whether the substitution was for the remuneration of a new or old service. For example, fee code K009A for complete physical examination was removed in 1991 and replaced with A003A for general assessment, with a higher price. The service was deemed not to have changed and K009A was assigned the same standard price as A003A.

Delisting, or the removal of fee codes from health insurance coverage, was treated as a form of price change in this analysis. For services that were delisted, the standard price was set at zero. Thus, with delisting, unadjusted billings decreased but utilization, as represented by price-adjusted billings, remained constant. For several fee codes, more stringent criteria were introduced governing the conditions under which the code could be billed. These code redefinitions were directed toward limiting utilization and had no effect on price; hence, no adjustments were made in the standard file for this type of fee schedule change.

To control for population growth, we calculated price-adjusted billings per capita with the use of Ontario population estimates for each year based on Census data. To control for aging of the population, price- and age/sex-adjusted billings per capita were calculated using direct standardization techniques, with 1991 as the reference population year. In each year, price-adjusted billings per capita for each age/sex group were calculated, and this amount was multiplied by the 1991 standard-year population for that age/sex group.

Findings

Total OHIP fee-for-service physician billings rose from $3.690 billion in 1989/90 to $4.450 billion in 1992/93, declined by $82 million to $4.368 billion in 1993/94, and then rose again to $4.458 billion in 1994/95 (see Exhibit 3.7). Between 1989/90 and 1994/95, overall billings increased by 20.8%.

Exhibit 3.7: ***Trends in OHIP Physician Fee-for-service Billings in Ontario, 1989/90 – 1994/95***

Year	Actual Billings ($ million)	% of 1989/90 Billings	Price-adjusted Billings ($ million)	% of 1989/90 Price-adjusted Billings	Per Capita Price-adjusted Billings ($)	% of 1989/90 per Capita Price-adjusted Billings	Per Capita Price- and Age/Sex-adjusted Billings ($)	% of 1989/90 per Capita Price- and Age/Sex-adjusted Billings
1989/90	3,690	100.0	3,720	100.0	366.5	100.0	368.9	100.0
1990/91	3,977	107.8	4,010	107.8	387.7	105.8	389.2	105.5
1991/92	4,266	115.6	4,287	115.2	409.4	111.7	409.4	111.0
1992/93	4,450	120.6	4,425	118.9	415.6	113.4	414.3	112.3
1993/94	4,368	118.4	4,434	119.2	410.1	111.9	407.4	110.4
1994/95	4,458	120.8	4,462	119.9	408.3	111.4	403.8	109.5

Notes: Actual billings include Social Contract fee reductions in 1993/94 and 1994/95, but exclude threshold reductions and retroactive adjustments to payments. Price-adjusted billings represent the amount that would have been billed if prices had remained constant at their 1994/95 level. Population denominators used in calculations of per capita rates were based on Census Canada intercensal year estimates. The 1991 Ontario population was used as the standard population in age/sex-adjusted rate calculations.

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

During the study period there were both increases and decreases in the fee schedule. The overall impact of these changes is reflected in the price-adjusted billings. In 1991/92 and 1992/93, years in which prices increased, overall billings grew more rapidly than price-adjusted billings. In 1993/94, during which a Social Contract holdback of 4.8% was instituted for six months, total billings decreased relative to price-adjusted billings. Between 1989/90 and 1994/95, price-adjusted billings increased by 19.9%. The slightly smaller change in price-adjusted billings compared to actual billings suggests that, during the entire study period, there was a small net increase in aggregate prices.

Another part of the change in billings can be explained by growth in the population. Price-adjusted billings per capita increased by 11.4% between 1989/90 and 1994/95. The ratio of the change in price-adjusted billings to the change in per capita price-adjusted billings (1.199/1.114 = 1.076, or 7.6%) gives the change that can be attributed to growth in the population. The Ontario population is not only growing; it is also growing older. Older people use more health care services, and the shift in the age distribution has an impact on billings. The ratio of the change in price-adjusted billings to the change in age/sex-adjusted per capita billings (1.199/1.095 = 1.095, or 9.5%) gives the change in utilization that can be attributed to both growth and aging of the population. The 9.5% is a measure of the increase in utilization that can be attributed to increased service provided to each resident of Ontario.

Billings did not increase steadily between 1989/90 and 1994/95. Overall billings increased from 1989/90 to 1992/93, decreased in 1993/94 and then increased again in 1994/95. Per capita billings increased from 1989/90 to 1992/93 and have decreased steadily since then.

Assessments and consultations accounted for 40.8% of billings in 1994/95 (Exhibit 3.8), followed by diagnostic and therapeutic procedures (20.0%), surgery (13.4%), psychotherapy and counselling (9.4%), laboratory medicine (10.6%), hospital visits (3.5%) and special premiums (2.4%). Billings on hospital visits declined by 15.4% between 1989/90 and 1994/95 but increased in all other categories. Billings on surgery exhibited relatively slow growth (7.7% increase in actual billings), while the fastest growing categories were psychotherapy and counselling (40.0%) and diagnostic and therapeutic procedures (30.9%). The growth in billings for outpatient visits was 22.6% and 22.5% for laboratory services. These were slightly above the average growth for the seven fee code categories (20.8%).

Exhibit 3.9 lists the top 20 diagnostic and therapeutic procedures, which together accounted for 67.6% of all billings on diagnostic and therapeutic procedures in 1994/95. Over the period 1989/90 to 1994/95, the fastest growing procedures were sleep studies (268.2% growth), computerized tomography and magnetic resonance imaging (CT/MRI) scans (70.4%), echocardiography (69.6%), nuclear medicine (59.4%) and mammography (57.5%). Most of the top 20 diagnostic and therapeutic procedures had little or negative growth from 1992/93 to 1994/95, except for sleep studies (104.7%), CT/MRI scans (19.2%), dialysis (13.5%), electromyography (12.4%), nuclear medicine (12.2%) and echocardiography (11.1%).

Exhibit 3.8: ***Actual OHIP Billings by Fee Code Category in Ontario, 1989/90 – 1994/95***

Year	Diagnostic and Therapeutic Procedures ($ million)	Hospital Visits ($ million)	Laboratory Medicine ($ million)	Outpatient Assessments and Consultations ($ million)	Psychotherapy and Counselling ($ million)	Surgery ($ million)	Special Premiums ($ million)
1989/90	681.0	184.4	385.7	1,483.6	298.5	553.2	104.0
1990/91	752.8	178.4	427.3	1,596.7	326.5	583.8	111.6
1991/92	814.8	173.9	476.5	1,718.9	364.1	602.7	115.2
1992/93	872.5	169.8	474.6	1,807.9	394.1	613.0	117.7
1993/94	855.1	161.4	465.9	1,771.0	400.3	600.7	113.9
1994/95	891.2	156.1	472.7	1,819.4	418.0	595.8	105.2

Notes: Figures reflect actual billings, and include Social Contract fee reductions in 1993/94 and 1994/95, but exclude threshold reductions and retroactive adjustments to payments.

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 3.10 lists the 20 laboratory tests billed to OHIP that accounted for the largest proportion of billings. As noted previously, laboratory services performed in hospitals have not been captured in this analysis. Although thyroid function tests were the item that accounted for the largest proportion of expenditures in 1989/90, expenditures on these tests experienced a 4.2% decline during the study period. Most of the decline occurred between 1992/93 and 1994/95, during which the fees for the T-3, T-3 uptake, and total and free T-4 tests were reduced to zero. In April 1993, the MOH established a policy in conjunction with the Ontario Association of Medical Laboratories to no longer cover these tests. The policy was changed in recognition that, in most clinical circumstances, sensitive thyroid-stimulating hormone (TSH) testing alone is adequate for diagnosis or monitoring of patients.

Over the period 1989/90 to 1994/95, the fastest growing laboratory tests in terms of billings were those for prothrombin time (170% growth), red blood cell (RBC) folate (138%), ferritin (67%), high-density lipoprotein (HDL) cholesterol (62%) and chlamydia (55%). Most of these tests, however, had relatively small absolute growth. Billings for basic cultures, which were the largest item in 1994/95, increased by $10.1 million, or 33% in relative terms. Spending on most laboratory tests exhibited little or no growth during the most recent three-year period from 1992/93 to 1994/95.

Price-adjusted per capita billings by age/sex group were then examined to identify subpopulations in which billings or billing growth

Exhibit 3.9: ***OHIP Billings for Top 20 Diagnostic and Therapeutic Procedures in Ontario, 1994/95***

Procedure	Billings 1994/95 ($ million)	% Change in Billings Between 1989/90 and 1994/95	% Change in Billings Between 1992/93 and 1994/95
Nuclear Medicine	81.03	59.4	12.2
Pelvic/Prenatal Ultrasound	74.00	38.6	2.6
Chest X-ray	52.52	11.0	-4.8
Echocardiography	47.92	69.6	11.1
Critical Care	42.23	2.9	2.9
Abdominal Ultrasound	41.61	28.1	-1.7
Computerized Tomography (CT)/Magnetic Resonance Imaging (MRI)	30.65	70.4	19.2
Electrocardiogram	28.53	11.8	-6.0
Mammography	28.17	57.5	-1.9
Office Injections	26.14	11.4	-5.0
Dialysis	22.22	46.4	13.5
Upper Gastrointestinal Series	19.47	4.4	-8.8
Physiotherapy	17.97	27.8	-4.7
Exercise Stress Test	15.27	27.2	2.9
Back X-ray	15.10	8.2	-7.2
Spirometry	14.15	37.0	-1.7
Knee X-ray	12.33	25.9	1.0
Sleep Studies	11.75	268.2	104.7
Electromyography	11.73	49.7	12.4
Barium Enema	9.99	3.2	-8.1

Notes: Figures reflect actual billings, and include Social Contract fee reductions in 1993/94 and 1994/95, but exclude threshold reductions and retroactive adjustments to payments. Totals include both technical and professional components of the procedures except for CT and MRI where only the professional component is remunerated by OHIP.

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 3.10: ***OHIP Expenditures in Ontario by Year for Top 20 Laboratory Services***

Laboratory Test	Billings 1994/95 ($ million)	% Change in Billings Between 1989/90 and 1994/95	% Change in Billings Between 1992/93 and 1994/95
Basic Culture (urine, throat, cervical, skin)	48.74	32.8	8.0
Thyroid Function Tests	46.93	-4.2	-9.9
Complete Blood Count	42.31	20.9	0.4
Pap Smear	16.44	11.0	-3.6
Hepatitis Screen	16.03	45.5	-6.4
Triglycerides	13.31	2.8	-2.0
Blood Glucose	11.83	24.1	-1.1
Electrolytes *	11.59	23.0	-1.0
Urea, Creatinine	11.46	33.2	1.2
Total Cholesterol	10.38	-1.4	-3.9
HDL Cholesterol	9.85	62.3	10.0
Urine Microscopy	8.63	-16.2	-34.9
Alkaline Phosphatase	8.49	36.8	2.6
Red Blood Cell Folate	7.92	137.7	-3.0
Ferritin	6.96	66.8	17.1
Aspartate Aminotransferase (AST)	6.78	37.0	6.4
Prothrombin Time	6.43	170.1	27.7
Chlamydia	5.78	54.9	23.3
Total Bilirubin	5.69	42.7	3.5
Serum Human Chorionic Gonadotropin	5.65	-20.2	-3.3

* *Includes sodium, potassium and chloride*

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

was highest (Exhibit 3.11). For the population under 20 years of age, children less than four years old had the highest per capita price-adjusted billing rates ($323). More than two-thirds of these rates were for outpatient assessments, which include well-baby visits. Chapter 11 provides more detailed information on billings for the pediatric population. Billings for women in the child-bearing years (20 to 44 years old) were double those for men in the same age category. This difference between the sexes was noted in all types of service categories, not just for obstetrical services. However, price-adjusted per capita billings for men older than 65 exceeded those for women in this age group.

Per capita billings in adults rose steadily with age, peaking in the group 85 to 89 years old. For example, per capita price-adjusted billings in 1994/95 for an 85-year-old man were $1,009, 5.8 times higher than the $175 spent per 20-year-old man. The profile of billings by age and sex for each category of service, however, varied considerably (Exhibit 3.12). For psychotherapy and counselling services, per capita billings were highest in the 40 to 44 age group (women $86, men $49) but were less than half that rate in the elderly (e.g., for those 65 to 69 years old, rates were $33 for women and $24 for men). For the two intervention-oriented categories (surgery and diagnostic/therapeutic procedures), per capita billings peaked in the 75 to 79 age group (women $312, men $399) and were lower in older categories (e.g., for those 85 to 89 years old, rates were $239 for women and $318 for men). For the remaining categories (assessments and consultations, hospital visits, laboratory medicine and special premiums), per capita billings peaked in the eldest age categories (e.g., for those over 90 years old, rates were $679 for women and $666 for men). Comprehensive data on categories of service by age/sex group are contained in the electronic version of the ICES *Practice Atlas* on diskette.

Rates of growth in billings from 1989/90 to 1994/95 were lowest in the age extremes (2.2% for those under 20 years of age, 14.4% for those 45 to 64 and 2.1% for those older than 85; Exhibit 3.11). This phenomenon was noted for most service categories. In the case of hospital visits, there were reductions in per capita billings in all age/sex groups, but the reductions were greatest in the pediatric population. For example, there was a 31.2% reduction in hospital visits among those under 20 years of age, a 27.4% reduction for those 45 to 64 and a 25.4% reduction for those older than 85.

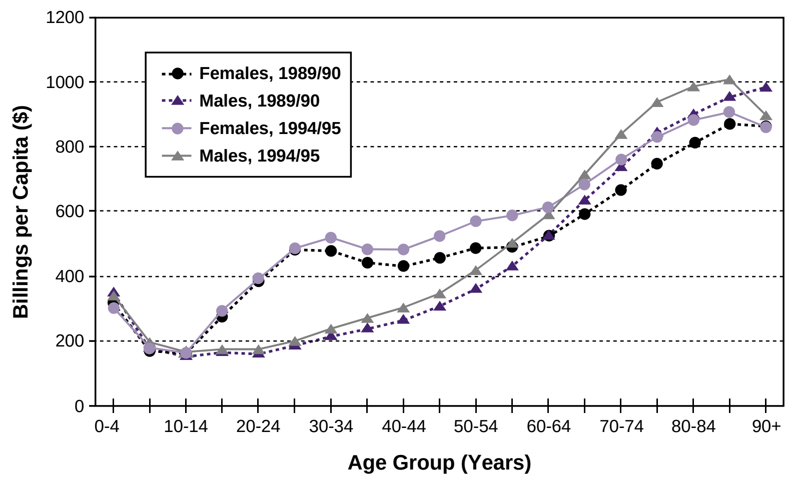
Comment

After increasing steadily for years, overall OHIP fee-for-service billings have been relatively stable since 1992/93. Stable billings in the face of a growing and aging population has meant that, for the first time, per capita utilization of fee-for-service physician services has decreased in Ontario. After adjusting for price changes, population growth and aging, Ontario residents in 1994/95 received about 2.5% fewer physician services than in 1992/93.

Our analysis is limited by the fact that physicians remunerated under Alternate Funding Plans (AFPs) have not been included. The size of the shift to payment plans outside of the fee-for-service domain has been relatively small, with the most significant examples being the alternate funding models introduced at the Hospital for Sick Children in Toronto in 1991/92 and at teaching hospitals in Kingston in 1994/95. Preliminary estimates from the MOH indicate a shift of $36 million from fee-for-service to AFPs in 1994/95, and no significant shift in 1993/94. When these shifts are considered, age/sex- and price-adjusted per capita billings still exhibit an overall decline from 1992/93 to 1994/95.

This decrease in physician services is consistent with the decrease in per capita use of hospital services. Part of the decrease in physician services can be attributed to a decrease in billings on hospital visits and surgical services. However, these were not the only physician service categories in which per capita billings decreased between 1992/93 and 1994/95; of the seven service categories analysed, all but one, psychotherapy

Exhibit 3.11: ***Total Ministry of Health Price-adjusted per Capita Billings by Age and Sex in Ontario, 1989/90 and 1994/95***



Notes: Price-adjusted billings represent the amount that would have been billed if prices had remained constant at their 1994/95 level. Population denominators used in calculations of per capita rates were based on Census Canada intercensal year estimates.

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

and counselling, showed a decrease in per capita billings between 1992/93 and 1994/95. This indicates that decreased use of inpatient care has not been associated with an increase in most facets of outpatient physician services.

Examination of the broad categories of physician services obscures some important changes in utilization of specific services. Along with the rapid increase in psychotherapy and counselling provided to Ontario residents, there have been some important changes in specific laboratory and diagnostic services. Increases in expenditures on CT/MRI, nuclear medicine, echocardiography and sleep studies reflect continuing diffusion of these technologies. Scrutiny of how these technologies are used and development of guidelines for their appropriate use should be priorities. The increase in expenditures on hemodialysis and mammography may reflect better access to effective diagnosis and treatment, but the steady increase in prenatal ultrasonographic examinations appears to be inconsistent with evidence that routine screening in uncomplicated pregnancies is of little clinical benefit[1]. Examination of the most common laboratory tests shows decreases in expenditures on tests that may be of limited value, such as urine microscopy and thyroid-function tests other than sensitive TSH testing. As noted above, the decrease in expenditures on the latter occurred after the MOH changed its reimbursement policy for these tests to promote a more rational approach to diagnosing thyroid disease.

The causes of the increase in billings on laboratory medicine and diagnostic and therapeutic procedures deserve further study. The increase may reflect an overall greater utilization of these procedures, driven by factors such as new indications for use, technology or changes in physician supply. Alternatively, overall utilization may have remained stable but the site of delivery may have moved from hospitals to physicians' offices and laboratories, resulting in a cost shift between hospital and OHIP funding pools. Such a shift may be related to increasingly limited access to outpatient hospital facilities as a result of budgetary constraints or to general trends toward

Exhibit 3.12: ***OHIP Billings by Fee Code Category and Age Group in Ontario, 1994/95***

Per Capita Billings by Fee Code Category and Age Group

	0-19 Years ($)	20-44 Years ($)	45-64 Years ($)	65-79 Years ($)	80+ Years ($)
Outpatient Assessments and Consultations	141.37	133.43	186.39	293.70	398.16
Hospital Visits	6.41	6.00	15.09	53.70	105.47
Psychotherapy and Counselling	12.36	50.81	53.54	27.48	21.70
Laboratory Medicine	15.94	44.49	55.36	77.19	96.83
Diagnostic and Therapeutic Procedures	26.99	61.44	130.50	193.66	122.67
Surgery	17.95	53.06	61.84	129.64	111.72
Special Premiums	7.75	8.55	6.63	19.02	59.85
Total	**228.76**	**357.76**	**509.35**	**794.38**	**916.39**

Percentage of Billings Attributable to Fee Code Categories by Age Group

	0-19 Years (%)	20-44 Years (%)	45-64 Years (%)	65-79 Years (%)	80+ Years (%)
Outpatient Assessments and Consultations	62	37	37	37	43
Hospital Visits	3	2	3	7	12
Psychotherapy and Counselling	5	14	11	3	2
Laboratory Medicine	7	12	11	10	11
Diagnostic and Therapeutic Procedures	12	17	26	24	13
Surgery	8	15	12	16	12
Special Premiums	3	2	1	2	7

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

shorter hospital stays, more day surgery and greater use of physicians' offices and laboratories for pre-admission diagnostic work-ups.

The greater use of physician services by the elderly than by the non-elderly is not confined to Ontario. The difference in per capita billings between elderly and young adults was most pronounced in the surgery and hospital visits categories. Interestingly, the only category in which per capita billings among the elderly were lower was psychotherapy and counselling. Although billings tended to increase with age, billing growth was slowest in the oldest age groups, and there was an apparent shift away from intervention-oriented services such as surgery, and diagnostic and therapeutic procedures in those 85 to 90 years old when compared with those 75 to 79 years old. This shift away from interventions may reflect a growing reluctance to use heroic medical measures to prolong life in the very old.

This analysis focused on billings and not actual expenditures, which reflect billings plus threshold reductions, retroactive payments and clawbacks. It is important to note that because of overall positive adjustments in 1989/90 and negative adjustments in 1994/95, actual expenditure growth was less than growth in billings. Nonetheless, utilization trends, as described by price-adjusted billings in this analysis, are not affected by these adjustments.

This analysis controls for three factors that drive billing growth: price changes, population growth and aging of the population. Obviously, many other factors, such as the aforementioned trends in hospital utilization, may have affected physician billings. Chapter 9 explores the relationship between billings and changes in physician supply, specialty mix and physician demographics, and provides a detailed account of the effect of retroactive adjustments on actual expenditures.

Overview of ODB Program Expenditures on Prescription Drugs for the Elderly

Introduction

The ODB program provides drug benefits for defined groups, the largest of which is all elderly residents of Ontario. This analysis examines ODB expenditures for the elderly over the period 1990/91 to 1994/95. During this period the program paid the full cost of each prescription for any product listed in the ODB Formulary. To be reimbursed for the prescription, the pharmacy had to submit a claim to ODB. The comprehensive claims data submitted to ODB were used to study important aspects of prescription drug expenditures in Ontario.

Data Source and Methods

The analyses were based on claims files for fiscal years 1990/91 to 1994/95 provided to ICES by the MOH. The files contain all claims submitted to ODB by a pharmacy for payment of a prescription for an insured person. The analysis was limited to the claims under the ODB program that provides drug benefits to elderly residents of Ontario. All claims in which the amount paid was negative or zero were excluded from the analysis. Drug costs were calculated as the difference between the total amount paid by ODB for the claim and the amount paid for the dispensing fee. Per capita costs were calculated with the use of the Census population for 1990/91 and intercensal population estimates for other years.

Unique drug identification numbers (DINs) were used to identify individual drugs. A coding system developed by the provincial government was used to link the DINs to product names, dosages and therapeutic categories. The ODB program uses a classification system based on the target conditions or body systems for prescription drugs to divide drugs into Pharmacologic-therapeutic Classification Groups (PCGs).

Before 1994, several drugs were included in more than one PCG, depending on their purpose. For example, hydrochlorothiazide was categorized in two PCGs, as a hypotensive agent and also as a diuretic. However, in the formulary issued Dec. 1, 1994, each drug was assigned to only one PCG. To make comparisons consistent over the study period, each drug that had been assigned to more than one PCG before 1994 was reassigned to the single PCG designated in the 1994 formulary.

The PCG code usually defines a category of drugs that is used to treat similar conditions (e.g., drugs to treat cardiovascular disease). However, one PCG, which is referred to as non-formulary benefits (NFB), contains claims for drugs that are not available through the standard claims process. Claims for these drugs are reimbursed only if accompanied by a specific reason for their use. Originally, the NFB category included claims for drugs that not in the general ODB formulary but that were deemed clinically necessary on a case-by-case basis. These claims were approved for reimbursement on receipt of a letter from the prescriber justifying clinical need. More recently, a set of drugs defined as limited-use products were added to the NFB category. Claims for drugs on this list are reimbursed only if the prescriber completes a form indicating that the drug is being used for an approved reason. Some drugs (e.g., loperamide) were moved from the general ODB list to the NFB category and some new products (e.g., omeprazole) were assigned directly to the NFB category.

Findings

Overall drug expenditures increased by 40% from 1990/91 to 1994/95 (Exhibit 3.13). During the same period,

Exhibit 3.13: ***Ontario Drug Benefit Program Drug Ingredient* Expenditures for People 65 Years and Older in Ontario, 1990/91 – 1994/95***

Drug Class	1990/91 ($ per Capita)	1991/92 ($ per Capita)	1992/93 ($ per Capita)	1993/94 ($ per Capita)	1994/95 ($ per Capita)
Cardiovascular	137.46	158.33	180.76	195.13	201.06
Central Nervous System	58.26	60.81	60.93	55.78	53.02
Gastrointestinal	68.10	73.17	75.70	63.40	57.11
Hormones and Substitutes	25.95	30.25	34.14	36.21	38.82
Anti-infective	15.07	18.21	20.83	22.02	23.41
Autonomic	17.34	17.97	18.61	18.55	18.41
Eye, Ear, Nose and Throat Preparations	16.92	19.13	21.10	19.46	20.07
Skin and Mucous Membrane Preparations	10.83	11.48	12.47	12.52	13.43
Unclassified Therapeutic Agents	14.26	14.62	13.69	15.64	15.50
Non-formulary Benefits	14.86	20.68	20.65	32.00	36.18
Nutritional Supplements	7.83	9.96	10.17	8.31	5.97
All Other Drug Classes	33.49	37.61	40.71	40.43	40.99
Total (per Capita)	**420.37**	**472.22**	**509.76**	**519.45**	**523.97**
Total Costs ($ million)	**489.29**	**567.88**	**631.51**	**662.73**	**686.60**

* *Drug ingredient costs only, excludes dispensing fees*

Data Source: Ontario Drug Benefit Claims File

Exhibit 3.14: *Ontario Drug Benefit Program Formulary per Capita Expenditures* on Subcategories of Cardiovascular Drugs for People 65 Years and Older in Ontario, 1990/91 – 1994/95*

Cardiovascular Drugs	1990/91 ($)	1991/92 ($)	1992/93 ($)	1993/94 ($)	1994/95 ($)
Cardiac **	63.29	68.96	70.75	72.40	74.88
Anti-lipemic	11.45	17.53	24.93	30.78	36.21
Hypotensive +	51.59	60.34	73.33	81.13	81.04
Vasodilating ++	6.12	6.59	7.37	6.78	5.37
Diuretics	5.02	4.91	4.39	4.04	3.55
Total	**137.47**	**158.33**	**180.77**	**195.13**	**201.05**

* *Drug ingredient costs only, excludes dispensing fees*

** *Contains antiarrhythmic drugs, digoxin and some Beta-blockers and calcium antagonists*

\+ *Contains ACE inhibitors and some Beta-blockers and calcium antagonists*

++ *Contains nitrate products*

Data Source: Ontario Drug Benefit Claims File

the number of elderly people in Ontario increased. As a result of the two trends, per capita expenditures increased by 25% during the four-year period, 21% between 1990/91 and 1992/93 and only 3% between 1992/93 and 1994/95.

Drugs used in the treatment of cardiovascular disease accounted for the largest proportion of drug expenditures in all five years (Exhibit 3.13). In 1994/95, 40% of total drug expenditures, or just over $200 for each elderly Ontarian, was spent on cardiovascular drugs. There was a 46% increase in per capita expenditures on cardiovascular drugs between 1990/91 and 1994/95. Drugs used to treat gastrointestinal conditions accounted for the second largest component of total expenditures, followed by drugs to treat disorders of the central nervous system, which, in the PCG system, includes nonsteroidal anti-inflammatory drugs. Taken together, the three largest drug categories accounted for almost 60% of drug expenditures for the elderly in 1994/95.

Closer examination of the pattern of expenditures on cardiovascular drugs (Exhibit 3.14) shows that expenditures increased for three subcategories of cardiovascular drugs (cardiac, anti-lipemic, and hypotensive drugs) and decreased for the other two (vasodilators and diuretics). Although antihypertensive drugs accounted for the largest proportion of cardiovascular drug expenditures, the greatest proportional increase in expenditures was for lipid-lowering drugs. New lipid-lowering agents that inhibit the 3-hydroxy-3-methylgluteryl (HMG)-CoA reductase enzyme accounted for 91% of the increase; expenditures for this subset of lipid-lowering agents increased from $7 per capita in 1990/91 to $30 per capita in 1994/95.

Per capita expenditures for the category defined by the ODB coding system as gastrointestinal drugs decreased by almost 25% between 1992/93 and 1994/95 (Exhibit 3.15). This decrease was due in part to some drugs (e.g., antidiarrheal agents—loperamide and diphenoxylate) being reclassified from gastrointestinal drugs to NFB drugs during that period. The analysis of expenditures on gastrointestinal drugs is further complicated by the fact that two drugs, cisapride and omeprazole, which on clinical grounds would normally be included with the other gastrointestinal drugs, are listed in the NFB category. When these two drugs, along with diphenoxylate and loperamide, are included in the total for gastrointestinal drugs, per capita expenditures decreased by less than 7% between 1992/93 and 1994/95 and increased by almost 14% between 1990/91 and 1994/95.

Omeprazole is one of several agents used in the treatment of peptic ulcer, dyspepsia and gastroesophageal reflux. Total expenditures on these drugs increased by almost 50% between 1990/91 and 1994/95 (Exhibit 3.16). In both 1990/91 and 1994/95, total expenditures on the histamine (H_2) receptor antagonist ranitidine topped the list of expenditures. During that five-year period, however, expenditures on omeprazole increased by $23 million, accounting for 95% of the increase in expenditures on this group of drugs.

Comment

Expenditures on the ODB program for the elderly continued to increase between 1990/91 and

Exhibit 3.15: ***Ontario Drug Benefit Program per Capita Expenditures* on Formulary and Non-formulary Gastrointestinal Drugs for People 65 Years and Older in Ontario, 1990/91 - 1994/95***

Formulary Drugs

	1990/91 ($)	1991/92 ($)	1992/93 ($)	1993/94 ($)	1994/95 ($)
Antacids and Adsorbants	3.01	2.71	3.40	1.85	0.00
Anti-diarrhea Agents	1.97	2.00	2.08	2.13	0.02
Cathartics	10.81	10.63	10.48	8.63	7.91
Digestants	0.50	0.48	0.51	0.03	0.05
Anti-emetics and Anti-nauseants	0.47	0.50	0.45	0.41	0.39
Miscellaneous	51.34	56.85	58.78	50.10	48.51
Total - Formulary Drugs	**68.10**	**73.17**	**75.70**	**63.40**	**56.90**

Non-formulary Benefit (NFB) Category

	1990/91 ($)	1991/92 ($)	1992/93 ($)	1993/94 ($)	1994/95 ($)
Omeprazole	2.10	6.35	8.76	15.44	19.48
Cisapride	0.41	1.32	1.38	1.97	2.02
Loperamide **	NA	NA	NA	NA	1.44
Diphenoxylate **	NA	NA	NA	NA	0.53
Total - NFB Category	**2.51**	**7.67**	**10.14**	**17.41**	**23.47**
Total for All Gastrointestinal Drugs in Either Formulary or NFB Categories	**70.61**	**80.84**	**85.84**	**80.82**	**80.35**

**Drug ingredient costs only, excludes dispensing fees*

*** 1990/91 through 1993/94 billings for these drugs are included in the formulary listing, anti-diarrhea agents subcategory.*

Data Source: Ontario Drug Benefit Claims File

1994/95, but the rate of growth decreased. This deceleration in growth rate may be attributed to changes made in the program during the years studied, including reductions in the number and type of products listed for reimbursement and stricter controls on reimbursement for non-formulary agents. The growth in overall expenditures is partly a result of the increasing size of the elderly population in Ontario. However, increases in per capita expenditures indicate that, on average, the ODB program is spending more on each elderly person.

Cardiovascular drugs continue to account for the largest proportion of drug expenditures for the elderly. Analysis in the previous edition of the ICES Practice Atlas showed that much of the growth in cardiovascular drug expenditures in the late 1980s and early 1990s was the result of greater expenditures on specific agents to treat hypertension, congestive heart failure and chest pain. These drugs are still important drivers of increased costs over the last few years, but drugs used in the treatment of hyperlipidemia have also had an important impact on costs during these years. Since 1990, when only one drug from this class was available on the formulary, six new agents have been approved for use and listed. There is strong evidence to support the use of these agents in patients with hypercholesterolemia who have had a myocardial infarction as secondary prevention. However, the use of these agents in elderly patients with hypercholesterolemia and no history or symptoms of ischemic heart disease (primary prevention) is more controversial.

As discussed in the first edition, expenditures on angiotensin converting enzyme (ACE) inhibitors and calcium-channel blockers account for a large proportion of cardiovascular drug expenditures. Although these drugs are first-line treatments for congestive heart failure and angina respectively, recent guidelines[2] indicate that diuretics, rather than these agents, should be the first-line treatment for hypertension in the elderly. The analysis indicates that expenditures on diuretics have actually fallen by 20% during the last five years.

Exhibit 3.16: ***Ontario Drug Benefit Program Expenditures* for Acid Reducing Agents for People 65 Years and Older in Ontario, 1990/91 and 1994/95***

	Total Cost ($ million)	
	1990/91	1994/95
Ranitidine**	34.97	29.72
Famotidine**	6.48	7.33
Misoprostil**	2.96	6.88
Omeprazole ✢	2.45	25.52
Cimetidine**	2.02	1.14
Nizatidine**	0.93	3.54
Total	**49.81**	**74.13**

* *Drug ingredient costs only, excludes dispensing fees*

** *These drugs are found among the drugs in the miscellaneous category in Exhibit 3.15.*

✢ *This drug is found in the non-formulary benefit category in Exhibit 3.15.*

Data Source: Ontario Drug Benefit Claims File

Examining the standard PCG classification gives the false impression that expenditures on gastrointestinal drugs have decreased in recent years. In fact, several important gastrointestinal drugs have been included in the NFB category, and combining these drugs with the gastrointestinal drugs on the regular ODB listing indicates continued increases in expenditures for gastrointestinal drugs. Placing drugs in the NFB category means that physicians have to provide written justification for their use to have them covered by the ODB. This measure provides more administrative control over their use than over the use of drugs in the normal ODB formulary. Even with this administrative control, one of the drugs in the NFB, omeprazole, accounts for a major proportion of total ODB expenditures. More detailed information on the trends in the use of particular drugs is contained in Chapter 12.

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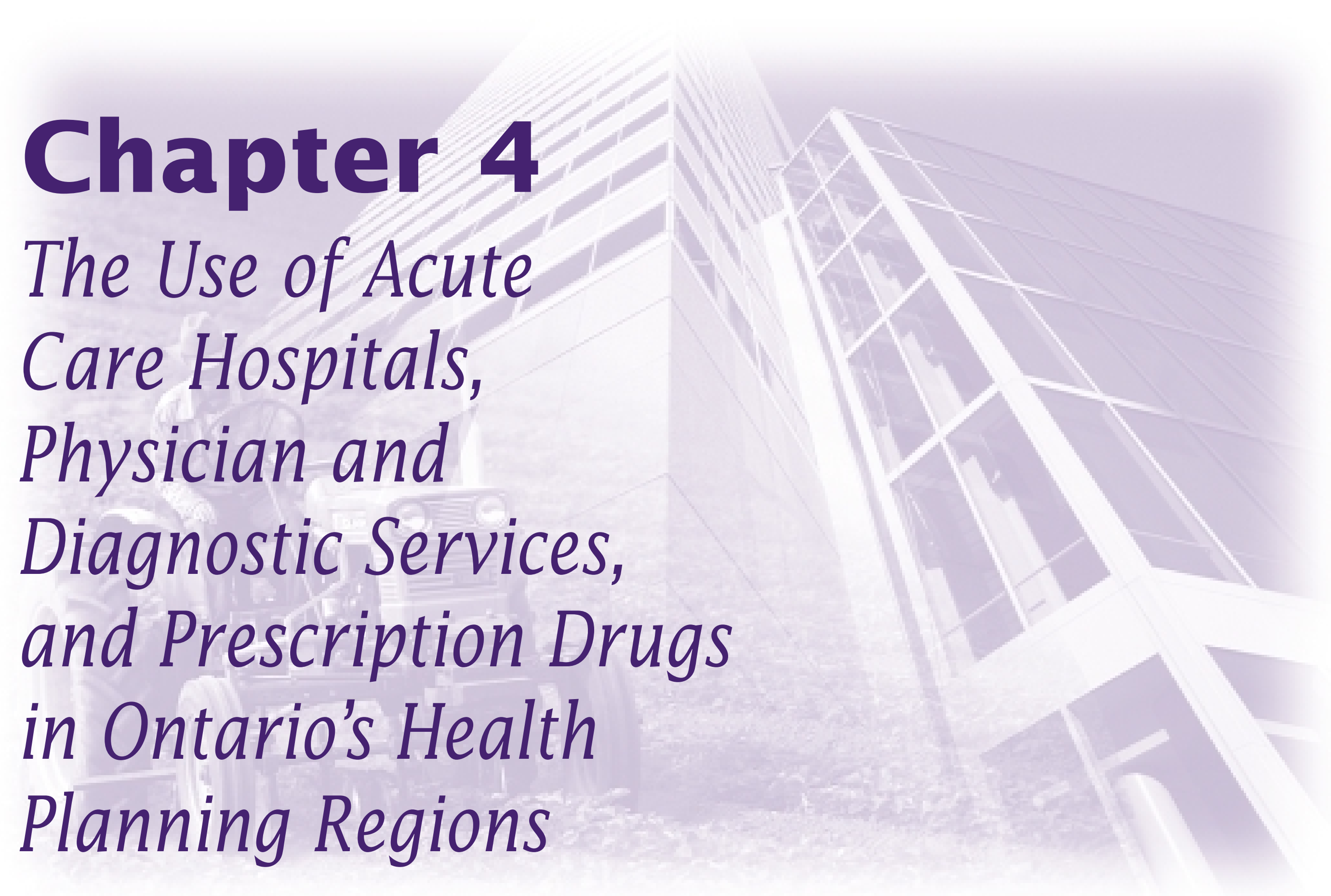
2. Reeves RA, Fodor JG, Gryfe CI et al: Report of the Canadian Hypertension Society Consensus Conference: 4. Hypertension in the elderly. *Can Med Assoc J* 1993; 149: 815–820



Chapter 4

The Use of Acute Care Hospitals, Physician and Diagnostic Services, and Prescription Drugs in Ontario's Health Planning Regions

Introduction

The Ontario Ministry of Health (MOH) funds health care services for approximately 11 million people. Ontario covers a vast geographic area; most residents live in urban areas but many, particularly those in the North, live in isolated rural areas. Providing equal access to health care services for this large and diverse population is a challenge.

This chapter provides estimates of 1994/95 MOH expenditures in the six health planning regions in the province as established by the MOH. This regional analysis examines three of the largest programs funded by the MOH: (1) acute care hospital services, (2) physician services and (3) prescription drugs for the elderly.

The ability to allocate expenditures to residents of a region varies by data source. The data used to study hospital separations (both inpatient and day surgery) identify the place of residence of the patient being treated. This makes it possible to allocate hospital services directly to residents of a region. The data used to analyse physician services and prescription drugs lack information on patients' place of residence but do include the location of service providers. This lack of data on patients' residence makes it impossible to link the use of these services directly to residents of a specific region. However, data on the location of providers can be used to estimate expenditures on physician services and prescription drugs for residents of a region if we assume that residents of these large planning regions receive most of their physician services and prescription drugs from local providers.

Taken together, the data on hospital use, physician services and prescription drugs provide an overview of MOH expenditures in each of the six health planning regions (South West, Central East, Central West, Eastern, North East and North West). This information can help to define more clearly the similarities and differences among regional MOH expenditures.

Data Sources and Methods

The analysis of acute care hospital separations used data on inpatient care and day surgery for 1994/95 from the Canadian Institute for Health Information (CIHI). Each separation was assigned to one of the six Ontario health planning regions according to the patient's county of residence.

The analysis of physician services includes data from the National Physician Database (NPDB), which records fee-for-service billings by each physician in Ontario for 1994/95 and the physician's postal code as reported to the Ontario Health

Insurance Plan (OHIP). Postal codes were linked to health planning regions with the use of the Postal Code Conversion File from Statistics Canada. Each physician's billing activity was assigned to a region and then total billings per region were calculated. Actual 1994/95 expenditures represent billings minus special expenditure control adjustments (see description of threshold reductions and retroactive utilization adjustments in Chapter 9). These adjustments amounted to 4% of billings and were excluded from the analysis. Their exclusion, however, has little effect on regional rate differences because over 90% of these adjustments were applied uniformly in all regions.

The analysis of prescription drugs used data from the Ontario Drug Benefit (ODB) program. Claims data for drugs received by the elderly under the ODB program in 1994/95 contain information on drug ingredient costs, the drug category and the county of the pharmacy that dispensed the drug. The data were aggregated to calculate total drug costs, as well as drug costs by category of prescription filled by pharmacies in the six health planning regions.

A potential problem with using the location of providers to estimate regional physician services and drug costs is that people who reside in one region may receive services from a physician or pharmacy located in another region. The larger the size of the regions in the analysis, the smaller the impact of cross-regional utilization on the accuracy of the measurement of regional expenditures. Each health planning region covers a large geographic area (Exhibit 4.1), and the populations of these regions range from about 250,000 for the North West to almost 5 million in the Central East. The large size of these regions should help to minimize the impact of cross-regional utilization. This impact can be further minimized if the regions are defined so that they reflect referral and care-seeking patterns. Since specialized services are the most likely to be associated with travel, and therefore with cross-regional referral, we examined cross-regional use of services provided by specialized or teaching hospitals as a way of determining the extent to which the planning regions capture existing referral patterns. As shown in Exhibit 4.1, the boundaries of Ontario health planning regions are very similar to the boundaries defined by referral patterns to tertiary care/regional hospitals.

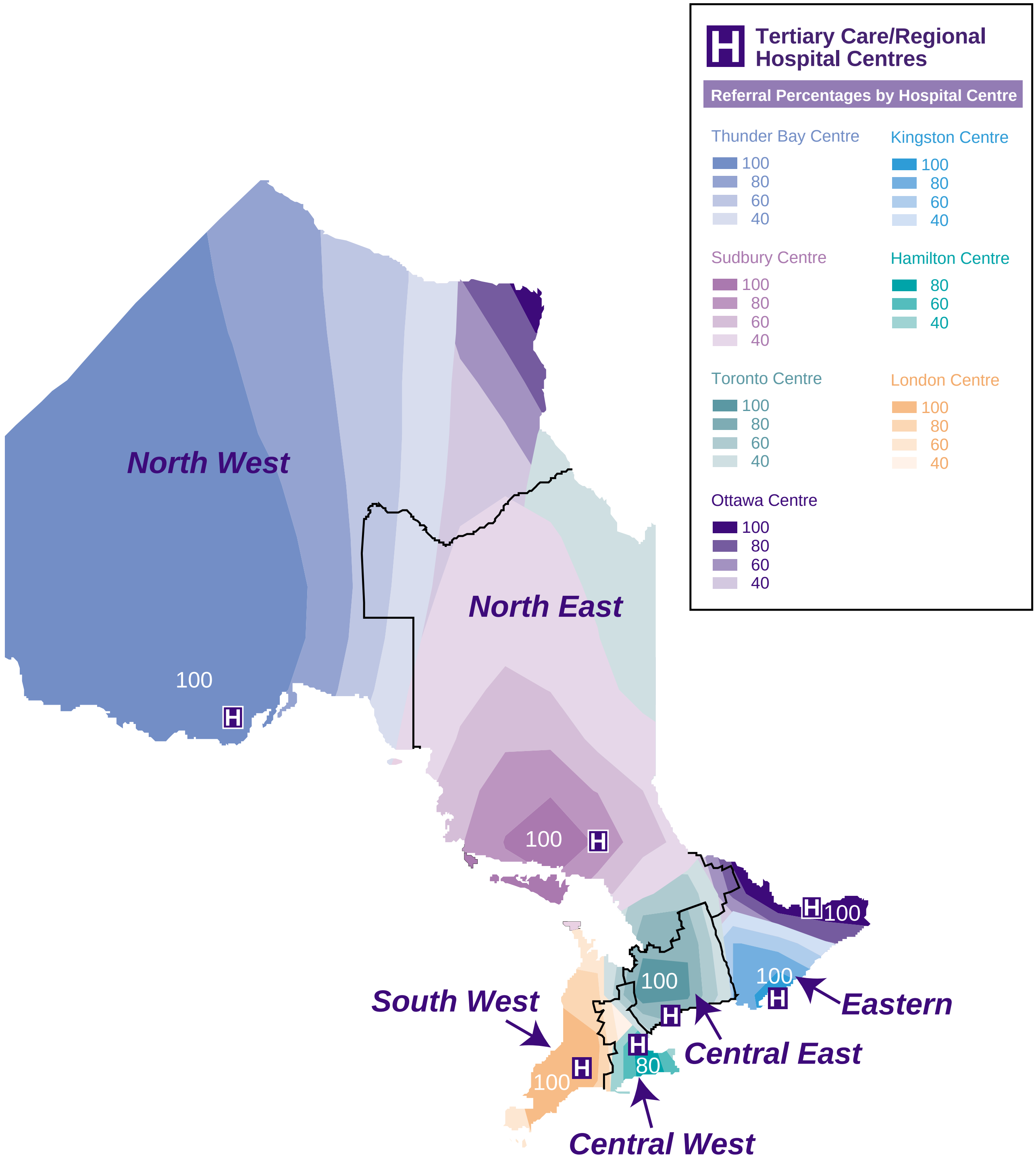
The measurement of hospital separations in this chapter is similar to that in Chapter 3. Acute care inpatient hospital separations were identified and divided into three subcategories: (1) obstetrical and newborn cases, (2) medical cases and (3) surgical cases. Outpatient surgery separations were treated as a separate category. Separations were assigned to a region based on the postal code of the patient's residence. Rates were calculated by dividing the separations by the Statistics Canada estimate of the population of that region in 1995. Both crude and age/sex-adjusted separation rates were calculated using the 1991 census population as the standard population.

The separation data were used as the basis for estimating hospital expenditures for residents of each region. Estimated hospital expenditures were calculated in two steps. In the first step, the relative amount of resources used to provide care for each type of separation was estimated. Some cases are more complex or resource intensive than others. For example, coronary artery bypass surgery involves the use of far more hospital resources than an uncomplicated labour and vaginal delivery. An expert advisory panel to CIHI has developed a set of Resource Intensity Weights® (RIWs) that estimate the differences in resources used to treat different types of cases. A case that has an RIW of 3.0 is estimated to require three times as many resources as a case with an RIW of 1.0. With the use of a computer program that takes into account a patient's age, diagnoses and procedures undergone, CIHI assigns each separation to one of approximately 600 different Case Mix Groups® (CMGs). Each CMG has a specific RIW.

The second step in moving from separation rates to per capita hospital expenditures is to assign a dollar value to each RIW. Different hospitals may have different costs for resources. The MOH uses financial data from hospitals to estimate the cost per RIW for each type of hospital. Hospital expenditures were estimated from a set of MOH-estimated costs per RIW, specific to the type of hospital in which the patient was treated. For example, the average cost per RIW was about $3,200 in a teaching hospital and about $2,200 in a small community hospital. A set of MOH costs per RIW, specific to 144 of the approximately 220 hospitals in the province, was used to estimate costs. For the hospitals that did not have specific costs calculated per RIW, the average cost per RIW for its hospital peer group was used. When this analysis was conducted, RIWs for outpatient surgery for 1994/95 were not available. Therefore, we assigned 70% of the inpatient RIW as the outpatient RIW. Costs were assigned to all separations for people residing in the region, and these costs were summed and divided by the regional population to yield estimated per capita acute care hospital costs.

The MOH expenditures for physician services include fee-for-service billings under the Ontario Health

Exhibit 4.1: ***Boundaries for Ontario Health Planning Regions Compared with Boundaries Defined by Referral Patterns to Tertiary Care Hospitals***



Note: Referral percentages reflect the percentage of patients from a geographic area referred to a hospital centre for inpatient care

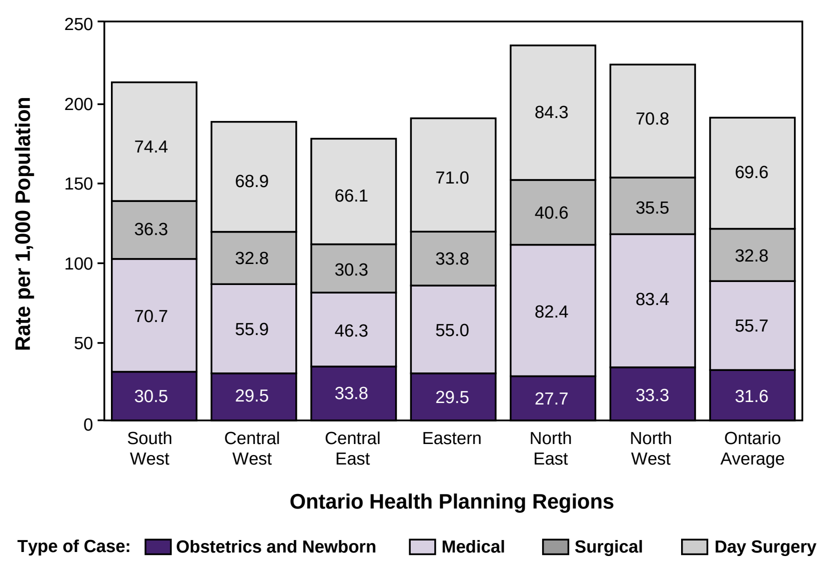
Insurance Plan (OHIP) as well as funds paid to physicians through programs that involve other types of payment mechanisms. One of these programs is the Health Service Organization (HSO) program, which funds payment to physicians for services provided to defined rosters of patients. Another is the Community Health Centre (CHC) program, which provides salaries to physicians who work in multidisciplinary primary care clinics across the province. A third is the Alternate Funding Plan (AFP). The AFPs are used to pay for a wide variety of services, including trauma programs and emergency department coverage. Most of these non-fee-for-service programs fund care in all the health planning regions. Two programs that may have an important impact on costs for specific regions have been included in the estimates of physician service expenditures. One program is the AFP which pays general pediatricians (i.e. those without sub-specialty training) who work at the Hospital for Sick Children in Toronto. General pediatricians at other hospitals are paid through OHIP fee-for-service payment. The AFP payments to pediatricians at the Hospital for Sick Children are included in the calculation of total physician expenditures for the Central East region. The other AFP program included in the calculation is the South East Academic Medical Organization (SEAMO). This AFP was started in July 1994 and was designed to reimburse physicians based at Queen's University medical school for services provided. Expenditures for this program over the nine month period that overlapped with the 1994/95 fiscal year were included in total physician expenditures for the Eastern region.

The OHIP fee-for-service billings for each region were calculated with the use of NPDB 1994/95 data and the fee code categories outlined in Chapter 3. Expenditures for laboratory services provided to outpatients can be allocated to one of three different sources. Claims for services provided by private laboratories are included in the OHIP fee-for-service expenditures. Services provided to outpatients by hospital-based laboratories are funded under hospital global budgets. Services provided by public health laboratories are funded directly by the MOH. Because the source of laboratory services may vary by region, OHIP fee-for-service laboratory costs may not provide an accurate assessment of total laboratory costs in a region.

OHIP fee-for-service billings per capita were calculated by dividing total OHIP billings on services provided by physicians practising in the region by the Statistics Canada population estimates for the region in 1995. Because of the lack of age/sex-specific data on physician billings, only crude per capita billings could be calculated.

Expenditures for HSOs and CHCs for each region were estimated from data supplied by the MOH. It was estimated that the average expenditure per patient rostered to an HSO in 1994/95 was $500. The MOH provided a list of HSOs in each planning region and the number of patients on their rosters. The number of rostered patients in each region was combined with the average per capita expenditure estimate of $500 to yield an estimated HSO expenditure per region. Physicians in CHCs are paid by salary. MOH data indicate that the average physician working full time in a CHC received a total annual salary of approximately $100,000. The MOH provided a list of CHCs in each region in 1994/95 and the number of physicians employed full time in each of these CHCs. The information on the number of

Exhibit 4.2: ***Separation Rates from Acute Care Hospitals for Residents of Ontario Health Planning Regions, 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

full-time CHC physicians in each region was combined with the estimated average salary of $100,000 to estimate expenditures on CHC physicians in each region. The estimated total expenditures on HSOs, CHCs and AFPs in each region were divided by the census population of the region to provide estimates of per capita expenditures for the non-fee-for-service programs in each region.

The 1994/95 Ontario Drug Benefit (ODB) program expenditures on drugs for the elderly were estimated with the use of the categories outlined in Chapter 3. Costs were assigned to each region on the basis of the location of the pharmacy from which the drug was dispensed. Per capita costs were calculated with the use of Statistics Canada population estimates for 1995. Although drug expenditure data are limited to drugs dispensed to the elderly, the total population was used as the denominator when calculating per capita expenditures so that these expenditures had the same denominator as the other two expenditure categories. This made it possible to add the per capita expenditures for the three categories to provide an estimated overall per capita cost for all three expenditure categories.

Findings

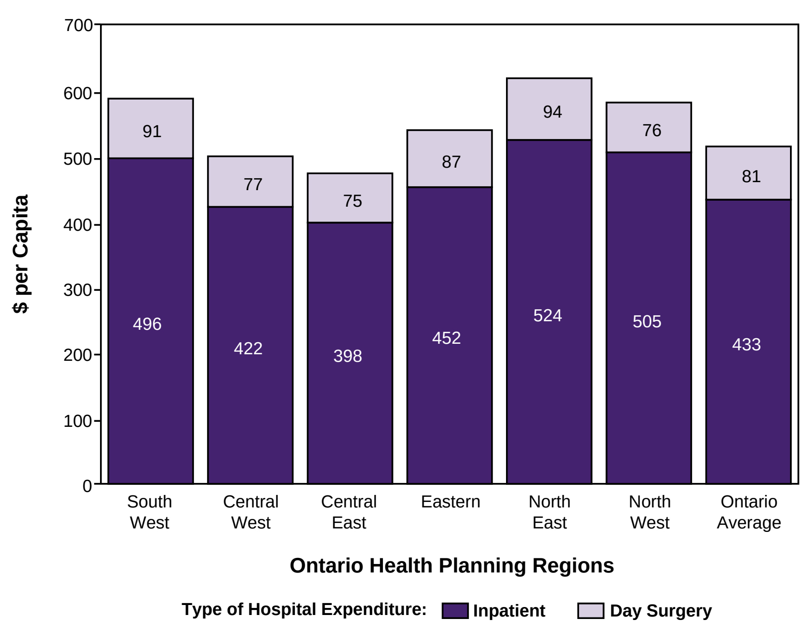
Acute Care Hospital Separation Rates and Estimated per Capita Acute Care Hospital Expenditures

In 1994/95, total inpatient separation rates in the two Northern regions were about 25% higher than the provincial average (Exhibit 4.2). There were differences in separation rates among the four Southern regions, with the separation rate in the South West almost 25% higher than that in the Central East. The data presented in Exhibit 4.2 are not adjusted for differences in the age and sex distributions of the residents of the different regions in Ontario. When age/sex-adjusted rates were calculated, the results were very similar to those obtained from crude rates.

The differences in overall hospitalization rates among the regions do not result from differences in obstetrical and newborn care. The Central East region, which has the lowest overall separation rate, has the highest obstetrical and newborn separation rate in the province (Exhibit 4.2). The bulk of the difference in separation rates between the two Northern regions and the rest of the province is the result of differences in medical separations. The medical separation rates in the two Northern regions are almost 50% higher than the provincial average. Inpatient surgery rates in the Northern regions, particularly the North East, are also higher than the provincial average. Outpatient surgery rates in the North East are also much higher than the provincial average. The South West region has medical separation rates that are almost 53% higher and combined inpatient and day surgery separation rates that are about 20% higher than those in the Central East region. These regional patterns are similar to those in 1991/92, discussed in the first edition of the ICES *Practice Atlas.*

Estimated per capita hospital expenditures are 20% higher in the North East and 13% higher in the North West than the provincial average (Exhibit 4.3). The estimated per capita expenditures in the South West are 24% higher than those in the Central East region. The smaller differences in estimated per capita costs than in separation rates result from both a less resource intensive case mix (i.e., a lower RIW per case) and a lower cost per RIW. The lower cost per

Exhibit 4.3: ***Estimated* per Capita Expenditures for Acute Care Hospital Use by Residents of Ontario Health Planning Regions, 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

** Expenditures were estimated using Resource Intensity Weights® (RIW); see methods section for details*

RIW is the result, at least in part, of less reliance on teaching hospitals for residents of some regions than for residents of other areas. Costs per RIW are highest in teaching hospitals, reflecting in part the research and teaching roles played by these institutions.

Estimated per Capita Expenditures for Physician Services

Analysis of OHIP fee-for-service billings reveals a very different regional pattern of use than the pattern of hospital separation rates (Exhibit 4.4). The Northern regions have much lower per capita billings for physician services than the Southern regions, and the South West region has lower billings than the Central East and the Eastern regions. The Central East has the highest overall billing rates, and these rates remain higher even after fee-for-service billings on laboratory services are excluded. Examination of the subcategories of OHIP fee-for-service billings reveals that the biggest absolute difference in regional billings is for outpatient assessments and consultations, and the largest proportional difference is for psychotherapy and counselling services. (This finding does not include laboratory services, which have a larger proportional difference in billings among regions; these differences may simply be the result of variation in the proportion of laboratory services provided by private fee-for-service laboratories.) The Central East and Eastern regions have per capita billings on psychotherapy and counselling that are double those in other non-Northern regions and about four times higher than those in the Northern regions. (Chapter 10 includes greater detail on billings for psychotherapy and counselling.)

Costs for the non-fee-for-service programs are highest in the Eastern region, due predominantly to SEAMO, and in the North East region, as a result of higher HSO and CHC expenditures.

Estimated per Capita ODB Program Expenditures on Drugs for the Elderly

The South West region has the highest per capita expenditures on prescription drugs, and the North West region has much lower per capita expenditures than those for the other regions (Exhibit 4.5). Per capita expenditures on drugs are 14% higher in the South West than in the Central East region. The proportional differences in expenditures are similar among drug categories, and the differences in regional per capita expenditures cannot be attributed to any particular drug category.

Exhibit 4.4: ***OHIP Fee-for-service✢ and Non-fee-for-service✶ Expenditures per Capita by Ontario Health Planning Region, 1994/95***

	Regional per Capita Expenditures ($)						
Expenditure Category	**South West**	**Central West**	**Central East**	**Eastern**	**North East**	**North West**	**Provincial Average**
Assessments and Consultations	152	145	183	149	119	117	166
Hospital Visits	18	14	13	13	12	16	14
Psychotherapy and Counselling	25	22	47	49	13	12	38
Diagnostic and Therapeutic Services	73	72	93	68	53	56	81
Surgery	57	51	56	49	46	44	54
Laboratory Medicine	29	23	65	22	12	15	43
Special Premiums	10	9	9	10	12	12	10
Total OHIP	364	335	467	360	267	271	406
Total OHIP, Excluding Laboratory	335	312	402	338	255	256	363
Non-fee-for-service ✶	7	13	8	30	34	2	10
Total Physician Expenditures, Excluding Laboratory	342	325	410	368	289	258	373

✶ *Includes estimated expenditures for Community Health Centres and Health Service Organizations in each region. Expenditures under the Alternate Funding Plan for non-subspecialty pediatricians at the Hospital for Sick Children were allocated to the Central East Region. Estimated expenditures for the South East Academic Medical Organization Alternate Funding Plan were allocated to the Eastern Region.*

✢ *OHIP fee-for-service billings were allocated to each region based on the billing address of the physician.*

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Estimated per Capita Expenditures on Hospitals, Physician Services and Drugs for the Elderly Combined

Exhibit 4.6 presents estimated regional expenditures for the three major MOH programs (acute care hospitals, OHIP and ODB) combined. Estimated expenditures per capita for these three programs range from $887 in the Central West to $998 in the South West. The Central West region has combined per capita expenditures that are 7% lower than the provincial average, whereas the South West has combined per capita expenditures that are 5% higher than the provincial average. In the two Northern regions, acute care hospital costs account for about 64% of the combined costs. In the Central East region, acute care hospital costs account for 50% of the combined costs.

Comment

The per capita costs presented in this chapter are estimates of the actual MOH expenditures in the province's six health planning regions. Although the mandatory reporting of place of residence on CIHI hospital separation data makes it possible to accurately measure local rates of use of specific components of hospital care (Chapter 5), these hospital costs are estimates based on current hospital costing techniques. These techniques cannot capture all of the differences in the resources used to provide care to different patients, nor can they accurately account for the true costs of these resources. However, these techniques are the best currently available and can be used to study expenditures and to guide funding decisions. The data on OHIP fee-for-service billings and ODB program drug costs provide an accurate measure of MOH expenditures. However, because of the lack of access to a file linking claimants' health care numbers to their county of residence, the analysis relied on the location of the provider to allocate costs to health planning regions. Although the health planning regions appear to define distinct referral areas, there is some cross-regional use of physician services and prescription drugs that cannot be accounted for. Finally, the analysis includes only selected MOH programs. Although the analysis is based on comprehensive data on acute care hospital use and OHIP fee-for-service billings, it excludes non-elderly ODB recipients, special adjustments to OHIP billings, some physician services remunerated through AFPs and important MOH programs such as Home Care and chronic care hospitals. Despite these limitations, it is possible to draw some general conclusions.

Exhibit 4.5: ***Ontario Drug Benefit Program per Capita Expenditures* by Category of Drug and Ontario Health Planning Region, 1994/95***

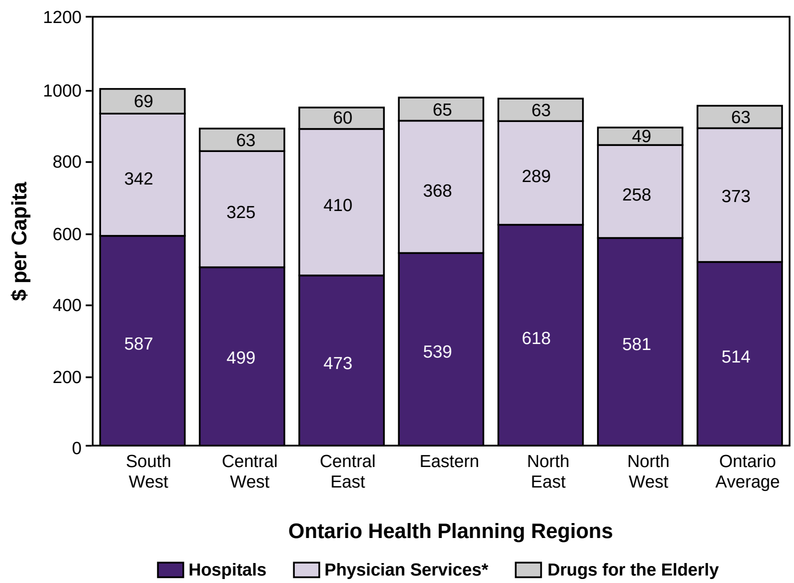
	Regional per Capita Expenditures ($)						
Drug Category	**South West**	**Central West**	**Central East**	**Eastern**	**North East**	**North West**	**Provincial Average**
Cardiovascular	26.97	24.67	23.92	24.26	24.96	19.15	24.47
Central Nervous System	7.63	6.50	5.65	7.13	6.63	5.41	6.34
Gastrointestinal Agents	7.74	6.87	6.73	7.30	6.98	5.00	6.95
Hormones and Substitutes	4.83	4.94	4.42	4.83	4.75	3.35	4.63
Anti-infective	3.05	2.76	2.91	2.61	2.37	1.78	2.80
Autonomic	2.99	2.15	1.85	2.45	2.86	1.65	2.20
Eye, Ear, Nose and Throat	2.11	2.11	2.19	2.32	2.10	1.49	2.16
Skin and Mucous Membranes	1.57	1.57	1.78	1.36	1.26	1.16	1.61
Unclassified Therapeutic Agents	1.80	1.95	1.61	1.88	1.39	1.54	1.72
Non-formulary Benefits	5.52	5.33	4.69	5.64	5.89	3.95	5.11
Nutritional Supplements	0.13	0.14	0.12	0.20	0.07	0.10	0.13
Other	4.47	4.20	4.37	5.27	4.14	4.10	4.45
Total	**68.81**	**63.19**	**60.24**	**65.24**	**63.40**	**48.68**	**62.58**

* *Expenditures were allocated to the region based on the postal code of the pharmacy that filled the prescription.*

Note: Per capita expenditures were estimated with the entire population as the denominator to make them consistent with other per capita costs in this chapter.

Data Source: Ontario Drug Benefit Claims File

Exhibit 4.6: ***Estimated per Capita Expenditures for Acute Care Hospitals, Physician Services and Drugs for the Elderly by Ontario Health Planning Region, 1994/95***



** Excluding laboratory services but including Community Health Centres (CHCs), Health Service Organizations (HSOs) and selected Alternate Funding Plan (AFP) expenditures*

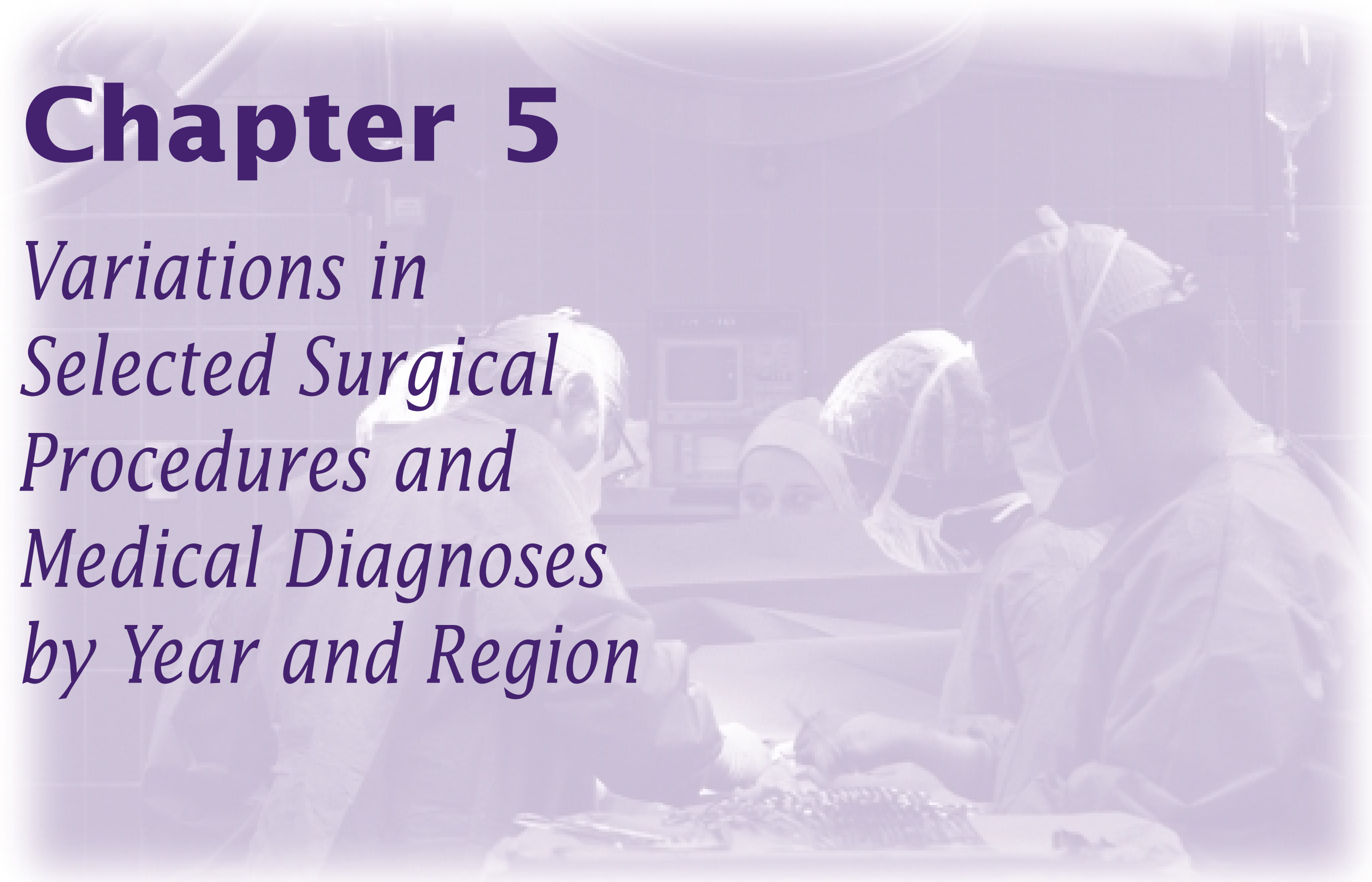
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health, Ontario Drug Benefit Claims File, National Physician Database

There are large differences in acute hospital separation rates among the regions. The analysis of age/sex-adjusted acute care hospital utilization indicates that these differences cannot be explained by the demographic composition of the populations of these regions. Moreover, the differences in acute care hospitalization are not spread evenly among types of cases but are focused on medical cases. People in different areas of the province have very different rates of use of acute care hospitals and, in particular, very different rates of use of hospitals for medical conditions. These differences must be linked to data on needs to determine whether they reflect differences in access to needed care or in hospital utilization for discretionary medical care. Although the differences between hospital use rates in the North and the rest of the province may partly reflect the unique challenges faced by residents and providers in these regions, the large difference in hospital utilization between the South West and Central East regions raises fundamental questions about the organization and delivery of acute care services.

There are also large differences in estimated OHIP physician fee-for-service billings. Per capita fee-for-service billings are much lower in the Northern regions than in the rest of the province, and these differences persist after the major components of non-fee-for-service payment are included in the analysis. The differences in fee-for-service billings are not equally distributed among types of services. The biggest absolute differences are for outpatient assessments and consultations, a large and non-specific category. The largest relative difference is for psychotherapy and counselling services, a category that includes a limited number of specific fee code items. These services can be provided by all practitioners, not just psychiatrists. More analysis is needed to determine whether these differences represent differences in access to psychiatrists or differences in the amount of psychotherapy and counselling services provided by non-psychiatrists. (More information on OHIP billings at the regional level can be found in Chapter 9, and a detailed analysis of mental health services is presented in Chapter 10.)

Despite the large regional differences in estimated per capita expenditures on physician services and acute hospital care, there are smaller relative differences when expenditures in all programs are combined. Taken together, the two Northern regions have combined per capita expenditures quite close to the provincial average, but these two regions have lower physician expenditures and higher hospital expenditures than the rest of the province. It is important to determine whether this fundamental difference in health care delivery between the North and the rest of the province is an optimal response to the geographic realities in the North or an adaptation arising from lack of access to ambulatory care.

In addition to differences in the patterns of care between the North and the rest of the province, there are differences in patterns of care among the four Southern regions. Although geography and physician supply may have some role to play in these differences, they may also reflect different practice styles. More detailed analysis is required to determine whether such differences affect quality of care and health outcomes.



Chapter 5

Variations in Selected Surgical Procedures and Medical Diagnoses by Year and Region

Introduction

In the first edition of the ICES *Practice Atlas,* we reported on regional variations in utilization of certain surgical procedures. This material sparked considerable interest, as professionals, administrators, policy makers and the general public sought to understand why rates of many procedures varied sharply according to where patients lived. Since the release of the first edition in May 1994, there has been limited opportunity to address these inter-regional variations, and most initiatives taken could not lead to measurable changes by March 31, 1995 — the end of the most recent fiscal year for which hospital discharge data were available for this edition. Moreover, as noted in the concluding chapter of the 1994 edition, the Ontario health care system lacks a coordinating body to take action on issues such as major geographic variations in the use of services. Therefore, in preparing this edition, we assumed that most of the variations demonstrated in the first edition would persist. However, it is appropriate to revisit the procedures covered in the first edition, since the final year covered therein ended March 31, 1992. We can compare the three fiscal years analysed in the previous edition (1989/90 to 1991/92) to the subsequent three years (1992/93 to 1994/95).

Accordingly, this analysis revisits the previous procedures and has been extended in four ways: (1) two other common surgical procedures — cataract surgery and cervical dilatation with endometrial curettage (D&C) — are covered; (2) geographic variations in hospitalization patterns for two common medical diagnoses — asthma and congestive heart failure — are included because these are regarded as diagnoses for which hospitalization rates may be reduced by effective primary care and ambulatory specialist care; (3) the section on gallbladder surgery reflects the impact of laparoscopic cholecystectomy, including outpatient surgery; and (4) the material on hysterectomy now examines different surgical approaches, including laparoscopically-assisted vaginal hysterectomy.

At the outset, we should emphasize that variations in health care are ubiquitous. Readers browsing through the ICES *Practice Atlas* will find such variations documented repeatedly, not only for the procedures and conditions analysed in this chapter, but throughout the Atlas.

How, then, do the geographic variations in this chapter fit into the larger picture of health care services? This question is perhaps best answered by recapitulating some background from the first edition. First, let us contrast analyses by site of patient residence with the hospital-level analyses presented in other chapters. Hospital-level analyses allow physicians, nurse managers and administrators in one institution to compare themselves directly with other institutions. However, the differences in practice patterns between two hospitals may be caused by referral bias arising because sicker patients, or those with unusual or complex disorders, tend to be referred to larger and more specialized hospitals. These issues of different patient populations should not be major confounding factors in comparisons by site of patient residence. In particular, more than 20 years of analyses of geographic variations in rates of service have failed to show that anything more than a trivial component of the differences in service rates is attributable to variations in incidence and severity of the related illnesses. Thus, after adjustments are made for demographic differences (as they are in all analyses below), we would not expect big differences in patterns of care provided to the residents of two regions.

One possible explanation for these differences is gross mismeasurement of the services or populations under analysis. A few potential sources of imprecision are worth noting here. Day surgery was consistently analysed for procedures in which it may have been applicable (e.g., cholecystectomy, orchidectomy and transurethral prostatectomy). Thus, regional variations in day surgery utilization cannot explain the observed patterns. Out-of-province surgery is a concern only for a few major procedures performed for residents in the northwest, e.g., coronary artery bypass surgery for residents of the Thunder Bay area, who may obtain services in the United States or in Winnipeg. Another source of error is interhospital and, by extension, interregional variation in the ways that diagnoses and procedures are recorded. Coding errors by hospitals that came to light after the publication of the last edition have led us to make two changes in this edition. First, we changed some procedure selection algorithms to make them more stringent and to reduce the chance of coding errors. Second, ICES mailed hospital level analyses to hospitals so that they could cross-check the data. In this edition, we also include an appendix that reviews available studies on coding accuracy. The accuracy of health record coding in hospitals is greatest for major surgery and diminishes with the complexity of the information and with secondary procedures and diagnoses. On the basis of these reviews and data checks, we remain confident that only a small fraction of the variation demonstrated below is attributable to coding imprecision.

Turning to denominators, it is unlikely that populations are mismeasured, since we use Statistics Canada data with appropriate intercensal interpolations and standard age/sex adjustments. These data take into account all residents of a District Health Council (DHC), including on-reserve native Canadians.

Since the observed variations are unlikely to be artifactual, the questions posed in the first edition are still relevant: Why do geographic variations occur, and what measures should be taken to respond to them? The explanations from the first edition remain pertinent and are repeated unapologetically.

Some random variation in measurements by time and place is reasonable. It is not sensible to expect absolutely identical rates of service in a complex system, no matter how well managed it might be. We accordingly present the standard statistical tests that reflect the extent to which the variations in surgical rates among regions are greater than would be expected by chance alone.

Physicians' judgements also play a role in the variation of surgical rates. This is a complex issue. When comparing, for example, a region with a high rate of a certain procedure to several other regions, a logical concern is that there may be inappropriate overuse of services in the high rate area. However, this hypothesis has not been strongly supported in several studies in which surgical and medical procedures have been examined and categorized by the strength of indications. Thus, in some instances, rate variations may be a signpost of underservice rather than of overzealous intervention. Previous studies of geographic variations in medical practice have also shown that disparities are greatest when there is a lack of evidence about the best treatment option for patients. Faced with uncertainty and incomplete evidence, clinicians' decisions will understandably vary. Such variations in practice style are not necessarily a concern if patients have similarly good outcomes from two or three different approaches. However, in most cases, there is no scientific proof that outcomes are equivalent for different practice patterns, and the variations simply reflect a lack of information. Options will usually have different costs or risks. Geographic variations are therefore useful to highlight research domains in which there has been inadequate evaluation of the scientific basis and economic implications of medical practice. On a more practical level, although variations in practice patterns seldom justify conclusions about the quality of medical care, they do focus attention on areas in which care may need to be improved.

A particularly important source of variation is the availability of services and technologies. The most obvious factors are medical manpower and hospital beds. In a universal health care system, regional disparities in these factors should be small. However, as noted in the last edition, Ontario's health care system is not a planned system per se, and there are many inconsistencies in the organization and availability of services. Certainly, in remote parts of the province and areas with low population density, there are still difficulties in gaining access to a variety of medical services. One reason we have openly identified DHCs is to permit planners, practitioners and residents in rural or remote regions to compare their region with other regions. This issue has also catalyzed the inclusion of the above-noted medical diagnoses as bellwethers for access to ambulatory care.

Variations in service profiles among small areas are like screening tests in medical practice. They tell us there may be a problem, but before deciding on a course of action we need to consider a range of explanations, and on most occasions, do more definitive tests. In many instances, a combination of several factors leads to variations in service rates. Among these factors are "systems" problems that are clearly not under the control of any one person or institution. Some systems problems, such as the long distances patients in remote regions must travel to receive specialized care, can not be easily remedied. It is therefore crucial that a nonjudgemental and blame-free approach be fostered when investigating the causes of variations.

What, then, can be done when major variations in surgical rates or condition-specific hospitalization are revealed? Hospitals and communities must review current practices as needed and determine what influences them. Practices must be related to available evidence about what will best serve patients' needs. If, as is sometimes the case, there is latitude for improvement, a multidisciplinary approach drawing on total quality management, may be the most constructive vehicle to effect changes in the system and the practice patterns of those working in it.

Lastly, we repeat here a key point that was made in the first edition. Rather than always tagging practice variations as problems, we can also see these variations as inadvertent experiments that allow providers and institutions to learn from each others' experiences. Carried through systematically, this learning process should catalyze movement toward a consistently higher level of effectiveness, efficiency and equity in health care delivery in Ontario.

General Approach to Analysis

The data sources for this chapter are the Canadian Institute for Health Information (CIHI) database on acute care hospitalization and Statistics Canada census information. We report rates by DHC. The patient's DHC of residence was determined from the residence codes in the CIHI abstracts. For ease of reference, the more populous DHCs — Metropolitan Toronto, Peel and Ottawa-Carleton — are broken down further by counties, cities, boroughs or regions on the basis of postal codes. Only those with valid postal codes are included in the breakdowns. Hence, the sums of the breakdowns do not necessarily equate to the overall DHC totals due to missing postal codes. Fourteen procedures are included: hip replacement, knee replacement, abdominal aortic aneurysm repair, carotid endarterectomy, peripheral vascular surgery, coronary artery bypass grafting, cholecystectomy, primary and incidental appendectomy, radical prostatectomy, orchidectomy, transurethral resection of the prostate, hysterectomy, dilatation of the cervix and endometrial curettage (D&C), and cataract surgery. Two medical diagnoses — asthma and congestive heart failure — are also covered, for the reasons given above.

In calculating the numerator, the number of procedures was not always equivalent to the number of people. For example, on occasion, one person could have two hip replacement operations within a given fiscal year or multi-year period as analysed here, either one on each side or a revision of an earlier procedure. In contrast, hysterectomy or appendectomy obviously cannot be repeated. This issue is highlighted where applicable.

The CIHI database includes separations (discharges, transfers, sign-outs or deaths) for all patients admitted to Ontario hospitals in a given fiscal year. In general, the analyses that follow excluded all records that carried codes showing cancellation of surgery. We also excluded duplicate records, sign-outs and records showing the procedure code when the patient was readmitted for treatment of a complication of that procedure. This cautious approach means that we may have slightly underestimated the rates of some types of surgery. Cases with missing residence codes were also eliminated. Cases with missing sex or age, or with age greater than 99 were also eliminated, but these criteria resulted in very few exclusions.

Records of separations from Manitoba hospitals for residents of northwestern Ontario were obtained from the Manitoba Health Service Commission and incorporated into the numeration of the Thunder Bay and Kenora–Rainy River DHCs. These data were available for 1989/90 to 1993/94, but not for 1994/95, at the time of analysis. Therefore, for 1994/95, we extrapolated these adjustments from previous years. This procedure alleviated the undercounting of some major procedures for these geographic areas in our first edition.

For most procedures, we report trends over a 10 year period, from 1985/86 to 1994/95. All rates were adjusted for age and sex differences among years and regions, except for procedures specific to one sex (for example, prostatectomy or hysterectomy); these are age-adjusted only.

We used several different age groupings in calculating the adjusted rates for the small areas, depending on the age distribution of the patients receiving the procedure, in an effort maximize the stability of the rate estimates. However, we used one standard age grouping in calculating the province-wide age/sex-specific rates and overall adjusted rate. This allows a more direct comparison of overall rates across procedures. The reader may notice that the province-wide adjusted rates for 1994/95 sometimes appear in more than one table with slightly differing values. This reflects the fact that different age groupings were used to calculate these rates.

Our comparisons of surgical rates among small areas, focused on 1992/93 to 1994/95. Rates and rankings for 1989/90 to 1991/92 are provided for comparison. Rankings were not provided for data specific to 1994/95, because the stability of the rankings would be affected by the reduction of the numbers of procedures to a single year. All cases in the years 1989/90 to 1991/92 and 1992/93 to 1994/95 were combined and the numbers divided by three to give stable rates for comparison among the DHCs. The denominators are drawn from Statistics Canada intercensal population estimates for Ontario for the years of interest; all age/sex-adjusted rates used the 1991 Ontario population as the standard.

We report the standard summary measures for geographic variations. The ratio of highest to lowest rates (the extremal quotient) is intuitively understandable but is driven by outliers. More useful measures are the coefficient of variation (CV) and the systematic component of variation (SCV). These allow one to benchmark the degree of variability among procedures and between the two time periods included here. We also report Chi-square values for each procedure and period that test for variation among the DHCs while controlling for age and sex differences among DHCs. Most of the overall Chi-square statistics will be highly significant because of the large volumes of the procedures included here; hence, some interpretive judgement must be exercised. A Chi-square statistic is also used to compare each DHC with the overall mean rate for the province. We note the DHCs in which rates are significantly higher or lower than the mean rate. A p value of less than 0.05 is more meaningful in area-by-area comparisons than in the overall comparison, which has a very high statistical power. However, a p value of less than 0.01 is a more reasonable threshold value because we made multiple comparisons (e.g., across more than 30 DHCs).

Readers will occasionally note that two DHCs have particularly high or low rates but only one DHC is marked as significantly higher than the mean rate. This is a function of increased statistical power in the DHC with a greater case volume.

An appendix to this chapter includes the procedure codes used in the analyses (A5.1). In a few instances, in which more complicated algorithms for record selection have been used, the codes and their rationale are also presented in the body of the chapter. A second appendix (A5.2) documents the excluded cases and those with missing data by procedure and year.

The data in the first edition of the ICES *Practice Atlas* were organized by county, whereas those in this edition are organized by DHC . To facilitate comparison of the data, the electronic version of the Atlas includes data by both the county and DHC of patient residence.

The rates presented in this edition of the ICES *Practice Atlas* may not agree exactly with the rates found in the first edition for the same procedure over the same time period. There are two primary reasons for this. First, we are using different (more accurate) population estimates in our denominators and second, we have improved our procedures for cleaning the data, which may produce a slightly different count in the numerator.

Total Hip and Knee Replacement

Overview

Lower limb arthroplasty can yield dramatic improvements in a patient's functional status and health-related quality of life.[1-6] For example, a recent meta-analysis of observational studies of knee arthroplasty outcomes concluded that more than 70% of patients have dramatic functional benefits and more than 80% achieve pain relief.[7] These procedures are occasionally required as a result of joint damage from inflammatory arthritides, (e.g., rheumatoid arthritis or the various seronegative syndromes). However, the predominant indication for joint replacement is osteoarthritis. It is estimated that 3% to 5% of people 65 years old experience osteoarthritis of the hip joint; osteoarthritis of the knee is even more common, and the prevalence of both conditions rises with age. Given the positive outcomes of arthroplasty, its use is understandably increasing in most industrialized countries as the technology diffuses and populations age.

A multidisciplinary Ontario panel has developed guidelines for family physicians to decide whether a patient should be referred to an orthopedist for possible joint replacement.[8] Non-surgical measures, including drugs, exercise and physiotherapy, are the first line of treatment. The key indications for knee or hip surgery are relief of pain and improvement of function, if non-surgical measures are deemed to have failed.

There are no definitive multivariate analyses concerning the short- and long-term benefit–risk ratios for various types of patients who might be considered for arthroplasty. Younger patients will often wear out a prosthesis in less than 10 years, especially if they are heavy or very active, whereas 90% of older and less active patients can expect their prosthesis to last 10 to 15 years. A second operation to revise failed components can be difficult. Therefore, attempts are often made to defer surgery as long as possible. Deferring surgery, however, may not always be the best strategy if reductions in the patient's activity and continued deterioration of the affected joint lead to a particularly protracted postoperative recovery.

Reconstruction or osteotomy is sometimes an alternative in younger patients, particularly those aged 60 or younger. Indications for osteotomy are controversial.[9–13] Osteotomy has the particular advantage of forestalling joint replacement in selected persons who are younger, more active and therefore more likely to wear out a prosthetic hip or knee. However, the rate of osteotomy of the knee (and especially of the hip) in Ontario is very low relative to other surgical procedures.[14] ICES scientists have not found any substitution effects in the use of the procedures; for example, higher use of osteotomy is not associated with lower rates of total joint replacement. Therefore, we focus here on total joint replacement alone.

Analysis of Total Hip and Knee Replacements

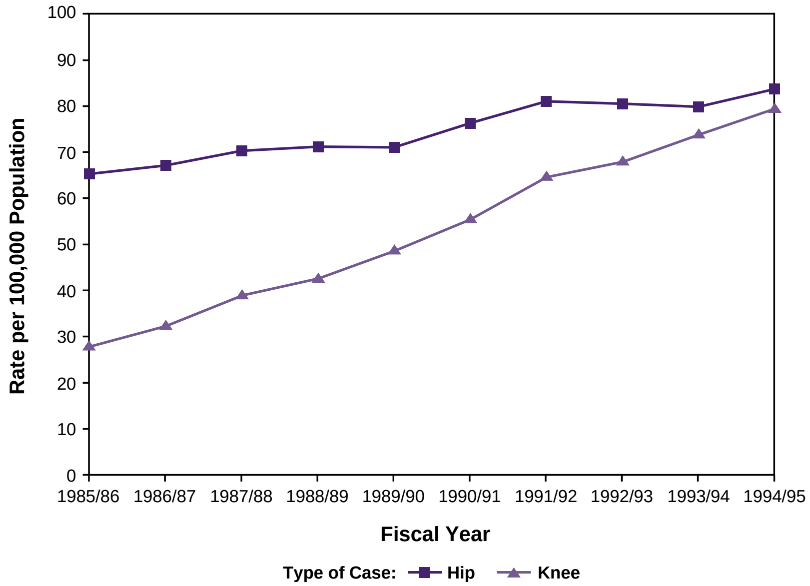
Methods

The analyses for total hip and total knee replacement closely followed the general approach outlined above. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in Hip and Knee Surgery

We reported in the first edition that the overall provincial age/sex-adjusted rate for total hip replacement had almost doubled between 1981/82 and

Exhibit 5.1: ***Overall Age/Sex-adjusted Hip and Knee Replacement Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

1991/92.[15] This rate showed a definite deceleration in growth from 1985/86, when the rate was 65.3 per 100,000 adults, to 1994/95 when it was 83.7 per 100,000 adults (Exhibit 5.1). Women continued to undergo total hip replacement more often than men, with higher utilization most evident in those 65 years of age and over. This age group is also the group most likely to undergo this procedure. Growth in utilization during the decade was most pronounced in women aged 65 and older and in men aged 75 and older (Exhibit 5.2).

For knee replacement surgery, a greater than fourfold growth in age/sex-adjusted rates for Ontario as a whole from 1981/82 to 1991/92 was reported in the previous edition.[16] This growth has decelerated somewhat but continued, from 64.9 procedures per 100,000 adults in 1991/92 to 79.6 per 100,000 adults in 1994/95 (Exhibit 5.1). It is apparent that the difference in rates

Exhibit 5.2: ***Overall and Age/Sex-specific Hip Replacement Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 - 1994/95***

Fiscal Year	Overall Rate	Women by Age Group					Men by Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1985/86	65.3	3.2	14.0	99.1	260.3	319.8	2.9	13.6	87.8	243.4	265.8
1986/87	67.1	2.6	13.6	102.0	287.3	330.5	2.2	13.3	88.1	248.1	254.9
1987/88	70.3	2.7	13.7	108.4	291.4	345.4	3.4	13.8	93.1	258.6	282.3
1988/89	71.2	3.6	15.4	107.8	303.5	351.2	2.1	16.0	94.4	251.9	271.4
1989/90	71.0	3.3	13.1	106.9	288.7	337.2	2.8	13.7	104.7	260.7	289.4
1990/91	76.3	2.5	15.9	111.7	320.2	378.3	3.7	19.4	97.6	266.4	324.3
1991/92	81.0	4.8	17.3	119.5	334.3	408.2	3.5	18.6	107.0	274.8	335.5
1992/93	80.5	4.0	16.3	114.8	347.2	391.0	4.0	15.5	106.0	286.2	347.0
1993/94	79.8	4.5	16.8	109.2	340.1	373.0	3.8	18.7	109.7	285.6	345.2
1994/95	83.7	5.7	16.6	109.8	377.2	407.5	3.5	19.5	117.2	279.6	341.2

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.3: ***Overall and Age/Sex-specific Knee Replacement Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 - 1994/95***

Fiscal Year	Overall Rate	Women by Age Group					Men by Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1985/86	28.1	0.4	3.5	40.2	159.0	139.3	0.5	2.1	26.6	104.1	114.2
1986/87	32.6	0.5	2.8	48.4	180.0	159.5	0.3	2.9	32.8	111.5	154.6
1987/88	39.2	0.8	4.8	59.2	209.6	175.7	0.4	1.4	37.7	163.7	180.9
1988/89	42.8	0.5	4.4	65.1	219.5	200.2	0.7	3.8	46.9	177.0	173.3
1989/90	48.9	1.1	4.3	72.4	264.3	220.7	0.9	2.8	51.1	201.4	212.7
1990/91	55.7	1.5	4.5	81.2	308.4	247.9	1.1	2.9	53.9	232.9	246.8
1991/92	64.9	0.7	5.6	92.4	335.6	323.3	0.6	3.7	63.7	283.5	277.6
1992/93	68.2	1.2	5.4	97.5	357.9	320.3	1.1	4.6	76.0	283.5	290.8
1993/94	74.1	1.5	7.0	106.2	403.0	322.4	0.8	4.2	79.6	316.8	321.6
1994/95	79.6	1.5	7.7	112.9	421.5	340.2	0.7	5.0	86.3	341.3	381.3

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

between total hip replacement and total knee replacement is narrowing; if current trends continue, knee replacement will soon be more common than hip replacement. In the first edition, which tracked trends to 1991/92, there were higher knee surgery rates among women than among men in almost all age groups. By 1994/95, however, total knee replacement was more common in men aged 75 and older than in women of this age group. However, there has been more or less parallel growth of rates in men and in women in other age groups (Exhibit 5.3).

Geographic Variations in Hip Replacement Surgery

As the map demonstrates (Exhibit 5.4), there is some variation in the rate of total hip replacement among DHCs (see also the list of DHC-specific rates in Exhibit 5.5). Metropolitan Toronto and Ottawa–Carleton are low outliers, and other areas are also ranked low but are not significant owing to smaller numbers of procedures. The high rate DHCs are also listed. The Huron/Perth, Kingston, Frontenac and Lennox & Addington, and Grey–Bruce DHCs are more than 20% higher than the provincial average.

As in the previous edition, we characterize the degree of interarea variation as small (see summary measures at the foot of Exhibit 5.5). Comparison of the 1989/90 to 1991/92 period with the 1992/93 to 1994/95 period also shows that the variation is declining. However, the rankings of total hip replacement rates for DHCs have remained somewhat consistent, with a Spearman rank correlation coefficient of 0.807 ($p < 0.0001$) between these two periods.

Geographic Variations in Knee Replacement Surgery

As mapped in Exhibit 5.6, the rate of total knee replacement continues to vary moderately according to the DHC of residence of the patients undergoing the procedure (see also the list of DHC-specific rates in Exhibit 5.7). Variations in the rate of total knee replacement remain greater than those of total hip replacement, as noted in the first edition, but with some parallel tracking of high- and low-rate districts for both procedures. For 1992/93 to 1994/95, Huron/Perth and Kent County are more than 80% above the provincial average. As with total hip replacement, Metropolitan Toronto and Ottawa –Carleton are low outliers. The low rates of total knee replacement appear to extend to the communities around Toronto, with York Region and Halton also being low outliers.

There is some evidence of a reduction in variations among DHCs, which is compatible with the hypothesis that as the technology diffuses and overall rates rise, the disparities between faster and slower uptake DHCs level out. All measures of variation have fallen from the 1989/90 to 1991/92 period to the 1992/93 to 1994/95 period (see foot of Exhibit 5.7). However, the relative ranking of DHCs has persisted over the last few years, with a Spearman rank correlation coefficient between the two periods of 0.868 ($p < 0.0001$).

Comment

After tracking joint replacement surgery in Ontario from the first edition to the most recent period reviewed here, it is clear that rates of total hip replacement and especially total knee replacement have increased dramatically since the early 1980s. Whereas knee replacement utilization lagged behind hip replacement for most of the last decade, rates of the two procedures have converged over the last three years. If current trends continue, total knee replacement will definitely be more common than total hip replacement in Ontario by the year 2000. The increasing need for knee replacement is not surprising, since osteoarthritis of the knee is very prevalent and expected to be more prevalent in the future as a result of the fitness activities of the present generation of middle-aged people.

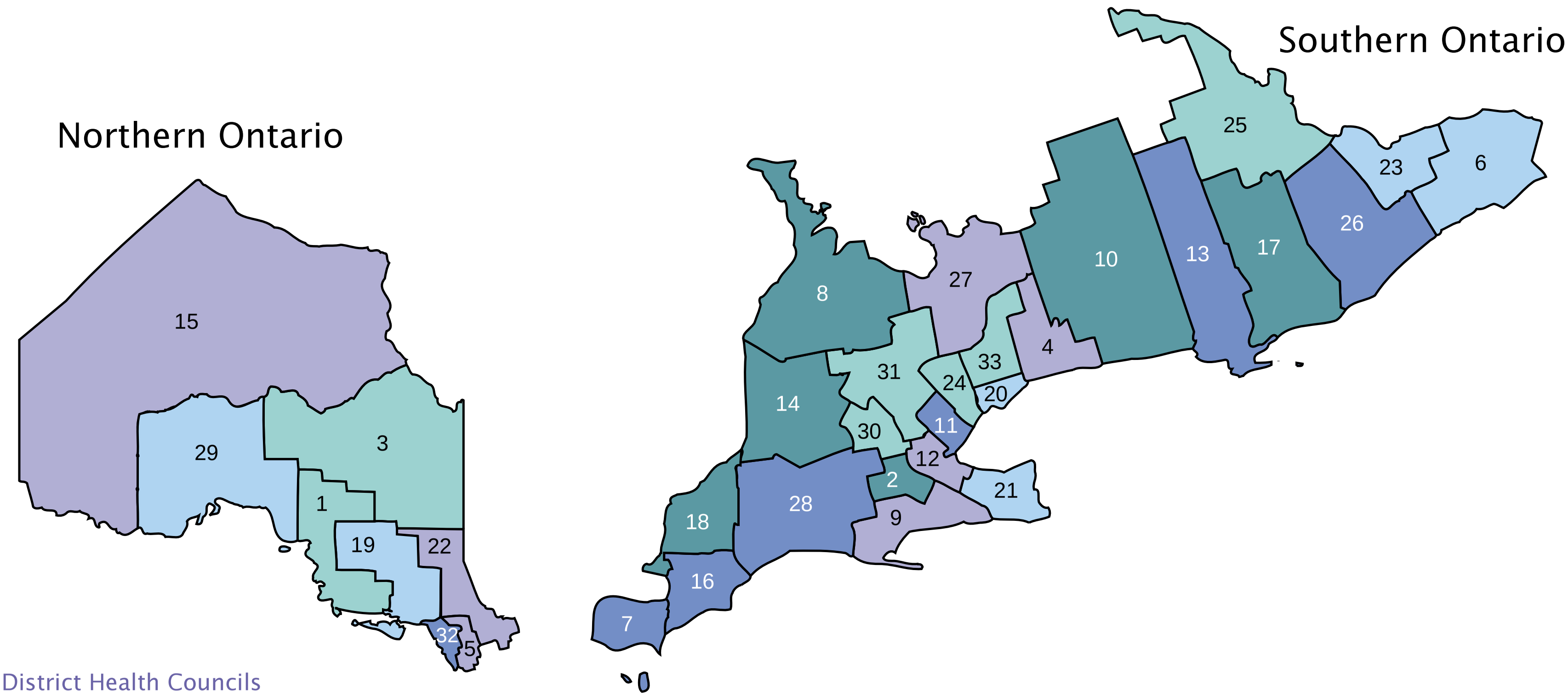
DHC variations in total hip replacement were small in 1989/90 to 1991/92 and fell further in the most recent period; similarly variations in total knee replacement, which were moderate to large in 1989/90 to 1991/92 are also declining. The most recent Ontario data show some parallels with analyses of National Health Service data from England and Wales, where area variations in the rate of total hip replacement levelled out as utilization rose and the technology was diffused.[17,18] The British data also suggest that revisions of previous operations, as well as other primary joint replacements in the same patient, are important facets of utilization profiles.[18] Unfortunately, our analysis does not permit us to address the issue of second or bilateral operations for the same patient. As more primary hip and knee replacements are conducted, the number of revisions will increase. It is anticipated that more detailed analysis, breaking out primary replacement and revisions, will be included in the next edition of the ICES *Practice Atlas.*

We should also note that age/sex-adjustment may not adequately adjust for differences in the prevalence and severity of osteoarthritis, although ecological correlations based on self-reported musculoskeletal disability from the Ontario Health Survey do not appear to explain the observed variations in hip and knee arthroplasty.

Area variations in joint arthroplasty have also been documented in Manitoba,[19] Quebec,[20] and in the United States.[21,22] The degree of variation seen in Ontario is typical of that found in these other jurisdictions. Variations in practice styles are one source of such variations. Canadian[23] and US[24] survey data confirm that there are areas of disagreement when orthopedic surgeons are asked about indications for knee replacement. A 1992 New Zealand panel[25] also noted "difficulty in getting agreed guidelines" for joint replacement "because there appears to be no general agreement anywhere, nationally or internationally." British data further show that the threshold for surgical referral of orthopedic patients for hip or knee replacement varies among general practitioners.[26] However, although variations in clinical decision-making are one likely factor in rate variations, it should be

Exhibit 5.4

Age/Sex-adjusted Hip Replacement Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

97.0 to 109.4
84.4 to 94.7
82.0 to 84.4
76.8 to 81.1
70.0 to 76.2

Exhibit 5.5: *Age/Sex-adjusted Hip Replacement Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

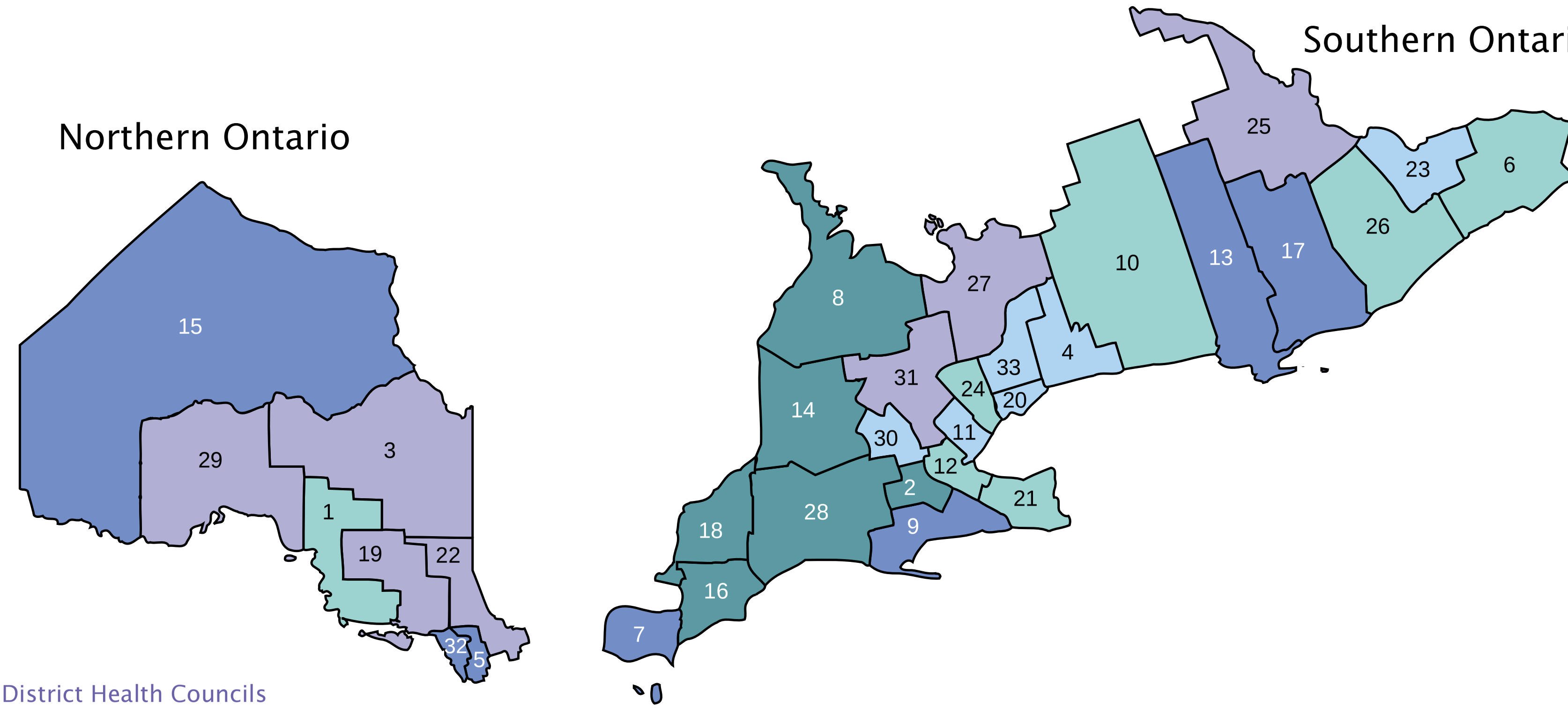
District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	71.6	29	77	76.8	27		83	82.6
Brant	81.2	12	96	98.4	4		95	96.6
Cochrane	79.0	15	50	80.2	22		38	60.1
Durham Region	62.5	33	214	82.0	20		226	85.7
East Muskoka-Parry Sound	80.8	13	56	83.4	18		58	86.4
Eastern Ontario	63.9	32	102	70.0	32		120	80.8
Essex County	78.0	18	255	94.7	7	*	288	105.4
Grey-Bruce	103.4	2	141	101.3	3	*	151	104.6
Haldimand-Norfolk	97.3	6	70	83.9	15		68	81.4
Haliburton, Kawartha & Pine Ridge	87.8	10	266	97.0	6	**	259	94.4
Halton	90.1	8	212	94.0	8	*	214	92.9
Hamilton-Wentworth	73.4	24	321	82.9	19		331	84.4
Hastings & Prince Edward Counties	92.9	7	122	93.0	9		105	81.0
Huron/Perth	101.4	4	132	109.4	1	✢✢	135	110.3
Kenora-Rainy River	81.2	11	50	84.4	14		41	67.2
Kent County	77.7	19	85	91.1	11		89	95.1
Kingston, Frontenac and Lennox & Addington	101.6	3	154	109.1	2	✢✢	163	114.2
Lambton	104.5	1	105	97.1	5		118	108.2
Manitoulin-Sudbury	73.2	25	110	74.3	30		120	81.2
Metropolitan Toronto:	67.7	31	1,427	73.4	31	✢✢	1,512	74.5
Borough of East York	68.7		75	69.5			80	73.4
City of Etobicoke	76.3		227	78.0			244	80.0
City of North York	66.3		371	72.7			401	75.3
City of Scarborough	62.1		288	74.4			308	76.6
City of Toronto	68.9		377	71.9			383	70.1
City of York	67.5		89	70.9			96	72.6
Niagara	72.2	28	277	76.2	28		308	82.7
Nipissing/Timiskaming	78.7	16	84	83.7	17		85	84.5
Ottawa-Carleton Regional:	73.6	23	353	70.0	33	**	381	73.9
City of Ottawa	72.6		223	67.5			244	70.9
Ottawa, Eastern Region	70.3		41	61.5			42	61.1
Ottawa, Western Region	80.1		89	82.5			95	86.5
Peel:	68.2	30	324	78.6	23		351	82.9
City of Brampton	70.7		116	83.7			133	90.6
City of Mississauga	67.0		208	76.1			218	78.9
Renfrew County	77.1	20	64	77.8	24		70	83.3
Rideau Valley	79.2	14	116	84.4	13		130	94.0
Simcoe County	72.7	26	206	83.9	16		217	87.1
Thames Valley	89.8	9	406	92.3	10	*	413	92.5
Thunder Bay	78.4	17	94	75.8	29		90	72.2
Waterloo Region	72.6	27	209	76.9	26		222	80.3
Wellington-Dufferin	75.9	21	121	81.1	21		146	96.2
West Muskoka-Parry Sound	97.7	5	19	90.2	12		15	70.7
York Region	75.4	22	231	77.2	25		263	85.8
Total Ontario	76.2		6,550	81.5			6,905	84.0
Coefficient of Variation (%) [CV]	13.4			11.8				
Extremal Quotient [EQ]	1.7			1.6			Spearman Correlation	R=0.807 (p<0.0001)
Systematic Component of Variation [SCV]	14.1			7.6				
Adjusted Chi-square (likelihood ratio)	99.0 (d.f. 32, p<0.0001)			93.0 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.6

Age/Sex-adjusted Knee Replacement Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Exhibit 5.7: *Age/Sex-adjusted Knee Replacement Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	56.2	22	70	68.6	26		80	78.7
Brant	86.9	4	100	102.7	5	**	98	100.5
Cochrane	60.3	17	50	81.4	15		55	89.0
Durham Region	40.7	32	170	68.2	28		198	77.3
East Muskoka-Parry Sound	64.3	15	66	94.2	8	*	74	105.3
Eastern Ontario	63.1	16	105	72.0	22		109	73.8
Essex County	81.4	7	275	101.0	7	++	284	103.4
Grey-Bruce	91.5	2	154	106.1	4	++	161	109.4
Haldimand-Norfolk	69.0	13	71	83.5	13		67	77.3
Haliburton, Kawartha & Pine Ridge	53.0	24	200	70.0	24		227	78.5
Halton	47.5	28	137	61.4	32	*	153	67.4
Hamilton-Wentworth	59.6	19	268	68.3	27		285	71.1
Hastings & Prince Edward Counties	81.7	6	115	85.6	12		123	90.0
Huron/Perth	120.3	1	164	136.9	1	++	183	149.9
Kenora-Rainy River	83.0	5	54	90.0	10		54	86.9
Kent County	79.1	9	125	131.3	2	++	154	161.1
Kingston, Frontenac and Lennox & Addington	58.5	21	123	86.7	11		143	99.8
Lambton	88.0	3	117	106.5	3	++	103	92.7
Manitoulin-Sudbury	64.5	14	116	76.6	19		122	80.7
Metropolitan Toronto:	40.1	33	1,131	57.8	33	++	1,317	64.6
Borough of East York	43.1		80	75.6			88	81.3
City of Etobicoke	46.4		196	65.6			225	71.5
City of North York	38.9		310	60.1			362	67.3
City of Scarborough	44.3		241	62.2			299	74.2
City of Toronto	34.3		233	44.4			269	49.2
City of York	39.8		71	56.0			74	55.9
Niagara	46.0	31	280	75.1	21		347	91.6
Nipissing/Timiskaming	53.2	23	84	82.6	14		87	84.6
Ottawa-Carleton Regional:	52.9	25	320	64.7	30	*	325	64.2
City of Ottawa	48.3		205	62.2			203	59.8
Ottawa, Eastern Region	60.5		43	66.3			52	79.7
Ottawa, Western Region	64.6		73	71.9			70	69.2
Peel:	52.0	26	273	69.7	25		318	79.8
City of Brampton	48.1		89	66.6			106	78.6
City of Mississauga	53.9		184	71.2			212	80.3
Renfrew County	70.7	12	67	79.4	17		73	83.9
Rideau Valley	59.1	20	100	71.9	23		105	74.5
Simcoe County	60.0	18	201	80.7	16		210	82.5
Thames Valley	79.9	8	450	102.2	6	++	497	111.1
Thunder Bay	78.2	11	96	77.4	18		89	70.8
Waterloo Region	46.8	29	173	64.8	29		180	66.3
Wellington-Dufferin	51.3	27	114	76.3	20		142	93.3
West Muskoka-Parry Sound	78.2	10	21	94.1	9		23	101.9
York Region	46.4	30	182	63.2	31	*	199	67.1
Total Ontario	56.7		5,971	74.2			6,585	80.0
Coefficient of Variation (%) [CV]	29.3			22.9				
Extremal Quotient [EQ]	3.0			2.4			Spearman Correlation	R=0.868 (p<0.0001)
Systematic Component of Variation [SCV]	102.3			63.2				
Adjusted Chi-square (likelihood ratio)	359.9 (d.f. 32, p<0.0001)			306.2 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

emphasized that budgets — and budgeting processes — for hip and knee prosthesis purchases vary from one hospital to the next. This creates a situation in which DHC variations in access to hip and knee replacement are difficult to address because there is no regional or provincial planning framework. Matters are exacerbated by the falling number of orthopedic surgeons in Ontario and their decisions to restrict their practices to specific subdisciplines other than joint replacement.

The total hip replacement rates in Ontario are now higher than those in most European jurisdictions, although one region of Denmark has reported a rate of 82 per 100,000 total population in 1988/90[27] which would be about 15% above Ontario's rate after adjustment for different denominators. As for total knee replacement, the Ontario experience again mirrors international trends. In 1988, US data showed considerable interstate variation in rates, from 22 to 98 per 100,000 total population,[21] but most experts expect these variations to have diminished with the growing success and popularity of knee replacement operations. Similarly, in Ontario, use of total knee replacement remains more geographically variable than total hip replacement, but the variations are diminishing steadily.

A multifaceted approach is needed to understand the persistent variations in joint replacement in Ontario. We noted earlier that guidelines for appropriate total hip and knee replacement case selection have been developed by an expert panel convened by ICES.[8] These guidelines have been applied to a random sample of hospital charts for patients undergoing joint replacement in high- and low-rate areas. Tellingly, there appears to be no major difference in case selection, or in appropriateness of surgery, between the high- and low-rate areas. Other research by a Toronto team including ICES researchers is addressing whether the prevalence of osteoarthritis differs between areas with high and low rates of joint replacement. If, as we expect, the burden of operable disease is similar in both types of regions, this would suggest that further growth in the use of joint replacement surgery is desirable.

Apart from rate variations, waiting lists constitute another "health-systems" issue in joint replacement surgery. Lengthy queues have been reported in some Canadian provinces,[28] the United Kingdom,[29] and New Zealand.[30] Surveys of Canadian patients suggest that waiting times of three to four months are well-tolerated but that dissatisfaction mounts with increasing delays.[31,32] Primary research by ICES has confirmed that there is a substantial reduction in quality of life for patients awaiting joint replacement, with dramatic improvements shortly after surgery.[33] These same data do not reveal the desired inverse correlation between severity of symptoms or dysfunction and waiting times. In addition to guidelines on referral decisions, our expert panel has generated guidelines for relative queue priority among patients accepted for hip and knee surgery.[8] We suggest that these guidelines be a starting point for a program of closer monitoring and better management of waiting lists for these procedures.

Assuming that further growth in the use of total hip and knee replacement is desirable, how might the health care system pay for increased use of these important life-enhancing procedures and manage the existing differences in regional utilization? In the concluding chapter of the first edition, we highlighted the potential increase in joint replacements that could be achieved by reinvesting savings from elsewhere in the system, using the example of reduced utilization of total hysterectomy.[34] Other options include finding more efficient ways to provide the same service. US data show average hospital charges in the early 1990s of $12,000 to $14,000 (US) for lower limb joint replacement. A Canadian group has estimated the average cost of initial hospitalization for hip replacement at $9,990 in 1988 dollars, which is in line with the usual cost differential between Canadian and US hospital services.[35] Detailed examination of cost trends in one US centre showed that the cost of total hip replacement was $12,348 (US) in 1990 dollars, whereas knees were costed at $11,826 (US) in 1991 dollars; in both cases, the prosthesis purchase prices were important factors in rising costs.[36,37] Recent reviews of the comparative performance of prostheses have highlighted the methodological deficiencies in available evidence and questioned whether newer and more expensive devices are appropriately selected and used.[38] One of the best comparative studies is a Canadian trial of conventional cemented hip prostheses versus newer "cementless" devices; this study showed identical outcomes in the two groups after 2 years.[39] Unfortunately, many years of follow-up are needed to generate a full comparative profile of prosthesis performance.

Savings might also be realized by reducing lengths of stay in acute care hospitals after total hip or knee replacement. Data in Chapter 8 show that the current length of stay after joint replacement surgery in Ontario hospitals remains at about 10 to 11 days on average. Weingarten and associates[40] have now developed decision rules to help select patients for total hip replacement who are at a low risk of complications and who can be transferred safely from an acute care hospital to a rehabilitation program after five days.[40] About 70% of their patients were in this group. Adoption of such guidelines in Ontario, contingent on the availability of appropriate rehabilitative facilities, could lead to meaningful cost savings. However, it is also important to ensure that the costs of a lengthy rehabilitation stay do not mitigate the savings achieved by earlier discharges from acute care hospitals. One alternative worthy of evaluation, pioneered by the Orthopaedic and Arthritic Hospital in Toronto, involves seven days of standard postoperative recovery followed by seven days of very intensive mobilization and rehabilitation for selected patients; preliminary data show that less than 20% of patients treated this way require further physiotherapy (Dr. Jeffrey Gollish, Orthopaedic and Arthritic Hospital, Toronto: personal communication, 1996).

There are several unresolved issues about the management and delivery of hip and knee replacement surgery in Ontario. The emerging evidence suggests that some continued growth in the use of both procedures is warranted. However, a registry system with a minimal data set on each patient's clinical profile might be helpful in three respects. First, it could give referring physicians acuity-adjusted information about waiting times to see orthopedists who do joint replacement as well as their typical booking times before surgery. Second, by highlighting waiting times in relation to severity of pain and dysfunction, it would also encourage surgeons to review their queue management practices in relation to those of their colleagues and catalyze some streaming of patients within established groups of surgeons. In this regard, analysis of 8,517 consecutive patients undergoing coronary artery bypass grafting in the Provincial Adult Cardiac Care Registry confirms that 99.1% of patients underwent surgery in their registering institution.[41] The registry mechanism thus serves to inform physicians and promotes better referral and management decisions; it does not tend to move patients after they have made a choice and established rapport with a particular practitioner.

Third, in keeping with the model of the successful Swedish joint registry, an Ontario arthroplasty registry might be a useful method of monitoring device performance and documenting operator-specific outcomes. There also appears to be a need to test and implement standardized protocols to reduce length of stay in acute care hospitals after joint replacement, since much of the rehabilitative care could be delivered in alternative settings. The purchasing patterns for prostheses bear review, since substantial savings might be achieved by group purchasing and standardized criteria for prosthesis selection. Last, given continuing budgetary pressures, there is a clear need for regionalized planning, lest uncoordinated shifts in availability of operating room time or cuts to prosthesis budgets exacerbate existing variations in the use of these quality of life enhancing procedures.

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Cholecystectomy

Overview

The use of cholecystectomy has important implications for resource allocation in the provincial health care system since the procedure is so frequently performed. In Ontario, cholecystectomy performed by laparoscopic approach was first introduced in 1990 and has now essentially replaced the traditional approach (open cholecystectomy) to become the surgical practice of choice for removing the gallbladder.

Some argue that the diffusion of a new procedure should follow the release of results from randomized clinical trials that compare the new procedure with an existing gold standard.[42] Supporters of this position [43,44] argue that laparoscopic cholecystectomy should have been adopted only if results from randomized clinical trials indicated that it led to significantly lower morbidity and mortality rates than conventional open cholecystectomy. In reality, only a few small clinical trials of laparoscopic cholecystectomy have been performed, and these results were available only after the widespread diffusion of laparoscopic cholecystectomy.

Fortunately, these trials suggest some advantages for laparoscopic methods. One randomized trial in Canada (involving 70 patients) compared laparoscopic cholecystectomy with minicholecystectomy (traditional cholecystectomy performed through a very small incision).[45] Patients in the laparoscopic cholecystectomy group experienced significantly less postoperative pain, an earlier resumption of full diet, reduced hospital stay and an earlier return to work than patients in the minicholecystectomy group. In another trial in Norway,[46] 70 patients were randomly assigned to laparoscopic or open cholecystectomy and similar benefits were seen. There was no difference in total complication rates between the open and laparoscopic cholecystectomy groups but two patients in the laparoscopic cholecystectomy group were readmitted to hospital because of abdominal pain.

Studies in the United States have found increases of 21% to 60% in the rate of cholecystectomy performed among the general population after laparoscopic cholecystectomy was introduced.[47–49] The reasons for the increases are speculative but may be related to a pent-up demand among symptomatic patients who were previously refused or who refused to undergo major surgery.[50] Alternatively, the increase may reflect a broadening of accepted indications for the procedure. Patients previously thought to have questionable indications for the procedure may now be offered the new technology because of the presumed lower morbidity associated with it.[50–53] One recent US study suggests that the threshold for performing cholecystectomy has been lowered. This conclusion was reached because the proportions of patients with uncomplicated gallstone disease and with elective admissions in Pennsylvania increased 52% after the introduction of laparoscopic cholecystectomy.[51] A recent Canadian study by our group had similar findings.[54]

We examine the trends in numbers and rates of cholecystectomy in Ontario before and after the introduction of laparoscopic cholecystectomy.

Analysis of Cholecystectomy

Methods

Standard methods were used to determine the age/sex-adjusted rates over time and by DHC. To determine the proportion of cases performed laparoscopically, we used the number of cases of laparoscopic cholecystectomy divided by the total number of cholecystectomies conducted per year. The search algorithm included day surgery as well as inpatient procedures. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

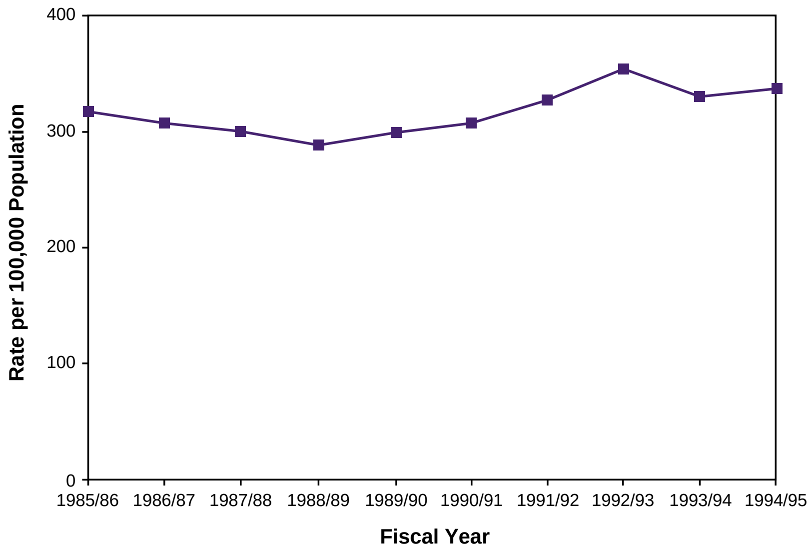
Overall Trends in Cholecystectomy

Rates of cholecystectomy (adjusted for differences in age and sex) declined from the early 1980s until 1988/89. After 1988/89, rates increased 23% from 288 per 100,000 population in 1988/89 to 354 per 100,000 in 1992/93. Between 1992/93 and 1993/94, rates fell approximately 7% but then increased by 2% from 1993/94 to 1994/95. Overall, there was an increase of 16% from 1988/89 to 1994/95 (Exhibit 5.8) in the rate of cholecystectomy and a 32% increase in the number of cholecystectomies performed. Age/sex-specific rates increased after 1987/88 for all age groups except for patients over age 75 (Exhibit 5.9). Women of all ages had rates of gallbladder surgery higher than those of men, except for women over 75 years of age. Since the denominator for these rates is the entire population rather than people with intact gallbladders, the lower rate for women over 75 may be an artifact of earlier high rates of cholecystectomy in younger women.

Geographic Variations in Cholecystectomy

The rate of cholecystectomy varied according to the location of patient residence (Exhibits 5.10 and 5.11). Compared with other procedures, the relative variation between higher and lower rate regions was small. Nonetheless, the absolute difference in the cholecystectomy rate between the highest rate area and the lowest rate area was very large; in the 1992/93 to 1994/95 period, the highest rate region was Kenora–Rainy River, with a rate of 534 per 100,000 adults, and the lowest rate DHC was Ottawa–Carleton, with a rate of 289 per 100,000 adults, an absolute difference of 245 per 100,000. There has been little change in the rankings of the various DHCs over time. The rate of cholecystectomy increased in virtually all districts except for Lambton, whose rank shifted from second in 1989/90 to 1991/92 to seventh in 1992/93 to 1994/95. There were 13 DHCs with rates significantly above the provincial

Exhibit 5.8: ***Overall Age/Sex-adjusted Cholecystectomy Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

average and four DHCs with rates below. The Spearman correlation between the rankings in the period 1989/90 to 1991/92 and 1992/93 to 1994/95 was high, at 0.872.

Trends in Surgical Approach for Cholecystectomy

There has been a dramatic increase in the use of laparoscopic cholecystectomy in Ontario between 1989/90 and 1994/95. The proportion of procedures performed as laparoscopic cholecystectomy rose from less than 1% of the total to more than 85% (Exhibit 5.12). The number of hospitals adopting laparoscopic cholecystectomy increased rapidly over a three year period in both teaching and community hospitals.

Comment

In the first edition of the ICES *Practice Atlas,* we expressed a concern that the introduction of laparoscopic cholecystectomy might be associated with an increase in the already high cholecystectomy rates in the province. We have observed a 32% increase in the absolute number of cholecystectomies performed between 1987/88 and 1994/95 and a 12% increase in cholecystectomy rates, findings similar to observations in other jurisdictions. Over the same time period, the Ontario population increased only 7.4%. There was a slight fall in cholecystectomy rates in 1992/93 and 1993/94 but it is not known whether this was due to decreases in available patients, a decline in the number of operating room slots or a reduction in number of hospital beds. This fall in rates occurred at the same time as the major shift to day surgery. The decline in cholecystectomies was short-lived, and the numbers and rates increased again in 1994/95.

If the increase in the number of procedures was due to a backlog of symptomatic patients unwilling to undergo open cholecystectomy but willing to have laparoscopic cholecystectomy, we should expect the rates to decline to the level seen in earlier years after these patients have passed through the system. However, the increase in rates between 1993/94 and 1994/95 does not support this view. Alternatively, the higher rates may reflect the wide acceptance of broader indications for surgery. Our data are consistent with this explanation for the change in rates.[54] This explanation, in turn, raises concerns, given that cholecystectomy rates in Ontario were already much higher than in the United Kingdom and various European jurisdictions before the introduction of the laparoscopic approach.[55,56]

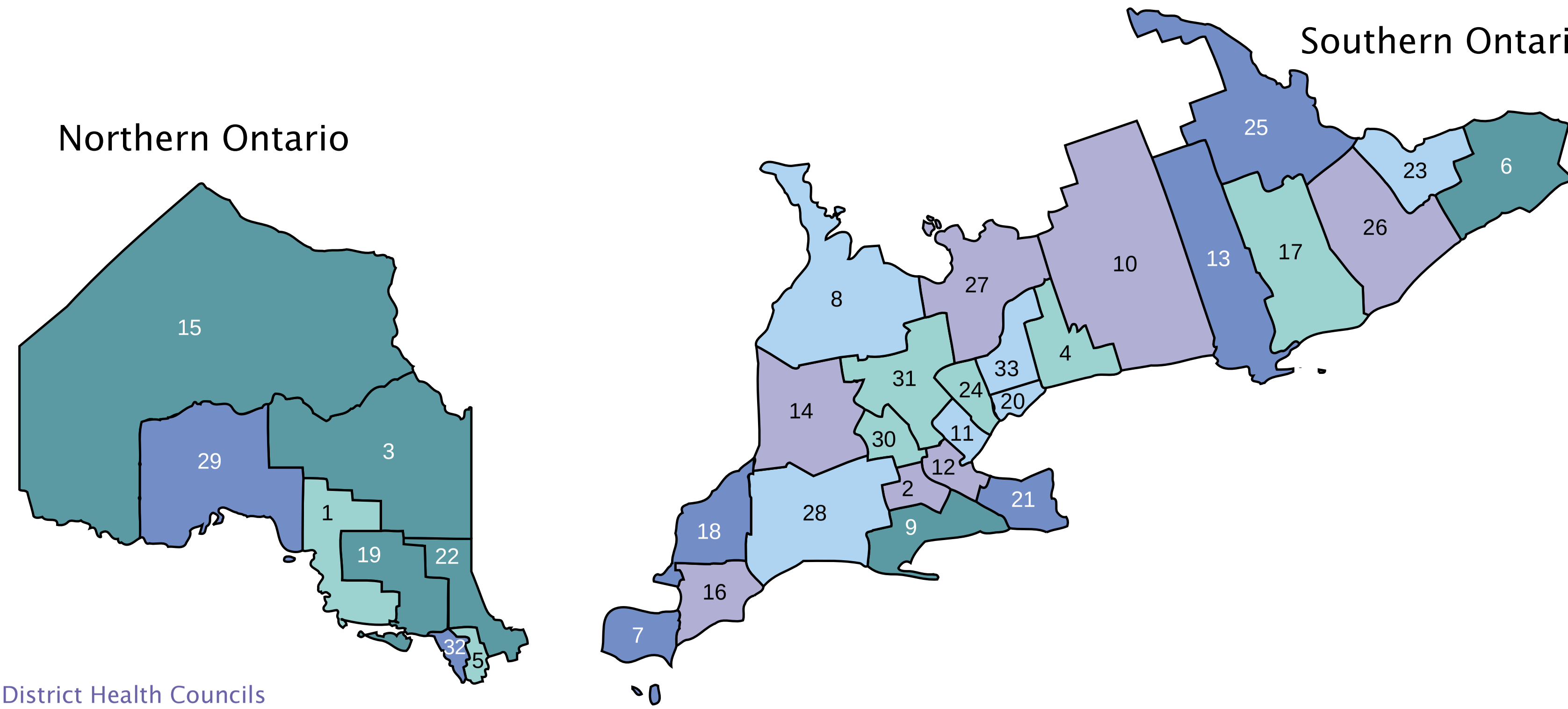
Although the laparoscopic technique is beneficial both from a patient and provider perspective, the increase in overall utilization and the associated costs raise concerns for the hospital sector as a whole. Costs to hospitals may be reduced by using nondisposable instruments for laparoscopic cholecystectomy.[57,58] If a sufficiently low cost for laparoscopic cholecystectomy can be achieved, the total cost of

Exhibit 5.9: ***Overall and Age/Sex-specific Cholecystectomy Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 - 1994/95***

Fiscal Year	Overall Rate	Women by Age Group					Men by Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1985/86	316.4	317.5	410.6	572.3	610.8	460.7	41.8	166.8	328.4	491.8	492.7
1986/87	307.3	297.1	409.4	561.6	609.5	440.4	37.8	152.2	321.2	487.4	504.2
1987/88	299.7	300.5	397.0	562.3	580.6	424.9	34.4	148.5	307.8	457.1	481.2
1988/89	288.2	298.4	379.5	530.7	539.2	388.3	36.9	145.3	297.6	453.2	444.0
1989/90	299.6	319.2	390.4	562.2	578.3	388.7	41.4	143.9	302.4	453.5	441.4
1990/91	307.3	337.9	402.7	585.2	561.2	401.6	40.4	148.2	298.5	465.6	451.8
1991/92	326.9	364.1	429.6	605.9	607.7	379.6	45.6	158.8	325.4	501.0	489.9
1992/93	353.8	385.6	467.4	673.2	660.8	426.8	50.9	174.9	348.6	531.4	476.1
1993/94	330.2	354.9	435.6	644.9	620.6	404.2	45.5	153.1	330.0	496.4	462.7
1994/95	335.8	371.9	444.4	650.7	638.9	385.8	52.0	156.3	320.8	498.4	446.4

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age/Sex-adjusted Cholecystectomy Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/sex-adjusted Rate
(quintiles)

407.2 to 534.0
375.7 to 400.6
353.5 to 369.7
334.3 to 352.2
288.7 to 328.0

Exhibit 5.10

Exhibit 5.11: *Age/Sex-adjusted Cholecystectomy Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	345.9	14	338	345.4	23		317	327.9
Brant	352.9	12	321	365.8	16		348	395.1
Cochrane	409.6	3	280	422.3	3	‡‡	253	382.9
Durham Region	304.7	28	1,025	339.4	25		1,086	353.3
East Muskoka-Parry Sound	301.4	30	199	351.9	22		191	356.3
Eastern Ontario	374.2	6	576	419.3	4	‡‡	565	406.8
Essex County	378.7	5	1,016	396.8	8	‡‡	957	371.2
Grey-Bruce	314.1	25	370	307.4	30	*	341	279.4
Haldimand-Norfolk	366.9	8	322	419.3	5	‡‡	317	412.3
Haliburton, Kawartha & Pine Ridge	329.8	18	859	368.7	15	*	847	357.3
Halton	313.0	26	808	326.4	29		807	323.3
Hamilton-Wentworth	339.8	16	1,330	369.7	14	**	1,348	369.6
Hastings & Prince Edward Counties	340.4	15	448	392.2	9	**	470	408.6
Huron/Perth	329.7	19	350	353.5	20		371	369.8
Kenora-Rainy River	503.3	1	317	534.0	1	‡‡	310	511.4
Kent County	353.4	11	300	358.1	18		298	357.8
Kingston, Frontenac and Lennox & Addington	306.2	27	457	344.9	24		392	292.9
Lambton	430.7	2	404	400.6	7	‡‡	411	408.3
Manitoulin-Sudbury	402.2	4	664	434.7	2	‡‡	628	410.8
Metropolitan Toronto:	263.8	33	5,615	300.6	31	‡‡	5,691	293.6
Borough of East York	236.3		263	290.3			278	296.0
City of Etobicoke	301.9		870	330.4			855	313.6
City of North York	265.0		1,537	327.0			1,560	320.9
City of Scarborough	285.2		1,337	329.6			1,377	327.1
City of Toronto	231.3		1,254	243.6			1,260	235.2
City of York	273.1		354	307.8			360	301.4
Niagara	320.7	22	1,198	375.7	13	**	1,198	375.6
Nipissing/Timiskaming	334.0	17	389	407.2	6	‡‡	393	411.8
Ottawa-Carleton Regional:	271.9	31	1,557	288.7	33	‡‡	1,645	300.0
City of Ottawa	284.3		343	322.1			360	337.8
Ottawa, Eastern Region	258.3		799	273.8			862	290.5
Ottawa, Western Region	293.2		415	298.0			423	295.7
Peel:	317.4	24	1,896	352.2	21		1,943	353.5
City of Brampton	304.7		642	331.1			625	316.2
City of Mississauga	323.0		1,254	363.1			1,318	373.2
Renfrew County	364.7	10	281	375.8	12		276	369.5
Rideau Valley	365.7	9	441	363.6	17		436	354.8
Simcoe County	319.8	23	825	356.2	19		775	330.6
Thames Valley	304.7	29	1,384	328.0	28		1,435	335.5
Thunder Bay	372.5	7	454	379.0	11	*	416	346.1
Waterloo Region	323.7	21	952	336.1	26		1,017	355.3
Wellington-Dufferin	329.5	20	506	334.3	27		507	331.3
West Muskoka-Parry Sound	348.4	13	68	387.5	10		78	446.2
York Region	271.6	32	1,105	289.2	32	‡‡	1,131	290.7
Total Ontario	311.1		27,052	339.4			27,198	335.5
Coefficient of Variation (%) [CV]	14.2			12.5				
Extremal Quotient [EQ]	1.9			1.9			Spearman Correlation	R=0.872 (p<0.05)
Systematic Component of Variation [SCV]	29.8			23.0				
Adjusted Chi-square (likelihood ratio)	465.4 (d.f. 32, p<0.0001)			416.2 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ‡‡ Significant at 0.1% level

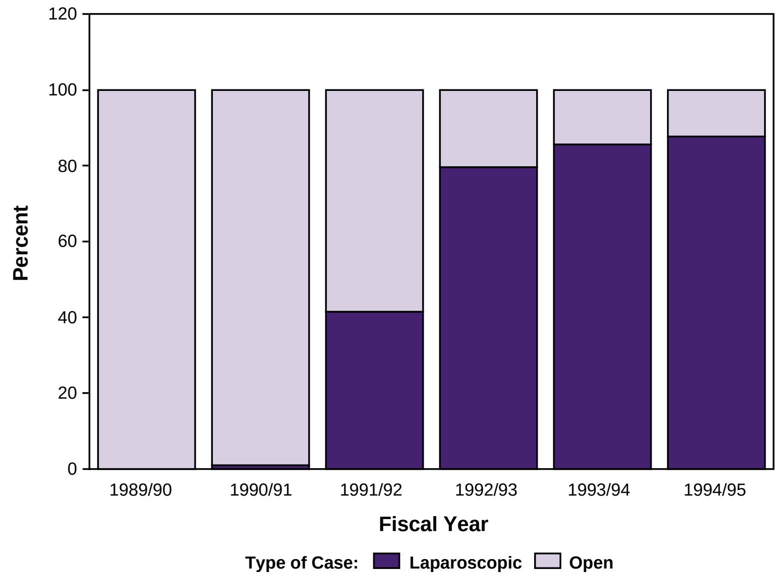
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

laparoscopic cholecystectomy for the health care sector could be lowered, notwithstanding the increase in the number of procedures.

From a patient point of view, those undergoing laparoscopic cholecystectomy experience significantly less postoperative pain, a better cosmetic result, an earlier resumption of full diet, reduced hospital stay and an earlier return to work than patients who undergo open cholecystectomy. These benefits strongly support the use of laparoscopic cholecystectomy. However, to evaluate fully the outcomes of laparoscopic cholecystectomy, a large scale randomized clinical trial would be most appropriate. Realistically, it is extremely unlikely that such a trial will now be launched because it is neither feasible nor ethical.[43] Nonrandomized studies using historical or concurrent controls suggest that laparoscopic cholecystectomy may be associated with comparable or lower morbidity rates than open procedures, but the changing case mix of patients, indications, experience of the surgeon and other factors may explain this finding. Overall mortality rates after cholecystectomy have not been affected by the introduction of laparoscopic cholecystectomy.[48,54]

Longer-term outcomes can be assessed now that laparoscopic cholecystectomy has diffused widely; we recommend that physicians participate in the monitoring of hospital-specific mortality rates, bile duct injury rates and indications for cholecystectomy as part of quality assurance and risk management activities. Hospital-specific data on cholecystectomy are included in Chapter 7.

Exhibit 5.12: ***Percentage of Laparoscopic vs. Open Cholecystectomies in Ontario, 1989/90 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

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Primary and Incidental Appendectomy

Overview

Primary appendectomy is defined as laparotomy with removal of the appendix in the presence of suspected or confirmed appendicitis. Appendectomy performed for preventive purposes on patients undergoing another abdominal procedure is termed “incidental appendectomy”. The issues surrounding utilization of these two procedures were reviewed in some detail in the first edition of the ICES *Practice Atlas,* including a geographic analysis of appendectomy utilization[59] and hospital-specific profiles.[60] Two articles by ICES scientists and staff have also appeared on this topic.[61,62] In what follows, we outline some changes in the coding algorithms used to select and categorize cases, update the previous profiles to include the three most recent fiscal years and recapitulate the relevant issues.

Delay in surgical intervention for suspected appendicitis may lead to complications such as perforation (commonly known as “rupture”) and peritonitis with sepsis. Since the diagnosis of appendicitis can be difficult and is primarily clinical, some appendectomies will inevitably be performed on patients who have conditions such as mesenteric lymphadenitis that do not require surgery. These cases are termed “negative appendectomies”; however, some patients in this category have other acute disorders that require laparotomy and further surgery. What remains unresolved is the optimal proportion of positive appendectomies in relation to all primary appendectomies — a percentage commonly termed “diagnostic accuracy.”

In this section, we revisit the utilization of appendectomy in Ontario to address two basic questions: (1) How has use of the procedure changed over time? We earlier demonstrated a trend toward increasing diagnostic accuracy and hoped to see it continue from 1992/93 to 1994/95. (2) How uniform have the changes been? We earlier hypothesized and showed that positive primary appendectomy rates would be more consistent among small areas than the other categories of procedures we examined, that progress in preoperative diagnosis (and attendant diagnostic accuracy) would be less consistent, as measured by greater variation in negative primary appendectomy rates, and that variation would be largest for incidental appendectomy. We hoped to demonstrate a reduction in inter-DHC variation in negative appendectomy rates in 1992/93 to 1994/95 as compared with 1989/90 to 1991/92, along with a further decline in the overall rate of incidental appendectomy.

Analysis of Appendectomy

Methods

We used the methods previously described, with one exception. Because appendectomies are performed on patients of any age, the denominators included all people in Ontario. Age standardization was based on the following age groups: 0 to 19, 20 to 34, 35 to 49, 50 to 64, 65 to 74, and 75 and older for temporal trends, and 0 to 14, 15 to 29, 30 to 44, and 45 and older for small-area-variation analysis.

In the most straightforward scenario for coding procedures, one would simply assign an incidental appendectomy to the relevant Canadian Classification of Procedures (CCP) code (59.2 in a second or higher position), and a primary appendectomy to one of three categories depending on the postoperative diagnoses: positive primary, in which the preoperative diagnosis of acute appendicitis was confirmed (e.g., concurrence of a CCP 59.0 anywhere in the list of procedures with an International Classification of Diseases, 9th revision, [ICD-9] code of 540.x or 541 anywhere in the list of diagnoses); negative primary without appendix-related diagnoses, in which a normal organ was removed (hereafter termed negative I and entailing CCP 59.0 in any position, without any concomitant appendicitis codes); and negative primary with appendix-related diagnoses (hereafter termed negative II, heralded by the combination of CCP 59.0 in any position with other nonacute appendicitis ICD-9 codes such as 542 or 543). However, there is clinical and pathological ambiguity in these latter appendiceal conditions; idiosyncrasies in categorization and coding unquestionably affect the likelihood that patients will be assigned to the negative II group depending on the DHC or hospital where they undergo an appendectomy.

Furthermore, we have become aware of coding inconsistencies as a result of follow-up to the last edition and correspondence with Ontario hospitals after sharing hospital-specific data with them while preparing this edition. For example, primary (CCP code 59.0) rather than incidental appendectomy (CCP code 59.2) is sometimes coded along with other major abdominal procedures, even when these were unrelated to suspected appendicitis. Including such cases as negative appendectomies falsely deflates the accuracy rate for calculations. Another source of confusion is a preoperative diagnosis of “rule-out appendicitis”; it appears that these cases are occasionally coded as appendicitis (ICD-9 540.x or 541), even in the absence of intraoperative or pathological confirmation. We have also found some records in which there is neither a diagnosis of appendicitis nor an appendectomy procedure code, yet a CCP code 59.1 for incision of an appendiceal abscess appears. It is rather difficult pathophysiologically to envisage how an abscess could form without prior appendicitis and at least microperforation with contamination of the adjacent peritoneum. Last, we recognize that almost any algorithm will misrepresent the diagnostic process for cases in which a tentative preoperative diagnosis of acute appendicitis is made but other overt surgical pathology is discovered during laparotomy. In these instances, the application of any coding rules is moot. The operation is not a negative appendectomy if the appendix is not removed; if it is removed, then almost by definition the procedure is not a negative appendectomy but an incidental appendectomy. Moreover, since there was acute surgical pathology and a case for urgent laparotomy, there are very limited grounds for concern about a preoperative misdiagnosis of suspected acute appendicitis.

We have accordingly adopted a more restricted algorithm for categorizing appendectomies in this edition. We now categorize as positive primary appendectomy only those cases with CCP 59.0 as the first procedure, accompanied by ICD-9 540.x or 541, or a CCP code of 59.1 for concurrent appendiceal drainage. Decision rules for negative I and II appendectomy are as above. If appendectomy appears as a secondary procedure, then we have aimed to reduce miscoding of incidental procedures as primary by including only secondary CCP 59.0s with the following procedure codes: 77.xx, 78.xx (procedures on the tubes and ovaries), 66.83 (laparoscopy), 66.2 to 66.4 (lysing adhesions), 58.81 to 58.83 (manipulation of intestines) and 59.1 (drainage of an appendiceal abscess). In these instances, we apply the previous rules for confirming the CCP 59.0 as positive or negative. Any other 59.0, 59.1 or 59.2 diagnoses are ignored.

The effect of this more stringent algorithm was to reduce the total number of appendectomies, especially those in the negative I category, with a resultant modest increase in accuracy. For comparative purposes, we have gone back to 1989/90 to 1991/92 and rerun the analyses from the first edition with the use of this new algorithm, to ensure that temporal comparisons take place on a "level playing field". Last, we suggest that readers examine the rates of negative I and negative II appendectomy separately, and then consider their potential combined proportion, in examining any specific area or hospital. Hospital-specific information has been included in Chapter 7. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2. (See Page 40)

Overall Trends in Appendectomy

In the first edition, for the decade 1981/82 to 1991/92 we showed moderate declines in the rates of positive primary appendectomy for women, with smaller declines for men. These trends are still evident for 1989/90 to 1994/95 (Exhibit 5.13) based on the tighter case definitions for this edition and are driven largely by moderate declines in positive primary appendectomy rates for younger men and women. For patients 35 and older, the reduction in appendicitis as confirmed at surgery is minimal and inconsistent.

Exhibits 5.14 and 5.15 show the trends in rates of negative I and II appendectomy. Clear declines in the rate of negative I appendectomies were evident in the last edition of the Atlas, particularly among patients aged 34 or younger. This trend is mirrored again in the most recent six years, with the steepest declines among younger women.

Overall diagnostic accuracy (excluding negative II cases) continued to rise. On the basis of the algorithm used in the previous edition, the diagnostic accuracy increased steadily in female patients during the years analysed, from 71.7% in 1981/82 to 80.2% in 1994/95, while accuracy was stable in male patients, at 89% to 90%. The new algorithm, as expected, starts with a higher baseline accuracy but again shows positive trends. Diagnostic accuracy for men was 94.3% in 1989/90 and 95.2% in 1994/95 and for women was 84.7% in 1989/90 and 87.2% in

Exhibit 5.13: ***Overall and Age/Sex-specific Positive Primary Appendectomy Rates per 100,000 Population (all ages) in Ontario, 1989/90 - 1994/95***

Fiscal Year	Overall Rate	Women by Age Group						Men by Age Group					
		0 - 19	20 - 34	35 - 49	50 - 64	65 - 74	75+	0 - 19	20 - 34	35 - 49	50 - 64	65 - 74	75+
1989/90	91.0	112.5	106.4	56.4	39.9	30.5	22.2	141.1	136.0	79.1	54.1	41.9	39.9
1990/91	90.9	108.5	104.8	56.9	37.2	28.9	22.9	142.3	138.9	80.7	54.2	45.3	36.4
1991/92	88.5	102.4	99.1	58.9	40.1	31.5	20.2	137.0	136.0	78.4	54.3	41.5	46.6
1992/93	83.7	98.4	94.7	53.3	40.0	33.1	25.2	129.3	128.2	71.7	52.6	40.1	28.7
1993/94	81.3	91.3	91.5	54.6	43.1	31.0	21.4	119.4	125.7	74.9	51.9	47.6	30.1
1994/95	83.1	92.8	94.1	57.0	46.0	28.3	26.3	126.1	124.6	78.8	48.7	38.4	33.3

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.14: ***Overall and Age/Sex-specific Negative I Appendectomy Rates per 100,000 Population (all ages) in Ontario, 1989/90 - 1994/95***

Fiscal Year	Overall Rate	Women by Age Group						Men by Age Group					
		0 - 19	20 - 34	35 - 49	50 - 64	65 - 74	75+	0 - 19	20 - 34	35 - 49	50 - 64	65 - 74	75+
1989/90	10.4	21.9	22.7	8.2	3.2	2.7	3.2	10.3	7.5	4.5	2.3	3.6	3.1
1990/91	10.0	20.5	22.5	9.6	4.8	0.5	2.1	8.2	7.5	4.8	2.1	1.3	4.1
1991/92	10.3	18.1	21.2	10.8	4.3	3.5	2.7	9.5	8.9	5.0	4.0	3.4	3.4
1992/93	8.9	15.1	18.2	9.3	3.7	2.2	3.2	9.6	7.4	4.7	1.9	3.3	2.8
1993/94	8.1	12.8	17.4	9.9	3.8	2.6	2.2	7.9	6.3	4.5	2.0	1.7	4.3
1994/95	7.8	13.6	17.5	8.2	3.3	3.0	2.5	6.9	6.4	3.6	2.0	2.5	2.1

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

1994/95. For more information regarding diagnostic accuracy for appendectomy, please see the discussion in Chapter 7.

For the most recent three years (1992/93 to 1994/95), positive primary appendectomy rates remained lower for women than for men in every age group (Exhibit 5.13). For negative I and negative II primary appendectomy, women had rates similar to, or lower than, men after the reproductive years. However, younger women had two to three-fold higher rates of negative primary appendectomy.

For incidental appendectomy, there has been a steady reduction in the overall rate from 32.4 per 100,000 population in 1985/86 to 12.0 per 100,000 by 1994/95. The procedure has declined in all age brackets, with particularly notable declines among women in the reproductive years (Exhibit 5.16).

Geographic Variations in Appendectomy

Exhibits 5.17 to 5.21 show the rates of each category of appendectomy by DHC and, where relevant, subdivisions of these DHCs. The overall extent of variation would be classified as small to moderate for positive primary appendectomy, moderately large for negative I and II primary appendectomy and extremely large for incidental appendectomy. The variations in negative appendectomy rates remain substantial despite the more stringent algorithms. Exhibit 5.22 maps DHC-specific age/sex-adjusted percentage accuracy, defined as above (number of positive primary appendectomies in the numerator and number of positive and negative I appendectomies in the denominator).

Consistency in the ranks of DHCs over time is shown by the Spearman rank correlation coefficients, as follows: positive primary, 0.86; negative I, 0.58; negative II, 0.72; and incidental, 0.83 (all $p < 0.0001$). The negative I appendectomy rates appear to be the least stable over time.

Comment

The decline in surgically confirmed acute appendicitis documented earlier persists and is consistent with trends seen in other industrialized countries. This has been attributed by some to changes in dietary habits, with the young preferentially affected. However, one counter-hypothesis is that the declines, in part, are an epiphenomenon of surgical conservatism. This school of thought argues that acute appendicitis is variable in severity and that some proportion of cases resolve spontaneously without rupture. Thus, in a region where patients are brought rapidly to medical attention and undergo surgery quickly, there will be both a higher incidence of positive primary appendectomy and lower accuracy, with higher rates of negative surgery. Conversely, surgical conservatism will lead to lower population-based rates of positive primary appendicitis and higher accuracy. (Whether this also leads to higher rates of perforation will be addressed in Chapter 7.) It is, of course, entirely possible that both factors are contributing to the declining incidence of acute appendicitis.

Relatively larger declines in negative primary appendectomy without appendix-related diagnoses (negative I) were also observed and were associated with a modest rise in preoperative diagnostic accuracy among women. Accuracy of preoperative diagnosis among men remained stable. This improvement in preoperative diagnosis reflects sound clinical judgement, supported by technologies such as laparoscopy and ultrasound. However, diagnostic accuracy among women remained about 8% lower than for men, even with the stringent

Exhibit 5.15: *Overall and Age/Sex-specific Negative II Appendectomy Rates per 100,000 Population (all ages) in Ontario, 1989/90 - 1994/95*

Fiscal Year	Overall Rate	Women by Age Group						Men by Age Group					
		0 - 19	20 - 34	35 - 49	50 - 64	65 - 74	75+	0 - 19	20 - 34	35 - 49	50 - 64	65 - 74	75+
1989/90	4.4	6.5	9.3	4.4	1.8	1.3	1.1	3.0	4.8	3.5	1.9	1.6	2.5
1990/91	4.3	7.6	8.2	4.7	1.4	1.6	2.0	3.3	4.2	2.1	2.3	1.9	0.6
1991/92	4.7	8.0	8.2	4.0	2.2	0.5	1.3	4.9	5.1	2.7	2.5	4.0	0.6
1992/93	4.8	7.2	10.9	5.1	3.6	2.0	1.6	4.0	3.9	2.6	1.5	1.5	0.0
1993/94	4.4	6.2	10.6	5.3	1.9	1.4	1.6	3.2	3.9	2.4	1.6	1.4	2.2
1994/95	4.5	6.8	9.0	4.7	3.0	0.7	2.1	3.7	4.5	3.3	1.5	1.7	1.0

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

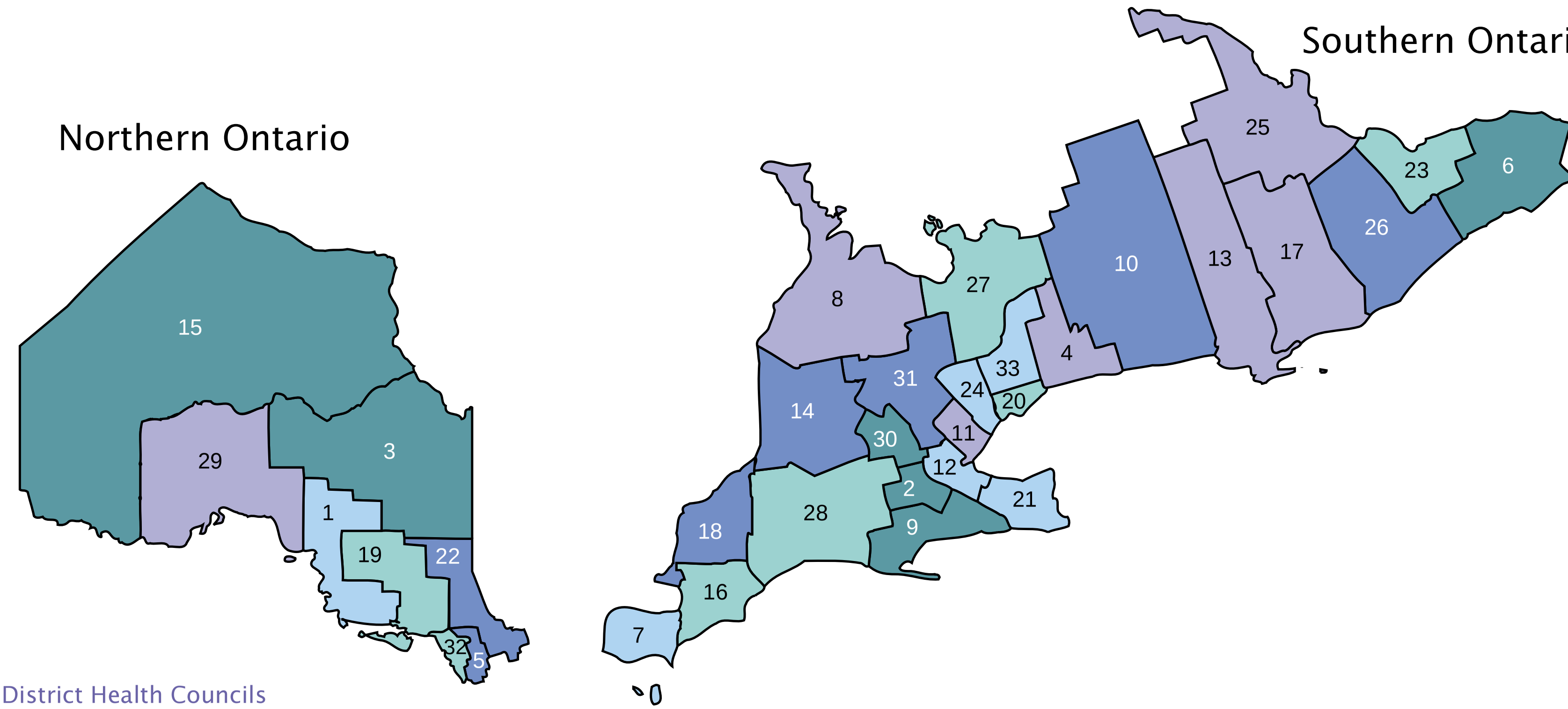
Exhibit 5.16: *Overall and Age/Sex-specific Incidental Appendectomy Rates per 100,000 Population (all ages) in Ontario, 1989/90 - 1994/95*

Fiscal Year	Overall Rate	Women by Age Group						Men by Age Group					
		0 - 19	20 - 34	35 - 49	50 - 64	65 - 74	75+	0 - 19	20 - 34	35 - 49	50 - 64	65 - 74	75+
1989/90	22.0	8.6	37.3	50.5	30.3	30.5	27.9	7.7	5.5	8.9	23.8	44.8	42.3
1990/91	20.1	10.2	32.2	44.8	28.1	29.9	24.9	8.0	5.5	8.9	20.4	32.9	43.5
1991/92	15.9	7.5	23.4	33.7	19.9	21.8	18.6	6.8	6.1	7.3	17.1	38.2	35.2
1992/93	13.7	6.7	17.0	26.4	16.9	23.6	20.3	6.6	5.6	4.8	17.8	29.1	47.5
1993/94	11.8	5.5	15.9	21.9	15.3	20.1	20.5	5.5	4.6	5.3	12.7	28.4	30.1
1994/95	12.0	6.5	16.5	23.2	14.6	17.8	20.8	5.2	3.9	5.6	13.5	27.8	34.4

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.17

Age/Sex-adjusted Positive Primary Appendectomy Rates per 100,000 Population (all ages) by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate (quintiles)

- 101.3 to 135.9
- 93.7 to 99.8
- 85.6 to 93.0
- 76.6 to 85.4
- 70.8 to 75.8

Exhibit 5.18: *Age/Sex-adjusted Positive Primary Appendectomy Rates per 100,000 Population (all ages) by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	72.8	33	92	71.2	32		96	74.9
Brant	147.7	1	146	122.5	2	✣✣	132	113.0
Cochrane	115.8	5	103	105.7	3	*	93	97.6
Durham Region	92.6	20	414	93.0	14	*	443	98.9
East Muskoka-Parry Sound	118.9	4	63	96.8	10		58	91.0
Eastern Ontario	104.1	12	187	101.3	6	**	193	104.5
Essex County	84.1	26	260	75.8	28		269	79.1
Grey-Bruce	97.5	16	128	86.0	19		128	85.6
Haldimand-Norfolk	108.0	10	103	102.9	4	*	104	104.7
Haliburton, Kawartha & Pine Ridge	103.4	14	265	97.6	9	*	299	109.3
Halton	87.6	23	291	87.8	17		288	87.5
Hamilton-Wentworth	76.6	32	327	70.8	33	**	333	72.0
Hastings & Prince Edward Counties	115.3	8	131	91.0	15		118	83.3
Huron/Perth	122.1	3	130	99.8	7	*	128	98.2
Kenora-Rainy River	141.2	2	125	135.9	1	✣✣	113	121.2
Kent County	98.9	15	92	81.9	24		98	88.6
Kingston, Frontenac and Lennox & Addington	109.2	9	151	88.0	16		150	88.6
Lambton	92.3	21	124	93.7	13		126	95.8
Manitoulin-Sudbury	90.3	22	174	83.4	23		173	84.2
Metropolitan Toronto:	80.2	29	1,816	77.3	26	**	1,859	77.8
Borough of East York	66.2		72	71.0			72	68.4
City of Etobicoke	90.9		274	88.9			273	87.3
City of North York	78.4		411	72.0			433	74.3
City of Scarborough	81.7		433	79.1			459	81.9
City of Toronto	79.6		512	75.5			499	73.0
City of York	73.1		114	79.1			123	83.7
Niagara	84.6	25	292	74.5	29	*	302	77.2
Nipissing/Timiskaming	103.4	13	120	95.2	12		97	77.2
Ottawa-Carleton Regional:	79.6	30	562	76.6	27		566	77.0
City of Ottawa	74.9		274	77.1			279	79.2
Ottawa, Eastern Region	86.7		129	74.3			144	82.9
Ottawa, Western Region	83.4		158	78.1			143	69.7
Peel:	78.8	31	615	73.3	31	**	606	71.6
City of Brampton	70.0		206	66.3			197	62.9
City of Mississauga	84.0		409	77.4			409	76.8
Renfrew County	83.8	27	85	85.6	20		76	76.4
Rideau Valley	95.4	17	146	99.7	8	*	155	105.6
Simcoe County	94.5	18	265	85.4	21		277	89.0
Thames Valley	85.7	24	444	77.9	25		448	79.2
Thunder Bay	93.5	19	143	87.0	18		132	81.1
Waterloo Region	115.7	7	416	101.7	5	✣✣	453	111.1
Wellington-Dufferin	115.8	6	207	96.3	11	*	192	89.6
West Muskoka-Parry Sound	106.3	11	15	84.4	22		17	92.2
York Region	80.8	28	422	73.8	30	*	442	77.8
Total Ontario	89.6		8,855	83.0			8,964	83.8
Coefficient of Variation (%) [CV]	16.2			13.8				
Extremal Quotient [EQ]	2.0			1.9			Spearman Correlation	R=0.864 (p<0.0001)
Systematic Component of Variation [SCV]	43.9			28.1				
Adjusted Chi-square (likelihood ratio)	234.8 (d.f. 32, p<0.0001)			159.8 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✣✣ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.19: *Age/Sex-adjusted Negative I Appendectomy Rates per 100,000 Population (all ages) by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	17.8	5	10	7.7	24		7	5.4
Brant	15.7	7	18	15.1	5	*	14	12.3
Cochrane	10.0	22	16	16.9	3	**	17	18.4
Durham Region	11.7	16	39	8.7	20		39	8.8
East Muskoka-Parry Sound	21.1	1	12	19.4	2	**	13	21.8
Eastern Ontario	5.7	32	14	7.5	25		14	7.9
Essex County	12.4	15	21	6.3	27		23	6.8
Grey-Bruce	10.7	19	16	11.0	11		15	10.2
Haldimand-Norfolk	17.7	6	8	7.9	22		8	7.6
Haliburton, Kawartha & Pine Ridge	19.6	3	38	14.6	6	✢✢	26	10.4
Halton	8.5	26	31	9.6	15		21	6.4
Hamilton-Wentworth	4.7	33	26	5.8	31		31	6.8
Hastings & Prince Edward Counties	14.5	10	13	9.0	18		12	8.5
Huron/Perth	18.1	4	15	11.7	10		21	16.7
Kenora-Rainy River	12.6	14	7	7.8	23		6	6.8
Kent County	14.1	11	13	12.0	8		14	12.6
Kingston, Frontenac and Lennox & Addington	8.6	25	18	10.5	12		17	10.3
Lambton	9.7	23	7	5.4	33		7	5.4
Manitoulin-Sudbury	20.1	2	24	11.7	9		17	8.3
Metropolitan Toronto:	7.5	29	146	6.2	28	✢✢	133	5.5
Borough of East York	4.1		4	4.2			5	5.0
City of Etobicoke	12.9		25	8.2			30	9.4
City of North York	6.1		40	7.0			31	5.4
City of Scarborough	9.9		42	7.6			35	6.2
City of Toronto	5.1		24	3.4			21	2.8
City of York	5.3		10	6.8			11	7.3
Niagara	8.3	27	35	8.9	19		33	8.5
Nipissing/Timiskaming	13.7	12	25	20.3	1	✢✢	29	24.2
Ottawa-Carleton Regional:	7.3	30	43	5.8	30	*	37	5.0
City of Ottawa	7.4		21	5.9			23	6.5
Ottawa, Eastern Region	8.2		11	6.7			8	4.9
Ottawa, Western Region	6.4		11	5.5			6	3.1
Peel:	10.0	21	67	8.0	21		52	6.1
City of Brampton	8.5		26	8.4			16	5.2
City of Mississauga	11.0		42	7.8			36	6.7
Renfrew County	7.5	28	6	5.8	29		4	3.9
Rideau Valley	8.6	24	8	5.6	32		13	8.9
Simcoe County	15.3	9	28	9.0	17		22	7.1
Thames Valley	10.1	20	57	10.1	13		60	10.7
Thunder Bay	11.7	17	16	10.0	14		13	7.8
Waterloo Region	13.4	13	39	9.5	16		36	8.9
Wellington-Dufferin	15.7	8	27	12.5	7	*	28	13.4
West Muskoka-Parry Sound	11.4	18	3	16.7	4		8	47.5
York Region	6.1	31	38	6.5	26		49	8.6
Total Ontario	10.1		884	8.3			839	7.9
Coefficient of Variation (%) [CV]	38.4			35.2				
Extremal Quotient [EQ]	4.5			3.7			Spearman Correlation	R=0.582 (p<0.0001)
Systematic Component of Variation [SCV]	142.3			173.6				
Adjusted Chi-square (likelihood ratio)	142.2 (d.f. 32, p<0.0001)			91.7 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.20: *Age/Sex-adjusted Negative II Appendectomy Rates per 100,000 Population (all ages) by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	1.7	33	5	3.6	24		5	3.9
Brant	14.4	1	12	10.2	3	**	17	14.8
Cochrane	8.3	5	7	7.8	6		4	4.3
Durham Region	2.9	28	17	3.8	20		18	4.0
East Muskoka-Parry Sound	3.1	26	1	1.5	32		1	1.9
Eastern Ontario	7.4	6	19	10.6	2	✢✢	22	12.5
Essex County	8.5	3	26	7.6	7	**	27	8.1
Grey-Bruce	2.6	30	6	4.4	18		9	6.4
Haldimand-Norfolk	3.8	20	3	2.7	29		4	4.1
Haliburton, Kawartha & Pine Ridge	4.5	17	14	5.3	13		19	7.2
Halton	5.2	16	24	7.4	8	*	30	9.4
Hamilton-Wentworth	3.5	23	14	3.1	27		5	1.1
Hastings & Prince Edward Counties	7.4	7	8	5.4	12		7	5.0
Huron/Perth	5.4	14	6	5.0	14		8	6.1
Kenora-Rainy River	6.1	11	10	10.9	1	**	12	12.9
Kent County	6.6	9	7	6.7	9		6	5.4
Kingston, Frontenac and Lennox & Addington	6.7	8	8	4.9	15		11	6.5
Lambton	5.5	13	6	4.7	16		8	6.5
Manitoulin-Sudbury	2.5	31	8	3.7	23		11	5.3
Metropolitan Toronto:	3.2	25	89	3.7	22		78	3.2
Borough of East York	3.8		2	1.6			0	0.0
City of Etobicoke	4.8		12	3.7			13	3.9
City of North York	3.2		29	5.0			29	5.1
City of Scarborough	3.0		23	4.2			14	2.5
City of Toronto	2.4		17	2.4			15	2.1
City of York	2.8		7	4.7			7	4.5
Niagara	8.5	4	18	4.6	17		13	3.3
Nipissing/Timiskaming	6.3	10	10	8.4	5		13	10.8
Ottawa-Carleton Regional:	5.3	15	32	4.3	19		29	3.9
City of Ottawa	5.4		17	4.4			13	3.4
Ottawa, Eastern Region	5.6		7	4.4			11	6.5
Ottawa, Western Region	5.0		7	3.8			5	2.6
Peel:	3.8	21	24	2.9	28	*	17	1.9
City of Brampton	2.1		4	1.2			2	0.6
City of Mississauga	4.8		21	3.9			15	2.7
Renfrew County	6.1	12	2	2.1	30		5	5.3
Rideau Valley	3.0	27	5	3.2	26		5	3.1
Simcoe County	3.6	22	17	5.5	11		14	4.6
Thames Valley	4.0	19	33	5.8	10		42	7.4
Thunder Bay	2.6	29	5	3.3	25		3	1.9
Waterloo Region	1.8	32	8	2.0	31	*	7	1.7
Wellington-Dufferin	8.7	2	21	9.8	4	✢✢	13	6.3
West Muskoka-Parry Sound	4.5	18	0	0.0	33	✢✢	0	0.0
York Region	3.3	24	22	3.8	21		22	3.9
Total Ontario	4.4		488	4.6			485	4.6
Coefficient of Variation (%) [CV]	48.0			42.6				
Extremal Quotient [EQ]	8.4						Spearman Correlation	R=0.718 (p<0.0001)
Systematic Component of Variation [SCV]	207.2			159.9				
Adjusted Chi-square (likelihood ratio)	92.8 (d.f. 32, p<0.0001)			80.3 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

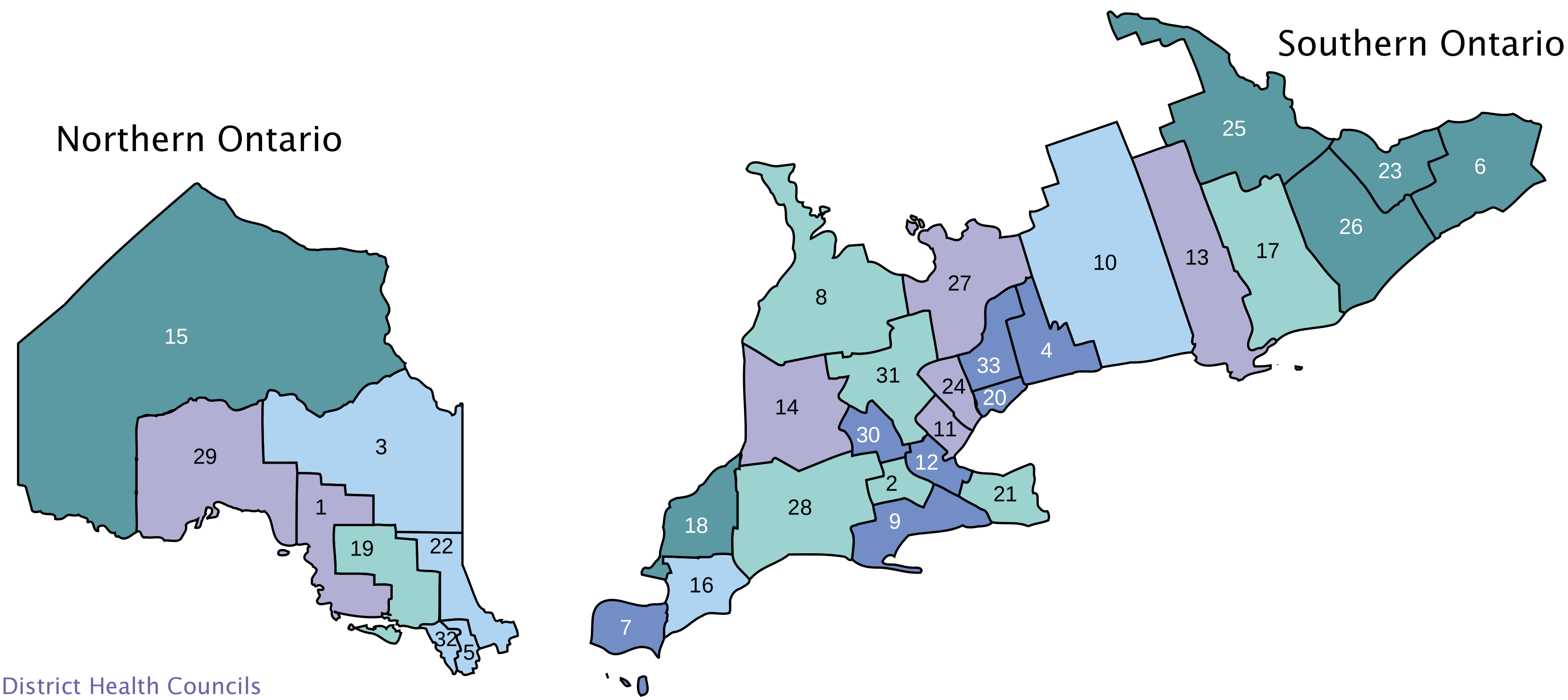
Exhibit 5.21: *Age/Sex-adjusted Incidental Appendectomy Rates per 100,000 Population (all ages) by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	8.2	33	11	8.0	31		12	9.1
Brant	29.2	11	24	19.7	8	*	27	21.5
Cochrane	11.8	27	11	11.4	22		6	6.3
Durham Region	29.2	12	71	16.5	13	*	70	16.0
East Muskoka-Parry Sound	50.7	4	16	20.3	6	*	17	22.6
Eastern Ontario	71.5	1	67	36.4	1	++	77	41.2
Essex County	16.0	21	43	12.2	18		38	10.7
Grey-Bruce	12.9	25	13	8.1	30		9	5.3
Haldimand-Norfolk	41.0	6	21	20.0	7	*	19	18.1
Haliburton, Kawartha & Pine Ridge	38.0	8	64	20.4	5	++	82	26.1
Halton	11.7	28	34	9.8	26		31	8.9
Hamilton-Wentworth	23.8	16	73	15.0	14		55	11.1
Hastings & Prince Edward Counties	39.2	7	50	31.6	2	++	36	22.7
Huron/Perth	35.8	9	13	9.6	27		10	7.3
Kenora-Rainy River	54.7	3	14	16.9	12		19	21.1
Kent County	22.9	17	15	13.3	16		13	11.6
Kingston, Frontenac and Lennox & Addington	45.0	5	52	28.9	3	++	44	23.9
Lambton	11.5	29	16	11.8	20		12	8.7
Manitoulin-Sudbury	16.2	20	24	11.3	23		25	11.9
Metropolitan Toronto:	12.3	26	193	7.8	32	++	183	7.2
Borough of East York	13.9		10	8.5			8	6.8
City of Etobicoke	10.2		23	7.1			17	4.9
City of North York	11.3		47	7.5			42	6.4
City of Scarborough	22.0		68	12.2			73	12.7
City of Toronto	7.0		36	5.4			34	4.8
City of York	10.7		9	6.1			9	5.8
Niagara	23.9	15	59	13.7	15		53	12.1
Nipissing/Timiskaming	17.2	18	27	20.9	4	*	25	19.8
Ottawa-Carleton Regional:	14.9	23	85	11.4	21		93	12.4
City of Ottawa	14.8		44	12.1			45	12.2
Ottawa, Eastern Region	20.0		21	13.4			26	16.2
Ottawa, Western Region	10.7		20	9.9			22	10.9
Peel:	8.8	32	55	6.9	33	++	47	5.8
City of Brampton	7.8		22	7.6			14	4.7
City of Mississauga	9.4		33	6.5			33	6.3
Renfrew County	10.9	30	11	10.8	25		9	8.9
Rideau Valley	31.0	10	30	19.0	9	*	36	22.1
Simcoe County	24.0	14	41	12.7	17		36	11.1
Thames Valley	14.7	24	63	10.9	24		84	14.3
Thunder Bay	15.1	22	15	9.0	28		15	9.4
Waterloo Region	9.3	31	36	8.9	29		36	9.0
Wellington-Dufferin	27.3	13	40	18.9	10	**	44	20.8
West Muskoka-Parry Sound	60.5	2	4	18.3	11		2	6.8
York Region	16.5	19	67	12.1	19		62	11.1
Total Ontario	19.3		1,357	12.4			1,327	12.0
Coefficient of Variation (%) [CV]	61.8			47.7				
Extremal Quotient [EQ]	8.7			5.3			Spearman Correlation	R=0.829 (p<0.0001)
Systematic Component of Variation [SCV]	707.1			296.4				
Adjusted Chi-square (likelihood ratio)	589.4 (d.f. 32, p<0.0001)			256.4 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age/Sex-adjusted Diagnostic Accuracy Rates for Appendectomy per 100,000 Population (all ages) by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate (quintiles)
0.93 to 0.95
0.91 to 0.93
0.90 to 0.91
0.88 to 0.90
0.83 to 0.87

Exhibit 5.22

coding rules used here. This difference was primarily driven by a higher rate of negative primary appendectomy for women in their reproductive years; gynecologic conditions and symptoms contribute to diagnostic confusion among these women.

The largest declines of all were seen in the use of incidental appendectomy. This shift probably reflects two factors. First, the appropriateness and preventive value of this procedure has been questioned in recent years and, as noted above, there are likely some minor short term adverse effects when this procedure is performed in the context of laparotomy for other reasons. Second, with the rise of laparoscopic surgery, it is less feasible and justifiable to attempt incidental appendectomy during other primary procedures.

Geographic variations in rates of negative primary appendectomy and the related variations in diagnostic accuracy by DHC remain a concern. In the last edition and a related journal article,[61] we showed that increases in diagnostic accuracy could not be clearly related either to higher rates of in-hospital death or to lengthened hospital stay. We will revisit this topic in Chapter 7. Since patients are not put at risk in centres with higher surgical accuracy, there remain opportunities for practitioners to learn from each other's experiences and management algorithms to improve the already excellent record of clinical diagnosis of this condition. As well, epidemiologists, surgeons and health records experts should revisit the coding of these procedures to reduce ambiguities and inconsistencies inherent in the relevant CCP and ICD-9 systems. Last, consideration could be given to establishing regional registries of patients presenting with abdominal pain, as this remains the most definitive way to assess practice patterns in this area of surgery.

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Lens Extraction

Overview

Cataract surgery is an extremely common procedure in elderly Ontarians. In fact, the total volume of cataract procedures each year is strikingly higher than that of many other procedures examined in the ICES *Practice Atlas*. The causes of cataracts include ocular trauma, uveitis, diabetes and long-term corticosteroid use. However, the cause of common age-related cataracts is usually not clinically apparent. Although the multifactorial pathways leading to age-related cataracts remain poorly understood, several risk factors have been convincingly documented.[63] Cortical and posterior subcapsular cataracts are associated with exposure to ultraviolet light, whereas nuclear cataracts are associated with smoking. Heavy alcohol intake is associated with all types of age-related cataracts. Although it appears likely that anti-oxidants have a protective effect, the therapeutic role of supplementation remains unclear.

In recent years, cataract surgery has undergone a major transformation affecting surgical techniques, clinical threshold for surgery and mode of care delivery. Ten years ago, cataract surgery was primarily an inpatient procedure; now most procedures are done as day surgery. Also a decade ago, cataract surgery and lens implantation had already undergone a shift from the intracapsular route, with or without implantation of an anterior intraocular lens, to an extracapsular technique using 150° limbal incisions with solid posterior chamber intraocular lens implantation. Now phacoemulsification — a variation of the extracapsular technique using much smaller incisions — with solid or flexible posterior intraocular lens implantation is increasingly the technique of choice. Other important technical innovations in the last decade include improved intraocular lens quality and the intraoperative use of viscoelastic. One of the changes accompanying these improvements in cataract surgery has been a concomitant decrease in the clinical threshold for surgery.

Despite the increased efficiency of the surgical procedures for cataract management, waiting lists for cataract surgery are a source of complaints from patients and physicians alike. This brief report provides ICES' first look at this complex area.

Analysis of Lens Extraction Surgery

Methods

The same general methods were followed as for other procedures, with the following variations. We examined all records for people 50 years of age and older in which a cataract was diagnosed (ICD-9 366) in association with a lens extraction, with or without intraocular lens implantation, by intracapsular (CCP 27.4), extracapsular (CCP 27.5) or other methods (CCP 27.6). Since pediatric patients were excluded, intracapsular cataract extraction was reserved for the rare cases of subluxed lenses, or was undertaken as a result of complications during extracapsular extraction or phacoemulsification. For simplicity, we did not differentiate among the foregoing codes. Both inpatient and outpatient records were searched. We report rates only since 1991/92 because day surgery data are incomplete before that fiscal year. All analyses are at the procedural level; that is, data have not been linked to determine the extent to which these procedure counts are affected by people who receive cataract surgery in both eyes in separate settings. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in Lens Extraction Surgery

As shown in Exhibit 5.23, there has been definite growth in the rates of cataract extraction in the four years under study, from 1577.2 per 100,000 adults in 1991/92 to 1822.9 per 100,000 adults in 1994/95. The growth has been consistent among age groups and sexes. During the period under study, rates of cataract extraction among women are consistently higher than those among men, by 25% to 30% in the 65 to 74 age group and by 15% to 20% in the age group older than 75.

Geographic Variations in Lens Extraction Surgery

Exhibit 5.24 maps the pattern of cataract surgery utilization among the DHCs of Ontario. In the most recent two year period, in people 50 years of age and older, the rates per 100,000 vary twofold after excluding one low outlier, Kenora–Rainy River (Exhibit 5.25). Although the relative differences in rates are small, the absolute disparities are not, with many DHCs differing from each other by 1,000 or more cataract operations per 100,000 people 50 years of age or older. Moreover, as measured by various summary measures (see foot of Exhibit 5.25), the degree of geographic variation is moderately large.

Comment

National data compiled by the Saskatchewan Health Utilization Research Commission (SHURC) show overall age/sex-adjusted rates of

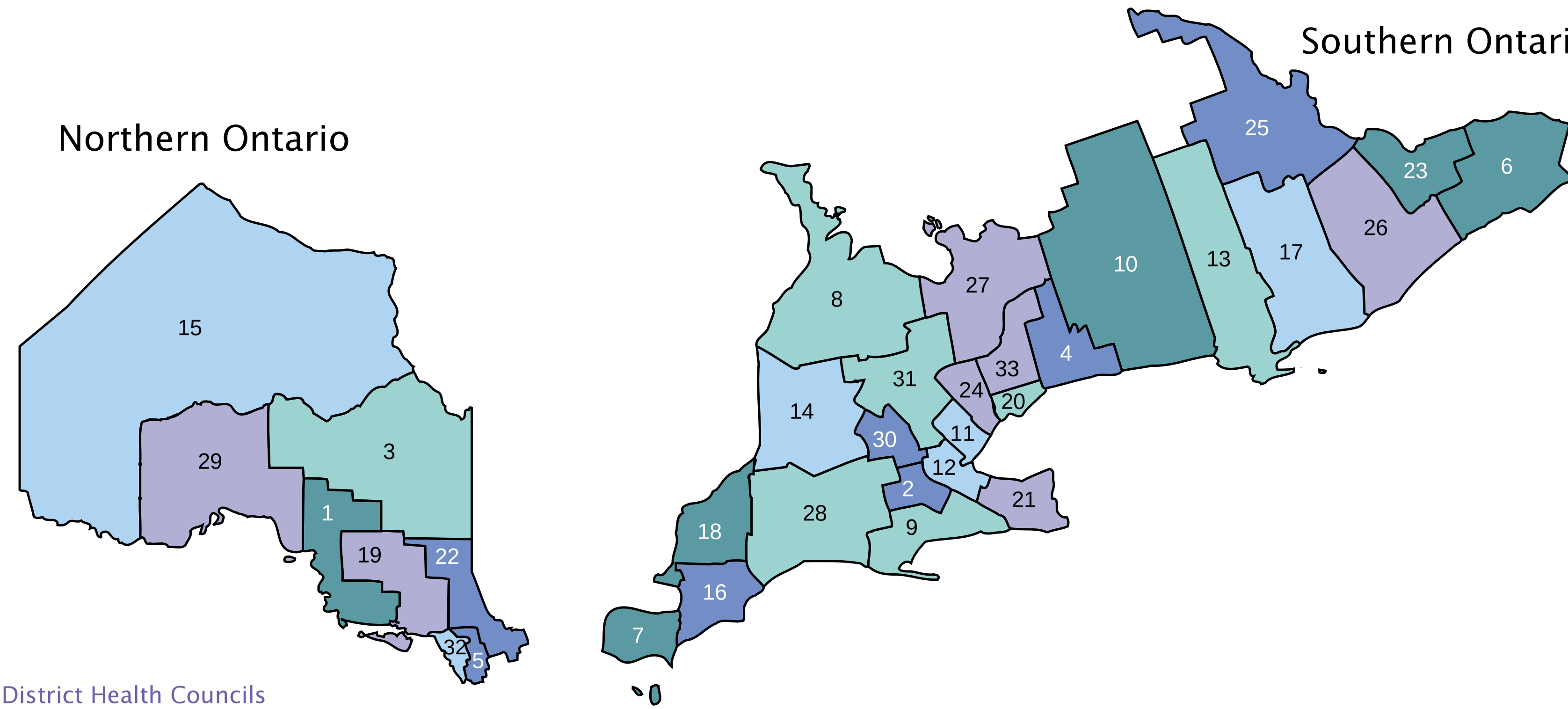
Exhibit 5.23: *Overall and Age/Sex-specific Lens Extraction Rates per 100,000 Population 50 Years and Over in Ontario, 1991/92 - 1994/95*

Fiscal Year	Overall Rate	Women by Age Group			Men by Age Group		
		50 - 64	65 - 74	75+	50 - 64	65 - 74	75+
1991/92	1,577.2	491.2	2,182.4	4,488.0	497.5	1,683.2	3,787.2
1992/93	1,640.4	506.8	2,304.7	4,622.9	503.4	1,809.9	3,901.9
1993/94	1,681.0	504.5	2,359.4	4,741.2	496.9	1,915.9	4,019.8
1994/95	1,822.9	551.2	2,556.8	5,154.1	530.0	2,034.2	4,472.4

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.24

Age/Sex-adjusted Lens Extraction Rates per 100,000 Population 50 Years and Over by DHC Area of Patient Residence in Ontario, 1993/94 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

- 2160.5 to 2571.9
- 1801.5 to 2029.6
- 1610.6 to 1779.3
- 1489.8 to 1600.3
- 539.7 to 1470.6

Exhibit 5.25: *Age/Sex-adjusted Lens Extraction Rates per 100,000 Population 50 Years and Over by DHC Area of Patient Residence in Ontario, 1991/92 - 1994/95*

District Health Council	1991/92 - 1992/93		1993/94 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	1,720.6	13	789	2,266.3	4	✣✣	822	2,349.2
Brant	1,990.2	5	713	2,009.8	8	✣✣	702	1,961.1
Cochrane	1,769.0	11	323	1,535.7	25	*	312	1,470.5
Durham Region	1,848.3	10	1,551	1,849.4	11	*	1,636	1,920.2
East Muskoka-Parry Sound	1,692.1	15	506	2,029.6	7	✣✣	544	2,173.5
Eastern Ontario	1,891.8	9	1,142	2,160.5	6	✣✣	1,212	2,262.8
Essex County	1,939.0	7	2,440	2,497.4	2	✣✣	2,416	2,440.6
Grey-Bruce	1,219.4	31	820	1,533.6	26	✣✣	862	1,591.9
Haldimand-Norfolk	1,288.5	28	451	1,489.8	27	✣✣	516	1,689.5
Haliburton, Kawartha & Pine Ridge	2,067.4	3	2,233	2,160.5	5	✣✣	2,251	2,156.8
Halton	1,426.4	23	1,130	1,470.6	28	✣✣	1,218	1,566.3
Hamilton-Wentworth	1,320.2	25	1,850	1,327.1	31	✣✣	2,016	1,425.8
Hastings & Prince Edward Counties	1,261.3	30	781	1,586.6	22	*	982	1,972.7
Huron/Perth	1,349.4	24	625	1,375.2	30	✣✣	693	1,504.1
Kenora-Rainy River	694.7	33	115	539.7	33	✣✣	126	586.7
Kent County	1,968.9	6	695	2,002.2	9	✣✣	716	2,037.4
Kingston, Frontenac and Lennox & Addington	1,265.5	29	690	1,377.6	29	✣✣	714	1,407.8
Lambton	2,345.1	1	1,000	2,571.9	1	✣✣	985	2,514.9
Manitoulin-Sudbury	1,515.5	17	845	1,664.4	18		890	1,744.0
Metropolitan Toronto:	1,506.9	19	11,003	1,576.2	23	✣✣	11,569	1,616.8
Borough of East York	1,403.8		596	1,461.3			627	1,483.6
City of Etobicoke	1,468.9		1,827	1,723.1			2,013	1,854.0
City of North York	1,577.2		3,130	1,676.4			3,238	1,693.6
City of Scarborough	1,622.5		2,240	1,682.4			2,397	1,759.0
City of Toronto	1,395.4		2,512	1,358.0			2,576	1,359.7
City of York	1,513.5		693	1,516.9			713	1,522.2
Niagara	1,609.0	16	2,240	1,676.0	17		2,362	1,747.9
Nipissing/Timiskaming	2,002.7	4	684	1,898.9	10	*	703	1,948.6
Ottawa-Carleton Regional:	1,931.5	8	3,974	2,287.7	3	✣✣	4,275	2,428.1
City of Ottawa	1,984.7		2,759	2,299.5			2,977	2,442.5
Ottawa, Eastern Region	1,803.5		404	2,004.8			462	2,250.9
Ottawa, Western Region	1,833.5		812	2,440.8			836	2,472.3
Peel:	1,717.6	14	2,287	1,779.3	14		2,465	1,885.9
City of Brampton	1,311.7		735	1,717.7			808	1,865.6
City of Mississauga	1,915.6		1,551	1,809.5			1,656	1,896.0
Renfrew County	1,724.0	12	554	1,801.5	13		621	1,994.4
Rideau Valley	1,503.0	20	863	1,688.6	16		872	1,685.1
Simcoe County	1,507.9	18	1,549	1,759.7	15		1,708	1,911.1
Thames Valley	1,319.2	27	2,529	1,600.3	21	✣✣	2,630	1,647.2
Thunder Bay	1,438.9	22	695	1,610.6	20	*	776	1,778.2
Waterloo Region	2,237.6	2	1,695	1,811.8	12		1,615	1,705.8
Wellington-Dufferin	1,319.8	26	810	1,543.8	24	**	857	1,609.9
West Muskoka-Parry Sound	1,004.1	32	107	1,323.9	32	**	110	1,334.6
York Region	1,444.1	21	1,587	1,641.9	19	**	1,736	1,780.1
Total Ontario	1,605.7		49,267	1,735.4			51,912	1,801.1
Coefficient of Variation (%) [CV]	17.5			18.2				
Extremal Quotient [EQ]	3.4			4.8			Spearman Correlation	R=0.860 (p<0.0001)
Systematic Component of Variation [SCV]	47.3			48.3				
Adjusted Chi-square (likelihood ratio)	1,382.4 (d.f. 32, p<0.0001)			1728.8 (d.f. 32, p<0.0001)				

* Significant at 5% level   ** Significant at 1% level   ✣✣ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

cataract extraction per 100,000 people 50 years of age or older in seven of the other provinces in 1993/94: Newfoundland 1,290, New Brunswick 1,800, Quebec 1,580, Manitoba 1,640, Saskatchewan 2,190, Alberta 2,350 and British Columbia 2,170.[64] Ontario's overall rate of cataract-surgery utilization, at about 1,800 procedures per 100,000 people 50 years of age or older, is about the median among Canadian provinces.

Javitt and associates[65] examined cataract surgery in US Medicare recipients (i.e., people 65 years of age and older) for 1986 and 1987. The 181 US health regions (Bureau of Economic Analysis of Economic Areas) analysed generally have much larger populations than Ontario DHCs . The overall rate was 2,540 operations per 100,000 people 65 and older, ranging from 380 per 100,000 to 4,120 per 100,000. Although the average rate is lower than the current (1994/95) rate in Ontario, the eight year time difference makes a direct comparison problematic. The US regional rate variation is considerably larger than the regional rate variation in Ontario. Similarly, the 1991/92 regional rate variation in Ontario (CV 17.5%) compares favourably with that in the United States in 1986/87 (CV 24%). Rates of surgery were higher for women (as is true here), for whites, for more affluent people and for residents of southern states.

Favourable international comparisons aside, the rate variation observed in Ontario is moderately large and a source of concern. It is highly implausible that this degree of variation is attributable to regional differences in risk factors for cataract surgery. As always, concerns arise about inadequate access to cataract surgery in low-rate areas and an unduly low threshold for lens extraction in high-rate areas. These issues can only be addressed with the use of primary data with clinical details of practice patterns and data relating cataract extraction waiting lists to patterns of surgery utilization.

The importance of reasonable access to cataract surgery should be emphasized. Treatment of cataracts enhances not just visual function but overall function, with measurable improvements in health-related quality of life.[66] For example, in a detailed study of 552 patients compared before and after surgery with the use of multiple outcome measures, Steinberg and associates[67] found that visual acuity was improved in 96% of patients and vision-related functional impairment was improved in 89% of patients. Satisfaction with visual outcomes was high, and overall function, as measured by Sickness Impact Profile scores, was also improved in most patients.[68]

Although cataract surgery is highly effective, with a low risk of complications, patients must recognize that improvements in outcomes may be less than anticipated and that complications do occur. Schein and associates[68] identified ocular comorbidities (macular degeneration, glaucoma and diabetic retinopathy), age over 75, low levels of cataract-related symptoms, and low levels of vision-related functional impairment, as independent predictors of lack of improvement on one or more outcome measures. Interestingly, preoperative visual acuity of better than 20/40 in the cataractous eye was not associated with lack of improvement on outcome measures. This finding supports the statement of the US Agency for Health Care Policy and Research[69] that there is no visual acuity threshold that can be used as a guideline for the appropriateness of cataract surgery. A meta-analysis[70] of the outcomes of posterior chamber intraocular lens implantation after extracapsular cataract extraction or phacoemulsification found the following complication rates: posterior capsule opacification (19.7%), clinically apparent cystoid macular edema (1.5%), intraocular lens malposition or dislocation (1.1%), retinal detachment (0.7%) and endophthalmitis (0.13%). Little difference in outcomes between standard extracapsular cataract extraction and phacoemulsification was seen. Fortunately, posterior capsule opacification, the most common complication of cataract surgery, is amenable to ND:YAG laser capsulotomy, although this procedure is associated with a 3.9-fold increased risk of retinal detatchment or retinal break.[71] Operator effects on outcomes appear to be minimal, at least for surgeons performing more than 50 cataract extractions per year.[72]

Potential economies in providing cataract surgery are limited. As noted in Chapter 8, the overwhelming majority of cataract procedures are now performed as day surgery. There is no evidence of poorer outcomes associated with the shift to outpatient procedures during the 1980s.[73,74] With mounting fiscal pressure, only the highest risk patients will likely still be managed as inpatients post-operatively.

In sum, cataract surgery is a common quality of life-enhancing procedure that is currently provided to elderly Ontarians with large variations among DHCs. Further research is needed to ensure the best use of these resources, and to assess the causes and impact on health status of the geographic variations in cataract extraction.

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Cardiovascular Procedures

Introduction

In the following sections we deal with another major source of disease, disability and premature death in Canadian society: cardiovascular disease related to atherosclerosis. We examine three vascular procedures: carotid endarterectomy, aortic abdominal aneurysm repair and arterial reconstructive and graft procedures involving blood supply to the legs. We also examine coronary artery bypass grafting (CABG).

Carotid Endarterectomy

Overview

Carotid endarterectomy is performed to prevent stroke; it involves removal of atherosclerotic blockage in one of the two major arteries on either side of the neck. During the 1980s, the indications for the use of carotid endarterectomy were somewhat controversial. Consequently, the use of this procedure varied among institutions and surgeons. In 1991, the North American Symptomatic Carotid Endarterectomy Trial (NASCET)[75] collaborators were the first to demonstrate the value of endarterectomy in lowering the risk of stroke and death in patients with high-grade, symptomatic atherosclerotic stenoses involving the internal carotid artery. This was subsequently confirmed by the European Carotid Endarterectomy Trial.[76] More recently, the investigators of the Asymptomatic Carotid Endarterectomy Study (ACAS) have suggested that endarterectomy in moderate to high-grade asymptomatic carotid stenoses also decreases the risk of future stroke and death.[77] Although the NASCET results demonstrated a decrease in the absolute risk of stroke from 28% to 11% over two years, ACAS suggested a decrease from 10.8% to 5.8% over three years. Both of these trials relied on selected centres that had demonstrated perioperative morbidity and mortality rates of less than 6%, in NASCET, and 3.5%, in ACAS.

Analysis of Carotid Endarterectomy

Methods

The analysis followed the methods outlined previously and included people 20 years of age and older as the denominator. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in Carotid Endarterectomy

Carotid endarterectomy rates showed a steady decline, from 18.0 per 100,000 adults in 1985/86 to a low of 8.4 per 100,000 in 1989/90, representing a more than 50% relative decrease (Exhibit 5.26).[78] Since then, the rate of carotid endarterectomy has been

Exhibit 5.26: *Overall and Age/Sex-specific Carotid Endarterectomy Rates per 100,000 Population 20 Years and Over in Ontario, 1981/82 - 1994/95*

Fiscal Year	Overall Rate	Women by Age Group					Men by Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1981/82	19.6	0.2	4.0	29.8	58.4	17.5	0.0	4.8	62.7	119.2	38.3
1982/83	20.2	0.0	2.8	28.2	59.8	14.6	0.3	5.9	62.7	134.0	42.3
1983/84	20.7	0.1	1.9	26.2	67.3	17.2	0.0	3.4	59.5	146.6	66.1
1984/85	19.7	0.1	2.2	24.5	68.5	22.2	0.1	4.6	56.8	122.6	60.5
1985/86	18.0	0.1	2.6	25.0	56.1	19.8	0.0	3.9	50.8	115.6	60.0
1986/87	13.6	0.0	1.6	17.1	41.9	13.0	0.0	1.7	38.4	94.0	52.2
1987/88	13.4	0.1	1.6	21.5	38.5	17.0	0.1	2.1	34.0	86.8	54.7
1988/89	8.8	0.0	1.0	11.9	25.8	12.5	0.1	1.6	24.1	58.9	30.8
1989/90	8.4	0.0	1.0	11.7	23.1	10.2	0.0	0.8	22.2	61.6	33.7
1990/91	9.3	0.0	1.1	12.6	28.1	12.3	0.0	1.9	23.4	66.4	30.0
1991/92	15.9	0.1	0.7	17.6	49.0	33.8	0.1	2.4	37.3	108.3	77.2
1992/93	16.0	0.0	1.5	17.0	53.0	29.1	0.0	2.6	35.1	114.6	78.3
1993/94	14.8	0.1	0.9	14.8	41.6	27.4	0.1	1.5	29.4	114.6	96.6
1994/95	17.7	0.1	1.0	22.3	50.7	36.1	0.0	1.8	35.4	126.2	105.2

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

on the rise (Exhibit 5.27). Of all age groups, the largest increase occurred among people 75 years of age or older, who had a threefold increase from 1989/90 to 1994/95. In the two most recent time periods studied, the provincial rate for this procedure increased from 11.2 per 100,000 (for 1989/90 to 1991/92) to 16.2 per 100,000 (for 1992/93 to 1993/94), representing a 44.6% increase (Exhibit 5.28).

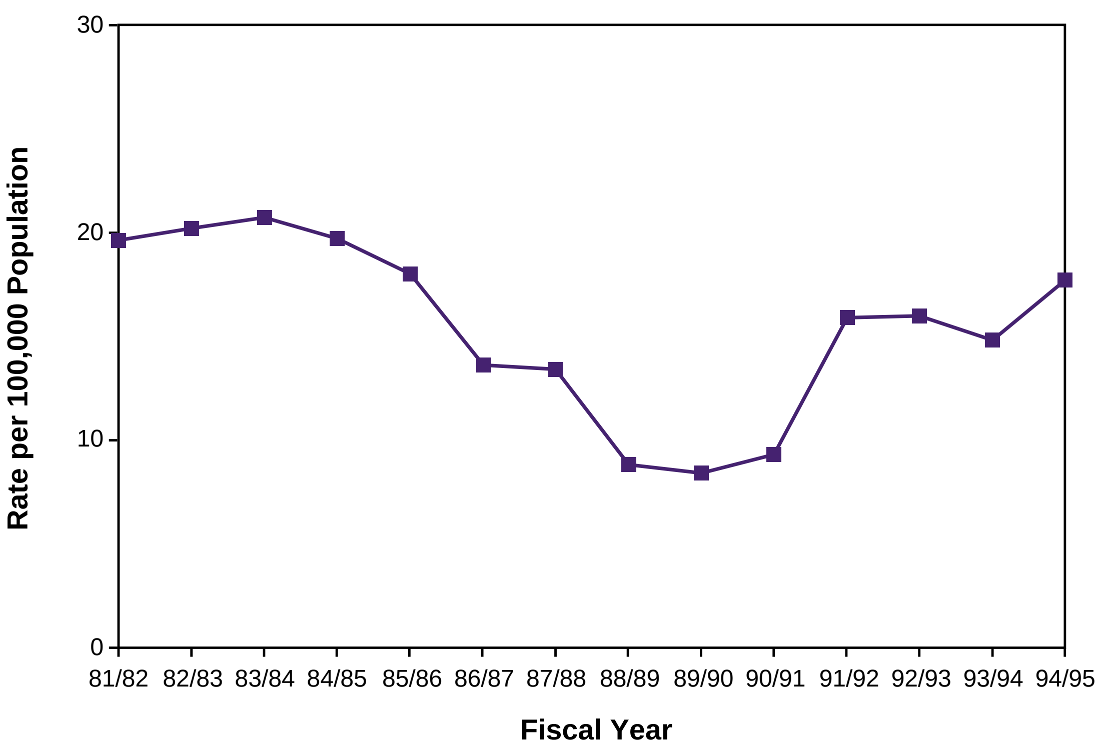
Geographic Variations in Carotid Endarterectomy

Exhibits 5.28 and 5.29 show data specific to DHCs. For the period 1989/90 to 1991/92, Manitoulin–Sudbury had the highest rate of carotid endarterectomy (32.0 per 100,000) and Wellington–Dufferin the lowest (6.7 per 100,000), a high–low rate ratio of 4.8. In 1992/93 to 1994/95, Cochrane had the highest rate of carotid endarterectomy (47.6 per 100,000) and Waterloo Region the lowest (9.3 per 100,000), a high–low rate ratio of 5.1. The variability of rates decreased, as indicated by the usual descriptive statistics at the foot of Exhibit 5.28. The rankings for DHCs were relatively consistent. In general, DHCs with higher rates remained higher and regions with lower rates remained lower. The Spearman rank correlation coefficient indicated a 74% correspondence between the ranks in the two periods studied.

Comment

The upward trend observed since late 1990 can be tied to the positive findings of major trials such as the NASCET[75] and the European Carotid Surgery Trialists' Collaborative Group [76]. This trend is a striking and positive demonstration of how surgeons shift their patterns of practice in response to major trial findings. It is, however, important to note that these trials were conducted at highly selected medical centres with documented low perioperative morbidity and mortality rates for symptomatic or asymptomatic endarterectomy and involved carefully selected patients who also had aggressive, modifiable risk-factor management. NASCET showed that only centres that could guarantee low rates of complications should perform the operation.[75] Our current data only allow us to describe current practice patterns in Ontario; they do not allow us to address the appropriateness of the increasing rate of carotid endarterectomy across the province. Further analyses are needed to evaluate outcomes and the appropriateness of this procedure.

Exhibit 5.27: ***Overall Age/Sex-adjusted Carotid Endarterectomy Rates per 100,000 Population 20 Years and Over in Ontario, 1981/82 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

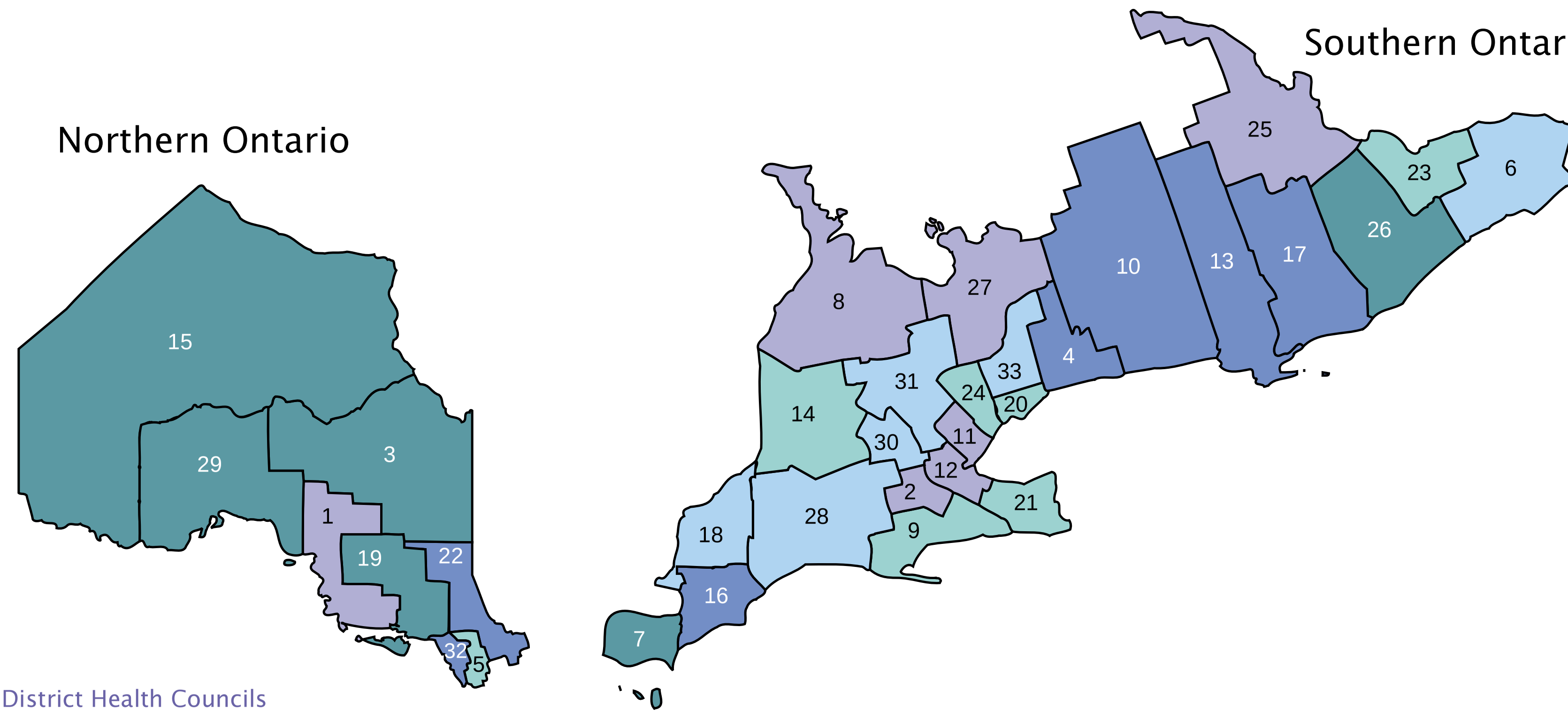
Exhibit 5.28: *Age/Sex-adjusted Carotid Endarterectomy Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	12.4	14	16	15.9	18		15	14.7
Brant	7.4	31	16	16.5	15		16	16.4
Cochrane	31.8	2	30	47.6	1	✣✣	33	52.7
Durham Region	11.4	17	52	20.2	9		57	21.8
East Muskoka-Parry Sound	9.8	22	20	13.8	26		21	14.8
Eastern Ontario	9.9	21	10	13.5	28		7	9.2
Essex County	17.7	6	66	24.6	3	✣✣	67	24.5
Grey-Bruce	8.8	26	24	17.2	14		28	19.6
Haldimand-Norfolk	10.7	19	13	15.6	21		16	18.2
Haliburton, Kawartha & Pine Ridge	18.1	4	57	20.4	7		64	22.3
Halton	9.6	23	36	15.7	20		37	15.8
Hamilton-Wentworth	8.1	29	62	15.9	19		74	18.7
Hastings & Prince Edward Counties	17.0	8	25	19.4	10		34	25.3
Huron/Perth	12.6	12	17	14.3	25		18	14.7
Kenora-Rainy River	10.3	20	15	24.1	4		12	18.9
Kent County	15.5	10	17	18.5	13		15	15.7
Kingston, Frontenac and Lennox & Addington	17.3	7	27	18.9	12		31	21.7
Lambton	8.9	25	13	12.3	31		12	11.0
Manitoulin-Sudbury	32.0	1	52	34.7	2	✣✣	60	39.7
Metropolitan Toronto:	8.8	27	284	14.6	23		319	15.8
Borough of East York	10.3		21	20.9			25	23.3
City of Etobicoke	10.3		45	14.9			52	16.7
City of North York	7.6		64	12.4			80	14.9
City of Scarborough	10.2		66	17.1			67	16.8
City of Toronto	7.1		69	13.6			80	15.4
City of York	10.4		19	15.1			15	11.4
Niagara	7.8	30	52	14.4	24		72	20.2
Nipissing/Timiskaming	15.2	11	20	20.3	8		18	18.1
Ottawa-Carleton Regional:	11.2	18	76	15.4	22		95	18.8
City of Ottawa	11.2		45	14.2			52	15.6
Ottawa, Eastern Region	8.4		11	16.5			17	26.2
Ottawa, Western Region	14.3		20	18.9			26	24.9
Peel:	8.4	28	54	13.6	27		64	15.6
City of Brampton	5.2		16	11.8			19	13.2
City of Mississauga	10.0		38	14.4			45	16.7
Renfrew County	12.5	13	13	16.0	17		18	22.0
Rideau Valley	19.0	3	33	23.4	5	*	27	19.4
Simcoe County	11.8	16	40	16.1	16		48	18.8
Thames Valley	12.2	15	55	12.6	30		50	11.3
Thunder Bay	17.9	5	28	22.4	6		21	16.3
Waterloo Region	6.9	32	25	9.3	33	**	29	10.8
Wellington-Dufferin	6.7	33	16	10.5	32		20	12.9
West Muskoka-Parry Sound	16.4	9	4	19.1	11		9	41.7
York Region	9.3	24	39	12.9	29		47	15.5
Total Ontario	11.2		1,305	16.2			1,454	17.7
Coefficient of Variation (%) [CV]	42.3			31.3				
Extremal Quotient [EQ]	4.8			5.1			Spearman Correlation	R=0.744 (p<0.001)
Systematic Component of Variation [SCV]	222.3			144.3				
Adjusted Chi-square (likelihood ratio)	122.0 (d.f. 32, p<0.0001)			101.6 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✣✣ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age/Sex-adjusted Carotid Endarterectomy Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

- 22.4 to 47.6
- 18.5 to 20.4
- 15.7 to 17.2
- 13.6 to 15.6
- 9.3 to 13.5

Exhibit 5.29

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Abdominal Aortic Aneurysm Repair

Overview

Abdominal aortic aneurysm (AAA) repair is undertaken to prevent or treat rupture of the aorta. Studies have shown that the incidence of AAA repair in Britain[79–82] and the United States[83] is increasing, and natural history studies[84] suggest that 5% to 8% of the general population over the age of 60 or 65 have an aneurysm.[85] Treatment (surgical repair) is recommended on an elective basis since emergent repair after rupture is associated with a mortality rate of more than 50%.[86-89] In contrast, the overall hospital mortality rate for elective surgery has improved dramatically during the last three decades, decreasing from approximately 13% to 15% in the 1950s down to about 2% to 5% in the current era.[90]

Early repair of AAA is obviously most appropriate for aneurysms that are likely to expand. Imaging techniques, such as computed tomography (CT), can define features associated with subsequent rapid aneurysmal expansion. Wolf and associates[91] identified two significant predictors of rapid expansion: the presence of concomitant carotid artery disease and a measure of the extent of the intraluminal thrombus. They observed rapid expansion (greater than 0.5 cm per year) in 19% of aneurysms. They suggested that an increased AAA thrombus load is particularly associated with a higher likelihood of rapid expansion and should weigh in favour of early surgical repair.

Previously, we reported a 42% relative increase in the use of AAA repair in Ontario from 1981/82 to 1991/92.[92,93] Substantial interarea variation in AAA surgery rates was also observed. This increasing AAA repair rate in Ontario was expected, as a result of previous reports of rising incidence[94] and more aggressive surgery being practised in Europe.[95] The increased operative rates in Ontario presumably represented a response to better detection (e.g. by ultrasound and CT scanning) and a shifting threshold for surgery, with elective resection now commonly recommended for aneurysms 5 cm in diameter rather than 7 cm in diameter, as recommended a decade ago.[95,96]

Analysis of AAA

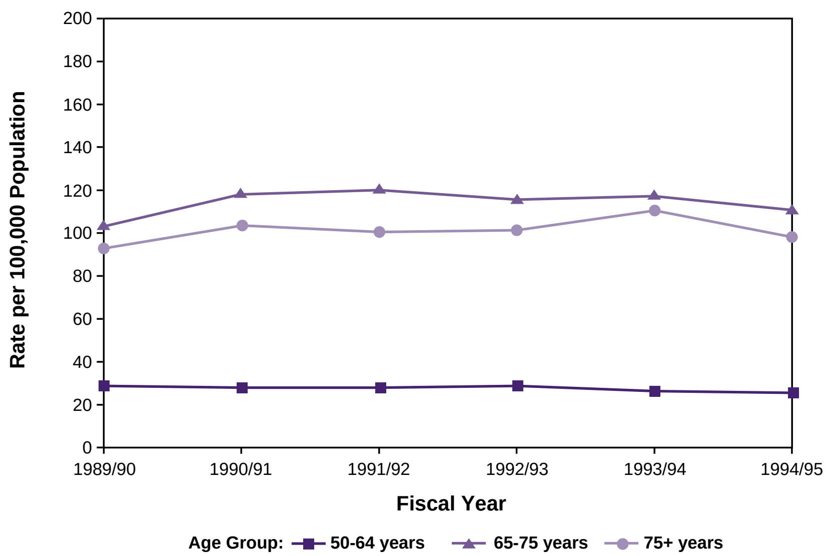
Methods

The method of analysis for AAA repair followed the general approach outlined previously. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in AAA Repair

In recent years in Ontario, the rate of AAA repair has been stable (Exhibits 5.30 and 5.31). For the two most recent time periods studied, the provincial rate of this procedure was steady at 22.9 per 100,000 in 1989/90 to 1991/92 and 22.6 per 100,000 in 1992/93 to 1994/95 (Exhibit 5.32).

Exhibit 5.31: ***Age-specific Abdominal Aortic Aneurysm Repair Rates per 100,000 Population 50 Years and Over in Ontario, 1989/90 – 1994/95***



Note: Rates for 20-34 and 35-49 year age groups are not displayed because they are all less than 2 per 100,000 population

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.30: ***Overall and Age/Sex-specific Abdominal Aortic Aneurysm Repair Rates per 100,000 Population 20 Years and Over in Ontario, 1989/90 - 1994/95***

Fiscal Year		Women by Age Group					Men by Age Group				
	Overall Rate	20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1989/90	21.5	0.1	0.5	8.9	31.1	31.8	0.6	1.4	49.6	193.5	199.2
1990/91	23.5	0.1	0.5	8.4	35.6	38.9	0.9	1.8	48.7	220.2	215.0
1991/92	23.5	0.2	0.5	9.9	40.0	33.8	0.9	2.1	45.9	219.1	214.6
1992/93	23.2	0.6	0.4	9.7	36.5	34.2	0.4	2.1	48.2	211.6	216.3
1993/94	23.2	0.1	0.5	9.0	41.6	35.9	0.4	0.8	44.5	209.1	238.4
1994/95	21.6	0.2	0.3	7.6	37.3	35.8	0.1	1.2	43.9	198.5	204.7

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.32: *Age/Sex-adjusted Abdominal Aortic Aneurysm Repair Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	24.9	14	30	28.6	9		26	25.5
Brant	25.2	12	24	25.5	16		25	26.2
Cochrane	22.3	22	15	23.7	21		18	27.6
Durham Region	19.3	27	63	25.1	17		88	34.0
East Muskoka-Parry Sound	24.3	16	39	25.9	14		39	25.9
Eastern Ontario	22.7	21	17	22.6	23		19	25.6
Essex County	23.4	18	51	18.7	30		36	13.3
Grey-Bruce	24.7	15	36	24.7	19		25	16.2
Haldimand-Norfolk	22.9	20	17	19.9	28		21	24.5
Haliburton, Kawartha & Pine Ridge	31.7	3	89	30.0	7	*	100	33.4
Halton	29.8	6	76	33.3	3	✢✢	87	37.5
Hamilton-Wentworth	28.7	8	115	29.1	8	**	129	32.1
Hastings & Prince Edward Counties	38.7	1	47	34.1	2	**	34	24.1
Huron/Perth	21.0	23	24	19.5	29		23	17.4
Kenora-Rainy River	20.7	24	14	22.3	24		15	22.5
Kent County	20.6	25	20	21.5	26		16	17.2
Kingston, Frontenac and Lennox & Addington	29.5	7	46	32.4	4	*	46	31.0
Lambton	16.5	31	29	26.2	13		33	29.4
Manitoulin-Sudbury	16.9	29	31	20.5	27		34	22.0
Metropolitan Toronto:	18.1	28	299	15.4	32	✢✢	270	13.2
Borough of East York	18.0		15	14.2			11	9.5
City of Etobicoke	21.2		59	19.4			59	18.7
City of North York	18.1		76	14.3			63	11.2
City of Scarborough	19.4		73	19.3			70	17.8
City of Toronto	16.2		62	12.3			54	10.2
City of York	14.2		15	12.4			13	10.1
Niagara	31.3	4	97	25.7	15		101	25.9
Nipissing/Timiskaming	27.0	10	33	32.2	5	*	28	27.0
Ottawa-Carleton Regional:	27.4	9	114	23.6	22		100	20.4
City of Ottawa	28.0		71	22.9			64	20.3
Ottawa, Eastern Region	18.9		14	21.8			13	19.9
Ottawa, Western Region	30.8		28	27.7			23	23.0
Peel:	16.8	30	62	16.4	31	**	58	14.9
City of Brampton	14.2		15	12.3			15	11.2
City of Mississauga	18.1		47	18.5			43	16.8
Renfrew County	25.1	13	22	24.9	18		18	20.5
Rideau Valley	33.4	2	39	27.1	11		34	23.3
Simcoe County	23.2	19	80	31.7	6	**	81	30.9
Thames Valley	23.9	17	118	26.8	12		109	24.2
Thunder Bay	20.2	26	31	24.0	20		26	19.9
Waterloo Region	16.2	32	57	21.6	25		62	23.0
Wellington-Dufferin	26.5	11	41	27.5	10		34	21.5
West Muskoka-Parry Sound	29.8	5	9	38.3	1		10	49.2
York Region	15.3	33	44	14.9	33	**	40	12.9
Total Ontario	22.9		1,829	22.6			1,784	22.5
Coefficient of Variation (%) [CV]	24.4			27.1				
Extremal Quotient [EQ]	2.5			2.6			Spearman Correlation	R=0.748 (p<0.0001)
Systematic Component of Variation [SCV]	18.3			31.9				
Adjusted Chi-square (likelihood ratio)	93.1 (d.f. 32, p<0.0001)			132.2 (d.f. 32, p<0.0001)				

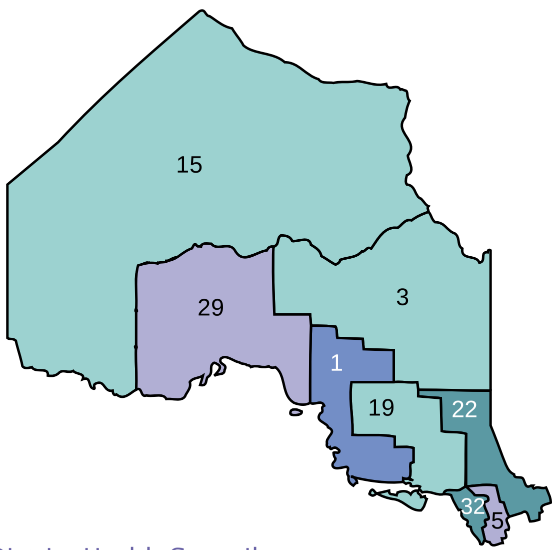
* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

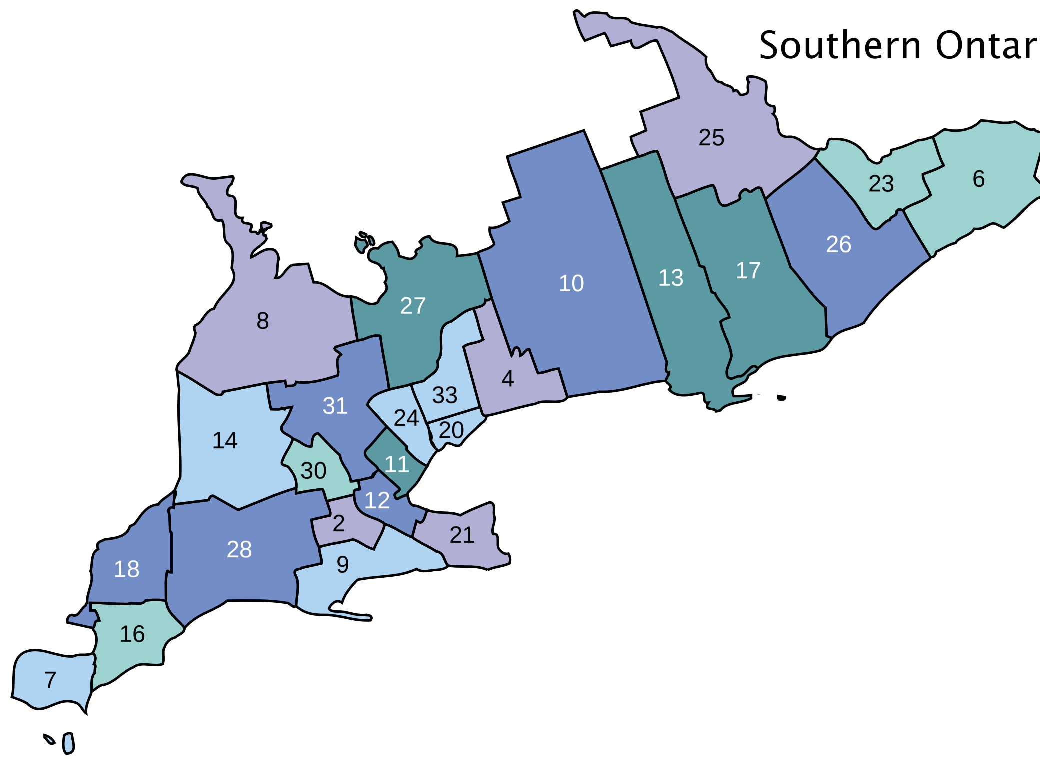
Age/Sex-adjusted Abdominal Aortic Aneurysm Repair Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95

Exhibit 5.33

Northern Ontario



Southern Ontario



Age/Sex-adjusted Rate (quintiles)

- 31.7 to 38.3
- 26.2 to 30.0
- 24.0 to 25.9
- 20.5 to 23.7
- 14.9 to 19.9

District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Geographic Variations in AAA Repair

Exhibits 5.32 and 5.33 show the data specific to DHC areas. In 1989/90 to 1991/92, Hastings and Prince Edward Counties had the highest rate of AAA repair (38.7 per 100,000) and York Region the lowest (15.3 per 100,000), a high–low rate ratio of 2.5. In 1992/93 to 1994/95, West Muskoka/Parry Sound had the highest rate of AAA repair (38.3 per 100,000) and York Region remained the lowest (14.9 per 100,000), a high–low rate ratio of 2.6. The variability in rates was moderate and showed a modest increase between the two periods studied, as indicated by the summary statistics at the foot of Exhibit 5.32. The rankings of DHCs were also relatively consistent. In general, DHCs with high rates remained high and those with low rates remained low (Spearman rank correlation coefficient 0.75).

Comment

Past growth in AAA surgery in Ontario was presumably attributable to increasing awareness of aneurysmal disease by both physicians and the public, a lower threshold for surgery (driven in part by the increasing safety of elective procedures), the availability of investigations such as outpatient ultrasound, and the aging of the population. Given the dramatic difference in outlook for elective repair versus emergency surgery postrupture, it is surprising that the growth of AAA repair has levelled off in the past six years.

Analysis of New York State data suggests that centres performing a higher volume of aortic surgery have a lower case-fatality rate for elective AAA repair. This observation supports regionalization of vascular services in Ontario. However, case-fatality rates for ruptured AAA surgery appear to be independent of surgical volumes, and patients with ruptured AAA are less likely to be transferred to tertiary hospitals than those undergoing elective AAA repair because of the degree of patient duress. Since ruptured AAA accounts for a significant percentage (22%) of aortic operations performed in Ontario, there are clear limits on the extent to which AAA surgery can be regionalized. An ICES analysis has addressed the potential yield from strict regionalization of elective AAA surgery to high volume centres. It found that, even if all elective cases were transferred to high volume centres rather than being performed in low volume centres (those with less than 40 cases per year), peri-operative fatalities would probably be reduced by no more than eight cases per year province wide.[97]

Case-fatality rates for ruptured AAA surgery were found to be closely related to the age of the patient, with the more elderly having particularly poor outcomes. Indeed, the age-related gradient in case-fatality rates for elective surgery was much smaller than for emergency surgery.[97] The obvious implication is that a more aggressive approach to asymptomatic aneurysmal disease in the elderly may be warranted. Further research is needed to understand why the rates of AAA repair have reached a plateau and to determine indication profiles for this potentially lifesaving and perhaps underused procedure.

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Procedures for Peripheral Vascular Disease

Overview

Peripheral vascular disease (PVD) predominantly affects the lower extremities. As the arteries narrow from atherosclerosis, insufficient blood supply leads to predictable changes that may ultimately lead to limb loss. Cigarette smoking plays a pivotal role in the pathogenesis of occlusive arterial diseases of the lower limb. Cessation of smoking, control of blood pressure and cholesterol, and regular exercise allow most patients with symptomatic peripheral vascular disease to avoid an operation.[98]

Results of the Swedish Ticlopidine Multicentre Study (STIMS)[99] suggested that male sex and previous peripheral artery surgery were strong predictors of the need for vascular surgery. STIMS also showed that in patients with intermittent claudication, the long-term use of the antiplatelet drug ticlopidine reduced the need for vascular reconstructive surgery by about half.

Analysis of PVD

Methods

The method of analysis for PVD followed the general approach outlined previously. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in PVD

In Ontario, the rate of PVD surgery showed a steady decline from 39.5 per 100,000 adults in 1989/90 to 32.1 per 100,000 in 1994/95, representing an 18.7% relative decrease (Exhibits 5.34 and 5.35). In all age groups, the rate is two to three times higher in men than in women. The biggest decline occurred among those 50 to 64 years of age, in whom the rate fell 21.2% from 1989/90 to 1994/95.

Geographic Variations in PVD

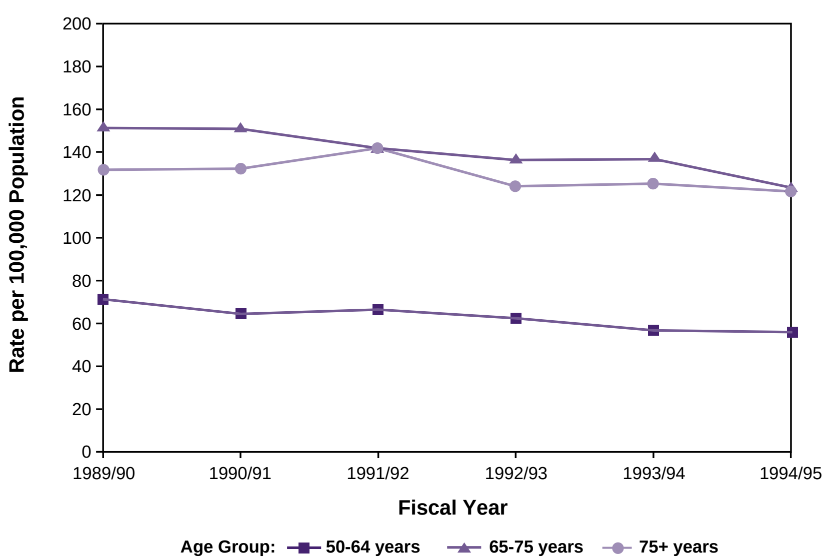
The variability in rates was minor and relatively consistent over time. Exhibits 5.36 and 5.37 show detailed data specific to DHCs. In 1989/90 to 1991/92, Cochrane had the highest rate of PVD surgery (78.3 per 100,000)

Exhibit 5.34: ***Overall and Age/Sex-specific Peripheral Vascular Surgery Rates per 100,000 Population 20 Years and Over in Ontario, 1989/90 - 1994/95***

Fiscal Year	Overall Rate	Women by Age Group					Men by Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1989/90	39.5	0.5	6.5	41.6	90.8	85.1	1.2	14.5	102.7	227.1	214.0
1990/91	37.8	0.9	5.9	36.5	89.8	93.6	1.3	12.0	94.4	226.9	199.8
1991/92	38.0	0.5	6.4	44.0	87.8	88.9	1.7	11.5	91.1	209.9	233.9
1992/93	35.0	0.8	4.3	39.3	82.2	82.3	1.2	10.2	87.5	203.3	197.0
1993/94	34.1	0.7	4.5	31.9	93.7	86.6	1.3	10.4	83.2	190.5	192.7
1994/95	32.1	0.5	4.1	34.6	76.2	78.0	1.0	9.1	78.9	181.2	198.5

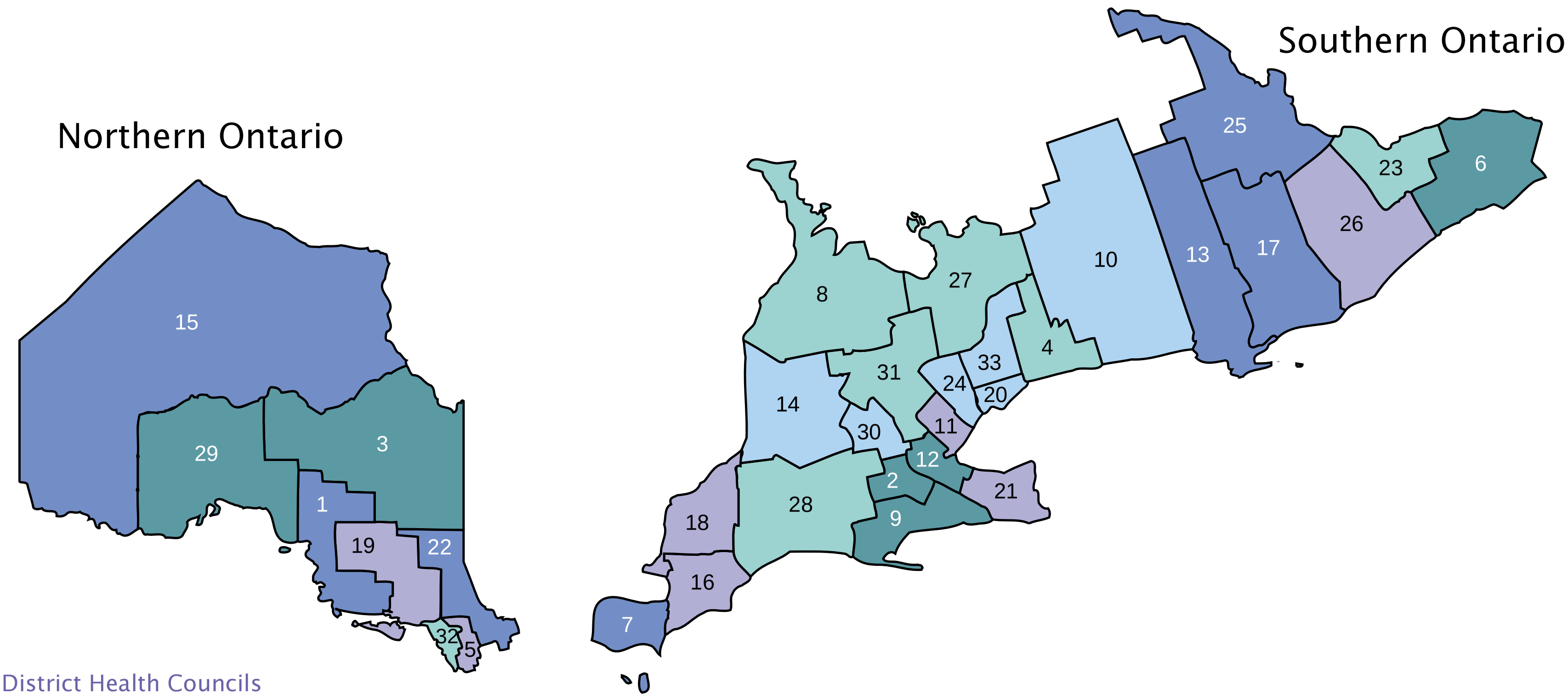
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.35: ***Age-specific Peripheral Vascular Surgery Rates per 100,000 Population 50 Years and Over in Ontario, 1989/90 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age/Sex-adjusted Peripheral Vascular Surgery Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

- 49.1 to 57.4
- 42.5 to 46.6
- 35.1 to 40.8
- 29.4 to 33.4
- 20.3 to 29.0

Exhibit 5.36

Exhibit 5.37: *Age/Sex-adjusted Peripheral Vascular Surgery Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92 Age/Sex-adjusted Rate per 100,000	1989/90 - 1991/92 Rank	1992/93 - 1994/95 Number of Procedures/Year	1992/93 - 1994/95 Age/Sex-adjusted Rate per 100,000	1992/93 - 1994/95 Rank	p-value	1994/95 Number of Procedures	1994/95 Age/Sex-adjusted Rate per 100,000
Algoma	56.5	5	46	45.6	8		37	37.2
Brant	67.5	3	54	57.4	1	++	48	50.6
Cochrane	78.3	1	33	50.4	5	*	28	43.2
Durham Region	39.1	19	84	32.3	23		75	28.0
East Muskoka-Parry Sound	45.7	12	23	35.6	18		21	32.4
Eastern Ontario	55.3	6	71	49.1	6	**	63	43.5
Essex County	49.1	10	114	42.5	13	*	119	44.4
Grey-Bruce	36.3	21	41	29.4	27		36	25.0
Haldimand-Norfolk	44.0	13	43	50.7	4	**	44	53.5
Haliburton, Kawartha & Pine Ridge	35.7	22	69	25.3	30	*	75	27.2
Halton	33.6	26	82	35.6	19		88	37.8
Hamilton-Wentworth	50.0	9	202	53.2	3	++	200	52.0
Hastings & Prince Edward Counties	34.9	23	57	43.7	12		59	42.7
Huron/Perth	23.2	32	29	24.4	31		28	23.3
Kenora-Rainy River	47.1	11	27	43.7	11		32	50.0
Kent County	33.2	27	37	40.8	14		35	37.6
Kingston, Frontenac and Lennox & Addington	42.7	15	61	44.0	10	*	47	32.0
Lambton	53.1	7	39	36.3	17		38	35.6
Manitoulin-Sudbury	43.0	14	58	37.9	15		66	42.9
Metropolitan Toronto:	33.8	24	554	28.7	29	++	485	24.2
Borough of East York	36.9		30	29.8			21	18.8
City of Etobicoke	32.0		85	29.5			68	22.4
City of North York	28.9		123	23.9			105	19.6
City of Scarborough	39.2		120	31.2			125	31.1
City of Toronto	36.7		161	31.5			147	28.0
City of York	28.4		35	28.3			19	14.7
Niagara	40.7	18	133	37.7	16		139	39.1
Nipissing/Timiskaming	51.6	8	46	46.6	7	*	52	52.9
Ottawa-Carleton Regional:	33.8	25	154	31.2	24		151	29.9
City of Ottawa	37.0		100	32.6			100	31.6
Ottawa, Eastern Region	30.1		21	30.3			26	34.0
Ottawa, Western Region	29.5		33	30.4			25	21.6
Peel:	31.9	29	94	22.5	32	++	95	21.6
City of Brampton	32.5		35	25.2			38	23.9
City of Mississauga	31.5		59	21.2			57	20.3
Renfrew County	41.6	17	36	44.1	9		41	50.2
Rideau Valley	33.0	28	47	35.1	20		43	31.6
Simcoe County	42.4	16	82	33.4	21		80	32.3
Thames Valley	37.6	20	144	33.0	22		141	31.8
Thunder Bay	77.6	2	66	53.4	2	++	65	52.4
Waterloo Region	30.5	30	78	29.0	28		90	32.6
Wellington-Dufferin	29.1	31	45	30.1	26		47	31.0
West Muskoka-Parry Sound	58.3	4	6	30.9	25		5	23.6
York Region	23.2	33	61	20.3	33	++	66	21.7
Total Ontario	38.4		2,714	33.8			2,639	32.2
Coefficient of Variation (%) [CV]	26.5			26.5				
Extremal Quotient [EQ]	3.4			2.8			Spearman Correlation	R=0.759 (p<0.0001)
Systematic Component of Variation [SCV]	111.1			69.6				
Adjusted Chi-square (likelihood ratio)	185.6 (d.f. 32, p<0.0001)			183.2 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

and York Region the lowest (23.2 per 100,000), a high–low rate ratio of 3.4. In 1992/93 to 1994/95, Brant had the highest rate of PVD surgery (57.4 per 100,000) and York Region remained the lowest (20.3 per 100,000), a high–low rate ratio of 2.8. The rankings of DHCs were relatively consistent. In general, DHCs with high rates remained high and DHCs with low rates remained low. The Spearman rank correlation coefficient indicated a 76% correspondence between the ranks in the two periods studied.

Comment

Most patients with intermittent claudication can avoid an interventional revascularization procedure (either surgery or transluminal dilatation) through cessation of smoking; control of blood pressure, serum cholesterol and diabetes; and a regular exercise regime. Since the mid-1980s, physicians have adopted a "secondary prevention" approach (e.g., recommending exercise) to reduce the need for vascular surgery. In the same period, there has been a steady decline in the use of PVD procedures. Although there has been a rapid increase in the number of new technologies with a potential role in the treatment of symptomatic peripheral vascular disease (e.g., stenting and atherectomy devices),[100-102] appropriate use of secondary prevention will limit the impact of these novel techniques. As a result, the present rate of interventions is expected to stabilize and decrease further.

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Coronary Artery Bypass Grafting

Overview

No surgical procedure has been as closely studied as coronary artery bypass grafting (CABG). More than 20 randomized trials have compared CABG to drug therapy in both stable and unstable coronary disease. Compared with drug therapy, CABG provides superior symptom relief and increases long-term survival for some patients. Groups with the greatest survival benefit are those with left ventricular dysfunction and patterns of coronary stenosis that further jeopardize pump function, e.g., left main-stem disease, triple vessel disease or more limited disease with proximal left anterior descending artery involvement.[103]

A new generation of trials is addressing the role of percutaneous transluminal coronary angioplasty (PTCA) in relation to CABG.[104-108] Short-term results suggest a small mortality and major morbidity advantage with PTCA, with shorter hospital stays and reduced costs. However, chest pain symptoms are not as well relieved with PTCA, and patients incur the morbidity of repeated PTCA for restenosis. Intracoronary stents, as an adjunct to PTCA, may reduce restenosis rates and render multivessel PTCA safer and more feasible, but the expense of stents reduces the short-term cost savings of PTCA over CABG. Costs of CABG, too, are in transition, with widespread adoption of early extubation and five day stays for uncomplicated cases. Intriguingly, there has even been exploration of "keyhole" coronary surgery using laparoscopic techniques. These procedures, known as left anterior small thoracotomy (LAST) operations, involve selective coronary revascularization using the internal thoracic artery without cardio-pulmonary bypass. Such techniques require fewer physical and human resources and dramatically lower length of hospital stay. For all of these reasons, this area will be one of technological ferment and debate over the next several years.

CABG remains the cornerstone of treatment for persons with complex stenoses or disease involving multiple arteries. As noted in the first edition, CABG is an unusual surgical service in two respects. First, the Ontario Ministry of Health exerts considerable control over the provision of CABG through annual hospital budgetary allocations and centralized approval processes, thereby confining cardiac surgery to regional referral centres. In contrast to most other services, this mechanism permits rate variations to be addressed in part through funding adjustments. Second, provider input into decision-making is provided consistently and systematically through a well-established advisory group, the Provincial Adult Cardiac Care Network, now known as the Cardiac Care Network (CCN).

Previous analyses by ICES, including those in the first edition,[109,110] showed marked interarea rate variations in the provision of CABG. We revisit this situation here, and, in the Comment section, report on the concrete action that has been taken to reduce rate variations.

Analysis of CABG

Methods

The analysis for CABG closely followed the general approach outlined previously. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in CABG

The overall provincial rate was 50 per 100,000 adults in 1981/82 (as reflected in the first Atlas) and rose slightly over the intervening five years. Exhibits 5.38 and 5.39 show trends for the decade between 1985/86 and 1994/95; the overall provincial rate rose from 57.4 per 100,000 adults to 79.9 per 100,000. There was negligible use of CABG among people 34 years of age and younger. There was no growth in utilization among women 35 to 64 years of age, a definite decrease in CABG among men 35 to 49 years of age, and a very modest increase in CABG among men 50 to 64 years of age. Growth in utilization affected mainly men and women 65 years of age and older.

Exhibit 5.38: ***Overall and Age/Sex-specific Coronary Artery Bypass Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 - 1994/95***

Fiscal Year	Overall Rate	Women by Age Group					Men by Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1985/86	57.4	0.6	9.9	61.0	79.8	18.2	1.1	60.5	260.2	250.3	57.1
1986/87	66.5	0.5	7.6	66.6	95.9	24.4	1.4	64.6	285.9	347.5	89.8
1987/88	59.9	0.3	7.5	52.3	93.2	23.5	1.2	56.9	258.1	324.6	74.1
1988/89	59.7	0.3	7.1	52.2	89.5	18.3	1.6	52.7	264.9	324.5	80.9
1989/90	66.0	0.5	8.6	53.7	116.8	24.0	1.4	53.0	283.7	375.1	99.3
1990/91	69.0	0.3	6.9	58.4	124.4	28.0	1.2	50.6	288.5	418.0	115.2
1991/92	72.0	0.3	7.7	61.7	135.5	41.8	1.3	50.4	288.9	435.8	143.1
1992/93	74.7	0.4	7.6	67.7	138.9	45.5	1.1	51.4	296.6	452.7	155.0
1993/94	75.3	0.6	7.3	60.8	140.5	50.4	1.2	48.5	294.1	471.5	190.0
1994/95	79.9	0.2	7.3	65.8	159.2	58.1	1.2	46.1	303.1	517.3	214.1

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Geographic Variations in CABG

Exhibit 5.40 maps DHC rates for the most recent fiscal years (1992/93 to 1994/95), showing clusters of higher rate DHCs around three referral centres — Sudbury, Ottawa and Kingston. Lower rates are found in the environs of three other referral centres offering CABG services — Hamilton, London and Toronto. These patterns, and their consistency with the 1989/90 to 1991/92 DHC profiles, are also shown in Exhibit 5.41, which provides a list of rates by DHC. A Spearman rank correlation coefficient of 0.88 ($p < 0.0001$) emphasizes the lack of change between the two periods examined.

Use of DHCs as the boundaries for geographic analysis dramatically reduced the extremal quotient when compared to that derived from the county-level analysis in the first edition of the *Practice Atlas*. For both 1989/90 to 1991/92 and 1992/93 to 1994/95, the ratio of highest-to-lowest DHC rates was about three. However, marked overall variation is evident in both periods. DHCs with significantly high or low rates are flagged in Exhibit 5.41. When 1994/95 is examined in isolation, there are no obvious shifts. This is the year after evidence of these variations was widely available.

Comment

This study confirms that the inter-DHC differences in CABG utilization that have been evident for more than a decade persisted into 1994/95. Thus, the expansion of CABG caseload from 1991/92 to 1994/95 simply reinforced existing interDHC differences in utilization. Overall CABG rates in Ontario, at about 80 per 100,000 adults in 1994/95, are similar to those in some European nations, much higher than those in New Zealand or the United Kingdom, but dramatically lower than those in the USA.[111] Several lines of evidence were accordingly used to address the question: Which rate is right?

First, three studies have compared Canadian and US practice patterns after acute myocardial infarction, focusing on use of revascularization (i.e., CABG and PTCA).[112-114] All studies showed two to three times as many CABG and PTCA procedures in US patients. Although Mark and associates[112] noted minimal differences in overall self-rated health status and similar rates of return to work for Canadian and US patients,[112] all three studies found that Canadians had a higher frequency of ongoing angina,[112-114] two showed poorer functional status for Canadians,[112,114] and one showed adverse consequences for Canadians on a variety of measures of health-related quality of life.[112]

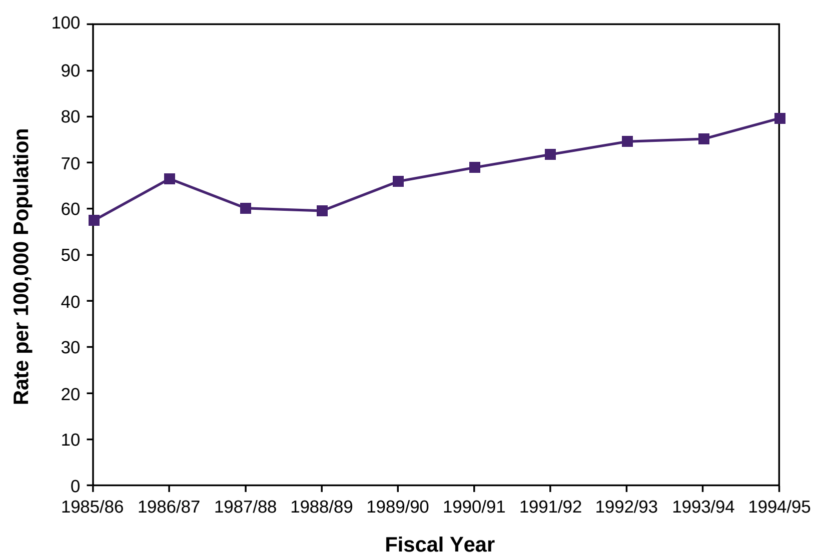
Second, in 1995 there was marked growth in the waiting lists for CABG (and other open heart surgery) at virtually all Ontario centres; this followed a period of stable waiting lists that had lasted more than three years.

Third, the trend data show a shift away from CABG for patients younger than 65; this is a PTCA substitution effect. However, unless evidence rapidly accrues to support stenting and multivessel PTCA, CABG will continue to be the primary revascularization method for Ontario's growing population of elderly people with coronary disease.

Fourth, ICES has collaborated with US researchers to compare utilization of CABG in New York State with that in Ontario and British Columbia.[115] The CABG rate in New York was then (and remains) about 40% higher than that in Ontario. There is close management of cardiac surgery in New York through certificate-of-need programs and practice profiling.[116] On the basis of explicit audit criteria,[117,118] more than 5% of audited cases were deemed inappropriate in New York State and in the two Canadian provinces noted above.[115] This leads logically to some concerns about underservicing in Ontario. New York's higher rate is partly accounted for by a much larger number of operations on patients over 75 who have limited coronary disease — a pattern that, in our view, should not be emulated in Canada. However, some of the difference is also attributable to higher rates of surgery in New York on younger patients with extensive coronary disease. This again suggests that the rates of CABG utilization in Ontario might be usefully increased.

Fifth, the CCN has run a provincial registry of all open-heart surgery cases in Ontario since 1991. Working closely

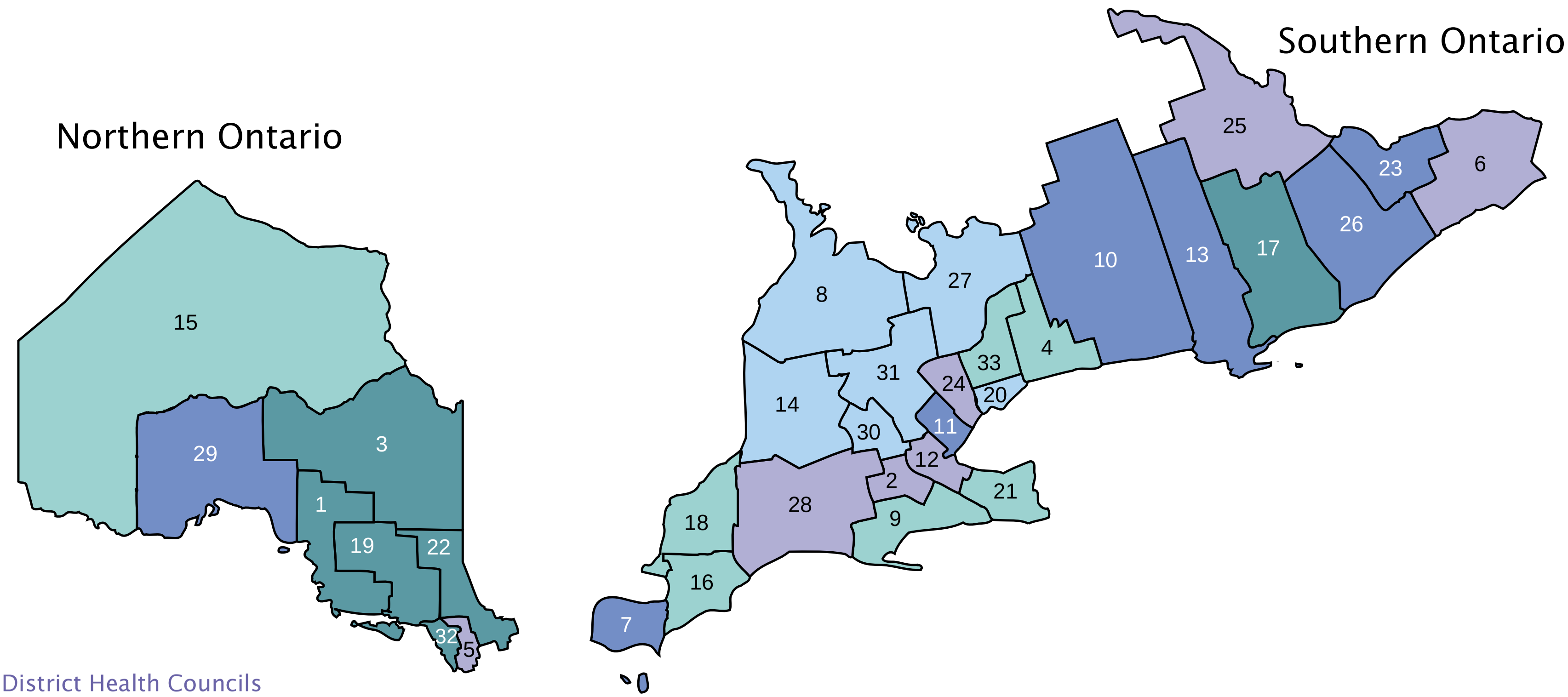
Exhibit 5.39: ***Overall Age/Sex-adjusted Coronary Artery Bypass Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.40

Age/Sex-adjusted Coronary Artery Bypass Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

	107.3 to 150.6
	83.1 to 104.3
	74.6 to 82.8
	67.2 to 74.3
	48.6 to 65.6

Exhibit 5.41: *Age/Sex-adjusted Coronary Artery Bypass Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 100,000
Algoma	99.8	6	108	107.3	6	**	126	125.5
Brant	65.7	19	68	74.6	20		76	82.2
Cochrane	117.6	3	83	124.8	3	✣✣	63	94.9
Durham Region	59.3	25	194	70.3	24		219	79.4
East Muskoka-Parry Sound	65.0	20	49	75.5	19		54	82.5
Eastern Ontario	71.5	14	115	82.0	16		129	91.9
Essex County	48.8	31	218	83.1	13		240	90.5
Grey-Bruce	63.9	21	76	58.7	31	**	65	48.6
Haldimand-Norfolk	57.9	27	56	70.5	23		59	74.3
Haliburton, Kawartha & Pine Ridge	87.3	9	233	91.2	11	*	234	89.1
Halton	82.4	10	217	92.2	10	*	218	91.7
Hamilton-Wentworth	70.6	16	302	81.2	17		308	81.8
Hastings & Prince Edward Counties	92.0	8	118	96.3	8	*	136	109.6
Huron/Perth	58.9	26	66	61.1	30	*	56	51.9
Kenora-Rainy River	52.4	30	44	71.4	22		40	62.5
Kent County	62.3	23	59	68.8	26		62	70.8
Kingston, Frontenac and Lennox & Addington	100.1	5	160	117.5	4	✣✣	164	119.3
Lambton	68.1	17	78	74.3	21		81	75.5
Manitoulin-Sudbury	159.5	1	232	150.6	1	✣✣	228	148.1
Metropolitan Toronto:	60.9	24	1,242	65.6	28	✣✣	1,385	70.6
Borough of East York	68.6		63	69.2			71	75.9
City of Etobicoke	58.6		183	64.3			192	65.0
City of North York	68.4		339	68.6			384	75.0
City of Scarborough	68.2		317	80.5			370	91.1
City of Toronto	51.5		283	56.0			300	57.4
City of York	51.7		57	47.4			68	55.2
Niagara	63.4	22	229	67.2	27	*	224	65.1
Nipissing/Timiskaming	104.2	4	108	110.3	5	✣✣	106	108.8
Ottawa-Carleton Regional:	77.2	11	449	89.4	12	**	478	94.0
City of Ottawa	72.4		263	88.2			275	90.2
Ottawa, Eastern Region	75.5		77	92.9			85	101.6
Ottawa, Western Region	88.1		109	90.5			118	100.5
Peel:	68.0	18	387	82.5	15		425	91.0
City of Brampton	58.8		132	80.5			132	82.1
City of Mississauga	72.5		255	83.6			293	95.8
Renfrew County	73.1	12	67	82.8	14		85	104.3
Rideau Valley	95.5	7	121	95.9	9	*	127	97.0
Simcoe County	55.4	29	155	64.9	29	*	169	69.9
Thames Valley	72.3	13	326	77.4	18		352	82.1
Thunder Bay	71.2	15	129	104.3	7	✣✣	114	91.5
Waterloo Region	44.4	33	133	48.6	33	✣✣	160	58.2
Wellington-Dufferin	44.9	32	81	54.9	32	**	86	57.4
West Muskoka-Parry Sound	136.9	2	25	132.0	2	*	24	122.6
York Region	57.1	28	233	69.2	25		262	78.8
Total Ontario	68.8		6,161	77.3			6,554	81.0
Coefficient of Variation (%) [CV]	27.1			23.1				
Extremal Quotient [EQ]	3.6			3.1			Spearman Correlation	R=0.880 (p<0.0001)
Systematic Component of Variation [SCV]	128.9			78.6				
Adjusted Chi-square (likelihood ratio)	331.5 (d.f. 32, p<0.0001)			303.7 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✣✣ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

with the CCN, ICES analysts have developed a population-based plan for increasing the rate of CABG in Ontario by about 20% over the next two to three years. This will address the foregoing concerns and reduce waiting lists. The CCN/ICES plan will also preferentially allocate CABG caseload to regions now below the provincial average CABG rate, thereby reducing the longstanding rate variations noted above. The plan has been approved, and about $16 million in incremental funding has been committed by the Ministry of Health for implementation. Parallel planning processes for expanding coronary angiography are under way.

CABG in Ontario serves as a case study of what can be done to benchmark overall utilization and address inter-area rate variations. The template is not immediately generalizable to all procedures: CABG services are being expanded within a strictly regionalized program with the use of targeted funding outside of global budgets. Nonetheless, CABG is an example of how small area variations can serve as a screening test that catalyzes a more detailed research agenda, which leads in turn to appropriate action in the health care system.

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Common Conditions Considered Sensitive to Ambulatory Care

Overview

A growing body of research in the United States has used hospital admission rates for various medical conditions as a marker of access to appropriate primary care.[119-121] The rationale for this approach is that, for specific conditions, there is evidence that effective primary care interventions can delay disease progression or prevent life-threatening complications, thereby reducing the need for hospitalization. These conditions are called "ambulatory care sensitive" conditions and hospital admissions for them are referred to as "preventable hospitalizations".

Asthma is an example of an ambulatory care sensitive condition, since there is good evidence that proper ambulatory care can reduce the number of asthma attacks and can improve symptoms and functional status. Access to appropriate ambulatory care should therefore mean less reliance on hospital care for the treatment of this condition.

Studies in the United States have shown that there is a strong relationship between low income and higher separation rates for ambulatory care sensitive conditions.[119,120] Although at least part of this relationship may be due to a higher prevalence of ambulatory care sensitive conditions in the poor, the relationship has been taken as a clear indication of barriers to appropriate ambulatory care resulting from the lack of universal health insurance in the United States. Along with the relationship to income in the United States, preventable hospitalizations have been shown to be related to the supply of primary care physicians: the lower the number of primary care physicians, the higher the rate of preventable hospitalizations.

To date, no studies of preventable hospitalizations in Canada have appeared in the peer reviewed literature. Although research shows that our universal health care system has reduced income-related differences in the use of services,[122] we still know little about specific aspects of services received by different income groups. Also, although there is great interest in physician-supply issues in Canada, we do not know a great deal about the impact of the level of supply of primary care physicians. As a first step in using preventable hospitalizations to examine these issues, we examine trends in separation rates for these conditions over time and among regions.

Analysis of Ambulatory Care Sensitive Conditions

Data Source and Methods

Two groups in the United States have developed a list of ambulatory care sensitive conditions and have studied patterns of preventable hospitalizations. They both used expert panels to define ambulatory care sensitive conditions, and the two panels identified overlapping but not identical lists of conditions.[119,120] Our analysis of preventable hospitalizations in Ontario is limited to two conditions that both groups agree are sensitive to ambulatory care: asthma (ICD-9 code 493) and congestive heart failure (ICD-9 code 428). The analysis is based on Canadian Institute for Health Information (CIHI) hospital separation data for 1985/86 through 1994/95. Separations were included in the analysis only if the primary diagnosis was either asthma or congestive heart failure. Diagnostic codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in Ambulatory Care Sensitive Conditions

Congestive heart failure was the more common of the two ambulatory care sensitive conditions studied. Separation rates for congestive heart failure increased from 263 per 100,000 adults in 1985/86 to 298 per 100,000 adults in 1994/95 (Exhibit 5.42). The separation rate was higher for men than for women in all age groups and increased rapidly with age. Separation rates for congestive heart failure among people 70 years of age and older are about four times higher than among those aged 60 to 69.

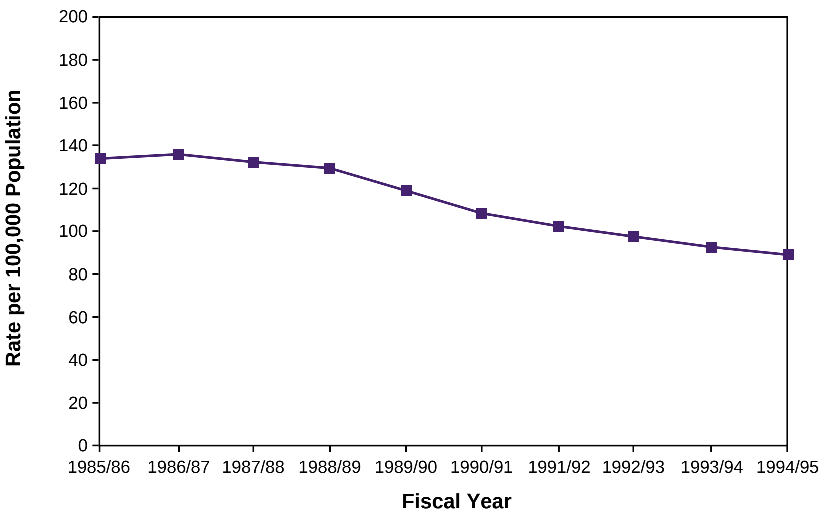
Separation rates for asthma have decreased steadily from 135 per 100,000 adults in 1985/86 to 93 per 100,000 adults in 1994/95 (Exhibit 5.43). In 1994/95, separation rates were about twice as high in women than men (Exhibit 5.44). Separation rates increased with age, but not as rapidly

Exhibit 5.42: ***Overall and Age/Sex-specific Congestive Heart Failure Hospitalization Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 - 1994/95***

Fiscal Year	Overall Rate	Women by Age Group					Men by Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1985/86	262.5	0.9	11.7	128.5	624.5	2,181.3	3.0	17.7	192.4	778.0	2,344.7
1986/87	259.9	1.3	10.8	130.3	581.2	2,209.1	1.4	25.8	268.1	930.3	2,599.6
1987/88	269.4	1.4	9.4	143.1	582.3	2,264.2	3.4	21.0	258.4	1,021.3	2,755.7
1988/89	271.0	2.0	9.8	133.6	605.4	2,327.4	2.6	18.2	259.7	1,016.0	2,727.2
1989/90	266.7	1.0	9.1	140.1	597.9	2,232.8	3.0	20.8	257.6	950.2	2,814.6
1990/91	270.7	1.8	11.8	133.7	612.6	2,304.2	3.4	21.6	259.0	954.7	2,813.1
1991/92	298.1	1.9	13.5	158.5	670.2	2,512.6	4.4	29.4	278.6	1,108.3	2,979.9
1992/93	305.5	1.0	16.1	157.0	657.7	2,538.7	3.2	24.1	288.6	1,141.7	3,222.7
1993/94	310.8	2.5	13.5	167.2	713.8	2,584.2	3.8	28.6	290.9	1,148.4	3,157.6
1994/95	297.6	2.4	11.8	156.3	673.8	2,465.2	4.0	25.6	273.4	1,148.8	3,020.2

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.43: ***Overall Age/Sex-adjusted Asthma Hospitalization Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86–1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

as rates for congestive heart failure. Clinically, asthma is uncommon in the elderly; separations for asthma in this age group may, in fact, be for other respiratory conditions.

Geographic Variations in Ambulatory Care Sensitive Conditions

There is extensive variation in separation rates for congestive heart failure (Exhibits 5.45 and 5.46). The measures of variation were very similar in the two time periods, and the ranking of rates among DHCs was very stable over time (Spearman rank correlation coefficient 0.825, $p < 0.0001$). The two DHCs with the highest rates (Renfrew County and Cochrane) had age/sex-adjusted separation rates greater than 400 per 100,000 adults; these rates were 60% to 70% higher than those in the DHCs with the lowest rates (Ottawa–Carleton and Kingston, Frontenac and Lennox & Addington).

There was even more extensive variation in asthma separation rates among the DHCs (Exhibits 5.47 and 5.48). In the period 1992/93 through 1994/95, the two DHCs with the highest rates (Renfrew County and Cochrane) had separation rates about three times higher than those found in the two DHCs with the lowest rates (Hamilton-Wentworth and Ottawa-Carleton Regional). The relative rates among DHCs were quite stable between the two time periods, with a Spearman rank correlation coefficient of 0.86 ($p < 0.0001$).

Although congestive heart failure and asthma have different causes and different epidemiological characteristics, separation rates for both these conditions are presumed to reflect, at least in part, access to primary care. The rank order of separation rates for these two conditions are highly correlated among DHCs, with a Spearman rank correlation coefficient of 0.75 ($p < 0.001$) in the 1992/93 to 1994/95 period.

Comment

The analysis shows significant variation in separation rates for these two common ambulatory care sensitive conditions among DHCs. Moreover, there is a strong correlation between a DHC's ranking of separation rates for asthma and for congestive heart failure. This suggests that there are some important differences in the rates of preventable hospitalizations among DHCs, and it raises questions regarding the factors explaining these differences.

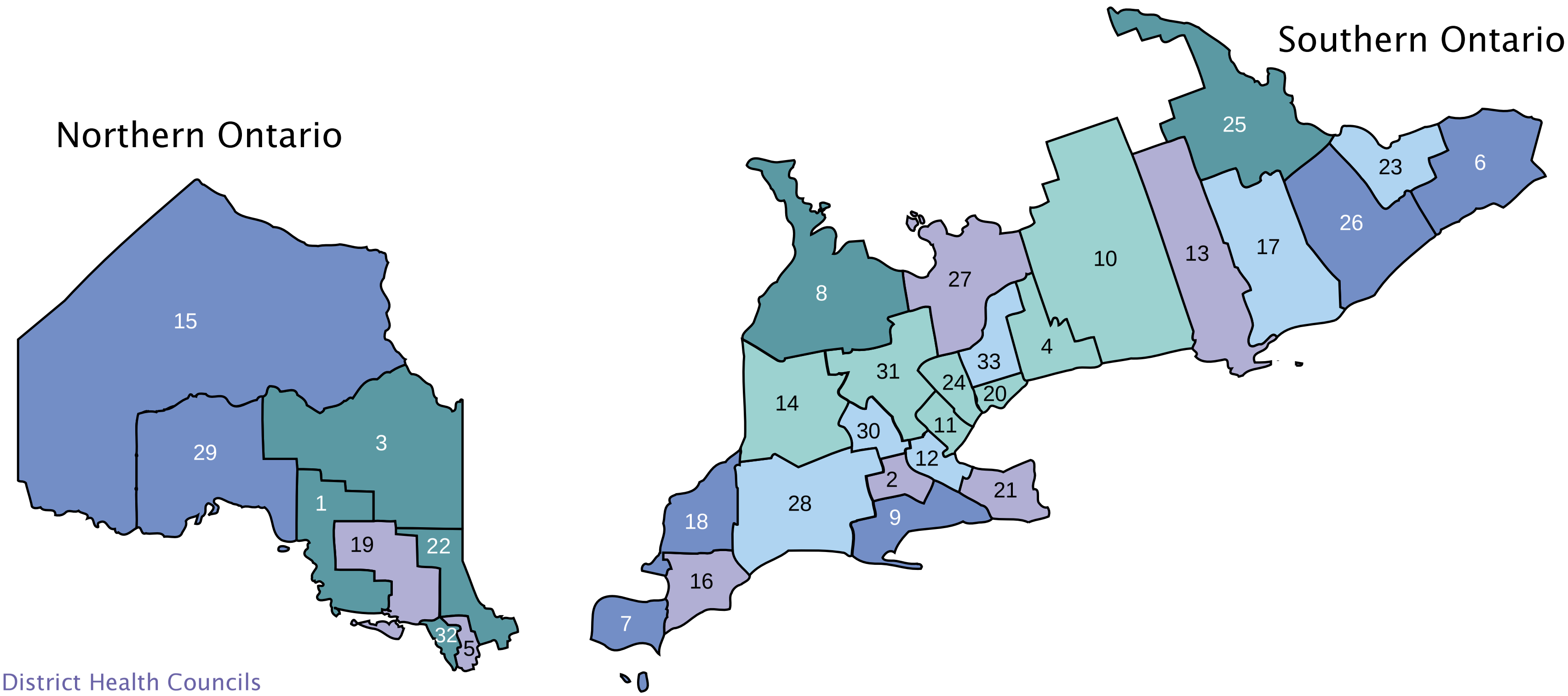
There are much higher separation rates for these two ambulatory care sensitive conditions in DHCs such as Renfrew County, Cochrane, Nipissing/Timiskaming and Kenora–Rainy River than in DHCs such as Ottawa-Carleton, Kingston, Frontenac and Lennox & Addington, and Hamilton-Wentworth. Although many of the high-rate DHCs are in the north, some are not. The common feature shared by high-rate DHCs is that they are primarily rural. What is it about these rural areas that results in higher separation rates? Without more detailed analysis, it is impossible to answer this question

Exhibit 5.44: ***Overall and Age/Sex-specific Asthma Hospitalization Rates per 100,000 Population 20 Years and Over in Ontario, 1985/86 - 1994/95***

Fiscal Year		Women by Age Group					Men by Age Group				
	Overall Rate	20 - 34	35 - 49	50 - 64	65 - 74	75+	20 - 34	35 - 49	50 - 64	65 - 74	75+
1985/86	135.4	126.3	139.0	207.7	272.5	269.4	56.1	61.6	140.4	239.2	235.0
1986/87	136.7	128.5	149.9	193.7	290.6	275.0	56.9	62.5	140.5	214.6	242.3
1987/88	133.6	136.3	137.8	196.1	282.9	261.3	60.3	54.1	133.9	211.8	217.6
1988/89	131.5	135.9	139.8	200.3	266.5	279.7	58.0	55.5	124.5	175.7	216.9
1989/90	121.0	119.4	131.4	183.1	259.3	283.2	49.7	49.6	110.9	171.1	189.4
1990/91	111.7	115.7	121.1	178.4	234.0	234.9	49.5	41.4	92.9	160.8	186.2
1991/92	106.4	106.9	111.0	171.9	209.3	267.6	45.8	41.6	90.6	145.3	181.7
1992/93	101.6	108.7	111.0	152.2	207.5	249.3	44.0	36.1	85.1	127.0	181.0
1993/94	97.4	108.0	102.1	154.3	205.3	234.5	39.8	36.7	71.1	115.4	187.9
1994/95	93.4	104.7	107.6	146.8	192.8	217.4	36.1	34.2	69.3	111.5	153.7

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age/Sex-adjusted Congestive Heart Failure Hospitalization Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

- 398.5 to 456.7
- 346.5 to 376.3
- 323.6 to 345.6
- 271.0 to 323.4
- 240.8 to 265.9

Exhibit 5.45

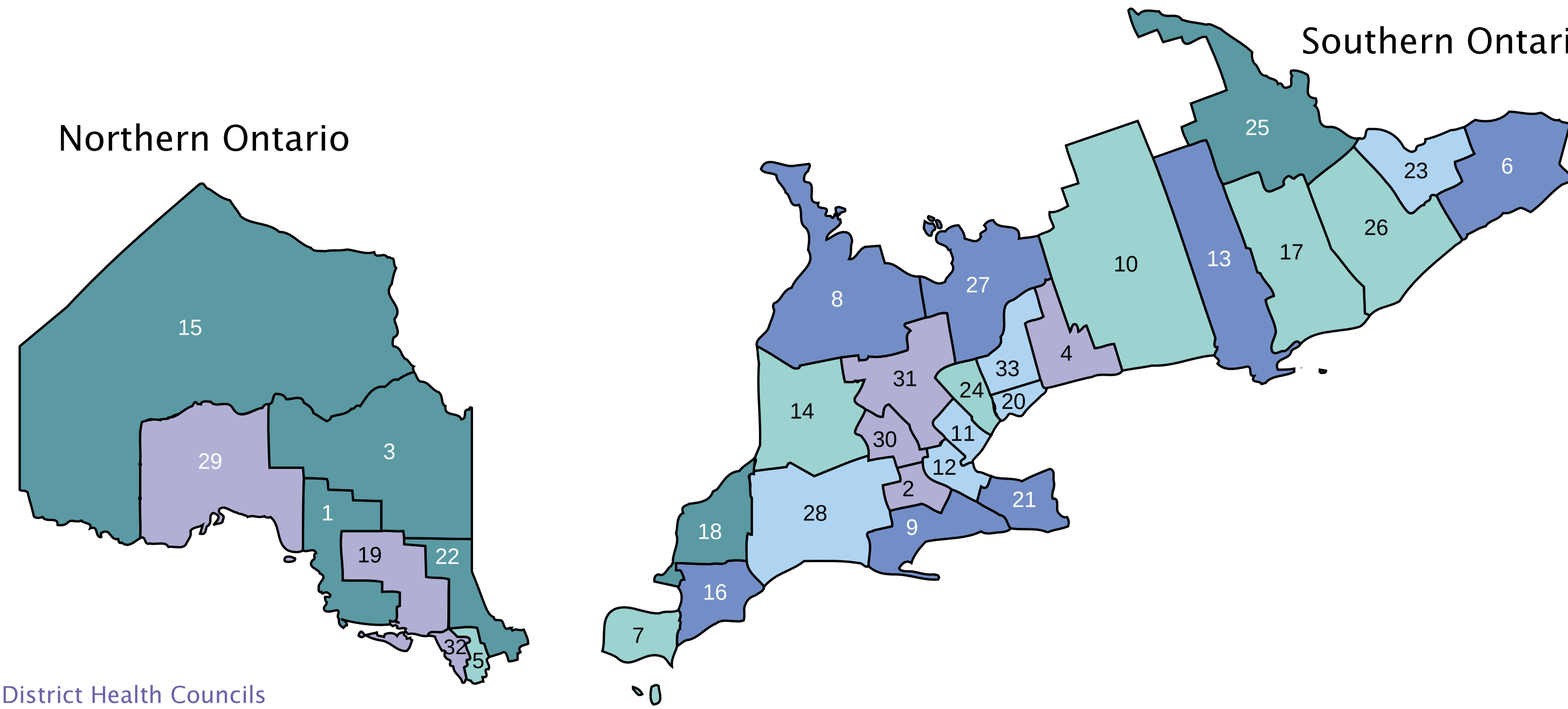
Exhibit 5.46: *Age/Sex-adjusted Congestive Heart Failure Hospitalization Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Hospitalizations/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Hospitalizations	Age/Sex-adjusted Rate per 100,000
Algoma	341.9	9	401	398.5	6	++	383	378.9
Brant	350.5	6	335	331.3	19		323	313.5
Cochrane	466.4	1	279	456.7	1	++	270	437.0
Durham Region	262.2	24	793	323.4	21		812	322.6
East Muskoka-Parry Sound	332.0	12	236	331.6	18		242	331.2
Eastern Ontario	337.4	10	524	346.5	13	**	482	312.3
Essex County	319.4	15	1,050	376.1	8	++	1,075	378.0
Grey-Bruce	380.4	3	656	428.2	4	++	652	409.4
Haldimand-Norfolk	344.5	8	325	371.6	11	++	381	428.2
Haliburton, Kawartha & Pine Ridge	261.4	25	885	296.1	24		944	309.9
Halton	231.3	33	609	275.9	25	*	642	284.5
Hamilton-Wentworth	250.0	28	1,064	265.4	29	++	1,092	264.5
Hastings & Prince Edward Counties	318.4	16	464	336.1	17		470	337.5
Huron/Perth	284.0	21	412	312.5	22		387	285.4
Kenora-Rainy River	349.8	7	230	372.0	10	**	251	396.1
Kent County	302.2	19	342	345.6	14	*	329	332.2
Kingston, Frontenac and Lennox & Addington	253.7	27	349	240.8	33	++	346	232.2
Lambton	323.8	14	419	376.0	9	++	393	348.6
Manitoulin-Sudbury	314.1	17	500	340.7	16	**	527	355.3
Metropolitan Toronto:	243.1	32	5,359	271.1	26	++	5,413	260.9
Borough of East York	258.0		318	279.2			325	271.6
City of Etobicoke	214.2		721	243.3			758	244.5
City of North York	245.4		1,490	281.0			1,483	267.3
City of Scarborough	262.3		991	265.8			1,008	258.1
City of Toronto	241.1		1,466	277.4			1,436	258.6
City of York	250.5		372	287.6			403	297.2
Niagara	333.6	11	1,242	323.6	20	*	1,257	320.9
Nipissing/Timiskaming	372.7	4	440	426.0	5	++	443	425.7
Ottawa-Carleton Regional:	247.7	31	1,236	247.6	32	++	1,130	220.5
City of Ottawa	254.6		156	268.3			149	251.6
Ottawa, Eastern Region	250.4		841	249.4			770	222.2
Ottawa, Western Region	254.3		240	253.6			211	215.5
Peel:	275.1	22	985	271.0	27	++	991	262.8
City of Brampton	276.4		344	285.5			295	235.8
City of Mississauga	274.6		641	263.9			696	276.2
Renfrew County	424.7	2	393	449.9	2	++	357	401.4
Rideau Valley	329.0	13	521	357.2	12	++	508	343.0
Simcoe County	311.1	18	871	341.4	15	++	848	322.8
Thames Valley	248.8	30	1,216	265.9	28	++	1,196	254.6
Thunder Bay	358.2	5	476	376.3	7	++	488	380.3
Waterloo Region	260.2	26	710	263.8	30	++	806	292.1
Wellington-Dufferin	285.2	20	463	306.2	23		454	293.6
West Muskoka-Parry Sound	273.9	23	97	443.0	3	**	91	416.2
York Region	249.6	29	717	258.4	31	++	714	253.1
Total Ontario	279.9		24,600	301.8			24,697	294.2
Coefficient of Variation (%) [CV]	16.3			16.6				
Extremal Quotient [EQ]	1.9			1.8			Spearman Correlation	R=0.825 (p<0.0001)
Systematic Component of Variation [SCV]	46.2			48.2				
Adjusted Chi-square (likelihood ratio)	553.4 (d.f. 32, p<0.0001)			666.1 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age/Sex-adjusted Asthma Hospitalization Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
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4. Durham Region
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7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

- 139.4 to 210.3
- 125.9 to 134.2
- 105.3 to 123.9
- 88.9 to 104.9
- 65.0 to 82.1

Exhibit 5.47

Exhibit 5.48: *Age/Sex-adjusted Asthma Hospitalization Rates per 100,000 Population 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 100,000	Rank	Number of Hospitalizations/Year	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of Hospitalizations	Age/Sex-adjusted Rate per 100,000
Algoma	192.8	3	145	150.6	5	++	122	128.3
Brant	131.7	18	111	123.9	14	*	138	151.3
Cochrane	225.0	2	119	180.5	2	++	130	196.5
Durham Region	115.4	23	340	113.2	16	**	324	106.4
East Muskoka-Parry Sound	131.5	19	52	98.1	25		48	91.9
Eastern Ontario	150.3	13	179	129.0	12	++	179	127.0
Essex County	126.2	21	253	98.6	24		242	93.9
Grey-Bruce	154.4	9	155	133.7	9	++	160	143.4
Haldimand-Norfolk	151.6	11	102	130.2	11	**	115	147.3
Haliburton, Kawartha & Pine Ridge	114.9	24	222	100.2	23		225	105.4
Halton	89.1	30	169	71.0	30	++	153	64.7
Hamilton-Wentworth	59.1	33	235	65.0	33	++	245	67.5
Hastings & Prince Edward Counties	150.4	12	143	125.9	13	**	138	120.1
Huron/Perth	154.2	10	101	102.8	22		100	102.3
Kenora-Rainy River	183.2	4	97	164.3	4	++	81	133.0
Kent County	156.3	7	114	134.1	8	++	120	143.4
Kingston, Frontenac and Lennox & Addington	111.3	27	122	92.8	26		124	93.1
Lambton	138.4	16	136	139.4	6	++	139	144.0
Manitoulin-Sudbury	111.4	26	163	107.1	19		162	106.3
Metropolitan Toronto:	89.4	28	1,548	82.1	28	++	1,489	75.9
Borough of East York	105.6		74	76.2			90	90.2
City of Etobicoke	76.2		203	74.7			200	70.7
City of North York	75.7		366	76.6			349	69.8
City of Scarborough	101.8		391	97.5			393	95.1
City of Toronto	93.7		435	84.0			387	71.7
City of York	103.3		79	67.4			70	57.6
Niagara	148.0	14	437	134.2	7	++	430	132.0
Nipissing/Timiskaming	182.5	5	160	168.4	3	++	161	170.0
Ottawa-Carleton Regional:	79.2	32	356	66.4	32	++	350	64.0
City of Ottawa	67.3		51	52.2			54	52.1
Ottawa, Eastern Region	82.9		204	68.0			186	61.8
Ottawa, Western Region	81.5		102	78.4			110	83.7
Peel:	113.9	25	460	88.9	27	*	460	86.3
City of Brampton	139.5		190	103.7			190	101.0
City of Mississauga	100.7		271	81.0			270	78.5
Renfrew County	264.1	1	157	210.3	1	++	141	189.2
Rideau Valley	138.8	15	124	104.9	21		91	77.1
Simcoe County	130.5	20	304	132.4	10	++	315	135.3
Thames Valley	89.4	29	338	80.2	29	++	299	70.8
Thunder Bay	156.1	8	133	111.1	18		124	104.2
Waterloo Region	158.8	6	320	113.1	17	**	301	106.0
Wellington-Dufferin	133.4	17	183	121.0	15	**	186	122.0
West Muskoka-Parry Sound	122.5	22	16	105.3	20		13	89.5
York Region	88.9	31	242	68.8	31	++	235	66.0
Total Ontario	112.8		7,736	97.3			7,540	93.4
Coefficient of Variation (%) [CV]	31.0			28.5				
Extremal Quotient [EQ]	4.5			3.2			Spearman Correlation	R=0.861 (p<0.0001)
Systematic Component of Variation [SCV]	171.5			143.4				
Adjusted Chi-square (likelihood ratio)	779.7 (d.f. 32, p<0.0001)			600.7 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

definitively. However, we may speculate about the causes of these urban–rural differences and suggest areas for further research.

Differences in separation rates for ambulatory care sensitive conditions could be the result of differences in the incidence of these conditions; however, it is highly implausible that the incidence of congestive heart failure or asthma would vary so much among DHCs. A more plausible hypothesis is that the different separation rates are related to patient management. Such variations in patient management, in turn, may reflect physician supply, community and institutional resources, barriers to care and practice styles. Physician supply is a particular focus for concern, given the geography of Ontario and the existence of medically underserviced areas. Physician supply can be measured as the ratio of the number of physicians who practise in the region to the population of the region (see Chapter 9). Measurement of physician supply is not without methodological challenges. Furthermore, at a theoretical level, it does not deal with the more central issue: the impact of physician supply on the quality of care and ultimately on health.

The finding that rural areas have higher separation rates for two common ambulatory care sensitive conditions is consistent with the notion that rural areas are underserviced and do not offer the same access to effective primary care as urban areas. Ambulatory specialist care may be a factor, since rural areas have a lower proportion of specialists than urban areas (see Chapter 9).

Along with physician supply, other resource factors could explain differences in separation rates for asthma and congestive heart failure. The ability to provide community-based care such as home nursing may be very different in urban and rural areas. On the other hand, there may be greater inpatient bed supply in rural areas than in urban ones. Although resource availability is an important issue, it should be remembered that, even in our universal health insurance system, there may still be socioeconomic barriers to appropriate ambulatory care. There are still large inequities in health status among income and educational groups in Canada.[123] The observed differences in separation rates for congestive heart failure and asthma may be a product of lower health status in rural areas. Last, the difference in separation rates may also reflect a deeper issue. It may be neither the supply of physicians in rural areas nor poorer health status that results in higher separation rates for ambulatory care sensitive conditions, but rather differences in income or social class, which remain determinants of access to appropriate care. The only way to clarify the complex relationship between discharge rates for ambulatory care sensitive conditions and physician supply, health status and socioeconomic characteristics is through further research.

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Dilatation and Curettage

Overview

Usually performed in a day surgery setting, dilatation and curettage of the uterus (D&C) has been used for diagnostic and therapeutic purposes. D&C ranks as one of the highest volume surgical procedures provincially and nationally. More than 30,000 D&Cs, unrelated to pregnancy or therapeutic abortion, were performed in Ontario in 1994/95.

A common indication for the use of D&C in premenopausal women is abnormal uterine bleeding (irregular intervals, lengthy bleeding or extensive blood loss).[124] Other frequent indications for D&C are postmenopausal bleeding and polyps of the cervix or endometrium.[125] Postmenopausal bleeding has many causes. The term "dysfunctional uterine bleeding" is reserved for bleeding in the absence of organic cause or anatomic lesions — it is a diagnosis of exclusion.[125,126] The most important diagnostic purpose of D&C is to detect or rule out endometrial cancer and its precursors — diseases in which unusual bleeding is a common symptom.[127,128]

The age of a woman influences whether D&C should be used diagnostically and, if it is used, at which stage of investigation it should be introduced. This view is rooted in the knowledge that endometrial cancer is rare in younger women.[129-131] Less than 1% of cancer of the endometrium occurs in women younger than 35 years of age, and only 6% occurs in women up to the age of 45 years.[130,132] Alternative endometrial sampling techniques, non-invasive monitoring and forms of medical management are recommended instead of D&C as primary measures for assessing and treating abnormal uterine bleeding in women younger than 40.[130,133,134]

D&C remains important for the diagnosis of cancerous or precancerous conditions of the uterus in women aged 40 years or older, particularly if they present with irregular bleeding.[131] More than 80% of endometrial cancer cases are seen in postmenopausal women, and the risk of endometrial cancer in patients with postmenopausal bleeding increases from 15% in the immediate postmenopausal period to almost 50% in patients older than 80 years.[125] However, it is troubling that, although D&C has been documented as an inappropriate procedure in younger women, recent studies in other jurisdictions[135] mirror earlier work[129,136] showing that a large proportion of D&C procedures are performed on women younger than 40 years of age.

Other concerns about the use of the procedure pertain to clinical appropriateness, correct patient selection and risks of surgery. The accuracy of D&C for diagnostic purposes has not been thoroughly tested or proven.[137] Studies have shown that D&C often misses lesions[138] and does not thoroughly sample the endometrium.[139] The likelihood of one or more complications associated with D&C is approximately 1.7%.[129] Although this risk of morbidity and mortality is low, it is important to consider because of the high volume of D&Cs performed annually. Typical complications include infection, laceration of the cervix and, rarely, uterine perforation.

Research in other countries has found that concerns about D&C have not been disseminated to the general medical community or been consistently reflected in its practices.[135] It is not clear if this pattern exists in Canada.

Analysis of D&C

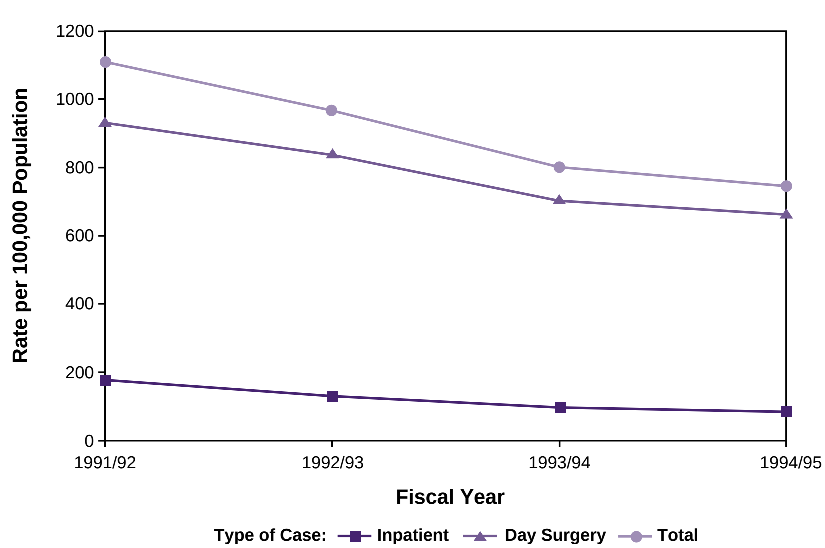
Methods

Although D&C has been performed as day surgery for many years in Ontario, complete information on day surgery procedures was only available from CIHI as of 1991/92. This study included women who were 20 years of age and older. Separations were included if D&C, performed for reasons unrelated to pregnancy or therapeutic abortion, was listed among any of the first eight procedures coded. The analysis otherwise followed standard methods outlined previously. The procedure code is included in appendix A5.1, while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in D&C

In 1994/95, 3,503 inpatient and 27,329 day surgery D&C procedures were performed in the province, for a total of 30,832 procedures. The provincial age-adjusted inpatient rate fell from 178 D&Cs per 100,000 women in 1991/92 to 85 per 100,000 women in 1994/95 (Exhibit 5.49). The age-adjusted day surgery rate declined from 932 per 100,000 women in 1991/92 to

Exhibit 5.49: ***Overall Age-adjusted Dilatation and Curettage Rates per 100,000 Women 20 Years and Over in Ontario, 1991/92 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

661 per 100,000 women in 1994/95, when the day surgery rate was almost eight times higher than the inpatient rate. The overall age-adjusted rate of D&C was 1,110 per 100,000 women in 1991/92 and 746 per 100,000 women in 1994/95, a decrease of 33%. Over the four years examined, age-specific rates (Exhibit 5.50) were highest for women 35 to 49 years of age. In 1994/95, there were 1,037 D&Cs per 100,000 women in this age group.

Exhibit 5.50: ***Overall and Age-specific Dilatation and Curettage Rates per 100,000 Women 20 Years and Over in Ontario, 1991/92 - 1994/95***

Fiscal Year	Overall Rate	Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+
1991/92	1,109.7	1,015.8	1,681.3	1,086.2	502.1	242.0
1992/93	967.7	880.7	1,439.1	975.6	473.0	221.5
1993/94	799.3	730.3	1,138.8	844.3	438.3	203.1
1994/95	746.3	674.3	1,036.6	798.9	466.2	224.1

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Geographic Variations in D&C

Exhibits 5.51 and 5.52 suggest that rates of D&C varied across the province. In 1992/93 to 1994/95, the rates varied three-fold among DHCs, with Essex County having the highest rate of D&C (1,302 per 100,000 women) and Thames Valley having the lowest rate (420 per 100,000 women). The statistical measures presented in Exhibit 5.52 support this finding, indicating that the geographic variation across the province is moderately large.

Comment

The D&C utilization patterns found in Ontario are similar to those found in other countries. Coulter and associates[135] reported a rate of 710 D&Cs per 100,000 women in England in 1989/90 and 2.7-fold variation in rates across the Oxford region. Newton, Seagroatt and Goldacre[140] also found relatively high variation in rates of hospital admission for D&C among districts (SCV = 56). Although comparison between different countries is limited because of different inclusion and exclusion criteria, time periods and denominators, variation in the rate of D&C use is clearly seen elsewhere and the amount of variation in Ontario is substantial.

What could account for the variation in the rate of use of D&C in Ontario? If there were differences in the prevalence of endometrial carcinoma and its precursors across Ontario, they would be small and would account for only a minor proportion of the variation in rates of D&C across the province. Resource availability may determine whether day surgery is utilized, as spaces in postanesthesia care units may be limited. Wennberg[141] showed that, when relatively more hospital beds were available, physicians tended to admit more patients with medical conditions that were less likely to require hospitalization.

Another possibility is that variation in the use of D&C within countries and between countries reflects differences in the clinical perception of its appropriateness.[135] Physicians in the same region may share a common clinical approach; patterns reflecting variation in practice may be more obvious for procedures for which indications are poorly defined, such as D&C.[140] Coyte[142] proposed that differences in physicians' clinical perceptions occur because of disagreement on the indications for intervention, the usefulness of alternative treatment methods and the benefits and adverse outcomes of the intervention. All of these categories apply to D&C. For example, if physicians in a particular region of the province emphasize medical management (e.g. use of oral contraceptives) for irregular bleeding in younger women, the rates of D&C may be lower in their region than in other regions. Patient preference could also play a role in the variation in use of D&C. Preferences are shaped by attitudes toward pain, disability and perceived benefits and risks of a service.[143] Patients' abilities to tolerate menstrual problems and their perceptions about the effectiveness of D&C could have had an impact on how the procedure was used.

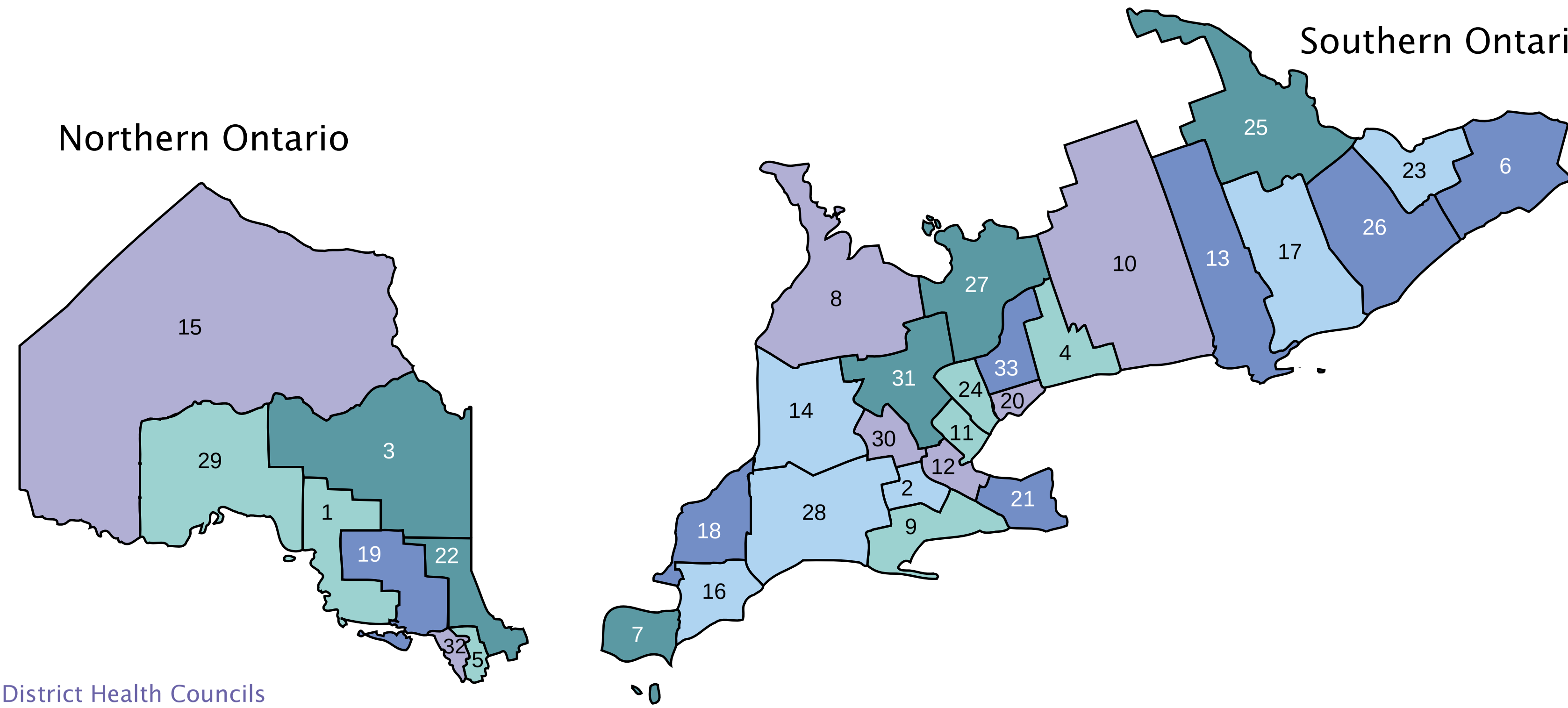
Despite questions about the effectiveness of D&C for diagnosis, the procedure is still performed at a very high rate in the province. The age-specific rates of use show that a large proportion of patients receiving the procedure are young women. Recent guidelines from England indicate that the use of D&C as a routine investigative procedure for women younger than 35 years is not justified[133,134] because endometrial cancer is rare in this age group. Research needs to be undertaken in Ontario to examine why, and at what stage of medical investigation, D&C is used in young women.

D&C is associated with significant health care expenditures when the cost of the total number of procedures performed is calculated.[135,137] It has been proposed that there could be significant cost savings if the number of young women receiving the procedure was reduced, if the proportion of D&C day surgery procedures (relative to inpatient procedures) was increased, and if less costly alternative endometrial sampling methods were substituted (not added to D&C).[144] Many critics of D&C have insisted that it should be replaced by other methods of endometrial examination such as office endometrial biopsy, which is less invasive and avoids the need for hospital admission, or hysteroscopy with directed biopsy, which allows the uterine cavity to be visualized.[137,138,145]

In conclusion, the patterns of use of D&C across Ontario are of concern, not only because of the uncertainty surrounding clinical appropriateness and patient selection but also because of the high volume of women who undergo D&C annually. Given these high volumes, even small improvements in patterns of use of D&C could have a significant impact on the care of a large number of women and, concurrently, the use of limited health care resources.

Exhibit 5.51

Age-adjusted Rates of Dilatation and Curettage per 100,000 Women 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age-adjusted Rate (quintiles)

- 1,089.9 to 1,302.3
- 930.7 to 1,068.4
- 812.7 to 901.8
- 676.1 to 803.3
- 420.3 to 675.3

Exhibit 5.52: *Age-adjusted Dilatation and Curettage Rates per 100,000 Women 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95*

District Health Council	1992/93 - 1994/95				1994/95	
	Number of Procedures/Year	Age-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age-adjusted Rate per 100,000
Algoma	344	708.8	26	**	337	703.8
Brant	264	597.9	29	✣✣	232	514.8
Cochrane	382	1,126.7	5	✣✣	324	960.9
Durham Region	1,308	793.3	22	*	1,284	770.1
East Muskoka-Parry Sound	199	772.5	23		163	645.4
Eastern Ontario	679	1,011.5	8	✣✣	613	908.2
Essex County	1,655	1,302.3	1	✣✣	1,557	1,217.5
Grey-Bruce	457	812.7	20		414	709.6
Haldimand-Norfolk	298	803.3	21		251	668.7
Haliburton, Kawartha & Pine Ridge	894	824.2	18		777	706.7
Halton	946	725.1	24	✣✣	883	674.7
Hamilton-Wentworth	1,431	813.3	19		1,262	706.7
Hastings & Prince Edward Counties	533	963.2	11	✣✣	461	820.9
Huron/Perth	211	443.2	31	✣✣	191	391.2
Kenora-Rainy River	265	886.6	16		263	864.5
Kent County	279	675.3	28	✣✣	254	615.7
Kingston, Frontenac and Lennox & Addington	294	437.4	32	✣✣	263	386.0
Lambton	461	948.6	12	*	404	830.2
Manitoulin-Sudbury	833	1,068.4	7	✣✣	730	943.6
Metropolitan Toronto:	8,492	901.8	14	✣✣	7,843	803.7
Borough of East York	353	801.6			302	659.5
City of Etobicoke	1,236	985.6			1,156	894.4
City of North York	2,315	1,012.2			2,137	901.0
City of Scarborough	2,107	987.4			2,004	906.7
City of Toronto	1,885	702.2			1,680	606.5
City of York	592	1,031.5			560	935.2
Niagara	1,511	970.4	10	✣✣	1,280	815.1
Nipissing/Timiskaming	600	1,272.3	2	✣✣	534	1,143.4
Ottawa-Carleton Regional:	1,478	518.9	30	✣✣	1,281	442.7
City of Ottawa	296	494.3			257	419.4
Ottawa, Eastern Region	754	513.0			654	435.4
Ottawa, Western Region	427	559.5			370	480.4
Peel:	2,193	712.0	25	✣✣	2,012	642.2
City of Brampton	914	821.4			862	764.1
City of Mississauga	1,279	650.4			1,150	573.9
Renfrew County	418	1,164.2	4	✣✣	383	1,065.6
Rideau Valley	526	930.7	13		467	824.7
Simcoe County	1,261	1,089.9	6	✣✣	1,167	994.0
Thames Valley	905	420.3	33	✣✣	777	356.7
Thunder Bay	403	676.1	27	✣✣	357	601.1
Waterloo Region	1,285	862.0	17		1,164	778.1
Wellington-Dufferin	982	1,255.5	3	✣✣	883	1,125.1
West Muskoka-Parry Sound	68	890.8	15		55	704.4
York Region	2,169	983.7	9	✣✣	1,966	891.5
Total Ontario	34,024	835.5			30,832	746.2
Coefficient of Variation (%) [CV]		25.2				
Extremal Quotient [EQ]		3.1				
Systematic Component of Variation [SCV]		72.9				
Adjusted Chi-square (likelihood ratio)		2,274.7(d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✣✣ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

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Hysterectomy

Overview

Hysterectomy is one of the most commonly performed surgical procedures in the province; in 1994/95 more than 20,000 hysterectomies were performed. Despite the high number of procedures and the increase in the number of women in the hysterectomy-prone age groups, the rate of hysterectomy fell 15% from 1981 to 1991,[146-148] with most of the decline seen among women younger than 40 years of age and among those undergoing a hysterectomy for bleeding.[148]

Surgical hysterectomy can be performed either abdominally or vaginally. As well, there is a choice of whether to perform a total hysterectomy (removal of the uterus and cervix) or a subtotal hysterectomy (removal of the uterus only). Choice of method for hysterectomy appears to be dictated by local therapeutic preference.[149] For example, Statistics Canada[150] indicates that in Prince Edward Island almost as many vaginal hysterectomies (VH) as total abdominal hysterectomies (TAH) were performed; in Manitoba, five times as many TAHs as VHs were performed. In the United States, between 1970 and 1978, women undergoing hysterectomy in the northeast had the lowest percentage of procedures performed using the vaginal approach and women in the west the highest percentage.[151] In Sweden, on the other hand, 30% of hysterectomies in 1988 were subtotal.[149]

Hysterectomies can now be done laparoscopically. The most common method, laparoscopically assisted vaginal hysterectomy (LAVH), allows the surgeon to perform the operation using four small "keyhole" incisions in the abdomen rather than a single large incision. The uterus is dissected from its surrounding structures laparoscopically and is then removed vaginally.

There is no consensus on the indications for the various approaches. In 1983, Easterday and associates[152] stated that the abdominal approach is indicated when there is invasive cervical, endometrial, tubal or ovarian cancer, or when a problem with the surrounding organs (e.g., ovaries, tubes) is suspected. Approximately 80% of hysterectomies meet these criteria. The vaginal approach is indicated only in the presence of uterine prolapse, i.e., in 20% of cases.

More recently, many gynecologists have argued that the vaginal approach may be safe for a much higher percentage of cases. Contraindications have been revised so that the indications for a VH are much broader.[153-155] These revisions have led some surgeons to estimate that up to 90% of cases can be safely performed vaginally.[155]

Controversy persists as to the indications for LAVH. Some gynecologists contend that LAVH offers the benefits of vaginal hysterectomy to women who would otherwise have to undergo an abdominal hysterectomy.[153] Others counter that traditional vaginal hysterectomy is currently underutilized and could be applied to a much wider range of indications without the need for laparoscopic dissection. For example, Wood and associates[156] estimated that at least 50% of hysterectomies may be suitable for the laparoscopic technique, whereas Kovac[157] estimated that the laparoscopic technique is needed in less than 10% of all cases. In this report, we update the trends in hysterectomy over the past decade, examine the changes in rates by the most frequent indications for hysterectomy and examine the proportion of hysterectomies performed by the various surgical approaches.

Analysis of Hysterectomy

Methods

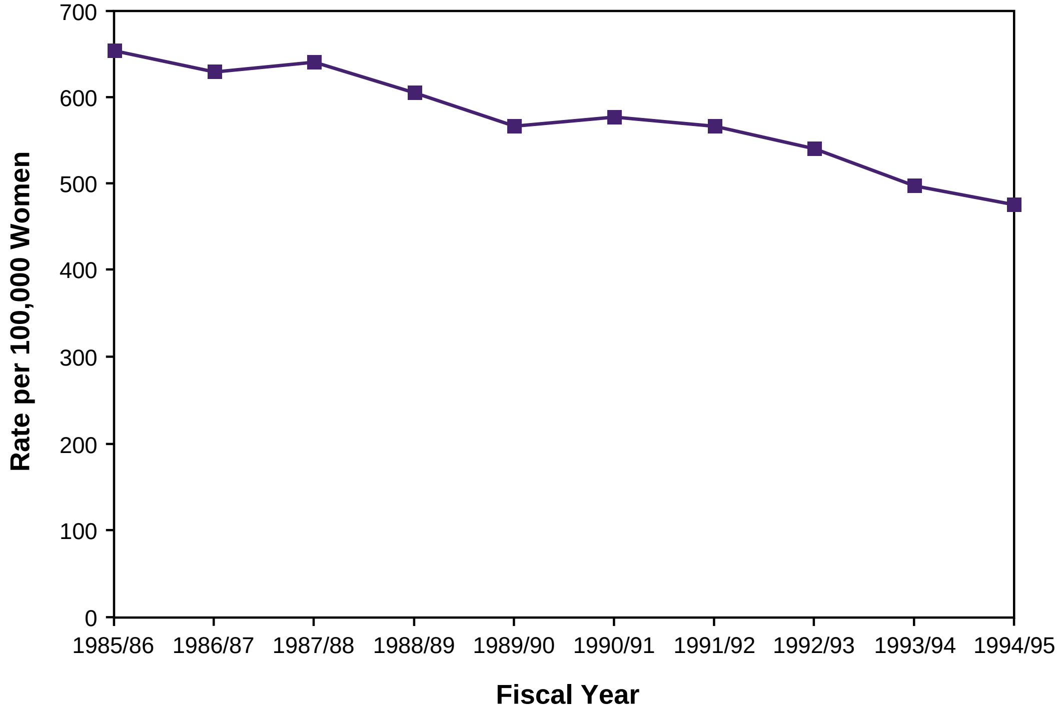
Standard methods were used to determine rates over time and by geographic areas. For determination of the proportion of hysterectomies by various surgical approaches for each year, the numerators were the specific surgical approaches (i.e., VH, LAVH, TAH, subtotal or other), and the denominators were the total number of hysterectomies. We also determined the proportion of hysterectomies performed by type of surgical approach for each DHC. The DHCs were ranked on the highest to lowest percentage of all hysterectomies in that DHC performed as VH and as TAH.

ICD-9 diagnostic codes on the hospital discharge abstracts were grouped into six categories: cancer, fibroids, menstrual hemorrhage, genital prolapse, endometriosis and all others. The first diagnosis coded was used to assign the record to a category, except when a cancer diagnosis appeared at any level, in which case the cancer code overrode other codes for categorization. Grouping records by other classification schemes gave similar results.[146] For each DHC, we determined the proportion of hysterectomies performed for each diagnosis for the years 1989/90 to 1991/92 and for the years 1992/93 to 1994/95. To determine if there had been a change in the DHC in the major reasons for performing hysterectomies, we determined the relative difference in rate. For each DHC, the rate of hysterectomies for each indication in 1992/93 to 1994/95 was subtracted from the rate performed in 1989/90 to 1991/92; the difference was then divided by the 1989/90 to 1991/92 rate. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in Hysterectomy

Overall provincial age-adjusted rates of hysterectomy continued to fall during the decade, from 654 per 100,000 women 20 years and older in 1985/86 to 477 per 100,000 in 1994/95 (Exhibit 5.53), which represents a 27% relative decline. Rates were stable for women 65 and older and fell for women younger than 50. The highest age-specific rates were found for women 35 to 49 (Exhibit 5.54).

Exhibit 5.53: ***Overall Age-adjusted Hysterectomy Rates per 100,000 Women 20 Years and Over in Ontario, 1985/86– 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.54: ***Overall and Age-specific Hysterectomy Rates per 100,000 Women 20 Years and Over in Ontario, 1985/86 - 1994/95***

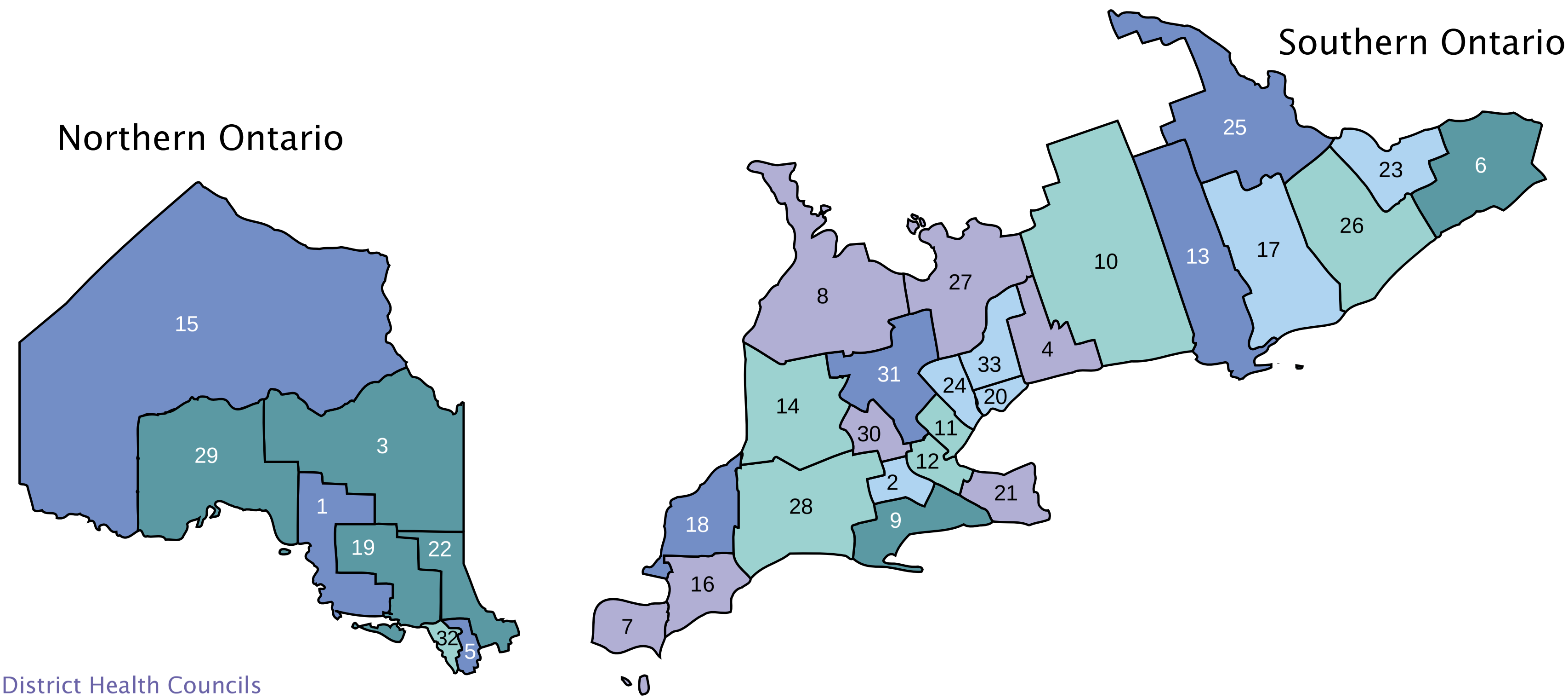
Fiscal Year	Overall Rate	Age Group				
		20 - 34	35 - 49	50 - 64	65 - 74	75+
1985/86	654.3	332.2	1,314.5	532.6	415.9	228.1
1986/87	629.7	301.9	1,262.2	537.5	428.1	214.7
1987/88	641.2	299.4	1,285.8	566.0	429.1	217.4
1988/89	605.7	278.6	1,203.8	535.9	438.3	217.8
1989/90	567.3	257.1	1,118.3	525.4	397.6	217.8
1990/91	577.5	246.4	1,116.2	561.0	465.8	231.2
1991/92	566.1	232.5	1,105.2	542.6	462.1	236.1
1992/93	541.0	220.0	1,042.0	536.6	451.4	232.5
1993/94	497.7	211.3	934.8	517.8	394.5	233.9
1994/95	476.7	192.0	886.1	499.5	417.6	244.3

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Geographic Variations in Hysterectomy

The rate of hysterectomy varied according to the residence of patients (Exhibits 5.55 and 5.56). The ratio of the highest to lowest rate for all hysterectomies in Ontario among DHCs was unchanged at 2.5 in both periods (1989/90 to 1991/92 and 1992/93 to 1994/95). The amount of variation across the province was moderately large for this procedure. Nipissing/ Timiskaming had the highest age-adjusted rate (932 per 100,000) for 1992/93 to 1994/95, maintaining its rank from the analysis in the previous edition. Metropolitan Toronto had the lowest rate (372 per 100,000) for 1992/93 to 1994/95 and also for 1989/90 to 1991/92. The age-adjusted rates fell in virtually all DHCs, with the largest declines seen in Algoma (26%) and in Thunder Bay (23.3%). Rates increased in only three DHCs — Hastings & Prince Edward Counties, Manitoulin–Sudbury and Simcoe County.

Age-adjusted Hysterectomy Rates per 100,000 Women 20 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
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20. Metropolitan Toronto
21. Niagara
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23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Exhibit 5.55

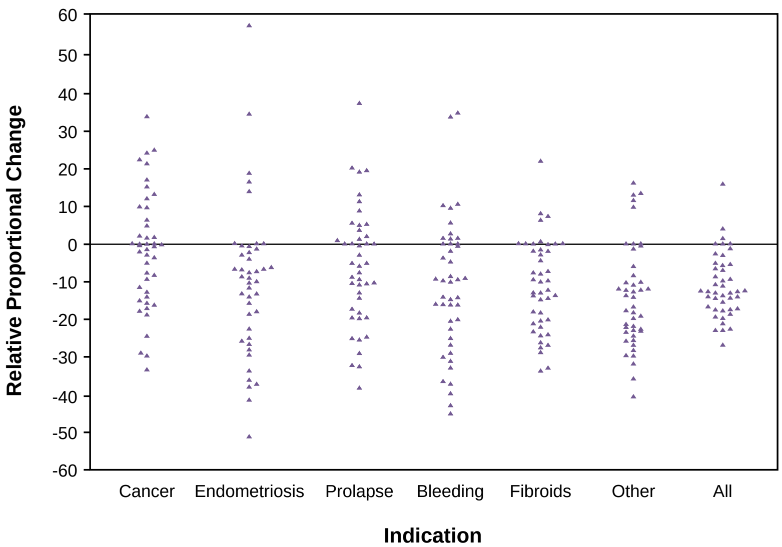
Exhibit 5.56: *Age-adjusted Hysterectomy Rates per 100,000 Women 20 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92 Age-adjusted Rate per 100,000	1989/90 - 1991/92 Rank	1992/93 - 1994/95 Number of Procedures/Year	1992/93 - 1994/95 Age-adjusted Rate per 100,000	1992/93 - 1994/95 Rank	p-value	1994/95 Number of Procedures	1994/95 Age-adjusted Rate per 100,000
Algoma	889.5	4	325	657.5	11	✣✣	302	613.8
Brant	477.1	29	198	438.8	29	*	203	443.7
Cochrane	976.1	3	293	859.1	2	✣✣	252	741.1
Durham Region	599.4	21	958	572.9	19	✣✣	950	558.8
East Muskoka-Parry Sound	757.5	11	180	678.1	7	✣✣	190	708.8
Eastern Ontario	858.9	6	486	696.7	6	✣✣	488	689.4
Essex County	712.7	13	782	599.1	17	✣✣	741	558.3
Grey-Bruce	672.2	16	349	604.4	16	**	323	551.4
Haldimand-Norfolk	734.4	12	274	720.3	5	✣✣	250	645.2
Haliburton, Kawartha & Pine Ridge	546.9	26	581	522.0	23		556	497.4
Halton	551.8	25	641	477.0	27		635	468.0
Hamilton-Wentworth	545.9	27	935	518.5	24		863	468.9
Hastings & Prince Edward Counties	574.8	24	379	670.7	10	✣✣	380	664.0
Huron/Perth	580.9	23	263	544.0	22		241	496.2
Kenora-Rainy River	803.0	7	186	625.9	13	**	205	671.1
Kent County	762.1	10	261	620.9	14	**	268	640.3
Kingston, Frontenac and Lennox & Addington	447.3	32	276	406.8	30	✣✣	271	392.8
Lambton	767.5	9	340	673.2	9	✣✣	338	663.3
Manitoulin-Sudbury	801.1	8	658	837.2	3	✣✣	628	797.0
Metropolitan Toronto:	416.9	33	3,494	371.9	33	✣✣	3,363	341.8
Borough of East York	368.4		153	336.4			132	275.7
City of Etobicoke	398.4		512	393.4			492	362.4
City of North York	435.1		900	383.0			868	353.3
City of Scarborough	513.5		947	444.2			916	412.2
City of Toronto	342.9		763	295.1			741	274.9
City of York	401.5		220	392.3			214	365.9
Niagara	680.7	15	907	565.5	20	✣✣	895	549.8
Nipissing/Timiskaming	1,056.5	1	444	931.6	1	✣✣	367	773.0
Ottawa-Carleton Regional:	524.0	28	1,276	440.6	28	✣✣	1,194	404.2
City of Ottawa	523.2		291	446.7			266	412.7
Ottawa, Eastern Region	499.8		606	416.7			552	369.6
Ottawa, Western Region	559.7		378	487.6			376	473.8
Peel:	451.8	31	1,152	384.3	32	✣✣	1,144	374.0
City of Brampton	506.3		479	443.4			474	432.1
City of Mississauga	422.1		674	351.3			670	341.7
Renfrew County	866.2	5	245	673.6	8	✣✣	263	719.8
Rideau Valley	653.9	17	337	564.1	21		386	636.2
Simcoe County	600.6	20	719	612.6	15	✣✣	752	627.5
Thames Valley	596.6	22	1,076	496.7	26		982	447.0
Thunder Bay	1,033.2	2	488	802.5	4	✣✣	421	688.4
Waterloo Region	615.2	19	862	578.3	18	✣✣	834	551.6
Wellington-Dufferin	712.2	14	495	628.0	12	✣✣	442	555.5
West Muskoka-Parry Sound	635.9	18	39	504.0	25		49	587.8
York Region	469.7	30	869	385.7	31	✣✣	860	375.9
Total Ontario	569.5		20,768	503.8			20,035	475.5
Coefficient of Variation (%) [CV]	26.8			26.1				
Extremal Quotient [EQ]	2.5			2.5			Spearman Correlation	R=0.902 (p<0.05)
Systematic Component of Variation [SCV]	116.2			97.4				
Adjusted Chi-square (likelihood ratio)	1,486.8 (d.f. 32, p<0.0001)			1,330.0 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✣✣ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.57: ***Relative Change in Age-adjusted Hysterectomy Rates by Indication for DHC Area of Patient Residence in Ontario, from 1989/90 - 1991/92 to 1992/93 - 1994/95***

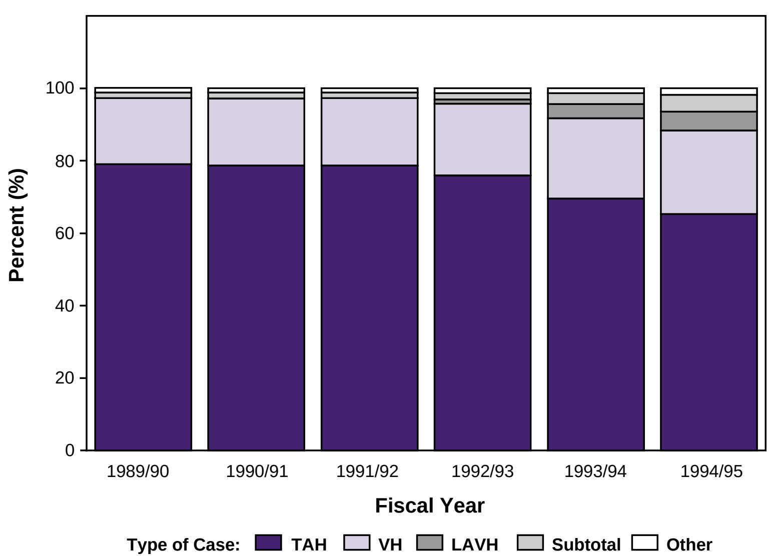


Each point represents one DHC

Relative proportional change = (1992/93 - 1994/95 rate minus 1989/90-1991/92 rate) divided by 1989/90-1991/92 rate

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.58: ***Percentage of Hysterectomies Performed as Subtotal, Vaginal (VH), Laparoscopically-assisted Vaginal (LAVH), Total Abdominal (TAH) and Other in Ontario, 1989/90 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Variations by Indication

Exhibit 5.57 shows the proportional change in the rate of hysterectomy by indication for each DHC. For cancer, approximately equal numbers of DHCs had either increased or decreased rates in 1992/93 to 1994/95 compared with 1989/90 to 1991/92. The rates for most DHCs decreased for most indications, but the rates of decline were greatest for endometriosis. Whereas overall rates of hysterectomy declined by 27% on average, for endometriosis and bleeding the rates fell 40% or more in some DHCs.

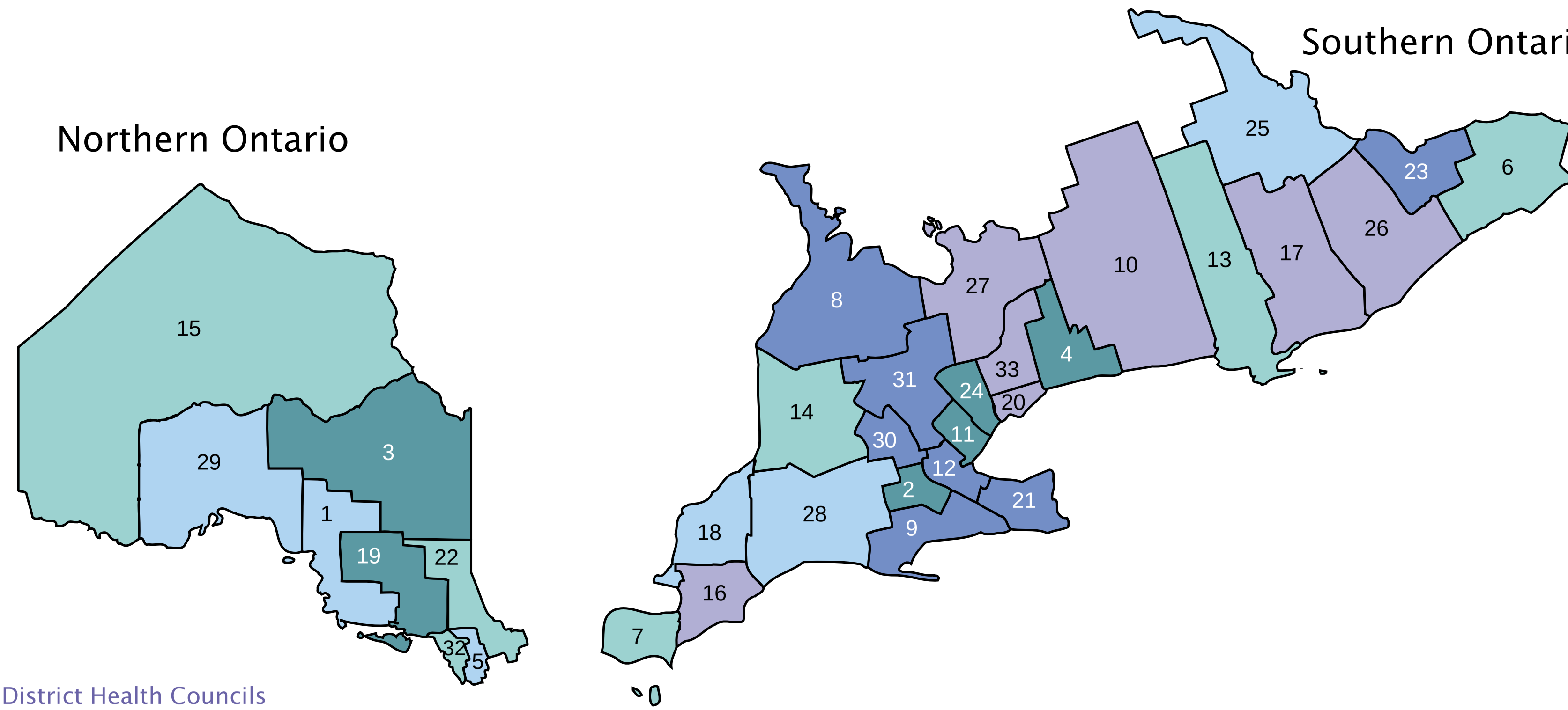
Trends in Surgical Approach

Traditionally, about 80% of hysterectomies performed in Ontario were TAH (Exhibit 5.58). By 1994/95, the proportion of hysterectomies done as TAH had fallen to 67%. The use of VH rose from 19% in 1989 to 23% in 1994. Although subtotal procedures accounted for small proportions overall, the proportion of subtotal procedures increased from less than 2% in 1989/90 to 5% in 1994/95, whereas the proportion of LAVH increased from 0% in 1989/90 to 5% by 1994/95.

There was wide variation in the surgical approach received by women in the various DHCs in 1994/95 (Exhibits 5.59a, 5.59b, and 5.60). The proportion of women who had subtotal hysterectomies ranged from 0 in West Muskoka–Parry Sound, Huron/Perth, Halimand–Norfolk, Ottawa-Carleton (Western Region), Renfrew County, Thames Valley and Nipissing/Timiskaming to 21% in Algoma. In Thunder Bay, 54% of women having hysterectomies had vaginal hysterectomies, whereas only 12% of women in Cochrane had vaginal hysterectomies. LAVH also varied considerably, from 0 in Grey–Bruce, Kenora–Rainy River, Thunder Bay and Manitoulin–Sudbury to 21% in Renfrew County and Nipissing/Timiskaming. The highest proportion of abdominal hysterectomies was seen in Manitoulin–Sudbury (84%). Within a DHC, there was no relationship between the rate of hysterectomy and the surgical approach used.

Exhibit 5.59a

Percentage of Hysterectomies Performed as Total Abdominal Hysterectomy for Women 20 Years and Over by DHC Area of Patient Residence in Ontario, 1994/95



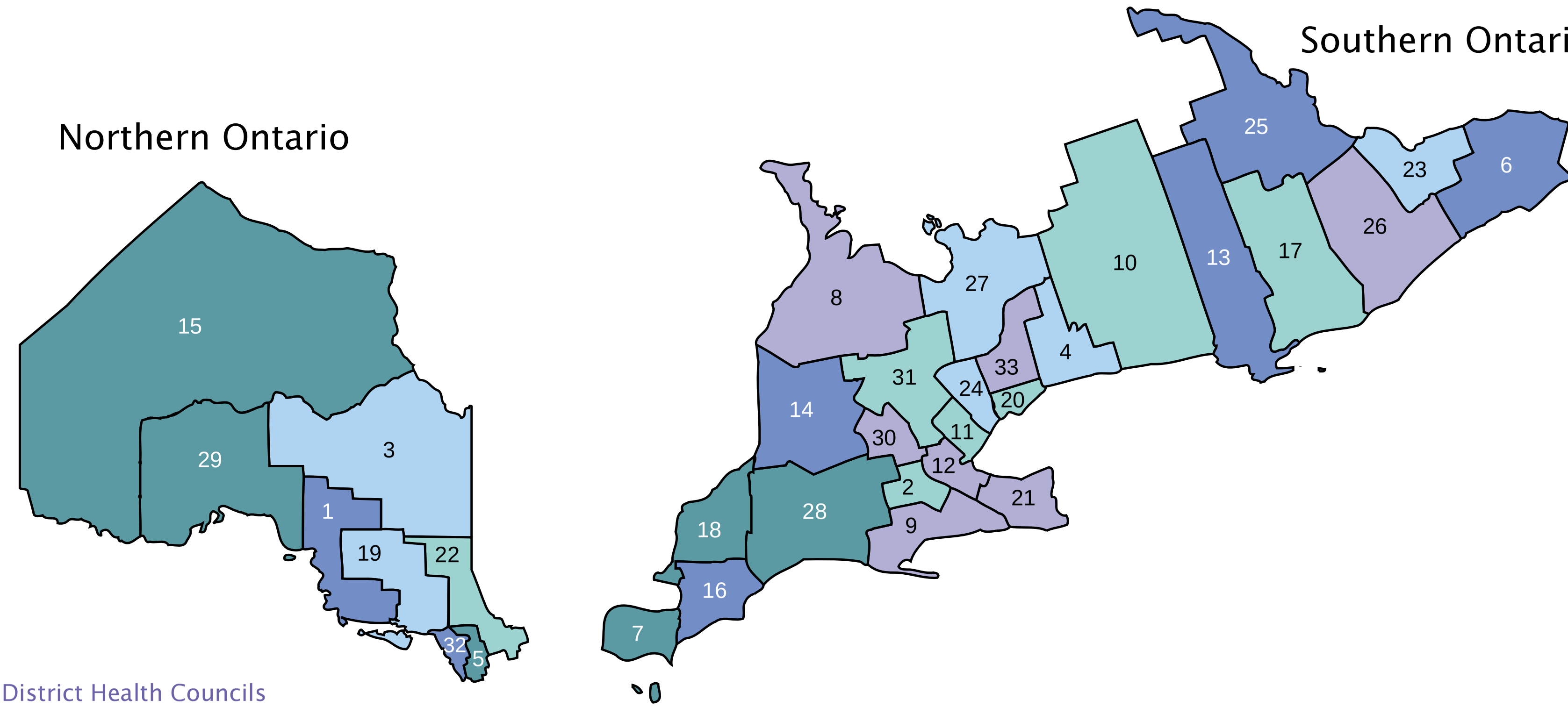
District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Percentage (quintiles)

- 73 to 84
- 70 to 72
- 63 to 68
- 58 to 62
- 39 to 51

Percentage of Hysterectomies Performed as Vaginal Hysterectomy for Women 20 Years and Over by DHC Area of Patient Residence in Ontario, 1994/95



District Health Councils

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4. Durham Region
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13. Hastings & Prince Edward Counties
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21. Niagara
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23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Percentage
(quintiles)

34 to 54
26 to 32
21 to 26
16 to 20
12 to 16

Exhibit 5.59b

Exhibit 5.60: *Percentage of Hysterectomies Performed as Subtotals, Vaginal (VH), Laparoscopically-assisted Vaginal (LAVH), Total Abdominal (TAH) and Other * by DHC Area of Patient Residence in Ontario, 1994/95*

District Health Council	Age-adjusted Rate per 100,000	Subtotals	VH	LAVH	TAH	Other*	Rank on % VH	Rank on % TAH
Algoma	613.8	21	26	6	46	1	13	31
Brant	443.7	2	16	3	76	3	27	2
Cochrane	741.1	5	12	10	73	1	33	5
Durham Region	558.8	4	15	4	75	1	29	3
East Muskoka-Parry Sound	708.8	1	40	19	39	1	3	33
Eastern Ontario	689.4	1	31	5	61	1	9	24
Essex County	558.3	1	38	1	58	1	5	27
Grey-Bruce	551.4	3	24	0	71	2	16	12
Haldimand-Norfolk	645.2	0	26	2	71	1	14	10
Haliburton, Kawartha & Pine Ridge	497.4	13	18	2	65	2	24	18
Halton	468.0	4	16	6	73	1	26	4
Hamilton-Wentworth	468.9	2	21	3	72	1	19	8
Hastings & Prince Edward Counties	664.0	5	32	1	60	1	7	25
Huron/Perth	496.2	0	26	8	62	3	11	21
Kenora-Rainy River	671.1	1	39	0	59	1	4	26
Kent County	640.3	1	32	1	64	2	8	19
Kingston, Frontenac and Lennox & Addington	392.8	9	20	1	68	1	21	14
Lambton	663.3	1	50	1	47	1	2	30
Manitoulin-Sudbury	797.0	1	13	0	84	1	32	1
Metropolitan Toronto:	341.8	11	20	3	65	1	22	17
Borough of East York	275.7	8	21	4	66	2		
City of Etobicoke	362.4	14	18	2	65	2		
City of North York	353.3	13	26	3	58	1		
City of Scarborough	412.2	11	20	3	65	1		
City of Toronto	274.9	10	18	1	70	1		
City of York	365.9	10	22	2	64	2		
Niagara	549.8	3	24	1	71	1	17	11
Nipissing/Timiskaming	773.0	0	17	21	61	0	25	23
Ottawa-Carleton Regional:	524.0	1	16	12	70	1	28	13
City of Ottawa	412.7	2	16	11	70	1		
Ottawa, Eastern Region	369.6	1	12	14	73	0		
Ottawa, Western Region	473.8	0	17	13	69	1		
Peel:	451.8	7	15	4	73	1	31	6
City of Brampton	432.1	9	17	2	70	2		
City of Mississauga	341.7	4	12	7	77	1		
Renfrew County	719.8	0	26	21	49	3	12	29
Rideau Valley	636.2	3	24	5	67	2	18	15
Simcoe County	627.5	3	15	13	67	2	30	16
Thames Valley	447.0	0	34	13	51	2	6	28
Thunder Bay	688.4	2	54	0	42	2	1	32
Waterloo Region	551.6	1	25	2	72	0	15	7
Wellington-Dufferin	555.5	1	18	9	71	1	23	9
West Muskoka-Parry Sound	587.8	0	27	12	61	0	10	22
York Region	375.9	10	21	4	63	1	20	20

* Other includes radical abdominal hysterectomy, radical vaginal hysterectomy and pelvic evisceration

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Unlike laparoscopic cholecystectomy, which was rapidly adopted by virtually all hospitals in Ontario over a three year period, LAVH is being used in far fewer hospitals. The use of LAVH increased among teaching hospitals (up to 65% in 1994/95) but is performed in a smaller proportion of community hospitals (35% in 1994/95).

Comment

The numbers and rates of hysterectomy continue to decline in Ontario and in virtually all DHCs. Notably, the largest declines were seen in regions which had the highest hysterectomy rates in the past. The fall in hysterectomy rates is likely attributable to alternative means, both medical and surgical, for treating the underlying conditions. The broader use of hormone therapy and the wider availability of endometrial ablation or myomectomy may help to explain the decline. However, for the most part, the newer surgical methods have not been subjected to rigorous evaluation, so we do not know whether they will actually “prevent” or merely delay hysterectomy in the longer term. Unfortunately, there have not been major advances in the treatment of fibroids. If even 50% of women with symptomatic fibroids could be helped by medical therapy, the impact on surgical rates and women’s quality of life would be substantial.

The selection of surgical methods is important, since morbidity and costs vary with the approach used. The abdominal approach causes greater discomfort in the postoperative phase and results in longer hospital stays. Our data demonstrate that there has been a decline in the proportion of hysterectomies performed with the use of the abdominal approach. There have been correspondingly small increases in the use of subtotal hysterectomy, vaginal hysterectomy and LAVH.

The surgical approach used in Ontario varied widely. Subtotal hysterectomy is associated with shorter hospital stay and less morbidity,[158-160] but was only received by women in a few DHCs. Vaginal hysterectomy appears to be the most widespread in some DHCs, with more than 50% of hysterectomies being performed as VH. The use of VH seems to depend on the training of the gynecologist: those trained outside North America are more familiar with the vaginal approach.[149,161]

For LAVH, the reported advantages include less operative trauma, decreased postoperative pain, lower blood loss, shorter hospital stay (one to two days), improved recuperation time (two to three weeks) and a better cosmetic result.[154,158,162-165] The available studies suggest that, although LAVH has demonstrable benefits over the abdominal approach, the benefits do not exceed those of vaginal hysterectomy.[166-168] In a randomized controlled trial and in several uncontrolled studies, there were no significant differences in patient morbidity or length of stay in hospital when LAVH was compared with VH.[166-169] In addition, the newer technique has been shown to be associated with unique complications related to laparoscopy rather than the hysterectomy.[158,162,168] The debate regarding the benefits and effectiveness of LAVH is likely reflected in the slow diffusion of the technique across the province. Unlike laparoscopic cholecystectomy, which now accounts for more than 85% of cholecystectomies, LAVH accounts for only about 5% of hysterectomies.

Despite possible advantages to patients, there is considerable evidence that LAVH is much more expensive for hospitals than either VH or TAH if disposable equipment is used.[165,170-173] However, if LAVH can be performed efficiently, its costs do not exceed those of the other approaches. We recommend that population-based studies be undertaken to examine the complication rates, longer term morbidity and efficiency of LAVH. Larger scale randomized studies comparing LAVH with VH are also needed.

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Radical Prostatectomy

Overview

In 1995, an estimated 16,100 new cases of prostate cancer were diagnosed in Canada, and approximately 4,200 patients were projected to die of the disease.[174] Prostate cancer is the most commonly diagnosed form of cancer and the second most common cause of death from malignant tumours, after lung cancer, in men.

Public awareness of prostate cancer has been increasing in recent years. The availability of a noninvasive blood test — the prostate specific antigen (PSA) test[175] — and new, improved surgical approaches (nerve-sparing prostatectomy), have been associated with a growing number of middle-aged men seeking screening tests for prostate cancer and advice about its surgical treatment.[176] Despite concerns about the benefits of early diagnosis of prostate cancer through screening[177,178] and doubts about the use of radical prostatectomy as a routine treatment for localized cancer, the use of radical prostatectomy continues to rise.

We previously reported a rapid increase in the rate of radical prostatectomy in Ontario.[179] The rates showed a monotonic increase from 9 per 100,000 men 50 years of age and older in Ontario in 1981/82 to 50 per 100,000 in 1991/92. The overall extent of small-area variation was characterized as large. In this section, we continue to examine the trends in radical prostatectomy performed in Ontario.

Analysis of Radical Prostatectomy

Methods

Methods used followed the standard approach except that the denominator for analysis in this section is all men residing in Ontario 50 years of age and older in the reference year. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in Radical Prostatectomy

Although the frequency of radical prostatectomy is increasing, it is still an uncommon procedure. In 1994/95, 1,081 radical prostatectomies were performed in Ontario among men 50 years or older. Radical prostatectomy has undergone a more than fourfold utilization increase from 20.7 per 100,000 in 1989/90 to 84.8 per 100,000 in 1994/95 (Exhibits 5.61 and 5.62). Over the two time periods studied, the overall age-adjusted provincial rate of radical prostatectomy showed a more than twofold increase (Exhibit 5.63).

Geographic Variations in Radical Prostatectomy

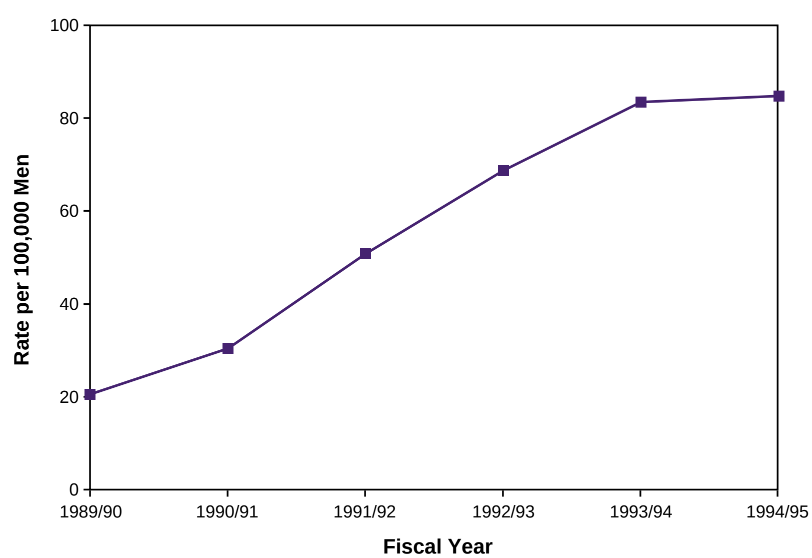
Exhibits 5.63 and 5.64 shows the detailed data specific to each DHC . In 1989/90 to 1991/92, Durham Region had the highest rate of radical prostatectomy (91.8 per 100,000) and Algoma the lowest (6.1 per 100,000), a high–low rate ratio of 15.1. In 1992/93 to 1994/95, Wellington–Dufferin had the highest rate of radical prostatectomy (131.5 per 100,000) and Algoma the lowest (20.8 per 100,000), a high–low rate ratio of 6.3, about 40% of that observed in 1989/90 to 1991/92. The variability of rates decreased, as indicated by the summary statistics at the foot of Exhibit 5.64. The rankings of DHC rates were relatively consistent over the two time periods. In general, DHCs with higher rates remained higher and DHCs with lower rates remained lower (Spearman rank correlation coefficient 0.70).

Exhibit 5.61: ***Overall and Age-specific Radical Prostatectomy Rates per 100,000 Men 50 Years and Over in Ontario, 1989/90 - 1994/95***

Fiscal Year	Overall Rate	Age Group		
		50 - 64	65 - 74	75 +
1989/90	20.7	16.0	36.3	11.0
1990/91	30.6	24.1	54.6	12.9
1991/92	50.8	38.9	96.9	13.6
1992/93	68.7	54.4	129.4	11.0
1993/94	83.5	73.7	141.8	7.5
1994/95	84.8	77.4	136.5	7.8

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.62: ***Overall Age-adjusted Radical Prostatectomy Rates per 100,000 Men 50 Years and Over in Ontario, 1989/90– 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

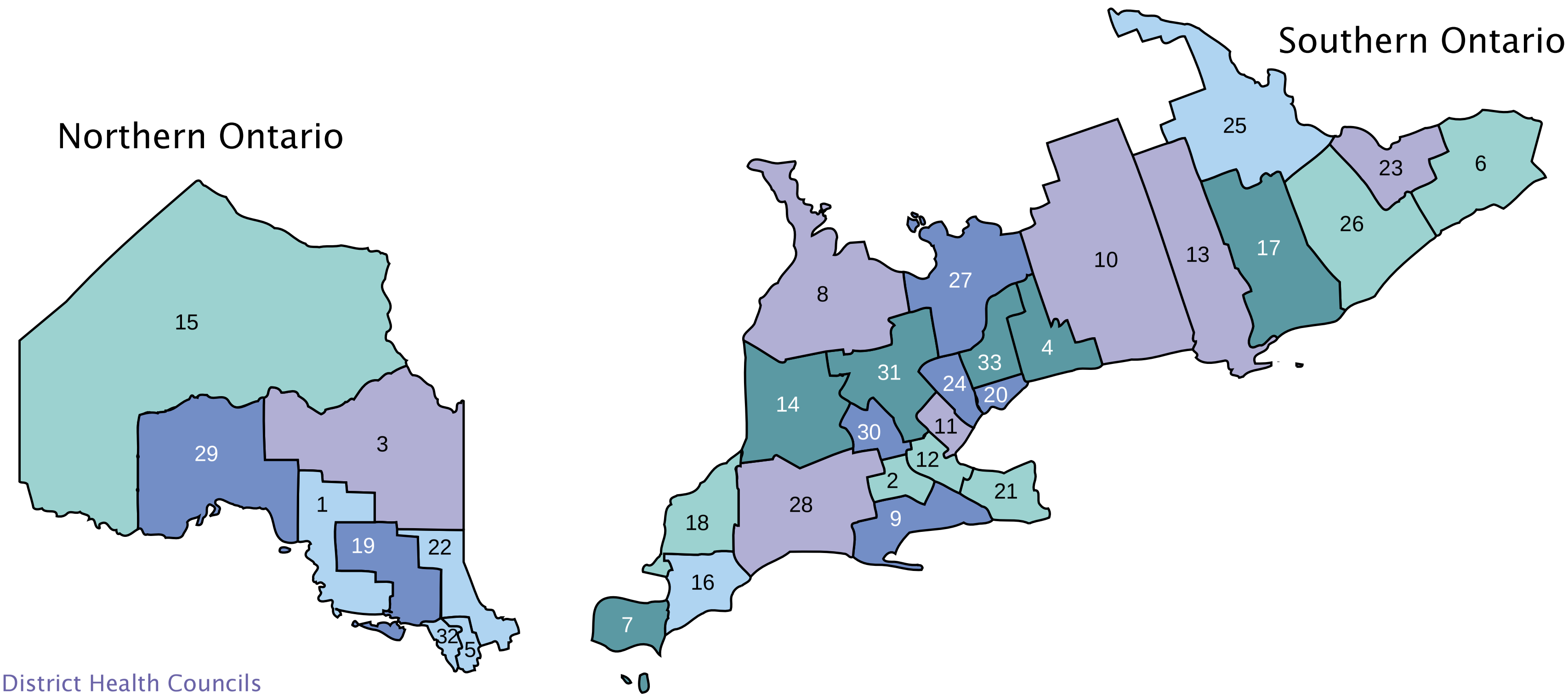
Exhibit 5.63: *Age-adjusted Radical Prostatectomy Rates per 100,000 Men 50 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age-adjusted Rate per 100,000
Algoma	6.1	33	4	20.8	33	**	7	39.9
Brant	53.6	5	7	48.9	25		8	55.0
Cochrane	25.2	21	8	73.2	16		12	110.0
Durham Region	91.8	1	50	124.7	2	**	50	119.8
East Muskoka-Parry Sound	19.8	23	8	34.3	30	*	6	27.1
Eastern Ontario	12.4	29	6	53.7	23		10	86.4
Essex County	58.5	3	47	113.0	6	*	57	134.0
Grey-Bruce	37.2	11	15	68.7	18		13	60.3
Haldimand-Norfolk	28.9	16	13	93.2	7		13	96.2
Haliburton, Kawartha & Pine Ridge	28.4	19	27	62.1	20		29	68.0
Halton	26.9	20	27	69.8	17		29	74.8
Hamilton-Wentworth	12.0	31	29	48.7	26	**	34	57.1
Hastings & Prince Edward Counties	31.8	15	13	64.2	19		12	59.4
Huron/Perth	51.7	6	20	113.7	5		24	135.6
Kenora-Rainy River	45.8	8	5	47.3	27		5	49.6
Kent County	12.2	30	4	29.3	31	*	4	30.0
Kingston, Frontenac and Lennox & Addington	57.4	4	25	114.7	4		23	108.0
Lambton	21.9	22	11	61.3	21		14	81.9
Manitoulin-Sudbury	17.9	26	23	87.8	9		27	102.8
Metropolitan Toronto:	38.1	10	258	87.2	10		265	86.2
Borough of East York	34.7		5	36.2			3	20.9
City of Etobicoke	48.6		44	91.7			49	99.9
City of North York	45.3		83	102.5			78	92.3
City of Scarborough	15.7		57	90.4			59	90.1
City of Toronto	45.7		55	74.4			56	73.4
City of York	26.2		15	82.7			20	107.4
Niagara	19.5	24	28	49.6	24	*	31	55.2
Nipissing/Timiskaming	8.5	32	7	44.9	29		8	48.8
Ottawa-Carleton Regional:	16.8	28	56	74.4	15		78	100.8
City of Ottawa	14.1		23	51.9			34	76.4
Ottawa, Eastern Region	18.5		8	56.1			13	87.2
Ottawa, Western Region	21.6		25	132.0			31	156.7
Peel:	34.5	13	60	88.1	8		63	86.4
City of Brampton	45.1		28	119.1			33	127.8
City of Mississauga	28.8		32	71.8			30	64.4
Renfrew County	19.0	25	3	21.3	32	*	5	39.7
Rideau Valley	35.2	12	12	58.8	22		8	37.8
Simcoe County	43.7	9	31	81.7	12		25	65.3
Thames Valley	28.5	18	50	77.5	14		67	103.0
Thunder Bay	34.1	14	17	85.9	11		24	118.2
Waterloo Region	28.5	17	33	80.4	13		45	108.5
Wellington-Dufferin	48.1	7	30	131.5	1	**	27	115.2
West Muskoka-Parry Sound	17.8	27	2	46.3	28		2	49.0
York Region	67.3	2	64	121.9	3	✢✢	56	106.0
Total Ontario	34.2		993	78.9			1,081	89.3
Coefficient of Variation (%) [CV]	49.9			30.9				
Extremal Quotient [EQ]	15.1			6.3			Spearman Correlation	R=0.700 (p<0.0001)
Systematic Component of Variation [SCV]	129.3			83.6				
Adjusted Chi-square (likelihood ratio)	93.0 (d.f. 32, p<0.0001)			101.4 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age-adjusted Radical Prostatectomy Rates per 100,000 Men 50 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



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29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age-adjusted Rate
(quintiles)

113.7 to 131.5
80.4 to 93.2
62.1 to 77.5
47.3 to 61.3
20.8 to 46.3

Exhibit 5.64

Comments

Reports in Ontario and elsewhere have documented the rapid rise in the number of men undergoing radical prostatectomy over the last decade. We suggest that the primary reason for the large increase in radical prostatectomy is increased detection of operable disease due to PSA screening. Other possible reasons for this rise include the aging of the population, the use of nerve-sparing procedures that may reduce the morbidity associated with surgery, and a shift away from radiation treatment due to concerns about its long-term efficacy.

Most men with localized prostate cancer are relatively symptom-free, although many have nonspecific urinary symptoms. Health care providers continue to face the controversy of whether to screen asymptomatic men for prostate cancer and the subsequent dilemma about whether to treat early-stage prostate cancer with surgery, radiation treatment or "watchful waiting." Debate continues over the degree to which screening and early treatment alter the natural history of the disease and whether the survival benefit outweighs the morbidity caused by treatment. Prospective randomized trials evaluating the efficacy of screening and of radical intervention, compared with observation are under way in the United States and Europe. However, the results from these will probably not be available before the year 2005.

The uncertainty about screening is reflected in the conflicting advice given by various national bodies. In Canada, most organizations oppose widespread screening. However, patients and their physicians continue to request PSA testing on the basis of their belief that earlier detection and treatment is likely to be beneficial.

Despite the decreased DHC-specific variation in use of radical prostatectomy, the geographic variation remains moderately large. This variation presumably reflects variable beliefs in local medical communities concerning the merits of early detection and treatment. A recent report of the Chief Medical Officers of England and Wales[180] noted that, “Care should be provided as close to the patient’s home as is compatible with high quality, safe and effective treatment.” Our data show that there are areas where radical prostatectomy is performed infrequently. Is it possible that the patient would be better served by being referred to a region or unit that does this procedure more often? A considerable amount of literature suggests that patients have lower rates of adverse outcomes if they have surgery performed in high volume institutions or by high volume surgeons.[181-186] The present data do not allow us to determine whether the outcomes of this surgery are correlated with the frequency of prostatectomy performed by an individual surgeon.

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Orchidectomy

Overview

Because prostate cancer is androgen-dependent in 85% to 90% of patients,[187–189] androgen ablation is the treatment of choice for patients with metastatic prostate cancer. It is also now used frequently in patients with less advanced disease prior to definitive local therapy or following biochemical failure after radical treatment (i.e., a rising PSA). Androgen ablation can be achieved by surgical castration (orchidectomy) or by the administration of drugs. Drug options include gonadotrophin-releasing hormone (GnRH) agonists, estrogen and progestational agents. Direct comparisons of these agents in randomized clinical trials have not demonstrated the superiority of one treatment over another, although not all treatment comparisons with these agents have been carried out. There are differences among them in the profile of side-effects and the costs of treatment regimens used. When there is no clear advantage of one therapy over another, decisions about which treatment to use are made on the basis of multiple factors. Among these factors are ease of use, perceived side-effect profile and cost. Ultimately, the selection of treatment becomes a matter of patient choice after available relevant information has been reviewed.

Androgen ablation by surgical orchidectomy or by the administration of GnRH agonists has now become standard treatment for advanced prostate cancer.[187,190] The efficacy of total androgen blockade (addition of an antiandrogen to one of the above therapies) versus monohormonal therapy in patients with advanced prostate cancer continues to be debated. Although some trials suggest that combined androgen blockade produced improvements in rates of response or survival over therapy with a single hormonal agent,[191-195] a recent meta-analysis of available randomized trials failed to show a conclusive benefit. Specifically, the Prostate Cancer Trialists' Collaborative Group[196] concluded that available evidence from 22 randomized trials did not show that total androgen blockage (castration plus prolonged use of an antiandrogen such as flutamide, cyproterone acetate or nilutamide) results in unequivocally longer survival than castration alone. This meta-analysis has been criticized on methodologic grounds, including the fact that it focuses on survival alone.[197-199] One major trial[200] showed that the combined use of an anti-androgen plus orchidectomy demostrated significant improvement or delayed deterioration for subjective variables such as metastatic pain, performance status and urinary symptoms.

Analysis of Orchidectomy

Methods

The denominator for the analyses in this section is all men residing in Ontario who were 50 years of age and older on the index admission analysed. Since orchidectomy can be performed as a day surgery procedure, we included day surgery data from 1991/92 to 1994/95 in addition to inpatient data. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in Orchidectomy

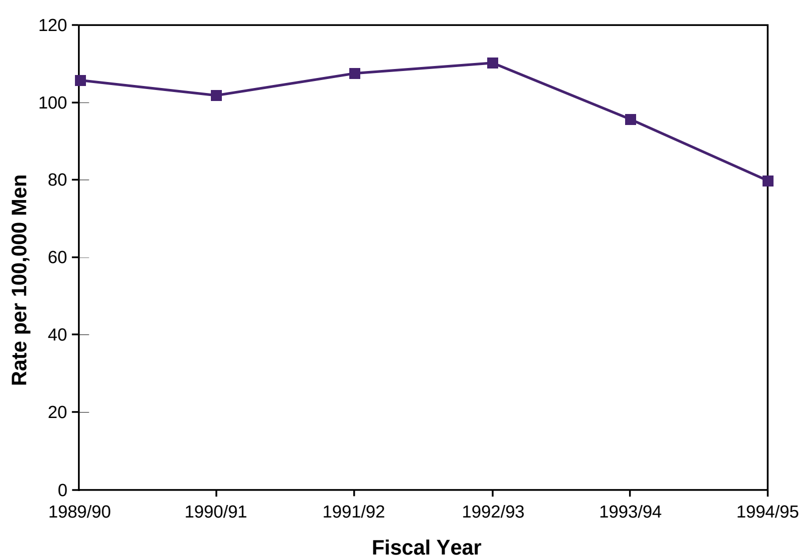
Surgical orchidectomy showed a steady increase from 67 per 100,000 men 50 years of age and older in 1981/82 to 108 per 100,000 in 1991/92, representing a 55.2% relative increase.[201] However, in the most recent years, the rate of surgical orchidectomy showed a steady decline (Exhibits 5.65 and 5.66). The provincial rate of surgical orchidectomy declined from 105.1 per 100,000 in 1989/90 to 1991/92, to 95.1 per 100,000

Exhibit 5.65: ***Overall and Age-specific Orchidectomy Rates per 100,000 Men 50 Years and Over in Ontario, 1989/90 - 1994/95***

Fiscal Year	Overall Rate	Age Group 50 - 64	65 - 74	75 +
1989/90	105.8	22.9	147.0	370.3
1990/91	101.7	21.1	137.2	363.7
1991/92	107.8	19.8	148.7	386.0
1992/93	110.5	17.2	126.8	348.1
1993/94	95.8	12.8	113.4	290.4
1994/95	80.0	13.6	93.1	227.6

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 5.66: ***Overall Age-adjusted Orchidectomy Rates per 100,000 Men 50 Years and Over in Ontario, 1989/90– 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

in 1992/93 to 1994/95, representing a 9.7% change (Exhibit 5.68).

Geographic Variations in Orchidectomy

Exhibits 5.67 and 5.68 show the data specific to DHCs. In 1989/90 to 1991/92, Wellington–Dufferin had the highest rate of orchidectomy (167.1 per 100,000) and East Muskoka–Parry Sound had the lowest (46.6 per 100,000), a high–low rate ratio of 3.6. In 1992/93 to 1994/95, Haliburton, Kawartha & Pine Ridge had the highest rate of orchidectomy (179.6 per 100,000) and East Muskoka–Parry Sound had the lowest (23.4 per 100,000), a relatively large high–low rate ratio of 7.7. Although the rates of orchidectomy have dropped in recent years, the variation in rates is moderately large and has increased, as indicated by the descriptive statistics at the foot of Exhibit 5.68. There was modest fluctuation in the ranks of DHCs in the two periods studied, as indicated by the Spearman rank correlation coefficient of 0.65.

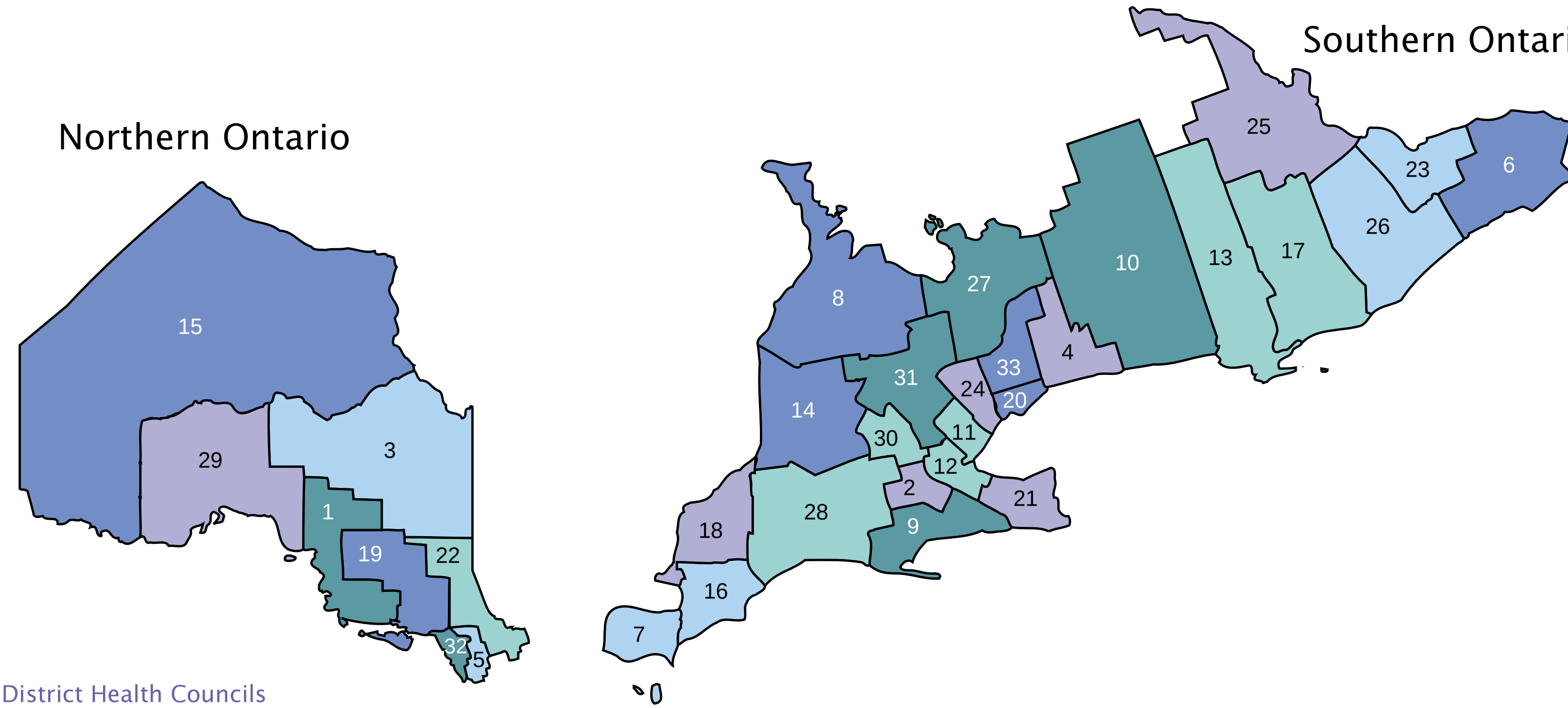
Comments

From 1981 to 1991 we observed a substantial relative increase (55%) in the surgical orchidectomy rate along with expenditures on hormonal therapies for prostate cancer that doubled between 1990 and 1992.[201] The growth in orchidectomy obviously reflected, in part, the growing incidence of prostate cancer. The substantial increase in expenditures for endocrine therapy for prostate cancer was due not only to changes in disease incidence, but also to an increased use of drugs as an alternative or supplement to surgical orchidectomy, and the initiation of treatment at an earlier stage, (i.e., in patients with a rising PSA level after definitive radical therapy). Over the last several years, it is clear that the use of orchidectomy is falling off as medical castration predominates.

The choice between medical and surgical castration is not straightforward. In general, the medical care of patients with advanced prostate cancer focuses on palliation and survival. Surgical orchidectomy is safe, often performed as an outpatient procedure under local anesthetic, and is inexpensive.[202] The disadvantages include the need for surgery and the psychological impact of castration on the patient's self-image.[202] The administration of GnRH agonists is safe and reliably produces castrate levels of testosterone without surgery. The disadvantages are the relatively high cost, the need for a monthly injection and occasional side-effects.[202] Progestational agents are also relatively safe, do not require injections and cause fewer hot flashes than surgical orchidectomy. The main disadvantages are cost, the lack of sustained suppression of testosterone to castrate levels and occasional side effects. Diethylstilbestrol (DES) is inexpensive and requires no injections or surgery but is associated with a significant risk of serious thromboembolic events.[202]

With the emergence of new diagnostic tests and drugs, patients with prostate cancer are now faced with more therapeutic options than ever. Therefore, it is important to incorporate shared patient decision-making in choosing between surgical orchidectomy and medical castration. All patients should be given a reasonable summary of extant knowledge about the relative benefits and risks of the various treatment options in hormonal palliation of advanced prostate cancer.

Age-adjusted Orchidectomy Rates per 100,000 Men 50 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age-adjusted Rate
(quintiles)

- 129.7 to 179.6
- 99.9 to 129.0
- 89.7 to 99.8
- 69.5 to 89.7
- 23.4 to 67.7

Exhibit 5.67

Exhibit 5.68: *Age-adjusted Orchidectomy Rates per 100,000 Men 50 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age-adjusted Rate per 100,000
Algoma	94.2	23	23	139.1	4		33	197.6
Brant	118.6	13	14	89.7	20		12	79.7
Cochrane	117.3	15	6	57.6	31		6	55.7
Durham Region	108.6	19	37	93.9	16		32	80.8
East Muskoka-Parry Sound	46.6	33	5	23.4	33	✢✢	2	8.2
Eastern Ontario	129.6	8	15	129.0	7		15	122.7
Essex County	109.4	17	26	62.2	29	*	20	46.5
Grey-Bruce	146.0	3	28	118.2	10		24	98.8
Haldimand-Norfolk	126.4	10	18	129.7	6		21	145.9
Haliburton, Kawartha & Pine Ridge	135.9	6	84	179.6	1	✢✢	58	124.1
Halton	140.9	4	30	83.7	23		17	47.1
Hamilton-Wentworth	91.9	24	45	73.8	24		36	57.7
Hastings & Prince Edward Counties	81.7	27	18	85.4	22		13	59.0
Huron/Perth	128.7	9	24	120.5	9		29	140.9
Kenora-Rainy River	135.0	7	13	125.5	8		10	96.2
Kent County	54.6	30	10	67.7	28		8	50.3
Kingston, Frontenac and Lennox & Addington	82.7	26	15	69.5	27		21	93.3
Lambton	111.0	16	17	95.6	15		11	62.9
Manitoulin-Sudbury	140.2	5	28	116.0	11		31	124.7
Metropolitan Toronto:	106.3	20	306	101.6	12		266	84.6
Borough of East York	115.8		14	89.7			13	84.2
City of Etobicoke	94.8		51	112.9			50	105.0
City of North York	109.6		85	99.5			67	75.1
City of Scarborough	95.6		62	109.4			60	99.2
City of Toronto	108.2		74	94.3			61	74.3
City of York	125.7		19	97.4			14	70.2
Niagara	99.2	21	59	99.8	14		44	74.3
Nipissing/Timiskaming	60.1	29	12	71.0	26		13	75.6
Ottawa-Carleton Regional:	49.6	32	46	61.0	30	**	36	45.9
City of Ottawa	53.2		25	53.3			27	57.7
Ottawa, Eastern Region	44.1		5	44.2			2	19.3
Ottawa, Western Region	46.9		17	94.8			7	34.8
Peel:	118.5	14	55	89.8	19		53	83.4
City of Brampton	128.4		21	105.6			14	71.7
City of Mississauga	113.5		34	82.0			39	90.0
Renfrew County	53.7	31	12	93.2	17		11	78.4
Rideau Valley	60.4	28	8	34.3	32	**	8	35.1
Simcoe County	148.3	2	65	162.4	2	✢✢	43	103.7
Thames Valley	109.3	18	50	73.6	25		40	57.2
Thunder Bay	125.3	11	18	91.7	18		17	83.7
Waterloo Region	88.4	25	37	89.7	21		36	85.8
Wellington-Dufferin	167.1	1	35	144.0	3	*	28	114.4
West Muskoka-Parry Sound	96.0	22	5	130.7	5		2	51.9
York Region	124.3	12	47	99.9	13		46	92.7
Total Ontario	105.1		1,211	95.1			1,042	73.7
Coefficient of Variation (%) [CV]	25.3			31.0				
Extremal Quotient [EQ]	3.6			7.7			Spearman Correlation	R=0.647 (p<0.0001)
Systematic Component of Variation [SCV]	37.7			76.2				
Adjusted Chi-square (likelihood ratio)	86.1 (d.f. 32, p<0.0001)			123.3 (d.f. 32, p<0.0001)				

* Significant at 5% level   ** Significant at 1% level   ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

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Transurethral Resection of the Prostate

Overview

Benign prostatic hypertrophy (BPH) is present to some degree in about 50% of all men by age 60 and in more than 90% of men 80 years of age or older. Not surprisingly, prostatic hypertrophy is a very frequent cause of hospitalization and surgery for men 65 years of age and older. Since people older than 75 are the most rapidly growing age group in Canada, BPH will continue to be a major public health issue.

The main indication for transurethral resection of the prostate (TURP) is acute or chronic urinary retention associated with BPH. It is also performed to eliminate or reduce complaints such as nocturia, reduced force of stream, frequency, double voiding or incomplete emptying and hesitancy. Perspectives about TURP have changed in the last five years. Indications for surgery have become more stringent, with increased emphasis on “watchful waiting” and drug therapy. As well, there has been increased emphasis on involving the patient in selecting treatment options, since the primary reason for surgery is to improve quality of life and relieve symptoms. This shift in perspective was most clearly articulated in the 1994 guidelines for management of benign prostatic hypertrophy distributed under the auspices of the US Agency for Health Care Policy and Research[203].

The range of treatment options has also changed. For example, randomized studies have compared TURP to alternatives such as transurethral microwave thermotherapy,[204] transurethral incision,[205] or transurethral balloon dilatation. Recently, there has been growing interest in laser-assisted prostatectomy under either visual control (visually-guided or endoscopic laser-assisted prostatectomy) or with ultrasound guidance (transurethral ultrasound-guided laser-induced prostatectomy). A further advance is the contact mode of laser prostatectomy that causes immediate vaporization of prostate tissue. In addition to these various surgical or interventional methods, many patients' symptoms respond to alpha-blockers (e.g. terazosin), finasteride or both drugs in combination. If the symptoms are mild, then watchful waiting might reasonably be a patient's preferred option.

Analysis of TURP

Methods

Since BPH is a condition of older men, we included only men 50 years of age and older, and used the following age groups: 50 to 64, 65 to 74, and 75 or older. Laser prostatectomy is still in its embryonic phase and not a concern in this analysis. However, current CCP coding methods do not clearly distinguish between total and minimal TURP, or even transurethral incision of the prostate. Furthermore, although the ICD-9-CM coding system provides a separate code for balloon dilatation of the prostate, there is no distinct code in the CCP.

We have taken steps to prevent undercounting through miscoding. First, we searched both inpatient and outpatient files for CCP codes 72.1 (transurethral resection of the prostate) and codes 72.59 (other prostatectomy) or 72.89 (other operations on the prostate) in combination with ICD-9 600 for benign prostatic hypertrophy. Outpatient 72.1 cases were attributed to their site of residence; many cases were missing residence codes, and were therefore assigned on the basis of postal codes. The proportion excluded remains small, amounting to 330 outpatient TURPs in 1994/95 or about 3% of the total number of procedures. In 1994/95, we found only 13 and 6 cases of 72.59 and 72.89 respectively, and only eight of the two codes combined in which the primary diagnosis was benign prostatic hypertrophy. These numbers suggest that neither new technologies or outpatient procedures are likely to cause any serious errors in calculating DHC rates of surgery for benign prostatic disease. Procedure codes are included in appendix A5.1 while missing data and excluded cases are summarized in appendix A5.2.

Overall Trends in TURP

In the first edition, we reported that overall provincial age-adjusted rates had not changed to any meaningful extent over time. The age-adjusted TURP rate among men 50 years and older was more or less constant from 1981/82 to 1991/92. However, we noted then that the rate increased slightly from 1981/82 to 1987/88 and then decreased from 1988/89 to 1991/92. In this same period, rates of use of other types of prostatectomy declined markedly.

The most recent period confirms that the downturn previously seen from 1988/89 to 1991/92 represents a strong trend. The TURP rate was steady at around 1430 per 100,000 men aged 50 years and older in 1985/86 and 1986/87 but dropped to 832.2 in 1994/95 — a dramatic decrease (Exhibits 5.69 and 5.70).

Exhibit 5.69: ***Overall and Age-specific Transurethral Resection of the Prostate Rates per 100,000 Men 50 Years and Over in Ontario, 1985/86 - 1994/95***

Fiscal Year	Overall Rate	Age Group 50 - 64	65 - 74	75 +
1985/86	1,432.6	571.5	2,215.2	3,449.1
1986/87	1,427.5	560.3	2,183.8	3,517.4
1987/88	1,537.4	643.1	2,330.7	3,668.0
1988/89	1,457.5	589.7	2,250.8	3,481.1
1989/90	1433.1	580.8	2,203.0	3,437.5
1990/91	1440.1	594.8	2,232.1	3,376.0
1991/92	1327.5	539.7	2,083.3	3,098.6
1992/93	1072.1	401.6	1,667.1	2,668.7
1993/94	887.9	317.2	1,389.4	2,255.7
1994/95	832.2	291.4	1,262.5	2,228.9

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

This decline is somewhat more marked for men 50 to 64 years of age, but unquestionably occurred in all age groups. The reductions for men 65 years of age and older are especially clear since 1991/92, the last year included in the previous edition (Exhibit 5.69).

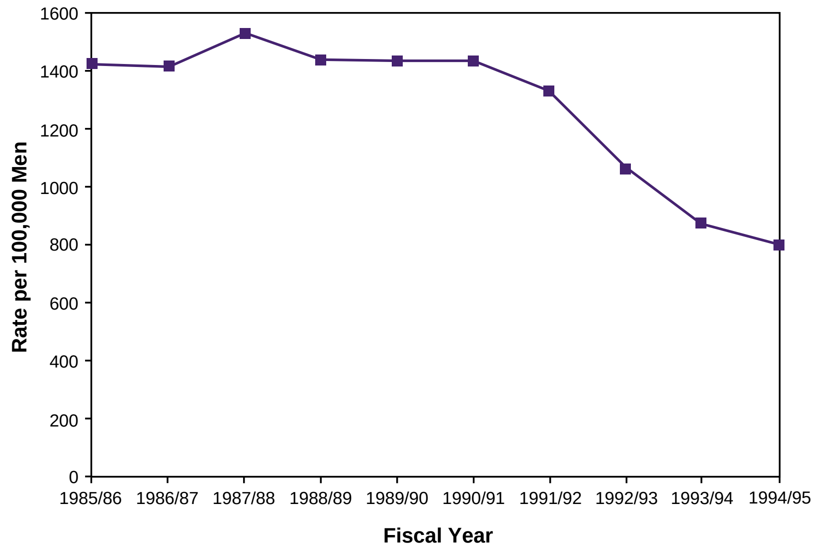
Geographic Variations in TURP

The map (Exhibit 5.71) shows geographic patterns of variation in rates of TURP by DHC of patient residence. The list of DHCs (Exhibit 5.72) confirms a two-fold variation from highest to lowest DHCs. However, there is a dramatic shift in absolute difference from the preceding period. In 1989/90 to 1991/92, several DHCs ranged as high as 1700 to 1800 operations per 100,000 men 50 years of age and older, whereas others were at about 800 to 900 operations per 100,000. The absolute inter-area differences for 1992/93 to 1994/95 are compressed, with only three DHCs around 1300 (or higher), and most ranging between 650 and 1000 procedures per 100,000. This is reflected by drops in both the Chi-square value and the SCV. Variation which was previously moderately large is now moderate. Moreover, the Spearman rank correlation coefficient, while highly significant ($p < 0.0001$), is lower than for many other procedures, at 0.705, confirming that some of the DHCs have undergone particularly sharp drops in TURP utilization (see summary measures at foot of Exhibit 5.72).

Comment

The modest decline in TURP seen in the last edition has now become much more pronounced, with a 40% decline in the age-adjusted TURP rate between 1985/86 and 1994/95. As has also been demonstrated in an analysis of US Medicare data,[206] the peak year was 1987/88. However, the downward trend in the United States occurred earlier. By 1990, age-specific TURP rates per 100,000 men were 2,500 for men 75 years of age and older, 1,900 for those 70 to 74 years of age, and 1,300 for those 65 to 69 years of age.[206] These rates are much lower than

Exhibit 5.70: ***Overall Age-adjusted Transurethral Resection of the Prostate Rates per 100,000 Men 50 Years and Over in Ontario, 1985/86– 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Ontario's TURP rates for the same year (see Exhibit 5.69). However, starting in 1990/91, there was an acceleration in the rate of decline in Ontario's TURP rates.

We speculate that this shift reflects primarily the use of alternative approaches such as medical therapy with alpha-blocking drugs and finasteride, along with a shift in thresholds for performing surgery, with more use of watchful waiting. In the latter respect, we reported in the first edition that by far the biggest decrease in rates was for men in the 50 to 59 year age group, which supports the hypothesis that urologists have largely abandoned the use of TURP as prophylaxis in younger men without clearcut symptoms. However, as noted above, the TURP rate has recently fallen sharply in all age groups, including those older than 75.

It is exceedingly unlikely that this decline is artifactual and due to unmeasured substitution effects. The CCP coding system does not provide specific codes for laser prostatectomies and balloon dilatations, in contrast to the ICD-9-CM system. However, as noted in the Methods section, when we examined "other prostatectomies" and "other operations on the prostate" in conjunction with the diagnosis code for benign prostatic hypertrophy, we did not turn up a substantial number of procedures in either the inpatient or outpatient files.

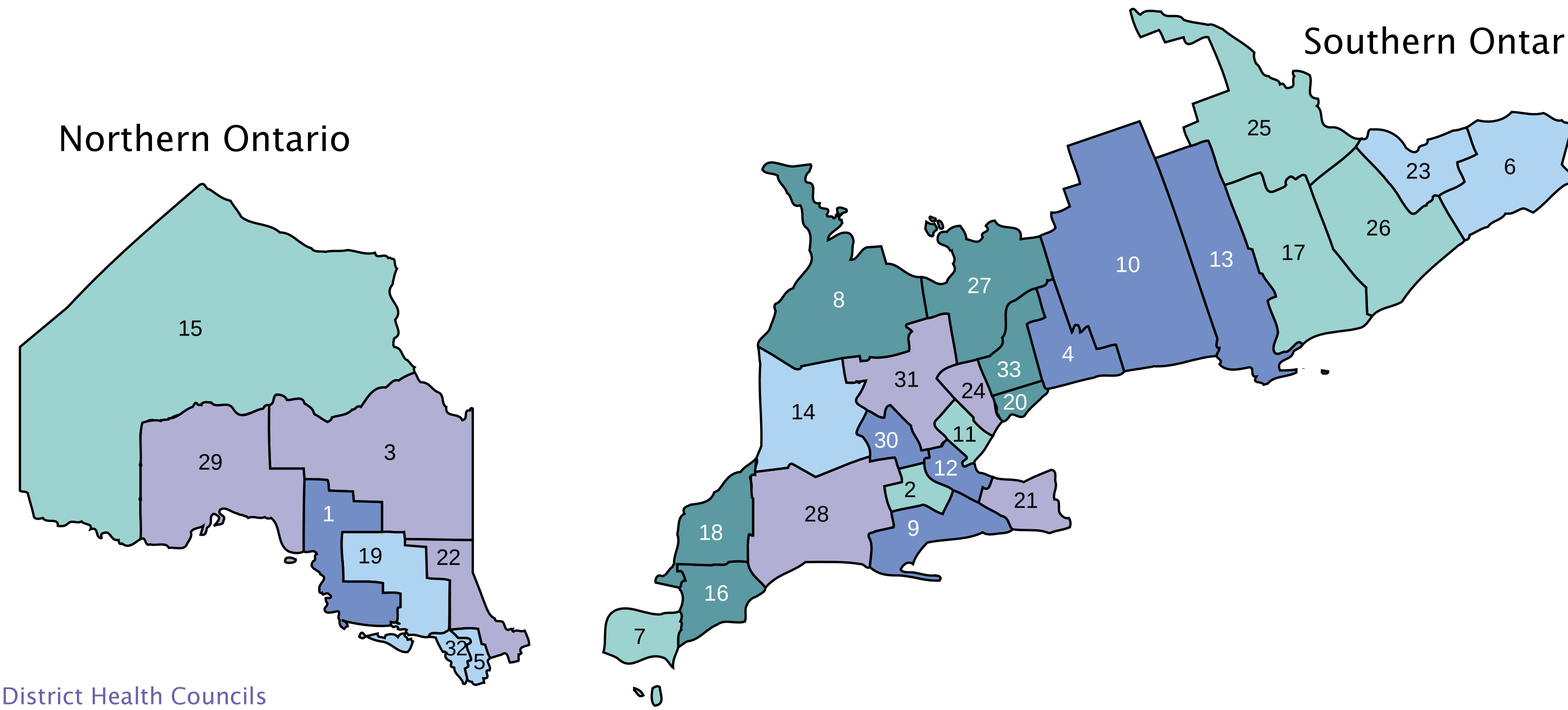
It is unclear why rates for some DHCs remain more than 1,000 yet those in several others are less than 700. Although the degree of geographic variation fell over the two study periods, it remains moderate.

A review of the literature raises some intriguing questions about the current and future utilization patterns of TURP. TURP remains the therapeutic "gold standard" for relief of urinary symptoms, mitigation of obstruction (as measured with urodynamic studies) and improvements in overall health status and self-rated quality of life.[207] There is controversy about whether suprapubic (i.e., open) prostatectomy is preferable to TURP for glands weighing more than 50 g,[208] but most of these cases are still handled by TURP.

Balloon urethral dilatation has the obvious advantage of being less invasive and having minimal morbidity. Optimistic assessments of its

Exhibit 5.71

Age-adjusted Transurethral Prostatectomy Rates per 100,000 Men 50 Years and Over by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age-adjusted Rate (quintiles)
1038.4 to 1299.3
910.2 to 1026.7
838.4 to 898.7
707.9 to 829.8
646.1 to 696.2

Exhibit 5.72: *Age-adjusted Transurethral Resection of the Prostate Rates per 100,000 Men 50 Years and Over by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age-adjusted Rate per 100,000	Rank	Number of Procedures/Year	Age-adjusted Rate per 100,000	Rank	p-value	Number of Procedures	Age-adjusted Rate per 100,000
Algoma	1,539.9	7	166	977.1	11		137	794.9
Brant	1,663.6	5	122	782.7	25		125	780.7
Cochrane	1,748.3	4	92	896.6	15		76	728.8
Durham Region	1,239.4	20	357	910.2	13		387	959.3
East Muskoka-Parry Sound	1,416.5	14	82	666.0	31	**	71	561.7
Eastern Ontario	847.5	32	159	672.9	29	++	175	727.2
Essex County	1,344.8	17	345	796.7	23	**	336	759.0
Grey-Bruce	1,493.8	11	272	1,081.2	3	**	241	927.6
Haldimand-Norfolk	1,753.9	3	141	990.5	10		125	852.7
Haliburton, Kawartha & Pine Ridge	1,426.6	13	501	1,016.2	9	*	423	841.1
Halton	1,234.5	21	274	762.2	26	++	262	720.2
Hamilton-Wentworth	1,645.3	6	642	1,026.7	7	*	573	889.1
Hastings & Prince Edward Counties	1,193.2	23	212	934.1	12		203	877.4
Huron/Perth	1,001.3	30	136	650.5	32	++	143	653.5
Kenora-Rainy River	1,058.6	28	84	825.2	22		80	756.7
Kent County	1,409.2	15	167	1,080.2	4	*	145	934.7
Kingston, Frontenac and Lennox & Addington	1,206.7	22	190	829.8	21		147	627.1
Lambton	1,783.3	2	234	1,299.3	1	++	170	937.0
Manitoulin-Sudbury	954.6	31	165	667.2	30	++	138	550.8
Metropolitan Toronto:	1,518.8	8	3,184	1,038.4	6	++	3,064	950.8
Borough of East York	1,780.0		219	1,358.8			200	1,173.7
City of Etobicoke	1,359.3		396	821.6			376	743.3
City of North York	1,419.8		793	925.7			776	860.6
City of Scarborough	1,878.6		871	1,467.8			862	1,388.7
City of Toronto	1,415.4		730	928.7			691	835.5
City of York	1,440.2		175	905.3			159	782.4
Niagara	1,427.3	12	516	845.2	19	*	456	728.1
Nipissing/Timiskaming	1,275.5	19	144	865.4	17		120	713.6
Ottawa-Carleton Regional:	1,171.6	25	521	696.2	28	++	436	565.6
City of Ottawa	1,212.2		316	665.0			252	518.5
Ottawa, Eastern Region	1,214.3		71	726.5			68	667.5
Ottawa, Western Region	1,047.0		134	796.8			116	658.4
Peel:	1,294.7	18	495	838.4	20	*	498	820.2
City of Brampton	1,749.5		193	964.7			171	810.7
City of Mississauga	1,063.6		302	774.3			327	823.4
Renfrew County	1,024.3	29	100	707.9	27	**	86	584.6
Rideau Valley	1,190.9	24	188	796.0	24		186	760.0
Simcoe County	1,505.8	9	461	1,133.1	2	++	435	1,032.3
Thames Valley	1,504.8	10	631	898.7	14		559	766.6
Thunder Bay	1,170.6	26	174	850.5	18		154	740.6
Waterloo Region	1,373.3	16	418	1,016.4	8		417	989.4
Wellington-Dufferin	1,163.7	27	208	865.8	16		165	673.7
West Muskoka-Parry Sound	845.4	33	26	646.1	33		20	477.3
York Region	1,843.2	1	493	1,059.1	5	**	419	883.5
Total Ontario	1,402.0		11,899	924.8			10,971	827.1
Coefficient of Variation (%) [CV]	15.2			15.3				
Extremal Quotient [EQ]	2.2			2.0			Spearman Correlation	R=0.705 (p<0.0001)
Systematic Component of Variation [SCV]	33.3			25.6				
Adjusted Chi-square (likelihood ratio)	397.8 (d.f. 32, p<0.0001)			288.0 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

cost-effectiveness have appeared.[209] However, in randomized trials, symptom relief is poorer and less durable with balloon dilatation than with TURP.[210] Balloon dilatation will likely be applicable, if at all, only to selected cases with small glands and modest obstruction. In these patients, who typically have glands estimated to weigh only 20 to 25 g, randomized trials suggest that transurethral incision or minimal resection is as effective as full TURP.[211,212] Here, too, although balloon dilatation is moderately effective, randomized comparisons suggest that incision leads to more durable symptom relief.[213] Thus, for small glands, incision may well be underutilized and the logical ancillary question becomes whether medical therapy would suffice for these patients. Neither current coding practices on discharge data nor the level of detail on computerized abstracts allow us to make any determination of the relationship between estimated prostate size, degree of obstruction, and use of incision or partial resection as opposed to conventional TURP.

Additional methods, including transurethral microwave thermotherapy,[204] which has yet to displace TURP, and, more recently, transurethral laser-assisted prostatectomy,[214] have been explored in randomized studies. Trials confirm that laser-assisted prostate surgery (either transurethral ultrasound-guided laser-induced prostatectomy or visual or endoscopic laser-assisted prostatectomy) has the advantage of major reductions in the need for blood transfusions and fewer short-term complications.[214,215] Cost reductions are also possible because patients undergoing laser prostatectomy can be managed as outpatients. On the other hand, symptom relief is slower and less complete with laser surgery, and the results appear less durable than those of TURP.[215,216] Furthermore, there is disagreement about the cost savings achievable with laser surgery. One recent analysis suggests that costs of supplies offset any differences between an outpatient visual laser-assisted prostatectomy and TURP with three day inpatient stay. Costs were $6,872.42 (US) and $6,925.00 (US) respectively[217], similar to the national average TURP charges (including surgeons' fees) compiled by a major insurer at $7,970, once one adjusts for an average length of stay of 4.3 days.[218] Another analysis concluded that there are savings from reduced hospital patient days, which average about $2,000 (US) per case.[219] These savings, however, may be mitigated if more centres move to outpatient TURPs. Although only 3% of Ontario's TURPs are currently performed on an outpatient basis, this trend may accelerate.[220] Furthermore, contact laser-assisted prostatectomy with immediate vaporization of prostate tissue has the advantage of faster symptom relief than earlier laser technology, and laser fibres may be reused up to six times — a feature that may improve the cost-effectiveness of this technology. Further comparisons of laser prostatectomy and TURP will therefore be important.

We earlier alluded to the guidelines released in 1994 by the US Agency for Health Care Policy and Research, which highlighted the role of informed consent for men choosing therapeutic options.[203] This guideline contains an excellent review of the likely outcome rates from various treatment options.

Serious complications of TURP are rare and becoming rarer. Retrograde ejaculation does occur as a result of surgery in most men, but impotence is not a side-effect. Moreover, short-term incontinence, seen in a substantial minority, subsides for most men by three to six months after surgery.

The benefits of TURP, and the reasons for conservatism in its use, are well illustrated by a randomized trial comparing TURP to watchful waiting for men with moderate syptoms of BPH.[221] After 2.8 years average follow-up, there were twice as many treatment failures in the watchful waiting group, and less interference with activities of daily living in patients who were assigned to early surgery. However, although 24% of the watchful waiting group underwent surgery within three years of assignment, most did not proceed to TURP.[221] Similarly, one review of a waiting list for TURP in the United Kingdom suggested that almost half of the patients had no immediate need for surgery.[222]

In conclusion, there has been an impressive reduction in utilization of TURP in Ontario, consistent with trends elsewhere and with emerging evidence about alternatives to conventional surgical management of benign prostatic hypertrophy. This shift reflects very favourably on the urological community, which, despite the obvious logistic and financial implications for many practitioners, has responded appropriately to new evidence about conservative management, including medical alternatives. Nonetheless, moderate geographic variations in TURP utilization persist, and we have not yet reviewed outcomes of TURP to determine whether operator-dependent variations seen elsewhere are present in Ontario.[223] Analyses using OHIP-linked data or changes in hospital record coding practices are needed to provide a clearer population-based picture of the extent to which urologists have embraced new alternatives to full TURP. Use of decision aids for patients is another fertile field for both research and action, given the current thrust of practice guidelines for management of benign prostatic hypertrophy. As usual, many of these questions and issues will require field work, with collection of primary data. TURP appears to be a procedure in transition; we urge further examination by the involved stakeholders and by Ontario's health research community.

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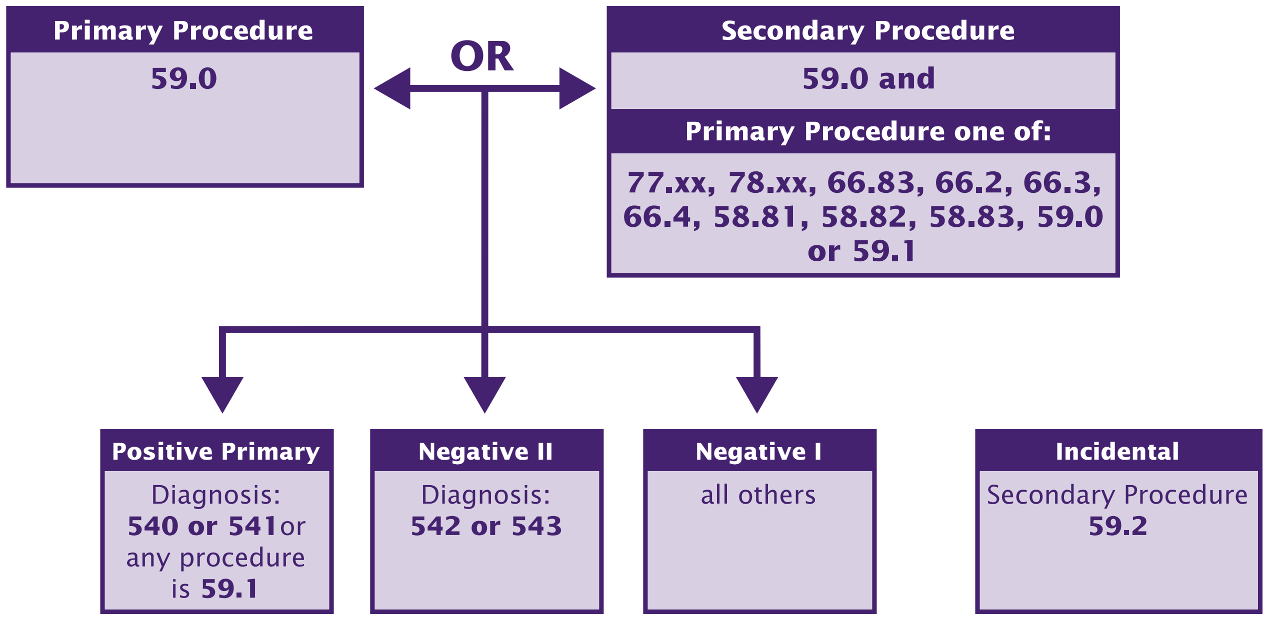
Appendix A5.1: *Procedures/Diagnoses and Canadian Classification of Procedure (CCP) and International Classification of Diseases Diagnosis Codes – 9th Revision (ICD-9)*

Procedure/Diagnosis	Description	CCP/ICD-9 Codes
Hip Replacement	Total Hip Replacement with Methyl Methacrylate Other Total Hip Replacement	93.51 93.59
Knee Replacement	Total Knee Replacement	93.41
Cholecystectomy	Total Cholecystectomy Laparoscopic Cholecystectomy Conversion Bile Duct Injury: Perforation of Bile Duct Accidental Puncture or Laceration During a Procedure Injury to Other Intra-abdominal Organ	63.12 63.12 and 66.83; 63.14 63.12 plus 63.14 with Suffix 8 576.3 **or** ICD-9 998.2 **or** ICE-9 868
Positive Primary Appendectomy	Acute Appendicitis	See Next Page for Algorithm *
Negative I Appendectomy	Diagnoses Appendix-unrelated	
Negative II Appendectomy	Other Diseases of the Appendix	
Incidental Appendectomy	Performed During Another Primary Abdominal Surgery	
Lens Extraction	Intracapsular Extraction of Lens Extracapsular Extraction of Lens Other Extraction of Lens	27.4 27.5 27.6
Carotid Endarterectomy	Endarterectomy on Vessel of Neck	50.12
Abdominal Aortic Aneurysm Repair	Resection of Vessel with Anastomosis Resection of Vessel with Replacement Aorta-iliac-femoral Bypass (with diagnosis of ICD-9 441.3 or 441.4 (abdominal aneurysm))	50.24 50.34 51.25
Peripheral Vascular Surgery	Other (Peripheral) Shunt or Bypass Aorta-iliac-femoral Bypass (WITHOUT diagnosis of ICD-9 441.3 or 441.4 (abdominal aneurysm))	51.29 51.25
Coronary Artery Bypass Surgery	Bypass Anastomosis of Heart Revascularization	48.1
Congestive Heart Failure	Heart Failure (Primary Diagnosis) Hypertensive Heart Disease (with secondary diagnosis code of ICD-9 428)	428 402
Asthma	Extrinsic Asthma (Primary Diagnosis) Intrinsic Asthma (Primary Diagnosis) Asthma, Unspecified (Primary Diagnosis)	493.0 493.1 493.9
Dilatation and Curettage	Diagnostic Dilatation and Curettage	81.09
Hysterectomy	Subtotal Abdominal Hysterectomy Total Abdominal Hysterectomy Vaginal Hysterectomy (Subtotal/Total) Laparoscopically-assisted Vaginal Hysterectomy Radical Abdominal Hysterectomy Radical Vaginal Hysterectomy Pelvic Evisceration	80.2 80.3 80.4 80.4 plus Suffix 4 80.5 80.6 80.7
Radical Prostatectomy	Suprapubic Prostatectomy (plus diagnosis code of ICD-9 185 (prostate cancer)) Retropubic Prostatectomy (plus diagnosis code of ICD-9 185 (prostate cancer)) Radical Prostatectomy (plus diagnosis code of ICD-9 185 (prostate cancer))	72.2 72.3 72.4
Orchidectomy	Bilateral (plus diagnosis code of ICD-9 185 (prostate cancer))	74.3
Transurethral Resection of the Prostate	Transurethral Prostatectomy	72.1

Appendix A5.1 Cont'd ***Appendectomy Algorithm***



Appendix A5.2: *Excluded Cases and Missing Data by Procedure/Diagnosis for Ontario*

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
Hip Replacements								
1985/86	4,285	89	4,196	10	6	0	16	4,180
1986/87	4,581	83	4,498	13	5	1	19	4,479
1987/88	4,944	97	4,847	6	1	0	7	4,840
1988/89	5,115	76	5,039	10	3	0	13	5,026
1989/90	5,247	81	5,166	4	5	0	9	5,157
1990/91	5,790	89	5,701	7	8	0	15	5,686
1991/92	6,262	61	6,201	4	8	0	12	6,189
1992/93	6,403	72	6,331	4	11	0	15	6,316
1993/94	6,505	69	6,436	6	3	0	8	6,428
1994/95	6,977	64	6,913	2	6	0	8	6,905
Total	56,109	781	55,328	66	56	1	122	55,206
% of Total		(1.4%)		(0.1%)	(0.1%)	(0.0%)	(0.2%)	(99.8%)
Knee Replacements								
1985/86	1,839	39	1,800	13	1	0	14	1,786
1986/87	2,225	48	2,177	8	2	0	10	2,167
1987/88	2,752	58	2,694	3	2	0	5	2,689
1988/89	3,073	54	3,019	3	3	0	6	3,013
1989/90	3,620	69	3,551	1	2	0	3	3,548
1990/91	4,202	50	4,152	1	8	0	9	4,143
1991/92	5,029	56	4,973	3	5	0	8	4,965
1992/93	5,417	53	5,364	2	9	0	11	5,353
1993/94	6,047	58	5,989	2	11	0	13	5,976
1994/95	6,638	47	6,591	1	5	0	6	6,585
Total	40,842	532	40,310	37	48	0	85	40,225
% of Total		(1.3%)		(0.1%)	(0.1%)	(0.0%)	(0.2%)	(99.8%)
Cholecystectomy								
1985/86	21,132	263	20,869	48	330	2	379	20,490
1986/87	21,463	241	21,222	53	312	0	365	20,857
1987/88	21,544	245	21,299	65	344	5	412	20,887
1988/89	21,213	159	21,054	100	394	0	494	20,560
1989/90	22,661	199	22,462	41	415	0	456	22,006
1990/91	23,783	216	23,567	44	444	2	490	23,077
1991/92	25,748	265	25,483	31	461	0	492	24,991
1992/93	28,370	225	28,145	10	506	0	516	27,629
1993/94	27,024	230	26,794	23	444	0	466	26,328
1994/95	27,946	217	27,729	23	509	0	532	27,198
Total	240,884	2,260	238,624	438	4,159	9	4,602	234,023
% of Total		(0.9%)		(0.2%)	(0.1%)	(0.0%)	(1.9%)	(98.1%)
Positive Primary Appendectomy								
1989/90	9,502	159	9,343	36	0	0	36	9,307
1990/91	9,587	122	9,465	25	0	0	25	9,440
1991/92	9,401	126	9,275	12	0	0	12	9,263
1992/93	8,992	115	8,877	5	0	0	5	8,872
1993/94	8,857	122	8,735	6	0	0	6	8,729
1994/95	9,116	147	8,969	4	1	0	5	8,964
Total	55,455	791	54,664	88	1	0	89	54,575
% of Total		(1.4%)		(0.2%)	(0.0%)	(0.0%)	(0.2%)	(99.8%)
Negative I Appendectomy								
1989/90	1,071	8	1,063	1	0	0	1	1,062
1990/91	1,053	8	1,045	7	0	0	7	1,038
1991/92	1,084	6	1,078	1	0	0	1	1,077
1992/93	954	11	943	1	0	0	1	942
1993/94	884	14	870	0	0	0	0	870
1994/95	851	12	839	0	0	0	0	839
Total	5,897	59	5,838	10	0	0	10	5,828
% of Total		(1.0%)		(0.2%)	(0.0%)	(0.0%)	(0.2%)	(99.8%)

Appendix A5.2: *(cont'd)*

Negative II Appendectomy

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1989/90	453	2	451	3	0	0	3	448
1990/91	447	2	445	1	0	0	1	444
1991/92	497	4	493	0	0	0	0	493
1992/93	509	3	506	0	0	0	0	506
1993/94	477	5	472	0	0	0	0	472
1994/95	497	12	485	0	0	0	0	485
Total	2,880	28	2,852	4	0	0	4	2,848
% of Total		(1.0%)		(0.1%)	(0.0%)	(0.0%)	(0.1%)	(99.9%)

Incidental Appendectomy

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1989/90	2,247	29	2,218	3	1	0	4	2,214
1990/91	2,098	21	2,077	6	0	0	6	2,071
1991/92	1,685	19	1,666	1	0	0	1	1,665
1992/93	1,482	20	1,462	0	0	0	0	1,462
1993/94	1,298	17	1,281	0	0	0	0	1,281
1994/95	1,354	27	1,327	0	0	0	0	1,327
Total	10,164	133	10,031	10	1	0	11	10,020
% of Total		(1.3%)		(0.1%)	(0.0%)	(0.0%)	(0.1%)	(99.9%)

Lens Extractions

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1985/86	21,322	443	20,879	35	952	6	978	19,901
1986/87	21,709	351	21,358	33	913	5	945	20,413
1987/88	21,186	319	20,867	37	819	8	860	20,007
1988/89	19,014	267	18,747	22	704	3	728	18,019
1989/90	17,184	232	16,952	2	632	0	634	16,318
1990/91	14,375	239	14,136	9	514	0	521	13,615
1991/92	43,685	362	43,323	133	1,745	0	1,873	41,450
1992/93	46,383	287	46,096	52	1,764	0	1,813	44,283
1993/94	48,872	399	48,473	43	1,811	0	1,851	46,622
1994/95	54,467	537	53,930	24	1,995	0	2,018	51,912
Total	308,197	3,436	304,761	390	11,849	22	12,221	292,540
% of Total		(1.1%)		(0.1%)	(3.9%)	(0.0%)	(4.0%)	(96.0%)

Carotid Endarterectomy

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1989/90	625	10	615	1	0	0	1	614
1990/91	697	6	691	0	0	0	0	691
1991/92	1,228	13	1,215	1	0	0	1	1,214
1992/93	1,272	11	1,261	0	0	0	0	1,261
1993/94	1,209	8	1,201	1	0	0	1	1,200
1994/95	1,471	17	1,454	0	0	0	0	1,454
Total	6,502	65	6,437	3	0	0	3	6,434
% of Total		(1.0%)		(0.0%)	(0.0%)	(0.0%)	(0.0%)	(100.0%)

Abdominal Aortic Aneurysm

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1989/90	1,597	41	1,556	0	0	0	0	1,556
1990/91	1,780	31	1,749	0	0	0	0	1,749
1991/92	1,823	29	1,794	0	0	0	0	1,794
1992/93	1,851	29	1,822	0	0	0	0	1,822
1993/94	1,911	29	1,882	1	0	0	1	1,881
1994/95	1,812	28	1,784	0	0	0	0	1,784
Total	10,774	187	10,587	1	0	0	1	10,586
% of Total		(1.%)		(0.0%)	(0.0%)	(0.0%)	(0.0%)	(100.0%)

Peripheral Vascular Surgery

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1989/90	2,925	45	2,880	7	0	0	7	2,873
1990/91	2,866	42	2,824	4	0	0	4	2,820
1991/92	2,945	36	2,909	2	0	0	2	2,907
1992/93	2,787	35	2,752	1	0	0	1	2,751
1993/94	2,801	49	2,752	0	0	0	0	2,752
1994/95	2,688	49	2,639	0	0	0	0	2,639
Total	17,012	256	16,756	14	0	0	14	16,742
% of Total		(1.5%)		(0.1%)	(0.0%)	(0.0%)	(0.1%)	(99.9%)

Appendix A5.2: *(cont'd)*

Coronary Artery Bypass Surgery

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1985/86	4,036	233	3,803	3	3	0	6	3,797
1986/87	4,767	202	4,565	4	1	0	5	4,560
1987/88	4,396	196	4,200	8	2	0	10	4,190
1988/89	4,487	211	4,276	4	6	0	10	4,266
1989/90	5,053	213	4,840	7	1	0	8	4,832
1990/91	5,389	226	5,163	6	1	0	7	5,156
1991/92	5,737	213	5,506	1	1	0	2	5,504
1992/93	6,103	233	5,870	9	0	0	9	5,861
1993/94	6,348	277	6,071	2	1	0	3	6,068
1994/95	6,825	266	6,559	2	3	0	5	6,554
Total	53,141	2,270	50,853	46	19	0	65	50,788
% of Total		(4.3%)		(0.1%)	(0.1%)	(0.0%)	(0.1%)	(99.9%)

Congestive Heart Failure

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1985/86	16,613	215	16,398	21	22	7	50	16,348
1986/87	17,210	190	17,020	38	20	2	60	16,960
1987/88	18,415	175	18,240	31	18	2	51	18,189
1988/89	19,152	200	18,952	66	33	0	99	18,853
1989/90	19,474	212	19,262	26	36	0	62	19,200
1990/91	20,333	183	20,150	18	27	1	46	20,104
1991/92	23,067	223	22,844	27	26	1	54	22,790
1992/93	24,305	244	24,061	12	43	0	55	24,006
1993/94	25,424	257	25,167	18	52	0	70	25,097
1994/95	24,946	206	24,740	6	37	0	43	24,697
Total	208,939	2,105	206,834	263	314	13	590	206,244
% of Total		(1.0%)		(0.1%)	(0.2%)	(0.0%)	(0.3%)	(96.0%)

Asthma

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1985/86	8,921	141	8,780	18	0	3	21	8.759
1986/87	9,431	128	9,303	13	0	3	16	9,287
1987/88	9,526	140	9,386	35	4	2	41	9,345
1988/89	9,587	139	9,448	39	3	1	43	9,405
1989/90	9,057	139	8,918	19	4	0	23	8,895
1990/91	8,520	105	8,415	18	1	0	19	8,396
1991/92	8,275	126	8,149	13	0	0	13	8,136
1992/93	8,036	99	7,937	7	1	0	8	7,929
1993/94	7,856	109	7,747	6	1	0	7	7,740
1994/95	7,636	90	7,546	5	1	0	6	7,540
Total	86,845	1,216	85,629	173	15	9	197	85,432
% of Total		(1.4%)		(0.2%)	(0.0%)	(0.0%)	(0.3%)	(99.8%)

Dilatation and Curettage

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1991/92	44,511	272	44,239	187	560	0	747	43,493
1992/93	39,367	200	39,167	48	425	0	473	38,694
1993/94	33,167	226	32.941	21	374	0	396	32,546
1994/95	31,396	203	31,193	18	343	0	361	30,832
Total	148,441	901	147,540	274	1,702	0	1,976	145,565
% of Total		(0.6%)		(0.2%)	(1.2%)	(0.0%)	(1.3%)	(98.7%)

Hysterectomy

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1985/86	21,469	319	21,150	34	37	6	77	21,073
1986/87	21,604	266	21,338	28	21	5	54	21,284
1987/88	22,663	227	22,436	36	34	9	78	22,358
1988/89	22,073	191	21,882	101	20	4	124	21,758
1989/90	21,345	187	21,158	19	15	1	35	21,123
1990/91	22,329	177	22,152	26	11	0	37	22,115
1991/92	22,445	228	22,217	15	14	2	30	22,187
1992/93	21,954	183	21,771	4	4	5	13	21,758
1993/94	20,696	166	20,530	6	10	3	19	20,511
1994/95	20,246	198	20,048	3	8	2	13	20,035
Total	216,824	2,142	214,682	272	174	37	480	214,202
% of Total		(1.0%)		(0.1%)	(0.1%)	(0.0%)	(0.2%)	(99.8%)

Appendix A5.2: *(cont'd)*

Radical Prostatectomy

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1989/90	245	6	239	0	0	0	0	239
1990/91	368	5	363	1	0	0	1	362
1991/92	616	2	614	0	0	0	0	614
1992/93	854	5	849	1	0	0	1	848
1993/94	1,058	6	1,052	2	0	0	2	1,050
1994/95	1,088	7	1,081	0	0	0	0	1,081
Total	4,229	31	4,198	4	0	0	4	4,194
% of Total		(0.7%)		(0.1%)	(0.0%)	(0.0%)	(0.1%)	(99.9%)

Orchidectomy

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1989/90	1,215	6	1,209	0	0	0	0	1,209
1990/91	1,204	7	1,197	0	0	0	0	1,197
1991/92	1,309	5	1,304	1	0	0	1	1,303
1992/93	1,379	7	1,372	1	0	0	1	1,371
1993/94	1,243	12	1,231	11	0	0	11	1,220
1994/95	1,049	5	1,044	2	0	0	2	1,042
Total	7,399	42	7,357	15	0	9	15	7,342
% of Total		(0.6%)		(0.2%)	(0.0%)	(0.0%)	(0.2%)	(99.8%)

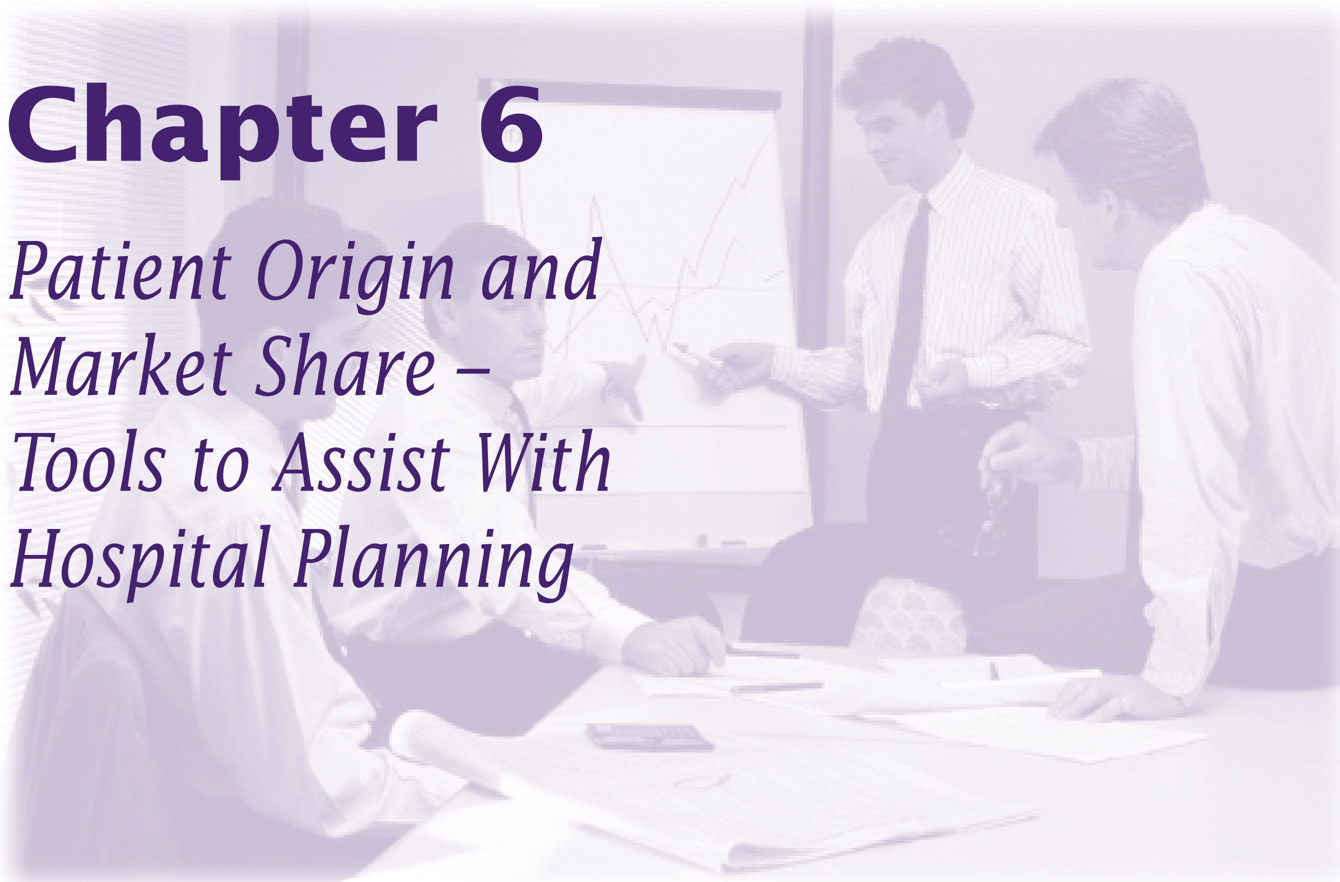
Transurethral Resection of the Prostate

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1985/86	14,719	259	14,460	27	177	1	205	14,255
1986/87	15,239	224	15,015	37	157	1	193	14,822
1987/88	16,881	173	16,708	31	184	0	213	16,495
1988/89	16,467	185	16,282	50	156	1	206	16,076
1989/90	16,634	146	16,488	10	162	0	170	16,318
1990/91	17,205	113	17,092	11	177	0	188	16,904
1991/92	16,313	111	16,202	12	143	0	155	16,047
1992/93	13,532	75	13,457	7	106	0	112	13,345
1993/94	11,529	66	11,463	8	73	0	81	11,382
1994/95	11,108	44	11,064	4	89	0	93	10,971
Total	149,627	1,396	148,231	197	1,424	3	1,616	146,615
% of Total		(0.9%)		(0.1%)	(1.0%)	(0.0%)	(1.1%)	(98.9%)

Appendix A5.3: *Summary of Rate Variations for Surgical Procedures*

Procedure	Study Population	Rate per 100,000 1989/90 - 1991/92	Rate per 100,000 1992/93 - 1994/95	Degree of Variation High:low Ratio 1989/90 - 1991/92	Degree of Variation High:low Ratio 1992/93 - 1994/95	Stability of Regional Rankings
Transurethral Resection of the Prostate	Men 50+ Years	1,402.0	924.8	2.2	2.0	71%
Radical Prostatectomy	Men 50+ Years	34.2	78.9	15.1	6.3	70%
Orchidectomy	Men 50+ Years	105.1	95.1	3.6	7.7	65%
Coronary Artery Bypass Surgery	20+ Years	68.8	77.3 *	3.6	3.1	88%
Carotid Endarterectomy	20+ Years	11.2	16.2	4.8	5.1	74%
Peripheral Vascular Surgery	20+ Years	38.4	33.8	3.4	2.8	76%
Abdominal Aortic Aneurysm Repair	20+ Years	22.9	22.6	2.5	2.6	75%
Dilatation and Curettage	Women 20+ Years	N/A	835.5	N/A	3.1	N/A
Hysterectomy	Women 20+ Years	569.5	503.8	2.5	2.5 **	90%
Lens Extraction	50+ Years	1,605.7 ✣	1,735.4 ✣✣	3.4	4.8	86%
Knee Replacement	20+ Years	56.7	74.2	3.0	2.4	87%
Hip Replacement	20+ Years	76.2	81.5	1.7	1.6	81%
Cholecystectomy	20+ Years	311.1	339.4	1.9	1.9	87%

Note: The overall rates for most procedures, while generally lower than those in the United States, are in the middle to high range when compared to most industrialized countries. These figures do not support the idea that many patients are denied important and beneficial services.
***** increase is primarily in the 65+ years group
** Ratio stated is for the overall degree of variation; may be different for indication-specific variations
✣ For Fiscal Years 1991/92 - 1992/93
✣✣ For Fiscal Years 1993/94 - 1994/95



Chapter 6

Patient Origin and Market Share – Tools to Assist With Hospital Planning

Introduction

Hospitals in Ontario are increasingly being asked to make decisions regarding the breadth and scope of the services they provide in light of the closure of hospital beds and the prospect of restructuring. Some hospital services have been organized into regional programs, such as trauma, perinatal care and coronary artery bypass surgery. Other services, such as pediatrics and obstetrics, have been amalgamated to ensure that nearby hospitals do not duplicate services. In their reports to District Health Councils (DHCs), hospitals are reconsidering the needs of the residents in their communities. Discussions focus on the roles and responsibilities of hospitals with respect to other hospitals and health care agencies in their DHCs, and the levels of service required by the residents of the area. Hospitals are also taking into account the number of services they provide to residents from communities outside their DHC areas.

Generally speaking, hospitals are autonomous agencies. Their boards are responsible for making decisions based on information provided by management, staff, or other individuals. Each hospital can examine its data and define the areas to which it will target its services. Hospitals can share their information with one another, or obtain data through the DHC to jointly plan services. Hospitals and DHCs vary in the information and the methods they use for analysing and presenting data. The purpose of this chapter is to provide DHCs, hospitals, health professionals, and policy-makers with tools to analyse the geographic distribution of patients by community, the hospital destination for residents of a community, and the degree to which hospitals rely on a community for patients.

Data Source and Methods

The analyses and information presented in this chapter are based on hospital separation records from the Canadian Institute for Health Information (CIHI) for the 1994/95 fiscal year. The analyses are focused on 10 categories of medical and surgical services routinely provided by acute care hospitals. The categories are based on primary procedure codes using Canadian Classificaion of Procedure codes (CCP), International Classification of Disease – 9th revision diagnosis codes (ICD-9), or Case Mix Groups® (CMG). The categories were defined so that they: were relatively clinically homogeneous; represented care types that could be generally defined as emergent or elective; and included a blend of medical diagnoses and surgical procedures to provide varied examples. The number of separations for each of the groupings included in the analyses are displayed in Appendix A6.1.

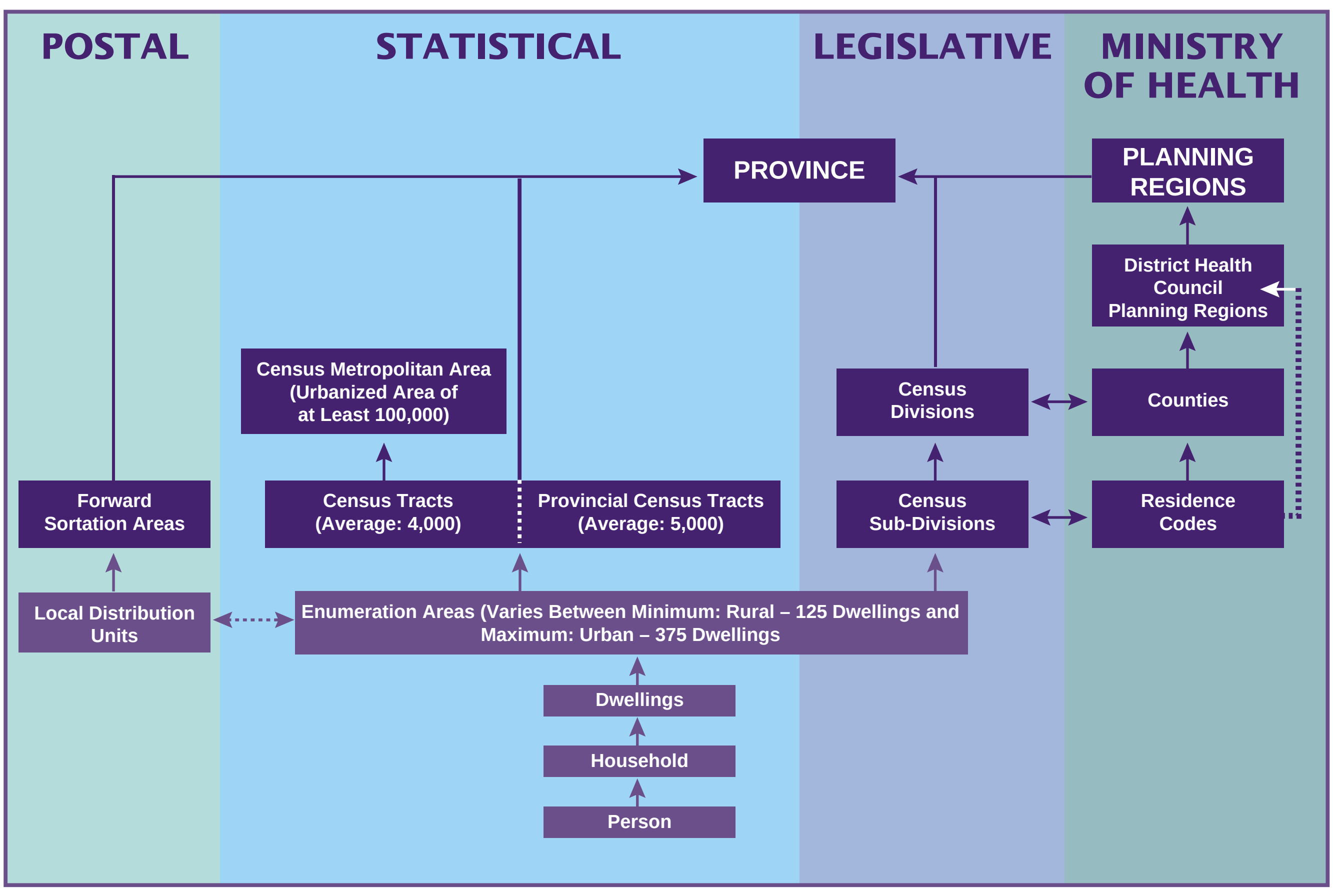
Hospitals considered in this study were those that patients attended, or the nearest eligible hospital that could have provided the service. Hospitals were considered eligible or ineligible on the basis of the services they provided. Only those facilities with at least five separations for given services were deemed "eligible." Hospitals providing obstetrical services were deemed eligible if they provided service to a minimum of 10 patients on either an emergency or elective basis.

To analyse market share, the geographic coordinates or boundaries associated with hospitals and patients must be precisely pinpointed. Postal codes provide geographic coordinates defined by Canada Post (see Appendix A6.2), and residence codes provide geographic boundaries defined by the Ministry of Health (see Appendix A6.3). Patient records were excluded from the analysis if they had missing or invalid postal or residence codes, if they were for newborns, if they were for patients who were not from Ontario, or if the patients had been transferred from another acute care hospital.

The analysis of health care data requires that geographic locations and boundaries sometimes be redefined into alternative geopolitical boundaries, municipalities, counties, districts and regions, or alternatively into census boundaries, enumeration areas, and census tracts defined by Statistics Canada. Exhibit 6.1 demonstrates the hierarchical ordering of the geographic building blocks for postal codes, residence codes, geopolitical units and census divisions. These building blocks can also be aggregated and applied to areas defined by the user. We used postal codes (the Canada Postal Conversion File for Ontario) to determine the latitude and longitude both for patients' residences and for hospitals. In northern and rural areas, postal code locations may represent a postal delivery point rather than the individual's location of residence. Since location calculations for these areas are subject to a higher degree of variation than for urban centres, the results for rural and northern areas should be interpreted with this limitation in mind. Despite this caveat, postal codes provide the greatest degree of specificity available to geographically locate individuals.

The next step was to estimate the distance between the patient's residence and the hospital providing service, and the distance between the patient's residence and the nearest eligible hospital. Estimates were based on linear distance and estimated driving times between the two points. When these were calculated, the spherical shape of the earth was taken into account using the methods outlined by Ng and associates.[1] Linear distances, however, do not take into account the average driving time required to travel between the two points. Estimates of the average driving time were based on the street network file (Appendix A6.4) and calculated using the Drive Time software application (referenced in Appendix A6.5).

Exhibit 6.1: ***Hierarchy of Standard Geographic Boundaries for Ontario***



Data Source: 1991 Census Dictionary: Statistics Canada and 1994 Residence Coding Manual: Ontario Ministry of Health

The terms "relevance" and "commitment" are used to describe the relationship between communities and hospitals. Commitment refers to the proportion of a defined community that goes to a particular hospital for service (also known as market share). Relevance refers to the proportion of patients discharged from a particular hospital that come from a given community (also known as patient origin).[2,3] The term "competition" is used to describe the relationships between hospitals in a community that provide equivalent services.

The means by which hospital service areas can be defined are generally derived from a body of literature related to applied geography and market research.[2,4–7] This research extends back to the mid-1930s, when central place theory was documented, and moves forward with such concepts as location allocation, gravity models and trade area analysis.[8–10] While each of these bodies of research addresses issues primarily related to retail trade, there is a common theme among them: a quantitative methodology that defines a spatial relationship between a vendor or provider and a market or patient.

Three general methodologies for defining a hospital's service area are presented in this chapter, along with a discussion of the strengths and weaknesses of each approach. The methodologies differ in the way they define the boundary of a service area (i.e., pre-defined, distance-based or patient origin).[2,5] These approaches yield more than a dozen alternative variations, some of which will be discussed in further detail.

The material presented in this chapter is supplemented by the electronic version of the Atlas. The electronic version of the Atlas includes a comprehensive data set related to the service categories used in this chapter and provides those data for all hospitals and DHCs in Ontario. The discussion in this chapter makes note of the data available through the electronic version of the Atlas and describes how it can be used for more extensive or related analyses.

Case Studies and Analysis

This section describes in detail the way health care data can be analysed by applying geographic and spatial concepts to a series of case studies. The methods and information outlined can be used to ensure that a community has reasonable access to care.[11]

Case Study I — Obstetrics in the Greater Toronto Area

Market share analyses have typically relied upon geopolitical boundaries (such as DHC, municipal or city boundaries) to measure patterns of hospital utilization. However, referral patterns depend on numerous factors other than geopolitical boundaries. Some of these other factors include patient perceptions, proximity to a hospital and physician referral. This case study presents a methodology for evaluating market share for a hospital or group of hospitals within specified communities and relating these to referral patterns. For the purpose of this discussion, communities that share a common attribute, such as their relationship to a hospital(s), are referred to as "natural neighbourhoods."[12]

Natural neighbourhoods can be used to tie together communities that share common attributes, such as a particular sociodemographic characteristic (e.g., a particular income or education profile or a level of commitment to a hospital). The neighbourhood concept can be an extremely useful method for developing community aggregates based on common and quantifiable attributes. In this manner, health care requirements can be further examined and addressed in a homogenous environment. However, the boundaries of the natural neighbourhoods may not follow traditional geopolitical boundaries which may make it difficult to relate sociodemographic information to them.

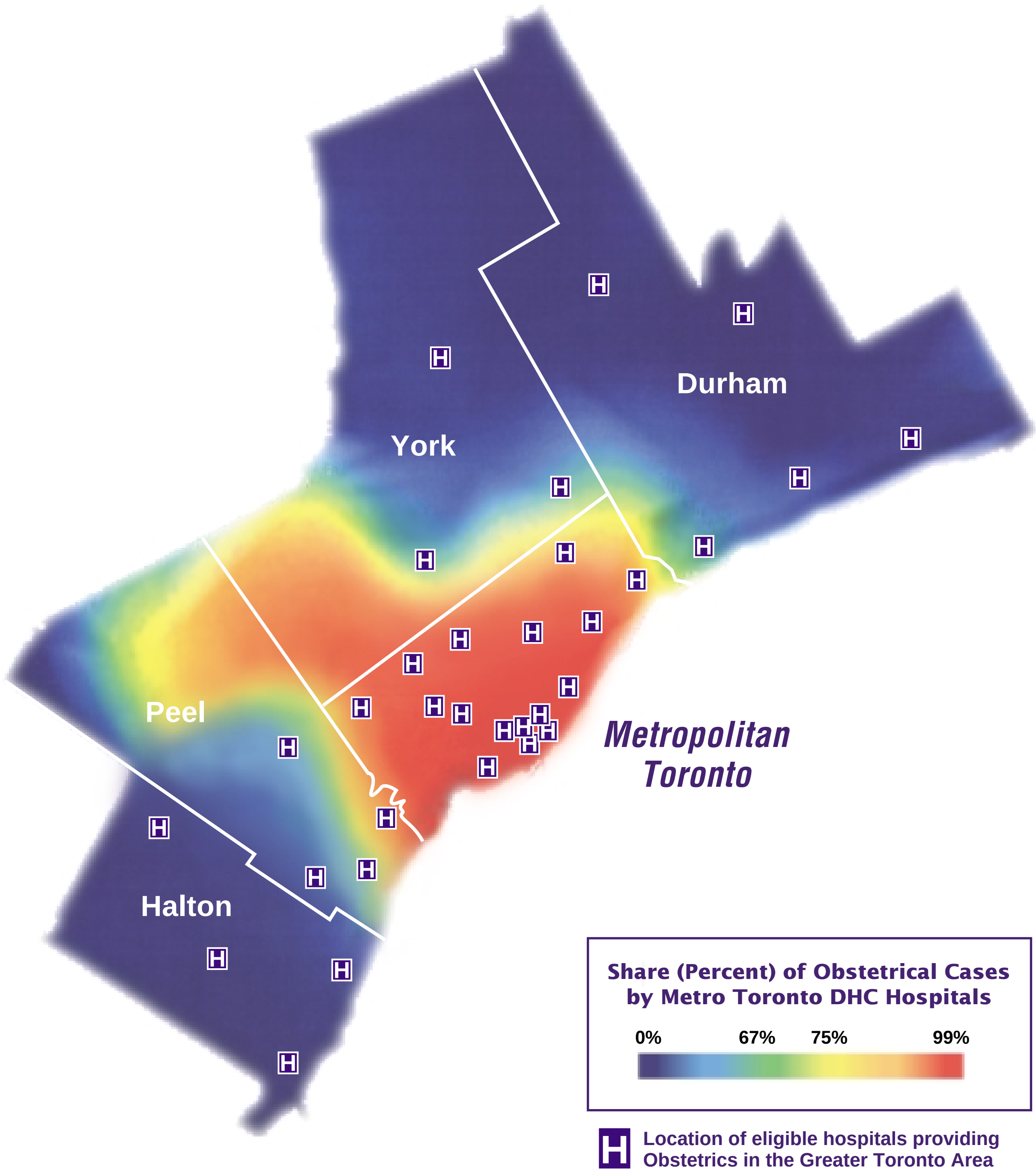
Traditional planning exercises have implicitly attempted to constrain patient preference by adhering to geopolitical boundaries. This assumes that predefined boundaries influence hospital selection or availability, and that access to care in a predefined area is a measure of the equity of service availability.

While geopolitical boundaries can be used to analyse health service utilization, they were developed to meet specific legislative, administrative, regulatory and statistical requirements (Exhibit 6.1). The value of using geopolitical boundaries to analyse referral patterns depends on: the homogeneity of the area in terms of service utilization patterns and demographics; the relevance of the area to the providers being considered; the population distribution within the area; and, the appropriateness of the boundary to the planning requirements. In considering geopolitical boundaries, the level of geographic detail must also be assessed. At the finest level of detail (i.e., an enumeration area) there may not be enough cases to undertake a meaningful analysis. For larger areas, the lack of homogeneity may mask the issues being analysed.

The greatest advantage to using geopolitical boundaries is that they follow the administrative and planning infrastructure of the Ontario Ministry of Health. The primary difficulty associated with the use of predefined boundaries is that, in a number of jurisdictions, utilization patterns do not follow the geopolitical borders.

Exhibit 6.2 reflects the market share, or the percentage of residents who access Metropolitan Toronto DHC hospitals for obstetrical care who live in the Greater Toronto Area (GTA). Market share can be used as a measure of the commitment of a geographic area to a hospital or group of hospitals. The DHC boundaries are included for comparative purposes. Together, the market share and DHC boundaries display the impact of the Metropolitan Toronto DHC hospitals on the southern part of York Region, the western portion of Durham Region and the eastern part of Peel Region.

Exhibit 6.2: ***Market Share Contours for Obstetrical Separations Within the Metro Toronto District Health Council - 1994/95***



The market share information can be used to define aggregate communities that are highly reliant on a hospital or group of hospitals for service (e.g., when more than 50% of the community relies on a hospital for service). These aggregate communities form "natural neighbourhoods" because they share a common attribute — in this case, their reliance on Metropolitan Toronto DHC hospitals for obstetrical care. The natural neighbourhoods can then be used to more accurately define the area from which Toronto hospitals draw obstetrical patients. Alternatively, the natural neighbourhoods may be differentiated on a tiered basis (e.g., market share cutoffs at 25%, 50% and 75%) to separate highly committed communities from those that are less committed.[13]

In examining data on deliveries for women living in southern York Region (made up of the City of Vaughan and the Town of Markham), 76% of the total 2,858 obstetrical separations for 1994/95 were for individuals who lived closest to a hospital outside the DHC boundary. Seventy-two percent of the obstetrical separations actually occurred in hospitals outside of York Region. Of the women whose closest hospital was outside the York Region DHC, who also delivered at a hospital outside the York Region DHC, approximately 23% attended the hospital closest to them. A woman may choose a hospital which is not closest to her home for a variety of reasons — she may have a number of hospitals from which to choose; there may be the attraction of a nearby teaching centre; she may have socio-ethnic ties to a particular hospital; or a physician may recommend a particular physician or hospital.

Although a number of arguments have been put forward to explain why residents seek care "out of area" (outside traditional geopolitical boundaries), this example suggests that the proximity of the hospital to the patient's home is a key factor. If traditional planning parameters based on geopolitical boundaries were applied to the population in southern York Region, then a significant proportion of the population would be prevented from using the closest hospital. The means to address this situation is to redefine the planning boundaries to coincide with service use through the development of natural neighbourhoods. This would mean that access and equity issues could be more appropriately identified and addressed, rather than artificially constraining them through geopolitical analyses.

This example treated the Metropolitan Toronto DHC hospitals as a single provider and the GTA as a single community, and therefore implied a certain homogeneity in community service patterns. However, the GTA is made up of many smaller communities and patterns of referral for individual communities and service providers may vary. A follow-up review should cluster smaller groupings of residents and hospitals to define more discrete natural communities, to allow significant variations to be observed and factored into planning decisions.

Case Study II — Acute Myocardial Infarction Cases in the Rideau Valley DHC

In Exhibit 6.3, smaller and more discrete communities based on market share contours (lines or regions that connect areas of equal value, such as the market share for a particular hospital) are examined. In Exhibit 6.3, the market share contours are colour coded for hospitals which admit patients with acute myocardical infarction (AMI) from the Rideau Valley DHC. AMIs are emergencies that result in self-referral to a hospital rather than a physician referral which is generally the case for elective procedures. These data can therefore be used to begin to approximate the referral patterns for each hospital's emergency department.

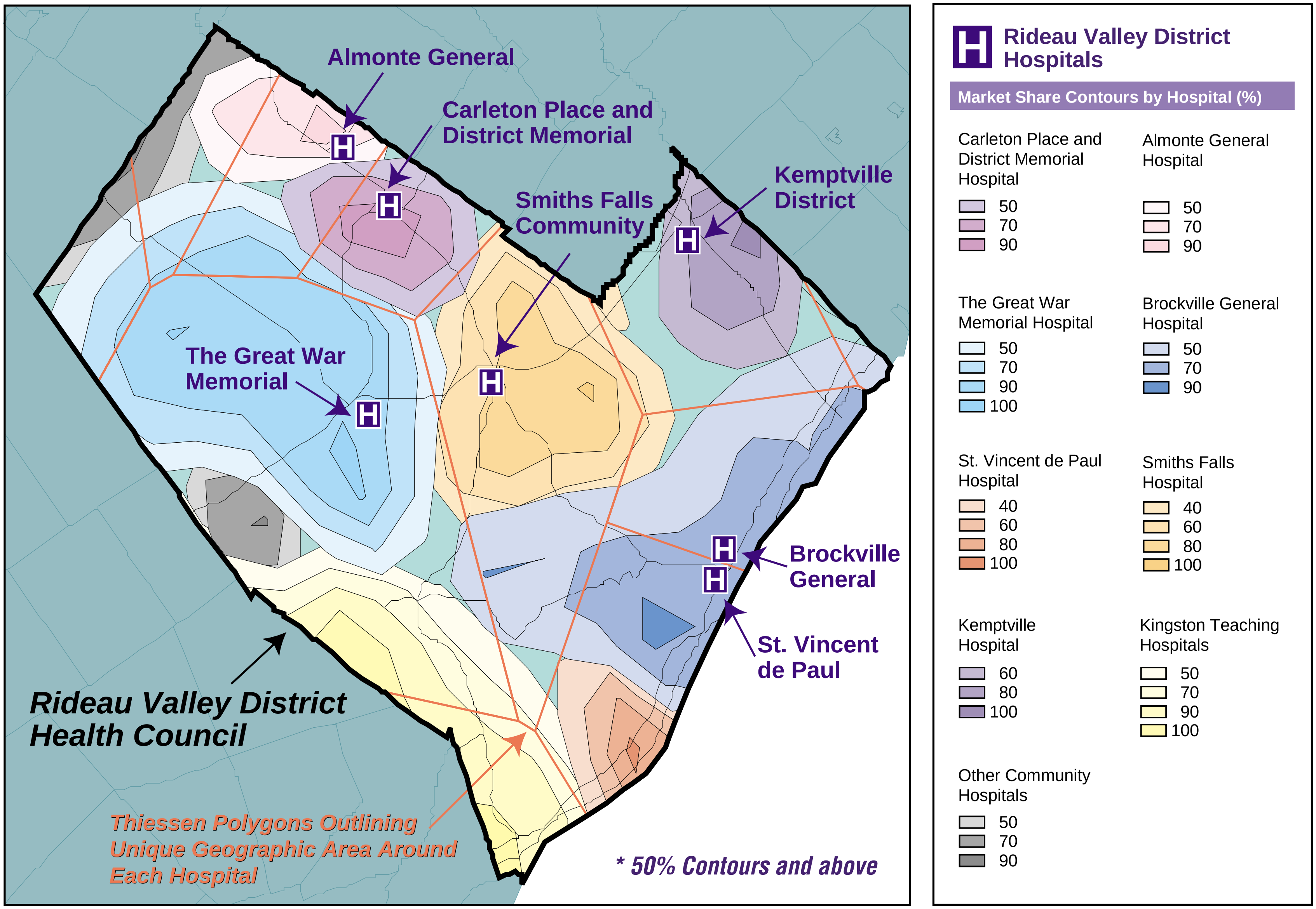
Exhibit 6.3 also includes geopolitical boundaries (i.e. the black boundary around the perimeter of the Rideau Valley DHC), local highways (in black) and Thiessen polygons (in red), which outline a geographic area for a specific provider and competing providers on the basis of proximity.[14] In general, Thiessen polygons are based on distance. Each Thiessen polygon defines a unique geographic area for a hospital, and any point inside the polygon is closer to the defining institution than it is to any other institution. Assuming that patients travel to the closest hospital for service in the case of an emergency, Thiessen polygon boundaries can be strong predictors of hospital utilization patterns. However, distance is not the only consideration in hospital selection. Factors such as teaching affiliation, reputation or physician referral patterns for elective procedures may override the proximity factor. As well, travel time can be a consideration.

The market share contours and Thiessen polygons provide a closer approximation of each hospital's service area than do geopolitical boundaries. In this example, a comparison of market share contours and geopolitical boundaries shows that they are only loosely related to each other.

In some cases, the contours that are concentrated in a particular polygon extend into the polygon for another hospital; the choice of hospital in these situations may be dictated by the layout of local highways. For example, the market share contours for Brockville General Hospital extend into the southwest section of the Smiths Falls Community Hospital polygon. In this particular case, the local highway provides easier access to Brockville General Hospital than it does to Smiths Falls Community Hospital.

The teaching hospitals in Kingston attract residents from the southwestern part of the DHC; similarly, the proximity of Brockville General Hospital and St. Vincent de Paul Hospital to one another minimizes the influence of St. Vincent de Paul Hospital.

Exhibit 6.3: ***Market Share Contours* for Hospitals in the Rideau Valley District Health Council Area – Acute Myocardial Infarction Separations, 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health, and Statistics Canada

Case Study III — AMIs and Hip Replacements at Oshawa General Hospital

In the previous section, the hospital usage patterns within communities were examined. However, hospitals must also be concerned with the communities on which they rely to ensure they serve enough patients to make them viable. To evaluate the importance of a community to a hospital, in terms of patient volume, relevance (patient origin) is measured.

In Exhibit 6.4 community relevance is examined in terms of service usage patterns associated with the Oshawa General Hospital. Predetermined distances and patient origin methods are used to illustrate the differences between linear-distance and drive-time calculations. The patient origin method uses the actual utilization patterns of patients to identify relevant communities.[2] Exhibit 6.4 shows different distance-based techniques to identify a hospital's service area and the relevant communities.

Patient relevance is based on the geographic areas upon which a hospital primarily relies to deliver viable services in terms of cost-efficiencies, clinical volumes, etc. The area can be defined by circumscribing linear-distance rings around a hospital that encapsulate a fixed percentage (e.g., 65%) of its cases. Alternatively, a drive-time polygon can be used to encapsulate an area (e.g., a 15 to 20 minute drive from a hospital).

The irregular shaped polygon highlighted in light green in Exhibit 6.4 represents a 15 to 20 minute drive time perimeter around Oshawa General Hospital. This area encapsulates 65% of the hospital's hip replacement separations and 88% of its AMI separations. On a linear-distance basis, 88% of the AMI patients live within seven kilometres (km) of the hospital. However, some patients who live within seven km of the hospital may reach it in only a few minutes, whereas it may take others 15 to 20 minutes, based on the configuration of the streets — as seen in the drive-time polygon.

In comparing the drive-time polygon and the linear-distance ring (both encompassing 88% of the hospital's AMI patients), it becomes evident that the linear-distance rings underestimate the potential geographic coverage of Oshawa General Hospital in relation to drive-time area. Because AMIs are emergent in nature (as opposed to elective), these areas can be used to identify the communities that may be included in the hospital's emergency coverage on a drive-time or linear-distance basis. However, the application of the drive-time polygon, and its basis for emergency service planning, must be reviewed locally (i.e., is 15 to 20 minutes a reasonable time in which to reach emergency care?).

In Exhibit 6.4, because of the placement of the other three eligible hospitals in the immediate area, no patient is actually 15 to 20 minutes away from service. In general, patients are up to 10 minutes away from the nearest emergency department. This analysis could be extended to include the neighbouring hospitals in Scarborough and Port Hope to determine the drive-time for patients in Durham Region, west of Ajax and Pickering General Hospital in Ajax and east of Memorial Hospital in Bowmanville.

The hip replacement service area for Oshawa General Hospital was included in Exhibit 6.4 because hip replacements are primarily elective in nature. The hip replacement and AMI programs at Oshawa General Hospital draw from different communities. A high proportion of the hospital's AMI cases come from Whitby and Oshawa, although the drive-time polygon suggests a larger potential service area. Hip replacement patients however, come from a larger area. This suggests that the hospital's hip replacement program serves a greater number of communities. The area served may be larger because there may be fewer competing hip programs in neighbouring hospitals, because hip patients are elective and patients are more willing to travel for care, or because the hospital has a strong reputation for orthopedic surgery and physicans refer hip replacement patients to it on a disproportionate basis. From a planning perspective, it must be recognized that different clinical programs will serve different communities for a variety of reasons.[15]

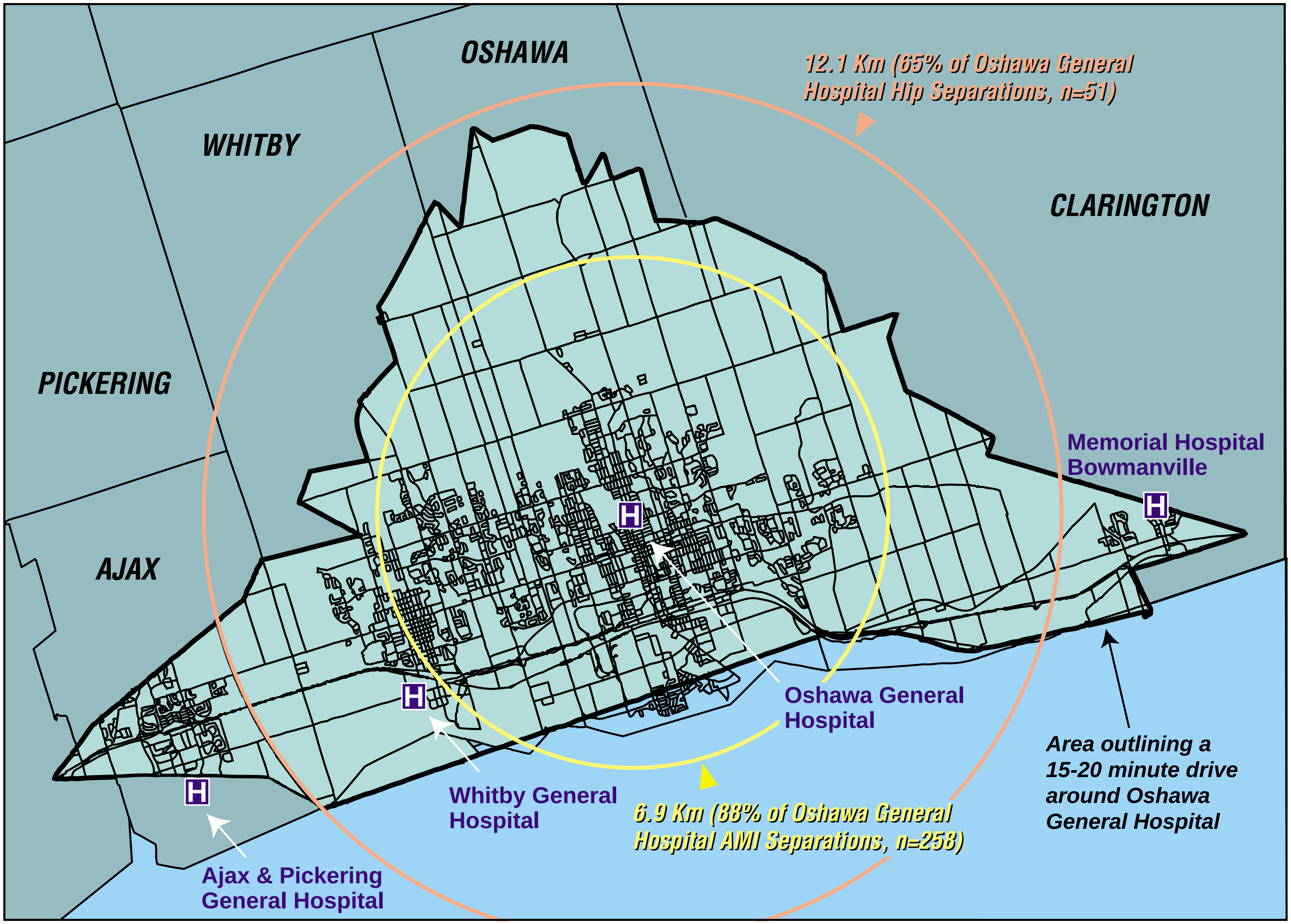
In the electronic version of the Atlas, linear-distance rings are presented for deciles for each Ontario hospital in each of 10 service categories. By applying the relevant decile distances, hospitals can determine the communities from which they draw patients on a program basis. Using the service categories primarily related to elective procedures, planners can approximate the service areas for elective procedures in general, and the emergency service categories can be used to approximate the corresponding coverage for emergency services. Drive time information is not included as part of the electronic data because it requires access to sophisticated mapping software and a street network file to make practical use of the information.

Case Study IV — Service Planning Considerations for Obstetrics for the Leamington District Memorial Hospital

In the preceding case studies, the concepts of commitment (market share) and relevance (patient origin) were discussed separately. In Exhibit 6.5 the two concepts are brought together to present their interrelationship and the need to consider both aspects for health service planning.

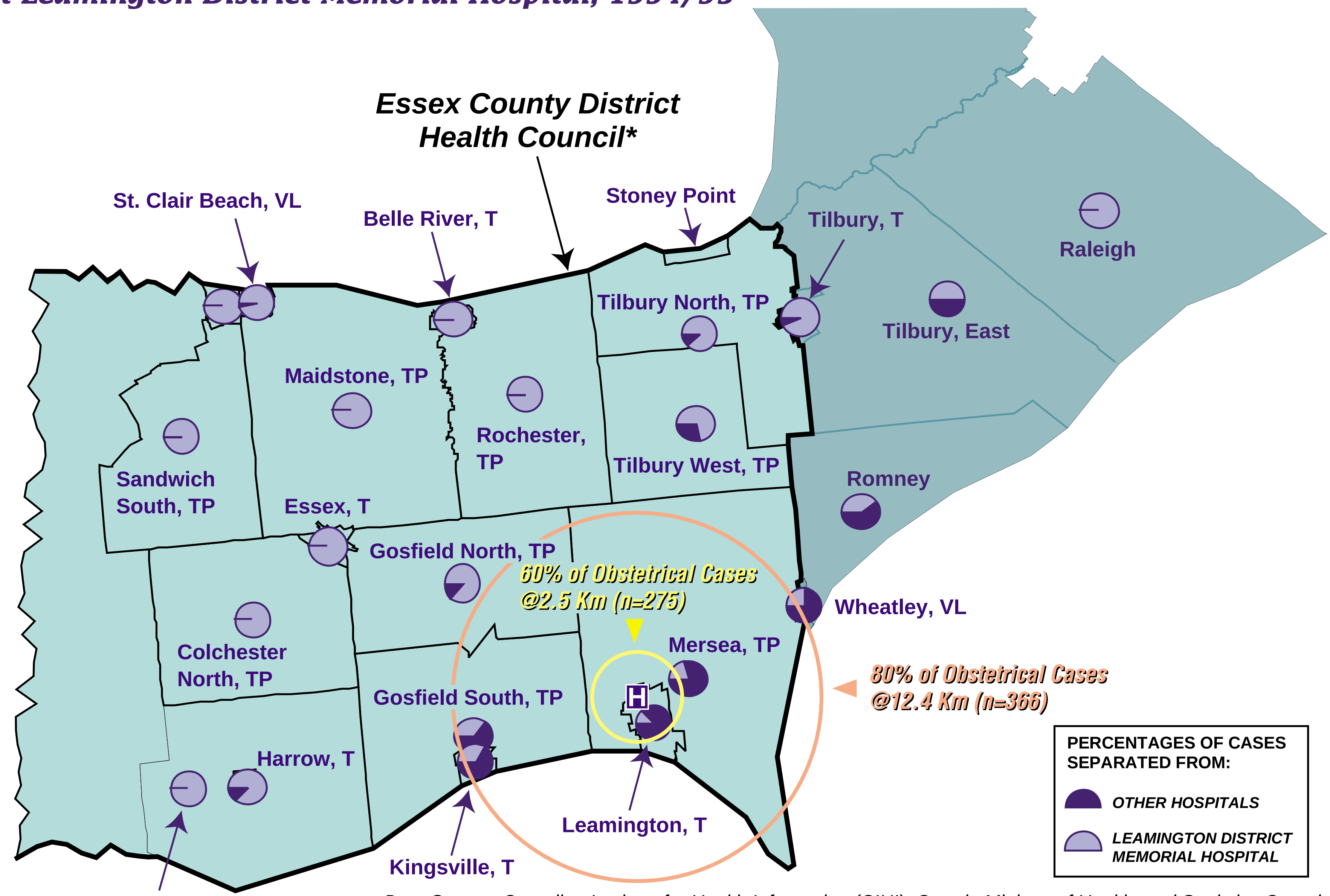
Approximately 60% of Leamington District Memorial Hospital's obstetrical patients come from the town of Leamington, and an additional 20% come from neighbouring townships. If the hospital were to plan its services around the needs of 80% of its patients, it would exclude a number of outlying communities, such as Tilbury East and Romney, which may provide only a small proportion of users of obstetrical services. However, these

Exhibit 6.4: ***Comparison of Drive Time and Straight Line Distance Methodologies for Calculating Service Areas Around Oshawa General Hospital, 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health, and Statistics Canada

Exhibit 6.5: ***Patient Origin and Market Share Considerations for Obstetrical Separations at Leamington District Memorial Hospital, 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health, and Statistics Canada
**Includes only the eastern portion of the DHC Area relevant to this example.*

two communities are strongly committed to the Leamington District Memorial Hospital (i.e., more than 50% of each community's obstetrical cases are discharged from Leamington District and Memorial Hospital) although they live in a different DHC.

Case Study V — Asthma Cases in the Huron/Perth DHC

Hospitals and DHCs are currently examining alternative service delivery patterns in an effort to reduce costs without materially affecting a community's access to necessary health services. The outcome of the planning exercises is that some institutions are undergoing role redefinitions, while others are merging or eliminating services altogether. Using the relevance and commitment concepts, multiple provider areas can be analysed to evaluate the degree of overlap or underlap of service provision and the necessity for role redefinitions.

Exhibit 6.6 examines the Huron/Perth DHC and the interrelationship between local hospitals addressing needs for inpatient asthma services. This exhibit circumscribes the areas (based on linear distance) covered by each of the eight hospitals in the region for 80% of their inpatient asthma separations. The 80% figure was selected for illustration purposes and can be further evaluated with the decile distances available through the electronic version of the Atlas. As can be seen in Exhibit 6.6, a number of the rings overlap.

Using this technique, planners can identify the hospitals that serve unique areas as opposed to those that overlap with other facilities. A drive-time analysis should be performed to ensure that access based on drive-time is also maintained. To the extent that asthma is representative of other diagnoses/procedures of an emergent nature, the results of the analysis for asthma can be used as a proxy for evaluating other diagnoses/procedures admitted on an emergent basis.

To complete the analysis, the influence of hospitals in external DHCs must also be considered to ensure a comprehensive solution. Local conditions and the delivery of unique services would have to be factored into any investigation and final recommendations.

Case Study VI — Comparison of Travel Distances by Type of Service

Exhibit 6.7 illustrates the average linear distance travelled by Ontario patients for each of the diagnoses/procedures presented in this chapter. Most notably, the elective services such as hip and knee replacement surgery or lens extractions, required patients to travel twice the distance they did for diagnoses treated on an emergency basis, such as for AMI or gastrointestinal bleeding (i.e., approximately 40 km for hip and knee replacements vs. 12 km for AMI and gastrointestinal bleeding).

In comparing appendectomy, which is primarily emergent in nature, and hernia repair, which is primarily elective, the relevant average distances were found to be essentially the same (i.e., 15 km vs 17 km). This may occur because both procedures are performed by general surgeons who have privileges at small- and medium-sized hospitals. As further consideration is given to the distribution and amount of service provided within a local community, planners must consider the appropriateness of delivery patterns, dealing with issues such as consolidation and regionalization.

In the electronic version of the Atlas, tables similar to Exhibit 6.7 are presented by case type on a DHC-specific basis to assist local planners to better understand the interrelationship of elective and emergent services and the average distance travelled by residents in the relevant communities.

Case Study VII — Comparison of Service Availability by Area

Exhibit 6.8 illustrates the average linear distance travelled by residents in Ontario by DHC for AMI and hip replacements, respectively. The exhibit illustrates the average linear distance to the hospital in which care was received and the closest eligible hospital to which a patient had access.

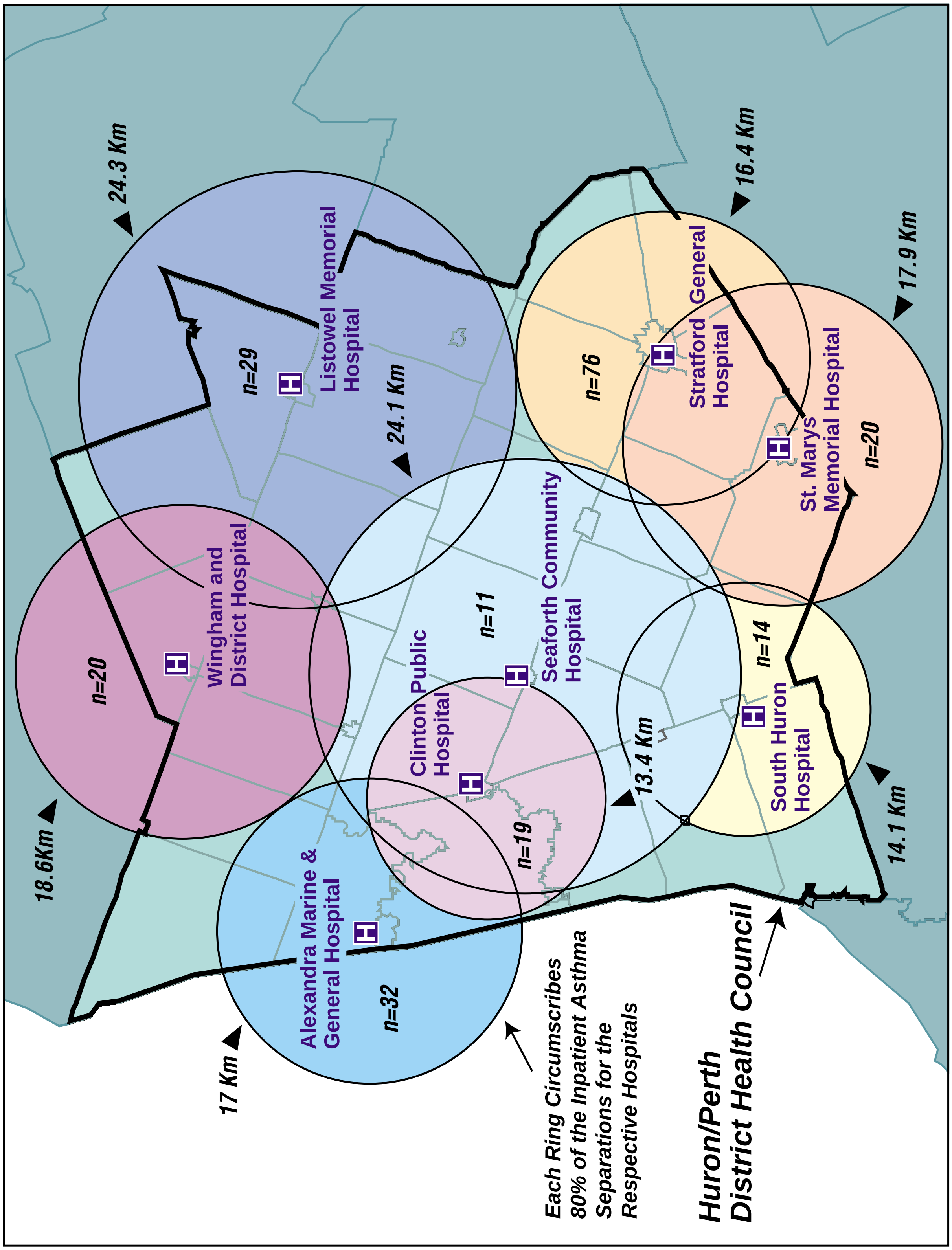
A comparison of the average closest hospital for AMI inpatients in the various DHCs indicates that the closest distances range from less than 3 km in Metropolitan Toronto to more than 20 km in Kenora-Rainy River. Also interesting to note is that, on average, patients tend to travel two to three times farther than their closest hospital to receive care. However, for emergent care, it is possible that patients attended

Exhibit 6.7: ***Average Distance Travelled by Diagnosis/Procedure in Ontario, 1994/95***

Diagnosis/Procedure	Average Distance Travelled (km)	Number of Separations
Acute Myocardial Infarction	12.9	20,203
Appendectomy	14.8	9,587
Asthma	11.4	18,272
Cerebrovascular Accident	10.5	8,005
Gastrointestinal Bleed	12.3	6,208
Hip Replacement	36.1	6,208
Hernia Repair - Inpatient	16.9	10,829
Hernia Repair - Day Surgery	14.9	7,132
Knee Replacement	39.8	6,322
Lens Extraction - Inpatient	40.7	5,013
Lens Extraction - Day Surgery	19.2	47,846
Normal Obstetrics	12.4	113,437

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 6.6: Comparison of Hospital Service Areas for Inpatient Asthma Separations in the Huron/Perth District Health Council Area



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health, and Statistics Canada

Exhibit 6.8: ***Average Distance Travelled for Acute Myocardial Infarction and Hip Replacement by District Health Council in Ontario, 1994/95***

District Health Council	Acute Myocardial Infarction		Hip Replacement	
	Average Distance to Hospital at Which Patient was Treated (km)	Average Distance to Hospital Closest to Patient's Residence (km)	Average Distance to Hospital at Which Patient was Treated (km)	Average Distance to Hospital Closest to Patient's Residence (km)
Algoma	19.4	7.8	194.8	35.4
Brant	14.7	4.6	20.5	4.1
Cochrane	28.2	5.9	234.5	87.7
Durham Region	10.3	4.2	30.8	8.8
East Muskoka-Parry Sound	27.0	16.0	96.5	58.2
Eastern Ontario	21.0	11.1	58.8	23.7
Essex County	15.3	6.5	31.5	11.0
Grey-Bruce	15.6	5.0	88.3	35.5
Haldimand-Norfolk	15.2	8.1	56.4	35.1
Haliburton, Kawartha & Pine Ridge	17.7	8.9	61.2	21.6
Halton	11.9	3.5	20.1	6.1
Hamilton-Wentworth	10.1	4.2	8.2	4.9
Hastings & Prince Edward Counties	23.1	8.0	62.9	18.3
Huron/Perth	15.2	5.5	45.5	34.4
Kenora-Rainy River	59.0	25.5	415.6	367.7
Kent County	13.4	8.3	54.2	15.6
Kingston, Frontenac and Lennox & Addington	14.0	9.0	23.0	15.2
Lambton	13.4	6.4	40.7	15.5
Manitoulin-Sudbury	23.3	12.8	100.5	19.9
Metropolitan Toronto	6.7	2.6	8.1	2.7
Niagara	7.8	3.6	23.7	6.7
Nipissing/Timiskaming	17.9	5.3	166.1	39.4
Ottawa-Carleton Regional	9.8	4.9	9.4	4.7
Peel	8.9	4.0	12.3	4.3
Renfrew County	19.3	6.5	103.2	90.6
Rideau Valley	24.3	10.0	66.3	19.8
Simcoe County	11.6	6.9	52.9	16.4
Thames Valley	12.7	5.5	18.2	9.9
Thunder Bay	29.6	7.8	74.3	18.3
Waterloo Region	8.3	4.1	24.4	4.6
Wellington-Dufferin	12.3	5.5	32.7	19.3
West Muskoka-Parry Sound	28.7	14.7	167.8	88.4
York Region	12.5	6.3	18.1	6.9
Ontario Weighted Average	**12.9**	**5.6**	**36.1**	**14.3**

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

a hospital when they began to experience symptoms, which may not have been when they were close to home.

The distance residents travelled in urban centres for hip replacements is consistent with the distance travelled for AMIs. For example, in Peel, the distances to access service for AMI and hip replacement are both approximately 4 km. This distance is also consistent with average distances in Ottawa-Carleton (both approximately 5 km) and Hamilton-Wentworth (both approximately 4 km). In northern Ontario, there are wide variations between access to care for AMI and access for hip replacement. In Algoma, a patient can access care for an AMI within 7.8 km of their residence, on average, whereas to access care for a hip replacement, a patient has to travel 35 km on average. This situation is even more pronounced in Cochrane, where the range varies from 5.9 km for AMIs to 88 km for hip replacements. This illustrates the degree to which residents in northern Ontario have less access to some specialized elective care in their local communities than do residents of southern urban centres such as Toronto, Ottawa or London.

In comparing access to care between communities in northern Ontario and southern urban centres, it is also important to note that residents in northern Ontario are bypassing their closest hospital for elective care and continuing to travel even further distances. This is evident in areas such

Exhibit 6.9: *Location of Patient Treatment Site in Relation to Whether the Closest Hospital was In- or Outside of the DHC of Patient Residence - Acute Myocardial Infarction Separations in Ontario, 1994/95*

District Health Council	Attended Hospital Outside DHC and Closest Hospital was Outside DHC (cases)	Attended Hospital Outside DHC, but Closest Hospital was Inside DHC (cases)	Attended Hospital Inside DHC, but Closest Hospital was Outside DHC (cases)	Attended Hospital Inside DHC and Closest Hospital was Inside DHC (cases)	% Treated in DHC
Algoma	1	9	1	314	96.9
Brant	3	22	3	236	90.5
Cochrane	2	8	--	191	95.0
Durham Region	30	72	13	542	84.5
East Muskoka-Parry Sound	39	16	1	125	69.6
Eastern Ontario	31	48	10	339	81.5
Essex County	2	25	1	704	96.3
Grey-Bruce	13	25	6	339	90.1
Haldimand-Norfolk	13	50	3	247	79.9
Haliburton, Kawartha & Pine Ridge	43	41	13	583	87.6
Halton	2	68	9	434	86.4
Hamilton-Wentworth	15	54	20	904	93.1
Hastings & Prince Edward Counties	30	20	40	299	87.1
Huron/Perth	--	31	1	306	90.8
Kenora-Rainy River	3	11	--	126	90.0
Kent County	15	11	21	312	92.8
Kingston, Frontenac and Lennox & Addington	9	4	17	382	96.8
Lambton	32	9	14	230	85.6
Manitoulin-Sudbury	10	13	15	385	94.6
Metropolitan Toronto	--	134	--	4,220	96.9
Niagara	1	27	9	887	97.0
Nipissing/Timiskaming	1	11	4	287	96.0
Ottawa-Carleton Regional	16	12	33	899	97.1
Peel	121	110	90	712	77.6
Renfrew County	--	9	--	183	95.3
Rideau Valley	25	45	5	284	80.5
Simcoe County	17	37	9	652	92.4
Thames Valley	11	48	22	1,099	95.0
Thunder Bay	--	10	1	337	97.1
Waterloo Region	2	33	4	640	94.8
Wellington-Dufferin	5	34	11	312	89.0
West Muskoka-Parry Sound	4	8	1	45	79.3
York Region	174	52	128	365	68.6

Attendance at a hospital in- or outside the DHC of patient residence does not mean the patient went to the closest hospital. Rather, it provides an indication of the actual in- and outflow patterns relative to the DHC boundaries
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

as Algoma and Cochrane where patients can access hip replacement surgery within 35.4 km and 87.7 km, respectively, but travel on average 194.8 km and 234.5 km, respectively.

Exhibits 6.9 through 6.12 illustrate usage patterns for AMI and hip replacement separations by DHC in Ontario. Each illustrates the number of patients treated at hospitals inside and outside the DHC in which they lived, and whether their closest hospital was in their local DHC. This information can be used to assess actual versus expected patterns of admission, relative to geo-political boundaries which, in this case, are the DHC boundaries.

By reviewing the data in Exhibits 6.9 and 6.10, planners can identify the degree to which local services were available and whether residents availed themselves of those services or went elsewhere. However, these data are not sufficiently detailed to indicate whether a patient attended the closest hospital to his or her residence; they merely indicate whether the closest hospital was internal or external to the patient's DHC of residence and whether he or she attended a hospital inside or outside this geopolitical boundary. For example, in 1994/95 there were 719 eligible AMI cases from York Region. Of this group, 417 (58%) patients lived closest to a hospital located within the York Region DHC. Nevertheless, 52 (12.5%) of these

Exhibit 6.10: ***Location of Patient Treatment Site in Relation to Whether the Closest Hospital was In- or Outside of the DHC of Patient Residence - Hip Replacement Separations in Ontario, 1994/95***

District Health Council	Attended Hospital Outside DHC and Closest Hospital was Outside DHC (cases)	Attended Hospital Outside DHC, but Closest Hospital was Inside DHC (cases)	Attended Hospital Inside DHC, but Closest Hospital was Outside DHC (cases)	Attended Hospital Inside DHC and Closest Hospital was Inside DHC (cases)	% Treated in DHC
Algoma	6	29	--	42	54.5
Brant	--	29	--	58	66.7
Cochrane	1	7	--	22	73.3
Durham Region	35	100	1	76	36.3
East Muskoka-Parry Sound	54	--	--	--	00.0
Eastern Ontario	21	53	--	37	33.3
Essex County	1	30	1	217	87.6
Grey-Bruce	9	74	2	57	41.5
Haldimand-Norfolk	62	--	--	--	00.0
Haliburton, Kawartha & Pine Ridge	13	96	5	119	53.2
Halton	37	55	8	92	52.1
Hamilton-Wentworth	6	17	9	271	92.4
Hastings & Prince Edward Counties	3	46	2	46	49.5
Huron/Perth	4	44	3	60	56.8
Kenora-Rainy River	30	--	--	--	00.0
Kent County	3	46	--	35	41.7
Kingston, Frontenac and Lennox & Addington	3	2	25	104	96.3
Lambton	9	27	1	60	62.9
Manitoulin-Sudbury	3	26	--	86	74.8
Metropolitan Toronto	--	33	--	1,297	97.5
Niagara	14	82	--	193	66.8
Nipissing/Timiskaming	11	27	1	34	47.9
Ottawa-Carleton Regional	1	1	--	349	99.4
Peel	36	99	18	171	58.3
Renfrew County	61	--	--	--	00.0
Rideau Valley	20	62	--	33	28.7
Simcoe County	14	93	2	90	46.2
Thames Valley	4	21	8	325	93.0
Thunder Bay	--	5	--	81	94.2
Waterloo Region	3	59	--	151	70.9
Wellington-Dufferin	43	23	2	68	51.5
West Muskoka-Parry Sound	14	--	--	--	00.0
York Region	66	51	27	95	51.0

Attendance at a hospital in- or outside the DHC of patient residence does not mean the patient went to the closest hospital. Rather, it provides an indication of the actual in- and outflow patterns relative to the DHC boundaries

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

patients left the DHC for care. Conversely, 302 (42%) lived closest to a hospital outside the DHC, but only 174 (57.6%) of these patients were treated at a hospital outside of their DHC. In total, 493 (68.6%) of the patients were treated at a hospital within their DHC. In comparison, 97% of patients in Thunder Bay were treated at a hospital within their DHC.

For comparative purposes, a table of hip replacements and DHC-based hospital usage is included as Exhibit 6.10. In York Region, 51% of the cases were treated within the DHC, whereas in Thunder Bay, the number remained relatively consistent, with 94% of hip replacements conducted within the DHC.

Exhibits 6.11 and 6.12 show the average distance travelled for patients residing in each DHC. In York Region, the average distance residents (whose closest hospital was in York Region) travelled for a hip replacement, to a York Region hospital, was 9.2 km. For residents whose closest hospital was in York Region but who attended a hospital outside York Region, the average distance travelled was 30 km.

By comparing the average distance travelled for specified services among DHCs, planners can better understand the geographic availability and distribution of services in Ontario and the extent to which residents travel for these services.

Exhibit 6.11: ***Location of Patient Treatment Site in Relation to Whether the Closest Hospital was In- or Outside of the DHC of Patient Residence - Average Distance Travelled, Acute Myocardial Infarction Separations in Ontario, 1994/95***

District Health Council	Average Distance to Hospital Attended Outside DHC when Closest Hospital was Outside DHC (km)	Average Distance to Hospital Attended Outside DHC when Closest Hospital was Inside DHC (km)	Average Distance to Hospital Attended Inside DHC when Closest Hospital was Outside DHC (km)	Average Distance to Hospital Attended Inside DHC when Closest Hospital was Inside DHC (km)
Algoma	51.4	339.7	127.9	9.8
Brant	24.5	125.1	23.8	4.2
Cochrane	664.8	386.6	--	6.5
Durham Region	29.2	43.3	26.6	4.5
East Muskoka-Parry Sound	28.5	119.9	299.8	12.5
Eastern Ontario	33.0	76.4	71.7	10.6
Essex County	18.0	225.0	69.1	7.7
Grey-Bruce	22.8	93.4	28.8	9.3
Haldimand-Norfolk	13.7	49.9	23.5	8.2
Haliburton, Kawartha & Pine Ridge	28.6	99.3	45.0	10.5
Halton	30.9	62.8	9.0	3.9
Hamilton-Wentworth	82.2	80.5	17.1	4.6
Hastings & Prince Edward Counties	42.5	200.3	38.1	7.3
Huron/Perth	--	91.0	161.1	7.1
Kenora-Rainy River	136.3	356.3	--	31.2
Kent County	27.9	118.8	27.5	8.1
Kingston, Frontenac and Lennox & Addington	89.5	189.6	66.0	8.0
Lambton	21.8	140.2	35.1	5.9
Manitoulin-Sudbury	98.5	233.7	58.4	12.9
Metropolitan Toronto	--	91.1	--	4.1
Niagara	14.0	100.4	75.4	4.3
Nipissing/Timiskaming	71.4	250.9	71.9	8.1
Ottawa-Carleton Regional	44.7	165.2	44.6	5.9
Peel	16.1	35.1	7.9	3.8
Renfrew County	--	249.3	--	7.9
Rideau Valley	37.5	89.6	297.4	8.0
Simcoe County	28.0	79.4	26.5	7.1
Thames Valley	23.9	139.4	33.3	6.6
Thunder Bay	--	723.6	0.4	9.1
Waterloo Region	88.5	80.6	13.0	4.3
Wellington-Dufferin	16.7	68.9	23.7	5.5
West Muskoka-Parry Sound	57.0	109.9	37.4	11.6
York Region	16.3	38.9	14.2	6.3

Attendance at a hospital in- or outside the DHC of patient residence does not mean the patient went to the closest hospital. Rather, it provides an indication of the actual in- and outflow patterns relative to the DHC boundaries

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

In analysing these distances however, particularly for emergent diagnoses/procedures, planners must recognize that if individuals require care while away from their primary residence, they will appear to have bypassed the closest hospital (based on their residence code) when in fact, they accessed the hospital closest to them at the time they required care.

Summary

The purpose of this chapter has been twofold: to provide an introduction to the application of spatial concepts to hospital service planning; and to present information on the way specific services are geographically delivered in Ontario and the degree to which the residents of local communities avail themselves of these services.

This chapter has focused primarily on concepts and techniques using case studies to highlight significant spatial issues and considerations for hospital service delivery in Ontario. A number of the methodologies presented can be used to define a hospital's service area, depending on one's objectives. Thiessen polygons are a relatively quick and inexpensive method to

Exhibit 6.12: ***Location of Patient Treatment Site in Relation to Whether the Closest Hospital was In- or Outside of the DHC of Patient Residence - Average Distance Travelled, Hip Replacement Separations in Ontario, 1994/95***

District Health Council	Average Distance to Hospital Attended Outside DHC when Closest Hospital was Outside DHC (km)	Average Distance to Hospital Attended Outside DHC when Closest Hospital was Inside DHC (km)	Average Distance to Hospital Attended Inside DHC when Closest Hospital was Outside DHC (km)	Average Distance to Hospital Attended Inside DHC when Closest Hospital was Inside DHC (km)
Algoma	276.5	433.4	--	18.4
Brant	--	53.4	--	4.1
Cochrane	778.7	645.7	--	79.0
Durham Region	41.0	45.4	43.9	6.6
East Muskoka-Parry Sound	96.5	--	--	--
Eastern Ontario	48.8	96.0	--	11.1
Essex County	125.4	172.0	37.6	11.6
Grey-Bruce	87.8	140.1	45.4	22.6
Haldimand-Norfolk	56.4	--	--	--
Haliburton, Kawartha & Pine Ridge	66.3	112.9	49.1	19.5
Halton	30.3	40.7	15.8	4.0
Hamilton-Wentworth	26.2	39.4	25.8	5.2
Hastings & Prince Edward Counties	90.8	111.4	96.1	11.2
Huron/Perth	52.3	69.5	51.8	27.2
Kenora-Rainy River	415.2	--	--	--
Kent County	146.1	81.7	--	10.2
Kingston, Frontenac and Lennox & Addington	165.7	238.8	45.1	9.4
Lambton	50.7	111.0	64.0	7.1
Manitoulin-Sudbury	232.3	351.2	--	20.1
Metropolitan Toronto	--	52.1	--	7.0
Niagara	23.9	63.2	--	6.9
Nipissing/Timiskaming	234.8	312.4	208.9	26.6
Ottawa-Carleton Regional	51.4	512.6	--	7.8
Peel	17.6	22.4	8.3	5.7
Renfrew County	103.2	--	--	--
Rideau Valley	63.7	93.8	--	16.1
Simcoe County	35.8	89.6	28.2	18.1
Thames Valley	33.2	90.6	51.8	12.5
Thunder Bay	--	924.0	--	21.8
Waterloo Region	79.0	71.9	--	4.8
Wellington-Dufferin	54.8	63.3	51.2	7.8
West Muskoka-Parry Sound	167.8	--	--	--
York Region	19.7	30.5	22.1	9.2

Attendance at a hospital in- or outside the DHC of patient residence does not mean the patient went to the closest hospital. Rather, it provides an indication of the actual in- and outflow patterns relative to the DHC boundaries

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

roughly determine a hospital's service area.

In evaluating service areas, it can be noted that the placement of hospitals has tended to follow population concentrations within the province. Ng and associates,[1] determined that, in the late 1980s, approximately 70% of the population of Ontario lived within five km of a hospital. In heavily populated centres, such as London, Toronto and Kingston, the population is served by more than one facility — local residents have a choice. As a result, the geographic service areas of hospitals in large urban areas can be blurred or may be indistinguishable. In some population centres, hospitals may have been constructed for reasons other than population density (e.g., religious affiliation). As a result, unique hospital service areas may likewise be difficult to differentiate. In both circumstances it may be appropriate to develop natural neighbourhoods on the basis of population distribution and service requirements, which could then be evaluated to determine the number and distribution of services required.

In rural settings, larger towns may act as hosts for local hospitals and access to another facility may be impractical from a time or distance perspective. In analysing referral patterns in rural situations with local monopoly providers, a geographic basis for defining a community may be very appropriate.

The two examples noted — urban and rural hospitals — tend to illustrate the extremes in terms of identifying service areas associated with hospitals. In reality, utilization patterns generally lie between the two extremes, incorporating features from both. In other words, referral patterns for a majority of communities are influenced both by geography and other factors, such as physician recommendation. For these reasons, careful consideration must be given to the way service areas are defined and related if access and equity issues are to be properly addressed at the provincial and community levels.[15]

The electronic edition of the Atlas contains more detailed data on the geographic use and delivery of services throughout the province. The types of data that are available electronically have been highlighted in this text. By examining the data from the electronic version of the Atlas in light of the case studies in this chapter, we hope local planners will be able to extend their analytical capabilities and develop origin and destination information at local levels. As the case studies illustrate, local circumstances must be considered when interpreting the data.

This chapter has presented a series of concepts and techniques for analysing geographic health care information. When planning future services, assumptions can be based on this information. Future research also needs to address such issues as optimum service size from a clinical and financial perspective, reasonable access times (or distances) to obtain different types of services, and the ability to predict how patient flow changes when services are realigned. The modelling of demand, and changes in demand, based on service location and other factors have been developed in other sectors using such means as gravity modelling.[10,16,17] These can be applied and further developed to provide information to ensure that the delivery and distribution of health care services in Ontario is optimum.

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Appendix A6.1: *Diagnosis/Procedure Codes and Number of Records Included*

Inclusion Criteria

Service Category	Definition for Inclusion	Number of Records Included	Number of Records Excluded
Appendectomy	Primary procedure code (CCP) of 59.0	9,587	609
Acute Myocardial Infarction	Primary diagnosis code (ICD9) of 410	20,203	2,015
Asthma	Primary diagnosis code (ICD9) of 493.0, 493.1, or 493.9	18,272	827
Cerebrovascular Acident	Primary diagnosis code (ICD9) of 436	8,005	581
Gastrointestinal Bleed	Primary diagnosis code (ICD9) of 456.0, 530.8, 531.0, 531.2, 532.0, 532.2, 533.0, 533.2, 534.0, 534.2, or 578	6,208	433
Hip Replacement	Any procedure code (CCP) of 93.51 with a CMG of 350, 352, or 353 (no fractures)	6,208	167
Knee Replacement	Any procedure code (CCP) of 93.41 with a CMG of 350 or 354 (no fractures)	6,322	117
Lens Extraction	Any procedure code (CCP) of 27.4, 27.5, or 27.6 with any diagnosis code (ICD9) of 366	Inpatient - 5,013 Day Surgery - 47,846	189 1,352
Hernia Repair	Any procedure code (CCP) of 65.01, 65.02, 65.03, 65.11, 65.12, 65.13, 65.21, 65.22, 65.23, 65.24, 65.31, 65.32, 65.33, or 65.34 with any diagnosis code (ICD9) of 550.9	Inpatient - 10,829 Day Surgery - 7,132	467 240
Normal Obstetrics	Any CMG code (1994 grouper) of 603, 604, 606, 607, 610, 611	113,437	3,113

Exclusion Criteria

The following conditions resulted in a record being excluded from the analysis:

- **missing or invalid postal code**
- **missing or invalid residence code**
- **non-Ontario resident**
- **patient transferred from another acute care facility**
- **a newborn entry code**

CCP — Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures

ICD9 — International Classification of Diseases (9th Revision).

Note: For the two hospital mergers that occurred prior to April 1, 1995, the institution numbers were replaced by the unique number of the newly combined facility. The records from Dufferin Area Hospital (Institution #1043) and Shelbourne District Hospital (Institution #1049) were recoded to the new Institution number (3684) for Dufferin-Caledon Health Care Corporation. Records from Porcupine General Hospital (Institution #2097) and St. Mary’s General Hospital (Institution #2099) were recoded to Institution #3414 for the Timmins and District Hospital.

Appendix A6.2: *Postal Code Definition and Considerations For Use*

A postal code is a six-character alpha numeric code defined and maintained by the Canada Post Corporation for the processing (sortation and delivery) of mail. The first character of a postal code represents a province or territory (from east to west across Canada) or a major sector entirely within a province. The first three characters of a postal code are referred to as the Forward Sortation Area (FSA) and represent well defined and stable geographic areas. Rural FSAs are identifiable by the presence of a '0' in the second position of the FSA code. However, there are exceptions to this rule.

FSAs were not designed to respect standard geographic boundaries except at the provincial level. Moreover, in some provinces, other than Ontario, FSAs do cross into multiple provinces. In 1991, there were 503 FSAs in Ontario. In mapping applications, an FSA is typically represented by a geographic boundary (polygon). For spatial analyses, a centroid is sometimes used in lieu of a polygon to map or evaluate data.

The last three characters of a postal code are known as a Local Delivery Unit (LDU). In urban areas, the LDU can specify a small and easily defined area within an FSA such as an apartment or office building, one side of a city street between consecutive intersections or a firm which does a large volume business with the post office. In rural areas, an LDU denotes a service area - the area served by a rural route delivery from a post office or postal station. In 1991, there were approximately 246,352 LDUs in Ontario. In mapping analyses, an LDU is typically represented by a point derived from its geographic center.

In using a postal code as the sole geographic indicator for health care-related records, there are generally six issues that need to be considered:

- In rural areas, a postal code may denote a delivery point rather than where an individual or agency resides;
- In urban areas, a postal code for a post office box cannot be used to geo-reference a street location;
- In new communities, the use of a community mailbox may preclude its use in locating a street position;
- For individuals in stress (i.e., when presenting to a health care facility) a self-reported postal code may be subject to error;
- In rural areas, a postal code or FSA may reference a large geographic area that cuts across other geographic areas such as counties or regions;
- Postal codes and FSAs do not follow statistical boundaries as established by Statistics Canada. As a result, FSAs may cross multiple statistical areas, such as counties, municipalities, or DHC planning regions.

Data Source: 1991 Census Dictionary; Statistics Canada, 1994 Residence Coding Manual; Ontario Ministry of Health

Appendix A6.3: *Residence Code (Municipal Code) Definition and Considerations for Use*

In Ontario, a standardized coding system - Residence Codes - has been adopted as a classification system for patient residence information. The purpose of the system is to provide a framework to find referral patterns to various health care facilities as well as to determine the geographic spread of disease. The system relies on a unique four-digit number that has been assigned to each municipality and populated Indian Reserve or Settlement in the province. Where an area is not municipally organized, the four-digit number refers to one or a group of census enumeration areas (the smallest geographic boundary defined by Statistics Canada).

The first two digits of the residence code delineates the county, district or regional municipality in which a place is located. The third and fourth digits identify municipalities, unorganized areas or Indian Reserves and Settlements within a county.

When an individual's residence cannot be accurately tracked to a four-digit code, the system provides a more general code at the county level through the use of '00' as the third and fourth level.

Data Source: 1991 Census Dictionary; Statistics Canada, 1994 Residence Coding Manual; Ontario Ministry of Health

Appendix A6.4: *Drive-Time Methodology*

Terms:

1. **Street Network File -** A street network file presents geocoded streets as lines for a specific geographic area. A street network file may identify different levels of street detail ranging from a comprehensive representation that includes highways, roads, lanes, etc. to highways only depending upon the application.
2. **Street Segment -** In general, a street segment refers to the section of the street that lies between two adjacent intersections.

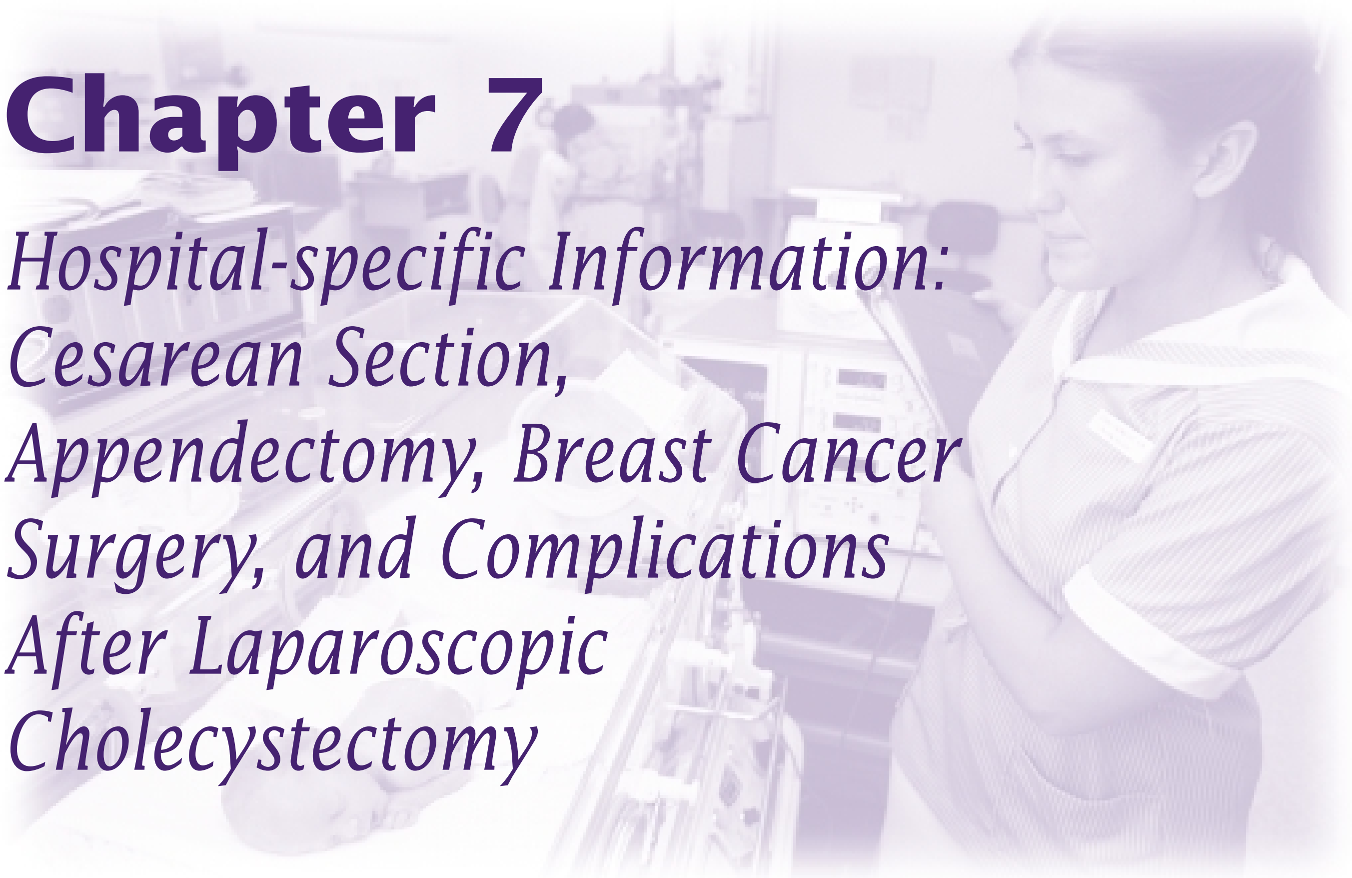
Discussion:

Drive-time calculations were developed by using the relevant street network file and the Drive Time application (Appendix A6.5). The street network file was used by first encoding each street segment by its type. Street types included categories such as: side streets, main thoroughfares, highways, etc. Each type was, in turn, assigned an absolute speed which was then applied to the relevant street segment for use in calculating the appropriate drive-time areas. Overall road speeds were subsequently modified on a percentage basis to reflect varying road conditions (e.g. time of day, weather, vehicle type, etc.). The drive-time polygon used in this chapter was calculated under both optimum and sub-optimum conditions to reflect real world conditions.

Appendix A6.5: *Software Used in the Production of Chapter 6*

In the development of the mapping output and geographic analyses, a number of software applications were used. They included:

- MapInfo (MapInfo, Troy, New York)
- Polygons of Influence (Kiev Software Factory, Troy, New York)
- Vertical Mapper (Northwood Geosciences, Ottawa)
- Drive Time (On Target Mapping, Pittsburgh, Pennsylvania)
- Isoline Generator (Kiev Software Factory, Troy, New York)



Chapter 7

Hospital-specific Information: Cesarean Section, Appendectomy, Breast Cancer Surgery, and Complications After Laparoscopic Cholecystectomy

Introduction

Many of the preceding chapters have dealt specifically with trends and practice variations by patient residence, with provincial and District Health Council (DHC) populations used to determine temporal trends and small area rate variations. In this chapter, we shift our review to utilization patterns by hospital for cesarean section, appendectomy, breast cancer surgery and cholecystectomy.

Hospital level analyses allow providers and administrators to focus on a manageable environment. However, as explained earlier, hospitals differ in their patient populations — for example, more seriously ill patients may be selectively referred to larger institutions in more densely populated parts of the province, and mid-sized institutions will sometimes function as referral centres in remote areas. By identifying individual institutions, clinicians and hospital administrators can select the institutions most like their own for peer group comparison.

For cesarean section, we focus on rates in Ontario over the last decade and the role that previous cesarean section, dystocia and fetal distress have had in shaping those trends. We extend the analysis from the first ICES *Practice Atlas* by adding fiscal years 1993/94 and 1994/95. In addition to determining the extent to which there are differences in the way hospitals use this procedure, the focus on specific indications makes it possible to better define the extent to which care is consistent with current evidence-based clinical practice guidelines. The section on appendectomy repeats our earlier published analyses relating accuracy to perforation rates, length of hospital stay and fatality rate by institution. It extends the analysis to include an additional two years of data, and incorporates a more stringent algorithm for case definition as explained in Chapter 5, as well as reviewing recent literature pertinent to the topic. Publication of breast cancer surgery rates in the first ICES *Practice Atlas* and the ensuing publicity led to a review of coding practices at many hospitals. Consequently, we present updated data on breast-conserving surgery rates, with hospital-specific data provided by quintile. The section on cholecystectomy highlights the shift from open to laparoscopic technique over the past few years and focuses on variations in conversion rates and bile duct injuries.

In an attempt to avoid concerns related to differences in coding practices between hospitals, we sent relevant codes for the procedures included in this chapter to all hospitals in Ontario during the early stages of preparation, recommending that coding practices and accuracy be reviewed. As well, hospitals were mailed their own rates to compare with provincial rates and they were asked to indicate whether major discrepancies were the result of coding differences. Overall, very few concerns were raised and identified differences tended to be minor —

not affecting the aggregate data used in the calculation of the rates presented.

Cesarean Section: Provincial Trends and Hospital-specific Rates

Introduction

This section of the ICES *Practice Atlas* examines the trends in cesarean section rates in Ontario over the last decade and the role that previous cesarean section, dystocia and fetal distress have had in shaping those trends. The first edition of the Atlas examined cesarean section rates through 1991/92. This chapter extends that analysis through 1994/95 and examines hospital level cesarean section rates for 1993/94 and 1994/95.

When used appropriately, a cesarean section can be life-saving for both mother and baby. However, if used inappropriately, this surgical procedure can put mother and child at risk. There is ongoing debate regarding appropriate indications for cesarean section, and at a broader level, the appropriate overall rate for cesarean sections.

The cesarean section rate in Canada increased steadily from about 6% of deliveries in the early 1970s to 20% of deliveries in the mid-1980s. Since then, rates have declined to 17% in 1994/95.[1] This is lower than the rate of almost 24% found in the United States, but much higher than the 10% to 13% rate found in most Western European countries.[2–4]

Along with the wide variation in cesarean section rates among countries, there are also differences in cesarean section rates among provinces. In 1991/92 in both Newfoundland and British Columbia, about 23% of deliveries were cesarean sections, whereas in Manitoba and Alberta deliveries by cesarean section were 14% and 16% respectively.[1]

The three most common indications for cesarean section are: having had a cesarean section previously; having slow progression of labour (called dystocia); and fetal distress. In general, these three indications account for about 75% of all cesarean sections.[5] In recent years, there has been a world-wide effort to better understand the risks and benefits of cesarean section for these indications. Over the last decade, all of the well-designed studies of obstetrical care interventions were reviewed and entered into the Oxford Perinatal Database. This work has formed the basis of Effective Care in Pregnancy and Childbirth[6] an evidence-based textbook of obstetrical care. The Society of Obstetricians and Gynaecologists of Canada (SOGC) has joined the effort to develop and promote evidence-based principles of obstetrical care by developing and disseminating clinical practice guidelines for management of women who have had a previous cesarean section and for the diagnosis and management of dystocia and fetal distress.[7–9]

The analysis of hospital-level cesarean section rates must be considered in the context of obstetrical care delivery in the province. Ontario provides obstetrical care on a regional basis. Each region consists of one or more referral hospitals, which provide care for high-risk patients (these are referred to as Level 2 or Level 3 hospitals, with Level 3 being the most specialized) and a set of Level 1 hospitals, which handle most low-risk pregnancies and routine deliveries. This classification scheme categorizes hospitals according to the nursery level at each.

Exhibit 7.1: ***Indication-Level Rates for Cesarean Section***

Incidence of Indication

$$\frac{\text{number of deliveries with indication}}{\textit{total number of deliveries}} \times 100$$

Indication-specific Cesarean Section Rate

$$\frac{\text{number of cesarean sections with indication}}{\textit{total number of deliveries with indication}} \times 100$$

Cesarean Sections Attributable to an Indication

$$\frac{\text{number of cesarean sections with indication}}{\textit{total number of deliveries}} \times 100$$

Note: See Appendix A7.1 for detailed procedure codes and algorithms

Data Source and Methods

The analysis is based on the Canadian Institute for Health Information (CIHI) hospital separation data. All acute care hospital separations that involved a delivery were identified based on a set of Case Mix Group® (CMG) codes. All cesarean sections were identified using a subset of these CMG® codes. Cesarean section rates were calculated as the number of cesarean sections per 100 deliveries.

A previously published algorithm[5] was used to assign one of four diagnoses or indications to each delivery: previous cesarean section; dystocia; fetal distress; and other. If only one of the first three diagnoses was listed on the separation abstract, then the delivery was assigned to that diagnosis. If none of the first three diagnoses was listed on the separation abstract, then the delivery was assigned a diagnosis of "other". If more than one of the first three diagnoses was listed on the separation abstract, a hierarchical rule was used to determine the diagnosis for that case. If one of the diagnoses on the abstract was previous cesarean section, then the case was assigned to previous cesarean section.

Exhibit 7.2: ***Trends in Deliveries, Cesarean Sections and Cesarean Section Rates in Ontario, 1984/85 - 1994/95***

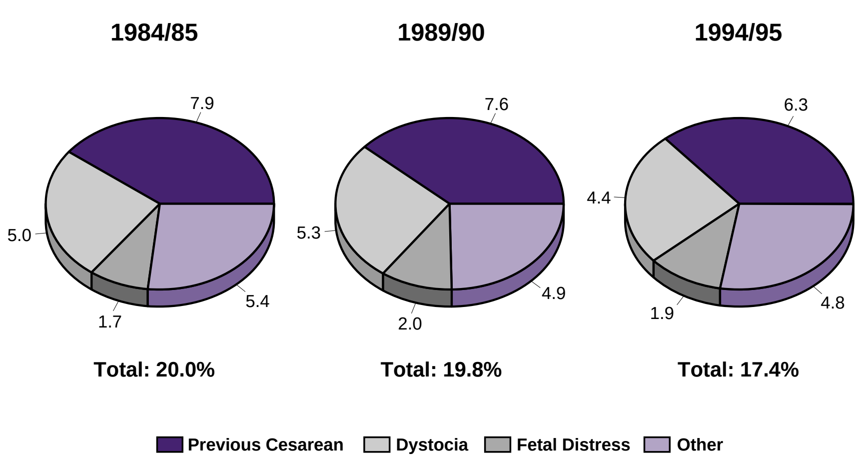
Year	Number of Deliveries (thousands)	Number of Cesarean Sections (thousands)	Cesarean Section Rate per 100 Deliveries
1984/85	125.3	25.0	20.0
1985/86	130.9	26.5	20.3
1986/87	133.2	26.9	20.2
1987/88	134.7	27.2	20.2
1988/89	139.1	27.8	20.0
1989/90	146.3	28.9	19.8
1990/91	150.8	28.8	19.1
1991/92	151.0	27.2	18.0
1992/93	149.5	26.5	17.7
1993/94	147.5	26.0	17.6
1994/95	147.4	25.6	17.4

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

If both dystocia and fetal distress were listed on the abstract, then the case was assigned to dystocia.

Three different sets of rates were calculated using these diagnoses or indications (Exhibit 7.1). One set measured the incidence of each indication and was calculated as the number of deliveries with the specific diagnosis over the total number of deliveries. Another set measured the number of women who had a specific diagnosis who then had a cesarean section. This is calculated as the number of cesarean sections with a specific diagnosis or indication divided by the number of women with that specific diagnosis or indication. This is referred to as the indication-specific cesarean section rate or, in the case of previous cesarean section, the repeat cesarean section rate. The final set of rates measured the number of cesarean sections that could be attributed to each diagnosis. These rates were calculated as the number of cesarean sections with the diagnosis or indication divided by the total number of deliveries. These are referred to as rates of cesarean section attributable to a specific indication. The cesarean section rate attributable to a specific indication divided by the overall cesarean section rate yields the proportion of total cesarean sections attributable to that indication.

Exhibit 7.3: ***Cesarean Section Rates Attributed to Different Indications in Ontario, 1984/85, 1989/90 and 1994/95***



Note: Totals represent the proportion of deliveries that were cesarean sections

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

All deliveries of Ontario residents in Ontario hospitals were used in the calculation of overall provincial cesarean section rates. Hospital specific analyses were limited to hospitals in which there were more than 300 hundred deliveries in 1993/94 and 1994/95 combined. These 106 hospitals represented about two-thirds of the hospitals that provided obstetrical care, but accounted for about 98% of deliveries in 1993/94 and 1994/95. Using various published reports and the results of a mailed survey, hospitals were assigned to Level 1, Level 2 or Level 3. Overall and indication-level cesarean section rates were calculated for each of these hospitals.

Findings

Cesarean section rates in Ontario peaked in 1985/86, remained at about that level through 1987/88, then decreased through 1992/93 when they levelled out at just less than 18% of deliveries, and then decreased to just more than 17% in 1994/95 (Exhibit 7.2). Almost 26,000 cesarean sections were performed in Ontario in 1994/95, making it the most common inpatient surgical procedure in the province.

In 1984/85, of the 20.0% of deliveries that were cesarean sections, 40% (or 7.9% of all deliveries) were for women who had a cesarean section previously (Exhibit 7.3). This decreased to 6.3% of all deliveries by 1994/95. The cesarean section rate attributable to previous cesarean sections is the number of women who present with the indication (i.e., the incidence of the indication) multiplied by the rate at which those women undergo a cesarean section (i.e., the indication-specific cesarean section rate). For example, in 1985/86, 8.7% of women who delivered had a previous cesarean section and 94% of these women had a repeat cesarean section — yielding an attributable rate of 8.2%. In 1994/95, the incidence of previous cesarean section as a diagnosis increased to 9.3% of all deliveries, but the indication-specific cesarean section rate decreased to 67%, yielding an attributable rate of 6.3%. Between 1984/85 and 1989/90 the number of cesarean sections attributable to fetal distress increased; since then it has decreased, but is still higher than in 1984/85. Over the 1984/85 to 1994/95 period, the incidence of the diagnosis of fetal distress increased from 6.3% to 7.0% of deliveries and the indication-specific cesarean section rate for fetal distress decreased from 31% to 27%. The number of cesarean sections attributable to dystocia peaked at 5.3% in the late 1980s and decreased to 4.4% by 1994/95. Between 1984/85 and 1994/95, the incidence of dystocia increased from 13.2% to 15.4% of deliveries, as the indication-specific cesarean section rate decreased from 38% to 28%.

For the two years studied, the 74 Level 1 hospitals accounted for just under 50% of the total deliveries in the province (Exhibit 7.4). The mean cesarean section rate for these hospitals was 18.1%. However, there was wide variation in hospital-level cesarean section rates among these institutions. One quarter of these hospitals had cesarean section rates that were less than 15% of all deliveries, and another quarter had rates that were 21% or more of all deliveries. There were 21 Level 2 hospitals in the province, and these institutions averaged about 4,500 deliveries each over the two-year period (ranging from a low of 1,278 to a high of 8,472) and accounted for about 30% of all deliveries in the province. The mean cesarean section rate at these hospitals was 17.3% of all deliveries, but again there was variation in hospital-level rates. Six of these hospitals had cesarean section rates of 14% or less, and another three had rates that were over 22% of deliveries. Only 11 hospitals are designated as Level 3 institutions. These are high volume hospitals (averaging about 5,100 deliveries over the two year period) that, along with providing care for some low risk pregnancies, deal with the highest risk pregnancies and deliveries. These hospitals account for about one-fifth of the total deliveries in the province and the mean cesarean section rate for these hospitals was 19.6% of deliveries. However, three of these Level 3 hospitals had cesarean section rates of 17.1% or lower.

Exhibit 7.5 provides information on the distribution of some of the diagnosis-level cesarean section rates described in Exhibit 7.1. Overall, Level 3 hospitals had lower repeat cesarean section rates than either Level 1 or Level 2 hospitals. Within each hospital level, there is variation in the repeat cesarean section rate, with many hospitals having repeat cesarean section rates of 65% or less, and many having rates of 85% or more. In general, Level 3 hospitals had higher numbers of cesarean sections attributable to dystocia and fetal distress than other hospitals. As well, Level 2 hospitals had lower median numbers of cesarean sections attributable to dystocia and fetal distress than Level 1 hospitals.

Overall cesarean section rates, repeat cesarean section rates, and the proportion of deliveries that have cesarean sections attributed to dystocia and fetal distress for the period 1993/94 and 1994/95 combined, for each of the 106 hospitals, are listed in Exhibit 7.6. Additionally, Exhibit 7.7 lists the number of deliveries and the cesarean section rate for each of these hospitals in 1993/94 and 1994/95 separately.

Exhibit 7.4: ***Cesarean Section Rates by Nursery Level in Ontario, 1993/94 and 1994/95 Combined***

Nursery Level	Number of Hospitals	Total Deliveries	Mean Cesarean Section Rate (%)	Percentile Distribution of Cesarean Section Rates		
				25th	Median	75th
Level 1	74	136,738	18.1	14.8	18.4	20.8
Level 2	21	95,916	17.3	13.6	15.7	20.6
Level 3	11	56,074	19.6	17.1	20.2	21.7

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 7.5: ***Distribution of Repeat Cesarean Section Rates and Cesarean Sections Attributable to Dystocia and Fetal Distress by Nursery Level in Ontario, 1993/94 and 1994/95 Combined***

Nursery Level	Percentile Distribution of Repeat Cesarean Section Rates			Percentile Distribution of Cesarean Sections Attributable to Dystocia			Percentile Distribution of Cesarean Sections Attributable to Fetal Distress		
	25th	Median	75th	25th	Median	75th	25th	Median	75th
Level 1	66.7	73.9	83.4	2.7	4.3	5.9	1.0	1.7	2.1
Level 2	57.4	66.2	72.8	2.8	3.6	4.8	1.3	1.5	1.9
Level 3	55.9	62.7	75.0	4.2	4.6	6.2	1.9	2.2	2.9

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 7.6: *Cesarean Section Rates Attributable to Different Indications, in Ontario Hospitals with Over 300 Deliveries, Classified by Nursery Level, 1993/94 and 1994/95 Combined*

Institution	Total Deliveries	Cesarean Section Rate per 100 Deliveries	Repeat Cesarean Section Rate per 100 Deliveries	Cesarean Sections Attributable to Dystocia	Cesarean Sections Attributable to Fetal Distress
Level One Hospitals					
Ajax and Pickering General Hospital	3,307	20.0	80.2	2.1	2.1
Almonte General Hospital	470	18.7	83.9	5.3	1.5
Belleville General Hospital	3,380	19.9	75.7	4.7	1.2
Brockville General Hospital	1,220	24.7	98.6	3.7	3.1
Cambridge Memorial Hospital	2,818	21.4	74.2	9.2	1.3
Central Hospital, Toronto	527	35.5	100.0	8.5	3.0
Clinton Public Hospital	355	12.1	67.9	2.0	0.6
Cobourg District General Hospital	627	16.4	71.8	2.6	1.9
Collingwood General and Marine Hospital	706	19.1	96.4	2.4	1.0
Community Memorial Hospital, Port Perry	353	14.7	83.9	2.8	0.3
Doctors Hospital, Toronto	3,380	20.5	78.7	4.3	2.0
Douglas Memorial Hospital, Fort Erie	334	22.2	93.3	6.9	5.4
Dryden District General Hospital	319	14.4	100.0	2.5	0.9
Dufferin-Caledon Health Care Corporation, Orangeville	1,123	16.2	87.4	6.2	1.3
Etobicoke General Hospital	5,032	20.5	68.3	6.5	2.8
Georgetown and District Memorial Hospital	580	22.9	73.1	8.3	2.1
Greater Niagara General Hospital	1,838	12.5	59.4	2.1	1.1
Groves Memorial Community Hospital, Fergus	536	25.9	92.3	7.3	1.1
Guelph General Hospital	3,230	12.5	61.1	2.8	2.4
Haldimand War Memorial Hospital, Dunnville	334	24.3	100.0	7.8	1.5
Hamilton Civic Hospitals (Henderson Division)	3,372	16.6	67.2	6.0	1.7
Hanover and District Hospital	303	11.2	16.7	0.3	0.0
Hawkesbury District General Hospital	480	14.6	80.6	2.7	1.7
Hopital Montfort, Ottawa	1,981	15.4	70.3	1.2	1.7
Hotel Dieu Hospital, Cornwall	1,803	18.6	70.1	2.7	1.8
Humber Memorial Hospital, Weston	2,694	14.9	75.8	3.2	2.0
Huntsville District Memorial Hospital	590	16.9	72.7	4.9	0.0
Huronia District Hospital, Midland	836	21.5	93.0	3.2	3.7
Joseph Brant Memorial Hospital, Burlington	3,372	15.6	62.8	4.8	1.1
Kirkland and District Hospital, Kirkland Lake	338	14.2	69.2	0.6	0.0
Lake of the Woods District Hospital, Kenora	698	17.3	73.9	4.7	3.2
Leamington District Memorial Hospital	955	20.3	83.1	5.2	1.4
Lennox and Addington County General Hospital, Napanee	391	14.1	73.9	5.1	0.0
Listowel Memorial Hospital	424	10.6	80.0	0.9	0.0
Markham Stouffville Hospital	3,859	18.5	63.0	4.0	2.0
McKellar General Hospital, Thunder Bay	1,936	21.0	73.5	6.7	1.5
Memorial Hospital, Bowmanville	758	24.5	85.0	6.9	1.8
Metropolitan General Hospital, Windsor	3,786	15.2	59.2	5.2	1.6
Milton District Hospital	609	16.9	72.2	4.8	1.5
Mississauga Hospital	6,413	15.7	51.1	4.2	2.6
Norfolk General Hospital, Simcoe	866	23.6	79.8	5.4	4.6
North York Branson, Hospital	4,393	20.1	73.3	7.1	2.2
Northwestern General Hospital, Toronto	3,006	19.2	83.7	6.5	1.9
Parry Sound District General Hospital	379	18.2	81.4	4.5	1.6
Pembroke General Hospital	1,720	11.9	66.1	1.4	0.5
Port Hope and District Hospital	318	20.8	86.8	0.9	1.3
Queensway General Hospital, Etobicoke	2,891	19.7	62.7	10.1	1.6
Riverside Health Care Facilities, Fort Frances	581	16.7	67.4	7.6	0.5
Riverside Hospital, Ottawa	4,435	12.2	57.4	5.1	0.7
Ross Memorial Hospital, Lindsay	1,116	17.0	78.6	5.6	1.1
Royal Victoria Hospital, Barrie	3,288	18.9	71.7	3.0	1.8
Salvation Army Grace General, Scarborough	6,254	14.6	59.5	3.8	2.3
Salvation Army Grace Hospital, Ottawa	5,221	16.8	65.6	4.7	2.1
Scarborough General Hospital	5,230	18.9	76.7	2.4	2.5
Sioux Lookout Zone Hospital	643	13.8	89.5	2.8	1.9
Smiths Falls Community Hospital	464	20.3	100.0	5.8	1.3
South Muskoka Memorial Hospital, Bracebridge	454	22.9	84.9	8.6	0.9
St. Joseph's General Hospital, Elliott Lake	444	20.7	97.0	2.0	1.6
St. Michael's Hospital, Toronto	3,346	19.4	74.6	4.3	3.0
St. Thomas Elgin General Hospital	1,655	14.0	66.3	4.0	0.8
Stevenson Memorial Hospital, Alliston	892	22.3	70.2	9.6	1.7
Stratford General Hospital	1,410	15.0	59.8	2.7	1.8
Strathroy-Middlesex General Hospital	692	15.6	75.4	4.3	1.7
Sydenham District Hospital, Wallaceburg	446	10.8	53.3	3.8	0.7

Continued on next page

Exhibit 7.6: ***(cont'd)***

Institution	Total Deliveries	Cesarean Section Rate per 100 Deliveries	Repeat Cesarean Section Rate per 100 Deliveries	Cesarean Sections Attributable to Dystocia	Cesarean Sections Attributable to Fetal Distress
Level One Hospitals (cont'd)					
Temiskaming Hospital, New Liskeard	501	23.6	82.5	5.6	2.8
Tillsonburg District Memorial Hospital	355	7.3	73.7	1.1	0.6
Toronto Hospital	5,001	19.1	68.1	3.9	2.9
Welland County General Hospital	1,400	24.1	90.8	6.6	2.4
Wellesley Hospital, Toronto	2,366	17.6	61.4	8.4	2.1
West Lincoln Memorial Hospital, Grimsby	875	22.2	82.9	6.3	2.1
Winchester District Memorial Hospital	753	15.9	100.0	3.1	0.3
Woodstock General Hospital	1,218	13.4	64.5	5.1	1.0
York Central Hospital Richmond Hill	3,160	19.2	75.1	3.6	1.8
York-Finch General Hospital, North York	4,898	21.9	84.5	6.7	2.3
Level Two Hospitals					
Brantford General Hospital	3,166	13.0	57.7	2.8	1.4
Centenary Health Centre, Scarborough	4,993	16.4	66.4	1.4	1.9
Credit Valley Hospital, Mississauga	7,548	14.4	71.6	3.6	0.9
Grand River Hospital Corporation, Kitchener	8,472	15.1	56.9	3.9	1.5
Grey Bruce Regional Health Centre, Owen Sound	1,575	29.3	75.7	2.3	0.7
North York General Hospital	6,447	20.5	74.0	3.3	1.8
Oakville Trafalgar Memorial Hospital	3,697	20.8	65.3	6.0	2.4
Orillia Soldier's Memorial Hospital	2,011	22.5	68.1	3.3	1.0
Oshawa General Hospital	5,395	19.5	69.4	4.8	2.3
Ottawa Civic Hospital	6,079	15.6	66.2	6.5	1.6
Peel Memorial Hospital, Brampton	7,067	18.8	68.9	7.8	1.9
Peterborough Civic Hospital	3,408	14.8	55.9	4.8	1.3
Public General Hospital, Chatham	2,089	22.5	87.5	3.4	1.4
St. Catharines General Hospital	4,274	12.6	61.5	2.4	1.5
St. Joseph's Health Centre of Sarnia	2,536	13.7	62.4	1.7	1.3
St. Joseph's Health Centre, Toronto	4,844	18.3	77.1	3.7	2.8
St. Joseph's Hospital, Hamilton	7,175	12.9	49.3	4.6	1.6
Timmins and District Hospital	1,278	20.7	84.6	4.7	1.3
Toronto East General and Orthopedic Hospital	5,004	13.5	56.8	2.7	2.3
Victoria Hospital Corporation, London	4,724	11.7	47.5	4.2	1.4
York County Hospital, Newmarket	4,134	15.7	64.0	3.6	1.7
Level Three Hospitals					
Chedoke-McMaster Hospitals, Hamilton	4,064	23.8	68.5	4.3	2.9
General Hospital of Port Arthur, Thunder Bay	2,019	25.5	77.2	4.6	3.2
Kingston General Hospital	4,611	15.7	55.9	5.0	1.8
Mount Sinai Hospital, Toronto	9,188	20.4	62.7	6.2	2.2
Ottawa General Hospital	5,221	17.1	54.9	4.5	1.8
Plummer General Hospital, Sault Ste. Marie	2,464	18.3	67.0	4.2	2.2
Salvation Army Grace Hospital, Windsor	4,722	17.7	57.6	5.5	3.0
St. Joseph's Health Centre of London	8,698	14.7	46.0	6.8	1.9
St. Joseph's Hospital, North Bay	2,375	20.2	75.0	3.9	1.9
Sudbury General Hospital of the Immaculate Heart of Mary	4,742	21.7	91.3	3.4	2.2
Women's College Hospital, Toronto	7,970	20.5	62.3	7.2	2.4

Note: Hospitals are classified by nursery level, which do not fully determine maternal-fetal case mix.
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Comment

The cesarean section rate in Ontario has decreased from its peak in the mid-1980s, and currently is near the national mean. This rate is much lower than that found in the United States or in some other provinces, but much higher than is found in many industrialized countries. The recent decrease in the cesarean section rate in Ontario is mainly due to a decrease in the number of repeat cesarean sections. In turn, this is the result of an increase in the rate at which women who have had a previous cesarean section go on to have a vaginal delivery. The increased reliance on a vaginal birth after a cesarean section (VBAC) is consistent with SOGC guidelines that recommend VBAC for most women who have previously had a cesarean section.[7]

Although there has been a decrease in cesarean sections for women with dystocia and for women who had a previous cesarean section, the number of cesarean sections performed for fetal distress has remained relatively stable over the past 10 years. On the basis of their commitment to evidence-based care and a careful review of research evidence, the SOGC released guidelines on the diagnosis and management of dystocia and the

Exhibit 7.7: *Cesarean Section Rates in Ontario Hospitals, Classified by Nursery Level, 1993/94 and 1994/95*

Institution	Total Deliveries 1993/94	Cesarean Section Rate per 100 Deliveries 1993/94	Total Deliveries 1994/95	Cesarean Section Rate per 100 Deliveries 1994/95
Level One Hospitals				
Ajax and Pickering General Hospital	1,592	18.0	1,715	21.7
Almonte General Hospital	230	17.8	240	19.6
Belleville General Hospital	1,693	19.6	1,687	20.2
Brockville General Hospital	603	24.9	617	24.5
Cambridge Memorial Hospital	1,448	22.4	1,370	20.2
Central Hospital, Toronto	423	36.2	104	32.7
Clinton Public Hospital	178	12.4	177	11.9
Cobourg District General Hospital	380	18.2	247	13.8
Collingwood General and Marine Hospital	339	19.5	367	18.8
Community Memorial Hospital, Port Perry	179	17.9	174	11.5
Doctors Hospital, Toronto	1,576	20.9	1,804	20.2
Douglas Memorial Hospital, Fort Erie	170	20.0	164	24.4
Dryden District General Hospital	168	15.5	151	13.2
Dufferin-Caledon Health Care Corporation, Orangeville	583	16.6	540	15.7
Etobicoke General Hospital	2,492	20.5	2,540	20.5
Georgetown and District Memorial Hospital	296	23.6	284	22.2
Greater Niagara General Hospital	927	13.3	911	11.7
Groves Memorial Community Hospital, Fergus	261	20.7	275	30.9
Guelph General Hospital	1,558	12.2	1,672	12.8
Haldimand War Memorial Hospital, Dunnville	182	23.6	152	25.0
Hamilton Civic Hospitals (Henderson Division)	1,737	16.2	1,635	17.1
Hanover and District Hospital	159	8.8	144	13.9
Hawkesbury District General Hospital	232	15.5	248	13.7
Hopital Montfort, Ottawa	1,082	17.1	899	13.3
Hotel Dieu Hospital, Cornwall	914	18.7	889	18.6
Humber Memorial Hospital, Weston	1,305	16.8	1,389	13.2
Huntsville District Memorial Hospital	280	18.6	310	15.5
Huronia District Hospital, Midland	444	23.2	392	19.6
Joseph Brant Memorial Hospital, Burlington	1,681	15.6	1,691	15.7
Kirkland and District Hospital, Kirkland Lake	169	13.0	169	15.4
Lake of the Woods District Hospital, Kenora	348	18.4	350	16.3
Leamington District Memorial Hospital	449	19.6	506	20.9
Lennox and Addington County General Hospital, Napanee	191	14.7	200	13.5
Listowel Memorial Hospital	205	12.7	219	8.7
Markham Stouffville Hospital	1,877	17.8	1,982	19.1
McKellar General Hospital, Thunder Bay	974	21.9	962	20.2
Memorial Hospital, Bowmanville	366	26.2	392	23.0
Metropolitan General Hospital, Windsor	1,882	14.2	1,904	16.3
Milton District Hospital	274	17.2	335	16.7
Mississauga Hospital	3,090	16.1	3,323	15.4
Norfolk General Hospital, Simcoe	420	25.7	446	21.5
North York Branson Hospital	2,180	18.3	2,213	21.8
Northwestern General Hospital, Toronto	1,502	18.3	1,504	20.0
Parry Sound District General Hospital	182	22.5	197	14.2
Pembroke General Hospital	821	11.8	899	12.0
Port Hope and District Hospital	172	19.8	146	21.9
Queensway General Hospital, Etobicoke	1,437	21.1	1,454	18.3
Riverside Health Care Facilities, Fort Frances	296	15.9	285	17.5
Riverside Hospital, Ottawa	2,257	12.5	2,178	11.8
Ross Memorial Hospital, Lindsay	593	16.5	523	17.6
Royal Victoria Hospital, Barrie	1,602	19.2	1,686	18.6
Salvation Army Grace General, Scarborough	3,153	14.8	3,101	14.5
Salvation Army Grace Hospital, Ottawa	2,610	15.9	2,611	17.6
Scarborough General Hospital	2,535	19.8	2,695	18.0
Sioux Lookout Zone Hospital	307	15.3	336	12.5
Smiths Falls Community Hospital	232	22.8	232	17.7
South Muskoka Memorial Hospital, Bracebridge	213	20.7	241	24.9
St. Joseph's General Hospital, Elliott Lake	214	23.4	230	18.3
St. Michael's Hospital, Toronto	1,759	20.4	1,587	18.2
St. Thomas Elgin General Hospital	818	13.8	837	14.2
Stevenson Memorial Hospital, Alliston	455	23.7	437	20.8
Stratford General Hospital	692	14.0	718	15.9
Strathroy-Middlesex General Hospital	369	18.7	323	12.1
Sydenham District Hospital, Wallaceburg	209	9.6	237	11.8

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Exhibit 7.7: *(cont'd)*

Institution	Total Deliveries 1993/94	Cesarean Section Rate per 100 Deliveries 1993/94	Total Deliveries 1994/95	Cesarean Section Rate per 100 Deliveries 1994/95
Level One Hospitals (cont'd)				
Temiskaming Hospital, New Liskeard	270	20.7	231	26.8
Tillsonburg District Memorial Hospital	173	4.6	182	9.9
Toronto Hospital	2,480	18.9	2,521	19.2
Welland County General Hospital	717	23.3	683	25.0
Wellesley Hospital, Toronto	1,066	18.5	1,300	16.8
West Lincoln Memorial Hospital, Grimsby	459	21.8	416	22.6
Winchester District Memorial Hospital	367	14.7	386	17.1
Woodstock General Hospital	618	14.1	600	12.7
York Central Hospital, Richmond Hill	1,554	19.4	1,606	19.1
York-Finch General Hospital, North York	2,349	21.2	2,549	22.6
Level Two Hospitals				
Brantford General Hospital	1,597	12.7	1,569	13.4
Centenary Health Centre, Scarborough	2,491	16.8	2,502	15.9
Credit Valley Hospital, Mississauga	3,790	14.0	3,758	14.8
Grand River Hospital Corporation, Kitchener	4,261	15.7	4,211	14.5
Grey Bruce Regional Health Centre, Owen Sound	812	30.3	763	26.3
North York General Hospital	3,160	20.0	3,287	21.0
Oakville Trafalgar Memorial Hospital	1,875	20.6	1,822	20.9
Orillia Soldier's Memorial Hospital	990	23.7	1,021	21.3
Oshawa General Hospital	2,753	20.2	2,642	18.7
Ottawa Civic Hospital	2,952	15.2	3,127	15.9
Peel Memorial Hospital, Brampton	3,524	18.4	3,543	19.2
Peterborough Civic Hospital	1,721	15.2	1,687	14.3
Public General Hospital, Chatham	1,070	23.6	1,019	21.2
St. Catharines General Hospital	2,189	12.9	2,085	12.2
St. Joseph's Health Centre of Sarnia	1,288	14.3	1,248	13.1
St. Joseph's Health Centre, Toronto	2,435	19.6	2,409	16.9
St. Joseph's Hospital, Hamilton	3,477	12.4	3,698	13.4
Timmins and District Hospital	392	20.4	886	20.9
Toronto East General and Orthopedic Hospital	2,430	14.0	2,574	13.1
Victoria Hospital Corporation, London	2,407	12.5	2,317	10.8
York County Hospital, Newmarket	2,075	15.9	2,059	15.6
Level Three Hospitals				
Chedoke-McMaster Hospitals, Hamilton	2,045	23.8	2,019	23.9
General Hospital of Port Arthur, Thunder Bay	1,026	26.7	993	24.3
Kingston General Hospital	2,309	16.2	2,302	15.2
Mount Sinai Hospital, Toronto	4,949	20.5	4,239	20.4
Ottawa General Hospital	2,595	16.0	2,626	18.2
Plummer General Hospital, Sault Ste. Marie	1,279	19.0	1,185	17.5
Salvation Army Grace Hospital, Windsor	2,313	17.8	2,409	17.6
St. Joseph's Health Centre of London	4,316	15.4	4,382	14.0
St. Joseph's Hospital, North Bay	1,196	20.2	1,179	20.1
Sudbury General Hospital of the Immaculate Heart of Mary	2,418	21.8	2,324	21.6
Women's College Hospital, Toronto	3,915	20.9	4,055	20.2

Note: Hospitals are classified by nursery level, which do not fully determine maternal-fetal case mix.
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

diagnosis and management of fetal distress in 1995.[8,9] These guidelines could have major impacts on the way obstetrical care is provided in Ontario.

The guidelines on dystocia emphasize the importance of correctly identifying the onset of active labour and the need to carefully monitor progress. They also point out the important effect that labour support and one-to-one nursing can have in managing labour and reducing the need for a cesarean section. The guidelines on fetal distress indicate that continuous electronic fetal monitoring is not required for most deliveries and can be replaced by intermittent auscultation (i.e., listening to the fetal heart with a fetoscope). Research evidence suggests that electronic fetal monitoring in low-risk cases does not result in better fetal outcomes and increases the cesarean section rate.[10,11] Surveys in Ontario suggest that electronic fetal monitoring is routine in many hospitals.[12]

The hospital-specific analysis indicates that there is wide variation in cesarean section rates and the diagnosis and management of the main indications for cesarean section among high-volume obstetrical care hospitals in Ontario. There are still many hospitals that have very high repeat cesarean section rates even though the SOGC guidelines suggest that any hospital that provides routine obstetrical care should be able to perform VBAC.[7] The diagnosis and management of dystocia appears to be uneven across the province. As is expected with a successful regional obstetrical care system, Level 3 hospitals deal with more cases of fetal distress than other hospitals in the province. However, once again there seems to be wide variation in the diagnosis and management of fetal distress among similar hospitals.

In conclusion, the last decade has seen a decrease in cesarean section rates that has been driven primarily by decreases in repeat cesarean section rates — a shift consistent with SOGC guidelines first published in 1986.[13] However, the repeat cesarean section rates do not seem to be as low as they could be in many institutions and there is room for further reduction. The guidelines on dystocia and fetal distress are more recent and future reductions in the cesarean section rate will depend on the extent to which these guidelines are accepted and implemented. The implementation of these two guidelines will involve some fundamental changes in the manner in which obstetrical care is provided in this province. Simply publishing guidelines is often not enough to change practice.[14] Successful implementation will require a coordinated and concerted effort by all stakeholders.[15] Currently ICES is working in conjunction with the Ministry of Health, the SOGC and the Ontario Medical Association to develop and pilot-test a comprehensive strategy for implementing evidence-based guidelines for obstetrical care.

Primary and Incidental Appendectomy

Introduction

In Chapter 5, we examined the DHC-specific patterns of use of primary and incidental appendectomy, along with temporal trends in the use of these procedures by age and sex groups. This section of Chapter 7 examines appendectomy utilization by hospital. We also repeat our earlier published analyses relating diagnostic accuracy to perforation rates, length of hospital stay, and fatality rates by institution. It is germane to revisit these analyses not only for the most recent period, but also to determine the impact on our previous conclusions of the more stringent algorithm used to select and categorize appendectomies in this edition of the ICES *Practice Atlas*. We shall also briefly recapitulate some of the recent literature pertinent to appendectomy.

Methods

Appendectomies were assigned to one of three categories for primary procedures, or as incidental appendectomy, as described in Chapter 5. Diagnostic accuracy was determined for each acute care hospital for fiscal years 1992/93 to 1994/95 inclusive; those with fewer than 20 cases for the three fiscal years were excluded from the hospital-specific lists, but are included in the overall analysis.

There appears to be an equal and somewhat interchangable use of the ICD-9 codes 540.9 (appendicitis without generalized peritonitis) and 541 (appendicitis unqualified). Perforation was therefore attributed in the presence of positive primary appendectomy where either the diagnosis code was 540.0 (signifying generalized peritonitis), or the incision of an appendiceal abscess was recorded as a concurrent procedure (CCP 591). Perforation should ideally be confirmed pathologically, but some hospitals reported that they coded a 540.0 based on a clinical diagnosis of generalized peritonitis. There is inconsistent use of ICD-9 code 540.1 (appendicitis with abscess); therefore we insisted on the appearance of the drainage procedure code CCP 591 before inferring perforation.

The percent of negative appendectomies is defined as the number of negative appendectomies divided by total number of non-incidental appendectomies (defined as an appendectomy performed for preventive purposes on patients undergoing another abdominal procedure). Percent perforation is defined as the percentage of positive primary appendectomies in which perforation occurred as defined above. The percent of incidental appendectomies is defined as the number of incidental appendectomies divided by the total number of all appendectomies, incidental or primary. Mean length of stay was defined as per our previous publications.[16]

We believe that coding remains somewhat idiosyncratic for perforation-related codes. Therefore, to avoid having readers focus unduly on specific numbers, we present summary tables in a categorical framework, with ranges for outcome values grouped by percentile as explained below. Among 170 hospitals with at least one appendectomy case, 11 hospitals with less than 10 primary procedures were excluded to stabilize rates. The values for the outcomes for the remaining 159 hospitals were ordered and grouped into five categories: first 10% (0 to 10th percentile), next 15% (10th to 25th percentile), next 50% (25th to 75th percentile), next 15% (75th to 90th percentile), and top 10% (90th to 100th percentile). Scores of 1 to 5 were assigned, depending on the category into which a hospital fell. Highly ranked performance would be a score of 1 in all categories, i.e., low percentage of negative appendectomies, low perforation rate, short length of stay, and low percentage of incidental appendectomies.

Multivariate logistic and linear regression methods, again as previously published, were used to examine the relationships between diagnostic accuracy and outcomes, while controlling for individual patient covariates (e.g., patient age, sex, and comorbidity as determined with Deyo's adaptation of Charlson's comorbidity index) and hospital-level ecological covariates (e.g., teaching status, bed size, and number of appendectomies performed). We also cross-tabulated site of surgery and site of patient residence for each of the 33 DHCs used in the geographic analyses in this edition of the Atlas. This allowed us to determine the extent to which patients underwent surgery in a hospital outside their region of residence.

Findings

The overall diagnostic accuracy, as noted in Chapter 5, has risen steadily. Using the new algorithms that bias the analysis towards overestimating accuracy, we found in 1994/95 that the accuracy was 87.2% among women and 95.2% among men (Exhibit 7.8). Length of stay has fallen steadily and significantly for both sexes, and there has been no meaningful change in in-hospital fatality rates. On the other hand, there has been a temporal increase in the perforation rate that is clearly significant for both sexes ($p<0.001$).

In the summary table for hospital-specific outcomes for 1992/93 to 1994/95 (Exhibit 7.9), we show the outcome values at the 10th, 25th, 75th and 90th percentiles that demarcate the five groups for the list of hospital-specific grades. Exhibit 7.10 shows the hospital-specific grades. The variations in accuracy are modest but appear clinically meaningful. For example, even a hospital scoring 5 for accuracy could have an accuracy rate of more than 75% (see threshold for 90th percentile in Exhibit 7.9). About one-third of hospitals, however, have an accuracy rate of more than 90% using the current analytical algorithm, and the mean length of stay for confirmed cases is only three to four days in many centres with very high accuracy. Perforation rates have the most variable outcomes, which may be partly related to coding imprecision. As a review of the hospital-specific scores suggests (Exhibit 7.10), there is no logical relationship between perforation and accuracy or even length of stay. As well, the use of incidental appendectomy was, and remains, highly idiosyncratic.

There is a definite correlation between the number of cases and the diagnostic accuracy observed by DHC of patient residence and DHC where surgery was performed (Exhibit 7.11), indicating that inter-regional referral is not common for these procedures. Thus, interhospital differences in accuracy are unlikely to be attributable to case mix.

Last, we have redone our earlier multivariate models drawing on data from the most recent three fiscal years, including 26,906 positive primary appendectomies, and accuracy defined strictly by the proportion of negative I appendectomies out of the total of negative I and positive primary cases. Two models were developed: one with perforation as an outcome, and another in which perforation is taken as an individual-level covariate and potential predictor of death or length of stay. These analyses reconfirm that there is no significant relationship between accuracy and fatality rates or length of stay (Appendices A7.2 and A7.3). Presence of a comorbid condition is by far the strongest predictor of death or prolonged length of stay. There appears to be a weak relationship between diagnostic accuracy and chance of perforation (odds of perforation increase 5% with each 10% increase in accuracy);

Exhibit 7.8: ***Diagnostic Accuracy and Perforation Rate, In-hospital Death Rate and Average Length of Hospital Stay (ALOS) for Women and Men with Acute Appendicitis in Ontario, 1989/90 - 1994/95***

Year	Women Accuracy (%)	Women Perforation (%)	Women Death Rate (%)	Women ALOS, (SD)		Men Accuracy (%)	Men Perforation (%)	Men Death Rate (%)	Men ALOS, (SD)	
1989/90	84.7	21.1	0.12	5.8	(4.5)	94.3	22.7	0.11	5.5	(4.4)
1990/91	84.6	20.8	0.10	5.6	(4.4)	94.8	24.4	0.18	5.2	(4.1)
1991/92	84.6	21.2	0.20	5.1	(4.1)	93.8	24.2	0.17	4.9	(3.9)
1992/93	86.2	23.2	0.21	4.8	(4.0)	94.1	25.8	0.14	4.5	(3.6)
1993/94	86.5	24.0	0.11	4.3	(3.2)	94.7	26.7	0.14	4.2	(3.2)
1994/95	87.2	23.4	0.13	4.0	(2.9)	95.2	26.5	0.23	4.0	(3.0)

See Appendix A5.1 for procedure codes and definitions

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 7.9: ***Range of Appendectomy Outcomes Within Each Quintile in Ontario, 1992/93 - 1994/95***

Outcome	Class 1		Class 2		Class 3		Class 4		Class 5	
	0 percentile	10th percentile	10th percentile	25th percentile	25th percentile	75th percentile	75th percentile	90th percentile	90th percentile	100th percentile
% Negative Appendectomies	0.00	5.71	5.71	8.28	8.28	17.31	17.31	23.08	23.08	66.67
% Perforation	0.00	12.12	12.12	17.00	17.00	29.94	29.94	38.46	38.46	73.08
Mean Length of Stay	2.53	3.35	3.35	3.77	3.77	4.83	4.83	5.28	5.28	8.75
% Incidental Appendectomies	0.00	2.33	2.33	5.58	5.58	14.87	14.87	20.93	20.93	47.62

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 7.10: *Hospital Classifications for Appendectomy Outcomes in Ontario, 1992/93 - 1994/95 (as per Exhibit 7.9)*

Institution	% Negative Appendectomies	% Perforation	Mean Length of Stay	% Incidental Appendectomies
Ajax and Pickering General Hospital	2	3	3	4
Alexandra Hospital, Ingersoll	2	2	3	5
Alexandra Marine and General Hospital, Goderich	4	5	3	3
Almonte General Hospital	1	1	1	3
Arnprior and District Memorial Hospital	1	2	1	4
Belleville General Hospital	2	3	3	5
Brantford General Hospital	3	3	2	3
Brockville General Hospital	2	3	3	3
Bruce County General Hospital, Walkerton	3	3	5	1
Cambridge Memorial Hospital	3	3	3	3
Campbellford Memorial Hospital	5	3	2	2
Centenary Health Centre, Scarborough	3	3	3	3
Central Hospital, Toronto	3	2	2	5
Centre Grey General Hospital, Markdale	3	2	3	1
Charlotte Eleanor Englehart Hospital, Petrolia	3	3	1	3
Chedoke-McMaster Hospitals, Hamilton	2	3	3	4
Children's Hospital of Eastern Ontario, Ottawa	1	3	3	3
Children's Hospital of Western Ontario, London	3	3	5	4
Clinton Public Hospital	3	2	3	2
Cobourg District Hospital	3	1	4	2
Collingwood General and Marine Hospital	3	1	4	3
Community Memorial Hospital, Port Perry	3	4	3	4
Cornwall General Hospital	3	3	3	5
Credit Valley Hospital, Mississauga	3	3	2	2
Doctors Hospital, Toronto	2	3	3	1
Douglas Memorial Hospital, Fort Erie	1	2	3	2
Dryden District General Hospital	1	3	4	3
Dufferin-Caledon Health Care Corporation, Orangeville	3	4	3	4
Etobicoke General Hospital	3	2	1	2
General Hospital of Port Arthur, Thunder Bay	3	3	3	3
Georgetown and District Memorial Hospital	5	5	2	1
Grand River Hospital Corporation, Kitchener	2	3	2	2
Great War Memorial Hospital of Perth	2	5	2	1
Greater Niagara General Hospital, Niagara Falls	3	2	5	3
Grey Bruce Regional Health Centre, Owen Sound	3	5	4	2
Groves Memorial Community Hospital, Fergus	5	3	3	2
Guelph General Hospital	3	3	3	3
Haldimand War Memorial Hospital, Dunnville	3	3	3	5
Hamilton Civic Hospitals (General Division)	2	4	4	3
Hamilton Civic Hospitals (Henderson Division)	3	4	3	3
Hanover and District Hospital	4	5	5	3
Hawkesbury District General Hospital	3	5	1	3
Hopital Montfort, Ottawa	3	3	4	3
Hospital for Sick Children, Toronto	1	4	5	4
Hotel Dieu Hospital, Cornwall	4	3	3	5
Hotel Dieu Hospital, Kingston	4	3	3	4
Hotel Dieu Hospital, St. Catharines	4	2	4	5
Hotel Dieu of St. Joseph's Hospital, Windsor	3	3	3	4
Humber Memorial Hospital, Weston	3	3	3	2
Huntsville District Memorial Hospital	3	1	2	3
Huronia District Hospital, Midland	3	4	3	1
Joseph Brant Memorial Hospital, Burlington	3	3	3	3
Kemptville District Hospital	4	5	3	3
Kincardine and District Hospital	4	2	1	1
Kingston General Hospital	2	3	3	5
Kirkland and District Hospital	5	2	2	3
Lady Minto Hospital, Cochrane	3	3	5	1
Lake of the Woods District Hospital, Kenora	3	3	4	3
Laurentian Hospital, Sudbury	3	4	2	2
Leamington District Memorial Hospital	4	3	4	2
Lennox and Addington County General Hospital, Napanee	4	1	3	4
Listowel Memorial Hospital	4	5	1	3
Manitoulin Health Centre, Little Current	1	1	1	1
Markham Stouffville Hospital	2	5	3	3
McKellar General Hospital, Thunder Bay	3	3	3	3
Memorial Hospital, Bowmanville	4	2	2	4
Metropolitan General Hospital, Windsor	3	3	4	2
Milton District Hospital	2	3	3	3

Continued on next page

Exhibit 7.10: *(cont'd)*

Institution	% Negative Appendectomies	% Perforation	Mean Length of Stay	% Incidental Appendectomies
Mississauga Hospital	3	4	3	3
Mount Sinai Hospital, Toronto	2	3	4	2
National Defense Medical Centre, Ottawa	3	3	4	3
Norfolk General Hospital, Simcoe	2	4	3	3
North Bay Civic Hospital	3	4	5	3
North York Branson Hospital	3	3	2	1
North York General Hospital	4	4	3	3
Northwestern General Hospital, Toronto	3	3	3	2
Notre Dame Hospital, Hearst	5	1	3	1
Oakville Trafalgar Memorial Hospital	3	3	1	3
Orillia Soldier's Memorial Hospital	1	1	2	3
Oshawa General Hospital	3	3	3	3
Ottawa Civic Hospital	3	3	3	2
Ottawa General Hospital	1	4	2	3
Palmerston and District Hospital	2	4	3	2
Peel Memorial Hospital, Brampton	3	3	2	3
Pembroke Civic Hospital	3	3	3	3
Pembroke General Hospital	2	4	2	3
Penetanguishene General Hospital	3	5	5	3
Peterborough Civic Hospital	4	3	3	4
Plummer General Hospital, Sault Ste. Marie	3	3	3	3
Plummer Memorial Public Hospital, Sault Ste. Marie	4	4	3	3
Port Colborne General Hospital	3	3	1	3
Prince Edward County Memorial Hospital, Picton	4	3	3	3
Public General Hospital, Chatham	3	3	3	3
Queensway General Hospital, Etobicoke	3	3	3	1*
Queensway-Carleton Hospital, Nepean	3	4	3	3
Red Lake Margaret Cochenour Memorial Hospital	4	1	3	3
Renfrew Victoria Hospital	2	4	3	4
Riverside Health Care Facilities, Fort Frances	4	2	1	3
Riverside Hospital, Ottawa	5	3	3	5
Ross Memorial Hospital, Lindsay	3	3	3	3
Royal Victoria Hospital, Barrie	4	3	3	3
Salvation Army Grace General, Scarborough	1	3	1	3
Salvation Army Grace Hospital, Ottawa	3	1	3	4
Salvation Army Grace Hospital, Windsor	3	3	5	3
Sarnia General Hospital	1	3	2	3
Scarborough General Hospital	4	3	4	3
Seaforth Community Hospital	3	1	3	3
Sensenbrenner Hospital, Kapuskasing	5	1	3	3
Sioux Lookout District Health Centre	1	1	5	1
Sioux Lookout Zone Hospital	1	3	5	1
Smiths Falls Community Hospital	1	1	3	1
South Muskoka Memorial Hospital, Bracebridge	5	2	2	4
St. Catharines General Hospital	3	4	3	3
St. Joseph's General Hospital, Elliot Lake	1	5	5	1
St. Joseph's General Hospital, Thunder Bay	3	2	2	2
St. Joseph's Health Centre of London	5	5	3	3
St. Joseph's Health Centre of Sarnia	3	3	4	3
St. Joseph's Health Centre, Toronto	3	4	4	2
St. Joseph's Hospital and Health Centre, Peterborough	3	2	3	5
St. Joseph's Hospital, Brantford	5	1	1	3
St. Joseph's Hospital, Chatham	3	3	4	4
St. Joseph's Hospital, Guelph	5	3	3	5
St. Joseph's Hospital, Hamilton	3	3	3	5
St. Joseph's Hospital, North Bay	5	4	3	3
St. Mary's General Hospital, Kitchener	3	3	3	3
St. Mary's Memorial Hospital, St. Mary's	2	3	2	1
St. Michael's Hospital, Toronto	3	3	4	4
St. Thomas Elgin General Hospital	3	3	3	3
St. Vincent De Paul Hospital, Brockville	2	3	3	4
Stevenson Memorial Hospital, Alliston	3	3	3	4
Stratford General Hospital	3	5	1	3
Strathroy-Middlesex General Hospital	4	2	4	3
Sudbury General Hospital of the Immaculate Heart of Mary	3	3	3	3
Sudbury Memorial Hospital	3	3	3	3
Sunnybrook Health Science Centre, North York	2	2	3	3
Sydenham District Hospital, Wallaceburg	5	2	2	3
Temiskaming Hospital, New Liskeard	3	2	2	3

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Exhibit 7.10: ***(cont'd)***

Institution	% Negative Appendectomies	% Perforation	Mean Length of Stay	% Incidental Appendectomies
Tillsonburg District Memorial Hospital	3	2	5	2
Timmins and District Hospital	3	3	1	2
Toronto East General and Orthopedic Hospital	2	5	4	4
Toronto Hospital	1	3	3	2
Trenton Memorial Hospital	3	2	1	4
University Hospital, London	2	5	5	2
Victoria Hospital Corporation, London	4	3	4	5
Weeneebayko General Hospital, Moose Factory	2	4	5	3
Welland County General Hospital	5	3	2	3
Wellesley Hospital, Toronto	3	3	3	4
West Lincoln Memorial Hospital, Grimsby	4	3	2	3
West Nipissing General Hospital, Sturgeon Falls	5	1	3	5
West Parry Sound Health Centre	3	2	3	3
Whitby General Hospital	1	4	4	4
Winchester District Memorial Hospital	3	3	4	5
Windsor Western Hospital	2	2	3	3
Wingham and District Hospital	3	3	3	2
Women's College Hospital, Toronto	3	3	4	4
Woodstock General Hospital	4	3	3	3
York Central Hospital, Richmond Hill	3	4	3	3
York County Hospital, Newmarket	3	3	3	3
York-Finch General Hospital, North York	4	4	4	3

* Based on recategorization of several incidental appendectomies as primary appendectomies, as per Queensway General Hospital correspondence of January 31, 1996.

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

however, the confidence intervals on the odds ratio run from 0.99 to 1.11. Higher volume and larger hospitals have shorter lengths of stay, although non-teaching hospitals have lower perforation rates (odds ratio 0.75, 95% confidence interval of 0.70 to 0.80) and lengths of stay shorter by about half a day (ß –0.41, 95% confidence interval of –0.50 to –0.32). In the latter instance, the observed volume or bed size effects in reducing length of stay are partly mitigated by teaching status. Men have a higher perforation rate (odds ratio 1.24, 95% confidence interval of 1.17 to 1.32). Whereas our earlier published models showed perforation to be a statistically significant predictor of death, this relationship is weaker in the recent data (odds ratio 1.52, 95% confidence interval of 0.78 to 2.97). Nonetheless, occurrence of perforation does appear to add about two days to hospital stay (ß 2.20, 95% CI 2.11 to 2.29).

Comment

The general surgical community in Ontario continues to achieve high levels of accuracy in the diagnosis of appendicitis, and enhanced efficiency is indicated by the decreasing lengths of stay for this condition. However, the inter-DHC variations in accuracy demonstrated in Chapter 5 are reflected in variations at the hospital level. These variations do not appear to be caused by referral bias, and occur among groups of hospitals that are very similar in other respects.

In revisiting hospital-specific data on appendectomy utilization, we emphasize that the data largely originate from a period before the first ICES *Practice Atlas* was published. Any action taken to improve accuracy would be poorly captured in the aggregated data for 1992/93 to 1994/95 presented here, since only the last few months of 1994/95 could have been affected. There are also many potentially mitigating factors (e.g., coding idiosyncrasies, geography, diagnostic technology, size of practice group and availability of back-up surgeons) to be considered as explanatory factors for the observed variations. However, some burden of proof must rest with institutions that have low accuracy.

The continued increase in perforation rates appears to be weakly linked to an increase in accuracy, but "code creep" for perforation is expected for reasons discussed in previous publications.[16–19] As well, persons with perforation of the appendix tend to have longer lengths of stay than those without perforation. However, it is clear from the hospital-specific data that centres with high accuracy do not necessarily have high perforation rates or long lengths of stay; nor is the relationship between higher perforation rates and longer lengths of stay consistently shown at the institutional level, notwithstanding the findings from person-level multivariate models.

Accordingly, as noted in the first edition of the ICES *Practice Atlas*, we agree with authorities who have argued that perforation rates are not, in themselves, a good indicator of quality of surgical care, especially when considering the toll of negative abdominal exploration for the patient and related costs to the hospital. This concern is underscored by coding vagaries. Therefore, we again suggest that a study of operating room notes and pathology reports is needed to determine how perforation of the appendix is diagnosed and coded,

Exhibit 7.11: ***Diagnostic Accuracy Rate for Appendectomies by District Health Council of Patient Residence in Ontario, 1992/93 - 1994/95***

District Health Council	Number of Positive Procedures per Year	Number of Negative I Procedures per Year	Accuracy Rate	Rank
Algoma	92	10	0.90	17
Brant	146	18	0.89	23
Cochrane	103	16	0.86	30
Durham Region	414	39	0.91	13
East Muskoka-Parry Sound	63	12	0.84	31
Eastern Ontario	187	14	0.93	5
Essex County	260	21	0.92	10
Grey-Bruce	128	16	0.89	24
Haldimand-Norfolk	103	8	0.93	7
Haliburton, Kawartha & Pine Ridge	265	38	0.87	28
Halton	291	31	0.90	16
Hamilton-Wentworth	327	26	0.93	9
Hastings & Prince Edward Counties	131	13	0.91	14
Huron/Perth	130	15	0.90	20
Kenora-Rainy River	125	7	0.95	2
Kent County	92	13	0.87	29
Kingston, Frontenac and Lennox & Addington	151	18	0.90	21
Lambton	124	7	0.95	3
Manitoulin-Sudbury	174	24	0.88	27
Metropolitan Toronto	1,816	146	0.93	8
Niagara	292	35	0.89	22
Nipissing/Timiskaming	120	25	0.83	33
Ottawa-Carleton Regional	562	43	0.93	6
Peel	615	67	0.90	18
Renfrew County	85	6	0.94	4
Rideau Valley	146	8	0.95	1
Simcoe County	265	28	0.90	15
Thames Valley	444	57	0.89	26
Thunder Bay	143	16	0.90	19
Waterloo Region	416	39	0.92	12
Wellington-Dufferin	207	37	0.89	25
West Muskoka-Parry Sound	15	3	0.83	32
York Region	422	38	0.92	11
Total Ontario	**8,855**	**884**	**0.91**	

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

and why some hospitals have more cases diagnosed with otherwise uncommonly used codes for other appendix-related diseases.

How might accuracy be improved? The cornerstone of diagnostic accuracy was demonstrated 20 years ago to be a strategy of watchful waiting in the person with an equivocal clinical presentation.[20] Our multivariate models and overall outcome data lend credence to the fact that, except at the extremes of age, a prudent approach to laparotomy is warranted. In this regard, management of suspected appendicitis with antibiotics and ultrasonographic monitoring has been given credence by a small randomized trial.[21] However, the exact contribution of ultrasonography in diagnosis and monitoring is controversial. Eriksson and associates[21] have suggested that ultrasound is accurate and helpful; they note that persistent observation of the appendix in persons with suspected appendicitis who are treated with antibiotics may be predictive of a recurrence with subsequent appendectomy. In contrast, Ford and associates[22] have questioned the value of ultrasound, but their conclusions were based on a retrospective single-centre case series from the late 1980s. The evidence for laparoscopy is more clear-cut. Two randomized trials[23,24] have shown that preoperative diagnostic laparoscopy reduces the rate of misdiagnosis of appendicitis in women.

Although laparoscopy is a useful diagnostic adjunct, it is clear that the procedure should be reserved for those situations where there is doubt — e.g., a laparoscopy would constitute inappropriate delay if the patient had acute generalized peritonitis. Moreover, the evidence does not consistently support a major shift to laparoscopy as the primary mode of performing the appendectomy. Four studies,[25-28] including one randomized trial,[25] have shown complication rates to be as low as, or lower than, those with open procedures, and lengths of stay to be shorter; however, because operating room charges were higher, cost savings were non-existent. Much depends on the costing perspective. Since patients return to normal activities, including work, faster, the laparoscopic procedure may indeed be beneficial from a societal and patient perspective, regardless of third-party costs. A further issue from the standpoint of cost-reduction is length of stay after open or conventional appendectomy. While lengths of stay in Ontario hospitals after appendectomy were demonstrated to have fallen in this analysis, some groups abroad now discharge the majority of patients within 24 hours of uncomplicated open or conventional appendectomy.[29]

We turn penultimately to incidental appendectomy. The value of this prophylactic procedure remains controversial. Proponents cite case series showing no short-term adverse effects from incidental appendectomy. However, these series have all been small, and often uncontrolled. We recently published an historical cohort analysis of open cholecystectomy with and without incidental appendectomy.[17] Whereas the main intent of that analysis was to highlight difficulties in controlling for confounding by selection factors, we also concluded that incidental appendectomy probably had minor adverse effects on short-term outcomes. While the trend away from incidental appendectomy is continuing, this section has underscored the persistent major interinstitutional variation in use of this procedure.

In conclusion, the findings show continued improvement in the accuracy of diagnosing appendicitis, no increases in fatality rates, and declining lengths of stay. All these trends are positive. It is essential that each hospital confirm the accuracy of its coding of appendicitis outcomes, given the vagaries of the administrative data as described above. It is especially important to determine precise definitions for diagnoses such as perforation/generalized peritonitis or appendiceal abscess. However, unless the overwhelming majority of the categorizations are attributable to coding errors, process and outcome variation among hospitals is moderately large. We suggest that improvement in the diagnostic accuracy in some hospitals with lower accuracy might be achieved by using diagnostic algorithms from hospitals with higher accuracy. Girotti and Holiday,[30] two academic general surgeons at London's Victoria Hospital, have suggested in the *Canadian Medical Association Journal* that these analyses largely reinforce what surgeons already know, or should know. Their verdict is beyond reproach: the data suggest that there may be gains if clinical opinion leaders revisit a common clinical problem — right lower-quadrant pain — and develop clinical guidelines to improve both the diagnostic accuracy and the outcome from this illness with some regard for the use of health care resources.

Breast Cancer Surgery

Introduction

At present, many women newly diagnosed with breast cancer have a choice of initial surgical options: lumpectomy (breast conserving surgery) with follow-up radiation therapy; or mastectomy. Recently, the Ontario Cancer Treatment and Research Foundation (OCTRF) Practice Guidelines Initiative released guidelines that concluded that these two options are equivalent and that the choice is a personal one for the patient. Recent international publications continue to support this view.[31,32]

In the first edition of the ICES *Practice Atlas*, we reported on practices for breast cancer surgery in Ontario. It later emerged that systematic coding errors took place at some hospitals. Some hospitals reported that breast-conserving procedures were classified as mastectomy on the CIHI abstracts.

Much of the concern expressed and documented regarding the coding of breast procedures relates to the way that procedures which are less extensive than a mastectomy are coded. The terms "breast biopsy," "wedge resection," "lumpectomy," "segmental resection," "quadrant resection" or "partial mastectomy" may be used by surgeons in their operative notes to describe procedures that are all breast conserving. These terms may lead to several different CCP procedure codes. However, for purposes of analysis in the previous and current editions of the ICES *Practice Atlas*, these procedure codes are all assigned to breast conservation.

The publication of the first Atlas, and the ensuing publicity, led to a review of coding for breast cancer surgery at many hospitals, and in some instances, to changes in coding practices. Although we continue to share concerns about the quality of these data, we update the hospital-specific breast cancer surgery statistics in this edition of the Atlas due to the amount of public interest in this area. However, as with the preceding analysis of hospital-level appendectomy outcomes, we have not published specific values for breast conserving surgery rates in this edition of the Atlas. Instead, we group hospitals and list only the quintile into which a hospital belongs. It is important to emphasize that there may be many legitimate reasons for variability in breast cancer surgery practices, such as tumour characteristics at presentation, breast size and availability of follow-up services. Most importantly, patient preference must be considered. Many patients choose one type of surgery over another for personal reasons. These can include: personal factors that affect the decision to undergo radiation treatment, such as travel, work and family responsibilities; follow-up considerations, since more intensive follow-up is required after breast conserving surgery which may lead to continued stress and anxiety about the possible recurrence of breast cancer; and body image and sexuality.[33-35] Administrative data do not provide the personal reasons for selection of one procedure over another.

Methods

This analysis is based on 1994/95 CIHI inpatient and day surgery data files. All 7,888 records for women with a diagnosis of breast cancer (ICD-9 code 174) in either file were selected. Records for bilateral procedures and for non-residents of Ontario were excluded, leaving 7,764 records for analysis. A further 44 records with missing or invalid health numbers were excluded. Records were then matched based on health number, date of birth and postal code. For subjects with one or more procedures within 90 days of the first procedure, the most extensive procedure was selected, and was assigned to the facility where it was conducted. The procedure codes are shown in Appendix A7.4. The proportion of breast conserving surgery for each hospital was calculated as the number of cases having breast conserving surgery divided by the number of cases having either conserving surgery or mastectomy. The final analysis is based on the 6,366 individual cases of breast cancer surgery that were identified. Since this analysis combines breast cancer surgery at all Ontario hospitals, individual hospitals cannot readily replicate the analysis with their data alone.

In addition to concerns about the coding of data for breast surgery, there are a few other limitations to these data. Unlike our previously published study,[36] the cases in this series were not selected based on an Ontario Cancer Registry (OCR) diagnosis. The OCR approach allowed us to ensure that we were including only incident cases of invasive breast cancer with pathological confirmation. In the current series, we may have cases inadvertently coded as breast cancer with carcinoma in-situ or benign disease. Such cases would receive conservative procedures that would inflate the breast conserving surgery proportion. We may also have included women being managed for a recurrence of breast cancer, who could have received either procedure. Since we do not have complete identifiers in the CIHI data, our record linkage may have failed to match some cases. This could lead to counting more than one procedure for the same woman. This also inflates the breast conserving surgery proportion since the net effect is to count biopsies and lumpectomies that would otherwise have been excluded. Given these concerns, we have grouped hospitals into quintiles according to their breast conserving surgery proportion, and only provide grouped data. Hospitals with less than 12 cases were excluded, as the proportions are statistically unstable. Note that the groupings for the five categories are exact quintiles (i.e., evenly split at the 20th, 40th, 60th and 80th percentiles), in contrast to the asymmetric divisions appropriate for the distribution of appendectomy outcomes.

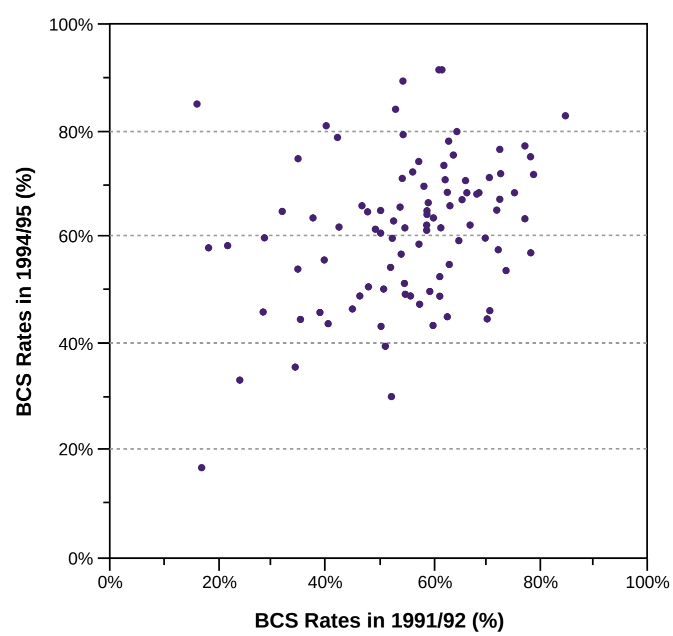
We are currently completing a study based on chart abstractions which will assess the quality of coding for breast surgery procedures. We anticipate further work with Ontario hospitals to improve processes for coding breast surgery.

Findings

The overall breast conserving surgery proportion in 1994/95 was 63.5%, an increase from the proportion of 57.1% observed for 1991/92. Exhibit 7.12 illustrates the correlation between rates observed in 1991/92 and 1994/95. The exhibit shows that many hospitals had a higher proportion of breast cancer cases managed by breast conserving surgery in 1994/95. The variability among hospitals decreased somewhat over time, with a narrower range in values for breast conserving surgery in 1994/95.

Exhibit 7.13 provides benchmarks for interpreting the quintile categories,

Exhibit 7.12: ***Breast Conserving Surgery (BCS) Proportion by Hospital in Ontario, 1991/92 vs. 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 7.13: *Breast Conserving Surgery Proportions by Hospital in Ontario, 1994/95*

Institution	Number of Hospitals	Number of Cases	Range of Rates		
			Lowest	Median	Highest
First Quintile Hospitals	22	1,042	0.17	0.45	0.50
Ajax and Pickering General Hospital					
Grey Bruce Regional Health Centre, Owen Sound					
Hopital Montfort, Ottawa					
Hotel Dieu Hospital, Kingston					
Humber Memorial Hospital, Weston					
Lake of the Woods District Hospital, Kenora					
McKellar General Hospital, Thunder Bay					
Orillia Soldiers' Memorial Hospital					
Oshawa General Hospital					
Pembroke Civic Hospital					
Pembroke General Hospital					
Plummer General Hospital, Sault Ste. Marie					
Ross Memorial Hospital, Lindsay					
Scarborough General Hospital					
St. Joseph's Health Centre of London					
St. Joseph's Health Centre of Sarnia					
St. Mary's General Hospital, Kitchener					
St. Vincent de Paul Hospital, Brockville					
Sunnybrook Health Science Centre, North York					
Timmins and District Hospital					
Windsor Western Hospital					
Woodstock General Hospital					
Second Quintile Hospitals	21	1,062	0.51	0.56	0.60
Chedoke-McMaster Hospitals, Hamilton					
Dufferin-Caledon Health Care Corporation, Orangeville					
Guelph General Hospital					
Hotel Dieu of St. Joseph's Hospital, Windsor					
Laurentian Hospital, Sudbury					
Markham Stouffville Hospital					
Memorial Hospital, Bowmanville					
Mississauga Hospital					
Ottawa General Hospital					
Peterborough Civic Hospital					
Public General Hospital, Chatham					
Queensway-Carleton Hospital, Nepean					
Renfrew Victoria Hospital					
St. Joseph's General Hospital, Elliot Lake					
St. Joseph's Hospital and Health Centre, Peterborough					
St. Joseph's Hospital, Brantford					
St. Joseph's Hospital, North Bay					
Sudbury General Hospital of the Immaculate Heart of Mary					
Victoria Hospital Corporation, London					
Winchester District Memorial Hospital					
York Central Hospital, Richmond Hill					
Third Quintile Hospitals	21	1,281	0.60	0.63	0.66
Cambridge Memorial Hospital					
Central Hospital, Toronto					
Kingston General Hospital					
Grand River Hospital Corporation, Kitchener					
Leamington District Memorial Hospital					
Oakville Trafalgar Memorial Hospital					
Ottawa Civic Hospital					
Parry Sound District General Hospital					
Peel Memorial Hospital, Brampton					
Plummer Memorial Public Hospital, Sault Ste. Marie					
Salvation Army Grace General, Scarborough					
Salvation Army Grace Hospital, Windsor					
St. Joseph's General Hospital, Thunder Bay					
St. Joseph's Hospital, Chatham					
St. Joseph's Hospital, Hamilton					
St. Thomas Elgin General Hospital					
Stratford General Hospital					
Sudbury Memorial Hospital					
Toronto Hospital					
University Hospital, London					
Wellesley Hospital, Toronto					

Continued on next page

Exhibit 7.13: *(cont'd)*

Institution	Number of Hospitals	Number of Cases	Range of Rates		
			Lowest	Median	Highest
Fourth Quintile Hospitals	21	1,501	0.66	0.69	0.74
Belleville General Hospital					
Brantford General Hospital					
Centenary Health Centre, Scarborough					
Credit Valley Hospital, Mississauga					
Doctors Hospital, Toronto					
Etobicoke General Hospital					
General Hospital of Port Arthur, Thunder Bay					
Greater Niagara General Hospital					
Hamilton Civic Hospitals (General Division)					
Hamilton Civic Hospitals (Henderson Division)					
Joseph Brant Memorial Hospital, Burlington					
North York Branson Hospital					
North York General Hospital					
Port Colborne General Hospital					
Riverside Hospital, Ottawa					
Salvation Army Grace Hospital, Ottawa					
Sarnia General Hospital					
St. Joseph's Hospital, Guelph					
Strathroy-Middlesex General Hospital					
York County Hospital, Newmarket					
York-Finch General Hospital, North York					
Fifth Quintile Hospitals	21	1.248	0.74	0.79	0.92
Arnprior and District Memorial Hospital					
Douglas Memorial Hospital, Fort Erie					
Hotel Dieu Hospital, Cornwall					
Hotel Dieu Hospital, St. Catharines					
Huntsville District Memorial Hospital					
Metropolitan General Hospital, Windsor					
Milton District Hospital					
Mount Sinai Hospital, Toronto					
Norfolk General Hospital, Simcoe					
Northwestern General Hospital, Toronto					
Queensway General Hospital, Etobicoke					
Royal Victoria Hospital, Barrie					
St. Catharines General Hospital					
St. Joseph's Health Centre, Toronto					
St. Michael's Hospital, Toronto					
Tillsonburg District Memorial Hospital					
Toronto East General and Orthopedic Hospital					
Trenton Memorial Hospital					
Welland County General Hospital					
West Lincoln Memorial Hospital, Grimsby					
Women's College Hospital, Toronto					

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

with the lowest, highest and median breast conserving surgery rates shown within each quintile as well as the quintile in which each of the hospitals belongs.

Comment

It is evident that since 1991/92, there has been an overall increase in the proportion of women with breast cancer who are managed with conservative surgery. This continues to be the trend in Ontario, with surgeons adopting practices that have resulted in increased use of breast conserving surgery.[37] In addition, there may be other factors contributing to the shift. Patients with breast cancer have become more aware of alternatives. This increased awareness is a result of the increased profile of advocacy groups, media attention, and events such as the National Forum on Breast Cancer in November of 1993 in Montreal.

The adoption of breast conserving surgery practices is also supported by published studies of long-term follow-up. These studies support the role of breast conservation by demonstrating no difference in outcome between women who have had mastectomy and those who have had breast conserving surgery.[31,32]

Increased early detection, through mammography and clinical breast examination, would lead to more women presenting with smaller tumours, increasing the proportion of women eligible for breast conserving surgery. Publicity as a result of the development of the Ontario Breast Screening Program (OBSP) and the publication of the results of the National Breast Screening Study (NBSS) may have resulted in an increased use of mammography for early detection. Since administrative data do not contain tumour size, we do not know how much of the increase can be accounted for by smaller tumour size.

Furthermore, the use and availability of diagnostic techniques such as ultrasound, fine-needle aspiration and needle-guided biopsy have led to earlier diagnosis when tumours are smaller.

Radiation therapy is recommended for women who have breast conserving surgery. Decreased use of breast conserving surgery could be due to a lack of availability of such services or women choosing not to undergo radiation treatment. Controversy exists around the role of radiation following breast conservation with some suggesting that there are subsets of women for whom radiation can be forgone.[38] However, the Ontario Guidelines developed by the OCTRF recommend that all women who have breast conserving surgery receive radiation.

In this edition of the *Practice Atlas*, there appears to be less variability among hospitals in the type of breast cancer surgery conducted. At the National Forum on Breast Cancer, consumers clearly voiced their desire to see consistency among regions in the care that women with breast cancer receive. The question remains regarding how much variability is appropriate when treatment options are considered to be equivalent in terms of outcomes. This requires further exploration and consideration by the surgical community and other stakeholders.

Women need to be aware of the options available for management of breast cancer and receive information to make well informed decisions. Decision aids have been shown to be useful in many situations. ICES is collaborating with other stakeholders in the development of a decision aid for the local management of breast cancer that can be easily used in community settings at the time of diagnosis.

Complications after Laparoscopic Cholecystectomy

Introduction

As noted in the section on regional variations in surgical rates, cholecystectomy is one of the most frequently performed surgical procedures in the province. Since the introduction of laparoscopic cholecystectomy in Ontario in 1989, the proportion of laparoscopic procedures has increased from 1% in 1990 to over 85% in 1994/95 (Exhibit 5.12 in Chapter 5). For patients, the advantage of laparoscopic surgery is a shorter length of stay than with traditional cholecystectomy. In fact, some hospitals perform laparoscopic cholecystectomy on a day surgery basis.

Currently, in most hospitals, traditional cholecystectomy (open cholecystectomy) is performed only for a small group of patients ineligible for laparoscopy. As well, there are circumstances in which the operation is begun as a laparoscopic procedure, but because of certain problems (e.g., difficulty in visualizing the gall bladder), the operation is "converted" to the traditional open procedure. Technically speaking, a certain number of conversions should be expected because there will always be a small number of patients who have unusual anatomy or who have too much scarring from previous surgery, making laparoscopic surgery difficult and risky to the patient. Conversion to an open procedure has been reported in the literature to occur in 0% to 33% of procedures; the overall rate for 13,721 laparoscopic cholecystectomies reported in 25 papers was 5.4%.[39]

Early on, preliminary reports from the literature noted an increase in bile duct injury after laparoscopic cholecystectomy. Some of these injuries were minor, but others required extensive reconstructive surgery, long hospital stays, and, in rare situations, caused permanent damage to the bile duct. These injuries have been attributed by some to a learning curve. As surgeons learn how to use the new laparoscopic equipment, limited ability to see the bile duct and other problems can lead to the bile duct being injured.[40–42] Historically, based on hospital series, the rate of bile duct injury following open cholecystectomy ranged from 0.1% to 0.3% of procedures.[43,44] Following laparoscopic cholecystectomy, the rate was three to 10 times higher — about 1% of procedures.[45,46] These rates reflect results from tertiary care hospitals; the rate of such injuries in other hospital settings is not known.

In this section, the rate of conversion from laparoscopic to open cholecystectomy and the rate of bile duct injury are reported for hospitals based on the number of procedures conducted.

Data Source and Methods

Data from CIHI for fiscal years 1993/94 and 1994/95 were used. The numerator for the rate of conversion was the number of cases in which a cancellation code was given in conjunction with a code for laparoscopic cholecystectomy and a code for an open cholecystectomy. The denominator was the number of cases that were performed as laparoscopic cholecystectomies plus those cases which were converted. (See Appendix A5.1 and A5.2 for procedure codes and for inclusions and exclusions.)

The numerator for the calculation of the rate of bile duct injury was the number of cholecystectomy cases per year in which a bile duct injury occurred during the hospital stay. The denominator was the total number of cholecystectomies at the hospital that year.

Since the number of conversions and the number of bile duct injuries are small, it was not possible to provide accurate rates for individual hospitals due to instability associated with small numbers. We calculated the rates of conversion and bile duct injury for hospitals that performed: fewer than 100 procedures, 100 to 199 procedures, 200 to 299 procedures, 300 to 399 procedures, and more than 400 procedures. We did this to determine whether there was a relationship between experience in performing

Exhibit 7.14: *Rate of Bile Duct Injury and Conversion Rate from Laparoscopic to Open Procedure by Number of Procedures Performed per Hospital in Ontario, 1993/94 and 1994/95*

	1993/94									1994/95								
Number of Procedures	Number of Hospitals	Mean # of Cholecyst-ectomies	% LC*	Rate of Bile Duct Injury (%)			Rate of Conversion (%)			Number of Hospitals	Mean # of Cholecyst-ectomies	% LC*	Rate of Bile Duct Injury (%)			Rate of Conversion (%)		
				Average	Minimum	Maximum	Average	Minimum	Maximum				Average	Minimum	Maximum	Average	Minimum	Maximum
400+	15	500	81.4	0.9	0.2	2.1	5.4	0.0	8.7	15	541	85.3	1.0	0.2	2.5	4.8	2.3	9.4
300 - 399	13	335	83.2	1.3	0.0	6.3	5.0	2.4	8.1	15	342	83.1	1.0	0.0	2.3	6.2	0.8	11.7
200 - 299	28	250	80.0	1.3	0.0	10.3	6.5	2.1	12.9	23	252	82.5	1.9	0.0	11.5	6.5	1.1	24.3
100 - 199	33	148	76.1	1.0	0.0	5.6	7.2	0.0	20.4	35	158	78.5	0.8	0.0	5.6	8.4	1.8	25.0
<100	56	51	76.3	1.3	0.0	13.8	6.3	0.0	45.5	57	51	79.3	1.1	0.0	19.1	5.9	0.0	50.0
Total	**145**	**183**	**79.8**	**1.2**	**0.0**	**13.8**	**6.0**	**0.0**	**45.5**	**145**	**190**	**82.3**	**1.2**	**0.0**	**19.1**	**6.2**	**0.0**	**50.0**

* Percent of successfully completed laparoscopic cholecystectomies (LCs) divided by the total number of cholecystectomies
Mean number of cholecystectomies is the total number of cholecystectomies divided by the number of hospitals
Average rate of bile duct injury is the number with code 576.3, 993.2 or 868 divided by the total number of cholecystectomies
Average conversion rate is the number with both LC and open procedures recorded, divided by the number of LCs plus number with both recorded
See Appendix A5.1 and A5.2 for procedure codes and inclusions/exclusions
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

laparoscopic cholecystectomy and the risk of injury or conversion. We present the average rate for each hospital grouping as well as the minimum and maximum values for 1993/94 and 1994/95.

Findings

Between 1993/94 and 1994/95, there was a 3.5% increase in the overall number of cholecystectomies performed in the province. In 1993/94, 79.8% of cholecystectomies in Ontario were completed laparoscopically, increasing to 82.3% in 1994/95.

The provincial rate of bile duct injury was unchanged at 1.16% of procedures in both 1993/94 and 1994/95. The rate of conversion increased marginally from 6.0% in 1993/94 to 6.2% in 1994/95.

Exhibit 7.14 shows the rate of bile duct injury and the rate of conversion to open cholecystectomy by hospital group in 1993/94 and in 1994/95. There were 15 hospitals that performed more than 400 cholecystectomies during each of the study years (the mean number was 500 cholecystectomies). For these high-volume hospitals in 1993/94, the proportion of cholecystectomies performed laparoscopically was 81.4%. The proportion performed laparoscopically increased to 85.3% in 1994/95. In 1993/94, the average rate of bile duct injury for the high-rate hospitals was 0.9% of cholecystectomies, ranging from 0.2% to 2.1% of procedures. The average conversion rate was 5.4%, ranging from 0% to 8.7%.

In 1993/94, the proportion of cholecystectomies performed laparoscopically was highest for hospitals performing 300 to 399 procedures. In 1994/95, the proportion of cholecystectomies performed laparoscopically was highest for the hospitals performing more than 400 cases per year.

The rate of bile duct injury did not vary much among the hospital groupings, with an average of approximately 1.2% to 1.3% of procedures in 1993/94. This rate was essentially unchanged in 1994/95. Similarly, the 1993/94 rate for conversion was similar to that for 1994/95 for these hospital groupings. For hospitals performing few procedures annually, the rates of conversion varied widely. As well, we found no relationship between a hospital's rate of bile duct injury and its rate of conversion to open procedures.

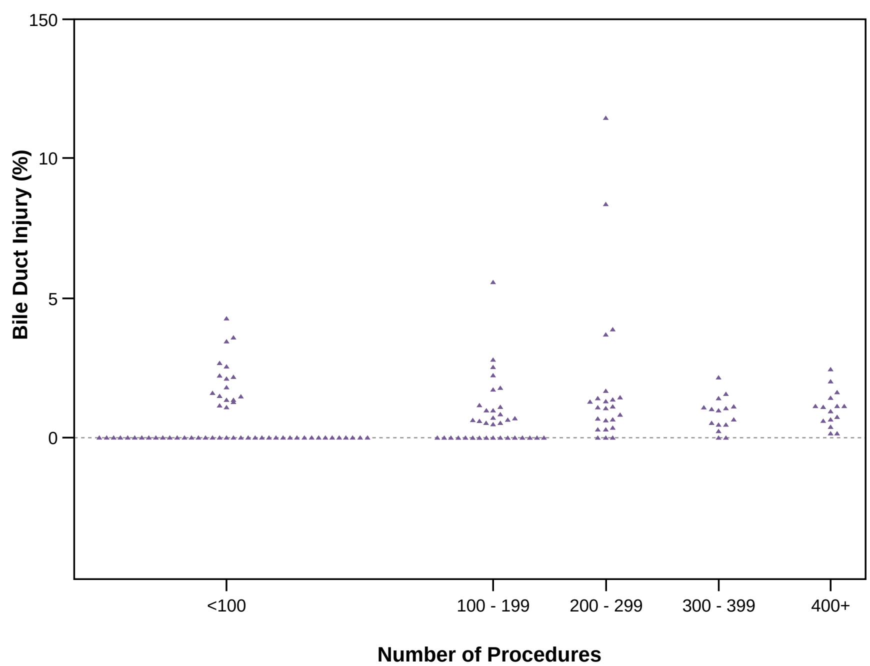
Exhibit 7.15 shows that there is a wide variation in the rate of bile duct injury within each hospital grouping, but especially for hospitals performing 200 to 299 procedures. There was less variation for hospitals performing larger numbers of procedures. There was also a very wide range of values for conversion rates among hospitals associated with the number of procedures performed (Exhibit 7.16). More variation was seen among hospitals performing fewer procedures. As well, the small hospital group was more likely to include institutions with conversion rates of zero; this may be the result of unstable rates due to small numbers of procedures.

Comment

The literature reports complication rates experienced by expert surgeons in academic centres. Since complications may develop after a symptom-free period,[47] the studies may underestimate the rate of injury. It remains uncertain whether the results found by the specialists typically practising at teaching hospitals on selected patients can be duplicated at community hospitals for general surgical populations. For example, Nenner and associates[48] reported complication rates in New York State after cholecystectomy of 11.9% in 2,940 Medicare patients and 9.7% in 1,108 Medicaid patients. These complication rates were higher than those reported in most surgical series.

In our earlier population-based report,[49] we found that the proportion of laparoscopic cases increased to 82.3% of all cholecystectomies and that laparoscopic cholecystectomy is performed in almost all hospitals where cholecystectomies are offered (only about three hospitals in the province

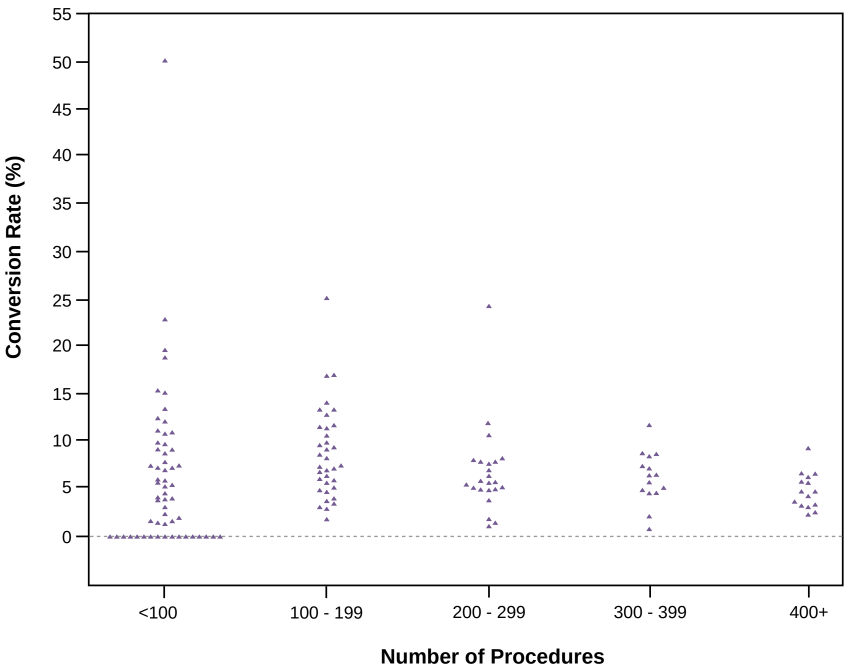
Exhibit 7.15: ***Rate of Bile Duct Injury by Hospital, by the Number of Procedures Performed, in Ontario, 1994/95***



Each point represents one hospital.

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 7.16: ***Rate of Conversion from Laparoscopic to Open Cholecystectomy by Hospital, by the Number of Procedures Performed, in Ontario, 1994/95***



Each point represents one hospital.

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

that perform cholecystectomy do not report the use of laparoscopy).

In 1994/95, 37 of the 57 hospitals performing fewer than 100 cholecystectomies reported no bile duct injuries. Seventeen of the 57 hospitals in this group reported no conversions. It is possible that some of these results may be due to coding practices so that the true rates may be underestimated.

Alternatively, since the overall bile duct injury rate is about one in 100 procedures, these hospitals may be doing too few procedures to observe bile duct injuries on an annual basis. At the rate of 21 per year, they would only expect to see one every five years.

Overall, the rate of bile duct injury was similar among different hospital types and by the number of procedures. Our finding of the rate of bile duct injury of 1.16% is similar to that reported in the literature.[45,46] Given that laparoscopic cholecystectomy had diffused to virtually all hospitals in Ontario by 1992/93, surgeons may well be over their learning curve. The lack of a decline in bile duct injury from 1993/94 to 1994/95 remains unexplained.

Finally, studies to evaluate patient outcomes after laparoscopic cholecystectomy would be useful to elaborate on the type of hospital (community or teaching institution), the duration and mode of follow-up, characteristics of the patients, and provider characteristics.

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Appendix A7.1: *Selection of Cases, Definition of Indications and Calculation of Rates for Cesarean Sections*

Data Source

All data were drawn from the Canadian Institute for Health Information (CIHI) year end acute care hospital discharge abstract database. All discharge data abstracts in the database have ICD-9 diagnostic coding. The case mix groups® (CMGs) are assigned to discharges by CIHI using a software package.

Definition of Deliveries Included in the Analysis

A) Delivery Inclusion Criteria

1984/85 with 1987 CMG Grouper:	CMGs 502, 503, 504, 505, 506, 507
1985/86 to 1987/88 with 1990 CMG Grouper:	CMGs 600, 601, 602, 603, 604
1988/89 to 1992/93 with 1992 CMG Grouper:	CMGs 600, 601, 602, 603, 604
1993/94 with 1993 CMG Grouper:	CMGs 600, 601, 602, 603, 604
1994/95 with 1994 CMG Grouper:	CMGs 601, 602, 603, 604, 606, 607, 608, 609, 610, 611

B) Delivery Exclusion Criteria

- **Miscoded or Out-of-province Residence Codes**
- **Missing Sex**
- **Missing Age or Age ≥ 100**

Definition of Cesarean Section

1984/85:	CMG 502, 503
1985/86 - 1993/94:	CMG 604
1994/95:	CMG 601, 602, 603, 604

Definition of Indication

The algorithm for assigning indications to deliveries has been used in previously published studies[1,2]. The first eight diagnosis fields are tested for the indication diagnoses. If an admission qualifies for more than one category, then priority is given to the lower number (eg. if previous cesarean section and fetal distress are competing, previous cesarean section will be coded). Please note: Algorithm is based on ICD-9 coding.

1. Previous Cesarean Section	dx 654.2
2. Dystocia	dx 660.0, 660.1, 660.2, 660.3, 660.4, 660.5, 660.6, 660.8, 660.9, 661.0, 661.1, 661.2, 661.4, 661.9, 662.0, 662.1, 662.2
3. Fetal Distress	dx 656.3
4. Other	All other cases that do not have any of the above listed codes

Calculation of Rates

A) Cesarean Section Rate:
Total number of cesarean sections divided by the total number of deliveries, multiplied by 100.

B) Cesarean Section Attributed to Dystocia:
Total number of cesarean sections with the dystocia indication divided by the total number of deliveries, multiplied by 100.

C) Cesarean Section Attributed to Fetal Distress:
Total number of cesarean sections with the fetal distress indication divided by the total number of deliveries, multiplied by 100.

D) Cesarean Sections Attributed to Previous Cesarean Section:
Total number of cesarean sections with previous cesarean section indication divided by the total number of cesarean sections, multiplied by 100.

E) Repeat Cesarean Section Rate:
Total number of cesarean sections with previous cesarean section indication divided by the total number of deliveries with previous cesarean section indication, multiplied by 100.

Appendix A7.2: ***Appendectomy – Odds Ratios for Perforation and In-hospital Death and Linear Regression Coefficients for Length of Hospital Stay in Ontario, 1992/93 - 1994/95***

Determinants	Perforation		In-hospital Death		Length of Stay (Days)	
Diagnostic Accuracy - **10% increase**	1.05	(0.99, 1.11)	1.21	(0.67, 2.19)	0.00	(-0.07, 0.07)
Primary Appendectomy Volume - **50 case increase**	1.02	(1.01, 1.02)	1.01	(0.91, 1.12)	-0.04	(-0.05, -0.03)
Bedsize - **30 bed increase**	0.99	(0.98, 0.99)	0.97	(0.88, 1.06)	0.01	(0.00, 0.02)
Treated in Teaching Hospital - **yes=0; no=1**	0.75	(0.70, 0.80)	0.49	(0.23, 1.05)	-0.41	(-0.50, -0.32)
Age* - **10 year increase**	1.25	(1.22, 1.27)	NA		0.55	(0.53, 0.57)
Sex - **female=0; male=1**	1.24	(1.17, 1.32)	0.99	(0.51, 1.92)	-0.09	(-0.17, -0.01)
Comorbidity Index - **none=0; any=1**	1.35	(1.17, 1.55)	23.94	(11.19, 51.22)	2.02	(1.89, 2.29)

* In-hospital death was calculated only for subjects aged 45 years and over; numbers in brackets represent 95% confidence intervals.
See Appendix A5.1 for procedure codes and definitions and A5.2 for excluded cases and missing data
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Appendix A7.3: ***Appendectomy – Odds Ratios for In-hospital Death and Linear Regression Coefficients for Length of Hospital Stay in Ontario, 1992/93 - 1994/95***

Determinants	In-hospital Death		Length of Stay (days)	
Diagnostic Accuracy - **10% increase**	1.23	(0.68, 2.22)	-0.02	(-0.09, 0.05)
Primary Appendectomy Volume - **50 case increase**	1.01	(0.92, 1.12)	-0.05	(-0.06, -0.04)
Bedsize - **30 bed increase**	0.97	(0.88, 1.06)	0.01	(0.00, 0.02)
Treated in Teaching Hospital - **yes=0; no=1**	0.50	(0.23, 1.07)	-0.29	(-0.38, -0.20)
Age* - **10 year increase**	NA		0.46	(0.44, 0.48)
Sex - **female=0; male=1**	0.99	(0.51, 1.92)	-0.17	(-0.24, -0.10)
Comorbidity Index - **none=0; any=1**	22.86	(10.64, 49.12)	1.86	(1.66, 2.07)
Perforation - **no=0; yes=1**	1.52	(0.78, 2.97)	2.20	(2.11, 2.29)

* In-hospital death was calculated only for subjects aged 45 years and over; numbers in brackets represent 95% confidence intervals.
See Appendix A5.1 for procedure codes and definitions and A5.2 for excluded cases and missing data
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Appendix A7.4: *Procedure Codes Used for Breast Conserving Surgery and Cholecystectomy Analysis*

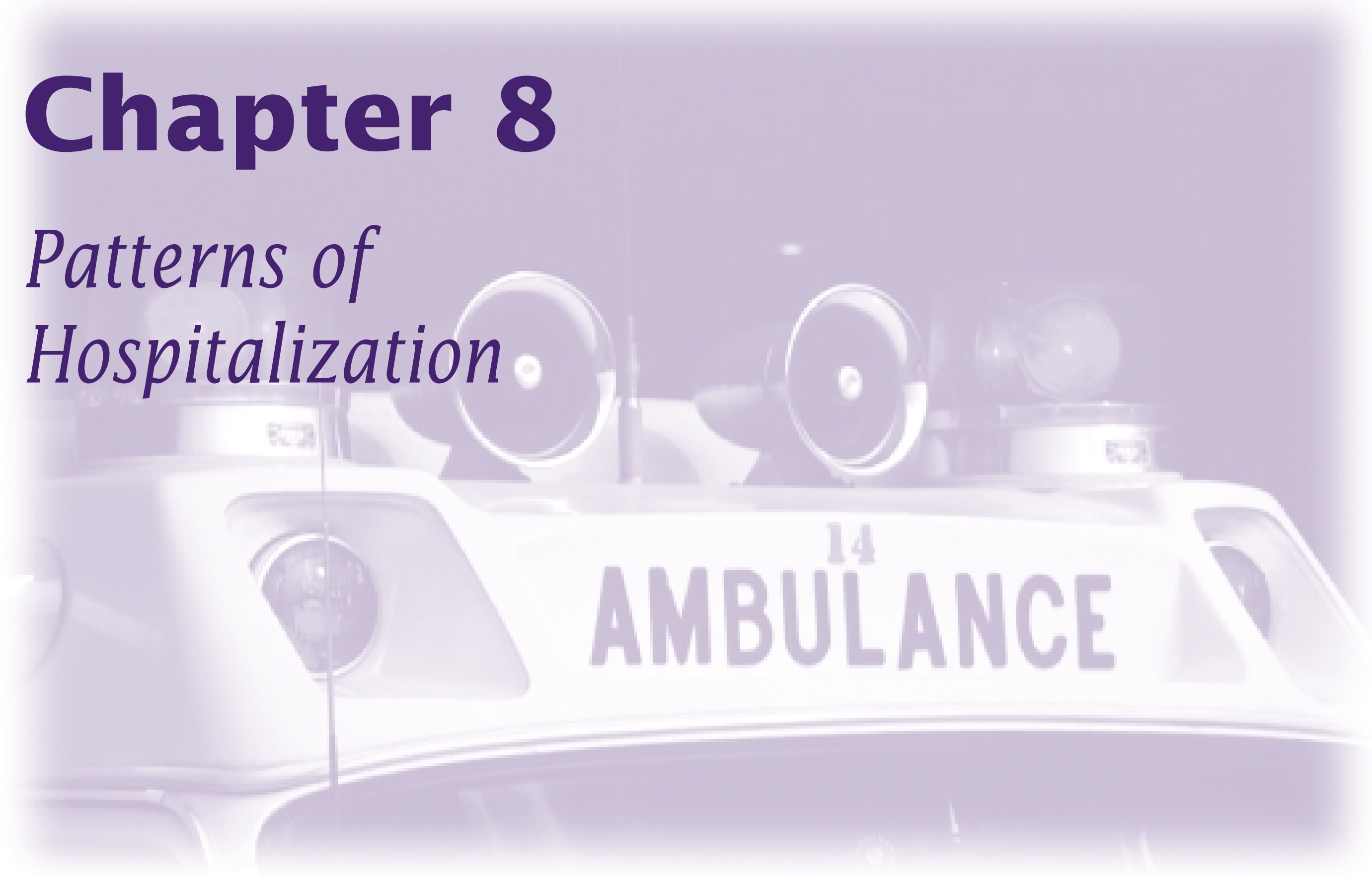
Procedure	Procedure Code		
Unilateral Breast Surgery Procedures Coded as Breast Ablative			
Extended Radical Mastectomy		97.18	
Radical Mastectomy		97.16	
Modified Radical Mastectomy		97.14	
Simple Mastectomy		97.12	
Unilateral Breast Surgery Procedures Coded as Breast Conserving			
Partial Mastectomy		97.28	
Quadrantectomy		97.27	
Lumpectomy		97.11	
Cholecystectomy			
Total Cholecystectomy	63.12		
Laparoscopic Cholecystectomy	63.12a	63.14	
Conversion	63.12	63.14	
Bile Duct Injury (diagnostic codes)	576.3	998.2	868

Note: Excluded cases and missing data are documented in the Methods section for Breast Conserving Surgery in this chapter

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Chapter 8

Patterns of Hospitalization



Introduction

In this chapter, we provide an overview of the indicators for hospital utilization in Ontario over three years — 1992/93 to 1994/95 — and compare these data with previous years to highlight trends. These analyses are an extension of those provided in the first edition of the ICES *Practice Atlas*. The number of hospitals in this analysis has been expanded to include smaller hospitals (Ontario Ministry of Health Peer Groups 5, 6 and 7) that were not included in the first edition. By using the data from the first edition of the ICES *Practice Atlas*, the cumulative time range analysed (1991/92 to 1994/95), provides a clearer perspective from which to examine trends in hospital utilization. A number of the diagnosis and procedure groupings have also been expanded to accommodate the coding practices of individual institutions.

This chapter has several sections. We begin with an update of the material on length of stay and day surgery rates presented in the first edition of the Atlas. As will be explained in the Methods section below, use of fractional hospital days provides an alternative perspective on exactly what constitutes a day surgery case, and the resource implications of different patterns of day surgery practices. We then use data linkage methods to track total institutional days for selected conditions and procedures, taking into account transfers from the admitting institution to other acute, rehabilitation or chronic facilities. The third section of the chapter considers the rates of readmission to an acute care institution anywhere in the province, for a variety of procedures and diagnoses, over a follow-up period of 30 days from the index day of admission. Both the total length of stay analysis and the readmission analysis are listed by index hospitalization, i.e., assigned to the hospital where the patient was first admitted with the diagnosis or procedure of interest. As part of the total length of stay analysis, we include the impact of alternate level of care days (ALC) for two conditions with very long lengths of stay. As part of the readmission analysis, we include a special case study on an issue that has captured media attention in Ontario — the readmission of newborns who are discharged early from hospital.

General methods for these analyses follow, together with further details on methods for each subsection. Due to the large number of detailed exhibits developed for this chapter, a majority of the exhibits are organized by topic and hospital size at the end of the chapter. The electronic edition of the Atlas contains information on total length of stay and transfers to other facilities, day surgery, inpatient length of stay, and readmissions.

Methods

Overview

We analysed diagnoses and procedures by groups (appendix A8.1 and A8.2). The clinical conditions selected for the first edition of the ICES *Practice Atlas* were maintained. These were the most common groups of medical, surgical and obstetrical cases listed as most responsible diagnoses (and their corresponding procedures for surgical cases). For each condition, we made every attempt to include codes that struck a balance between clinical homogeneity and sufficient breadth to encompass most cases.

When obvious clinical factors existed that may have led to systematic differences in the process of care, subgroups of diagnoses or procedures were formed to allow for adjustment based on subgroup status. For example, separate subgroups were formed for hip and knee replacement procedures, and the corresponding diagnostic codes were subgrouped to differentiate osteoarthritis due to fracture from arthroplasty revisions. In order to minimize the influence of underestimated severity of underlying rheumatoid arthritis on length of stay, rheumatoid arthritis was excluded from the analyses for hip and knee replacements. These subgroups are considered in the adjustment of the average length of stay (LOS) calculated for each institution.

We excluded deaths that occurred in hospital from the analysis. Sign-out cases were included. Transfers were considered only for the analysis of total LOS among facilities for a single episode of illness. Any LOS above the 97.5 percentile for a clinical grouping was considered excessive, resulting in the assignment of a LOS value truncated at the 97.5 percentile. This method does not exclude alternate level of care (ALC) days.

Length of Stay and Day Surgery Rates

In the first edition of the ICES *Practice Atlas*, to account for the LOS in acute hospitals where ambulatory procedures are at issue, we used integer lengths of stay for inpatients and assigned a length of stay of half a day for true day surgery procedures (i.e., when the hospital stay was less than 24 hours). In this edition, we calculated LOS as the number of days, or fraction thereof, spent in hospital from admission time to discharge time using admission and discharge hours. Admission and discharge hours are universally coded by all hospitals. For example, for 1994/95, only 180 of 2,270,782 separations were missing a valid hour of discharge. Although we have no direct evidence to support the validity of admission and discharge hours, indirect evidence exists from reviewing the admission and discharge patterns for elective and emergent conditions; the patterns are consistent with those expected. This provides a more accurate estimation of LOS for short stay patients and means that, for LOS analyses, it is immaterial whether the record of the patient's encounter was recorded in the day surgery or the inpatient abstract file. The use of fractional hospital days diminishes the reliance on day surgery rates, which have been fraught with problems of definition, as the sole indicator of utilization for short stay surgical cases. Accounting for the time in hospital on a continuum may be more illuminating than simply counting hospitalizations occurring over less than a calendar day or 12 hours in hospital, notwithstanding implications for funding of ambulatory and short stay hospital encounters. Although we introduce this new method of analysis, we also report day surgery rates using the commonly accepted definition for day surgery cases.

In the first edition of the ICES *Practice Atlas*, we defined benchmark levels for adjusted LOS and day surgery rates on a population basis. That is, for LOS, we initially adjusted outcomes within each hospital for patient characteristics such as age, distance from home to hospital, and comorbidity. We used the Deyo modification of the Charlson index, which provides a score based on the number and type of comorbid conditions.[1] We calculated a predicted outcome (LOS or rate of day surgery) for the entire population within a peer group after adjusting for the influence of patient, but not hospital, factors. We defined benchmark levels at the quartiles (25% for LOS, 75% for day surgery) of the predicted population values for these variables. That is, the benchmark or 25th percentile for LOS for a given diagnosis indicates that 25% of patients admitted to hospitals within the grouping were at the benchmark LOS or below (adjusted for patient factors).

For day surgery, a benchmark level was similarly calculated. That is, the benchmark-adjusted linear predictor in a logistic regression model was determined analogously to the benchmark predictor in the linear regression model for LOS. In order to convert this to a benchmark day surgery rate for each hospital, the benchmark parameter was applied, together with the patient factors for the population attending the specific hospital, to create a benchmark rate for each hospital, against which the hospital's raw rates of day surgery could be compared. In both the analyses for medical cases and surgical procedures, the adjustments for patient characteristics were done within each peer grouping (teaching, medium, and small hospitals).

In the hospital-specific summary tables for LOS (Exhibits 8.4, 8.5, 8.6, 8.10, 8.11, 8.12) aggregate benchmark lengths of stay for medical and surgical cases are presented. These are average benchmark lengths of stay, weighted by each hospital's medical and surgical case mix. Aggregate LOS benchmarks vary by hospital as a result of differences in the case mix in each hospital.

We defined conservable bed days as the number of days that might be conserved if a hospital decreased the adjusted average LOS from existing levels to the benchmark levels. We counted only those bed days over the benchmark level; no credit for bed days under benchmark levels was given. For individual diagnoses within specific hospitals, conservable bed days are the number of days by which the adjusted average LOS exceeds the benchmark level times the number of cases. However, in the summary tables, this relationship does not generally hold, since the aggregate conservable bed days for each hospital will be a sum of caseloads times excess lengths of stay including, for most hospitals, some diagnoses with lengths of stay below benchmark levels. In the hospital-specific summary tables we also include the ratio of the aggregate adjusted average LOS to the aggregate benchmark LOS for each hospital. This serves as a global summary of the percentage by which the hospital-adjusted LOS result exceeds (or is below) the benchmark LOS within each year. Since this summary is a ratio of case-mix weighted adjusted LOS to case-mix weighted benchmark LOS, credit for adjusted LOS below benchmark levels is recognized — leading to some hospitals' measures remaining below 1.0, demonstrating overall LOS performance below benchmark levels.

We applied uniform rules for defining day surgery, regardless of whether the record of the patient's encounter was reported in the inpatient or outpatient hospital abstract file. The definition of day surgery used was admission and discharge on the same day, or a total LOS of 12 hours or less (allowing overnight stay). For the analyses of day surgery rates, we included all cases that fell into the defined diagnosis or procedure clusters. Conservable bed days for day surgery were calculated for each hospital if their day surgery rate for a particular procedure was below the benchmark rate. The day surgery rate difference (benchmark minus actual day surgery rates) was multiplied by the number of cases. This yielded the excess inpatient cases — i.e., the number of inpatients who might potentially have had their procedure conducted on a day surgery basis. We assumed that those inpatient cases with the shortest stay were most likely to be convertible to day surgery. We sorted all inpatient cases by length of stay. From the excess inpatient cases with the shortest lengths of stay, we subtracted the average LOS for that day surgery procedure. This yielded an estimate of the number of days above the average LOS for the inpatient cases potentially convertible to day surgery. These excess lengths of stay for the shortest inpatient stays were summed to yield the conservable bed days that could be attained by increasing to benchmark day surgery levels for each hospital in each year. For example, if the hospital had 100 cases annually, 30 of which were day surgery, and the day surgery benchmark rate was 50, the LOS of the 20 shortest inpatient stays (minus the average day surgery LOS for the peer group) would be summed to yield the day surgery conservable bed days.

Total Length of Stay for a Single Episode of Illness for Selected Conditions and Procedures Among Institutions

Traditionally, LOS analyses have been conducted from the perspective of the institution providing care from the time of admission to acute care hospital to discharge home. These previous analyses have excluded patients transferred between institutions. By considering the LOS within a single institution only, they fail to consider all the components of care required in more complex hospitalizations of longer duration. As hospital restructuring leads to the rationalization and specialization of services, it will become increasingly important to account for the care received for a single episode of illness in more than one institution. From the perspective of the patient, the most relevant LOS is the total length of the hospitalization, regardless of the number of institutions within which this occurred. We therefore extended the analyses of the previous sections to include patients who were transferred to other institutions.

Records for episodes of care were constructed by linking separation abstracts by health number (HN). Discrepancies in HN were identified in some cases; simple mistakes in coding were rectified, and all other discrepant cases were eliminated. For example, where more than one birth date was identified for the same HN within the same institution and the discrepancy resulted from a simple inversion of the coding for month and day, the coding error was rectified. However, if two chart numbers were identified for a single HN within an institution, the case was eliminated. Although the rate of discrepant coding of HNs in the database is unknown, we can estimate this through a comparison with other identifiers. For example, if we construct a patient identifier based on date of birth, institutional chart number and postal code, the rate of intra-institutional miscoding of HNs is less than 0.4%.

An acute hospitalization episode was defined as either an admission to an acute care setting from which the patient is discharged, or a continuous sequence of hospital stays in different hospitals to which the patient is transferred. The LOS for a hospitalization episode is the sum of the lengths of stay for all component hospital stays within the hospitalization episode. We attributed the hospitalization episode to the hospital initially recording the most responsible diagnosis or procedure. For many elective cases, this makes sense.

For example, the transfer of patients to rehabilitation hospitals is part of the clinical management plan for some elective surgical procedures. When patients are stabilized and triaged to other facilities, it is possible to define the index hospitalization either with the initiating hospital, or with the receiving hospital; we chose the former in order to include the experience of smaller hospitals. In this chapter, we only report lengths of stay for episodes associated with acute care as the index hospitalization.

Analyses of LOS outcomes (initial length of stay both with and without ALC days, and total length of stay for a single episode of illness) were performed using standard linear regression techniques. The LOS outcomes were adjusted for patient factors (age, sex, comorbidity) and clinical context (diagnosis subgroup and procedure type). We aggregated data over the calendar years 1993 and 1994. All LOS outcomes were trimmed at their 97.5 percentile and regression analyses were performed separately for each peer grouping and each outcome.

We excluded deaths that occurred on initial admission and patients for whom a transfer was coded in the Canadian Institute for Health Information (CIHI) record but no matching record was found. We excluded patients transferred into the initial institution from another acute, chronic or rehabilitation institution.

Readmission Rates

We focused our analysis on a subset of conditions for which we expected relatively high rates of readmission. Among these were chronic medical conditions such as angina and chronic obstructive pulmonary disease, and recurrent conditions such as congestive heart failure and pneumonia. We also studied surgical procedures for which premature discharge may have led to early unplanned readmission or for which readmission may be a concern due to shifts to day surgery (transurethral prostatectomy, tonsillectomy and cholecystectomy).

Hospital discharge data for all admissions to Ontario hospitals for individuals who had at least one hospitalization for the most responsible diagnosis or procedure in the diagnostic grouping (e.g., ICD-9 code "410" for acute myocardial infarction), between April 1, 1992 and March 31, 1995 were assembled. For each individual with at least one index case, a three-year history of all hospitalizations was constructed. Cases were linked by matching on HN as described above for the total length of stay analyses.

Only patients who were discharged within two years of the study (January 1, 1993 to December 31, 1994) were included in order to uniformly accumulate pre-hospitalization information and to track early readmissions. Since readmission to hospital is common for the chronic medical conditions studied, the likelihood of a patient being readmitted is influenced by their clinical history and factors pertaining to the index admission (i.e., admission to hospital for the diagnosis under study with no transfer to another acute care facility). In order to account for readmissions that may have been explained by clinical history, we determined a number of indicators for previous hospitalizations for each index case. The total number of hospitalizations in the preceding six months, the total length of acute or chronic hospital stays in the previous six months, and the average Charlson-Deyo index over previous hospitalizations were included in the analysis. We defined all non-elective readmissions to acute care hospitals anywhere in Ontario within 30 days of discharge as an unplanned readmission. We combined data for the two calendar years in order to improve the precision of the resulting estimates.

The probability of readmission among index patients was estimated by logistic regression analysis, adjusting for patient characteristics and current and previous hospitalization factors. By applying the prediction model to a standard population (i.e., all index patients), we adjusted the raw hospital readmission rate to account for differences in case mix. We also developed regression models that included the adjusted average LOS for each hospital; these analyses were restricted to teaching and medium-sized hospitals to minimize the effects of higher variability in average LOS and readmission rates among smaller hospitals.

Results

Length of Stay and Day Surgery Rates

Average lengths of stay have been declining since the 1980s. They were in a period of relatively rapid decline at the time of publication of the first edition of the ICES *Practice Atlas*. In the ensuing two years, further declines were noted.

For example, in medium-sized hospitals (Ontario Ministry of Health Peer Groups 2, 3, and 4), the average adjusted LOS for acute myocardial infarction decreased from 9.9 days in 1991/92 (reflected in the first edition of the Atlas) to 8.3 days in 1994/95 (Exhibit 8.2). For the same group of hospitals, during the same time period, the average LOS decreased from 9.1 to 7.8 days for congestive heart failure and from 26.3 to 16.8 days for cerebrovascular accident. For medical and obstetrical cases, the yearly decline in average LOS was greater between 1993/94 and 1994/95 than it was for the previous year. For surgical cases (Exhibit 8.8), the LOS declined the same amount from 1993/94 to 1994/95 as from 1991/92 to 1992/93. During the three fiscal years from 1992/93 to 1994/95, the total caseload for common conditions remained static, with marked declines for only a few conditions (i.e., croup).

For a number of surgical procedures the decreases in average LOS were small (less than or equal to 0.1 day) (Exhibits 8.7 - 8.12). These procedures have largely been shifted to day surgery (eg., varicose vein removal, lens replacements, breast lesions, arthroscopy, carpal tunnel release, needle biopsy of the prostate, urethral stricture, tooth extraction and deviated nasal septum). This corresponds to the attainment of near-maximum day surgery rates at or greater than 90% of all cases for each procedure, (Exhibits 8.13, 8.14, 8.15). This may mark the beginning of the stabilization of lengths of stay for a number of surgical conditions, as was reported in the United States approximately five years after the introduction of the prospective payment system.

Parallel to adjusted average LOS, benchmark LOS levels have also declined over the years studied, more markedly in 1994/95 for medical and obstetrical cases than for surgical cases. During these years, the gaps between benchmark and average LOS levels have remained relatively constant within hospital groups — small-sized, medium-sized and teaching hospitals (Exhibits 8.1 to 8.12). This indicates that the existing level of variability among hospitals is relatively stable, despite the fact that entire groups continue to move to shorter stays overall. The consistency in this interhospital variability coincides with the stability of hospitals' relative positions among their peer group from year to year. This can be seen in the consistency in the ratio of overall adjusted average LOS to overall benchmark LOS — an indicator of relative efficiency for individual hospitals (Exhibits 8.4 to 8.6 and 8.10 to 8.12). For example, a number of hospitals remained consistently above the adjusted LOS to benchmark ratio value of 1.2, indicating aggregated average adjusted lengths of stay at least 20% above benchmark levels from 1992/93 to 1994/95. Conversely, a number of hospitals maintained ratios consistently below 1.0, indicating LOS performance below benchmark levels throughout the period.

For a number of procedures, day surgery levels appear to have achieved near-maximum levels (Exhibits 8.13 to 8.18). For arthroscopy, carpal tunnel release and cataract surgery, the rates of day surgery are very high and are close to the benchmark levels. Appreciable savings in bed days can be realized for only a few procedures — tonsillectomy, deviated nasal septum and adult hernias — where there are wide gaps between the high benchmark levels and average levels of day surgery. When hospitals convert procedures from inpatient to day surgery, changes in LOS tend to be relatively rapid and stable. For example, underlying the gradual increase in the overall rate of day surgery for tonsillectomy, the shift to day surgery in individual hospitals followed a pattern of rapid conversion from "inpatient" to "outpatient" surgery over approximately three months.

Comparison With Other Reports

Other agencies have produced reports with tables reflecting hospital utilization for Ontario hospitals. The Joint Policy and Planning Committee reported LOS and day surgery analyses for diagnostic groups defined by Case Mix Groups® (CMGs) developed by CIHI.[2] There are a number of details that differ between their reports and the analyses presented here. Their analyses are based on CMGs, which for some procedures are broader than those included here. They do not adjust for patient factors such as age, sex and comorbidity. Their benchmark levels are based on percentiles calculated for hospitals; we calculate benchmark percentiles based on patient populations. In their calculations, hospitals with small and large caseloads contribute equally to the determination of benchmark levels, whereas in these analyses, caseload is accounted for in the benchmarks.

Despite these methodological differences, the relative levels of utilization and conservable bed days are comparable among diagnoses and among hospitals. The consistency of these findings emphasizes the relevance of routine use of unadjusted analyses such as those published by the Joint Policy and Planning Committee or developed by utilization managers in hospitals for internal purposes.

Total Length of Stay for a Single Episode of Illness for Selected Conditions and Procedures Among Institutions

Two cases are illustrative. Hip and knee replacements, and cerebrovascular accidents led to the longest stays for patients admitted to and discharged from a single institution. For both, there was some variability in length of initial hospitalization, as is evident in the variation between average and benchmark LOS levels (Exhibit 8.19). Moreover, the rate of transfer to other institutions (either acute or chronic hospitals) varies among hospitals. Therefore, the average number of consecutive days of institutionalization varies widely for patients admitted through different acute care hospitals. For example, after adjustment for type of surgery, diagnostic subgroup (i.e., osteoarthritis, fracture, etc.) and other patient factors, the adjusted LOS for hip and knee replacement procedures in teaching hospitals (Exhibit 8.19), for patients who were not transferred from acute care to another setting, varied between 8.2 and 13.8 days. However, due to differing patterns of transfer to rehabilitation hospitals, the average time spent in an institution varied more markedly when both transferred and non-transferred patients were combined — between 9.1 and 31.4 days. Indeed lengths of stay that appear short on standard reports that include only acute care stay may reflect only one component of the overall stay. While acute care facilities cannot manage the patient's care after transfer to another facility, total LOS can change dramatically when viewed from this system-wide perspective.

An example from Exhibit 8.19 demonstrates the effect on an individual hospital of linking LOS for all institutions. Chedoke-McMaster Hospitals transferred 4% of the 374 eligible patients who received hip and knee replacements in calendar years 1993 and 1994. The average LOS at Chedoke-McMaster for those patients who were not transferred was 13.8 days. The average total LOS for all patients — those who were transferred and those who were not — was 15.6 days, a figure that includes days spent in rehabilitation facilities. Sunnybrook Health Science Centre transfers a much larger percentage (86.1%) of its patients to long-term care facilities for rehabilitation. The average LOS for the 13.9% of patients who were not transferred was 10.1 days. However, the total mean LOS for the 13.9% who were not transferred and the 86.1% who were transferred was 31.4 days, including total days in acute and rehabilitation facilities.

Exhibit 8.19 (column 4) also demonstrates the impact of ALC days on the average LOS for patients who were not transferred. The impact appears to be negligible for hip and knee replacements but is greater in the analysis of cerebrovascular accident.

It should be noted that ALC days are still reported with variable frequency. For example, for hip/knee replacement surgery among teaching hospitals, only one hospital (Mount Sinai Hospital) reported ALC days for an appreciable number of cases (27%). This resulted in a 1.1 day decrease in ALOS. All other hospitals had decreases of 0.4 days or less, when ALC days were excluded. For cerebrovascular accident, the change in ALOS with and without ALC days ranged from 2.3 to 28.3 days, corresponding to the reporting of ALC days for between 8% and 57% of a hospital's cases.

Exhibit 8.19 illustrates that, on average, ALC days were reported for 4% of hip and knee replacement and 16% of cerebrovascular accident cases during the study period. The reporting by hospital varied — between 0% and 27% of cases of hip/knee replacement and between 8% and 57% of cerebrovascular accident cases had ALC days coded by teaching hospitals. It is unclear whether the variability in reported ALC days by hospitals reflects variable rates of actual ALC cases, variable coding practices, or both.

In addition to the data presented in Exhibit 8.19, the electronic version of the ICES *Practice Atlas* also includes these data for small- and medium-sized hospitals and for the following additional procedures and diagnoses: transurethral prostatectomy, acute myocardial infarction, congestive heart failure, pneumonia and chronic obstructive pulmonary disease.

Readmission Rates

For all medical conditions studied, the adjusted predicted probability of readmission (Exhibits 8.20 to 8.25) was either unrelated to (cerebrovascular accident), or positively associated with (acute myocardial infarction, congestive heart failure, pneumonia or hip replacement), longer patient stays within each hospital. That is, the probability of readmission either was not substantially affected by variations in LOS, or more commonly, was higher when the patient's index LOS was longer. The latter finding is likely because the index LOS acted as an indicator of unmeasured case severity.

Between hospitals, there were variations in readmission rates. For example, the weighted 25th percentile for the readmission rate for pneumonia was 9.3%, the weighted 75th percentile was 12.5% and the average rate overall was 11.2%. However, it should be noted that there was a fair amount of overlap in the confidence intervals around the readmission rates, suggesting that many of the apparent differences in rates between hospitals are not statistically significant.

The relation between readmission rates and average hospital lengths of stay were studied by regressing the adjusted readmission rates against the adjusted hospital average lengths of stay. For most diagnoses, this relation was in the opposite direction to that observed within hospitals. That is, shorter lengths of stay were associated with higher readmission rates (Exhibit 8.26). This relationship was not statistically or clinically significant for many of the diagnoses considered, although it was more marked for acute myocardial infarction (Exhibit 8.27). Although the apparent increase in readmission rates (approximately 1% increase in readmission rate for each one day reduction in LOS) with decreased LOS is both clinically and statistically significant in the case of acute myocardial infarction, it is evident that the variation between individual hospitals is much greater than can be explained solely by variations in LOS. Many hospitals achieve both low readmission rates and first quartile LOS.

Case Study — Readmission of Newborns

A recent study[3] has raised concerns that, coincident with decreased lengths of stay for newborns between 1987 and 1994, the rate of hospital readmissions doubled during the first 14 days of life to 1.32%. A recent review of the literature by Britton and associates[4] underscores the relative lack of evidence on which to base recommendations regarding the timing of newborn discharge, and concludes that the recommendations of the American Academy of Pediatrics remain appropriate.[5] In general, these recommendations include criteria for early discharge relating to preparation to ensure mothers achieve skill in feeding and general care, minimum neonatal birth-weight of 2,500 gms, uncomplicated delivery and normal blood work, and appropriate support post-discharge including a medical appointment at two to three days of age. The few available data suggest that early discharge (within 24 to 48 hours of birth) may be associated with increased parental satisfaction and may lead to increased rates of breastfeeding after discharge.[4] However, although the available controlled trials and case series have provided no evidence of increased risk for carefully planned early discharge with follow-up care, they are of insufficient size to differentiate significant changes in readmission rates.[4,6,7]

We studied the patterns and determinants of rehospitalization for Ontario newborns discharged between April 1, 1992 and February 28, 1995.

Given the relatively short hospitalization period for newborns, we calculated the age of the newborn in hours at the time of discharge. In order to study a homogeneous cohort, we chose babies with an ICD-9 code of "V300" (delivery in normal pregnancy) as the first or second coded diagnosis with no co-diagnoses other than those related to jaundice. We restricted the study to those cases where newborn and mother were both discharged at the same time.

Although a unique identifier does not exist to link the abstracts of mother and baby, we performed matches in the following fashion. We considered a match to occur when a woman of childbearing age (12 to 44 years) was admitted to the same hospital at or before the time of birth of the neonate, and had the same discharge date and postal code. We excluded those cases where a match could not be made. We also excluded cases where the healthy newborn was readmitted with the mother due to maternal complications, although their inclusion did not alter the findings. We excluded newborns with a birth-weight of less than 2,500 gm, although there were only a small proportion of healthy newborns with this code. Newborns with the same health number as the mother were excluded, to eliminate the possibility that the newborns may have been readmitted under another number, which occurred only in 0.04% of potentially eligible cases. In order to increase the likelihood of including all relevant readmissions, we studied readmissions within 14 days of being born.

We found that there was a relationship between age at discharge and readmission, although this may be largely determined by factors such as birthweight (Exhibit 8.28). There is no adverse relationship between average hospital LOS for newborn care and readmission rates.

More than one-half of the readmissions (2220/3882) were due to neonatal jaundice (Exhibit 8.29). These readmissions were relatively short (mean of 2.2 days), and the majority involved treatment with phototherapy. Of those readmitted for jaundice, 14% were originally discharged with a diagnosis of jaundice compared to 4% of eligible newborns discharged with a diagnosis of jaundice.

For readmissions not due to jaundice, failure to feed was the most common reason, accounting for 14% of cases. There was no relation between the likelihood of readmission for feeding problems and LOS. The relative risk for readmission for feeding problems was 1.03 when comparing discharge of less than two days of life with discharge of greater than two days after birth.

Those most likely to be readmitted for any reason are those with a birthweight under 3,000 gm (14% of eligible newborns over 2,500 gm are under 3,000 gm). Indeed, when readmission for all causes is considered, there is a gradient of likelihood for readmission by birthweight for a LOS of less than four days (Exhibit 8.28). The likelihood of readmission for 3,000 to 3,500 gm newborns is greater at two to four days LOS than for those weighing greater than 3,500 gm. This gradient of readmission likelihood by LOS and birthweight is illuminated by considering the

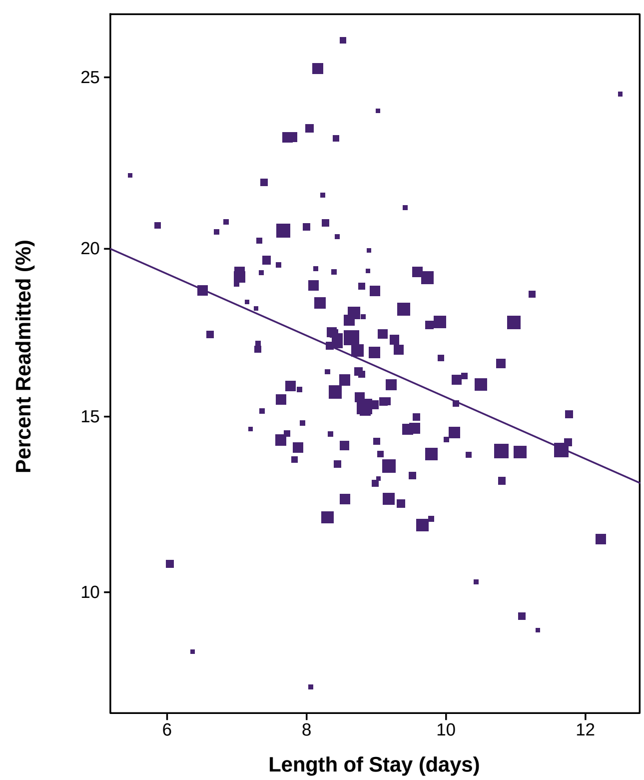
Exhibit 8.26: ***Relation Between Readmission Rate and Adjusted Hospital Average Length of Stay, 1993 and 1994***

Procedure/Diagnosis	Increase in Readmission Rate (%) *	95% Confidence Interval	p-value
Acute Myocardial Infarction	0.90	0.47 - 1.33	0.00
Chronic Obstructive Pulmonary Disease	-0.22	-0.76 - 0.33	0.44
Congestive Heart Failure	0.54	0.07 - 1.02	0.02
Cerebrovascular Accident	0.11	0.01 - 0.20	0.03
Pneumonia	0.17	-0.32 - 0.65	0.50
Hip Replacement	0.33	0.10 - 0.55	0.00
Transurethral Prostatectomy	-0.16	-0.73 - 0.42	0.60
Tonsillectomy	0.32	-0.28 - 0.93	0.29
Cholecystectomy	0.45	-0.06 - 0.96	0.08

* For every one day increase in hospital-adjusted ALOS, there may be an associated change in 30 day unplanned readmission rate (i.e., every one day decrease in ALOS for AMI was associated with a 0.90% higher readmission rate.

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.27: ***Readmission Within 30 Days of Discharge from Acute Care Hospital for Acute Myocardial Infarction in Ontario, 1993 and 1994***



Note: Size of box is proportional to caseload at each hospital.

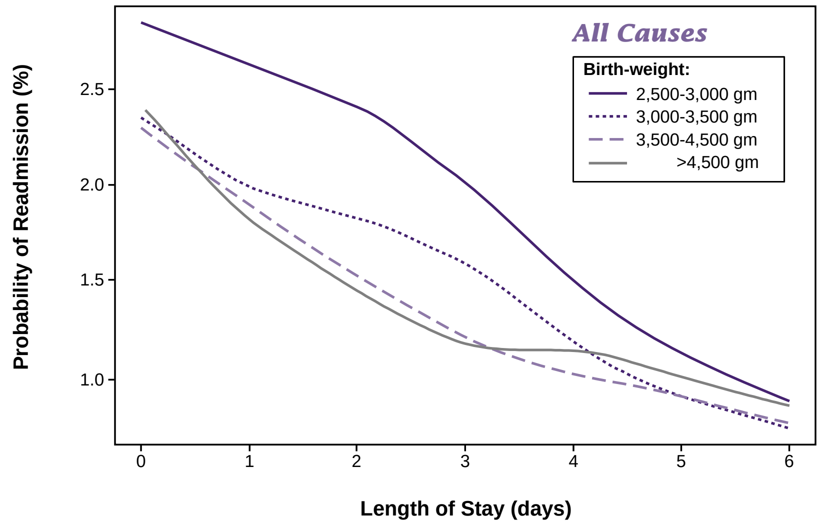
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

patterns of readmission for jaundice and non-jaundice causes (Exhibits 8.29 and 8.30). It is clear that the weight gradient is solely explained by the greater propensity of readmission among smaller neonates with earlier discharge. This is consistent with the increased susceptability of smaller neonates to neonatal jaundice, and the decreased likelihood of detection of jaundice with early (less than two day) discharge. When readmission for causes other than jaundice are considered, it is clear that there is little relationship between readmission and LOS of one to five days of stay. (The increase in readmission among large neonates greater than 4,500 gm at four to five days LOS may be due to the phenomenon of longer LOS among neonates with a greater number of uncoded complications.)

In summary, the vast majority of newborns are not rehospitalized, even when discharged early. Although there is a relationship between newborn LOS and readmission, it is almost entirely explained by increased readmission for neonatal jaundice among those discharged earliest, especially among smaller newborns. The readmissions for jaundice are relatively short and require phototherapy. Of interest is the strong seasonal effect on readmissions for jaundice. Readmissions in the winter months may exceed those in the summer by up to 50% (Exhibit 8.31), as might be expected due to differing levels of sunlight. This suggests that some jaundice readmissions may potentially be averted through simple measures and patient education. Given the relatively short readmissions requiring phototherapy, many hospital readmissions for jaundice might be averted through improved routine surveillance after discharge and subacute treatment. Hence, while these findings emphasize the importance of patient education and routine review of discharged neonates at two to four days of age, they do not, on their own, support the need for increased length of hospitalization. Of the remaining readmissions, there is little relation between LOS and readmission rates, especially in the period from one to five days following discharge.

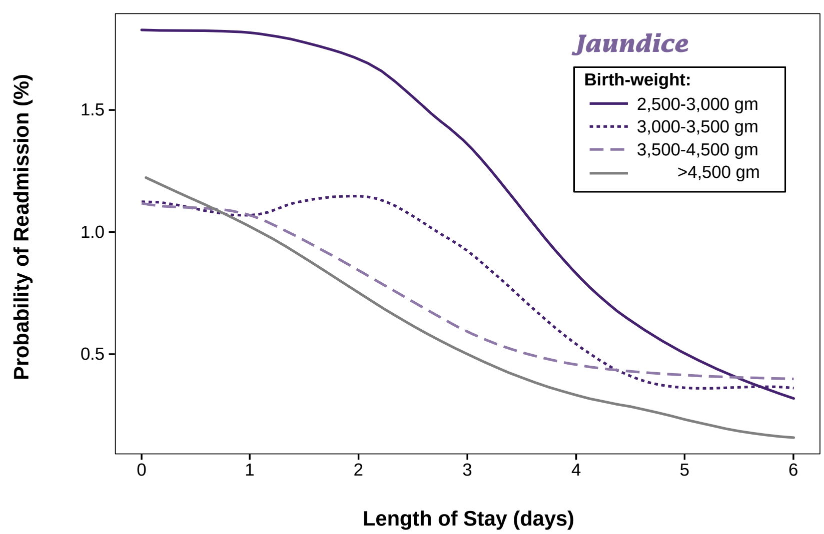
The Ontario data suggest that, in addition to including criteria for early discharge in guidelines, similar to those of the American Academy of Pediatrics,[5] new guidelines should consider specification of ranges of birth-weights appropriate for discharge within the first 48 hours of life. In addition, there might be a decreased need for readmission if information on recognizing and managing neonatal jaundice is included in parental education programs, and the need for follow-up care is anticipated.

Exhibit 8.28: ***Readmission of Newborns to Hospital Within 14 Days of Birth by Birth-weight and Neonatal Length of Stay (All Causes) in Ontario, 1992/93 – 1994/95***



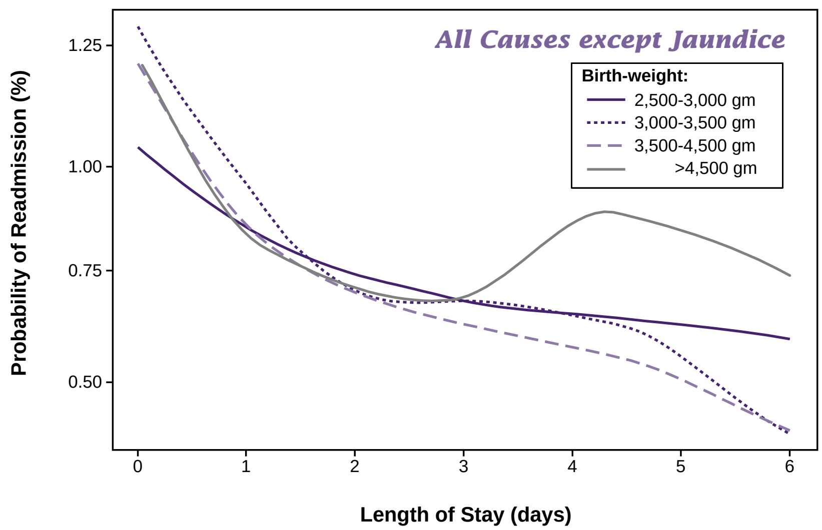
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.29: ***Readmission of Newborns to Hospital Within 14 Days of Birth by Birth-weight and Neonatal Length of Stay (Jaundice) in Ontario, 1992/93 – 1994/95***



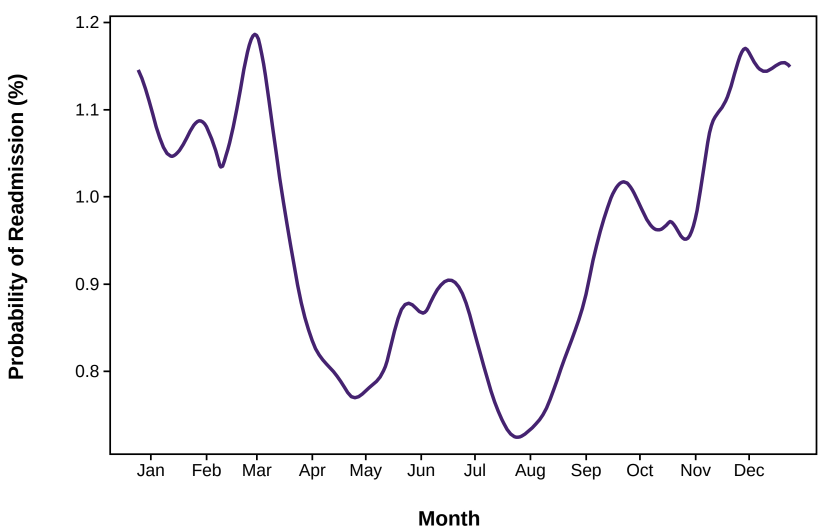
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.30: ***Readmission of Newborns to Hospital Within 14 Days of Birth by Birth-weight and Neonatal Length of Stay (All Causes except Jaundice) in Ontario, 1992/93 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.31: ***Readmission of Newborns to Hospital Within 14 Days of Birth by Birth-weight and Neonatal Length of Stay by Calendar Month (Jaundice) in Ontario, 1992/93 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Discussion

Length of Stay and Day Surgery Rates

We observed that declines continued in LOS among hospital groups, particularly for medical and obstetrical cases, and remained stable for surgical cases. Further pressures on acute care hospitals and shifts in resource allocation to home care programs may lead to more decreases in LOS. There are varied increases in rates of day surgery. For some procedures there appears to be a stabilization in LOS and day surgery rates. It may be that a maximum level of efficiency has been reached within hospitals for these procedures given current practices and constraints.

The overall level of hospital activity, measured in number of cases, has remained relatively constant for most diagnoses. The decrease in total volume of hospitalization (patient days) has largely been accomplished by decreasing each patient's LOS.

While the level of utilization has changed in most hospitals, each hospital's position relative to its peers has, for the most part, remained stable in terms of overall levels of utilization. This may relate to factors other than clinical processes of care. Varied access to home care programs, community and other medical services may account for some of the differences among hospitals.

For many diagnoses, the variation between actual and benchmark levels has remained constant over the years, leading to current levels of conservable bed days per diagnosis that are similar to those reported in 1991/92. Overall, the number of conservable bed days decreased by approximately 15% for medical cases and 23% for surgical cases in teaching hospitals. For medium- and smaller-sized hospitals, the conservable bed days were fairly constant from 1992/93 to 1994/95 for medical cases and decreased by 27% for surgical cases. It may be that substantial alteration of these fixed relative patterns of utilization will require a fundamental reorganization of patterns of service provision.

Total Length of Stay for a Single Episode of Illness for Selected Conditions and Procedures Among Institutions

Analysis of episode-based lengths of stay reveal greater variation in the duration of institutionalization than is apparent from analysis of single hospitalizations.

Underlying these differences are widely varying patterns of practice (for example, transfer of patients to rehabilitation facilities after hip and knee arthroplasty). In addition, differing patterns of coded days designated as requiring alternate levels of care may be the result of coding practice variation, differing levels of actual care provided in acute care settings, or both. The variable LOS for patients with similar diagnoses and procedures emphasizes the limitations of analyses of hospital efficiency, based on cases which are assumed to be similar. For example, since the vast majority of hip and knee arthroplasty cases are transferred to rehabilitation facilities by some institutions, analysing lengths of stay based on non-transferred cases does not reflect the typical course for a majority of cases in some institutions. For diagnoses/procedures for which there is wide variability in transfer practices, comparison among institutions' average lengths of stay for non-transferred cases is of limited value.

Readmission Rates

In Ontario, the overall number of admissions to hospital has remained constant, while average lengths of stay have decreased in conjunction with increases in day surgery rates. These shifts in patterns of care underscore fundamental changes in the delivery of acute hospital care. While shorter stays and increased day surgery rates are encouraged in order to improve the efficiency of the delivery of care, concerns have been raised about whether quality of care will be threatened in the haste to achieve efficiency, and about the adverse consequences that may result from the discharge of patients with unstable conditions. Some fear that shorter stays mean less time to educate the patient and family members about providing for patient needs, and less time to coordinate services from home health and community agencies.[8]

Patients may be sent home in a more dependent state, requiring more home care.[9] Studies have demonstrated that patients with unmet needs after acute hospitalization have significantly poorer outcomes, that is, more overall complications within two to four weeks of hospital discharge, and more hospital readmissions within three months of discharge. For example, patients whose needs were not met had a 25% rate of unplanned, but related rehospitalization within three months, compared with the 15% rate among those whose needs were met.[8] As well, the elderly who received visiting nursing services after hospital discharge were less likely to be readmitted.[10]

The study of readmission rates assumes that the pressure to shorten hospital stays compromises quality of care. Compromised quality of care may in turn lead to a greater risk of adverse post-hospitalization events, of which hospital readmission may be an indicator. Few studies have reported the relationships among LOS, quality of care and readmission rates. In a case-controlled study in Veteran's Administration hospitals in the United States, Ashton[11] found that decreased quality of patient care was associated with increased unplanned early readmission rates for congestive heart failure, diabetes mellitus and obstructive lung disease. Early readmissions are common for patients with these chronic diseases. Other studies[12–15] have failed to demonstrate an association between quality of care and readmission.

A study published in 1990[16] examined the quality of care received by Medicare patients with one of five common diseases before and after the introduction of fixed-fee prospective payment; it estimated changes in quality coincident with the change in the funding system. The results of the study were mixed. After the introduction of the prospective payment system, patients were sicker at admission.[17] The quality of care improved and was associated with decreased 30-day post-admission mortality;[18] sickness-adjusted six-month mortality and readmission rates were unchanged.[19] Lengths of stay for the study conditions decreased 24%.[19] However, patients were more likely to be discharged in unstable conditions.[20,21] These results indicate that funding changes are compatible with some positive effects on quality — "doing more with less" — whereas the finding that 12% of patients continued to experience poor or very poor care[22] and the increased rate of discharge of patients in an unstable condition underscores the necessity for vigilance to adverse sequelae. In a follow-up, Brook and associates[23] argued for routine reviews of patients before discharge, with explicit plans made for those sent home in an unstable condition.

Little is known about the impact on patients of changes in hospitalization practices in Canada. In a recent study of readmission rates, it was demonstrated that there was no increase in readmission rates among seven Winnipeg hospitals during the period in which average LOS decreased.[24] There have been no previous studies which examine readmission rates in Ontario.

Readmission rates have not uniformly been adversely associated with decreased lengths of stay. In fact, for most diagnoses, patient LOS may serve as an indicator of case severity, and may therefore be positively related to readmission rates. However, the relation between hospital average LOS and readmission rates, especially for acute myocardial infarction, suggests that a phenomenon linking institutional processes of care and readmission propensity may exist. While these findings reflect the lack of dramatic impact of changes in processes of acute care on readmission, this analysis may not be sufficiently sensitive to measure the impact such changes may have had on patients and their families. An unfortunate impact of reducing hospitalization is the transfer of costs between sectors within the health care system. Even with expanded home care services, patients and families will continue to bear more costs and inconvenience with reductions in the hospital sector. While not all early discharges are reflected in increased readmission rates, some complications are likely reflected in increased visits to family doctors or specialists in the early days post-discharge. Further research into patient satisfaction and measures of indirect societal costs must be undertaken to address these issues.

Furthermore, readmission rates are not the best measure of quality of care; they were used here as they are the only measure available from administrative data. The variation in readmission rates among hospitals remains unexplained, and could serve as an indicator for hospital review and quality assurance.

These data did not allow for a detailed assessment of potential regional problems with access to hospital services. With the continuing restructuring of the hospital sector, markers for reduced access must be developed and monitored. Some of the procedure-specific analyses by site of patient residence in Chapter 5 illustrate the extent to which utilization varies across regions; more detailed analyses, including monitoring of waiting lists for diverse conditions and procedures will be important in the future. While overall, Ontario's hospitals have managed to "do as much with less," it is unclear where and whether needs for hospital services are being poorly met as the inpatient sector continues to shrink.

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Exhibit 8.1: *Length of Stay for Medical Cases by Diagnosis for Teaching Hospitals in Ontario, 1992/93 - 1994/95*

Medical Diagnosis	Number of Cases			Adjusted Average Length of Stay			Benchmark Length of Stay			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Acute Myocardial Infarction	3,382	3,321	3,154	9.68	9.50	9.49	9.10	8.70	8.77	2,655	2,950	2,574
Angina	4,377	4,456	4,757	5.02	5.32	5.33	3.87	4.26	4.41	5,594	5,658	5,381
Chest Pain	2,891	2,888	3,234	2.54	2.38	2.32	2.05	2.14	2.03	1,571	949	1,131
Congestive Heart Failure	3,668	3,687	3,640	9.08	8.98	8.54	8.16	8.22	7.74	4,041	3,359	3,329
Asthma - Child	1,976	1,858	1,659	2.13	2.19	2.17	1.83	1.94	1.93	592	474	414
Asthma - Adult	1,059	1,028	979	5.35	5.30	5.20	4.96	4.74	4.38	597	647	898
Chronic Obstructive Pulmonary Disease	1,847	1,708	1,742	9.09	9.08	8.43	8.21	8.07	7.34	1,834	1,964	2,114
Croup	254	526	161	1.70	1.53	1.67	1.63	1.44	1.37	27	57	52
Pneumonia - All	3,433	3,805	3,989	7.19	7.02	6.51	6.51	6.42	6.11	2,561	2,585	2,003
Abdominal Pain - Child	625	557	560	1.76	1.68	1.73	1.34	1.37	1.03	277	225	399
Abdominal Pain - Adult	4,492	4,305	4,182	1.68	1.50	1.50	1.30	1.15	1.20	1,928	1,643	1,359
Gastroenteritis - Child	912	1,009	705	1.62	1.38	1.78	1.06	0.90	1.04	516	488	525
Gastroenteritis - Adult	2,095	2,091	2,192	1.75	1.50	1.33	1.29	1.21	0.88	1,022	674	1,053
Cerebrovascular Accident	1,478	1,701	1,532	18.50	18.59	14.65	15.12	15.31	12.39	5,684	6,118	3,927
Convulsion - Child	526	507	468	3.01	2.74	2.47	1.97	1.78	1.72	603	518	392
Convulsion - Adult	400	408	419	5.75	5.74	4.79	5.31	5.58	3.99	241	180	356
Cesarean Section	4,851	4,690	4,511	4.65	4.53	4.21	4.52	4.38	4.08	886	864	651
Normal Delivery	4,015	3,515	3,203	2.45	2.30	2.11	2.30	2.24	2.02	704	328	384
Threatened Premature Labour	2,310	2,176	2,333	1.12	1.29	1.08	0.52	0.55	0.47	1,402	1,613	1,434
Trauma to Perineum	8,303	8,533	8,586	2.61	2.47	2.32	2.44	2.36	2.28	1,689	1,272	809
Fetal Distress	2,371	2,183	2,208	3.62	3.68	3.44	3.19	3.33	3.04	1,284	972	974
Neonate	15,330	16,569	17,085	2.50	2.37	2.15	2.23	2.14	1.94	4,344	3,964	3,773
Total	**70,595**	**71,521**	**71,299**	**4.19**	**4.13**	**3.83**	**3.69**	**3.67**	**3.41**	**40,053**	**37,503**	**33,932**

See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.2: *Length of Stay for Medical Cases by Diagnosis for Medium-sized Hospitals in Ontario, 1992/93 - 1994/95*

Medical Diagnosis	Number of Cases			Adjusted Average Length of Stay			Benchmark Length of Stay			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Acute Myocardial Infarction	9,041	9,155	9,121	9.33	8.74	8.28	8.49	8.10	7.54	9,215	7,652	8,048
Angina	9,581	9,834	9,997	4.70	4.62	4.44	4.10	4.17	3.61	7,442	6,561	9,481
Chest Pain	8,122	7,882	8,051	2.62	2.44	2.29	2.17	1.95	1.83	4,251	4,193	4,056
Congestive Heart Failure	10,870	11,643	11,336	8.47	8.18	7.75	7.68	7.27	7.33	9,732	12,134	7,318
Asthma - Child	7,365	6,732	6,479	2.69	2.54	2.46	2.40	2.26	2.07	2,644	2,285	2,763
Asthma - Adult	4,545	4,470	4,309	4.68	4.63	4.32	4.34	4.16	4.00	2,213	2,582	2,005
Chronic Obstructive Pulmonary Disease	5,669	5,976	6,146	8.23	8.22	7.50	7.47	7.43	6.62	5,246	5,753	6,383
Croup	2,182	3,712	1,440	1.98	1.82	1.61	1.78	1.57	1.40	559	1,043	349
Pneumonia - All	9,998	11,190	12,850	6.88	6.73	6.04	6.54	6.28	5.73	4,107	6,201	5,847
Abdominal Pain - Child	1,636	1,319	1,300	1.94	1.88	1.69	1.66	1.65	1.41	543	404	441
Abdominal Pain - Adult	13,704	12,815	12,922	1.68	1.64	1.57	1.24	1.27	1.18	6,517	5,218	5,508
Gastroenteritis - Child	3,877	4,155	3,516	2.21	2.14	1.93	1.98	1.98	1.70	1,123	912	944
Gastroenteritis - Adult	5,464	5,636	6,089	2.27	2.12	2.06	1.84	1.66	1.52	2,687	2,848	3,736
Cerebrovascular Accident	4,409	4,621	4,583	17.60	17.43	16.78	14.58	14.10	13.48	16,658	18,482	17,945
Convulsion - Child	2,233	2,169	2,087	2.13	2.07	1.91	1.80	1.69	1.59	900	948	764
Convulsion - Adult	1,502	1,498	1,464	4.28	4.11	4.28	3.40	3.46	3.58	1,419	1,136	1,161
Cesarean Section	14,249	14,206	14,027	4.55	4.32	4.02	4.25	4.02	3.83	4,902	4,677	3,532
Normal Delivery	15,623	14,180	13,157	2.66	2.41	2.11	2.48	2.29	1.97	3,326	2,312	2,479
Threatened Premature Labour	6,960	6,055	5,380	0.74	0.71	0.77	0.51	0.35	0.42	1,921	2,265	1,962
Trauma to Perineum	18,580	20,673	20,948	2.64	2.45	2.15	2.48	2.33	2.03	3,838	3,242	3,727
Fetal Distress	5,613	5,518	5,236	3.69	3.46	3.25	3.40	3.22	2.94	1,972	1,738	1,893
Neonate	46,156	51,874	56,884	2.64	2.43	2.16	2.50	2.30	1.99	9,314	8,279	11,661
Total	**207,379**	**215,313**	**217,322**	**4.06**	**3.90**	**3.63**	**3.67**	**3.51**	**3.25**	**100,526**	**100,865**	**102,005**

See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.3: *Length of Stay for Medical Cases by Diagnosis for Smaller-sized Hospitals in Ontario, 1992/93 - 1994/95*

Medical Diagnosis	Number of Cases			Adjusted Average Length of Stay			Benchmark Length of Stay			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Acute Myocardial Infarction	3,012	3,233	3,192	9.34	8.68	8.23	8.46	7.81	7.43	3,026	3,191	3,133
Angina	3,983	4,133	4,359	3.97	3.84	3.70	3.57	3.37	3.21	1,951	2,241	2,527
Chest Pain	3,386	3,396	3,391	2.48	2.36	2.18	2.26	2.15	1.92	1,059	1,010	1,087
Congestive Heart Failure	4,553	4,726	4,582	7.99	7.76	7.51	7.29	6.84	6.61	4,103	5,055	4,634
Asthma - Child	2,219	2,074	1,640	2.56	2.47	2.29	2.19	2.23	1.97	952	663	602
Asthma - Adult	1,859	1,826	1,705	4.52	4.37	4.20	3.93	3.88	3.71	1,286	1,129	1,069
Chronic Obstructive Pulmonary Disease	3,059	3,200	3,261	7.97	7.68	7.36	7.14	6.97	6.64	3,075	2,926	3,056
Croup	828	1,352	535	1.93	1.89	1.65	1.67	1.59	1.44	241	464	133
Pneumonia - All	4,582	5,154	5,628	6.48	6.73	6.14	6.09	6.26	5.70	2,308	3,084	3,277
Abdominal Pain - Child	904	893	762	1.93	1.93	1.71	1.59	1.60	1.47	349	350	249
Abdominal Pain - Adult	2,045	2,048	2,235	2.85	2.55	2.35	2.43	2.06	1.86	1,110	1,203	1,224
Gastroenteritis - Child	701	601	547	1.63	1.68	1.59	1.42	1.32	1.22	211	269	245
Gastroenteritis - Adult	4,569	4,276	4,606	2.07	2.02	1.80	1.78	1.64	1.33	1,617	1,875	2,479
Cerebrovascular Accident	1,593	1,493	1,489	14.07	13.52	12.93	11.30	10.76	10.12	5,268	4,821	4,911
Convulsion - Child	500	515	482	1.67	1.49	1.32	1.28	1.28	1.01	228	144	187
Convulsion - Adult	576	588	599	3.74	3.73	3.15	3.13	2.89	2.52	440	576	459
Cesarean Section	2,759	2,584	2,392	4.61	4.29	4.11	4.34	4.05	3.87	897	809	761
Normal Delivery	3,979	3,428	3,200	3.01	2.77	2.53	2.74	2.56	2.35	1,214	851	630
Threatened Premature Labour	1,337	1,166	1,039	0.98	0.99	0.98	0.66	0.66	0.67	443	414	355
Trauma to Perineum	3,715	3,705	3,844	3.05	2.80	2.57	2.85	2.59	2.38	992	908	850
Fetal Distress	684	598	553	4.03	3.64	3.54	3.69	3.14	2.96	302	318	354
Neonate	11,276	11,132	11,030	2.97	2.80	2.56	2.80	2.61	2.38	2,631	2,586	2,382
Total	**50,843**	**50,989**	**50,041**	**4.44**	**4.33**	**4.11**	**4.00**	**3.86**	**3.64**	**33,703**	**34,886**	**34,603**

See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.4: *Length of Stay for Medical Cases by Hospital for Teaching Hospitals in Ontario, 1992/93 - 1994/95*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Chedoke-McMaster Hospitals, Hamilton	2,606	3,215	3,742	3.97	3.53	3.16	3.90	3.61	3.18	1.02	0.98	0.99	774	746	599
Children's Hospital of Eastern Ontario, Ottawa	1,495	1,798	1,273	1.97	1.95	2.12	2.08	2.06	2.22	0.95	0.95	0.96	4	0	11
Hamilton Civic Hospitals (General Division)	1,902	1,923	2,099	6.84	6.76	6.36	5.23	5.22	4.93	1.31	1.30	1.29	3,057	2,986	2,988
Hamilton Civic Hospitals (Henderson Division)	2,602	2,671	2,565	5.33	5.62	5.42	4.53	4.55	4.35	1.17	1.23	1.25	2,095	2,873	2,751
Hospital for Sick Children, Toronto	1,323	1,230	1,270	3.43	3.45	3.54	2.39	2.37	2.40	1.43	1.46	1.48	1,371	1,330	1,454
Hotel Dieu Hospital, Kingston	1,744	1,766	1,536	5.29	4.83	5.06	4.52	4.32	4.35	1.17	1.12	1.16	1,455	1,010	1,363
Kingston General Hospital	3,409	3,354	3,554	3.82	4.02	3.81	3.97	3.99	3.66	0.96	1.01	1.04	526	682	914
Mount Sinai Hospital, Toronto	6,608	7,145	6,557	3.22	3.05	2.82	2.96	2.82	2.56	1.09	1.08	1.10	1,858	1,762	1,840
Ottawa Civic Hospital	7,085	7,342	7,448	4.86	4.82	4.17	3.77	3.81	3.48	1.29	1.26	1.20	7,725	7,395	5,306
Ottawa General Hospital	3,404	3,388	3,174	4.33	4.38	4.04	4.39	4.53	4.10	0.98	0.97	0.99	874	510	458
St. Joseph's Hospital, Hamilton	6,381	5,808	5,876	4.22	4.18	3.81	3.48	3.62	3.46	1.21	1.15	1.10	4,917	3,522	2,728
St. Joseph's Hospital, London	6,644	6,423	6,310	3.29	3.28	3.02	3.21	3.18	2.87	1.02	1.03	1.05	965	1,015	1,288
St. Michael's Hospital, Toronto	3,941	3,576	3,465	3.62	3.96	3.74	3.31	3.43	3.26	1.09	1.16	1.15	1,405	1,983	1,700
Sunnybrook Health Science Centre, North York	1,829	1,821	1,850	6.72	6.51	5.63	5.72	5.85	5.52	1.17	1.11	1.02	1,834	1,294	411
Toronto Hospital	5,436	5,191	5,106	5.59	5.51	4.87	4.60	4.71	4.23	1.22	1.17	1.15	5,392	4,192	3,291
University Hospital, London	1,024	974	1,240	6.95	7.06	6.16	5.37	5.66	4.60	1.29	1.25	1.34	1,644	1,373	1,951
Victoria Hospital Corporation, London *	4,908	4,952	4,752	3.41	3.52	3.55	3.45	3.42	3.33	0.99	1.03	1.07	593	870	1,362
Wellesley Hospital, Toronto	3,162	2,757	3,025	4.02	4.06	3.63	3.60	3.65	3.22	1.12	1.11	1.13	1,567	1,545	1,558
Women's College Hospital, Toronto	5,092	6,187	6,457	3.13	3.05	2.76	2.74	2.66	2.47	1.14	1.14	1.12	1,994	2,414	1,961
Total	**70,595**	**71,521**	**71,299**	**4.19**	**4.13**	**3.83**	**3.69**	**3.67**	**3.41**	**1.13**	**1.13**	**1.12**	**40,053**	**37,503**	**33,932**

* Includes data for Children's Hospital of Western Ontario, London
See Appendix for inclusions/exclusions
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.5: *Length of Stay for Medical Cases by Hospital for Medium-sized Hospitals in Ontario, 1992/93 - 1994/95*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Belleville General Hospital	3,325	3,652	3,645	3.90	3.42	3.31	3.65	3.47	3.27	1.07	0.99	1.01	1,254	687	867
Brantford General Hospital	4,146	4,450	4,270	4.17	3.74	3.69	3.81	3.58	3.34	1.09	1.05	1.10	1,786	1,305	1,799
Cambridge Memorial Hospital	3,930	3,928	3,694	4.30	4.15	4.17	3.51	3.43	3.40	1.22	1.21	1.23	3,204	2,926	2,959
Centenary Health Centre, Scarborough	6,062	6,330	6,429	3.83	3.70	3.20	3.31	3.21	3.01	1.16	1.15	1.06	3,139	3,085	1,894
Credit Valley Hospital, Mississauga	4,011	6,405	6,345	3.96	3.23	2.95	3.69	3.01	2.85	1.07	1.07	1.04	1,581	1,594	1,100
Doctors Hospital, Toronto	2,084	2,546	2,954	3.94	3.29	2.62	3.81	3.27	2.64	1.04	1.00	0.99	633	525	496
Etobicoke General Hospital	5,703	5,776	5,778	3.98	3.91	3.85	3.42	3.26	3.17	1.17	1.20	1.22	3,217	3,788	4,049
General Hospital of Port Arthur, Thunder Bay	2,367	2,053	2,347	3.66	3.80	3.33	3.41	3.41	2.97	1.08	1.11	1.12	770	905	1,186
Grand River Hospital Corporation, Kitchener	7,333	7,429	6,986	3.45	3.27	3.17	3.24	3.09	2.91	1.06	1.06	1.09	2,191	1,755	2,170
Greater Niagara General Hospital	3,035	3,105	3,268	3.97	3.88	3.90	3.97	3.73	3.64	1.00	1.04	1.07	373	623	1,008
Grey Bruce Regional Health Centre, Owen Sound	2,685	2,748	2,563	4.50	4.40	3.73	3.79	3.76	3.34	1.18	1.17	1.12	2,149	1,937	1,260
Guelph General Hospital	3,380	3,315	3,314	4.05	3.84	3.60	3.57	3.26	3.05	1.13	1.17	1.18	1,616	1,897	1,817
Hopital Montfort, Ottawa	2,623	3,172	2,897	4.56	4.39	3.96	3.67	3.62	3.26	1.24	1.21	1.21	2,370	2,459	2,096
Hotel Dieu Hospital, Cornwall	2,380	2,545	2,542	4.01	3.75	3.68	3.44	3.43	3.24	1.17	1.09	1.14	1,415	854	1,136
Hotel Dieu Hospital, St. Catharines	1,615	1,631	1,610	4.68	4.32	4.17	4.20	3.98	3.84	1.11	1.09	1.09	792	625	646
Hotel Dieu of St. Joseph's Hospital, Windsor	2,817	2,907	2,904	4.91	4.98	5.05	4.30	4.22	4.11	1.14	1.18	1.23	1,777	2,245	2,799
Humber Memorial Hospital, Weston	3,813	4,011	3,641	3.97	4.10	3.88	3.88	3.73	3.54	1.02	1.10	1.10	1,047	2,190	1,960
Joseph Brant Memorial Hospital, Burlington	3,832	3,960	3,969	3.76	3.80	3.71	3.56	3.55	3.19	1.06	1.07	1.16	1,219	1,336	2,143
Laurentian Hospital, Sudbury	725	750	674	4.55	4.21	3.58	3.35	3.05	2.74	1.36	1.38	1.30	867	876	578
Markham Stouffville Hospital	3,110	3,251	3,144	3.30	3.24	2.84	3.25	3.11	2.88	1.01	1.04	0.98	542	609	260
McKellar General Hospital, Thunder Bay	1,971	2,056	1,964	4.75	4.80	4.52	4.24	4.10	3.85	1.12	1.17	1.17	1,048	1,535	1,307
Metropolitan General Hospital, Windsor	3,582	3,575	3,769	3.95	4.00	3.74	3.64	3.53	3.15	1.09	1.13	1.19	1,436	1,944	2,378
Mississauga Hospital	5,339	5,497	7,725	4.62	4.40	3.27	3.98	3.88	3.09	1.16	1.13	1.06	3,435	2,841	1,743
North York Branson Hospital	3,323	5,365	5,483	5.83	4.36	3.91	4.67	3.68	3.43	1.25	1.19	1.14	4,007	3,810	2,823
North York General Hospital	6,913	6,800	6,865	3.85	4.16	3.74	3.54	3.49	3.16	1.09	1.19	1.19	2,235	4,700	4,077
Northwestern General Hospital, Toronto	3,250	3,319	3,913	4.41	4.00	3.55	3.87	3.63	3.30	1.14	1.10	1.08	1,846	1,612	1,138
Oakville Trafalgar Memorial Hospital	4,457	4,276	4,239	4.34	3.86	3.45	3.54	3.43	3.24	1.22	1.12	1.06	3,657	1,954	1,931
Orillia Soldiers' Memorial Hospital	2,529	2,604	2,605	4.39	3.88	3.59	4.12	3.92	3.58	1.07	0.99	1.00	1,003	643	761
Oshawa General Hospital	7,425	7,403	7,142	3.56	3.48	3.54	3.23	3.10	2.92	1.10	1.12	1.21	2,908	2,899	4,424
Peel Memorial Hospital, Brampton	6,898	6,651	6,892	3.54	3.61	3.27	3.44	3.41	3.11	1.03	1.06	1.05	2,315	2,412	2,480
Peterborough Civic Hospital	3,537	4,088	4,264	3.84	3.61	3.38	3.48	3.37	3.14	1.11	1.07	1.08	1,649	1,494	1,271
Plummer General Hospital, Sault Ste. Marie	2,177	2,064	1,858	3.75	3.53	3.43	3.03	2.93	2.73	1.24	1.20	1.26	1,614	1,319	1,373
Plummer Memorial Public Hospital, Sault Ste. Marie	1,326	1,303	1,326	5.28	5.41	5.38	5.15	5.54	4.99	1.02	0.98	1.08	922	430	944
Public General Hospital, Chatham	2,638	2,466	2,454	4.36	4.25	3.83	3.71	3.75	3.49	1.18	1.14	1.10	1,810	1,415	1,060
Queensway General Hospital, Etobicoke	2,948	3,266	3,352	4.97	4.83	4.13	4.25	3.98	3.52	1.17	1.21	1.17	2,175	2,821	2,069
Queensway-Carleton Hospital, Nepean	1,358	1,434	1,390	5.90	5.87	6.07	5.54	5.23	5.00	1.06	1.12	1.21	625	978	1,500
Riverside Hospital, Ottawa	2,944	3,078	3,079	4.12	4.22	3.96	3.54	3.44	3.10	1.16	1.23	1.28	1,998	2,435	2,669
Royal Victoria Hospital, Barrie	4,382	4,244	4,323	3.78	3.74	3.61	3.49	3.50	3.31	1.08	1.07	1.09	1,679	1,116	1,585
Salvation Army Grace General, Scarborough	5,424	5,233	5,171	3.01	2.99	2.78	3.25	3.18	2.86	0.93	0.94	0.97	274	254	251
Salvation Army Grace Hospital, Ottawa	4,063	4,071	3,938	2.89	2.70	2.63	2.68	2.51	2.25	1.08	1.07	1.17	908	754	1,542
Salvation Army Grace Hospital, Windsor	3,360	3,470	3,293	3.46	3.13	3.18	3.13	2.91	2.69	1.11	1.07	1.18	1,392	1,022	1,643
Sarnia General Hospital	1,581	1,670	1,777	5.22	4.97	4.83	4.89	4.88	4.67	1.07	1.02	1.03	706	569	454
Scarborough General Hospital	6,454	6,665	6,697	4.25	3.87	3.57	3.76	3.61	3.31	1.13	1.07	1.08	3,186	1,738	1,808
St. Catharines General Hospital	4,935	4,761	4,527	3.81	3.79	3.54	3.53	3.50	3.26	1.08	1.08	1.09	1,547	1,572	1,417
St. Joseph's General Hospital, Peterborough	553	547	509	7.77	6.99	6.29	6.18	5.29	4.97	1.26	1.32	1.27	948	972	774
St. Joseph's Health Centre of Sarnia	1,546	1,451	2,284	4.27	4.13	3.31	3.44	3.27	2.61	1.24	1.26	1.27	1,332	1,273	1,783
St. Joseph's Health Centre, Toronto	4,425	4,266	4,944	4.27	4.24	3.68	3.66	3.69	3.33	1.17	1.15	1.10	2,914	2,580	2,024

Continued on next page

Exhibit 8.5: *(cont'd)*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
St. Joseph's Hospital, Guelph	207	152	257	3.62	3.60	5.11	3.62	3.25	3.97	1.00	1.11	1.29	63	77	320
St. Mary's General Hospital, Kitchener	1,588	1,586	1,666	6.01	5.83	5.90	5.21	5.21	5.02	1.15	1.12	1.18	1,338	1,068	1,541
St. Thomas Elgin General Hospital	2,218	2,311	2,277	4.02	3.91	3.74	4.23	4.07	3.93	0.95	0.96	0.95	263	388	256
Stratford General Hospital	1,918	1,739	1,677	3.28	2.86	2.81	3.56	3.21	3.11	0.92	0.89	0.90	291	153	278
Sudbury General Hospital of the Immaculate Heart of Mary	4,492	4,791	4,735	4.07	3.94	3.65	3.14	2.94	2.70	1.30	1.34	1.35	4,194	4,781	4,528
Sudbury Memorial Hospital	1,536	1,562	1,642	7.10	7.17	6.95	5.07	4.99	4.55	1.40	1.44	1.53	3,120	3,401	3,943
Timmins and District Hospital	2,106	2,170	1,989	3.93	3.97	3.93	3.78	3.43	3.31	1.04	1.16	1.19	595	1,276	1,258
Toronto East General and Orthopedic Hospital	5,732	5,790	4,913	4.41	4.00	3.64	4.33	4.04	3.98	1.02	0.99	0.91	1,958	1,914	1,144
Welland County General Hospital	2,087	2,091	2,019	4.54	4.72	4.89	3.85	3.84	3.75	1.18	1.23	1.30	1,530	1,849	2,320
Windsor Western Hospital	1,140	1,210	1,210	5.47	5.75	5.65	5.20	4.95	4.81	1.05	1.16	1.18	543	1,141	1,082
Woodstock General Hospital	1,915	1,904	1,853	3.90	3.97	3.74	3.59	3.49	3.11	1.09	1.14	1.20	853	965	1,164
York Central Hospital, Richmond Hill	3,240	3,398	3,621	3.92	3.76	3.53	3.68	3.51	3.22	1.06	1.07	1.10	1,172	1,056	1,368
York County Hospital, Newmarket	5,131	5,382	5,148	3.63	3.33	3.14	3.43	3.28	2.96	1.06	1.01	1.06	1,547	1,209	1,675
York-Finch General Hospital, North York	5,755	5,640	5,558	3.46	3.52	3.20	3.23	3.14	2.90	1.07	1.12	1.10	1,550	2,273	1,675
Total	**207,379**	**215,313**	**217,322**	**4.06**	**3.90**	**3.63**	**3.67**	**3.51**	**3.25**	**1.11**	**1.11**	**1.12**	**100,526**	**100,865**	**102,005**

See Appendix for inclusions/exclusions
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: The Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.6: *Length of Stay for Medical Cases by Hospital for Smaller-sized Hospitals in Ontario, 1992/93 - 1994/95*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Ajax and Pickering General Hospital	3,285	3,297	3,481	4.07	3.87	3.81	3.44	3.29	3.19	1.18	1.18	1.19	2,110	1,980	2,191
Alexandra Hospital	394	450	490	4.91	4.24	4.18	4.26	3.74	3.60	1.15	1.13	1.16	291	260	292
Alexandra Marine and General Hospital, Goderich	466	539	570	5.04	4.75	4.04	4.37	4.17	3.81	1.15	1.14	1.06	374	322	186
Arnprior and District Memorial Hospital	556	466	393	4.52	5.50	5.77	4.14	4.64	4.36	1.09	1.18	1.32	271	404	559
Brockville General Hospital	1,798	1,595	1,585	3.67	3.53	3.32	3.59	3.50	3.32	1.02	1.01	1.00	487	280	235
Bruce County General Hospital, Walkerton	513	538	474	4.13	4.05	4.57	3.54	3.53	3.43	1.17	1.15	1.33	314	337	546
Campbellford Memorial Hospital	294	425	437	6.02	5.55	4.77	5.59	5.35	4.50	1.08	1.04	1.06	191	185	215
Central Hospital, Toronto	974	839	351	3.63	3.13	2.77	3.17	2.87	2.47	1.15	1.09	1.12	474	256	115
Centre Grey General Hospital, Markdale	293	329	275	4.80	4.19	3.96	4.47	4.00	3.79	1.08	1.05	1.04	148	117	102
Charlotte Eleanor Englehart Hospital, Petrolia	519	456	454	4.74	4.64	4.40	4.13	4.03	3.85	1.15	1.15	1.14	373	313	267
Cobourg District General Hospital	1,385	1,265	694	4.14	3.94	4.03	3.94	3.65	3.51	1.05	1.08	1.15	457	464	376
Collingwood General and Marine Hospital	1,474	1,326	1,342	4.88	4.64	4.47	4.15	3.97	3.78	1.18	1.17	1.18	1,086	887	915
Cornwall General Hospital	822	839	881	5.25	4.70	4.52	4.51	4.25	3.81	1.16	1.11	1.19	716	587	745
Douglas Memorial Hospital, Fort Erie	673	707	702	5.47	5.20	4.67	4.59	4.22	3.98	1.19	1.23	1.17	592	706	482
Dryden District General Hospital	544	537	494	4.13	4.11	3.71	3.91	3.84	3.42	1.06	1.07	1.08	199	192	265
Dufferin-Caledon Health Care Corporation, Orangeville	1,775	1,824	1,816	3.97	4.01	3.62	3.83	3.73	3.37	1.04	1.08	1.08	804	873	746
Georgetown and District General Hospital	875	778	732	4.38	4.39	4.16	3.68	3.58	3.47	1.19	1.23	1.20	634	678	515
Glengarry Memorial Hospital, Alexandria	218	254	215	7.05	7.81	7.94	5.39	5.40	4.92	1.31	1.45	1.62	375	626	651
Great War Memorial Hospital of Perth	656	551	459	4.38	4.57	4.43	4.12	4.03	3.81	1.06	1.13	1.16	315	320	295
Groves Memorial Community Hospital, Fergus	759	741	847	4.77	4.48	4.33	4.26	3.70	3.57	1.12	1.21	1.21	468	579	652
Haldimand War Memorial Hospital, Dunnville	538	599	546	4.31	4.10	4.01	3.91	3.71	3.68	1.10	1.10	1.09	295	291	266
Hanover and District Hospital	630	711	639	4.19	4.47	4.19	3.50	3.49	3.32	1.20	1.28	1.26	454	716	567
Hawkesbury and District General Hospital	1,164	1,164	1,115	4.70	4.54	4.18	4.38	4.29	3.88	1.07	1.06	1.08	459	476	405
Huntsville District Memorial Hospital	993	1,039	1,104	4.06	4.03	3.29	4.17	4.13	3.72	0.98	0.97	0.89	152	205	27
Huronia District Hospital, Midland	1,557	1,591	1,522	4.12	4.09	4.02	3.66	3.64	3.41	1.13	1.12	1.18	785	779	953
Kemptville District Hospital	246	233	246	5.33	6.04	5.27	4.42	4.88	4.28	1.21	1.24	1.23	236	279	271
Kincardine and District General Hospital	541	522	541	4.21	4.19	4.19	3.63	3.47	3.38	1.16	1.21	1.24	347	398	449
Kirkland and District Hospital	755	681	707	4.69	4.62	4.43	3.91	3.92	3.75	1.20	1.18	1.18	605	526	485
Lake of the Woods District Hospital, Kenora	962	1,078	954	4.35	3.67	3.74	3.98	3.57	3.44	1.09	1.03	1.09	508	323	376
Leamington District Memorial Hospital	1,248	1,316	1,447	4.23	3.98	3.96	3.96	3.64	3.54	1.07	1.09	1.12	466	566	706
Lennox and Addington County General Hospital, Napanee	771	882	868	4.05	3.88	3.63	3.95	3.77	3.55	1.03	1.03	1.02	198	273	169
Listowel Memorial Hospital	680	657	646	4.63	4.59	4.04	3.77	3.58	3.27	1.23	1.28	1.24	589	670	559
Manitoulin Health Centre, Little Current	360	356	342	4.42	3.71	3.73	4.33	3.95	3.76	1.02	0.94	0.99	200	79	97
Meaford General Hospital	345	393	373	5.06	5.27	5.18	4.58	4.32	4.38	1.10	1.22	1.18	216	376	380
Memorial Hospital, Bowmanville	1,121	1,380	1,375	4.79	4.34	4.01	4.18	3.92	3.74	1.15	1.11	1.07	691	658	519
Milton District Hospital	798	746	873	4.42	4.62	4.11	3.88	3.93	3.50	1.14	1.18	1.18	492	551	541
Norfolk General Hospital, Simcoe	1,866	1,903	1,837	4.41	4.13	4.13	4.32	4.12	4.05	1.02	1.00	1.02	488	505	536
North Bay Civic Hospital	598	642	881	5.57	5.48	4.68	5.04	5.01	4.28	1.11	1.09	1.09	381	338	436
Notre Dame Hospital, Hearst	459	481	464	4.27	4.25	4.09	3.62	3.43	3.16	1.18	1.24	1.29	336	434	442
Parry Sound District General Hospital	730	655	779	4.95	5.19	4.76	4.28	4.30	3.89	1.15	1.21	1.22	527	610	706
Pembroke Civic Hospital	716	650	645	5.61	5.24	5.13	4.94	4.94	4.34	1.14	1.06	1.18	501	325	509
Pembroke General Hospital	1,821	1,763	2,014	3.78	3.65	3.34	3.37	3.28	3.06	1.12	1.11	1.09	766	684	619
Penetanguishene General Hospital	344	354	389	5.16	5.08	4.24	4.89	4.94	4.32	1.06	1.03	0.98	141	141	138
Port Colborne General Hospital	481	466	605	4.72	4.45	4.72	4.56	4.18	4.10	1.03	1.07	1.15	161	202	412
Prince Edward County Memorial Hospital, Picton	624	646	603	4.94	4.38	4.55	4.58	4.34	4.15	1.08	1.01	1.10	274	111	291
Renfrew Victoria Hospital	562	505	489	4.44	4.32	3.66	4.57	4.55	4.17	0.97	0.95	0.88	126	103	45
Riverside Health Care Facilities, Fort Frances	737	696	709	3.99	3.28	3.09	4.01	3.31	3.46	1.00	0.99	0.90	200	119	42

Continued on next page

Exhibit 8.6: *(cont'd)*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Ross Memorial Hospital, Lindsay	1,931	2,230	2,040	4.73	4.54	4.62	4.32	4.15	4.15	1.10	1.09	1.11	906	1,006	1,064
Sensenbrenner Hospital, Kapuskasing	565	570	583	4.82	4.73	4.42	3.95	3.77	3.42	1.22	1.25	1.29	505	554	582
Smiths Falls Community Hospital	980	1,000	901	4.59	4.80	4.16	4.08	3.99	3.67	1.12	1.20	1.13	516	815	466
South Muskoka Memorial Hospital, Bracebridge	1,095	1,070	1,193	3.94	4.01	3.54	3.85	3.76	3.39	1.02	1.07	1.04	256	315	265
St. Joseph's General Hospital, Blind River	216	165	162	4.85	4.46	5.12	4.54	4.19	4.40	1.07	1.06	1.17	129	76	160
St. Joseph's General Hospital, Elliott Lake	671	701	683	4.95	4.75	4.50	3.92	3.98	3.50	1.26	1.19	1.28	691	570	722
St. Joseph's General Hospital, North Bay	3,156	3,213	3,255	3.52	3.28	3.25	3.28	3.02	2.76	1.08	1.09	1.18	902	849	1,633
St. Joseph's General Hospital, Thunder Bay	746	709	656	6.38	6.47	6.17	4.76	4.60	4.49	1.34	1.41	1.37	1,210	1,329	1,103
St. Joseph's Hospital, Brantford	219	197	205	5.13	4.67	4.09	4.41	4.11	3.59	1.16	1.14	1.14	220	159	154
St. Joseph's Hospital, Chatham	1,288	1,124	1,208	4.05	4.49	4.04	3.57	3.79	3.63	1.14	1.18	1.11	662	812	563
St. Mary's Memorial Hospital, St. Mary's	401	429	397	5.13	5.00	4.68	3.95	3.66	3.57	1.30	1.37	1.31	509	575	471
St. Vincent de Paul Hospital, Brockville	516	530	524	5.76	5.87	6.04	5.47	5.22	5.07	1.05	1.12	1.19	184	391	528
Stevenson Memorial Hospital, Alliston	976	1,065	1,034	4.03	3.99	3.78	3.85	3.68	3.79	1.05	1.09	1.00	288	460	250
Strathroy Middlesex General Hospital	1,183	1,226	1,079	4.49	4.26	4.07	3.85	3.68	3.56	1.17	1.16	1.14	862	764	610
Sydenham District Hospital, Wallaceburg	707	736	896	4.20	4.06	4.02	4.37	3.99	3.74	0.96	1.02	1.07	155	222	342
Temiskaming Hospital, New Liskeard	840	930	874	4.11	4.32	4.19	3.49	3.48	3.42	1.18	1.24	1.23	538	777	687
Tillsonburg District Memorial Hospital	1,189	1,096	1,065	4.46	4.98	4.70	4.09	4.09	3.94	1.09	1.22	1.19	449	975	814
Trenton Memorial Hospital	1,225	1,072	1,018	4.63	4.41	4.10	4.01	4.16	4.04	1.15	1.06	1.01	796	321	275
West Haldimand General Hospital, Hagersville	328	331	286	5.10	5.47	5.47	4.69	4.70	5.11	1.09	1.17	1.07	179	281	164
West Lincoln Memorial Hospital, Grimsby	892	906	844	3.95	3.95	3.80	4.33	4.18	3.94	0.91	0.95	0.96	173	280	299
West Nipissing General Hospital, Sturgeon Falls	627	607	465	5.50	5.32	4.72	4.09	3.97	3.74	1.35	1.34	1.26	930	860	488
Whitby General Hospital	604	622	650	6.48	5.94	4.48	5.07	4.78	3.75	1.28	1.24	1.20	854	768	550
Willett Hospital, Paris	53	42	50	4.00	4.93	3.93	5.71	5.57	5.29	0.70	0.89	0.74	5	20	9
Winchester District Memorial Hospital	1,148	1,088	1,094	3.89	3.88	3.84	3.76	3.80	3.43	1.04	1.02	1.12	263	169	518
Wingham and District Hospital	643	597	504	4.21	4.61	4.80	3.85	3.90	3.63	1.09	1.18	1.32	248	436	586
Total	**62,119**	**62,121**	**61,071**	**4.44**	**4.33**	**4.11**	**4.00**	**3.86**	**3.64**	**1.11**	**1.12**	**1.13**	**33,703**	**34,886**	**34,603**

See Appendix for inclusions/exclusions
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.7: *Length of Stay for Surgical Cases by Procedure for Teaching Hospitals in Ontario, 1992/93 - 1994/95*

Surgical Procedure	Number of Cases			Adjusted Average Length of Stay			Benchmark Length of Stay			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Appendectomy - Adult	1,178	1,200	1,180	4.39	4.14	3.74	4.26	3.78	3.40	254	527	492
Appendectomy - Child	549	529	604	4.20	3.86	3.98	3.87	3.61	3.77	195	181	182
Total Cholecystectomy	795	513	456	8.33	8.60	8.08	7.39	8.22	7.02	823	275	514
Laparoscopic Cholecystectomy	4,158	3,927	4,191	2.22	2.13	1.88	1.86	1.90	1.66	1,603	957	1,030
Hernia Repair - Adult	2,616	2,651	2,778	2.24	1.82	1.56	1.79	1.33	1.16	1,516	1,486	1,240
Hernia Repair - Child	1,939	1,854	1,715	0.45	0.43	0.42	0.37	0.35	0.39	157	134	68
Excision of Breast Lesions	3,501	3,242	3,442	0.86	0.79	0.70	0.55	0.55	0.50	1,144	860	750
Hemmorhoidectomy	640	871	1,177	1.92	1.35	0.82	1.65	1.14	0.65	221	193	230
Stripping/Ligation Varicose Vein	965	914	972	1.27	0.99	0.92	0.54	0.34	0.37	757	601	567
Hip/Knee Replacement	2,639	2,792	3,041	11.56	10.61	9.61	10.42	9.75	8.45	3,364	3,286	3,791
Arthroscopy	2,504	2,304	2,375	0.48	0.40	0.35	0.35	0.34	0.28	337	151	175
Bunionectomy	718	704	709	2.03	1.71	1.55	1.58	1.36	1.05	400	295	373
Carpal Tunnel Release	2,520	2,539	2,405	0.25	0.21	0.19	0.18	0.17	0.12	216	142	168
Needle Biopsy of Prostate	669	601	504	0.68	0.52	0.42	0.35	0.21	0.27	228	191	84
Transurethral Excision Lesion of Bladder	1,717	1,862	1,842	3.06	2.76	2.25	2.63	2.12	1.82	911	1,271	926
Urethral Stricture Release	1,769	1,542	1,800	0.91	0.76	0.65	0.65	0.56	0.48	585	335	360
Transurethral Prostatectomy	2,069	1,715	1,586	5.22	4.82	4.18	4.58	4.24	3.44	1,387	1,157	1,250
Transurethral Clearance of Calculus	469	434	455	3.15	2.78	2.38	2.74	2.19	2.23	231	284	138
Hysterectomy	4,212	4,035	3,930	5.61	4.96	4.52	5.06	4.56	4.17	2,524	1,770	1,532
Laparoscopy	3,586	2,955	2,478	0.45	0.44	0.41	0.39	0.36	0.36	273	273	143
Tonsillectomy	4,620	4,570	4,829	0.78	0.67	0.53	0.44	0.39	0.35	1,632	1,335	928
Deviated Nasal Septum	1,703	1,622	1,671	0.89	0.75	0.57	0.70	0.47	0.41	401	468	276
Tooth Extraction	2,357	2,136	2,134	0.41	0.40	0.36	0.28	0.28	0.28	370	289	215
Lens Replacement	10,046	9,576	10,591	0.58	0.47	0.40	0.43	0.36	0.32	1,721	1,131	867
Total	**57,939**	**55,088**	**56,865**	**2.18**	**1.99**	**1.76**	**1.85**	**1.71**	**1.50**	**21,250**	**17,591**	**16,300**

See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.8: *Length of Stay for Surgical Cases by Procedure for Medium-sized Hospitals in Ontario, 1992/93 - 1994/95*

Surgical Procedure	Number of Cases			Adjusted Average Length of Stay			Benchmark Length of Stay			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Appendectomy - Adult	4,127	4,088	4,197	3.87	3.72	3.55	3.42	3.32	3.25	2,261	1,966	1,689
Appendectomy - Child	1,780	1,636	1,654	3.37	3.30	3.02	3.01	2.92	2.76	779	752	590
Total Cholecystectomy	3,478	2,385	2,002	7.05	7.20	6.86	6.50	6.53	6.49	2,816	2,267	1,344
Laparoscopic Cholecystectomy	12,723	12,825	13,858	2.06	1.86	1.64	1.66	1.55	1.46	5,738	4,768	3,476
Hernia Repair - Adult	7,706	7,790	8,615	1.85	1.53	1.22	1.49	1.21	0.92	3,509	3,092	3,086
Hernia Repair - Child	1,828	1,799	1,746	0.66	0.53	0.49	0.41	0.36	0.36	495	335	244
Excision of Breast Lesions	9,934	9,512	10,717	0.60	0.53	0.44	0.41	0.38	0.34	2,305	1,641	1,225
Hemmorhoidectomy	2,792	3,008	3,656	1.98	1.49	1.13	1.37	0.96	0.84	1,863	1,662	1,208
Stripping/Ligation Varicose Vein	3,400	3,351	3,396	1.21	1.04	0.93	0.72	0.53	0.52	1,865	1,778	1,493
Hip/Knee Replacement	3,849	4,067	4,450	12.07	11.20	10.25	10.38	9.80	9.05	7,230	6,318	5,903
Arthroscopy	9,352	8,402	8,361	0.40	0.36	0.32	0.34	0.29	0.25	741	740	574
Bunionectomy	2,509	2,460	2,528	2.15	1.89	1.60	1.49	1.41	1.23	1,810	1,335	1,125
Carpal Tunnel Release	6,407	6,627	6,861	0.23	0.21	0.19	0.17	0.16	0.14	463	402	363
Needle Biopsy of Prostate	3,518	3,548	3,574	0.64	0.51	0.41	0.28	0.23	0.17	1,380	1,097	896
Transurethral Excision Lesion of Bladder	4,210	4,299	4,601	2.71	2.41	2.05	2.09	1.80	1.53	3,224	2,890	2,728
Urethral Stricture Release	8,260	8,409	9,206	0.51	0.45	0.38	0.25	0.22	0.20	2,367	2,080	1,823
Transurethral Prostatectomy	5,909	5,046	4,871	5.65	5.09	4.49	5.09	4.19	3.78	4,402	5,069	4,085
Transurethral Clearance of Calculus	1,830	2,029	2,366	2.91	2.45	2.10	2.32	1.96	1.48	1,280	1,225	1,628
Hysterectomy	11,617	10,920	10,877	5.51	4.90	4.46	4.96	4.44	4.10	7,189	6,058	4,827
Laparoscopy	7,076	6,907	6,476	0.46	0.46	0.41	0.36	0.35	0.32	760	777	608
Tonsillectomy	13,102	12,106	14,310	0.86	0.76	0.64	0.57	0.53	0.46	4,077	3,075	2,845
Deviated Nasal Septum	5,348	4,807	4,797	0.79	0.72	0.66	0.50	0.37	0.35	1,831	1,778	1,564
Tooth Extraction	11,078	10,481	10,588	0.36	0.34	0.33	0.29	0.27	0.25	934	803	889
Lens Replacement	26,973	29,127	31,911	0.39	0.32	0.26	0.24	0.23	0.20	4,266	3,057	2,257
Total	**168,806**	**165,629**	**175,618**	**1.86**	**1.64**	**1.42**	**1.54**	**1.35**	**1.20**	**63,584**	**54,964**	**46,471**

See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.9: *Length of Stay for Surgical Cases by Procedure for Smaller-sized Hospitals in Ontario, 1992/93 - 1994/95*

Surgical Procedure	Number of Cases			Adjusted Average Length of Stay			Benchmark Length of Stay			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Appendectomy - Adult	1,085	1,118	1,095	4.07	3.92	3.63	3.56	3.38	3.31	648	703	521
Appendectomy - Child	602	519	567	3.33	3.32	3.02	2.98	2.86	2.54	286	296	308
Total Cholecystectomy	1,436	794	770	6.59	6.91	6.56	6.00	6.06	5.47	1,520	782	988
Laparoscopic Cholecystectomy	2,722	3,484	3,522	2.33	2.08	1.81	2.02	1.71	1.54	1,157	1,528	1,203
Hernia Repair - Adult	2,623	2,536	2,642	2.55	2.04	1.64	2.25	1.65	1.30	1,355	1,249	1,133
Hernia Repair - Child	402	341	356	1.04	0.89	0.69	0.62	0.42	0.37	201	168	122
Excision of Breast Lesions	2,267	2,134	2,298	0.75	0.67	0.54	0.42	0.43	0.38	810	617	427
Hemmorhoidectomy	1,143	1,074	1,161	2.22	1.97	1.35	1.01	1.04	0.86	1,445	1,050	625
Stripping/Ligation Varicose Vein	539	529	532	2.16	1.58	1.34	1.70	1.09	0.87	324	336	280
Hip/Knee Replacement	377	352	405	12.27	11.92	11.19	10.14	11.05	10.42	821	461	493
Arthroscopy	1,844	2,125	2,164	0.40	0.32	0.30	0.29	0.26	0.24	229	153	154
Bunionectomy	501	471	448	1.95	1.74	1.57	0.72	0.58	0.63	685	598	465
Carpal Tunnel Release	2,161	2,178	1,965	0.25	0.22	0.20	0.18	0.17	0.16	174	122	87
Needle Biopsy of Prostate	672	680	664	0.46	0.36	0.34	0.12	0.12	0.10	234	168	161
Transurethral Excision Lesion of Bladder	773	788	778	2.42	2.03	1.64	1.66	1.23	1.13	634	686	477
Urethral Stricture Release	1,364	1,291	1,400	0.54	0.54	0.36	0.43	0.38	0.31	212	269	164
Transurethral Prostatectomy	874	699	707	5.65	5.17	4.67	5.29	4.38	4.30	459	636	455
Transurethral Clearance of Calculus	119	109	101	2.85	2.19	2.11	2.23	1.65	1.77	89	76	58
Hysterectomy	2,470	2,406	2,317	5.62	5.11	4.49	4.97	4.36	3.89	1,767	1,934	1,553
Laparoscopy	1,592	1,421	1,549	0.59	0.53	0.50	0.32	0.34	0.34	447	291	270
Tonsillectomy	2,628	2,461	2,911	1.18	1.01	0.89	0.90	0.60	0.56	898	1,058	1,077
Deviated Nasal Septum	592	533	627	0.99	0.84	0.68	0.47	0.51	0.44	316	185	164
Tooth Extraction	4,471	4,355	3,985	0.26	0.27	0.26	0.20	0.23	0.22	330	231	208
Lens Replacement	5,395	6,069	7,478	0.47	0.41	0.31	0.28	0.25	0.23	1,091	995	669
Total	**38,652**	**38,467**	**40,442**	**1.86**	**1.58**	**1.35**	**1.52**	**1.25**	**1.10**	**16,132**	**14,593**	**12,060**

See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.10: *Length of Stay for Surgical Cases by Hospital for Teaching Hospitals in Ontario, 1992/93 - 1994/95*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Chedoke-McMaster Hospitals, Hamilton	2,778	2,789	2,820	2.11	1.87	1.71	1.86	1.62	1.39	1.13	1.15	1.24	866	911	947
Children's Hospital of Eastern Ontario, Ottawa	1,637	1,584	1,684	0.79	0.72	0.75	0.79	0.73	0.77	1.00	0.99	0.97	88	42	24
Hamilton Civic Hospitals (General Division)	2,125	2,198	2,207	1.92	1.70	1.56	1.66	1.44	1.28	1.16	1.18	1.21	721	618	663
Hamilton Civic Hospitals (Henderson Division)	2,700	2,590	2,462	3.54	3.11	2.73	2.99	2.87	2.61	1.18	1.08	1.05	1,583	806	467
Hospital for Sick Children, Toronto	2,624	2,619	2,369	0.80	0.76	0.76	0.54	0.51	0.54	1.49	1.48	1.40	689	650	517
Hotel Dieu Hospital, Kingston	2,275	2,332	2,418	1.60	1.35	1.20	1.51	1.34	1.10	1.06	1.01	1.09	650	424	403
Kingston General Hospital	2,879	2,815	2,542	2.13	2.24	2.05	2.22	2.11	1.88	0.96	1.06	1.09	126	482	539
Mount Sinai Hospital, Toronto	3,138	2,815	2,674	2.02	1.80	1.62	1.49	1.30	1.30	1.35	1.39	1.24	1,680	1,419	842
Ottawa Civic Hospital	3,987	3,577	4,065	2.90	2.62	2.13	2.23	2.16	1.74	1.30	1.21	1.22	2,733	1,703	1,649
Ottawa General Hospital	3,339	3,289	3,954	2.34	2.23	1.86	2.09	1.95	1.58	1.12	1.15	1.18	939	1,047	1,262
St. Joseph's Hospital, Hamilton	4,682	4,384	4,651	2.02	1.88	1.56	1.86	1.69	1.48	1.09	1.11	1.06	1,049	895	618
St. Joseph's Hospital, London	4,554	4,735	5,143	2.23	2.06	1.80	1.89	1.95	1.68	1.18	1.06	1.07	1,690	1,193	825
St. Michael's Hospital, Toronto	2,823	2,447	2,328	1.89	1.75	1.87	1.65	1.48	1.47	1.14	1.18	1.27	767	668	928
Sunnybrook Health Science Centre, North York	1,664	1,596	1,682	2.22	1.76	1.57	1.74	1.34	1.21	1.28	1.31	1.30	839	718	660
Toronto Hospital	5,999	5,278	5,299	2.02	1.81	1.72	1.60	1.43	1.25	1.26	1.27	1.38	2,563	2,036	2,497
University Hospital, London	2,312	2,046	2,152	3.22	3.04	2.75	2.85	2.72	2.43	1.13	1.12	1.13	877	678	708
Victoria Hospital Corporation, London *	4,552	4,283	4,470	2.35	2.14	1.77	1.91	1.72	1.43	1.23	1.25	1.23	2,023	1,865	1,588
Wellesley Hospital, Toronto	1,834	1,569	1,647	2.29	2.03	1.83	2.21	1.92	1.70	1.04	1.06	1.08	286	253	297
Women's College Hospital, Toronto	2,037	2,142	2,298	2.31	2.22	1.72	1.78	1.67	1.35	1.29	1.33	1.28	1,080	1,183	866
Total	**57,939**	**55,088**	**56,865**	**2.18**	**1.99**	**1.76**	**1.85**	**1.71**	**1.50**	**1.18**	**1.16**	**1.17**	**21,250**	**17,591**	**16,300**

* Includes data for Children's Hospital of Western Ontario, London
See Appendix for inclusions/exclusions
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Miscellaneous

Exhibit 8.11: *Length of Stay for Surgical Cases by Hospital for Medium-sized Hospitals in Ontario, 1992/93 - 1994/95*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Belleville General Hospital	2,201	2,067	2,110	2.50	2.14	1.93	1.98	1.96	1.81	1.26	1.09	1.07	1,151	494	382
Brantford General Hospital	2,456	2,561	2,657	1.87	1.52	1.23	1.66	1.38	1.15	1.13	1.10	1.07	699	503	331
Cambridge Memorial Hospital	3,459	3,196	2,835	1.64	1.55	1.72	1.40	1.20	1.31	1.17	1.29	1.31	972	1,173	1,180
Centenary Health Centre, Scarborough	4,654	4,958	5,392	1.80	1.45	1.15	1.34	1.06	0.92	1.34	1.36	1.25	2,174	1,960	1,337
Credit Valley Hospital, Mississauga	2,743	2,775	2,973	1.56	1.58	1.39	1.32	1.31	1.19	1.19	1.21	1.16	770	799	618
Doctors Hospital, Toronto	3,213	3,189	3,362	1.45	1.32	1.05	1.22	1.02	0.87	1.19	1.29	1.22	765	977	705
Etobicoke General Hospital	3,604	3,129	3,399	1.66	1.58	1.40	1.69	1.54	1.40	0.98	1.02	1.00	621	635	586
General Hospital of Port Arthur, Thunder Bay	1,514	1,515	1,346	1.55	1.44	1.59	1.34	1.30	1.41	1.15	1.11	1.12	383	313	394
Grand River Hospital Corporation, Kitchener	3,658	3,570	3,796	1.69	1.45	1.36	1.57	1.30	1.18	1.07	1.11	1.15	534	589	756
Greater Niagara General Hospital	2,687	2,815	3,019	1.53	1.44	1.20	1.36	1.18	1.04	1.12	1.22	1.15	660	838	701
Grey Bruce Regional Health Centre, Owen Sound	2,655	2,724	2,637	2.10	1.78	1.46	1.46	1.20	1.07	1.43	1.49	1.37	1,712	1,615	1,051
Guelph General Hospital	1,670	1,445	1,478	2.30	2.21	2.10	1.94	1.93	1.80	1.19	1.15	1.17	622	473	449
Hopital Montfort, Ottawa	2,576	2,571	2,715	2.41	1.89	1.30	1.63	1.39	1.13	1.48	1.36	1.15	2,058	1,318	615
Hotel Dieu Hospital, Cornwall	1,718	1,585	1,702	1.93	1.76	1.61	1.47	1.29	1.21	1.32	1.36	1.33	801	747	685
Hotel Dieu Hospital, St. Catharines	3,781	3,819	3,957	2.07	1.79	1.59	1.43	1.22	1.17	1.45	1.47	1.36	2,451	2,236	1,725
Hotel Dieu of St. Joseph's Hospital, Windsor	3,842	3,760	4,036	1.77	1.63	1.34	1.56	1.44	1.15	1.14	1.13	1.17	1,220	1,184	1,063
Humber Memorial Hospital, Weston	2,952	2,961	2,999	1.50	1.41	1.26	1.31	1.16	1.04	1.15	1.21	1.21	718	750	714
Joseph Brant Memorial Hospital, Burlington	3,383	3,026	3,614	1.41	1.32	1.22	1.60	1.41	1.18	0.89	0.94	1.03	368	263	394
Laurentian Hospital, Sudbury	2,157	1,888	2,265	2.80	2.47	2.02	2.00	1.80	1.50	1.40	1.37	1.34	1,731	1,260	1,203
Markham Stouffville Hospital	1,540	1,933	2,120	1.73	1.48	1.21	1.56	1.37	1.13	1.11	1.08	1.06	373	292	274
McKellar General Hospital, Thunder Bay	2,520	2,051	2,253	2.20	1.96	1.62	1.66	1.50	1.23	1.32	1.31	1.32	1,529	1,126	1,042
Metropolitan General Hospital, Windsor	2,287	2,521	2,656	2.41	1.74	1.71	1.84	1.37	1.32	1.31	1.27	1.30	1,320	945	1,057
Mississauga Hospital	4,887	4,518	5,326	1.85	1.89	1.38	1.50	1.45	1.21	1.23	1.31	1.14	1,901	2,028	1,100
North York Branson Hospital	3,208	3,099	3,278	1.50	1.26	1.02	1.20	1.02	0.90	1.26	1.23	1.14	1,017	783	507
North York General Hospital	4,529	4,683	4,934	1.67	1.49	1.30	1.62	1.25	1.10	1.03	1.19	1.18	1,054	1,341	1,027
Northwestern General Hospital, Toronto	1,740	1,729	1,969	2.49	1.71	1.45	1.71	1.29	1.22	1.46	1.33	1.19	1,373	770	500
Oakville Trafalgar Memorial Hospital	2,790	2,884	3,041	1.95	1.77	1.55	1.75	1.60	1.43	1.11	1.11	1.08	741	645	544
Orillia Soldiers' Memorial Hospital	2,000	1,975	2,349	1.91	1.57	1.30	1.47	1.37	1.12	1.29	1.14	1.16	940	596	629
Oshawa General Hospital	4,879	4,678	5,077	1.93	1.77	1.58	1.55	1.45	1.30	1.25	1.22	1.22	2,024	1,614	1,459
Peel Memorial Hospital, Brampton	4,702	5,156	5,256	1.69	1.44	1.34	1.49	1.35	1.23	1.14	1.07	1.09	1,209	794	891
Peterborough Civic Hospital	2,343	1,690	1,852	1.90	1.77	1.49	1.67	1.54	1.44	1.14	1.15	1.04	666	457	235
Plummer General Hospital, Sault Ste. Marie	1,619	1,508	1,607	2.32	2.08	1.91	1.66	1.42	1.37	1.40	1.46	1.40	1,081	996	871
Plummer Memorial Public Hospital, Sault Ste. Marie	1,653	1,440	1,448	1.68	1.30	1.15	1.44	1.06	0.96	1.17	1.23	1.21	568	387	334
Public General Hospital, Chatham	990	893	843	2.36	2.19	1.81	1.81	1.69	1.59	1.31	1.30	1.13	576	459	196
Queensway General Hospital, Etobicoke	2,402	2,301	2,346	1.68	1.57	1.46	1.49	1.30	1.25	1.12	1.21	1.17	637	666	561
Queensway-Carleton Hospital, Nepean	2,518	2,494	2,814	2.76	2.44	2.03	2.35	2.06	1.78	1.18	1.18	1.14	1,134	1,038	807
Riverside Hospital, Ottawa	3,018	2,936	3,100	2.24	1.99	1.63	1.71	1.43	1.27	1.31	1.39	1.29	1,609	1,645	1,137
Royal Victoria Hospital, Barrie	3,359	3,059	3,554	2.02	1.79	1.61	1.75	1.68	1.48	1.15	1.06	1.08	1,094	555	638
Salvation Army Grace General, Scarborough	2,396	2,484	2,583	1.63	1.21	1.08	1.50	1.16	1.10	1.09	1.04	0.99	457	355	330
Salvation Army Grace Hospital, Ottawa	3,119	4,054	4,561	1.24	0.78	0.66	0.89	0.61	0.52	1.39	1.29	1.26	1,102	767	691
Salvation Army Grace Hospital, Windsor	1,762	1,708	1,676	2.78	2.32	2.48	2.11	1.81	1.96	1.32	1.29	1.27	1,183	885	874
Sarnia General Hospital	2,168	2,114	2,108	1.64	1.31	1.05	1.26	1.08	0.94	1.30	1.21	1.11	906	533	297
Scarborough General Hospital	5,170	5,103	5,886	1.96	1.82	1.59	1.66	1.54	1.34	1.18	1.18	1.19	1,732	1,753	1,860
St. Catharines General Hospital	2,693	2,396	2,552	1.15	0.90	0.94	1.01	0.87	0.88	1.14	1.03	1.06	456	196	240
St. Joseph's General Hospital, Peterborough	3,034	2,899	3,102	1.70	1.84	1.57	1.47	1.49	1.36	1.16	1.23	1.15	1,004	1,131	711
St. Joseph's Health Centre of Sarnia	2,223	1,981	1,986	2.25	2.10	1.62	1.75	1.63	1.35	1.29	1.29	1.20	1,120	968	537
St. Joseph's Health Centre, Toronto	3,220	2,795	3,114	2.26	2.14	1.89	1.83	1.60	1.41	1.24	1.34	1.34	1,788	1,604	1,633

Continued on next page

Exhibit 8.11: *(cont'd)*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
St. Joseph's Hospital, Guelph	2,187	2,173	2,211	1.58	1.37	1.33	1.44	1.22	1.11	1.09	1.13	1.20	482	447	564
St. Mary's General Hospital, Kitchener	4,835	4,842	5,031	1.30	1.18	1.06	1.17	1.04	0.91	1.11	1.13	1.17	804	779	837
St. Thomas Elgin General Hospital	1,940	1,940	1,772	1.83	1.55	1.45	1.58	1.33	1.27	1.16	1.17	1.15	578	553	496
Stratford General Hospital	1,914	1,800	1,782	1.61	1.57	1.24	1.66	1.80	1.51	0.96	0.87	0.82	279	191	114
Sudbury General Hospital of the Immaculate Heart of Mary	2,550	2,856	3,060	2.07	1.86	1.60	1.53	1.38	1.15	1.35	1.34	1.39	1,377	1,364	1,389
Sudbury Memorial Hospital	900	829	745	2.22	1.89	1.38	1.61	1.49	1.10	1.38	1.27	1.25	567	341	208
Timmins and District Hospital	2,041	1,896	1,733	1.99	1.66	1.44	1.84	1.62	1.49	1.08	1.02	0.96	522	345	145
Toronto East General and Orthopedic Hospital	3,581	3,254	3,761	2.11	1.98	1.56	1.68	1.50	1.20	1.26	1.32	1.29	1,696	1,606	1,409
Welland County General Hospital	1,784	1,766	1,582	2.34	2.18	1.97	1.97	1.76	1.61	1.18	1.24	1.23	766	780	620
Windsor Western Hospital	2,743	2,928	2,741	1.57	1.19	1.11	1.17	0.89	0.77	1.35	1.34	1.44	1,115	886	937
Woodstock General Hospital	1,561	1,508	1,634	2.33	2.11	2.07	1.85	1.66	1.53	1.26	1.27	1.36	966	876	966
York Central Hospital, Richmond Hill	2,469	2,592	2,732	1.61	1.45	1.38	1.40	1.20	1.07	1.16	1.21	1.30	645	749	913
York County Hospital, Newmarket	3,627	3,518	3,810	1.94	1.75	1.38	1.55	1.32	1.10	1.25	1.32	1.26	1,421	1,516	1,125
York-Finch General Hospital, North York	2,982	3,091	3,341	1.66	1.43	1.18	1.20	1.08	0.92	1.38	1.33	1.28	1,368	1,100	878
Total	**168,806**	**165,629**	**175,618**	**1.86**	**1.64**	**1.42**	**1.54**	**1.35**	**1.20**	**1.21**	**1.21**	**1.19**	**63,584**	**54,964**	**46,471**

See Appendix for inclusions/exclusions
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark lenght of stay over hospital case mix
Data Source: The Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.12: *Length of Stay for Surgical Cases by Hospital for Smaller-sized Hospitals in Ontario, 1992/93 - 1994/95*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Ajax and Pickering General Hospital	1,100	1,179	1,319	2.45	2.24	2.11	1.91	1.64	1.63	1.28	1.37	1.30	606	716	646
Alexandra Hospital	190	143	130	2.43	2.08	1.71	2.45	1.34	1.22	0.99	1.55	1.40	79	106	64
Alexandra Marine and General Hospital, Goderich	206	280	345	1.62	1.22	1.02	1.47	1.13	0.99	1.11	1.07	1.03	51	46	27
Arnprior and District Memorial Hospital	285	235	245	1.92	1.38	1.39	1.60	1.27	1.26	1.20	1.09	1.10	105	43	53
Brockville General Hospital	890	890	1,113	2.44	2.05	1.98	2.03	1.75	1.73	1.20	1.17	1.15	531	377	418
Bruce County General Hospital, Walkerton	215	201	267	2.18	1.86	1.62	1.58	1.30	1.13	1.38	1.43	1.43	131	113	132
Campbellford Memorial Hospital	251	296	310	2.08	1.77	1.14	1.44	1.24	0.84	1.45	1.43	1.36	182	174	103
Central Hospital, Toronto	2,068	1,817	2,465	2.56	2.01	1.14	1.57	1.30	0.88	1.63	1.55	1.30	2,044	1,314	685
Centre Grey General Hospital, Markdale	65	67	53	1.73	1.99	2.02	1.11	1.10	1.37	1.56	1.82	1.48	40	60	37
Charlotte Eleanor Englehart Hospital, Petrolia	206	167	125	1.94	1.85	1.85	1.56	1.45	1.32	1.24	1.27	1.41	86	69	67
Cobourg District General Hospital	234	358	284	2.36	1.95	1.46	1.85	1.70	1.15	1.28	1.15	1.27	129	102	106
Collingwood General and Marine Hospital	414	452	501	2.67	2.31	2.12	2.08	1.53	1.32	1.28	1.51	1.60	255	352	410
Cornwall General Hospital	1,462	1,444	1,441	1.44	1.25	1.13	1.02	0.86	0.76	1.42	1.45	1.49	635	560	531
Douglas Memorial Hospital, Fort Erie	390	371	467	1.32	0.97	0.81	0.85	0.68	0.65	1.56	1.42	1.24	186	117	102
Dryden District General Hospital	91	132	192	2.32	2.91	2.25	1.32	2.33	1.95	1.76	1.25	1.15	93	86	75
Dufferin-Caledon Health Care Corporation, Orangeville	632	608	718	1.87	1.59	1.40	1.59	1.23	1.03	1.18	1.29	1.36	188	218	270
Georgetown and District General Hospital	330	289	362	2.14	2.07	1.51	2.46	1.68	1.23	0.87	1.23	1.23	94	139	108
Glengarry Memorial Hospital, Alexandria	1	1	0	0.46	0.45	--	0.43	0.38	--	1.08	1.16	--	0	0	0
Great War Memorial Hospital of Perth	281	268	275	0.95	1.06	1.16	1.21	1.21	1.30	0.78	0.87	0.90	12	25	42
Groves Memorial Community Hospital, Fergus	328	336	334	2.29	1.80	1.40	2.16	1.61	1.27	1.06	1.12	1.11	97	97	80
Haldimand War Memorial Hospital, Dunnville	132	151	124	3.85	2.58	2.61	2.65	2.02	1.90	1.45	1.28	1.37	158	91	92
Hanover and District Hospital	320	339	294	1.94	1.78	1.35	1.30	1.04	0.76	1.49	1.71	1.78	220	275	175
Hawkesbury and District General Hospital	408	473	414	2.06	1.46	1.61	1.74	1.46	1.57	1.18	1.00	1.03	148	45	57
Huntsville District Memorial Hospital	468	498	540	1.96	1.56	1.25	1.72	1.49	1.23	1.14	1.04	1.01	117	76	49
Huronia District Hospital, Midland	678	674	673	1.65	1.53	1.19	1.32	1.20	1.10	1.25	1.27	1.07	228	221	70
Kemptville District Hospital	39	46	37	2.68	2.61	1.60	2.08	1.81	0.99	1.29	1.44	1.61	23	37	24
Kincardine and District General Hospital	89	130	154	3.04	1.98	2.23	2.07	1.21	1.40	1.47	1.63	1.60	87	100	130
Kirkland and District Hospital	305	265	229	1.95	1.63	1.34	1.40	1.23	1.10	1.39	1.33	1.21	169	114	66
Lake of the Woods District Hospital, Kenora	423	236	283	1.80	1.81	1.87	1.47	1.48	1.51	1.22	1.23	1.23	155	95	113
Leamington District Memorial Hospital	486	476	500	3.00	2.59	2.38	2.20	1.70	1.51	1.37	1.53	1.58	396	428	437
Lennox and Addington County General Hospital, Napanee	249	247	266	2.49	2.61	2.34	2.30	2.13	1.79	1.08	1.23	1.30	74	119	146
Listowel Memorial Hospital	195	145	140	1.67	1.84	1.53	2.52	1.66	1.29	0.66	1.10	1.18	36	29	35
Manitoulin Health Centre, Little Current	17	15	12	1.34	1.18	1.21	1.68	1.50	1.06	0.80	0.78	1.14	1	2	3
Meaford General Hospital	138	121	106	1.73	1.82	1.36	1.08	1.12	0.75	1.60	1.62	1.81	90	85	66
Memorial Hospital, Bowmanville	721	945	1,239	1.21	1.24	0.75	0.94	0.78	0.65	1.29	1.58	1.16	238	442	171
Milton District Hospital	492	424	345	2.20	2.04	2.13	1.91	1.69	1.72	1.15	1.21	1.24	192	156	146
Norfolk General Hospital, Simcoe	1,126	1,099	1,050	1.91	1.47	1.27	1.54	1.30	1.13	1.24	1.13	1.13	453	252	239
North Bay Civic Hospital	1,894	1,972	2,063	1.49	1.09	1.10	1.19	0.83	0.86	1.25	1.30	1.28	595	535	549
Notre Dame Hospital, Hearst	192	206	238	1.88	1.78	1.60	1.26	1.29	1.02	1.49	1.38	1.56	133	104	156
Parry Sound District General Hospital	272	286	328	2.45	1.89	1.98	1.43	1.17	1.22	1.72	1.62	1.63	280	209	250
Pembroke Civic Hospital	866	833	859	1.63	1.36	1.06	1.38	1.11	1.02	1.18	1.22	1.04	319	249	156
Pembroke General Hospital	645	674	897	2.16	1.72	1.36	1.81	1.39	1.23	1.19	1.24	1.10	239	227	115
Penetanguishene General Hospital	404	264	358	1.99	1.37	0.94	1.67	1.14	0.75	1.19	1.20	1.25	136	76	87
Port Colborne General Hospital	759	911	816	1.23	1.09	1.21	1.16	1.04	1.08	1.06	1.05	1.12	128	109	138
Prince Edward County Memorial Hospital, Picton	237	217	239	1.44	1.17	0.80	1.47	1.14	0.96	0.98	1.03	0.83	77	55	20
Renfrew Victoria Hospital	163	166	162	1.57	1.77	1.30	1.96	1.98	1.47	0.80	0.89	0.88	21	13	16
Riverside Health Care Facilities, Fort Frances	357	353	356	2.49	2.07	1.60	1.98	1.69	1.37	1.25	1.23	1.17	189	154	101

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Exhibit 8.12: *(cont'd)*

Institution	Number of Cases			Adjusted Average LOS			Benchmark LOS			Average:Benchmark LOS Ratio			Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Ross Memorial Hospital, Lindsay	1,194	1,126	1,235	1.99	1.71	1.43	1.74	1.49	1.26	1.15	1.14	1.13	350	290	243
Sensenbrenner Hospital, Kapuskasing	323	344	293	2.47	1.97	1.71	1.53	1.12	0.98	1.61	1.77	1.75	306	300	219
Smiths Falls Community Hospital	639	621	528	1.42	1.41	1.31	1.81	1.33	1.25	0.78	1.06	1.05	135	138	97
South Muskoka Memorial Hospital, Bracebridge	657	705	801	1.46	1.15	0.92	1.57	1.13	0.89	0.93	1.02	1.03	44	91	53
St. Joseph's General Hospital, Blind River	1	0	0	0.53	--	--	1.01	--	--	0.52	--	--	0	0	0
St. Joseph's General Hospital, Elliott Lake	358	342	401	1.93	1.43	1.06	1.65	1.06	0.91	1.17	1.36	1.16	142	130	75
St. Joseph's General Hospital, North Bay	1,670	1,456	1,363	2.38	2.34	1.89	1.85	1.89	1.58	1.29	1.24	1.19	884	707	495
St. Joseph's General Hospital, Thunder Bay	1,937	2,130	1,868	1.26	1.00	1.06	1.23	0.88	0.89	1.02	1.13	1.19	190	297	335
St. Joseph's Hospital, Brantford	1,814	1,767	1,808	1.11	0.96	0.73	1.07	0.95	0.88	1.04	1.01	0.82	201	140	21
St. Joseph's Hospital, Chatham	1,576	1,543	1,656	1.79	1.40	1.30	1.53	1.22	1.14	1.17	1.15	1.14	453	466	478
St. Mary's Memorial Hospital, St. Mary's	53	100	62	1.54	1.71	1.61	1.67	1.60	1.34	0.92	1.07	1.20	20	33	33
St. Vincent de Paul Hospital, Brockville	1,083	1,062	1,104	1.34	1.27	1.12	1.15	0.96	0.83	1.17	1.32	1.34	306	342	321
Stevenson Memorial Hospital, Alliston	316	338	315	1.89	1.59	1.44	1.48	1.25	1.13	1.27	1.27	1.27	142	123	100
Strathroy Middlesex General Hospital	596	627	668	2.83	2.47	1.87	1.89	1.32	1.25	1.50	1.87	1.49	561	720	412
Sydenham District Hospital, Wallaceburg	308	319	240	1.64	1.72	1.54	1.60	1.58	1.27	1.02	1.09	1.21	55	66	78
Temiskaming Hospital, New Liskeard	263	329	320	2.24	2.36	2.03	1.49	1.43	1.30	1.50	1.65	1.56	198	309	234
Tillsonburg District Memorial Hospital	417	364	380	2.91	2.88	2.27	1.97	1.92	1.48	1.48	1.50	1.53	394	352	299
Trenton Memorial Hospital	1,192	1,147	1,272	1.55	1.16	1.08	1.27	1.02	0.85	1.23	1.14	1.26	359	222	289
West Haldimand General Hospital, Hagersville	88	55	27	0.28	0.20	0.21	0.26	0.29	0.43	1.09	0.68	0.49	5	1	0
West Lincoln Memorial Hospital, Grimsby	464	485	511	1.97	1.64	1.37	1.84	1.44	1.26	1.07	1.14	1.09	145	167	136
West Nipissing General Hospital, Sturgeon Falls	148	131	118	4.26	3.64	3.01	2.99	2.68	2.43	1.42	1.36	1.24	188	126	69
Whitby General Hospital	719	782	859	1.41	0.90	0.48	1.10	0.80	0.51	1.28	1.13	0.94	255	139	71
Willett Hospital, Paris	171	87	38	0.19	0.18	0.19	0.23	0.22	0.24	0.84	0.84	0.80	0	0	0
Winchester District Memorial Hospital	717	696	716	1.92	1.83	1.82	1.49	1.28	1.28	1.29	1.43	1.42	321	385	387
Wingham and District Hospital	234	211	191	1.15	1.06	1.19	1.12	0.94	0.95	1.03	1.13	1.25	31	36	54
Total	**38,652**	**38,467**	**40,442**	**1.86**	**1.58**	**1.35**	**1.52**	**1.25**	**1.10**	**1.23**	**1.27**	**1.22**	**16,132**	**14,593**	**12,060**

See Appendix for inclusions/exclusions
Adjusted Average LOS - the weighted adjusted average length of stay over hospital case mix
Benchmark LOS - the weighted average benchmark length of stay over hospital case mix
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.13: *Day Surgery Rates by Procedure for Teaching Hospitals in Ontario, 1992/93 - 1994/95*

Surgical Procedure	Number of Cases *			Day Surgery Rate (%)			Benchmark Day Surgery Rate (%)			Day Surgery Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Hernia Repair - Adult	2,619	2,651	2,778	18	21	28	21	31	43	248	367	384
Hernia Repair - Child	1,939	1,854	1,715	81	83	83	88	88	87	119	79	52
Excision of Breast Lesions	3,501	3,242	3,442	74	76	79	87	85	86	679	359	328
Hemmorhoidectomy	640	871	1,177	41	54	71	45	58	76	49	68	85
Arthroscopy	2,504	2,304	2,376	87	90	93	93	93	97	191	72	79
Bunionectomy	718	704	709	22	25	26	33	41	33	164	185	95
Carpal Tunnel Release	2,520	2,539	2,405	94	97	98	98	99	100	165	88	70
Needle Biopsy of Prostate	669	601	504	86	91	91	97	99	96	216	186	65
Transurethral Excision Lesion of Bladder	1,717	1,862	1,842	27	33	35	33	44	45	237	337	267
Urethral Stricture Release	1,769	1,541	1,800	76	77	81	86	84	88	384	173	213
Transurethral Prostatectomy	2,069	1,715	1,586	0	3	7	0	0	19	0	0	433
Transurethral Clearance of Calculus	469	434	455	9	13	19	12	18	18	25	34	15
Laparoscopy	3,586	2,955	2,478	92	92	93	94	96	95	119	152	54
Tonsillectomy	4,621	4,570	4,829	42	57	72	85	92	96	1,343	1,049	703
Deviated Nasal Septum	1,705	1,622	1,671	52	57	68	68	77	80	292	325	174
Tooth Extraction	2,357	2,136	2,134	89	90	92	98	96	98	363	204	205
Lens Replacement	10,068	9,576	10,591	76	82	86	84	91	93	1,217	1,010	772
Total	**44,436**	**42,091**	**43,464**	**64**	**68**	**73**	**76**	**79**	**83**	**6,378**	**5,155**	**4,460**

** Includes inpatient and outpatient procedures*
See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.14: *Day Surgery Rates by Procedure for Medium-sized Hospitals in Ontario, 1992/93 - 1994/95*

Surgical Procedure	Number of Cases *			Day Surgery Rate (%)			Benchmark Day Surgery Rate (%)			Day Surgery Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Hernia Repair - Adult	7,706	7,790	8,615	23	27	36	35	46	53	1,232	1,490	1,347
Hernia Repair - Child	1,828	1,799	1,746	67	76	77	83	90	88	303	241	170
Excision of Breast Lesions	9,934	9,512	10,717	85	86	88	91	92	93	1,117	853	637
Hemmorhoidectomy	2,792	3,008	3,656	41	52	60	51	63	71	571	622	680
Arthroscopy	9,352	8,402	8,361	91	93	95	94	96	98	332	359	337
Bunionectomy	2,509	2,460	2,528	22	22	25	35	33	38	628	451	468
Carpal Tunnel Release	6,407	6,627	6,862	96	98	99	99	100	100	238	202	140
Needle Biopsy of Prostate	3,520	3,548	3,574	84	85	89	98	98	99	1,246	908	653
Transurethral Excision Lesion of Bladder	4,210	4,299	4,601	34	36	41	46	48	53	1,038	740	817
Urethral Stricture Release	8,260	8,409	9,206	88	89	90	96	95	97	1,577	1,234	1,113
Transurethral Prostatectomy	5,909	5,046	4,871	0	2	3	0	0	0	0	26	16
Transurethral Clearance of Calculus	1,830	2,029	2,367	16	19	24	22	28	39	185	234	422
Laparoscopy	7,076	6,907	6,476	91	90	92	95	95	97	397	402	333
Tonsillectomy	13,102	12,108	14,312	39	46	60	67	73	85	3,133	2,399	2,450
Deviated Nasal Septum	5,348	4,807	4,797	50	51	57	79	90	94	1,522	1,580	1,509
Tooth Extraction	11,079	10,481	10,588	92	93	94	97	98	98	738	539	466
Lens Replacement	26,978	29,127	31,914	86	90	94	96	97	98	3,238	2,008	1,170
Total	**131,240**	**129,710**	**138,587**	**68**	**71**	**75**	**79**	**82**	**85**	**19,070**	**15,697**	**13,899**

** Includes inpatient and outpatient procedures*
See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.15: *Day Surgery Rates by Procedure for Smaller-sized Hospitals in Ontario, 1992/93 - 1994/95*

Surgical Procedure	Number of Cases *			Day Surgery Rate (%)			Benchmark Day Surgery Rate (%)			Day Surgery Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Hernia Repair - Adult	2,623	2,536	2,642	12	16	22	17	23	34	376	370	415
Hernia Repair - Child	402	341	356	50	53	62	78	83	86	183	134	96
Excision of Breast Lesions	2,267	2,134	2,298	80	82	86	91	89	92	472	305	225
Hemmorhoidectomy	1,143	1,074	1,161	44	44	53	57	54	60	476	269	197
Arthroscopy	1,844	2,125	2,164	92	95	97	97	98	99	178	120	96
Bunionectomy	501	471	448	39	43	42	81	88	60	585	549	218
Carpal Tunnel Release	2,161	2,178	1,965	96	98	99	100	100	100	140	73	45
Needle Biopsy of Prostate	672	680	664	88	94	96	100	99	100	180	114	121
Transurethral Excision Lesion of Bladder	773	788	778	29	40	47	52	60	67	355	294	276
Urethral Stricture Release	1,364	1,291	1,401	87	90	93	91	96	100	149	267	314
Transurethral Prostatectomy	874	699	707	0	1	3	0	0	0	0	0	0
Transurethral Clearance of Calculus	119	109	101	17	24	29	21	32	40	19	18	27
Laparoscopy	1,592	1,421	1,550	87	88	89	94	96	97	273	234	250
Tonsillectomy	2,629	2,461	2,913	20	32	39	19	64	73	185	806	936
Deviated Nasal Septum	592	533	627	52	53	62	84	84	90	268	185	180
Tooth Extraction	4,471	4,355	3,985	98	97	98	100	100	100	151	174	137
Lens Replacement	5,397	6,069	7,479	77	81	88	96	98	98	1,030	965	637
Total	**29,963**	**29,795**	**31,771**	**66**	**70**	**74**	**75**	**82**	**84**	**5,112**	**5,003**	**4,304**

** Includes inpatient and outpatient procedures*
See Appendix for inclusions/exclusions
Adult: 18+ Years
Child: 0 - 17 Years
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.16: *Day Surgery Rates by Hospital for Teaching Hospitals in Ontario, 1992/93 - 1994/95*

Hospital	Number of Cases *			Day Surgery Rate (%)			Benchmark Day Surgery Rate (%)			Day Surgery Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Chedoke-McMaster Hospitals, Hamilton	2,177	2,166	2,175	76	78	82	78	83	86	107	115	108
Children's Hospital of Eastern Ontario, Ottawa	1,455	1,406	1,483	90	91	94	88	91	94	46	26	19
Hamilton Civic Hospitals (General Division)	1,731	1,781	1,791	72	76	78	74	81	85	134	135	151
Hamilton Civic Hospitals (Henderson Division)	1,607	1,473	1,324	50	55	65	55	56	63	114	50	33
Hospital for Sick Children, Toronto	2,529	2,508	2,245	57	68	73	87	92	94	444	362	260
Hotel Dieu Hospital, Kingston	1,879	1,954	2,017	57	67	68	78	83	88	397	253	309
Kingston General Hospital	2,118	2,033	1,884	77	78	79	74	75	79	18	26	52
Mount Sinai Hospital, Toronto	2,452	2,244	1,968	52	56	67	79	83	85	857	778	376
Ottawa Civic Hospital	3,017	2,590	2,969	51	62	63	71	75	80	830	326	458
Ottawa General Hospital	2,462	2,426	2,994	66	67	72	76	79	85	286	316	361
St. Joseph's Hospital, Hamilton	3,459	3,237	3,532	63	65	77	74	77	81	372	318	108
St. Joseph's Hospital, London	3,526	3,556	3,899	61	69	75	72	75	80	486	316	300
St. Michael's Hospital, Toronto	2,215	1,914	1,734	81	79	77	85	87	87	225	220	235
Sunnybrook Health Science Centre, North York	1,307	1,311	1,359	67	68	70	77	79	81	227	220	184
Toronto Hospital	4,773	4,254	4,290	66	70	72	75	78	83	657	463	565
University Hospital, London	1,579	1,375	1,419	72	76	79	79	83	87	232	193	190
Victoria Hospital Corporation, London **	3,298	3,176	3,424	56	59	69	71	77	80	433	565	368
Wellesley Hospital, Toronto	1,379	1,167	1,247	70	70	73	71	75	78	63	89	72
Women's College Hospital, Toronto	1,473	1,520	1,710	50	57	63	74	76	77	451	385	311
Total	**44,436**	**42,091**	**43,464**	**64**	**68**	**73**	**76**	**79**	**83**	**6,378**	**5,155**	**4,460**

* Includes inpatient and outpatient procedures
** Includes data for Children's Hospital of Western Ontario, London
See Appendix for inclusions/exclusions
Hospital Day Surgery and Benchmark Day Surgery rates are weighted average over case-mix.
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.17: *Day Surgery Rates by Hospital for Medium-sized Hospitals in Ontario, 1992/93 - 1994/95*

Hospital	Number of Cases *			Day Surgery Rate (%)			Benchmark Day Surgery Rate (%)			Day Surgery Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Belleville General Hospital	1,560	1,362	1,398	72	75	73	81	81	82	185	118	120
Brantford General Hospital	1,856	1,954	2,052	62	62	71	71	74	82	189	189	173
Cambridge Memorial Hospital	2,739	2,534	2,128	78	76	72	81	83	84	120	210	256
Centenary Health Centre, Scarborough	3,660	4,061	4,438	63	69	78	82	85	88	767	641	437
Credit Valley Hospital, Mississauga	2,095	2,064	2,290	72	69	73	82	83	86	254	269	250
Doctors Hospital, Toronto	2,608	2,647	2,833	66	64	69	81	82	85	410	500	421
Etobicoke General Hospital	2,389	2,048	2,245	71	71	74	81	84	87	223	206	218
General Hospital of Port Arthur, Thunder Bay	1,224	1,197	1,026	80	81	81	87	89	89	166	139	94
Grand River Hospital Corporation, Kitchener	2,834	2,804	2,950	77	81	83	79	83	87	223	204	210
Greater Niagara General Hospital, Niagara Falls	2,189	2,323	2,497	78	81	85	79	83	87	183	217	152
Grey Bruce Regional Health Centre, Owen Sound	2,147	2,216	2,194	64	69	71	78	82	85	478	395	325
Guelph General Hospital	1,198	963	993	59	63	68	75	77	85	186	117	120
Hopital Montfort, Ottawa	2,031	2,035	2,218	58	74	77	77	81	84	538	218	167
Hotel Dieu Hospital, Cornwall	1,288	1,204	1,331	77	79	81	85	88	89	200	154	127
Hotel Dieu Hospital, St. Catharines	3,186	3,273	3,383	71	74	80	83	85	87	790	726	348
Hotel Dieu of St. Joseph's Hospital, Windsor	3,104	3,068	3,390	68	73	74	78	80	85	392	257	340
Humber Memorial Hospital, Weston	2,504	2,508	2,585	80	79	81	85	87	88	179	220	209
Joseph Brant Memorial Hospital, Burlington	2,586	2,342	2,860	62	74	81	70	75	84	231	99	117
Laurentian Hospital, Sudbury	1,810	1,514	1,873	47	46	52	67	71	77	450	374	434
Markham Stouffville Hospital	1,165	1,503	1,652	66	68	72	77	82	86	121	155	164
McKellar General Hospital, Thunder Bay	1,961	1,570	1,783	54	54	55	75	75	82	620	429	502
Metropolitan General Hospital, Windsor	1,706	1,977	2,057	70	76	77	82	87	89	335	257	340
Mississauga Hospital	3,697	3,329	4,031	69	67	79	79	79	83	456	432	239
North York Branson Hospital	2,647	2,561	2,742	74	83	85	82	85	87	325	183	112
North York General Hospital	3,405	3,570	3,776	76	77	84	81	83	86	143	154	85
Northwestern General Hospital, Toronto	1,304	1,348	1,493	45	61	71	72	78	79	471	259	131
Oakville Trafalgar Memorial Hospital	2,028	2,106	2,269	61	72	79	76	81	83	320	188	131
Orillia Soldiers' Memorial Hospital	1,544	1,555	1,883	66	67	68	81	81	86	358	237	309
Oshawa General Hospital	3,766	3,500	3,922	73	75	73	79	82	83	336	314	412
Peel Memorial Hospital, Brampton	3,616	4,085	4,194	53	61	71	77	82	85	712	637	477
Peterborough Civic Hospital	1,755	1,075	1,129	48	53	55	70	78	84	311	197	218
Plummer General Hospital, Sault Ste. Marie	1,233	1,167	1,246	57	64	63	76	81	84	241	168	210
Plummer Memorial Public Hospital, Sault Ste. Marie	1,342	1,189	1,199	80	83	85	83	86	89	112	40	62
Public General Hospital, Chatham	586	512	471	77	80	80	85	86	84	97	65	37
Queensway General Hospital, Etobicoke	1,912	1,863	1,829	64	68	76	80	82	85	280	208	158
Queensway-Carleton Hospital, Nepean	1,575	1,638	1,925	54	56	71	68	71	79	234	279	183
Riverside Hospital, Ottawa	2,211	2,161	2,292	60	69	76	76	79	82	520	307	219
Royal Victoria Hospital, Barrie	2,647	2,389	2,807	61	70	72	77	79	81	420	206	268
Salvation Army Grace General, Scarborough	1,773	1,932	2,011	68	67	82	76	80	82	131	204	92
Salvation Army Grace Hospital, Ottawa	2,782	3,750	4,254	75	82	86	90	93	95	546	454	349
Salvation Army Grace Hospital, Windsor	1,263	1,257	1,120	69	77	73	80	84	83	217	146	163
Sarnia General Hospital	1,849	1,815	1,805	72	81	85	83	85	88	197	74	64
Scarborough General Hospital	3,952	3,947	4,608	75	69	66	76	78	80	249	401	556
St. Catharines General Hospital	2,211	1,979	2,074	88	91	93	83	87	90	44	27	21
St. Joseph's General Hospital, Peterborough	2,669	2,579	2,791	72	75	78	83	81	81	539	291	127
St. Joseph's Health Centre of Sarnia	1,743	1,526	1,515	74	74	79	82	83	87	149	141	100
St. Joseph's Health Centre, Toronto	2,308	2,044	2,374	52	51	61	70	72	77	445	440	390

Continued on next page

Exhibit 8.17: *(Cont'd)*

Hospital	Number of Cases *			Day Surgery Rate (%)			Benchmark Day Surgery Rate (%)			Day Surgery Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
St. Joseph's Hospital, Guelph	1,800	1,852	1,873	74	76	79	78	80	83	129	83	105
St. Mary's General Hospital, Kitchener	4,071	4,144	4,276	78	79	80	84	84	85	282	305	319
St. Thomas Elgin General Hospital	1,498	1,556	1,381	70	76	75	78	84	86	195	175	159
Stratford General Hospital	1,493	1,337	1,347	63	68	79	77	79	84	214	152	103
Sudbury General Hospital of the Immaculate Heart of Mary	1,816	2,003	2,262	78	81	83	89	92	93	233	195	187
Sudbury Memorial Hospital	541	493	484	55	55	59	70	71	76	130	71	66
Timmins and District Hospital	1,516	1,345	1,272	66	81	86	78	85	85	280	154	39
Toronto East General and Orthopedic Hospital	2,835	2,571	3,001	50	49	61	69	72	77	572	535	405
Welland County General Hospital	1,285	1,280	1,160	70	66	71	79	79	83	192	213	153
Windsor Western Hospital	2,408	2,630	2,494	72	78	77	82	86	88	397	336	313
Woodstock General Hospital	1,163	1,170	1,198	55	56	53	75	78	80	370	393	483
York Central Hospital, Richmond Hill	1,966	2,044	2,168	74	72	75	79	82	85	164	245	293
York County Hospital, Newmarket	2,867	2,832	3,074	61	64	73	75	79	85	520	455	419
York-Finch General Hospital, North York	2,323	2,409	2,661	72	78	82	84	88	91	301	238	219
Total	**131,240**	**129,710**	**138,587**	**68**	**71**	**75**	**79**	**82**	**85**	**19,070**	**15,697**	**13,899**

* Includes inpatient and outpatient procedures
See Appendix for inclusions/exclusions
Hospital Day Surgery and Benchmark Day Surgery rates are weighted average over hospital case-mix.
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.18: *Day Surgery Rates by Hospital for Smaller-sized Hospitals in Ontario, 1992/93 - 1994/95*

Hospital	Number of Cases *			Day Surgery Rate (%)			Benchmark Day Surgery Rate (%)			Day Surgery Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Ajax and Pickering General Hospital	735	753	825	68	75	79	76	84	85	100	141	84
Alexandra Hospital, Ingersoll	122	93	84	62	49	56	71	70	76	24	43	24
Alexandra Marine and General Hospital, Goderich	128	201	256	80	79	75	80	79	77	6	12	14
Anrprior and District Memorial Hospital	184	157	148	66	65	64	76	74	75	21	16	18
Brockville General Hospital	610	636	810	71	76	74	75	82	80	68	68	88
Bruce County General Hospital, Walkerton	170	152	198	56	55	56	65	77	77	14	35	38
Campbellford Memorial Hospital	203	217	250	50	54	62	63	76	86	45	69	64
Central Hospital, Toronto	1,774	1,501	2,146	46	56	74	71	73	84	892	403	226
Centre Grey General Hospital, Markdale	56	54	40	66	67	72	76	84	76	13	25	5
Charlotte Eleanor Englehart Hospital, Petrolia	159	121	87	78	74	69	82	81	81	16	19	23
Cobourg District General Hospital	169	223	222	63	67	60	67	77	78	21	26	39
Collingwood General and Marine Hospital	255	307	357	49	57	53	58	74	74	43	103	126
Cornwall General Hospital	1,282	1,260	1,258	80	79	80	91	94	95	167	202	224
Douglas Memorial Hospital, Fort Erie	353	335	390	78	83	84	87	93	92	59	66	51
Dryden District General Hospital	77	66	109	27	53	74	71	71	75	45	22	13
Dufferin-Caledon Health Care Corporation, Orangeville	460	454	550	49	53	65	58	75	82	40	83	96
Georgetown and District General Hospital	204	182	269	56	53	62	66	67	81	42	35	55
Glengarry Memorial Hospital, Alexandria	1	1	0	100	100	0	99	100	0	0	0	0
Great War Memorial Hospital of Perth	219	218	197	82	87	85	80	82	76	7	11	8
Groves Memorial Community Hospital, Fergus	184	213	231	47	62	73	46	64	70	22	26	10
Haldimand War Memorial Hospital, Dunnville	69	76	59	29	51	44	49	56	54	35	24	15
Hanover and District Hospital	270	267	238	70	73	76	69	79	84	35	51	50
Hawkesbury and District Hospital	303	299	221	62	68	68	68	75	74	36	17	21
Huntsville District Memorial Hospital	300	318	370	67	77	84	81	86	89	64	36	31
Huronia District Hospital, Midland	546	496	492	72	72	78	84	87	89	108	110	61
Kemptville District Hospital	29	35	34	38	49	59	46	59	75	7	10	10
Kincardine and District General Hospital	69	102	101	28	35	30	50	61	63	23	41	50
Kirkland and District Hospital	226	189	176	51	59	52	64	80	76	49	60	38
Lake of the Woods District Hospital, Kenora	277	152	167	74	65	56	78	72	67	30	13	23
Leamington District Memorial Hospital	288	266	285	49	55	51	65	75	76	73	61	87
Lennox and Addington County General Hospital, Napanee	104	104	120	45	42	55	60	65	71	34	27	22
Listowel Memorial Hospital	120	77	93	43	55	39	56	69	67	18	10	22
Manitoulin Health Centre, Little Current	12	11	8	83	91	100	83	61	96	0	0	0
Meaford General Hospital	120	106	96	72	76	81	85	85	88	39	17	17
Memorial Hospital, Bowmanville	632	832	1,087	81	67	91	86	93	93	95	248	52
Milton District Hospital	297	239	186	63	71	63	73	82	73	49	35	25
Norfolk General Hospital, Simcoe	800	787	765	63	66	68	69	75	80	100	109	89
North Bay Civic Hospital	1,743	1,903	1,958	49	58	63	76	85	89	431	495	456
Notre Dame Hospital, Hearst	161	166	191	81	78	77	89	90	85	32	39	27
Parry Sound District General Hospital	199	211	226	60	61	69	74	79	83	53	53	55
Pembroke Civic Hospital	648	621	685	59	67	72	79	81	81	196	142	78
Pembroke General Hospital	482	535	711	68	82	84	66	82	86	64	33	51
Penetanguishene General Hospital	209	198	305	63	72	70	79	86	89	45	38	63
Port Colborne General Hospital	673	771	682	77	87	86	82	87	87	51	27	17
Prince Edward County Memorial Hospital, Picton	180	165	188	71	71	90	57	68	74	46	40	8
Renfrew Victoria Hospital	98	86	99	87	86	89	69	75	73	6	3	1
Riverside Health Care Facilities, Fort Frances	215	205	217	46	50	52	56	71	75	33	46	46

Continued on next page

Exhibit 8.18: *(Cont'd)*

Hospital	Number of Cases *			Day Surgery Rate (%)			Benchmark Day Surgery Rate (%)			Day Surgery Conservable Bed Days		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Ross Memorial Hospital, Lindsay	838	773	889	71	77	76	76	83	85	45	42	90
Sensenbrenner Hospital, Kapuskasing	252	291	246	51	52	61	62	76	83	74	110	104
Smiths Falls Community Hospital	528	528	433	76	78	79	68	76	79	68	69	49
South Muskoka Memorial Hospital, Bracebridge	544	613	703	78	81	86	72	81	86	15	42	19
St. Joseph's General Hospital, Blind River	1	0	0	0	0	0	32	0	0	0	0	0
St. Joseph's General Hospital, Elliott Lake	281	256	306	71	71	80	67	83	85	43	47	36
St. Joseph's General Hospital, North Bay	1,012	776	768	66	69	75	79	84	87	238	160	101
St. Joseph's General Hospital, Thunder Bay	1,627	1,848	1,626	75	81	81	80	86	87	131	128	127
St. Joseph's Hospital, Brantford	1,654	1,640	1,679	84	85	90	89	90	90	106	98	33
St. Joseph's Hospital, Chatham	1,457	1,408	1,465	69	75	76	72	82	85	96	201	219
St. Mary's Memorial Hospital, St. Mary's	44	73	48	84	92	92	60	75	77	3	6	9
St. Vincent de Paul Hospital, Brockville	1,000	971	1,018	62	71	73	72	83	86	132	113	130
Stevenson Memorial Hospital, Alliston	254	272	255	49	60	64	55	76	83	34	50	46
Strathroy Middlesex General Hospital	437	503	515	33	41	50	61	71	76	225	235	193
Sydenham District Hospital, Wallaceburg	231	229	184	77	78	73	77	79	78	9	16	49
Temiskaming Hospital, New Liskeard	197	234	229	51	50	57	63	73	76	54	88	63
Tillsonburg District Memorial Hospital	256	205	245	50	53	40	63	74	70	52	57	74
Trenton Memorial Hospital	943	933	1,058	64	67	70	74	79	85	163	139	168
West Haldimand General Hospital, Hagersville	88	55	27	100	100	96	98	93	84	0	0	0
West Lincoln Memorial Hospital, Grimsby	339	328	345	63	68	73	63	77	74	32	53	40
West Nipissing General Hospital, Sturgeon Falls	78	72	66	38	46	53	57	67	75	34	26	18
Whitby General Hospital	629	690	818	73	83	92	83	88	93	112	51	32
Willett Hospital, Paris	171	87	38	99	100	100	97	100	99	0	0	0
Winchester District Memorial Hospital	496	486	483	76	76	75	81	86	87	44	67	65
Wingham and District Hospital	191	163	140	73	72	70	75	83	85	5	16	20
Total	**29,963**	**29,795**	**31,771**	**66**	**70**	**74**	**75**	**82**	**84**	**5,112**	**5,003**	**4,304**

* Includes inpatient and outpatient procedures
See Appendix for inclusions/exclusions
Hospital Day Surgery and Benchmark Day Surgery rates are weighted average over hospital case-mix.
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.19: *Total Length of Stay for a Single Episode of Illness Among Institutions for Hip and Knee Replacement and Cerebrovascular Accident for Teaching Hospitals in Ontario, 1993 and 1994*

Institution	Hip and Knee Replacement						Cerebrovascular Accident					
			Adjusted ALOS (days)						Adjusted ALOS (days)			
	Number of Cases	Cases Transferred (%)	Cases Not Transferred*	Cases Not Transferred* Excluding ALC days	All Cases Including Transfers	% of Days in Rehab/ Chronic/ ALC	Number of Cases	Cases Transferred (%)	Cases Not Transferred*	Cases Not Transferred* Excluding ALC days	All Cases Including Transfers	% of Days in Rehab/ Chronic/ ALC
Chedoke-McMaster Hospitals, Hamilton	374	4.0	13.8	13.7	15.6	12.6	173	35.3	16.2	12.9	46.6	67.0
Hamilton Civic Hospitals (General Division)	329	13.4	10.7	10.6	14.2	33.4	260	30.0	23.8	16.9	45.1	60.3
Hamilton Civic Hospitals (Henderson Division)	501	5.6	12.2	11.9	13.9	18.7	213	41.3	23.6	15.2	53.1	64.8
Hotel Dieu Hospital, Kingston	306	8.8	8.2	8.2	9.7	14.4	90	35.6	18.6	10.1	44.2	79.9
Kingston General Hospital	495	12.7	10.1	10.1	13.6	26.2	252	36.9	16.4	14.8	38.4	58.9
Mount Sinai Hospital, Toronto	490	76.3	8.8	7.7	29.9	73.8	168	30.4	20.8	14.8	41.7	61.2
Ottawa Civic Hospital	690	8.6	12.3	12.0	14.3	19.0	459	21.4	29.4	18.0	50.4	60.3
Ottawa General Hospital	485	9.5	12.4	12.3	15.3	13.4	332	26.5	21.4	13.5	44.0	65.1
St. Joseph's Hospital, Hamilton	369	0.0	12.1	12.0	12.8	0.2	226	12.0	28.1	18.0	42.3	59.3
St. Joseph's Hospital, London	853	6.0	8.5	8.2	10.2	12.0	199	31.2	15.5	11.9	34.5	61.7
St. Michael's Hospital, Toronto	327	81.4	11.5	11.4	29.5	58.6	120	16.7	22.2	15.8	35.4	49.8
Sunnybrook Health Science Centre, North York	374	86.1	10.1	10.0	31.4	66.1	368	26.6	21.7	19.3	40.9	49.7
Toronto Hospital	564	60.6	11.4	11.0	24.7	50.7	419	24.3	28.5	22.6	47.1	35.8
University Hospital, London	846	4.7	8.7	8.7	9.1	9.0	205	26.3	19.8	15.0	35.5	48.7
Victoria Hospital Corporation, London **	328	8.5	11.0	10.9	14.0	10.7	216	28.7	16.0	13.7	26.4	48.1
Wellesley Hospital, Toronto	362	50.8	10.7	10.4	22.6	54.0	133	21.0	39.7	11.4	61.6	78.1

* Index Admission
** Includes data for Children's Hospital of Western Ontario, London
Note: See Appendix for inclusions/exclusions; number of cases includes transferred cases
The rate of reported ALC days varies by hospital; on average, 4% of hip/knee replacement cases and 16% of CVA cases have reported ALC days (Range: 0 - 27% of hip/knee cases; 8 - 57% of CVA cases)
This may reflect variable rates of actual ALC cases, variable reporting, or both.
Women's College Hospital, Toronto excluded due to small number of hip/knee and CVA cases
Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.20: *Unplanned 30 Day Readmission Rates for Selected Medical Diagnoses for Teaching Hospitals in Ontario, 1993 and 1994*

Institution	Acute Myocardial Infarction			Congestive Heart Failure			Pneumonia			Chronic Obstructive Pulmonary Disease			Cerebrovascular Accident		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
Chedoke-McMaster Hospitals, Hamilton	268	18.4	16.4 - 20.4	279	20.4	18.3 - 22.4	432	13.4	12.0 - 14.8	358	14.4	12.7 - 16.0	113	8.9	6.6 - 11.2
Hamilton Civic Hospitals (General Division)	453	15.0	13.6 - 16.3	544	20.9	19.5 - 22.4	285	14.6	12.9 - 16.3	305	13.9	12.4 - 15.3	193	4.2	3.0 - 5.4
Hamilton Civic Hospitals (Henderson Division)	442	16.9	15.5 - 18.3	474	23.1	21.5 - 24.7	310	13.2	11.7 - 14.7	263	14.2	12.5 - 15.8	133	12.5	10.1 - 14.8
Hotel Dieu Hospital, Kingston	277	16.5	14.7 - 18.4	290	21.9	20.0 - 23.9	388	10.2	8.9 - 11.5	164	13.4	11.4 - 15.3	61	4.7	2.5 - 6.9
Kingston General Hospital	403	17.8	16.3 - 19.4	268	21.6	19.5 - 23.6	406	13.3	12.0 - 14.6	272	16.1	14.4 - 17.8	164	7.5	5.8 - 9.2
Mount Sinai Hospital, Toronto	217	18.6	16.5 - 20.8	309	21.7	19.8 - 23.6	241	12.6	11.0 - 14.3	177	15.2	13.2 - 17.3	118	11.4	8.9 - 13.8
Ottawa Civic Hospital	597	15.0	13.8 - 16.2	706	24.8	23.5 - 26.2	451	13.4	12.2 - 14.7	452	15.0	13.8 - 16.3	378	6.0	5.0 - 7.0
Ottawa General Hospital	382	19.3	17.5 - 21.0	427	28.5	26.7 - 30.3	354	10.3	9.0 - 11.6	437	17.8	16.4 - 19.3	252	5.7	4.4 - 6.9
St. Joseph's Hospital, Hamilton	453	18.7	17.3 - 20.2	563	22.8	21.3 - 24.2	592	8.7	7.7 - 9.7	454	16.3	14.9 - 17.7	212	7.7	6.3 - 9.2
St. Joseph's Hospital, London	406	13.6	12.2 - 15.0	381	23.2	21.4 - 25.0	307	12.0	10.5 - 13.5	365	15.1	13.6 - 16.5	146	5.3	3.7 - 7.0
St. Michael's Hospital, Toronto	161	16.0	13.6 - 18.3	276	23.8	21.8 - 25.9	203	12.4	10.6 - 14.3	231	13.2	11.6 - 14.9	106	8.9	6.6 - 11.2
Sunnybrook Health Science Centre, North York	462	20.0	18.5 - 21.6	599	25.3	23.8 - 26.8	342	11.5	10.1 - 12.8	265	15.5	13.7 - 17.3	281	10.4	9.0 - 11.9
Toronto Hospital	606	15.0	13.9 - 16.2	990	25.9	24.8 - 27.0	702	14.3	13.3 - 15.3	551	16.6	15.4 - 17.8	335	7.8	6.6 - 9.0
University Hospital, London	242	17.5	15.5 - 19.5	217	25.4	23.0 - 27.8	166	11.4	9.4 - 13.4	126	12.7	10.4 - 15.0	158	3.0	1.8 - 4.2
Victoria Hospital Corporation, London *	517	14.5	13.2 - 15.9	437	20.7	19.1 - 22.3	488	9.8	8.7 - 10.9	673	13.3	12.0 - 14.5	158	6.0	4.5 - 7.6
Wellesley Hospital, Toronto	206	16.4	14.3 - 18.6	271	27.4	25.3 - 29.6	291	16.1	14.4 - 17.7	246	18.3	16.5 - 20.2	113	7.8	5.7 - 9.8
Women's College Hospital, Toronto	81	15.3	12.2 - 18.4	176	23.6	21.0 - 26.2	157	5.9	4.4 - 7.4	152	11.4	9.3 - 13.5	41	3.3	0.6 - 5.9

* Includes data for Children's Hospital of Western Ontario, London

Note: See Appendix for inclusions/exclusions
Chronic Obstructive Pulmonary Disease includes Asthma (ICD-9 493.9)

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.21: *Unplanned 30 Day Readmission Rates for Selected Medical Diagnoses for Medium-sized Hospitals in Ontario, 1993 and 1994*

Institution	Acute Myocardial Infarction			Congestive Heart Failure			Pneumonia			Chronic Obstructive Pulmonary Disease			Cerebrovascular Accident		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
Belleville General Hospital	326	15.2	13.6 - 16.8	363	23.4	21.6 - 25.2	368	12.0	10.7 - 13.4	675	12.8	11.7 - 13.8	64	11.8	8.3 - 15.2
Brantford General Hospital	358	15.4	13.8 - 17.0	445	24.3	22.7 - 26.0	538	9.7	8.7 - 10.7	594	13.6	12.5 - 14.7	175	10.2	8.4 - 12.1
Cambridge Memorial Hospital	311	18.6	16.8 - 20.3	373	25.6	23.8 - 27.5	634	10.3	9.2 - 11.3	412	14.1	12.8 - 15.4	71	8.4	5.7 - 11.2
Centenary Health Centre, Scarborough	444	17.4	15.9 - 18.9	426	24.3	22.6 - 26.0	463	12.5	11.2 - 13.8	1,128	12.2	11.3 - 13.0	236	5.6	4.4 - 6.8
Credit Valley Hospital, Mississauga	361	15.3	13.7 - 16.8	312	18.8	17.0 - 20.6	399	6.9	5.8 - 8.0	294	11.8	10.2 - 13.4	141	12.2	9.9 - 14.6
Doctors Hospital, Toronto	80	16.5	13.0 - 20.0	175	19.1	16.7 - 21.6	206	11.8	10.1 - 13.4	323	14.2	12.8 - 15.6	78	10.7	7.8 - 13.5
Etobicoke General Hospital	446	16.3	14.8 - 17.8	509	22.0	20.5 - 23.6	532	11.6	10.4 - 12.8	346	14.2	12.7 - 15.6	232	6.2	4.9 - 7.6
General Hospital of Port Arthur, Thunder Bay	149	17.9	15.4 - 20.4	221	27.0	24.7 - 29.4	252	9.9	8.4 - 11.4	279	12.4	10.8 - 14.0	72	14.3	10.8 - 17.7
Grand River Hospital Corporation, Kitchener	370	13.7	12.2 - 15.2	461	18.4	16.9 - 19.9	466	12.5	11.2 - 13.8	953	12.8	11.9 - 13.8	179	11.6	9.6 - 13.5
Greater Niagara General Hospital	298	16.8	15.0 - 18.6	482	25.2	23.6 - 26.8	399	10.6	9.4 - 11.9	783	13.5	12.5 - 14.5	162	8.8	7.0 - 10.7
Grey Bruce Regional Health Centre, Owen Sound	217	16.8	14.7 - 18.9	350	25.6	23.7 - 27.5	313	14.5	12.8 - 16.1	550	17.4	16.1 - 18.6	72	9.9	6.9 - 12.9
Guelph General Hospital	265	16.6	14.7 - 18.4	225	18.7	16.6 - 20.8	324	9.0	7.7 - 10.4	617	13.0	11.9 - 14.2	80	1.5	0.4 - 2.6
Hopital Montfort, Ottawa	210	15.6	13.6 - 17.7	331	26.3	24.4 - 28.3	311	12.4	11.1 - 13.8	337	17.5	16.1 - 19.0	100	7.0	4.9 - 9.1
Hotel Dieu Hospital, Cornwall	158	12.6	10.5 - 14.8	209	21.5	19.2 - 23.8	463	12.5	11.2 - 13.9	683	13.7	12.6 - 14.8	38	2.3	0.4 - 4.1
Hotel Dieu Hospital, St. Catharines	182	16.4	14.1 - 18.7	350	27.0	25.1 - 28.9	216	9.2	7.7 - 10.6	323	13.3	11.9 - 14.7	105	13.3	10.7 - 15.9
Hotel Dieu of St. Joseph's Hospital, Windsor	273	15.4	13.7 - 17.1	606	26.8	25.4 - 28.3	506	12.7	11.5 - 14.0	1,097	14.3	13.4 - 15.2	231	10.1	8.5 - 11.7
Humber Memorial Hospital, Weston	320	18.0	16.2 - 19.9	554	27.3	25.7 - 28.8	359	11.8	10.4 - 13.2	560	10.6	9.5 - 11.7	235	12.8	11.0 - 14.6
Joseph Brant Memorial Hospital, Burlington	391	13.9	12.5 - 15.3	444	24.1	22.4 - 25.7	386	9.9	8.7 - 11.2	416	12.4	11.0 - 13.8	150	10.2	8.2 - 12.2
Laurentian Hospital, Sudbury	21	6.7	2.9 - 10.6	36	20.6	15.4 - 25.8	185	7.3	5.4 - 9.2	480	10.2	8.8 - 11.5	12	0.2	0.0 - 0.8
Markham Stouffville Hospital	167	21.2	18.5 - 23.8	178	30.2	27.4 - 33.0	251	11.6	9.9 - 13.3	191	18.8	16.5 - 21.0	62	6.7	4.0 - 9.3
McKellar General Hospital, Thunder Bay	280	16.3	14.5 - 18.0	298	21.3	19.3 - 23.2	288	10.8	9.3 - 12.3	300	12.7	11.2 - 14.2	121	9.6	7.4 - 11.8
Metropolitan General Hospital, Windsor	357	14.0	12.5 - 15.5	377	26.3	24.5 - 28.2	242	12.2	10.6 - 13.7	308	14.6	13.1 - 16.0	144	10.0	7.9 - 12.1
Mississauga Hospital	490	17.5	16.1 - 18.9	598	22.3	20.9 - 23.7	645	11.2	10.2 - 12.2	617	12.3	11.3 - 13.3	427	8.6	7.5 - 9.7
North York Branson Hospital	520	17.1	15.8 - 18.4	827	26.9	25.7 - 28.2	351	10.4	9.1 - 11.6	469	12.7	11.6 - 13.9	279	13.2	11.5 - 14.9
North York General Hospital	660	16.6	15.4 - 17.8	569	24.8	23.4 - 26.3	575	13.0	11.9 - 14.2	680	12.0	10.9 - 13.0	292	8.6	7.2 - 9.9
Northwestern General Hospital, Toronto	301	11.9	10.4 - 13.5	442	24.2	22.6 - 25.9	334	10.4	9.1 - 11.6	289	11.8	10.4 - 13.1	178	6.4	4.9 - 7.9
Oakville Trafalgar Memorial Hospital	340	14.0	12.4 - 15.5	395	21.6	19.9 - 23.2	462	9.6	8.5 - 10.7	487	11.5	10.3 - 12.6	173	9.2	7.5 - 11.0
Orillia Soldiers' Memorial Hospital	235	14.7	12.8 - 16.6	293	25.9	23.8 - 28.0	413	11.9	10.6 - 13.1	569	13.4	12.4 - 14.6	123	10.3	8.0 - 12.6
Oshawa General Hospital	425	13.2	11.9 - 14.6	647	20.6	19.3 - 21.9	699	8.2	7.4 - 9.1	922	13.3	12.4 - 14.3	209	10.4	8.6 - 12.2
Peel Memorial Hospital, Brampton	509	15.0	13.7 - 16.4	508	21.7	20.2 - 23.2	698	9.6	8.6 - 10.6	1,248	13.6	12.7 - 14.4	242	9.2	7.6 - 10.7
Peterborough Civic Hospital	328	18.6	16.8 - 20.4	394	24.6	22.8 - 26.3	442	10.1	8.8 - 11.3	587	12.4	11.2 - 13.6	189	5.8	4.4 - 7.2
Plummer General Hospital, Sault Ste. Marie	313	14.8	13.2 - 16.5	421	16.0	14.4 - 17.6	232	4.1	3.0 - 5.1	267	7.6	6.4 - 8.9	145	9.1	6.4 - 11.7
Plummer Memorial Public Hospital, Sault Ste. Marie	319	18.0	16.3 - 19.7	235	24.2	22.0 - 26.5	204	8.3	6.9 - 9.7	408	10.1	9.1 - 11.2	75	13.4	10.3 - 16.6
Public General Hospital, Chatham	13	13.1	5.8 - 20.4	68	12.6	9.2 - 16.0	168	12.1	10.0 - 14.2	353	16.5	14.8 - 18.2	95	6.4	4.3 - 8.5
Queensway General Hospital, Etobicoke	430	11.4	10.1 - 12.7	455	22.2	20.6 - 23.9	262	9.9	8.4 - 11.3	343	12.9	11.6 - 14.2	208	4.1	3.0 - 5.3
Queensway-Carleton Hospital, Nepean	256	13.5	11.7 - 15.3	397	27.7	25.8 - 29.5	271	10.7	9.2 - 12.1	443	12.2	11.0 - 13.4	166	7.1	5.5 - 8.8
Riverside Hospital, Ottawa	184	14.4	12.4 - 16.5	292	22.7	20.7 - 24.7	213	9.1	7.6 - 10.6	236	12.0	10.4 - 13.6	119	7.6	5.6 - 9.6
Royal Victoria Hospital, Barrie	346	24.5	22.6 - 26.4	433	25.6	23.9 - 27.2	640	11.5	10.4 - 12.5	828	11.4	10.4 - 12.3	124	11.8	9.3 - 14.2
Salvation Army Grace General, Scarborough	292	22.5	20.4 - 24.5	343	21.7	19.9 - 23.6	267	7.7	6.2 - 9.1	283	12.2	10.6 - 13.8	139	10.8	8.6 - 13.0
Salvation Army Grace Hospital, Ottawa	5	19.5	5.0 - 33.9	82	5.3	3.0 - 7.7	84	3.6	1.8 - 5.2	110	6.3	4.3 - 8.3	14	8.1	1.5 - 14.7
Salvation Army Grace Hospital, Windsor	137	18.1	15.5 - 20.8	233	22.3	20.0 - 24.6	165	9.3	7.7 - 10.9	173	16.2	14.2 - 18.2	71	20.4	6.6 - 24.3
Sarnia General Hospital	272	16.6	14.8 - 18.5	385	23.9	22.1 - 25.6	307	13.0	11.4 - 14.5	653	15.6	14.6 - 16.7	134	9.4	7.3 - 11.5
Scarborough General Hospital	700	14.6	13.5 - 15.7	774	22.8	21.6 - 24.0	766	13.3	12.3 - 14.3	671	12.4	11.5 - 13.4	306	13.1	11.5 - 14.7
St. Catharines General Hospital	338	16.5	14.8 - 18.2	508	25.1	23.4 - 26.7	418	9.3	8.0 - 10.5	661	10.7	9.7 - 11.7	204	7.4	5.8 - 9.1

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Exhibit 8.21: *(cont'd)*

Institution	Acute Myocardial Infarction			Congestive Heart Failure			Pneumonia			Chronic Obstructive Pulmonary Disease			Cerebrovascular Accident		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
St. Joseph's General Hospital, Peterborough	103	19.5	16.2 - 22.7	124	19.6	16.7 - 22.5	167	9.7	8.0 - 11.4	134	17.2	14.8 - 19.6	59	4.9	2.6 - 7.2
St. Joseph's Health Centre of Sarnia	67	20.4	16.4 - 24.4	121	19.9	16.8 - 22.9	111	9.0	6.7 - 11.4	210	13.2	11.5 - 14.9	50	9.3	6.0 - 12.6
St. Joseph's Health Centre, Toronto	431	11.2	10.0 - 12.4	607	23.5	22.1 - 24.9	424	12.9	11.6 - 14.1	417	14.7	13.4 - 16.0	123	7.6	5.6 - 9.7
St. Joseph's Hospital, Guelph	27	3.8	0.9 - 6.6	61	26.5	21.9 - 31.0	91	10.7	8.1 - 13.2	103	17.9	15.1 - 20.7	38	9.0	5.0 - 13.0
St. Mary's General Hospital, Kitchener	311	13.4	11.8 - 15.1	383	22.5	20.8 - 24.3	327	9.0	7.7 - 10.2	459	14.2	13.0 - 15.4	195	4.9	3.6 - 6.1
St. Thomas Elgin General Hospital	223	18.9	16.7 - 21.0	309	28.8	26.8 - 30.9	341	11.1	9.8 - 12.5	782	14.2	13.2 - 15.1	158	9.3	7.4 - 11.2
Stratford General Hospital	162	16.7	14.2 - 19.2	156	17.4	14.8 - 20.0	203	5.7	4.2 - 7.1	285	14.1	12.3 - 15.9	41	5.2	2.3 - 8.2
Sudbury General Hospital of the Immaculate Heart of Mary	190	13.6	11.6 - 15.6	228	25.6	23.3 - 27.9	198	10.7	9.0 - 12.4	331	13.8	12.4 - 15.2	111	9.8	7.5 - 12.2
Sudbury Memorial Hospital	314	10.8	9.4 - 12.2	336	23.2	21.3 - 25.1	252	8.4	7.1 - 9.7	421	13.0	11.9 - 14.2	113	10.1	7.8 - 12.4
Timmins and District Hospital	119	16.0	13.3 - 18.8	212	28.1	25.6 - 30.6	262	11.1	9.5 - 12.6	402	11.8	10.6 - 13.1	56	5.9	3.2 - 8.6
Toronto East General and Orthopedic Hospital	574	19.8	18.4 - 21.1	875	25.5	24.3 - 26.7	733	17.6	16.5 - 18.7	1,038	18.0	17.1 - 18.9	387	9.8	8.6 - 11.1
Welland County General Hospital	212	11.8	10.1 - 13.6	323	24.8	22.9 - 26.8	311	10.4	8.9 - 11.9	490	12.3	11.1 - 13.6	101	10.7	8.1 - 13.2
Windsor Western Hospital	187	14.8	12.7 - 16.9	345	25.8	23.9 - 27.6	254	11.4	10.0 - 12.9	291	17.6	16.0 - 19.3	98	9.4	7.0 - 11.8
Woodstock General Hospital	164	19.9	17.3 - 22.4	221	24.5	22.1 - 26.8	139	9.3	7.3 - 11.3	247	15.2	13.5 - 16.9	54	4.8	2.5 - 7.0
York Central Hospital, Richmond Hill	345	17.2	15.5 - 18.8	312	24.5	22.6 - 26.5	383	11.2	9.9 - 12.4	489	14.2	12.9 - 15.6	155	10.2	8.2 - 12.2
York County Hospital, Newmarket	379	18.4	16.7 - 20.1	534	26.4	24.8 - 28.0	470	11.0	9.9 - 12.2	743	14.6	13.5 - 15.7	132	7.9	6.0 - 9.8
York-Finch General Hospital, North York	349	14.5	12.9 - 16.1	391	26.3	24.5 - 28.1	459	13.8	12.6 - 15.1	532	13.3	12.0 - 14.6	158	7.1	5.4 - 8.8

Note: See Appendix for inclusions/exclusions
Chronic Obstructive Pulmonary Disease includes Asthma (ICD-9 493.9)

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.22: *Unplanned 30 Day Readmission Rates for Selected Medical Diagnoses for Smaller-sized Hospitals in Ontario, 1993 and 1994*

Institution	Acute Myocardial Infarction			Congestive Heart Failure			Pneumonia			Chronic Obstructive Pulmonary Disease			Cerebrovascular Accident		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
Ajax and Pickering General Hospital	172	13.2	11.1 - 15.4	199	13.4	11.4 - 15.4	314	14.8	13.2 - 16.5	538	16.3	14.9 - 17.7	91	13.8	10.8 - 16.9
Alexandra Hospital, Ingersoll	46	17.2	13.0 - 21.5	88	26.8	23.0 - 30.6	42	15.5	11.1 - 20.0	65	15.2	12.0 - 18.5	33	12.4	7.6 - 17.1
Alexandra Marine and General Hospital, Goderich	75	19.3	15.8 - 22.9	101	29.5	25.9 - 33.2	131	7.6	5.8 - 9.4	124	15.1	12.6 - 17.6	27	14.2	8.7 - 19.6
Arnprior and District Memorial Hospital	52	19.4	14.9 - 23.8	90	23.6	20.0 - 27.2	73	12.0	9.0 - 14.9	134	23.8	21.2 - 26.6	28	18.0	11.9 - 24.1
Brockville General Hospital	137	17.1	14.3 - 19.9	137	28.9	25.7 - 32.1	247	12.6	10.8 - 14.5	118	18.8	16.2 - 21.4	41	14.9	10.2 - 19.6
Bruce County General Hospital, Walkerton	44	10.6	6.9 - 14.3	61	12.1	8.6 - 15.7	53	9.6	5.9 - 13.2	97	14.7	11.4 - 17.9	21	19.8	12.5 - 27.1
Campbellford Memorial Hospital	87	20.8	17.1 - 24.4	112	21.2	17.9 - 24.4	154	6.9	5.3 - 8.4	131	18.4	15.8 - 21.1	29	17.0	11.2 - 22.7
Central Hospital, Toronto	3	0.6	0.0 - 2.9	36	21.2	15.4 - 27.1	21	15.8	9.2 - 22.3	62	15.9	11.6 - 20.3	8	0.1	0.0 - 0.7
Centre Grey General Hospital, Markdale	32	14.8	9.4 - 20.4	75	34.2	29.8 - 38.5	37	14.0	9.6 - 18.4	34	24.2	18.6 - 29.9	23	9.9	4.5 - 15.4
Charlotte Eleanor Englehart Hospital, Petrolia	35	16.4	11.6 - 21.1	97	20.8	17.5 - 24.1	110	11.6	9.1 - 14.1	75	20.8	16.9 - 24.7	38	23.2	17.6 - 28.9
Cobourg District General Hospital	84	15.9	12.5 - 19.3	167	23.6	21.0 - 26.3	229	17.6	15.6 - 19.7	164	13.7	11.6 - 15.7	44	8.2	4.9 - 11.4
Collingwood General and Marine Hospital	140	13.2	10.8 - 15.5	193	20.5	18.1 - 22.9	211	8.0	6.6 - 9.5	249	17.5	15.6 - 19.4	85	12.6	9.6 - 15.6
Cornwall General Hospital	129	14.4	11.8 - 17.0	149	18.2	15.6 - 20.8	187	9.8	8.1 - 11.5	227	13.8	12.2 - 15.5	48	16.4	12.0 - 20.9
Douglas Memorial Hospital, Fort Erie	72	21.6	17.6 - 25.5	165	25.2	22.5 - 28.0	127	8.4	6.4 - 10.4	262	18.3	16.2 - 20.3	39	8.4	4.6 - 12.2
Dryden District General Hospital	43	19.8	14.5 - 25.1	53	21.9	17.1 - 26.7	88	8.0	5.6 - 10.4	111	9.6	7.3 - 11.8	26	11.3	6.6 - 15.9
Dufferin-Caledon Health Care Corporation, Orangeville	162	13.7	11.4 - 16.0	214	21.1	18.9 - 23.4	341	10.4	9.0 - 11.8	346	12.6	11.1 - 14.2	64	8.2	5.3 - 11.2
Georgetown and District General Hospital	74	10.3	7.4 - 13.2	86	26.3	22.4 - 30.1	72	10.0	7.1 - 12.9	115	25.1	22.1 - 28.2	31	10.0	5.4 - 14.5
Glengarry Memorial Hospital, Alexandria	8	0.4	0.0 - 1.2	58	27.8	22.9 - 32.8	116	5.5	3.9 - 7.0	141	15.5	13.3 - 17.8	9	20.9	9.8 - 32.1
Great War Memorial Hospital of Perth	52	8.9	5.9 - 11.9	136	30.0	26.7 - 33.3	98	8.8	6.5 - 11.2	101	10.5	7.9 - 13.2	24	8.2	3.5 - 12.8
Groves Memorial Community Hospital, Fergus	76	16.4	12.9 - 20.0	118	25.5	22.3 - 28.7	85	7.4	5.0 - 9.7	100	18.3	15.4 - 21.2	49	9.4	5.8 - 13.1
Haldimand War Memorial Hospital, Dunnville	53	14.8	10.6 - 18.9	71	28.3	23.9 - 32.6	69	11.8	8.7 - 14.9	102	21.6	18.2 - 25.1	31	12.7	7.7 - 17.7
Hanover and District Hospital	43	17.3	12.6 - 21.9	98	24.2	20.7 - 27.7	102	12.3	9.7 - 14.9	84	19.5	16.4 - 22.6	16	5.5	1.0 - 10.0
Hawkesbury and District General Hospital	78	19.4	15.7 - 23.2	145	21.7	18.9 - 24.5	105	9.8	7.6 - 12.1	335	16.4	14.8 - 17.9	29	6.4	2.8 - 10.1
Huntsville District Memorial Hospital	112	20.7	17.4 - 24.0	204	32.0	29.4 - 34.6	180	12.3	10.3 - 14.3	126	14.6	12.2 - 17.1	63	12.8	9.3 - 16.3
Huronia District Hospital, Midland	149	9.3	7.4 - 11.2	232	26.3	24.0 - 28.7	178	16.2	14.0 - 18.4	214	13.0	11.1 - 14.9	65	6.4	3.8 - 8.9
Kemptville District Hospital	27	22.7	16.1 - 29.4	52	22.1	17.5 - 26.8	86	8.0	5.5 - 10.5	99	16.8	13.7 - 19.8	22	16.0	9.8 - 22.2
Kincardine and District General Hospital	49	14.0	9.9 - 18.0	80	12.5	9.6 - 15.5	65	5.5	3.2 - 7.8	105	14.5	11.4 - 17.5	4	0.1	0.0 - 0.8
Kirkland and District Hospital	75	18.0	14.5 - 21.6	123	24.7	21.4 - 27.9	131	11.0	8.9 - 13.2	191	14.1	12.0 - 16.2	40	11.9	7.7 - 16.1
Lake of the Woods District Hospital, Kenora	68	19.3	15.1 - 23.5	80	24.2	20.4 - 28.0	245	13.0	11.1 - 14.9	208	17.1	14.9 - 19.2	37	11.1	6.8 - 15.5
Leamington District Memorial Hospital	126	16.4	13.7 - 19.0	238	25.1	22.8 - 27.3	90	7.4	5.0 - 9.7	217	13.2	11.4 - 15.0	61	6.9	4.2 - 9.7
Lennox and Addington County General Hospital, Napanee	112	14.6	11.8 - 17.4	103	17.7	14.5 - 20.9	106	5.6	3.8 - 7.4	143	12.6	10.3 - 14.8	32	6.2	2.7 - 9.8
Listowel Memorial Hospital	8	27.1	14.1 - 40.2	25	21.4	14.6 - 28.2	46	9.6	6.0 - 13.2	34	14.3	9.1 - 19.4	8	12.6	2.9 - 22.4
Manitoulin Health Centre, Little Current	36	12.0	8.1 - 16.0	86	25.2	21.5 - 28.9	76	17.9	14.3 - 21.4	65	8.9	6.0 - 11.8	12	14.4	6.2 - 22.7
Meaford General Hospital	43	19.0	14.2 - 23.8	116	23.3	20.1 - 26.4	74	2.0	0.8 - 3.1	78	13.3	10.3 - 16.3	33	18.4	12.8 - 24.0
Memorial Hospital, Bowmanville	108	15.5	12.7 - 18.3	170	24.0	21.3 - 26.6	341	8.1	6.9 - 9.3	274	19.4	17.3 - 21.4	51	16.0	11.9 - 20.2
Milton District Hospital	77	15.3	11.7 - 18.8	141	33.1	29.9 - 36.3	106	7.3	5.3 - 9.3	132	14.6	12.1 - 17.2	32	3.4	0.6 - 6.1
Norfolk General Hospital, Simcoe	320	23.2	21.3 - 25.2	323	27.5	25.5 - 29.5	348	14.0	12.5 - 15.5	339	19.7	18.0 - 21.4	139	10.9	8.7 - 13.1
North Bay Civic Hospital	45	17.5	12.6 - 22.4	220	27.1	24.6 - 29.6	231	8.9	7.4 - 10.4	302	18.3	16.6 - 20.0	66	3.0	1.3 - 4.8
Notre Dame Hospital, Hearst	16	6.1	1.3 - 10.9	39	18.6	13.2 - 24.0	56	10.6	6.6 - 14.5	189	13.0	11.1 - 15.0	6	10.2	1.6 - 18.1
Parry Sound District General Hospital	65	20.4	16.3 - 24.4	142	24.8	21.8 - 27.8	136	11.6	9.5 - 13.7	133	9.4	7.5 - 11.2	57	9.6	6.5 - 12.8
Pembroke Civic Hospital	76	7.2	4.7 - 9.8	172	22.1	19.5 - 24.6	114	17.7	15.0 - 20.4	256	17.4	15.7 - 19.1	63	14.0	10.4 - 17.6
Pembroke General Hospital	64	17.1	13.1 - 21.1	179	25.7	23.0 - 28.4	122	10.7	8.4 - 13.1	215	16.2	14.4 - 18.0	46	15.8	11.3 - 20.3
Penetanguishene General Hospital	56	24.0	19.2 - 28.8	63	33.7	28.9 - 38.4	96	13.5	10.8 - 16.2	146	14.9	12.6 - 17.2	26	15.9	9.9 - 21.9

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Exhibit 8.22: *(cont'd)*

Institution	Acute Myocardial Infarction			Congestive Heart Failure			Pneumonia			Chronic Obstructive Pulmonary Disease			Cerebrovascular Accident		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
Port Colborne General Hospital	82	14.9	11.7 - 18.2	132	23.2	20.2 - 26.3	78	8.7	6.2 - 11.2	94	20.5	17.4 - 23.6	21	9.4	4.1 - 14.6
Prince Edward County Memorial Hospital, Picton	78	20.5	16.8 - 24.2	178	33.5	30.7 - 36.4	127	14.6	12.2 - 17.0	132	14.6	12.2 - 17.0	39	16.1	11.1 - 21.0
Renfrew Victoria Hospital	91	19.5	16.1 - 23.0	133	18.9	16.2 - 21.7	83	10.9	8.1 - 13.6	167	16.3	14.2 - 18.5	24	9.0	4.0 - 14.1
Riverside Health Care Facilities, Fort Frances	58	18.5	14.2 - 22.7	101	27.6	24.1 - 31.1	91	13.3	10.4 - 16.2	137	14.2	11.8 - 16.5	22	21.1	14.1 - 28.2
Ross Memorial Hospital, Lindsay	319	18.9	17.1 - 20.7	346	22.9	21.0 - 24.8	584	12.3	11.2 - 13.4	397	13.6	12.2 - 14.9	100	12.2	9.4 - 15.0
Sensenbrenner Hospital, Kapuskasing	74	19.0	15.1 - 22.8	128	24.8	21.6 - 28.0	163	15.9	13.7 - 18.1	210	21.0	19.0 - 23.1	45	11.3	7.4 - 15.2
Smiths Falls Community Hospital	128	17.3	14.6 - 20.0	171	26.9	24.2 - 29.6	151	12.1	10.1 - 14.2	210	12.0	10.2 - 13.8	37	8.9	4.9 - 12.9
South Muskoka Memorial Hospital, Bracebridge	27	23.4	17.0 - 29.8	36	30.2	24.0 - 36.4	53	10.1	6.8 - 13.3	30	19.3	14.1 - 24.5	10	22.6	12.0 - 33.2
St. Joseph's General Hospital, Blind River	91	14.6	11.4 - 17.8	111	30.9	27.4 - 34.4	71	7.9	5.2 - 10.6	157	26.9	24.2 - 29.6	26	7.2	3.1 - 11.3
St. Joseph's General Hospital, Elliott Lake	197	23.5	20.9 - 26.1	118	22.1	19.0 - 25.3	234	10.2	8.4 - 12.1	349	16.6	14.8 - 18.4	31	10.4	5.7 - 15.1
St. Joseph's General Hospital, North Bay	98	14.0	11.2 - 16.9	180	20.0	17.6 - 22.5	127	11.5	9.2 - 13.7	219	14.0	12.2 - 15.7	66	10.0	6.8 - 13.2
St. Joseph's General Hospital, Thunder Bay	2	0.3	0.0 - 1.6	28	27.7	21.0 - 34.4	53	5.2	2.8 - 7.6	55	11.8	8.7 - 15.0	12	8.2	1.7 - 14.7
St. Joseph's Hospital, Brantford	120	16.3	13.7 - 19.0	169	27.1	24.4 - 29.8	247	8.3	6.8 - 9.8	234	13.8	12.2 - 15.5	53	7.4	4.4 - 10.3
St. Joseph's Hospital, Chatham	35	15.6	10.4 - 20.8	62	22.6	18.3 - 27.0	85	16.1	13.0 - 19.2	68	10.2	6.8 - 13.4	18	4.7	0.8 - 8.6
St. Mary's Memorial Hospital, St. Mary's	56	8.3	5.1 - 11.5	222	24.9	22.5 - 27.3	174	17.9	15.6 - 20.2	143	15.9	13.6 - 18.1	50	12.9	8.9 - 17.0
St. Vincent de Paul Hospital, Brockville	171	10.8	8.8 - 12.8	129	27.5	24.3 - 30.8	118	13.8	11.1 - 16.4	143	18.4	15.5 - 21.4	33	28.8	22.2 - 35.3
Stevenson Memorial Hospital, Alliston	103	12.1	9.5 - 14.7	142	26.7	23.6 - 29.7	226	7.0	5.6 - 8.4	186	14.6	12.5 - 16.6	45	15.7	11.4 - 20.0
Strathroy Middlesex General Hospital	114	14.0	11.4 - 16.6	145	24.6	21.5 - 27.7	92	10.8	8.0 - 13.5	116	8.8	6.4 - 11.2	35	19.8	14.3 - 25.4
Sydenham District Hospital, Wallaceburg	51	20.0	15.4 - 24.6	115	24.8	21.6 - 28.1	123	12.9	10.4 - 15.4	202	14.6	12.5 - 16.7	40	15.5	10.7 - 20.4
Temiskaming Hospital, New Liskeard	59	18.3	14.2 - 22.3	95	17.0	13.8 - 20.1	86	10.2	7.8 - 12.6	133	16.3	13.8 - 18.8	17	18.5	10.6 - 26.4
Tillsonburg District Memorial Hospital	110	23.2	19.9 - 26.6	202	20.5	18.2 - 22.8	182	12.9	10.8 - 15.1	321	13.5	11.9 - 15.1	46	7.5	4.1 - 11.0
Trenton Memorial Hospital	135	16.0	13.4 - 18.7	172	26.2	23.5 - 28.9	252	10.2	8.6 - 11.7	364	15.9	14.3 - 17.4	45	6.5	3.5 - 9.5
West Haldimand General Hospital, Hagersville	52	22.1	17.3 - 27.0	65	18.7	14.8 - 22.5	90	10.8	8.3 - 13.3	88	13.8	10.7 - 16.9	50	8.7	5.3 - 12.1
West Lincoln Memorial Hospital, Grimsby	159	20.8	18.2 - 23.4	60	29.4	24.5 - 34.3	115	12.1	9.6 - 14.6	204	13.4	11.4 - 15.3	78	3.8	2.0 - 5.5
West Nipissing General Hospital, Sturgeon Falls	59	24.5	20.1 - 28.9	87	24.4	20.8 - 28.0	116	12.7	10.3 - 15.2	172	16.1	14.0 - 18.2	28	3.6	0.7 - 6.5
Whitby General Hospital	105	26.1	22.6 - 29.6	131	29.9	26.6 - 33.1	191	14.9	12.9 - 17.0	140	15.8	13.4 - 18.1	52	10.4	6.7 - 14.0
Willett Hospital, Paris	2	0.8	0.0 - 4.8	10	43.9	30.7 - 57.1	33	12.2	7.6 - 16.7	16	28.6	19.9 - 37.4	12	6.8	1.2 - 12.2
Winchester District Memorial Hospital	113	13.9	11.2 - 16.6	116	26.2	22.9 - 29.6	169	9.5	7.7 - 11.3	193	14.4	12.4 - 16.4	54	18.3	14.0 - 22.7
Wingham and District Hospital	56	13.3	9.8 - 16.8	115	24.7	21.3 - 28.2	65	12.3	9.2 - 15.4	104	9.8	7.5 - 12.2	35	7.8	4.1 - 11.5

Note: See Appendix for inclusions/exclusions
Chronic Obstructive Pulmonary Disease includes Asthma (ICD-9 493.9)

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.23: *Unplanned 30 Day Readmission Rates for Selected Surgical Procedures for Teaching Hospitals in Ontario, 1993 and 1994*

Institution	Transurethral Prostatectomy			Hip Replacement			Tonsillectomy			Laparoscopic Cholecystectomy		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
Chedoke-McMaster Hospitals, Hamilton	91	6.4	4.3 - 8.4	366	3.0	2.3 - 3.8	255	1.4	0.7 - 2.1	389	6.3	5.3 - 7.3
Children's Hospital of Eastern Ontario, Ottawa	--	--	--	--	--	--	1,574	2.1	1.8 - 2.5	8	8.8	2.8 - 14.9
Hamilton Civic Hospitals (General Division)	76	5.1	3.0 - 7.2	289	5.1	3.9 - 6.2	803	1.1	0.8 - 1.4	411	3.4	2.6 - 4.1
Hamilton Civic Hospitals (Henderson Division)	332	4.6	3.5 - 5.6	487	5.5	4.6 - 6.3	143	0.9	0.4 - 1.4	716	4.4	3.7 - 5.1
Hospital for Sick Children, Toronto	--	--	--	--	--	--	3,087	2.1	1.8 - 2.4	36	2.0	0.3 - 3.6
Hotel Dieu Hospital, Kingston	--	--	--	287	6.2	4.9 - 7.5	1,109	1.4	1.1 - 1.8	296	3.6	2.7 - 4.5
Kingston General Hospital	308	6.6	5.4 - 7.7	433	3.4	2.6 - 4.1	--	--	--	393	2.6	1.9 - 3.2
Mount Sinai Hospital, Toronto	144	10.0	7.9 - 12.1	118	3.8	2.2 - 5.3	120	1.6	0.9 - 2.2	459	2.4	1.8 - 3.0
Ottawa Civic Hospital	287	3.9	2.9 - 4.8	640	3.1	2.5 - 3.6	77	2.9	1.7 - 4.2	442	2.7	2.0 - 3.3
Ottawa General Hospital	148	4.8	3.4 - 6.3	449	2.8	2.2 - 3.5	129	1.4	0.7 - 2.1	354	4.3	3.4 - 5.2
St. Joseph's Hospital, Hamilton	347	7.8	6.6 - 9.1	374	3.6	2.8 - 4.4	969	1.3	1.0 - 1.6	883	2.4	2.0 - 2.9
St. Joseph's Hospital, London	270	8.6	7.2 - 10.0	812	3.7	3.1 - 4.4	909	2.1	1.7 - 2.5	723	3.2	2.7 - 3.8
St. Michael's Hospital, Toronto	82	12.2	9.1 - 15.3	64	2.9	1.2 - 4.7	67	1.4	0.6 - 2.2	203	3.4	2.3 - 4.4
Sunnybrook Health Science Centre, North York	119	6.8	4.9 - 8.6	55	1.8	0.3 - 3.2	18	0.0	0.0 - 0.1	219	6.6	5.2 - 8.0
Toronto Hospital	486	5.6	4.7 - 6.4	227	3.3	2.4 - 4.3	179	0.6	0.3 - 0.9	883	3.0	2.5 - 3.5
University Hospital, London	54	8.0	5.0 - 10.9	828	4.2	3.4 - 4.9	69	1.2	0.2 - 2.2	322	2.4	1.7 - 3.1
Victoria Hospital Corporation, London *	233	5.6	4.5 - 6.8	305	4.8	3.7 - 5.8	850	1.6	1.3 - 2.0	580	2.1	1.6 - 2.6
Wellesley Hospital, Toronto	175	9.6	7.6 - 11.5	184	3.5	2.3 - 4.6	68	3.2	1.8 - 4.6	263	4.2	3.2 - 5.3
Women's College Hospital, Toronto	99	4.9	3.1 - 6.7	1	0.1	0.0 - 1.6	19	0.0	0.0 - 0.1	388	4.8	3.8 - 5.7

* Includes data for Children's Hospital of Western Ontario, London
Note: See Appendix for inclusions/exclusions

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.24: *Unplanned 30 Day Readmission Rates for Selected Surgical Procedures for Medium-sized Hospitals in Ontario, 1993 and 1994*

Institution	Transurethral Prostatectomy			Hip Replacement			Tonsillectomy			Laparoscopic Cholecystectomy		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
Belleville General Hospital	82	4.9	2.90 - 7.0	286	6.4	5.2 - 7.6	273	3.0	2.1 - 3.9	380	5.8	4.8 - 6.8
Brantford General Hospital	122	8.1	6.2 - 10.1	82	5.8	3.9 - 7.8	1,087	1.9	1.6 - 2.3	472	3.9	3.2 - 4.6
Cambridge Memorial Hospital	115	9.1	7.0 - 11.2	137	5.8	4.2 - 7.5	662	3.5	3.0 - 4.1	512	2.8	2.2 - 3.3
Centenary Health Centre, Scarborough	299	3.4	2.5 - 4.4	30	2.7	0.4 - 5.0	910	1.3	1.0 - 1.6	738	3.2	2.7 - 3.8
Credit Valley Hospital, Mississauga	81	7.4	5.0 - 9.8	120	4.4	2.8 - 6.0	478	2.9	2.2 - 3.6	528	2.7	2.1 - 3.4
Doctors Hospital, Toronto	159	9.5	7.5 - 11.5	11	0.1	0.0 - 0.4	455	2.4	1.8 - 3.0	534	4.4	3.6 - 5.1
Etobicoke General Hospital	50	6.0	3.2 - 8.8	174	3.7	2.6 - 4.9	817	2.0	1.6 - 2.5	970	4.2	3.6 - 4.8
General Hospital of Port Arthur, Thunder Bay	16	4.9	0.9 - 9.0	82	3.4	1.8 - 5.0	43	0.0	0.0 - 0.1	80	8.0	5.5 - 10.6
Grand River Hospital Corporation, Kitchener	100	4.1	2.4 - 5.8	39	3.8	1.6 - 6.0	1,746	0.7	0.5 - 0.8	125	2.1	1.1 - 3.1
Greater Niagara General Hospital	123	6.8	4.8 - 8.7	180	4.0	2.9 - 5.2	1,115	3.7	3.2 - 4.2	406	6.2	5.1 - 7.2
Grey Bruce Regional Health Centre, Owen Sound	204	3.6	2.5 - 4.6	63	8.1	5.2 - 11.0	359	3.3	2.6 - 4.1	358	2.9	2.3 - 3.6
Guelph General Hospital	39	13.0	8.8 - 17.2	177	7.4	5.9 - 9.0	691	3.8	3.1 - 4.4	75	3.9	2.1 - 5.7
Hopital Montfort, Ottawa	147	3.4	2.1 - 4.6	97	7.1	5.1 - 9.2	131	1.0	0.4 - 1.6	409	2.2	1.7 - 2.8
Hotel Dieu Hospital, Cornwall	21	0.1	0.0 - 0.3	43	5.5	2.9 - 8.0	245	1.4	0.7 - 2.0	202	3.2	2.2 - 4.1
Hotel Dieu Hospital, St. Catharines	293	7.4	6.2 - 8.7	347	3.3	2.5 - 4.2	174	3.0	2.0 - 3.9	395	5.8	4.8 - 6.8
Hotel Dieu of St. Joseph's Hospital, Windsor	126	8.4	6.5 - 10.2	353	4.3	3.4 - 5.2	1,450	2.5	2.1 - 2.8	431	3.6	2.8 - 4.3
Humber Memorial Hospital, Weston	221	7.9	6.4 - 9.5	155	7.4	5.6 - 9.2	296	3.6	2.7 - 4.5	298	2.8	2.0 - 3.5
Joseph Brant Memorial Hospital, Burlington	171	5.5	4.0 - 7.0	233	4.6	3.5 - 5.6	1,005	0.9	0.6 - 1.1	571	5.4	4.6 - 6.2
Laurentian Hospital, Sudbury	171	5.1	3.7 - 6.5	328	8.7	7.4 - 10.0	722	1.5	1.1 - 1.9	241	2.2	1.4 - 3.0
Markham Stouffville Hospital	105	11.3	8.7 - 14.0	92	5.3	3.2 - 7.4	362	2.8	2.0 - 3.5	331	4.1	3.2 - 5.0
McKellar General Hospital, Thunder Bay	110	8.8	6.6 - 11.0	73	3.2	1.6 - 4.7	615	2.6	2.1 - 3.1	202	2.4	1.5 - 3.3
Metropolitan General Hospital, Windsor	93	8.2	6.0 - 10.4	174	3.1	2.0 - 4.3	98	1.2	0.5 - 2.0	261	0.9	0.4 - 1.4
Mississauga Hospital	212	7.0	5.6 - 8.5	354	2.4	1.7 - 3.1	949	1.8	1.5 - 2.2	1,271	5.4	4.8 - 5.9
North York Branson Hospital	165	8.1	6.4 - 9.9	25	4.7	1.9 - 7.5	45	5.9	3.1 - 8.7	561	2.5	2.0 - 3.0
North York General Hospital	324	4.5	3.5 - 5.6	24	2.3	0.4 - 4.2	860	1.7	1.3 - 2.0	949	2.5	2.1 - 2.9
Northwestern General Hospital, Toronto	70	4.5	2.4 - 6.6	28	2.5	0.4 - 4.6	171	5.2	3.9 - 6.6	343	3.1	2.4 - 3.9
Oakville Trafalgar Memorial Hospital	165	4.2	2.8 - 5.6	269	5.4	4.2 - 6.5	745	0.9	0.6 - 1.2	493	3.5	2.8 - 4.3
Orillia Soldiers' Memorial Hospital	152	7.8	6.0 - 9.6	45	4.8	2.5 - 7.0	435	3.2	2.5 - 4.0	222	2.9	2.0 - 3.7
Oshawa General Hospital	300	4.4	3.4 - 5.4	236	5.0	3.8 - 6.2	1,387	3.7	3.3 - 4.2	695	3.2	2.7 - 3.8
Peel Memorial Hospital, Brampton	305	8.8	7.5 - 10.2	359	5.6	4.5 - 6.6	1,009	1.5	1.2 - 1.8	899	3.8	3.1 - 4.4
Peterborough Civic Hospital	18	0.1	0.0 - 0.4	--	--	--	1,210	3.5	3.0 - 4.0	501	5.2	4.3 - 6.0
Plummer General Hospital, Sault Ste. Marie	110	4.2	2.6 - 5.7	100	4.7	3.1 - 6.3	592	2.8	2.2 - 3.4	180	5.0	3.7 - 6.2
Plummer Memorial Public Hospital, Sault Ste. Marie	40	4.6	2.0 - 7.3	79	3.6	1.9 - 5.3	156	1.2	0.6 - 1.8	200	2.8	1.9 - 3.8
Public General Hospital, Chatham	--	--	--	9	0.0	0.0 - 0.3	3	0.0	0.0 - 0.3	296	1.9	1.3 - 2.5
Queensway General Hospital, Etobicoke	143	8.2	6.4 - 10.1	91	1.9	0.8 - 3.0	197	2.2	1.4 - 3.0	278	2.5	1.6 - 3.3
Queensway-Carleton Hospital, Nepean	106	0.8	0.2 - 1.5	349	1.8	1.2 - 2.4	280	3.1	2.4 - 3.9	645	3.2	2.6 - 3.9
Riverside Hospital, Ottawa	125	3.9	2.4 - 5.3	150	3.9	2.6 - 5.2	163	1.2	0.6 - 1.8	700	4.6	4.0 - 5.3
Royal Victoria Hospital, Barrie	318	5.8	4.7 - 7.0	458	7.5	6.3 - 8.6	737	3.1	2.5 - 3.6	545	4.6	3.9 - 5.4
Salvation Army Grace General, Scarborough	231	2.4	1.6 - 3.4	22	0.1	0.0 - 0.4	353	1.6	1.0 - 2.1	568	3.8	3.1 - 4.6
Salvation Army Grace Hospital, Ottawa	62	3.8	1.6 - 6.0	1	0.1	0.0 - 2.2	5	0.0	0.0 - 0.3	153	0.7	0.1 - 1.2
Salvation Army Grace Hospital, Windsor	41	3.4	1.4 - 5.4	245	5.2	4.0 - 6.4	--	--	--	158	3.3	2.3 - 4.4
Sarnia General Hospital	82	2.4	1.0 - 3.9	130	5.3	3.6 - 6.9	601	2.7	2.1 - 3.3	233	5.6	4.5 - 6.8
Scarborough General Hospital	399	7.1	6.0 - 8.2	254	3.3	2.3 - 4.3	699	1.0	0.7 - 1.3	789	3.2	2.7 - 3.6
St. Catharines General Hospital	--	--	--	44	4.3	2.2 - 6.4	1,048	4.6	4.0 - 5.2	420	4.8	3.8 - 5.7

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Exhibit 8.24: *(cont'd)*

Institution	Transurethral Prostatectomy			Hip Replacement			Tonsillectomy			Laparoscopic Cholecystectomy		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
St. Joseph's General Hospital, Peterborough	433	8.3	7.2 - 9.4	444	2.7	2.0 - 3.4	40	0.0	0.0 - 0.2	119	2.3	1.2 - 3.4
St. Joseph's Health Centre of Sarnia	218	5.9	4.5 - 7.2	164	3.3	2.1 - 4.6	53	6.9	4.6 - 9.2	267	4.5	3.4 - 5.6
St. Joseph's Health Centre, Toronto	390	5.8	4.8 - 6.8	81	6.7	4.5 - 8.9	475	1.8	1.3 - 2.3	595	5.1	4.4 - 5.8
St. Joseph's Hospital, Guelph	186	4.9	3.6 - 6.2	170	1.9	1.0 - 2.8	--	--	--	398	3.4	2.6 - 4.1
St. Mary's General Hospital, Kitchener	355	9.4	8.1 - 10.7	231	4.9	3.7 - 6.1	467	0.3	0.1 - 0.5	871	3.2	2.6 - 3.7
St. Thomas Elgin General Hospital	133	4.6	3.2 - 6.0	127	7.8	5.8 - 9.8	243	5.1	3.9 - 6.2	283	5.2	4.1 - 6.2
Stratford General Hospital	78	2.7	1.1 - 4.3	219	7.2	5.5 - 8.8	594	2.5	1.9 - 3.1	233	2.6	1.6 - 3.5
Sudbury General Hospital of the Immaculate Heart of Mary	--	--	--	--	--	--	304	1.6	1.0 - 2.2	335	4.4	3.5 - 5.2
Sudbury Memorial Hospital	--	--	--	--	--	--	--	--	--	397	3.6	2.8 - 4.3
Timmins and District Hospital	64	6.3	3.7 - 8.8	124	5.7	3.8 - 7.5	81	1.2	0.2 - 2.1	256	5.4	4.3 - 6.5
Toronto East General and Orthopedic Hospital	622	5.2	4.5 - 5.9	52	1.8	0.3 - 3.4	640	4.2	3.6 - 5.0	653	2.4	2.0 - 3.0
Welland County General Hospital	123	6.8	4.9 - 8.8	221	4.1	3.0 - 5.1	298	0.4	0.2 - 0.7	314	4.4	3.5 - 5.4
Windsor Western Hospital	168	9.4	7.6 - 11.3	146	6.3	4.7 - 7.9	413	2.3	1.7 - 2.9	245	7.8	6.5 - 9.0
Woodstock General Hospital	97	4.4	2.8 - 6.0	203	10.6	8.8 - 12.5	169	0.6	0.1 - 1.0	240	3.8	2.8 - 4.8
York Central Hospital, Richmond Hill	169	3.4	2.1 - 4.6	18	4.2	0.8 - 7.8	283	1.3	0.8 - 1.9	477	2.5	2.0 - 3.0
York County Hospital, Newmarket	273	10.6	9.0 - 12.1	145	6.9	5.2 - 8.7	884	2.7	2.3 - 3.2	498	3.8	3.1 - 4.5
York-Finch General Hospital, North York	88	6.6	4.4 - 8.8	33	5.2	2.2 - 8.2	559	3.0	2.4 - 3.6	587	2.0	1.5 - 2.4

Note: See Appendix for inclusions/exclusions

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 8.25: *Unplanned 30 Day Readmission Rates for Selected Surgical Procedures for Smaller-sized Hospitals in Ontario, 1993 and 1994*

Institution	Transurethral Prostatectomy			Hip Replacement			Tonsillectomy			Laparoscopic Cholecystectomy		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
Ajax and Pickering General Hospital	4	0.0	0.0 - 0.4	32	2.8	0.6 - 5.0	195	1.4	0.6 - 2.3	245	2.5	1.7 - 3.2
Alexandra Hospital, Ingersoll	--	--	--	--	----		26	4.3	0.9 - 7.7	49	2.2	0.4 - 4.0
Alexandra Marine and General Hospital, Goderich	--	--	--	2	0.0	0.0 - 0.4	1	0.0	0.0 - 0.3	106	5.4	3.6 - 7.2
Arnprior and District Memorial Hospital	--	--	--	--	--	--	12	0.0	0.0 - 0.1	110	2.4	1.2 - 3.6
Brockville General Hospital	83	9.5	6.8 - 12.2	119	4.2	2.7 - 5.8	63	1.9	0.4 - 3.3	209	4.2	2.7 - 5.7
Bruce County General Hospital, Walkerton	--	--	--	3	0.0	0.0 - 0.2	74	0.4	0.0 - 1.0	28	4.4	0.9 - 7.8
Campbellford Memorial Hospital	--	--	--	--	--	--	96	1.3	0.2 - 2.3	89	0.9	0.2 - 1.6
Central Hospital, Toronto	103	3.1	1.6 - 4.5	1	0.0	0.0 - 0.8	160	1.9	1.0 - 2.8	190	6.7	5.1 - 8.4
Centre Grey General Hospital, Markdale	--	--	--	7	5.9	0.2 - 11.6	10	0.0	0.0 - 0.2	6	0.1	0.0 - 0.8
Charlotte Eleanor Englehart Hospital, Petrolia	--	--	--	--	--	--	13	0.0	0.0 - 0.1	38	5.6	2.5 - 8.7
Cobourg District General Hospital	--	--	--	--	--	--	171	5.6	3.7 - 7.4	60	3.5	1.5 - 5.5
Collingwood General and Marine Hospital	22	0.0	0.0 - 0.1	11	0.0	0.0 - 0.0	146	0.8	0.3 - 1.2	129	5.8	4.2 - 7.4
Cornwall General Hospital	5	0.0	0.0 - 0.2	49	0.0	0.0 - 0.1	30	0.0	0.0 - 0.0	99	0.9	0.2 - 1.6
Douglas Memorial Hospital, Fort Erie	--	--	--	3	0.0	0.0 - 0.2	23	0.0	0.0 - 0.1	38	7.6	3.5 - 11.7
Dryden District General Hospital	--	--	--	--	--	--	--	--	--	23	0.1	0.0 - 0.5
Dufferin-Caledon Health Care Corporation, Orangeville	--	--	--	1	0.0	0.0 - 0.4	371	8.2	6.8 - 9.7	139	2.2	1.2 - 3.2
Georgetown and District General Hospital	23	8.5	3.7 - 13.3	--	--	--	89	1.5	0.3 - 2.8	79	1.3	0.2 - 2.4
Glengarry Memorial Hospital, Alexandria	--	--	--	--	--	--	--	--	--	--	--	--
Great War Memorial Hospital of Perth	--	--	--	25	3.5	0.5 - 6.5	--	--	--	74	3.2	1.4 - 5.0
Groves Memorial Community Hospital, Fergus	--	--	--	--	--	--	182	2.8	1.8 - 3.9	91	3.4	1.8 - 5.0
Haldimand War Memorial Hospital, Dunnville	--	--	--	9	23.4	12.2 - 34.5	21	0.0	0.0 - 0.1	60	3.4	1.5 - 5.4
Hanover and District Hospital	--	--	--	2	10.6	0.0 - 26.7	72	0.6	0.1 - 1.2	65	1.4	0.2 - 2.4
Hawkesbury and District General Hospital	--	--	--	--	--	--	47	3.0	0.6 - 5.4	114	2.0	0.8 - 3.1
Huntsville District Memorial Hospital	--	--	--	5	0.0	0.0 - 0.2	40	6.9	3.9 - 9.9	120	3.8	2.4 - 5.1
Huronia District Hospital, Midland	--	--	--	--	--	--	21	0.0	0.0 - 0.1	114	4.2	2.6 - 5.9
Kemptville District Hospital	--	--	--	--	--	--	--	--	--	--	--	--
Kincardine and District General Hospital	--	--	--	--	--	--	49	1.4	0.2 - 2.5	39	2.7	0.5 - 4.9
Kirkland and District Hospital	--	--	--	13	4.6	0.7 - 8.6	131	0.0	0.0 - 0.0	72	6.6	4.2 - 9.0
Lake of the Woods District Hospital, Kenora	--	--	--	5	0.0	0.0 - 0.2	46	1.2	0.1 - 2.3	81	4.4	2.4 - 6.4
Leamington District Memorial Hospital	--	--	--	4	0.0	0.0 - 0.2	44	0.0	0.0 - 0.0	176	3.0	2.0 - 4.0
Lennox and Addington County General Hospital, Napanee	--	--	--	1	0.0	0.0 - 0.4	35	0.0	0.0 - 0.1	135	6.2	4.6 - 7.8
Listowel Memorial Hospital	--	--	--	--	--	--	50	0.0	0.0 - 0.1	62	7.1	4.3 - 9.8
Manitoulin Health Centre, Little Current	--	--	--	--	--	--	2	0.0	0.0 - 0.2	--	--	--
Meaford General Hospital	--	--	--	11	0.0	0.0 - 0.1	8	0.0	0.0 - 0.1	--	--	--
Memorial Hospital, Bowmanville	--	--	--	--	--	--	104	6.0	3.7 - 8.3	80	3.2	1.7 - 4.6
Milton District Hospital	5	0.0	0.0 - 0.3	6	0.0	0.0 - 0.1	3	0.0	0.0 - 0.1	139	6.5	4.9 - 8.2
Norfolk General Hospital, Simcoe	47	4.0	1.7 - 6.4	14	4.5	1.0 - 8.1	240	1.9	1.2 - 2.6	293	3.4	2.5 - 4.3
North Bay Civic Hospital	132	6.1	4.2 - 8.0	134	5.0	3.2 - 6.8	457	5.1	3.9 - 6.3	--	--	--
Notre Dame Hospital, Hearst	10	0.0	0.0 - 0.2	--	--	--	31	0.0	0.0 - 0.1	19	10.0	4.5 - 15.5
Parry Sound District General Hospital	--	--	--	5	0.0	0.0 - 0.1	47	2.0	0.4 - 3.6	79	3.8	2.2 - 5.4
Pembroke Civic Hospital	60	4.0	1.8 - 6.3	--	--	--	53	3.6	1.9 - 5.3	294	6.0	4.8 - 7.2
Pembroke General Hospital	40	10.4	6.4 - 14.5	--	--	--	190	3.0	1.7 - 4.3	--	--	--
Penetanguishene General Hospital												
Port Colborne General Hospital	63	5.8	3.4 - 8.2	26	4.2	0.6 - 7.7	18	0.0	0.0 - 0.1	105	3.5	1.9 - 5.1
Prince Edward County Memorial Hospital, Picton	--	--	--	1	0.0	0.0 - 0.3	115	0.0	0.0 - 0.1	60	1.6	0.3 - 3.0

Continued on next page

Exhibit 8.25: *(cont'd)*

Institution	Transurethral Prostatectomy			Hip Replacement			Tonsillectomy			Laparoscopic Cholecystectomy		
	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval	# of Cases	Readmission Rate (%)	95% Confidence Interval
Renfrew Victoria Hospital	--	--	--	--	--	--	5	0.0	0.0 - 0.2	57	7.6	4.6 - 10.6
Riverside Health Care Facilities, Fort Frances	14	7.8	1.7 - 13.9	10	2.7	0.1 - 5.2	139	1.6	0.8 - 2.4	136	9.5	7.3 - 11.7
Ross Memorial Hospital, Lindsay	13	0.0	0.0 - 0.1	39	13.0	8.0 - 18.0	88	4.0	2.2 - 5.9	330	3.7	2.9 - 4.5
Sensenbrenner Hospital, Kapuskasing	--	--	--	--	--	--	162	1.7	1.0 - 2.5	6	0.1	0.0 - 1.0
Smiths Falls Community Hospital	53	11.0	7.0 - 15.0	39	13.2	8.3 - 18.1	123	2.4	1.2 - 3.5	98	0.8	0.2 - 1.6
South Muskoka Memorial Hospital, Bracebridge	84	5.0	3.0 - 7.1	4	8.3	0.0 - 17.1	--	--	--	86	4.8	2.9 - 6.7
St. Joseph's General Hospital, Blind River	--	--	--	--	--	--	--	--	--	--	--	--
St. Joseph's General Hospital, Elliott Lake	--	--	--	--	--	--	110	4.1	2.1 - 6.0	86	2.3	1.0 - 3.7
St. Joseph's General Hospital, North Bay	--	--	--	--	--	--	29	0.0	0.0 - 0.1	408	4.1	3.3 - 4.9
St. Joseph's General Hospital, Thunder Bay	92	4.8	3.0 - 6.6	26	0.0	0.0 - 0.0	65	3.2	1.3 - 5.0	330	6.4	5.2 - 7.5
St. Joseph's Hospital, Brantford	57	2.3	0.3 - 4.3	164	2.0	1.0 - 3.1	--	--	--	81	1.8	0.4 - 3.3
St. Joseph's Hospital, Chatham	149	9.1	7.2 - 11.0	164	8.4	6.1 - 10.7	422	4.0	3.1 - 4.8	72	1.8	0.4 - 3.3
St. Mary's Memorial Hospital, St. Mary's	--	--	--	--	--	--	--	--	--	--	--	--
St. Vincent de Paul Hospital, Brockville	60	6.9	4.4 - 9.5	--	--	--	173	0.8	0.2 - 1.5	--	--	--
Stevenson Memorial Hospital, Alliston	--	--	--	--	--	--	313	5.3	4.0 - 6.6	1	0.1	0.0 - 1.9
Strathroy Middlesex General Hospital	91	3.8	2.2 - 5.5	5	0.0	0.0 - 0.1	105	3.0	1.6 - 4.4	140	6.8	5.1 - 8.6
Sydenham District Hospital, Wallaceburg	27	19.3	13.0 - 25.5	8	0.0	0.0 - 0.3	--	--	--	68	2.0	0.4 - 3.6
Temiskaming Hospital, New Liskeard	15	6.1	1.2 - 11.1	--	--	--	117	1.3	0.6 - 2.1	65	7.4	5.2 - 9.8
Tillsonburg District Memorial Hospital	--	--	--	13	10.7	4.1 - 17.3	82	2.0	0.8 - 3.2	120	3.6	2.2 - 5.1
Trenton Memorial Hospital	83	5.8	3.5 - 8.1	--	--	--	223	1.8	1.1 - 2.6	269	4.8	3.8 - 5.9
West Haldimand General Hospital, Hagersville	--	--	--	--	--	--	--	--	--	--	--	--
West Lincoln Memorial Hospital, Grimsby	--	--	--	--	--	--	137	1.3	0.5 - 2.0	124	1.6	0.6 - 2.6
West Nipissing General Hospital, Sturgeon Falls	--	--	--	--	--	--	--	--	--	--	--	--
Whitby General Hospital	49	2.0	0.3 - 3.7	--	--	--	26	0.0	0.0 - 0.1	81	4.0	1.7 - 6.2
Willett Hospital, Paris	--	--	--	--	--	--	1	0.0	0.0 - 0.8	--	--	--
Winchester District Memorial Hospital	--	--	--	--	--	--	84	2.0	1.0 - 3.0	192	2.5	1.6 - 3.4
Wingham and District Hospital	--	--	--	--	--	--	51	0.0	0.0 - 0.1	54	1.6	0.3 - 2.9

Note: See Appendix for inclusions/exclusions

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Appendix A8.1: *Medical Conditions: Inclusion/Exclusion Criteria and Adjustments*

Diagnosis Name	Diagnosis Code	Diagnosis Adjustment	Procedure Code	Procedure Adjustment	Age Restriction	Include Cases from Day Surgery file
Acute Myocardial Infarction	410				A	
Angina	411	✓			A	✓
	413	✓				
Chest Pain	786.5				A	✓
Congestive Heart Failure	428.0 428.1 428.9				A	
Asthma	493.0 493.1 493.9				A , P	
Chronic Obstructive Pulmonary Disease	491.1 491.2 491.8 491.9 492 494	✓			A	
	496	✓				
Croup	464.4				P	
Pneumonia	481 482.2 482.3 482.9 483 485 486 487				All	✓
Abdominal Pain	789.0		*	✓	A , P	✓
Gastroenteritis	558				A , P	✓
Cerebrovascular Accident	431 434.0 434.1 434.9 436		**	✓	A	
Convulsion	780.3				A , P	✓
Cesarean Section	654.2	✓			A	
	641 641.1 641.2 641.8 641.9 645 652.2 653.4 656.3	✓	86.0	✓		
	660.0 660.1 660.2 660.4 660.6 660.7 660.8 660.9 644.1 652.0 652.1 652.2 652.3 652.4 652.5 652.7 652.8 652.9 653.0 653.1 653.2 653.3 653.4 653.8 653.9 663.0 663.1 663.2 663.3 663.4 663.5 663.6 663.8 663.9 661.2	✓	86.1 86.8 86.9	✓ ✓		
Normal Delivery	650				A	
Threatened Premature Labour	644.0				A	
Trauma to Perineum	664.0	✓	84.0 84.71 84.79 85.09 85.69 87.98	✓	A	
	664.1	✓	87.89	✓		
	664.2	✓	84.1 85.7	✓		
Fetal Distress	656.3				A	
Neonate	V300				N	

Age Restriction:
P = Pediatric - 0 - 17 Years
A = Adult - 18+ Years
E = Elderly - 50+ Years
N = Newborn - Birth in Hospital
All = No Age Restriction

Diagnosis/Procedure Adjustments: Regression model includes adjustment factors for these diagnosis/procedure subgroups

* Includes procedure codes 0x.xx only
** Includes procedure codes 14.xx only
Note: .xx = any extension

Appendix A8.2: *Surgical Procedures: Inclusion/Exclusion Criteria and Adjustments*

Procedure Name	Procedure Code	Procedure Adjustment	Associated Diagnosis Code	Diagnosis Adjustment	Age Restriction
Appendectomy	59.0		289.2 540.9 541 542 543 789.0	✓	A , P
			540.0 540.1	✓	
Total Cholecystectomy	63.12		574.0 574.1 574.3 574.4 575.0 575.1	✓	A
			574.2 574.5 789.0	✓	
Laparoscopic Cholecystectomy	63.14		574.0 574.1 574.3 574.4 575.0 575.1	✓	A
			574.2 574.5 789.0	✓	
Hernia Repair	65.0 65.1 65.2	✓	550.1	✓	A , P
	65.02 65.12	✓	550.9	✓	
	65.03 65.13	✓			
	65.04 65.14	✓			
	65.21 65.22 65.23 65.24	✓			
	65.31 65.32 65.33 65.34	✓			
Excision of Breast Lesions	97.11 97.81 97.82 97.91		61x.x 214 217 216.5 706.2	✓	A
			17x.x 233.0 V711	✓	
Hemmorhoidectomy	61.36	✓	455.0 455.1 455.3 455.4 455.6 455.7 455.9	✓	A
	61.35	✓	455.2 455.5 455.8	✓	
Stripping/Ligation Varicose Vein	50.48		454.9	✓	A
			454.0 454.1 454.2	✓	
Hip/Knee Replacement	93.51 93.59 93.62	✓	715.1 715.2 715.3 715.8 715.9 733.4	✓	E
	93.41 93.47	✓	820.0 820.1 820.3 820.8 820.9	✓	
			996.4 996.5 996.6 996.7	✓	
Arthroscopy	92.32 92.85		Any		A
Bunionectomy	89.41 89.42 89.43 89.44 89.49		735.0	✓	A
			727.1	✓	
Carpal Tunnel Release	17.33		354.0		A
Needle Biopsy of the Prostate	72.91		599.6 599.7 599.9 600 601.x 602.x	✓	A
			185 V711	✓	
Transurethral Excision Lesion of Bladder	69.21 69.29		All except V670		A
Urethral Stricture Release	69.91	✓	595.x 596.x 597.x 598.x 599.x 600 601.1 625.6 788.x		A
	70.4	✓			
	69.92 70.5	✓			

Appendix A8.2: *(cont'd)*

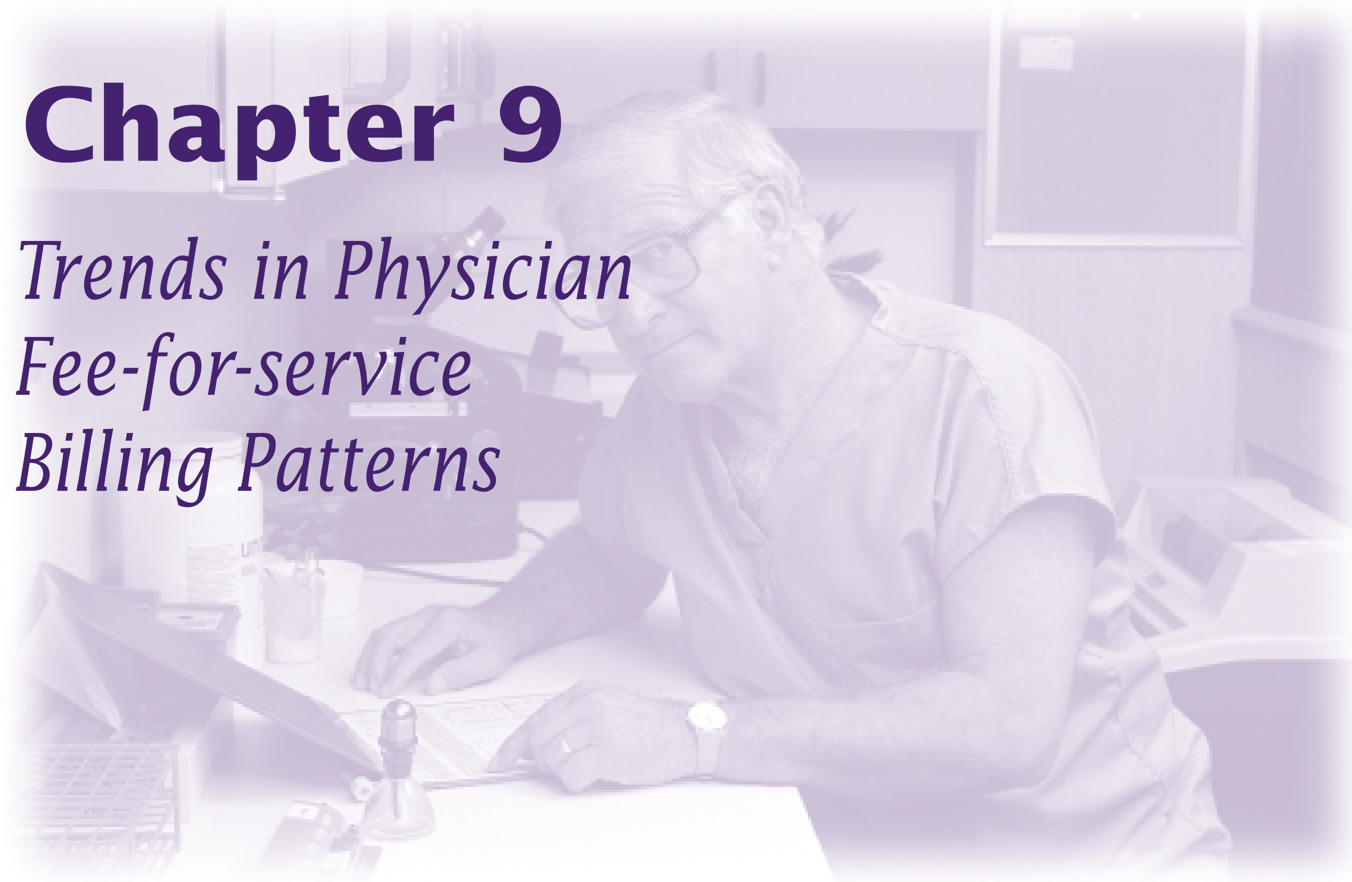
Procedure Name	Procedure Code	Procedure Adjustment	Associated Diagnosis Code	Diagnosis Adjustment	Age Restriction
Transurethral Prostatectomy	72.1		600		A
Transurethral Clearance of Calculus	68.0		592.1		A
Hysterectomy	80.19 80.2 80.3 80.4	✓ ✓ ✓ ✓	617.0 617.1 617.2 617.3 617.8 617.9 618.0 618.1 618.2 618.3 618.4 618.8 618.9 620.2 621.0 621.1 621.2 621.3 614.3 614.4 614.5 614.6 614.7 614.8 614.9 615.0 615.1 615.9 616.0 625.3 625.6 625.8 625.9 626.2 626.4 626.8 626.9 627.0 627.1 218	✓ ✓ ✓ ✓ ✓	A
Laparoscopy	66.83		218 568.0 614.6 62x.x V25.x V26.x 256.4 614 617.x 789.0	✓ ✓	A
Tonsillectomy	40.1 40.2 40.3 40.5 *	✓ ✓ ✓ ✓	474.0 474.1 474.9 463		P
Deviated Nasal Septum	33.4 33.76	✓ ✓	470.x 471.x 472.x 473.x 738.0 748.1 V501	✓ ✓	A
Tooth Extraction	35.19		520.x 521.x 522.x 523.x 524.x 525.x		All
Lens Replacement	27.61 27.62 27.69 27.41 27.49 27.51 27.59 **	✓ ✓ ✓	366.1 366.9		A

Age Restriction: P = Pediatric - 0 - 17 Years
A = Adult - 18+ Years
E= Elderly - 50+ Years
N = Newborn - Birth in Hospital
All = No Age Restriction

Diagnosis/Procedure adjustments : Regression model includes adjustment factors for these diagnosis/procedure codes

* If there is a secondary procedure code of 40.7, include adjustment factor for this complication
** If the primary procedure code is 27.71, 27.72 or 27.73 and there is a secondary lens code (as listed above), use the secondary lens code

Note: .x = any extension



Chapter 9

Trends in Physician Fee-for-service Billing Patterns

Introduction

Chapter 3 presented an analysis of trends in expenditures on physician services by category of service and by the age and sex of patients who received services. This chapter examines expenditures on physician services in terms of the characteristics of the physicians providing the services. An analysis from this perspective provides insight into trends in physician supply and changes in billing patterns for different groups of physicians. This information plays an important role in better understanding what has happened to Ontario Health Insurance Plan (OHIP) expenditures over the last few years and in ensuring the effectiveness of future reimbursement policies.

OHIP remunerates physicians through fee-for-service reimbursement and represents 95% of total Ministry of Health (MOH) physician expenditures in the province. The remaining 5% of expenditures are made under the Alternate Funding Plan (AFP) such as capitation or salary, according to the MOH. Under fee-for-service reimbursement, physicians are paid for each insured service they provide. The services covered and the fee paid for each of these services are listed in the OHIP Schedule of Benefits. Since the establishment of universal health insurance, the MOH and the Ontario Medical Association (OMA) have negotiated changes in overall fee levels. The OMA established fees for each service or fee code item found in the Schedule of Benefits on the basis of the negotiated levels. After extra-billing was banned in Ontario in 1986, the fee listed in the Schedule of Benefits became the full payment received by the physician for each insured service provided. Although this process of Ministry–OMA negotiations established ceilings on fees, it did not limit total OHIP fee-for-service expenditures or the amount an individual physician could bill for OHIP-insured services. Even if fees remained constant, total expenditures could increase as the volume (i.e. quantity) of services increased.

Starting in 1991, the OMA and the MOH agreements not only established fee levels but also set limits on overall OHIP fee-for-service expenditures. A chronology and brief description of these agreements are contained in Exhibit 9.1. One major milestone was the introduction of individual billing thresholds; individual physician billings for certain services were subject to a fee reduction if billings exceeded a set amount. A second major milestone was the OMA and MOH's agreement to share the cost of utilization increases (a so-called "soft cap") under the April 1991 Interim Agreement on Economic Arrangements and the introduction of a limit on total OHIP expenditures (a so-called "hard cap") as part of the provincial government's Social Contract legislation in 1993. A third milestone was an attempt to reduce the supply of physicians in the province by restricting new billing numbers to Ontario graduates, except in under-serviced areas. This policy was also part of the 1993 Social Contract which ended March 31, 1996.

Exhibit 9.1: ***Major Policy Changes Affecting OHIP in Ontario, 1989/90 – 1994/95***

Date	General Policy Changes	Threshold Levels	Major Fee Schedule Adjustments	Utilization Adjustments
April 1991	• 1991 Interim Agreement on Economic Arrangements • Excess adjusted utilization growth over 1.5% to be shared by Ministry of Health and physicians • Ministry of Health to reimburse difference between 1986 and current year Canadian Medical Protective Association dues	Established at $400,000 (⅓ reduction in billings above $400,000) $450,000 (⅔ reduction in billings above $450,000)	Fee increase of 3.95% announced but not implemented for 6 months	2% retroactive payment of total billings from 1989/90 to 1990/91
October 1991			Fee increase of 3.95% implemented	Retroactive payment of 3.95% of billings from April 1 to Sept 30, 1991
December 1991	OMA Dues Act provides OMA with right to represent all fee-for-service physicians			
October 1992	1992 Interim Agreement on Economic Arrangements	Raised to $402,000 and $452,250	Fees increased by 1%	
April 1993		Raised to $404,000 and $454,500		
August 1993	1993 Interim Agreement on Economic Arrangements Hard caps on utilization set at: $3.850 billion for 1993/94 $3.085 billion for 1994/95 and 1995/96			
October 1993			Temporary fee reduction of 4.8% of October 1992 level	
April 1994			• Fees readjusted to October 1992 level • Delisting of selected cosmetic surgery, reversal of sterilization and circumcision • Replacement of Emergency Department Equivalent bonus (E030) with partial assessment fee (A888)	
June 1994			Social Contract fee reduction of 2% of October 1992 level	
November 1994				Utilization adjustment of $16 million recovered from physicians
December 1994			Social Contract fee reduction of 6% of October 1992 level	

This chapter describes changes in OHIP fee-for-service expenditures between 1989/90 and 1994/95, a period that encompassed important changes in fee-for-service reimbursement. It also examines trends in expenditures for services provided by specific groups of physicians, as defined by their specialty, practice location, age, sex and billing profile. Overall expenditures are the product of the number of physicians billing and the average billings per physician. The analysis examines these variables and estimates the extent to which they affected expenditure growth or decline. The specific questions addressed include:

- Did regional differences in fee-for-service expenditures increase or decrease? (Chapter 4 provides more information on overall expenditures.)
- What differences were there in billings across different specialties, and how were billings distributed within specialties?
- Did the mix of services provided (e.g., office visits, psychotherapy, and diagnostic and therapeutic procedures) change over time for different specialties?
- Did physician billings vary by the age and sex of the physician, and did these variations change over time?
- What proportion of billings was accounted for by high-billing physicians?
- To what extent were changes in expenditures driven by changes in the number of practising physicians or by changes in billings per physician?

The complex set of policy initiatives related to physician reimbursement, some of which have been completed and some of which are still ongoing, means that there is a continually shifting level of payment for services provided. We have used fee-for-service billings as reported to the National Physician Database (NPDB) as the basis for our analysis. The NPDB provides an accurate description of services provided but does not completely describe the amount actually paid to physicians. This is because the database records the amount billed before certain retroactive and concurrent adjustments to billings are implemented. Where relevant to the analysis, we have estimated expenditures both before and after these adjustments were made.

Although the analysis examines OHIP fee-for-service billings by different physician groups, it does not measure net professional income of these groups. Net professional income is the difference between total earnings and expenses. OHIP fee-for-service payments may represent only a portion of a physician's professional income. Other sources may include private insurance and Workers' Compensation Board payments, administrative fees charged to patients, salaries and sessional fees. Fee-for-service physicians have a range of professional expenses such as office rent, employees' salaries, supplies, equipment and professional dues. For diagnostic and therapeutic procedures performed in hospitals, the technical fee intended to defray the costs of performing the procedure is often remitted directly to hospitals, not to physicians. Neither secondary income sources nor expenses are included in our data, and payments to hospitals have not been subtracted from individual physician billings. To avoid confusion between billings and income, we provide some estimates of net income (gross income less expenses) to place billing information in its proper context.

Although the billing data provide information on services delivered and on payments to physicians, it does not offer insight into the indications for providing the service, the appropriateness or quality of care, or the impact on population health. This type of analysis would require access to diagnostic and clinical outcome data, which the NPDB does not contain.

Data Source and Methods

The analysis is based on National Physician Database (NPDB) data on OHIP fee-for-service billings from 1989/90 to 1994/95, obtained from the Canadian Institute for Health Information.

The NPDB contains quarterly summaries of claims submissions for each physician and each fee code, as well as a record of each physician's sex, date of birth, specialty, year of graduation, year of specialization, medical school and postal code. OHIP remunerates all physician services performed by all participating fee-for-service physicians, with the exception of diagnostic and therapeutic procedures on inpatients and laboratory services performed in hospitals on both an inpatient and outpatient basis (see the Methods section of Chapter 3 for a full description of services covered). Payments to physicians outside Ontario and payments for services rendered to non-Ontario residents within the province were beyond the scope of this analysis.

Billings were measured in both actual and price-adjusted dollars. Price-adjusted billings measure expenditure growth if prices had not fluctuated during the study period. We created a reference list of standard prices for each fee code; standard prices equalled total billings divided by the number of services in 1994/95. Special adjustments were made in the case of fee code splits and substitutions. The price-adjusted billings for a fee code in any given year are the number of services billed in that year multiplied by the standard price. A more detailed description of how standard prices were calculated is found in the Methods section of Chapter 3.

The OHIP billing database excludes remuneration to physicians through AFPs. Although these plans account for only 5% of total physician expenditures, their concentration in certain specialties or geographic areas could distort the analyses in this chapter. We paid particular attention to four large AFPs: the recently created South East Academic Medical Organization (SEAMO) in Kingston; the Hospital for Sick Children in Toronto; the Sault Ste. Marie Group Health Centre; and physician-sponsored Health Service Organizations (HSOs), half of which are located in the Hamilton–Wentworth and Waterloo

Region District Health Councils in the Central West region of the province. For each of these large AFPs, we estimated the direction and magnitude of bias that could affect the utilization measures.

The data do not include the 2% retroactive payments on billings made in 1989/90 and 1990/91, the retroactive payments of $74.1 million and $14.2 million in 1991/92 and 1992/93 respectively for delayed implementation of price increases, or a utilization "clawback" of $16.0 million in 1993/94 and $178.6 million in 1994/95. These utilization adjustments represented the amount by which total physician billings exceeded the negotiated ceiling; this amount was recovered from physicians in the next fiscal year. As well, the data do not include threshold reductions, which amounted to $33 million in 1991/92, $23 million in 1992/93, $15 million in 1993/94 and $17 million in 1994/95, according to the MOH.

These data exclusions produce distortions in the interpretation of total expenditures and average billings per physician over time. To present a more accurate picture of the actual amount received by physicians, we also calculated actual gross payments to physicians, a figure that takes into account all of the aforementioned payment adjustments, less OHIP payments to hospitals for technical components of procedures. The source of this data on hospital payments was a separate data analysis provided by the MOH to the OMA. The calculation of actual gross payments also included a $35.6 million net shift from the fee-for-service expenditure pool to AFPs in the middle of 1994/95. Under the 1993 Interim Agreement on Economic Arrangements, shifts from fee-for-service to AFP were to result in equal reductions in the amount of the hard cap and, ultimately, an increase in any necessary utilization adjustments. By adding back $35.6 million, the total amount paid to physicians in that year is more accurately reflected.

Net income after expenses was estimated on the basis of total payments to physicians and data from the OMA on overhead-to-billings ratios. This OMA data was based on a proprietary Statistics Canada analysis of professional income and expenses reported to Revenue Canada by a sample of full-time Ontario physicians. Like other self-employed professionals, physicians are able to claim office-related expenses to reduce the amount owed for income tax. The overhead-to-billings ratios were 37.1%, 37.8%, 38.6% and 39.1% for taxation years 1989 to 1992, respectively. The ratio was assumed to remain constant in subsequent years.

Physicians participating in OHIP must register their specialty designation, as defined by the Royal College of Physicians and Surgeons. All physicians without a Royal College certified specialty register as non-specialists, and no distinction is made between general practitioners and family physicians (GP/FPs) certified by the College of Family Physicians of Canada. To verify the accuracy of specialty information, the number of physicians in each specialty group, as calculated from the NPDB, was compared to the number calculated from the Ontario Physician Human Resources Data Centre (OPHRDC), a database that pools physician information from the College of Physicians and Surgeons, OHIP and other sources. The NPDB data on most major subspecialties were consistent with the OPHRDC data to within 90%. The major exceptions were the internal medicine subspecialties (e.g. cardiologists and respirologists). Although the total number of medical specialists counted in the NPDB was consistent with that in the OPHRDC, the number in each subspecialty group was much less in the NPDB than in the OPHRDC, suggesting that many subspecialists were being coded as general internists. This is not surprising, because the amount billable for consultations and procedures does not vary by internal medicine subspecialty; hence, there is no reason for physicians to change their designation from general internist to subspecialist after attainment of their subspecialty. Because we could not distinguish between subspecialties, all medical subspecialties were grouped with general internal medicine and labelled "medical specialists". For similar reasons, we also grouped diagnostic radiologists with nuclear medicine specialists. Cardiovascular, vascular and thoracic surgeons also could not be reliably identified and were grouped with general surgeons. Emergentologists were included with medical specialists.

A Statistics Canada Postal Code Conversion file was used to link each physician's postal code for the registered practice location to the MOH planning region and District Health Council (DHC) area. Physicians may have moved or changed specialties within the course of a given fiscal year; in such instances, we assigned to each physician their location and specialty during the last quarter of the year. Because certain specialty services may be provided only at regional referral centres, specialist services were analysed only at the level of the six MOH planning regions. Services provided by GP/FPs are more likely to be obtained locally, and GP/FP billings were analysed for both the health planning region and DHC. Statistics Canada census data for the populations in each DHC and MOH planning region were used as denominators to calculate expenditure rates.

Services were categorized according to the same scheme described in previous chapters: outpatient assessments and visits to consultants; hospital visits; psychotherapy and counselling; diagnostic and therapeutic procedures; surgical procedures; and special premiums. A full description of these categories is found in the Methods section of Chapter 3. We excluded laboratory services provided by private laboratories (L-series codes in the Schedule of Benefits), since the payment for these procedures was not subject to the cap on physician services (with one exception, noted below). Laboratory procedures performed in physicians' offices were classified under diagnostic and therapeutic procedures.

We counted only physicians defined as "active" in the calculation of physician supply. During the course of a year, some physicians enter practice and others leave. Alternatively, some physicians may devote only a portion of their time to fee-for-service practice. An analysis that included physicians who were only minimally active would have distorted the estimate of the number of physicians in the province. In this chapter, a dollar value of billings was used as a cutoff to define an active physician. As the billing cutoff is raised, the sample is more likely to contain only active physicians. However, raising the cutoff excludes more and more physicians from the analysis.

The cutoff used in this analysis was annual billings of more than $35,000. This definition excluded 15% of the physicians identified in the NPDB as having billed OHIP. However, these 15% of physicians accounted for only 1% of total OHIP expenditures in any year. A cutoff of $35,000 in annual billings may be considered conservative and was chosen to ensure completeness of the data. We also performed a sensitivity analysis using a less conservative cutoff of $60,000 per year. This analysis, although not providing as complete an accounting of overall OHIP expenditures, yielded very similar results in terms of the relationship of various physician characteristics to billing patterns. The results of the analysis using the $60,000 cutoff are included in the electronic version of the ICES *Practice Atlas.* The consistency of the analyses using the two different cutoff points suggests that the main findings are not very sensitive to the billing cutoff used to define an active physician.

To verify the concordance of NPDB data with MOH and OMA data, we attempted to reconcile total expenditures in 1993/94 and 1994/95 with the hard cap in those years. Several special adjustments were made to total Ontario physician billings in the calculation of the amount subject to the expenditure cap. First, laboratory services representing interpretation of tests by pathologists (L800 series in the Schedule of Benefits) were added back to total expenditures. Second, tests paid for by other ministries such as the Ministry of Community and Social Services and the Attorney General were subtracted. These amounts were calculated at $12.8 and $12.9 million in 1993/94 and 1994/95 respectively. After taking into account these special adjustments, as well as threshold reductions, utilization adjustments and shifts from fee-for-service to AFP, our calculations for total expenditures differed from those of the MOH by less than 0.3%.

Exhibit 9.2 lists each measure of OHIP physician activity described above and summarizes key points for interpretation.

Exhibit 9.2: ***Description of OHIP Physician Activity Measures***

Measure	Interpretation
Billings	Amount billed by physicians to OHIP: • Includes Social Contract fee holdbacks in 1993/94 and 1994/95 • Excludes retroactive payments, utilization adjustments and threshold payment reductions • Includes portion of physician billings for technical component of procedures remitted directly to hospitals
Price-adjusted Billings	Amount that would have been billed to OHIP had prices remained constant
Actual Gross Payments to Physicians	Billings after taking into account: • Social Contract fee holdbacks • Retroactive payments • Utilization adjustments • Threshold payment reductions Does not include payments to hospitals for technical component of procedures Includes special mid-year Alternate Funding Plan adjustments in 1994/95
Net Payments to Physicians	Gross payments to physicians MINUS estimated expenses
Active Physicians	Physicians in active practice in Ontario who bill at least $35,000 per year

Findings

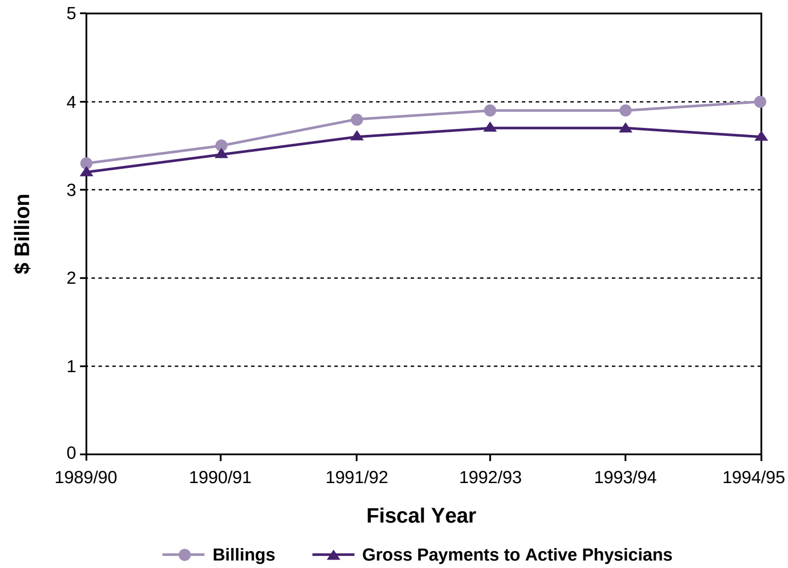
General Trends

From 1989/90 to 1992/93, OHIP fee-for-service billings, excluding billings by private laboratories, increased by 21.3% (6.7% compound annual rate), from $3.256 to $3.950 billion. In 1993/94, billings decreased by 1.7%, to $3.881 billion. This decrease was followed by an increase of 2.0%, to $3.960 billion in 1994/95 (Exhibit 9.3). For almost all of this period, trends in actual gross payments to physicians mirrored those of total billings, with a peak in 1992/93 followed by a decline in 1993/94 (Exhibit 9.3). However, in 1994/95, when the hard cap was decreased by $45 million, actual gross payments declined further, in contrast to the increase in billings that year. These trends were also apparent in billings and payments per physician (Exhibit 9.4).

There was a steady growth in the supply of active physicians, from 15,277 in 1989/90 to 17,297 in 1994/95 (Exhibit 9.5). This increase was most rapid from 1989/90 to 1993/94 (3.3% compound annual rate of growth), stabilizing at a 0.6% growth rate from 1993/94 to 1994/95. In contrast, both average billings per physician and average gross payments to physicians reached a peak in 1992/93 and began to decline in 1993/94. In 1994/95, average billings increased again; however, because of the hard cap and small growth in physician supply, actual gross payments per physician declined to $206,400, only slightly above the 1989/90 level of $205,300. Estimated net payments after expenses per physician mirrored trends in actual gross payments per physician.

Exhibit 9.6 shows total billings and price-adjusted billings by quarter for each fiscal year. This analysis illustrates the effect of price fluctuations during the study period. From 1989/90 to 1992/93 there was a cyclical trend: a sharp decrease in billings in the second quarter (i.e., July, August and September) followed by a rise in billings, with the

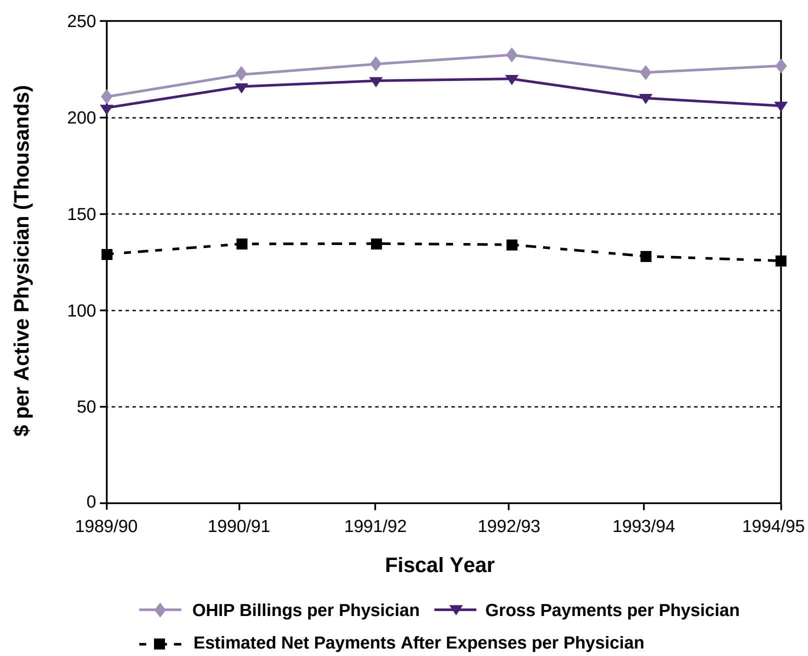
Exhibit 9.3: ***OHIP Billings and Actual Gross Payments to Physicians in Ontario, 1989/90 – 1994/95 ($ billion)***



Notes: Billings include Social Contract fee reductions in 1993/94 and 1994/95, but exclude threshold reductions and retroactive adjustments to payments. Actual Gross Payments reflect Billings including threshold reductions and retroactive adjustments to payments, and excluding payments directly to hospitals for technical components of procedures. Net Payments reflect Actual Gross Payments minus approximate overhead expenses, as estimated from proprietary Revenue Canada data. Active Physicians are defined as those billing over $35,000 per year.

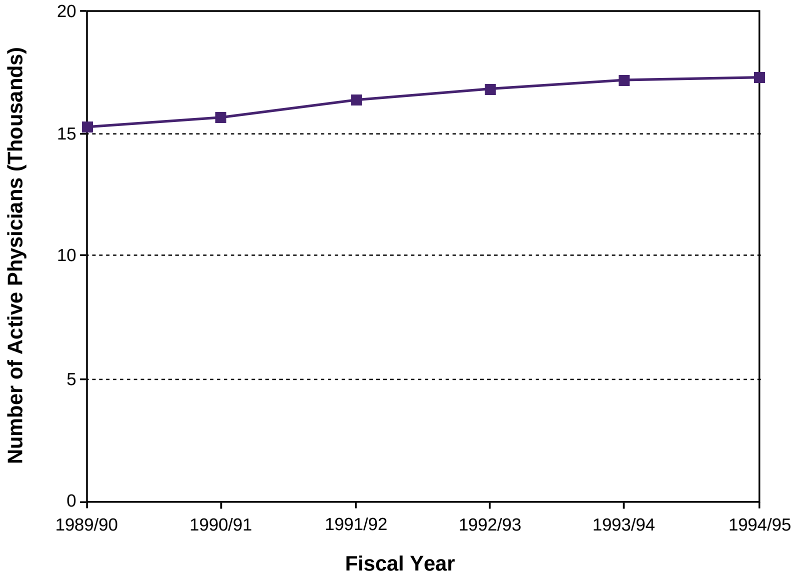
Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 9.4: ***OHIP Billings and Gross and Net Payments per Physician in Ontario, 1989/90 – 1994/95***



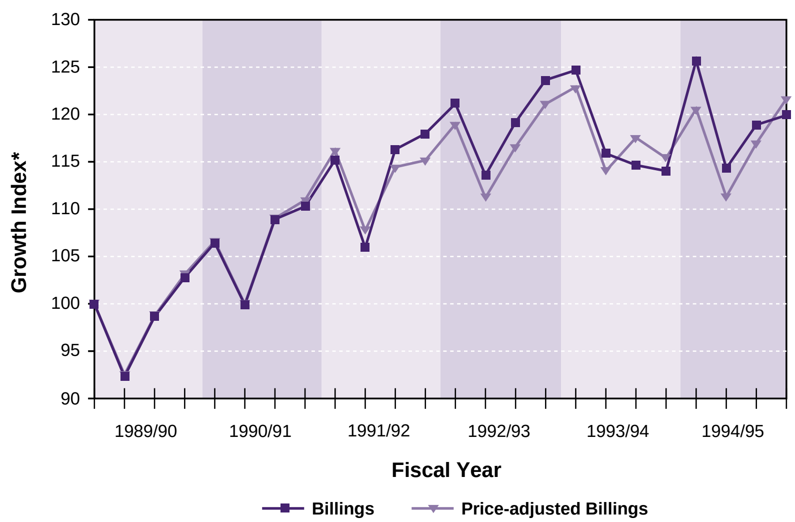
(For Notes and Data Source refer to Exhibit 9.3)

Exhibit 9.5: ***Number of Active Physicians in Ontario, 1989/90 – 1994/95***



(For Notes and Data Source refer to Exhibit 9.3)

Exhibit 9.6: ***Growth in OHIP Billings and Price-adjusted Billings by Fiscal Quarter, 1989/90 – 1994/95***



**Growth Index: 100 = Level at first quarter, 1989/90*

Notes: Billings include Social Contract fee reductions in 1993/94 and 1994/95, but exclude threshold reductions and retroactive adjustments to payments. Price-adjusted billings represent the amount that would have been billed if prices remained constant at their 1994/95 level.

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

last quarter's billings being the highest in the year. Fee-schedule increases implemented in the second half of 1991/92 and in 1992/93 coincided with an observed increase in billings relative to price-adjusted billings during this period. In 1993/94, during which total OHIP billings decreased, unadjusted billings fell below price-adjusted billings in the second half of the year, coinciding with the 4.8% Social Contract fee reduction. Also, although price-adjusted billings were higher in the first three-quarters of 1993/94 than in the first three-quarters of 1992/93, there was a decrease during the final quarter. In 1994/95, unadjusted billings initially rose above price-adjusted billings as the 4.8% Social Contract holdback was removed. However, by the end of the year, as new Social Contract holdbacks were instituted, unadjusted billings once again fell below price-adjusted billings. Price-adjusted billings in the first three-quarters of 1994/95 were below their 1993/94 levels, but increased sharply in the final quarter.

Billings and Payments by Specialty

In 1989/90, the ratio of total billings by specialists to total billings by GP/FPs was 1.403. This ratio rose to 1.416 in 1994/95. During this period, the overall growth rate in billings was 21.0% for GP/FPs and 22.1% for specialists. The specialties with the most rapid growth in total billings were internal medicine (31.3%), radiology (31.1%), and psychiatry (27.6%) (Exhibit 9.7). The specialties with the slowest growing billings were dermatology (0.7%), ear, nose and throat (6.3%), general surgery (10.2%), and obstetrics/gynecology (10.7%).

In all specialty categories, there was an increase in the number of active physicians from 1989/90 to 1994/95. The change in physician supply, however, varied widely by specialty (Exhibit 9.7). The number of pediatricians showed little growth (1.5%) whereas the number of radiologists increased by 40.2%. This high growth

Exhibit 9.7: *Physician Supply and Billings by Specialty (1994/95) and Percent Change (1989/90 – 1994/95) in Ontario*

Specialty	Activity Measures for 1994/95				Percent Change from 1989/90 to 1994/95			
	Total Billings (Millions) ✢($)	No. of Active Physicians ✢✢	Mean Billings per Active Physician ✢✢✢($)	Mean Gross Payments per Active Physician ✢✢✢✢($)	Total Billings	No. of Active Physicians	Mean Billings per Active Physician	Mean Gross Payments per Active Physician
Anesthesia	142.8	751	188,924	181,000	18.1	10.3	6.8	0.4
Dermatology	48.1	181	265,050	254,000	0.7	17.5	-14.2	-19.2
GP/FP	1639.2	8,664	186,743	179,000	21.0	9.7	10.8	4.1
General Surgery	190.5	727	260,564	248,000	10.2	2.5	7.4	0.8
Internal Medicine	579.3	2,216	258,945	225,000	31.3	24.5	5.4	-2.4
Laboratory *	12.5	73	154,683	143,000	189.7	180.8	16.1	26.5
Neurosurgery	16.2	64	250,940	241,000	14.8	3.2	10.3	4.0
Obstetrics & Gynecology	161.6	595	270,693	254,000	10.7	9.8	0.8	-5.8
Ophthalmology	123.2	394	311,747	296,000	14.6	14.9	-0.2	-6.7
Orthopedics	94.4	347	271,074	260,000	22.6	8.8	12.6	6.0
Otolaryngology	68.6	211	324,042	291,000	6.3	6.6	-0.5	-7.5
Pediatrics	129.7	595	215,023	205,000	12.1	1.5	10.4	3.6
Plastic Surgery	33.5	130	256,183	246,000	22.5	11.1	9.8	3.3
Psychiatry	233.2	1,450	158,522	152,000	27.6	21.7	4.8	-1.4
Radiology **	431.5	708	608,555	406,000	31.1	40.2	-6.3	-12.1
Urology	55.9	191	291,543	279,000	11.5	13.0	-1.6	-7.5
Total	**3960.2**	**17,297**	**226,766**	**206,000**	**21.6**	**13.2**	**7.6**	**0.5**
Total of Subspecialty Surgery ***	553.4	1,932	285,391	269,000	13.7	10.4	2.9	-3.6
All Specialists	2321.0	8,633	266,932	234,000	22.1	16.9	4.4	-2.9
Specialists Excluding Radiologists	1889.5	7,925	236,413	219,000	20.2	15.2	4.2	-2.8
Total Excluding Radiologists	3528.7	16,589	210,471	198,000	20.6	12.3	7.5	0.7

* *Includes pathology and clinical biochemistry. Calculations exclude all L-codes for services in private facilities. These results must be interpreted with caution because OHIP billings excluding L-codes account for a small proportion of laboratory physician income.*

** *Includes diagnostic radiology and nuclear medicine*

*** *Includes neurosurgery, obstetrics/gynecology, ophthalmology, orthopedics, otolaryngology, plastic surgery and urology*

✢ *Reflects billings by all physicians and includes Social Contract fee reductions in 1993/94 and 1994/95, but excludes threshold reductions and retroactive adjustments to payments*

✢✢ *Defined as physicians billing over $35,000 per year*

✢✢✢ *Billings by active physicians (including Social Contract fee reductions, excluding threshold reductions and retroactive adjustments) divided by the number of active physicians*

✢✢✢✢ *Billings by active physicians (including threshold reductions and retroactive adjustments to payments, excluding payments directly to hospitals for technical components of procedures) divided by the number of active physicians*

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

may be artifactual, however, as many groups of radiologists who had previously processed claims under one billing number prior to 1991/92 arranged with the MOH to bill under individual numbers. This enabled them to receive a fairer assessment under the threshold billing reductions, according to the MOH. Other specialties with relatively high growth rates included medical specialists (24.5%) and psychiatrists (21.7%). The number of GP/FPs grew by 9.7%, whereas the number of specialists (excluding radiologists) increased by 15.2%. General surgeons increased by 2.5% and subspecialty surgeons increased by 10.4%.

Average gross payments per active physician in 1994/95 ranged from a low of $143,000 for laboratory physicians to a high of $406,000 for radiologists (Exhibit 9.7). The average gross payment for active GP/FPs was $179,000; this increased by 4.1% from 1989/90 to 1994/95. Average gross payments for specialists (excluding radiologists) decreased by 2.8%. For radiologists, average gross payments declined 12.1% between 1989/90 and 1994/95. Again, this decline is likely artifactual, for reasons noted above. Excluding radiology, the four other specialties with the largest declines in average gross payments (dermatology, urology, otolaryngology and ophthalmology) had the highest billings per physician in 1989/90.

Billings, Billings per Physician and Physician Supply by Health Planning Region

The two Northern planning regions had the lowest billings per capita for specialists in 1994/95 and the slowest rate of growth in these billings since 1989/90 (Exhibit 9.8). Even if expenditures for the Sault Ste. Marie Group Health Centre were included in the North East region's billings, the region's low ranking would not change. The Central East region had the highest per capita specialist billing rate in both 1989/90 and 1994/95 ($211 and $238 per capita respectively), and billing growth in this region was close to the provincial average. The Eastern region appears to have had a low billing growth rate, but this may be attributable to the creation of SEAMO in July 1994. Once the estimates of the amount shifted from the fee-for-service pool to the AFP are taken into consideration, per capita growth rates in the Eastern region were comparable to those of the Central West and South West regions.

In 1994/95, there were approximately equal numbers of active GP/FPs and specialists in Ontario, but the ratio of specialists to GP/FPs varied by region within the province. The North East and North West regions had the lowest specialist-to-GP/FP ratios (0.64 and 0.58 respectively), whereas the Eastern and Central West regions had more specialists than GP/FPs (the specialist-to-GP/FP ratios were 1.14 and 1.07, respectively). The two Northern regions were the only areas in the province where per capita billings on primary care exceeded those on specialty care in 1994/95.

In 1994/95, there were 0.27 active fee-for-service psychiatrists per 10,000 population in the North East health planning region and 0.31 per 10,000 population in the North West region, compared to the provincial average of 1.33 per 10,000 population. Between 1989/90 and 1994/95 the number of active fee-for-service psychiatrists in the province increased by 259. During

Exhibit 9.8: ***OHIP per Capita Billings, Average Billings per Physician and Physician Supply in Ontario, 1994/95, and Percent Change, 1989/90 – 1994/95***

Region	Price-adjusted Billings per Capita for GP/FPs		Price-adjusted Billings per Capita for Specialists		Average Billings by GP/FPs		Average Billings by Specialists		GP/FPs per 10,000 Population		Specialists per 10,000 Population	
	($)	% Change	($)	% Change	($)	% Change	($)	% Change	#	% Change	#	% Change
South West	140	0.8	194	16.1	196,639	6.9	271,918	5.9	7.01	-0.4	7.12	8.9
Central West	122	2.3	191	15.7	183,155	6.1	272,983	5.9	6.49	1.0	6.94	8.4
Central East	165	8.3	238	13.5	194,320	16.1	281,874	5.6	8.37	-1.4	8.37	7.6
Eastern	136	6.1	201	5.5	156,236	4.3	206,899	-1.8	8.50	6.9	9.66	7.1
North East	131	-5.4	125	4.6	193,420	4.3	294,555	5.2	6.63	-5.2	4.24	-1.5
North West	132	7.1	125	5.0	175,168	4.6	289,820	-3.4	7.38	7.9	4.29	7.8
All Ontario	150	7.1	212	13.6	186,743	10.8	266,932	4.4	7.93	1.9	7.90	8.6

Note: Billings include Social Contract fee reductions in 1993/94 and 1994/95, but exclude threshold reductions and retroactive adjustments to payments. Price-adjusted billings represent the amount that would have been billed if prices remained constant at their 1994/95 level. Population denominators were calculated from Statistics Canada intercensal year estimates. Provincial total includes physicians for whom regional information was missing (1.5% of physicians). Mean billings are based on billings per physician among active physicians, defined as those billing over $35,000 per year. Physician-population ratios are also based on the number of active physicians.

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 9.9: ***Number of GP/FPs per 10,000 Population, Average Billings per Physician and Price-adjusted Billings per Capita by District Health Council in Ontario, 1994/95***

District Health Council	No. of GP/FPs per 10,000	Average Billings per MD ($)	Price-adjusted per Capita Billings ($)
Algoma	5.89	188,732	116.32
Brant	7.86	187,934	147.89
Cochrane	7.20	198,262	145.61
Durham Region	5.97	221,205	132.37
East Muskoka-Parry Sound	6.53	151,433	101.68
Eastern Ontario	7.08	174,249	124.96
Essex County	6.20	237,831	147.99
Grey-Bruce	7.15	193,100	139.88
Haldimand-Norfolk	4.84	235,676	115.82
Haliburton, Kawartha & Pine Ridge	7.39	186,957	139.61
Halton	7.87	188,673	150.63
Hamilton-Wentworth	6.40	169,254	113.34
Hastings & Prince Edward Counties	8.06	203,970	165.66
Huron/Perth	7.18	180,837	132.28
Kenora-Rainy River	8.23	156,666	132.47
Kent County	6.06	227,622	138.08
Kingston, Frontenac and Lennox & Addington	9.66	139,259	139.58
Lambton	5.39	240,704	129.96
Manitoulin-Sudbury	5.79	215,563	125.77
Metropolitan Toronto	10.00	187,111	190.51
Niagara	6.58	199,518	132.20
Nipissing/Timiskaming	8.00	188,018	152.49
Ottawa-Carleton Regional	9.13	141,479	133.53
Peel	6.90	214,110	148.23
Renfrew County	7.51	181,118	138.05
Rideau Valley	7.00	181,207	129.54
Simcoe County	6.92	204,644	142.71
Thames Valley	7.99	170,131	138.93
Thunder Bay	6.91	187,340	131.71
Waterloo Region	5.98	178,003	109.34
Wellington-Dufferin	7.55	170,225	130.10
West Muskoka-Parry Sound	7.78	171,363	136.07
York Region	7.09	193,866	138.65

Notes: Calculations for average billings and physician supply are based on active physicians, defined as those billing over $35,000 per year.

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

the same period, there was a net increase of only one psychiatrist in Northern Ontario whereas the number of psychiatrists increased by 155 in the Central East region.

The Northern regions had the lowest supply of specialists but the highest average billings per specialist (Exhibit 9.8). Conversely, the Eastern region had the highest specialist supply but the lowest billings per specialist. Central East was the only region with both above-average specialist supply and above-average billings per specialist.

The analysis of the supply of fee-for-service GP/FPs was extended from the level of health planning regions to that of DHCs. The results for physician supply and total billings in the Algoma, Hamilton–Wentworth and Waterloo Region DHC's must be interpreted with caution, since in these DHC's a high proportion of physicians are remunerated under AFPs.

Those DHCs with fewer than 6.5 active GP/FPs per 10,000 residents were Durham Region, Haldimand-Norfolk, Essex County, Kent County, Lambton and Manitoulin–Sudbury. The DHCs with the highest GP/FP supply (greater than 9 per 10,000) tended to have large urban teaching centres and included Kingston, Frontenac and Lennox & Addington, Metropolitan Toronto and Ottawa–Carleton.

Average billings per active GP/FP tended to be higher in DHCs where the supply of active GP/FPs was lowest (Exhibit 9.9). In an examination of all DHCs in 1994/95, we estimated that for every decrease of one active GP/FP physician per 10,000 population, there was an associated increase of $14,600 in billings per GP/FP ($p < 0.0001$, $R^2 = 0.42$). There was also a tendency for price-adjusted billings per capita for GP/FP services to increase with the supply of active GP/FPs (Exhibit 9.9). For every increase of one physician per 10,000 population, there was an estimated increase of $8.96 in price-adjusted billings per capita ($p < 0.0001$, $R^2 = 0.39$)

Expenditure growth for GP/FP services varied by region; some DHCs experienced growth in per capita expenditures, whereas others had decreases. Four of the six DHCs with the highest growth rates in per capita GP/FP expenditures were located in the Greater Toronto area. In both 1989/90 and 1994/95, the Metropolitan Toronto DHC had the highest price-adjusted billings per capita for GP/FP services of any DHC in Ontario. The Metropolitan Toronto DHC also had the highest supply of active GP/FPs in both 1989/90 and 1994/95, despite a 1.2% decrease in the GP/FP-to-population ratio during this period. At the same time as the supply of active GP/FPs decreased in Toronto, the average billings per active GP/FP increased by 16.7%, well above the provincial average increase of 10.8%.

Age and Sex Distribution of Physicians by Region

Physicians were classified into four age categories: older than 65 years of age, 60 to 65 years of age, established practitioners (less than 60 years of age but not defined as recent graduates) and recent graduates. The latter category refers to GP/FPs who were practising within seven years of graduation from medical school (taking into account an approximate two years of postgraduate training before starting practice) and to specialists who were practising within five years of attaining their specialty. Physicians older than 60 years of age accounted for 15.4% and recent graduates for 19.0% of active physicians in the province in 1994/95 (Exhibit 9.10). The percentage of physicians older

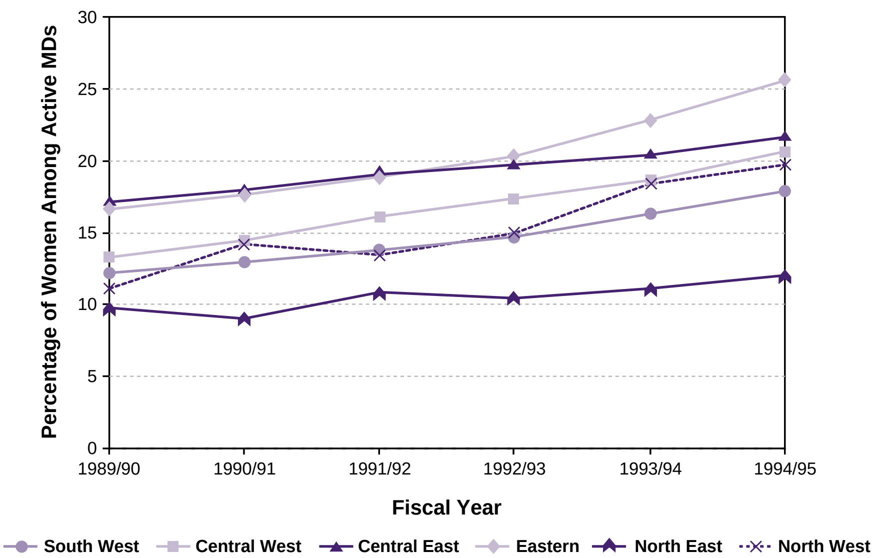
Exhibit 9.10: *Percentage of Physicians by Age, Sex, and Ontario Health Planning Region, 1994/95*

Region	Number of Active Physicians	% of Female Physicians	% of Recent Graduates	% of Physicians 60 to 65 Years	% of Physicians Older than 65 Years
South West	2,083	17.9	19.5	6.6	8.6
Central West	2,342	20.6	16.9	9.1	8.7
Central East	8,836	21.7	18.0	7.3	8.3
Eastern	2,758	25.6	20.9	6.3	6.8
North East	715	12.0	23.4	7.7	9.0
North West	299	19.7	26.4	4.7	8.7
All Ontario	17,297	21.3	19.0	7.3	8.1

Note: Active physicians defined as those billing over $35,000 per year. Recent graduates are defined as specialists attaining their specialty within the past five years or GP/FPs graduating from medical school within the past seven years (accounting for approximately two years of postgraduate training).
Total includes 264 physicians with missing information on region.

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 9.11: ***Proportion of Women in Medicine by Ontario Health Planning Region, 1989/90 – 1994/95***



Notes: Active physicians defined as those billing over $35,000 per year

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

than 60 varied from a low of 13.1% in the Eastern region to 17.8% in the Central West region. The two Northern regions had the highest percentage of recent graduates (North East 23.4% and North West 26.4%) whereas the Central West region had the lowest (16.9%). The percentage of women among active physicians was highest among recent graduates (32.6%) and lowest among physicians older than 65 (6.4%). Among specialists, 17.9% were older than 60, compared with 12.7% of GP/FPs.

In 1989/90, 15.5% of active physicians were women, and this proportion increased to 21.3% in 1994/95 (Exhibit 9.11). In 1989/90, the Northern regions had the lowest proportions of women in active practice (North East 9.8% and North West 11.2%). By 1994/95, the proportion had risen substantially in the North West (19.7%), but remained low in the North East (12.0%). The Eastern region had the highest proportion of women (25.6%).

Female physicians had lower average billings per physician than their male counterparts; as a result, the women who made up 21.3% of active physicians accounted for only 15.3% of billings in 1994/95 (Exhibit 9.12). The proportion of billings accounted for by physicians older than 60 increased from 11.8% in 1989/90 to 13.2% in 1994/95. Much of this increase was attributable to physicians older than 65, whose share of billings rose from 4.6% to 5.9%. The proportion of billings attributable to recent graduates decreased from 17.3% to 16.2%. By region, the percentage of billings accounted for by physicians older than 60 ranged from 11.6% in the Eastern region to 14.1% in the Central West region.

The shift in proportional OHIP billings, away from recent graduates toward older physicians, was related to both a faster growing supply of older physicians and to a higher growth rate in average billings among older physicians (Exhibit 9.13). From 1989/90 to 1994/95, the number of recent graduates increased by 18, whereas the number of active physicians older than 65 rose by 381 and the number of active physicians between 60 and 65 years of age increased by 63.

Established physicians had the highest average billings per active physician (Exhibit 9.13). Active physicians older than 65 years of age had average billings that were about two thirds the average billings of established physicians. Among specialists (excluding radiologists), average billings per physician declined for recent graduates and increased for all other age groups, particularly for the older than 60 category. Among GP/FPs, average billings per physician grew at about the same rate for recent graduates and older physicians, with a slightly lower growth rate for established physicians.

Distribution of Billings

We examined the distribution of billings for active GP/FPs and specialists by determining the median billings and the percentage of active physicians whose total annual billings fell into ranges defined by multiples of $100,000 (Exhibit 9.14). Again, physicians billing less than $35,000 were excluded from the analysis. Radiologists, 70% of whom billed more than $400,000 in 1994/95, were also excluded because a high proportion of their billings represents technical fees to hospitals or other facilities. Median billings (i.e., billings by physicians at the midpoint or 50th percentile of the ranking of billings) in 1994/95 were $177,900 for GP/FPs and $210,400 for specialists. These median billings were lower than average billings, indicating that the distribution of billings was skewed, with some very high billing physicians shifting the average billings above the median. Among active GP/FPs, 42.7% billed between $100,000 and $200,000, and 2.5% billed more than $400,000. The distribution of billings among active specialists was more dispersed, with 29.8% billing between $100,000 and $200,000, and 12.4% billing more than $400,000.

To examine the impact of the physicians at the high end of the billing distribution, a cutoff of $400,000 in OHIP billings per year was used to define "high-volume" fee-for-service physicians. Radiologists were

Exhibit 9.12: ***Physician Billings by Age, Sex and Ontario Health Planning Region, 1994/95***

Region	Total Billings ($ Million)	Percentage of Billings (%)			
		Female Physicians	Recent Graduates	Physicians 60 to 65 Years	Physicians Older than 65 Years
South West	488.6	11.7	16.6	7.4	6.6
Central West	537.6	14.9	15.0	8.4	5.7
Central East	2,103.8	15.9	15.2	7.4	5.9
Eastern	505.2	19.4	17.2	6.3	5.3
North East	166.5	7.3	20.6	7.6	6.1
North West	65.0	12.9	21.6	3.4	8.6
All Ontario	3,922.4	15.3	16.2	7.3	5.9

Note: *Calculations are based on active physicians, defined as those billing over $35,000 per year. Hence, total provincial billings differ from total billings noted in Exhibit 9.7 which include all physicians. Total provincial billings include physicians with missing data on region who accounted for $55.6 million of billings. Recent graduates are defined as specialists attaining their specialty within the past five years or GP/FPs graduating from medical school within the past seven years (accounting for an approximate two years of postgraduate training).*

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 9.13: ***Average OHIP Billings by Active Physician Specialty and Age in Ontario, 1989/90 – 1994/95***

Specialty	Age Group	Number of Active Physicians in 1989/90	Number of Active Physicians in 1994/95	Average Billings per Active Physician in 1989/90 ($)	Average Billings per Active Physician in 1994/95 ($)	% Change in Number of Active Physicians	% Change in Average Billings
GP/FP	Recent Graduates	1,631	1,542	139,409	156,368	-5.5	12.2
GP/FP	Established Physicians	5,264	6,023	184,248	201,458	14.4	9.3
GP/FP	60 to 65 Years	488	470	148,186	169,016	-3.7	14.1
GP/FP	Older than 65 Years	512	629	119,956	133,549	22.9	11.3
Specialists	Recent Graduates	1,490	1,597	201,256	195,902	7.2	-2.7
Specialists	Established Physicians	4,313	4,909	248,474	261,820	13.8	5.4
Specialists	60 to 65 Years	628	709	192,662	222,858	12.9	15.7
Specialists	Older than 65 Years	446	710	152,022	165,401	59.2	8.8

Note: *Radiologists were excluded from specialty calculations. Recent graduates are defined as specialists attaining their specialty within the past five years or GP/FPs graduating from medical school within the past seven years (accounting for an approximate two years of postgraduate training). Established physicians include physicians who are not recent graduates and are less than 60 years old. All calculations are based on active physicians, defined as those billing over $35,000 per year.*

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 9.14: ***Percentage of Physicians in Various Billing Ranges in Ontario, 1994/95***

Group	% of Active Physicians				
	< $100,000	$100,000 to $199,999	$200,000 to $299,999	$300,000 to $399,999	> $400,000
GP/FPs	17.9	42.7	28.2	8.6	2.5
Specialists	17.3	29.8	24.7	15.9	12.4

Note: *Radiologists were excluded from specialty calculations. All calculations are based on active physicians defined as those billing more than $35,000 per year.*

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 9.15: ***Percentage of OHIP Billings for High-volume Physicians* by Ontario Health Planning Region, 1994/95***

Region	% of Billings by High-volume GP/FPs	% of Billings by High-volume Specialists
South West	7.5	27.0
Central East	7.5	29.1
Central West	4.7	26.0
Eastern	3.4	16.5
North East	5.4	37.5
North West	4.3	28.9
All Ontario	6.4	27.0

Note: Radiologists were excluded from specialist calculations.
**High-volume physicians are defined as those billing over $400,000 per year.*

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

excluded from the analysis of high-volume physicians. In 1994/95, active GP/FPs billing over $400,000 accounted for 6.4% of total billings (Exhibit 9.15), and specialists billing over $400,000 accounted for 27% of billings by active specialists. High volume GP/FPs accounted for a greater percentage of overall billings in the Central East and South West regions than in other regions. High-volume specialists accounted for a greater percentage of billings in the North East than in the other regions.

Billings by Specialty and Fee Code Category

As described in Chapter 3, there were substantial changes in the type of services billed to OHIP between 1989/90 and 1994/95. The extent of these changes varied by specialty. For medical specialists, the share of billings accounted for by hospital visits declined from 15.2% to 11.1%, while diagnostic and therapeutic procedures increased from 33.8% to 37.8% (Exhibit 9.16). Among pediatricians, the percentage of billings attributable to hospital visits decreased from 11.4% to 7.0%, while assessments and consultations increased from 64.1% to 69.9%. Among pediatricians and GP/FPs, there was a modest shift away from procedure-oriented categories (surgery and diagnostic procedures) to psychotherapy and counselling services.

Comment

This analysis describes the changes in OHIP fee-for-service physician billings (excluding fees paid to private laboratories) between 1989/90 and 1994/95, a period that has seen fundamental changes in the rules governing physician reimbursement in the province. The results indicate that there have been important shifts in the distribution of billings among and within specialties, by location of practice, by age and sex of the physician and by individual billing volume. The analysis is descriptive and cannot be used to attribute these changes to specific policy interventions, nor to assess the implications of these changes on quality of care. Nonetheless, this description can help define further research questions and inform future policy initiatives.

Trends in Overall OHIP Fee-for-service Billings

The decline in actual payments to physicians from 1992/93 to 1994/95 reflects the 1993 Social Contract legislation, which set caps on total fee-for-service expenditures. Given the continued increase in physician supply, it was inevitable that average payments to physicians would decline. The question of "how many doctors are needed in Ontario" is complex and sensitive and is beyond the scope of this analysis. However, if expenditure control is to be a primary policy objective, then the merits and disadvantages of more aggressive limits on the supply of physicians must be weighed against physicians' increasing dissatisfaction with their declining income levels resulting from the absence of physician-supply controls. In either case, broadly restrictive measures on physician supply and across-the-board reductions in individual physicians' incomes are blunt instruments for expenditure control, and their effect on quality of care is unknown. Future research and policy aimed at developing more selective incentives for high-quality care may be a more desirable long-term strategy to control expenditures.

Our analysis indicates that physician response to the hard cap varied considerably from 1993/94 to 1994/95. In 1993/94, the first year of the cap, billings declined to the point where a utilization adjustment of only $16 million (0.4% of billings) was required. The Social Contract fee holdback of 4.8% was an important factor, but the analysis of price-adjusted billings over this period

Exhibit 9.16: ***Proportion of Billings in Each Fee Code Category by Specialty in Ontario, 1994/95 and Percentage Change Between 1989/90 and 1994/95***

Specialty	Diagnostic & Therapeutic Procedures	Hospital Visits	Assessments & Consultations	Psychotherapy & Counselling	Surgery	Special Premiums
GP/FPs	**6.5**	**3.0**	**70.0**	**11.3**	**5.7**	**3.4**
% Change	(0.1)	(-1.5)	(2.2)	(2.0)	(-2.0)	(-0.8)
Internal Medicine *	**37.8**	**11.1**	**42.8**	**1.6**	**5.3**	**1.4**
% Change	(4.0)	(-4.1)	(0.5)	(0.8)	(-1.2)	(-0.1)
Obstetrics & Gynecology	**8.8**	**1.3**	**28.4**	**2.5**	**52.6**	**6.5**
% Change	(2.4)	(-0.9)	(0.5)	(0.7)	(-3.2)	(0.5)
Pediatrics	**13.5**	**7.0**	**69.9**	**6.1**	**0.5**	**3.0**
% Change	(-2.0)	(-4.4)	(5.8)	(1.9)	(-0.8)	(-0.5)
Psychiatry	**0.7**	**3.2**	**8.1**	**87.7**	**0.0**	**0.4**
% Change	(0.2)	(-1.7)	(-0.8)	(2.3)	(0.0)	(0.0)
Radiology **	**99.2**	**0.0**	**0.2**	**0.0**	**0.5**	**0.1**
% Change	(-0.2)	(0.0)	(0.0)	(0.0)	(0.2)	(0.0)
Surgery ***	**10.3**	**2.3**	**31.9**	**0.3**	**51.8**	**3.3**
% Change	(0.6)	(-1.1)	(-0.3)	(0.1)	(0.8)	(-0.2)

* *Includes general internists and medical subspecialists*

** *Includes diagnostic radiologists and nuclear medicine specialists*

*** *Includes general and subspecialty surgeons; does not include obstetricians and gynecologists*

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

also indicates that a decline in utilization, particularly during the final quarter of 1993/94, contributed to the decline in billings. This period coincided with an appeal by the OMA to physicians to voluntarily close their offices or cancel elective procedures during certain so-called "Social Contract Days." In 1994/95, fees decreased further and several services were delisted. Despite these measures, billings increased from the previous year. Much of the utilization growth occurred in the final quarter of 1994/95.

The reasons why physicians increased their billings in 1994/95 are a matter of further debate. Did the preceding years' success in limiting expenditures close to the cap give physicians a false sense of security? Were physicians not adequately informed of projected utilization above the cap until it was too late to react? External factors, such as increasing patient demands and continued shifting of inpatient diagnostic and therapeutic procedures to outpatient facilities, may also have contributed to expenditure growth. All of these possible explanations are speculative and should be the subject of further research.

A fundamental issue is fairness to individual physicians. Under the current expenditure-control measures, physicians who succeed in voluntarily reducing utilization are penalized financially, whereas physicians who do not practice restraint are not. Thus, individual physician compliance with voluntary utilization restraint depends on both the physician's desire to contribute to the goal of cost containment and his or her confidence that the entire medical community will cooperate with voluntary restraint. Whether this confidence was broken in 1994/95, leading to the substantial increase in billings, is another matter for future study.

The analysis in Chapter 3 examined OHIP expenditures in terms of the population being served and showed a steady decrease in per capita OHIP expenditures since 1992/93. Although billings increased between 1993/94 and 1994/95, more people were receiving services. Expenditure control should therefore be set in the context of population changes.

Billings by Specialty

This analysis shows not only substantial differences in average payments to different specialty groups but also considerable shifts in the proportion of the OHIP expenditure pool allotted to different specialties. Because this descriptive analysis provides no information on quality of care provided, we cannot make any inference about whether these shifts were appropriate. The analysis also demonstrates that some specialties experienced an overall increase in payments per physician whereas others experienced a decline. Again, we cannot provide any insight into the fairness of such changes to individual physicians, nor can we determine whether remuneration continues to be sufficient to attract physicians to provide necessary medical services. However, these data serve as a baseline for future debate and research, and they invite stakeholders to evaluate further whether the observed trends are desirable from a public policy perspective.

In aggregate terms, there has not been a large shift in the balance between primary care and specialty services. Between 1989/90 and 1994/95, there were similar growth rates in total billings by GP/FPs and specialists. At the individual physician level however, GP/FPs and specialists have experienced different changes in remuneration. The growth in the number of active GP/FPs was relatively slow compared to the growth in specialists, and GP/FPs had a modest 4.5% increase in average gross payments. The number of active specialists, on the other hand, increased more rapidly and average gross payments declined by 2.9%. Thus, it appears that the balance between primary and specialty care is driven by factors other than physician supply alone.

The number of medical specialists increased more rapidly than that of any other major specialty group during the study period. This increase in supply, combined with a 5% increase in billings per physician, meant that medical specialists increased their total billings and overall share of OHIP expenditures more than any other major specialty group. This increase in internist billings happened at the same time as a steady decline in OHIP payments for hospital visits, previously a mainstay of medical specialists' incomes. This indicates a fundamental change in the practice of internal medicine and its subspecialties, with a shift away from inpatient care to more ambulatory care services and diagnostic and therapeutic procedures.

Radiologists also received an expanding share of OHIP expenditures over time, with a five-year growth rate only slightly lower than that for medical specialists. When examining radiologists' billings, it is important to recognize that a large proportion of radiologists' billings are for technical fees intended to cover the cost of equipment, technical staff and materials. Professional fees cover the cost of interpretation of the test result, and range in value from two-thirds to one-tenth of the technical fee, depending on the test. Although technical fees are exempt from threshold calculations, they are nonetheless counted in overall expenditure growth and contribute to the amount of utilization adjustments due to expenditure growth beyond the global cap. Hence, an increasing proportion of the OHIP fee-for-service pool is being directed towards technical fees, a portion of which does not contribute to physicians' incomes.

The growth in radiologists' billings may be related to several factors. Relatively new technologies such as MRI, CT, and nuclear medicine continue to be diffused across the province. As noted in Chapter 3, these technologies, along with prenatal ultrasonography, are among the fastest growing fee code items in Ontario. Second, the shift away from inpatient hospital care in recent years may have resulted in more diagnostic tests being performed on an outpatient basis. This trend would tend to shift funding for these services from hospital global budgets into the OHIP fee-for-service pool. The extent of such shifts deserves further study.

The share of OHIP billings for psychiatrists also increased over time, in part because psychiatrists had the second largest increase in number of physicians of any specialty. However, of the net increase of 259 active fee-for-service psychiatrists in the system, only one was added to northern Ontario, whereas 155 were added to the Central East region. The relatively low expenditures on psychotherapy and counselling in the North are likely to continue as long as this is the pattern of physician deployment. (Chapters 4 and 10 provide more information on expenditures for psychotherapy and counselling.)

There was little growth in the number of general surgeons, compared with subspecialty surgeons, during the study period. The causes of this trend to greater specialization and its relationship to health care needs should be the subject of further study. From the perspective of a rural health policy maker, it will be important to decide whether to plan for the placement of general surgeons in smaller communities or to create highly specialized surgical referral centres to support rural hospitals staffed by GP/FPs.

Regional Differences in Billings

There are growing differences in specialist billings by region to the point that, by 1994/95, per capita billings for specialists in the two Northern regions were only about half those for the Central East region. This trend occurred despite threshold exemptions for designated underserviced areas, restrictions on new billing numbers in southern Ontario for out-of-province graduates and the variety of bursary and incentive programs offered by the MOH Underserviced Area Program.

This analysis does not account for two possible errors which could lead to underestimation of the volume of services delivered to residents of northern Ontario. First, patients may travel outside the region for specialty services. Even if this were the case, however, the large difference in per capita billings by region still suggests an access problem: patients may be getting services, but they may have to travel long distances to obtain them. Second, southern Ontario-based physicians may be servicing travelling specialist clinics in the North administered by the MOH Underserviced Area Program. Unfortunately, data on the number of such physicians and the amount of money spent on the program for physician services were unavailable. However, the total 1994/95 budget for the Underserviced Area Program was $14.7 million or $16 per resident. Even if all of these expenditures were devoted to specialists (which is not the case, as the program also funds primary care and allied health professionals), they would still be inadequate to make up the $87 difference in per capita billings between the North and the provincial average.

Northern Ontario is often considered the only area in Ontario which has difficulty attracting and retaining GP/FPs. However, many DHCs in southern Ontario had GP/FP-to-population ratios and billings per capita as low as or lower than those in northern Ontario regions. Northern primary care physicians may, however, have greater clinical responsibilities, given the particularly low specialist-to-GP/FP ratio in their regions. The Underserviced Area Program has traditionally focused on providing recruitment and retention incentives for northern regions. The problem of rural southern Ontario, however, has received increasing attention. The recently established OMA Rural Placement Program provides locum coverage to more broadly defined rural regions, which include those in southern Ontario. The Scott Report on the Provision of Small/Rural Hospital Emergency Department Physician Service[1], acknowledged that rural communities across Ontario were at risk of losing basic emergency department coverage because of physician shortages and inadequate remuneration for on-call services. The results of this study lend support to calls for a more equitable distribution of physician resources to rural southern Ontario.

The analysis shows that, even in areas that had relatively high physician density and billings per capita in 1989/90, both the supply of physicians and billings per physician could grow at rates well above the provincial average. This was the case particularly for specialists in the Central East region and for GP/FPs in Metropolitan Toronto. This trend, combined with the growing concern over potentially underserviced areas, suggests that current policies need to be changed to ensure that the physician distribution in the province reflects regional needs. Quebec has recognized the importance of promoting physician redistribution and has long had fee differentials by practice region, with 20% premiums for practising in underserviced areas and 30% penalties for practising in urban regions. The Scott Report recommended special sessional fees for rural emergency physicians; such fees represent a significantly greater financial incentive to provide emergency services in these areas. Such policies may be a useful approach to the problem of geographic disparities in physician supply.

Impact of Physicians with High Billing Levels

Although the NPDB billing data do not take into account the impact of the fee reductions contained in the individual physician billing-threshold policies, they do provide an accurate record of the number of services billed by all physicians. The proportion of billings attributable to physicians billing over $400,000 climbed steadily until 1992/93, the first year in which individual physician thresholds were introduced. In 1993/94, the proportion of billings attributable to physicians billing more than $400,000 decreased, but it increased again in 1994/95. That year, the number of physicians billing over $400,000 rose at a rate faster than the overall increase in physician supply. These results suggest that threshold reductions, on their own, had a limited impact on levels of service provision.

High-volume billing by a physician may well be the result of low physician supply; the GP/FPs or specialists in underserviced areas may have to work longer hours to compensate for the lower supply of physicians. In recognition of this situation, physicians in selected underserviced areas were exempted from the threshold reductions. Consistent with this supposition, we found that the two northern regions with the lowest supply of specialists had the highest proportion of total specialist billings attributable to high billers, whereas the Eastern region, with the highest specialist density, had the lowest proportion attributable to high billers. However, this relationship did not hold as consistently for GP/FPs as it did for specialists. The Eastern region had the highest GP/FP-to-population ratio and the lowest proportion of billings attributable to high-billing family physicians. However, the Central East region, which had a GP/FP-to-population ratio similar to that in the Eastern region, had the highest proportion of GP/FP billings attributable to high-billing physicians. The two regions with lowest GP/FP density, Central West and South West, both had proportions of total billings attributable to high billers that were below the provincial average. These findings suggest that the threshold policies with exemptions for underserviced areas did not consistently reduce utilization generated by high-volume GP/FPs working in areas with high GP/FP-to-population ratios.

Billings by Age and Sex

In relative terms, individual average billings increased more rapidly for older physicians than for established physicians or recent graduates. Furthermore, the supply of older physicians was growing faster than the supply of recent graduates in both relative and absolute terms. Recent physician supply policies, such as regional restrictions on billing numbers, tend to be directed toward recent graduates rather than older physicians. Recent debate in Ontario has focused on retirement incentives for physicians. Such a policy could enhance the entry of women into the medical profession, as the proportion of women among recent graduates was significantly higher than among older physicians. Although early retirement could reduce the pressure on the fee-for-service pool, it could also exacerbate physician shortages, particularly among specialists in underserviced areas.

Practice restrictions for recent graduates notwithstanding, there was a substantial increase in the percentage of women in practice over the study period. In 1989/90, the two Northern regions had lower-than-average proportions of billings attributable to female physicians. Although the absolute numbers are small, the North West region almost doubled the number of active female physicians in five years. At the same time, the proportion of female physicians in the North East region made only slight gains, from 9.8% to 12.0%.

Future Research

The analysis presented in this chapter examines changes in OHIP expenditures from the perspective of changes in physician supply and average billings. Both physician supply and billing patterns are politically charged issues, but require ongoing examination. The changes in OHIP funding of fee-for-service medical care in Ontario have been accompanied by a redistribution of billings among different physician groups. In all likelihood, there will be further shifts in OHIP reimbursement policy in the future. Both the government and the medical profession will be well served if they plan and evaluate these changes in terms of their impact on physician supply and the distribution of billings.

References

1. Report of the Fact Finder on the issue of small/rural hospital emergency department physician service. Ontario Ministry of Health, 1995

Chapter 10

Mental Health: Levels of Need and Variations in Service Use in Ontario

Introduction

When people talk about health and health care, they usually think in terms of physical illness and medical treatments. Mental health is usually ignored or added only as an after thought. This is natural for many reasons. Mental illnesses are often perceived as rare conditions and have been characterized historically as afflicting primarily people who are weak or lack moral fibre. These illnesses do not have clear-cut causal agents (such as bacteria or viruses) that are easily identifiable and treatable. Furthermore, they are seen as less debilitating than many physical illnesses. They are usually not immediately fatal and with some exceptions, do not have symptoms that society views as shocking or costly.

Information gathered over the last two decades shows that the majority of these perceptions are incorrect. Poor mental health is more common than is frequently believed. Epidemiologic surveys conducted in the United States, Canada and New Zealand report that between 20% and 30% of the general public have had mental health problems in the previous 6 to 12 months that were serious enough to qualify as formal disorders and to impair their day-to-day functioning.[1–4] The most sobering statistic from these kinds of surveys is that between 50% and 75% of these people did not receive help for their problems during that year.

The cost of mental illness to society is also significant. For example, studies by the World Bank and World Health Organization[5] suggest that among non-communicable diseases, depression is estimated to be the third highest reason for healthy years of life lost for women and the fifth highest cause for men. Recent estimates of the economic burden of mental illness for the United States were $148 billion in 1990 – including $99 billion for alcohol abuse, and $67 billion for drug abuse.[6] The costs specifically associated with depression were found to be comparable with those associated with heart disease.[7]

The purpose of this chapter is to compare mental health needs in Ontario with the way provincial mental health care dollars and services are distributed. This examination is important for two reasons. First, given the potential number of people who may suffer from poor mental health, any description of the health of people in Ontario is incomplete if it is limited to physical health. Second, the province is in the process of making major changes in policy and service delivery and is therefore in need of information about system performance. Mental health reform, the result of decades of planning, is intended to address the lack of coordination and balance within the current groups of services that are predominantly institutional or hospital based. The details are outlined in the Ministry of Health (MOH) document, *Putting People First: The Reform of Mental Services in Ontario*, released in June 1993.[8] Priority is given to meeting the needs of the severely mentally ill in a consumer-oriented and community-focused system. The strategies set out include:

- establishing a comprehensive system of key services and supports;
- creating a provincial structure for managing and funding the system;
- providing strong local and regional planning;
- defining and realigning roles within the system; and
- establishing measurable targets and time lines.

By the year 2003, based on the system of care envisaged, 40% of mental health spending would be on institutional care and 60% on community services. In comparison, the 1992/93 ratio was 80% for institutional care and 20% for community services. The total number of provincial and general psychiatric beds per 100,000 people is expected to fall from 58 to 30. The current government has confirmed its commitment to the direction of reform[9] and has recently announced community investment funding of $28.5 million for implementation. Bed closures have been temporarily put on hold while new community programs are put in place. A detailed multi-year plan is being prepared.

Our goal is to establish a baseline for evaluating future assessments of the mental health care system and for identifying gaps in our current knowledge. Several sources of information are used to accomplish this, including the Mental Health Supplement (the Supplement)[10] to the Ontario Health Survey; the National Physician Database (NPDB) containing data from the Ontario Health Insurance Plan (OHIP); the Admissions, Discharges, Transfers/Central Patient Index (ADT/CPI) for Provincial Psychiatric Hospitals (PPH), and the Canadian Institute for Health Information (CIHI) data for general and specialty hospitals. Each will be described in detail later in this chapter. The Supplement was conducted in 1990/91 while the NPDB and hospital data sets are examined for the three years from 1992/93 to 1994/95. The timeframes we present in this chapter were dictated by issues concerning the quality and stability of the data, our interest in comparing service use from a point in time close to the Supplement, and a need to present data relevant to the current situation.

These data were chosen because they are currently the best available for meeting our objectives. However, these sources of information were developed independently and for different purposes (research, billing and administration). This leads to several limitations to the approach we have taken. First, the methods used to identify mental health needs (particularly as measured by psychiatric diagnoses) are conceptually related, but do not lead to identical results. For example, the Supplement uses a research survey questionnaire to assess psychiatric diagnosis. In contrast, diagnoses reported in the hospital databases (ADT/CPI and CIHI) are based on clinical interviews with patients. Studies indicate that conclusions reached using the most recently available research instruments to assess psychiatric diagnoses are fairly consistent with judgements made by trained psychiatrists,[11] although they do not always agree perfectly.

Second, the quality and reliability of the data within each source varies. This is particularly true of the hospital and OHIP data, where the recording of information is not completely standardized across all hospital and practice settings. For example, it is possible that a psychiatrist might diagnose a patient with a psychiatric diagnosis, whereas a GP/FP assessing the same patient in a different setting might assign a non-psychiatric diagnosis.

Finally, the structures of these data sets vary because of the different purposes for which they were designed. The Supplement information is organized by survey respondent, the OHIP data by billing physician and the ADT/CPI and CIHI data by hospital facility. Consequently, analyses of the regional distribution of needs are based on the location of the population, whereas analyses of the regional distribution of services and expenditures are based on the location of the provider or facility.

The effects of these limitations should be small because of the large amounts of information being analysed. Nevertheless, the reader should be aware that the picture of the mental health care system we are drawing is quite broad and only partially complete. Better data are required to get a more detailed picture. However, the information presented in this chapter does represent an important first step in identifying the gaps between what the system ought to do and what it does, and in assessing how well reform is being carried out. Evaluating the effects of reform on the mental health of the province's residents will require new sources of data that reflect changes over time.

Our findings are reported in four sections: Mental Health Needs, which describes mental health needs using data from the Supplement; Mental Health Expenditures, which discusses provincial expenditures by service component (e.g., hospital, outpatient, community mental health centres); OHIP Utilization, which describes OHIP-related expenditures; and Inpatient Utilization, which describes inpatient mental health services using provincial hospital and CIHI data. A concluding summary follows.

Mental Health Needs

Purpose

This section describes the magnitude of mental health needs in the households of Ontario and the regional distribution of these needs using data from the Supplement.

Data Source and Methods

The Supplement was a community survey conducted between November 1990 and March 1991. It was specifically designed to augment the Ontario Health Survey (OHS) by asking more detailed questions about symptoms, personal consequences and health service use associated with mental disorder and mental health problems. The sample for the Supplement consisted of all residents of the 13,002 households that participated in the second half of the OHS. One individual, aged 15 years or older, was randomly chosen from each household and asked to participate in the Supplement. Seventy-six percent of those selected agreed to be interviewed (9,953 respondents). Ontario residents who were institutionalized or living on reserves, or those for whom English or French was not their first language, are underrepresented.

Special attention was paid to two groups of respondents — transitional youth and those over 65 years of age. Because of the Ministry of Community and Social Services' (COMSOC) interest in adolescents and young adults, more residents between 15 and 24 were sampled to provide sufficient data for statistical analysis of this age group. As the Supplement questionnaire was fairly long — it took an average of one to two hours to administer — a shortened version was used for respondents over 65 years of age. Consequently, some measures of mental health needs were not assessed for the older age groups, and some of the information in this section is limited to the 15 to 64–year-old age group.

Supplement investigators were interested in assessing the need for mental health services. Because previous studies had strongly suggested that single measures of need (for example, psychiatric diagnosis) only provide a partial picture,[12,13] the Supplement included several methods of assessing mental health. Those explored in this chapter are mental disorder, reported disability and self-rated mental health.

Mental disorder is defined as meeting the criteria for any of the psychiatric diagnoses assessed by the Supplement. The criteria used are based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R),[14] the standard established by the American Psychiatric Association and used internationally in research. The time period assessed was the year before the interview, and the assessment instrument used was the Composite International Diagnostic Interview (CIDI, UM-CIDI version 3), an instrument developed by the World Health Organization.[11,15] Respondents were asked a series of questions by trained lay interviewers about symptoms pertaining to different types of mental disorder, and their responses were classified by a computer program into DSM-III-R diagnoses based on the patterns of their answers. The primary categories of psychiatric illnesses measured were affective disorders (of which major depression is the most common), anxiety disorders, and substance abuse or dependence disorders. In addition, the Supplement also assessed bulimia, antisocial personality disorder and conduct disorder. These are grouped together as "other mental disorders." Schizophrenia, although assessed in the Supplement, was not reported as a separate category because the number of respondents meeting the diagnostic criteria was too small to provide reliable estimates. These individuals, however, are included in the overall estimate of mental disorder.

A subcategory of Supplement respondents was identified[8,10] because of MOH interest in targeting services to more severely mentally ill Ontarians. These were people who had a lifetime history of a UM-CIDI disorder (other than substance abuse or dependence) combined with evidence of a psychiatric disability — either they considered themselves to be disabled due to mental illness or they reported being hospitalized for mental health reasons in the year before the interview. Only a few findings can be reported for this group because their numbers were small.

Reported disability is measured in two ways. Respondents classified as having disability "in main activity" were those who reported having difficulty in the previous six months performing what they considered to be their main activity, as well as those who defined their main activity as "permanently unable to work." Respondents having "disability days" were those reporting one or more days out of the previous 30 in which they were completely unable to function normally because of their emotional or mental health, or because of alcohol or drug use.

Self-rated mental health is the respondent's perception of his or her own mental health. Here we report the percent who felt that their mental health was only fair or poor.

Results

The provincial rate of mental disorder for Supplement respondents between 15 and 64 years of age was 19.5%. Nearly 14% reported disability in their main activity. A small percentage (1.3%) had one or more disability days in the previous month, and a somewhat larger group (3.6%) rated their mental health as fair or poor. Respondents classified as more severely ill constituted 2.0% of the sample, and more than 70% of these were between 25 and 44 years old. There were no significant differences in either the sex or regional distribution of the more severely ill respondents.

Exhibit 10.1 shows the age/sex-specific rates of mental disorder, reported disability, and self-rated mental health for the entire sample. While there is considerable variation within groups, two overall patterns can be seen. First, for many measures of need, there is an inverse relationship between age and need. Those between 15 and 19 years old, for example, report the highest rates of mental disorder (28.7% for women, 34.9% for men), disability in main activity (26.0% for women, 37.0% for men) and disability days (3.4% for women, 1.1% for men). Those in the older age groups (45 to 64, and 65 and older) generally report the lowest levels. The primary exception is in

Exhibit 10.1: ***Age/Sex-specific Weighted Proportions of Mental Disorder, Reported Disability and Self-rated Mental Health Status in Ontario, 1990***

Indicators	Age Group							
	15 - 19 Years		20 - 44 Years		45 - 64 Years		65 + Years	
	Sample**	Proportion (%)	Sample**	Proportion (%)	Sample**	Proportion (%)	Sample**	Proportion (%)
Women								
Mental Disorder:								
Anxiety Disorder	491	18.8	2,562	16.4	1,168	11.1	NA	NA
Affective Disorder	491	6.9	2,562	6.3	1,168	4.4	1,115	1.8
Substance Abuse or Dependence	491	3.4	2,562	2.8	1,168	0.4	1,115	0.0
Other Mental Disorder	491	7.6	2,562	1.7	1,168	0.7	NA	NA
Any Mental Disorder	491	28.7	2,562	20.6	1,168	14.9	NA	NA
Reported Disability:								
In Main Activity	500	26.0	2,588	14.9	1,197	13.8	1,153	11.3
Disability Days *	500	3.4	2,588	1.2	1,197	0.2	1,153	0.6
Self-rated Mental Health Status:								
Percent Fair and Poor	499	5.6	2,582	3.6	1,193	4.1	1,148	7.6
Men								
Mental Disorder:								
Anxiety Disorder	509	11.4	2,262	10.3	1,021	4.8	NA	NA
Affective Disorder	509	1.6	2,262	3.8	1,021	2.5	651	0.5
Substance Abuse or Dependence	509	11.0	2,262	10.5	1,021	2.6	651	1.8
Other Mental Disorder	509	20.2	2,262	4.8	1,021	1.1	NA	NA
Any Mental Disorder	509	34.9	2,262	21.4	1,021	8.4	NA	NA
Reported Disability:								
In Main Activity	513	37.0	2,285	9.1	1,033	7.6	684	1.9
Disability Days *	513	1.1	2,285	1.8	1,033	0.7	684	0.1
Self-rated Mental Health Status:								
Percent Fair and Poor	513	3.4	2,282	3.3	1,031	3.0	677	7.8

NA - Not Available

***** Respondents who were totally unable to carry out their normal activities, one or more days in the previous 30, due to mental health or emotional problems

****** Sample reflects the number of respondents within each age group, whereas % represents the weighted percentage of individuals who reported they had experienced the disorder or disability. Weighting of the percentages was based on the sampling technique used for the survey. The N for each age group varies slightly because of the non-response to some questions by some individuals.

Data Source: Ontario Health Survey, Mental Health Supplement

the self-rated mental health category, where it is the older respondents — particularly those older than 65 — who are more likely to rate themselves as having only fair or poor mental health (7.6% for women, 7.8% for men). The low disorder rates in those older than 65 should be interpreted with caution. Researchers have suggested that structured interviews such as the UM-CIDI do a poor job of detecting mental illness in this age group.[16]

Second, since men and women have different types of mental disorders, they also have different types of needs. Men are significantly more likely to have substance-related or other mental disorders (primarily antisocial personality and conduct disorder), whereas women are more likely to have affective or anxiety disorders.

When all the measures shown in Exhibit 10.1 are considered together, those in greatest need are the 15 to 19–year-olds of both sexes. Compared with women between 45 and 64 years old, late adolescent women have nearly twice the rate of mental disorder and disability in main activity and 17 times the rate of disability days. The younger men have four to five times the rate of mental disorder or main activity disability as the 45 to 64–year olds, and one and a half times the rate of disability days.

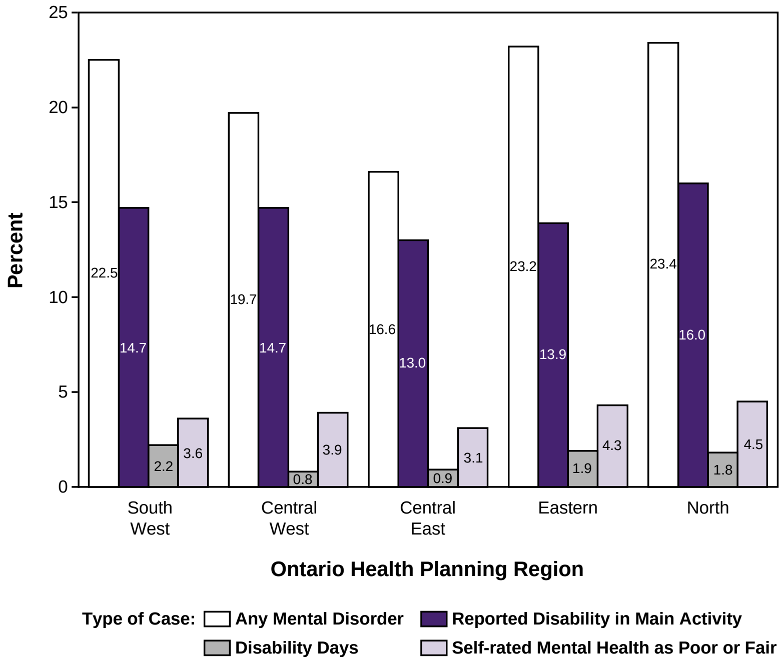
The regional distribution of mental disorder, reported disability and self-rated mental health is shown in Exhibit 10.2. (For reasons described earlier, these are shown for the 15 to 64 – year old respondents only.) In general, these indices of need are more evenly distributed among planning regions than among age or sex groups. While there are geographic fluctuations, they are generally considerably lower than the age group fluctuations (and are not statistically significant). The highest rate of mental disorder (23.4% for the North) is only 1.4 times the lowest rate (16.6% for the Central East) while the highest rate of disability days (2.2% for the South West) is about 2.8 times the lowest (0.8% for the Central West).

Discussion

Mental illness in Ontario is not rare. Approximately one in five Supplement respondents met the criteria for a mental disorder during the year before the study, a rate comparable to the 20% to 30% figure reported in similar studies worldwide. Rates of reported disability and self-rated poor mental health were lower, but overall, the measures of need showed similar distribution patterns.

The wide age and sex variations indicate different types and levels of need among these sociodemographic groups. Women suffer from different disorders than men, and the distribution of these disorders and the other measures of

Exhibit 10.2: ***Percentage with Mental Health "Need" for People 15 to 64 Years by Ontario Health Planning Region, 1990***



Data Source: Ontario Health Survey, Mental Health Supplement

need are unevenly distributed among age groups. The respondents with the greatest need — the mid- to late-adolescents of both sexes — have rates of disorder and reported disability between two and four times higher than respondents in the 45 to 64 year age group.

The measures of need were more evenly distributed among planning regions — not particularly surprising since the regions do not differ significantly in their age and sex profiles. This suggests that there is no need for major regional differences in the broad mix of services offered. However, there are likely to be distinct local patterns that we were unable to identify because of the small sample size.

It was noted earlier that the mental health needs of four groups of Ontario adults were poorly assessed, either because of limitations in the sampling or in the instrument used in the Supplement. These were institutionalized individuals, those uncomfortable communicating in French and English, native people on reserves and the elderly. Although people hospitalized for psychiatric reasons use a substantial portion of mental health resources, the total daily census for all psychiatric beds in the province represents only 0.05% of the population.[17] Consequently, their underrepresentation in the Supplement would have only a minor effect on the results. Of more concern are those who are not comfortable in either English or French, residents of Native Reserves and the elderly — their needs are not well represented in these data.

Mental Health Expenditures

Purpose

This section describes the fiscal resources spent on mental health in 1992/93 in order to give an overall picture of the system and to examine regional distributions by service component.

Data Source and Methods

The primary data used was compiled specifically for the MOH. Cost and activity data for services funded by the MOH were drawn from a variety of sources to form an interim Regional Mental Health Database which is analysed and reported on in this section. Drug benefit programs, home care programs and specialized alcohol and substance abuse services are not included. The general hospital expenditures are direct salary and benefit costs for all clinical and clerical personnel assigned to psychiatric services and do not include services provided by diagnostic and therapeutic departments, or such support areas as housekeeping, administration or medical records. This is a conservative approach used to identify resources that could potentially be reallocated. The amounts are considerably less than the estimated expenditures based on Case Mix Groups® and Resource Intensity Weights®. PPH expenditures include all the operating expenditures for the individual facilities. Central MOH administrative and support costs and payments by other ministries are not included. OHIP spending is based on separate analyses completed specifically for this chapter using an extensive set of fee codes related to mental health services (Appendix A10.1).

It should be noted that this method, dictated by the limitations of the data available, underestimates OHIP billings related to mental health since services which might apply to both physical and mental health problems are not counted.

Results

Exhibit 10.3 depicts total provincial spending on mental health services. For the fiscal year 1992/93, total costs for mental health were $1.28 billion. Total health care costs during the same year were approximately $17 billion. The largest share of mental health funding (34.1%) went to the 10 PPHs, which are provincially owned and operated and have community advisory boards. Psychiatrists and family physicians, who are funded through OHIP billings, received 33.1% of the funding. The third largest share (11.3%) of mental health resources went to general hospitals. Sixty-five general hospitals with psychiatric units are

Exhibit 10.3: ***Total Expenditures on Mental Health Services in Ontario, 1992/93***

Service Component	Provincial Total ($ million)	% of Total Expenditures (without OHIP)	% of Total Expenditures (with OHIP)
Provincial Psychiatric Hospitals (PPH)			
Inpatient	382.2		
Outpatient	53.2		
Total PPH	**435.4**	**51.0**	**34.1**
Specialty Hospitals			
Inpatient	85.5		
Outpatient	2.1		
Total Specialty	**87.6**	**10.3**	**6.9**
General Hospitals			
Inpatient	91.5		
Outpatient	50.8		
Without Psychiatric Units	1.5		
Total General	**143.8**	**16.8**	**11.3**
Hospital Subtotal	**666.8**	**78.1**	**52.3**
Community Mental Health (CMH)			
Community Sponsored	89.3		
Hospital Sponsored	35.6		
Unclassified	2.0		
Total CMH	**126.9**	**14.9**	**9.9**
Homes for Special Care (HSC)			
Nursing Homes	42.7		
Residential Homes	17.7		
Total HSC	**60.4**	**7.1**	**4.7**
Total Without OHIP Billings	**854.1**		
OHIP Billings	**422.4**		**33.1**
Total Including OHIP Billings	**1,276.5**		

Data Source: Interim Regional Mental Health Database, National Physician Database

Exhibit 10.4: ***Per Capita Expenditures on Mental Health Services by Ontario Health Planning Region, 1992/93***

Service Component	South West ($)	Central West ($)	Central East ($)	Eastern ($)	North ($)	Ontario ($)
Provincial Psychiatric Hospitals	44.19	30.13	33.86	49.52	73.31	40.92
Specialty Hospitals	0.00	13.21	6.42	17.28	7.29	8.23
General Hospitals	14.28	14.62	13.83	13.37	8.58	13.50
Community Mental Health	11.40	11.02	10.97	10.07	21.68	11.92
Homes for Special Care	8.07	5.08	4.67	6.02	8.03	5.67
Total Without OHIP Billings	**77.94**	**74.06**	**69.75**	**96.26**	**118.89**	**80.24**
OHIP Billings	26.98	22.48	50.01	50.73	13.74	39.68
Total Including OHIP Billings	**104.92**	**96.54**	**119.76**	**146.99**	**132.63**	**119.92**

Data Source: Interim Regional Mental Health Database, National Physician Database

funded as part of global hospital budgets and operated by hospital boards; approximately 120 additional general hospitals admit patients with a psychiatric diagnosis even though they do not have psychiatric units. Five specialty hospitals, each with a unique role, operate under boards of directors and represent 6.9% of the total spending. Close to 370 community mental health programs account for 9.9% of the funding. These programs are transfer payment agencies, some operated by free-standing boards, others by sponsoring organizations or hospitals. They provide different types of programs: case management, social rehabilitation, crisis intervention, etc. The Homes for Special Care program (4.7%) is funded by the MOH and provides long term housing and daily care to former inpatients of PPHs.

Exhibit 10.4 shows per capita mental health spending among the health planning regions for the 1992/93 fiscal year. There are wide regional discrepancies in the amount spent on different service components. The greatest differences are in provincial hospital and OHIP billings. Per capita spending for PPHs ranges from $30.13 in the Central West to $73.31 in the North. In contrast, per capita spending for medical practitioners is lowest in the North, with an OHIP per capita rate of $13.74, whereas the Eastern and Central East regions spend about $50 per capita. Rates of expenditures for general hospitals and community mental health programs are fairly even from one region to the next, with the exception of the North, where general hospital spending is less than the provincial average and community mental health spending is more. In terms of total spending, the two regions with higher than average per capita rates are the North and Eastern regions, although their ranking changes depending on whether or not OHIP is included. The South West, Central West and Central East regions have lower than average total spending, with and without OHIP.

Discussion

Approximately 8% of the provincial health budget goes to mental health services. Given the growing body of evidence that even the most serious mental illnesses can be effectively treated[18], as well as the burden of these conditions in Ontario society, the logical question becomes: Is this level of expenditure adequate?

Most of the mental health fiscal resources are allocated to hospital and medical practitioner services. It is therefore important to look more closely at these sectors to understand how resources are utilized and where reallocations might occur. This will be the focus of the following sections. Within the hospital sector, the use of a direct cost method for general hospitals underestimates total hospital costs. Sixteen percent of the direct cost is for outpatient care. Unfortunately there are few data available to describe these services, so subsequent analyses are restricted to inpatient care.

One of the fiscal objectives of mental health reform policy is to transfer funds from hospital inpatient services to community support programs. To achieve this, shifts will have to occur from inpatient to outpatient spending within the hospital sectors and from the hospital sector to community mental health. PPH expenditures will be a focus of these shifts. Within the general and specialty hospital sectors, the emphasis is on achieving greater efficiencies and providing secondary care for the most seriously ill. Another fiscal objective is to achieve greater equity between underserviced areas and other parts of the province. This does not assume that total per capita funding should be equal in all regions — other factors, such as the composition and dispersion of the population and its mental health needs, may influence costs. However, it does imply that the relative distribution of resources should be more even than it is at present, particularly with regard to the PPHs and OHIP. The following descriptions of service utilization provide a baseline from which change can be monitored over the next five to 10 years.

OHIP Utilization

Purpose

This section describes OHIP-related billings as they are distributed among five planning regions. Specific attention will be paid to the type of provider (GP/FP, psychiatrist, other MD) receiving payment for mental health-related services and to the age and sex breakdown of the recipients of mental health services. The use of mental health service resources, as reflected in OHIP billings, will be compared with the distribution of mental health needs described earlier in this chapter. The figures used in this section are unadjusted dollar amounts. For a discussion of both adjusted and unadjusted OHIP expenditures, see Chapters 3 and 9.

Data Source and Methods

Information on the use of mental health-related services is drawn from the NPDB. Data were extracted from OHIP billing records and summarized for Ontario physicians. This data set is fairly inclusive in that it represents 95% of all physician expenditures in the province. Services excluded are those covered by sessional fees or provided by physicians who are salaried (such as those in PPHs) or practising under Alternate Funding Plans. (For a detailed list of the services included in the NPDB, see the Methods section in Chapter 9.)

Because this information is organized by physician rather than by patient, two points must be kept in mind when interpreting these data. First, geographic information reflects the regional location of the service provider, not the recipient. Therefore, if a person travels to another region to consult a specialist, the service will be reflected in the region where the specialist practises, not the patient's region of residence. Second, mental health billings are identified using fee code information since patient diagnoses are not available. We have used the list of codes defined as mental health-related by the MOH (see below and Appendix A10.2). However, this method does not capture all visits. As mentioned earlier, services that can apply to either physical or mental health problems (e.g., minor assessments by GP/FPs) or that may address a combination of physical and mental health complaints at the same time (e.g., multiple system assessments) are not included in our analyses.

Our focus is on the total dollars billed for mental health-related fee codes. The services covered by these codes include: the psychotherapy and counselling services described in Chapters 3 and 9; assessments, visits and consultations performed by psychiatrists; electroconvulsive therapy; and certain general and specialty hospital procedures (such as inpatient group or individual psychotherapy). Information from 1992/93 will be described by age and sex and by planning region to allow comparison with the 1990/91 indicators of need measured in the Supplement. OHIP data from the three years between 1992/93 and 1994/95 will also be examined to see if any spending trends emerged during that time.

Results

Exhibit 10.5 shows the percentage of mental health-related spending and the per capita rate by age and sex across three years. While there is very little fluctuation in the percentages or the per capita rates between 1992/93 and 1994/95, the increase in actual billings is a little over $22.5 million, an increase of 5.3%. By comparison, non-mental health OHIP billings decreased by 0.3% within that same time period.

There are some marked age and sex differences in mental health OHIP billings. For both sexes, per capita spending for the 20 to 44 age group and the 45 to 64 age group is higher than for adolescents and those older than 65. Per capita spending for women is greater than that for men in all age groups, with the largest sex differences occurring in the 20 to 44 and 45 to 64 age groups.

Exhibit 10.6 shows the regional percentages of mental health-related OHIP billings, broken down by type of provider. Although the information presented is from 1992/93 only, comparisons with 1993/94 and 1994/95 OHIP data indicate very little change in the billing patterns by region or type of provider. Mental health-related OHIP billings have increased steadily as a proportion of total OHIP expenditures (9.5%, 9.8% and 10.0% for 1992/93, 1993/94 and 1994/95, respectively). There is considerable regional variation in per capita OHIP billings for mental health care, ranging from lows of $13.74 in the North and $22.48 in the Central West to highs of $50.01 in the Central East and $50.73 in the Eastern region (Exhibit 10.7). Much of the regional variation is because of reimbursements to psychiatrists. The figures for the number of physicians per 1,000 population (Exhibit 10.6) indicate that one contributing factor is physician supply, although the correlation is not exact.

Discussion

Mental health-related OHIP billings increased moderately between 1992/93 and 1994/95, whereas other OHIP billings have essentially remained stable. Physician billings for mental health services have increased from 9.5% to 10.0% of the total OHIP dollar. However, the overall pattern among age and sex groups and among planning regions has changed very little.

There is considerable variation in mental health OHIP billings both within age and sex groups and within planning regions. Relatively speaking, the 20 to 64 year olds use a larger share of OHIP mental health dollars than either young adults or the elderly. The largest number of dollars per capita are for services to women — particularly women between 20 and 64 years of age — a pattern of utilization that is not unique to Ontario.[19] In contrast, the overall rates of need described earlier are generally equivalent for men and women, and those most likely to be in need are men and women between 15 and 19 years of age. Therefore, the distribution of needs described earlier does not match the distribution of per capita OHIP dollars spent on mental health services. The most noticeable gaps occur for men (suggesting that their mental health problems are not addressed by OHIP providers) and for the young and the elderly. The extent to which the needs of these groups are being met through other formal services (such as specialized addiction services or COMSOC programs) must be answered by data sources other than the ones examined in this chapter.

Exhibit 10.5: *Mental Health Billings and per Capita Billings by Age and Sex in Ontario, 1992/93 – 1994/95*

Age Group	1992/93 % of Mental Health Billings	1992/93 Per Capita Billings ($)	1993/94 % of Mental Health Billings	1993/94 Per Capita Billings ($)	1994/95 % of Mental Health Billings	1994/95 Per Capita Billings ($)
Women						
15 - 19 Years	2.6	31.52	2.5	31.26	2.4	31.51
20 - 44 Years	36.8	70.31	35.9	69.09	35.0	70.19
45 - 64 Years	16.2	64.30	16.9	65.65	17.7	69.35
65+ Years	5.2	30.26	5.3	30.39	5.5	32.17
Men						
15 - 19 Years	1.5	17.17	1.5	17.33	1.4	17.72
20 - 44 Years	20.0	37.86	19.4	37.02	19.1	38.15
45 - 64 Years	9.9	39.78	10.4	40.92	10.8	42.84
65+ Years	2.8	22.78	2.9	23.17	3.1	24.81
Total Mental Health OHIP Billings ($ Million)	**422.4**		**426.9**		**445.0**	
Per Capita Mental Health OHIP Billings ($)	**39.68**		**39.48**		**40.72**	

Data Source: National Physician Database

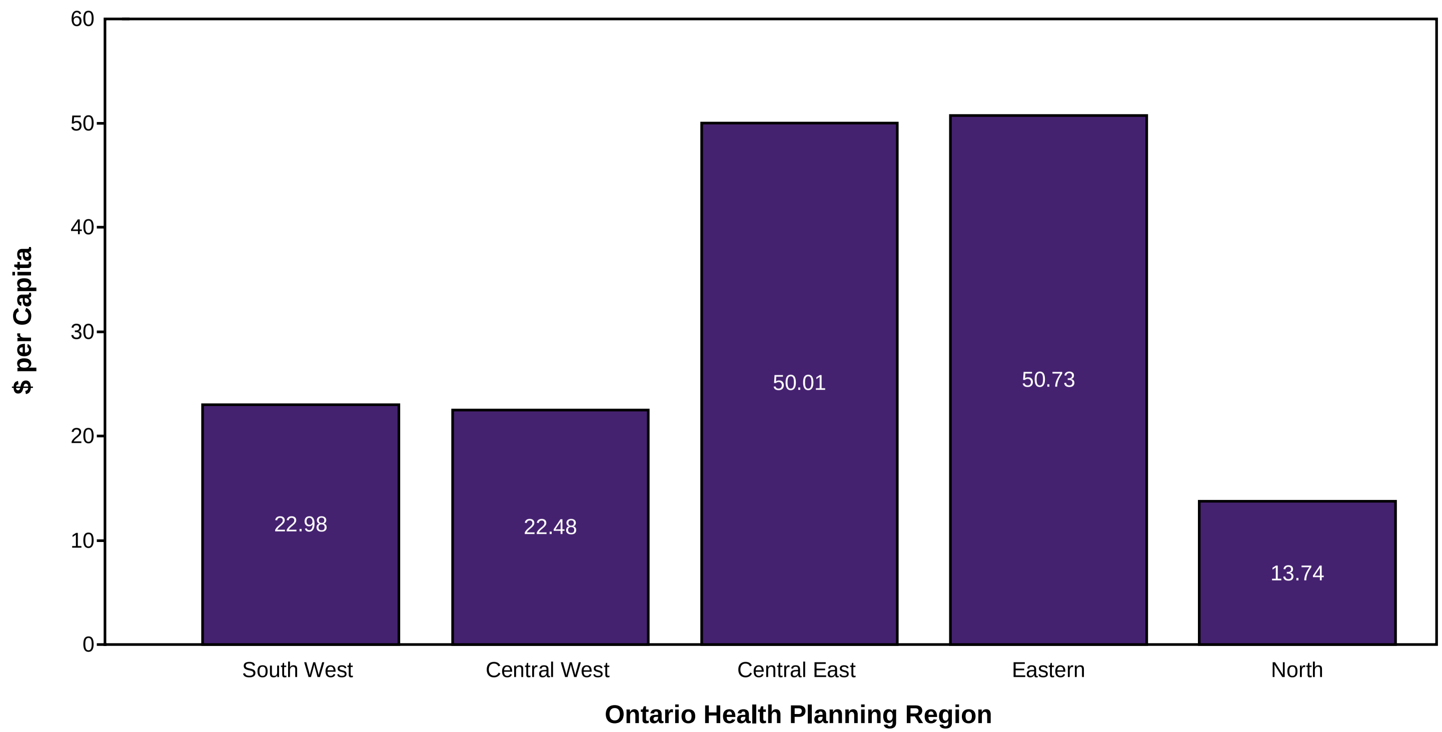
Exhibit 10.6: *OHIP Billings for Mental Health and Physician Supply by Ontario Health Planning Region, 1992/93*

Health Planning Region	Total OHIP Billings		Total Physicians * /1,000 Population	Mental Health OHIP Billings		GP/FPs * /1,000 Population	OHIP Billings for GP/FP-provided Services		Psychiatrists* /1,000 Population	OHIP Billings for Psychiatrist-provided Services		Other MDs * /1,000 Population	OHIP Billings for Other MD-provided Services	
	($ million)	($ per Capita)		(%)	($ per Capita)		(%)	($ per Capita)		(%)	($ per Capita)		(%)	($ per Capita)
South West	552.5	373.13	1.71	7.1	26.98	0.87	3.2	12.07	0.11	3.6	13.77	0.73	0.3	1.14
Central West	585.0	336.92	1.62	6.5	22.48	0.84	2.9	9.83	0.09	3.2	10.95	0.69	0.5	1.69
Central East	2,406.6	472.48	1.95	10.6	50.01	1.00	4.2	19.79	0.17	5.9	27.72	0.78	0.5	2.50
Eastern	578.6	385.78	2.28	13.0	50.73	1.11	4.6	18.12	0.23	7.8	30.46	0.94	0.6	2.14
North	264.9	290.90	1.37	4.7	13.74	0.86	3.0	8.67	0.04	1.6	4.56	0.47	0.2	0.50
Ontario	**4,449.7 ****	**417.98**	**1.88**	**9.5**	**39.68**	**0.97**	**3.8**	**16.03**	**0.15**	**5.2**	**21.59**	**0.76**	**0.5**	**1.97**

* Total number of physicians submitting claims to OHIP (not limited to those billing greater than $35,000 as in Chapters 3, 4 and 9)
** Provincial total is greater than the sum of the regional totals due to missing regional information.

Data Source: National Physician Database

Exhibit 10.7: *Per Capita OHIP Billings for Mental Health by Ontario Health Planning Region, 1992/93*



Data Source: National Physician Database, and Census Canada

Another notable disparity arises when these distributions are compared among the health planning regions. Although mental health needs were relatively evenly spread across the regions, per capita OHIP reimbursement clearly is not. The highest per capita OHIP billings for mental health (in the Central East and Eastern regions) are nearly four times the lowest (in the Central West and North). The data suggest that one reason for this disparity is the uneven distribution of physicians, especially psychiatrists. High per capita OHIP costs might be offset in some regions by low per capita costs for non-OHIP related services, thereby resulting in total per capita health care expenditures which are not high. For example, while per capita OHIP billings are high for the Central East, the region spends less per capita on other services, so their total expenditure is not high (Exhibit 10.4).

There are two significant obstacles to evaluating the implications of these findings both for the current OHIP system and for the changes necessary to further mental health reform — the lack of detail in the data currently available and the lack of uniform definitions and standards. As noted earlier, the NPDB is structured to give general information about providers. Therefore, we know little about where recipients of service live, what their mental health needs are, or what treatment they received and how appropriate or effective it was. Furthermore, consistent standards of practice and definitions of the role which physicians should play in a reformed mental health care system are still evolving. The information provided here is a start, but uniform definitions and standards and data systems that link provider and consumer characteristics with outcomes will add immeasurably to our understanding and ability to evaluate and plan.

Inpatient Utilization

Purpose

This section describes and compares inpatient utilization by region and by hospital. This information serves as a baseline for planning and evaluating mental health reform and describes performance indicators that can be used to gauge efficiency and progress within each sector.

Data Source and Methods

Two different data sources were used: the ADT/CPI for provincial hospitals and the CIHI data for general and specialty hospitals. The former is based on snapshot descriptions of the populations within the provincial hospitals conducted on an annual basis. This census method of describing utilization has advantages over admission and discharge data in long-term facilities where only a small proportion of the population may turn over in a year. Data were summarized from snapshots conducted on August 19, 1992, April 28, 1993 and August 17, 1994. For the general and specialty hospitals, information that described all patients aged 18 and older discharged with a "most responsible diagnosis of mental disorder" was analysed for 1992/93, 1993/94 and 1994/95. A more detailed description of the inclusion and exclusion criteria and definitions of variables is found in appendix A10.2.

It should be noted that the use of discharge diagnosis as a means of describing the acute care sample means that all discharges with a primary psychiatric diagnosis are included whether or not they were admitted to a psychiatric service. This broad and inclusive definition of utilization leads to an overestimation of the need for specialized psychiatric beds for some subgroups. For example, elderly patients with dementia are typically and appropriately admitted to medical beds unless there are complicating behavioural problems.[20] There are other subgroups not included in the mental disorder classification who do require specialized psychiatric services. For example, those with a diagnosis of drug poisoning admitted to psychiatric services are most likely drug overdoses or suicide attempts. Ideally, patient service codes should be combined with diagnoses to develop more meaningful definitions of psychiatric utilization. Unfortunately the patient service codes are currently not sufficiently reliable to be used in this fashion.

There are some differences in the way volume of utilization is described in acute and long term care hospitals. Within the acute sector, days of care are calculated by multiplying the average length of stay (LOS) by the number of separations within a year. This method would be misleading in the PPHs where lengths of stay are often of several years duration; consequently, if these patients received care for the entire year, they would not be counted as separations. If discharged, they could skew the calculation of days of care. Therefore, in the long-term sector, days of care are calculated by multiplying the daily census by 365 (the number of days in a year). Turnover in long-term facilities is represented by the number of episodes of care in a year — estimated from the LOS data for the census sample (appendix A10.2). The populations served by the PPHs are defined by geographic catchment areas with fixed boundaries. In contrast, for the acute care sector, the population base relates to the health planning region in which the facility is located, which may not be equivalent to the actual population of users.

Given the limited information contained in the two data sets, several additional performance indicators relevant to mental health reform have been defined. For the PPH sector, the long-stay group comprises those who have been in hospital for longer than one year at the time the snapshot is taken. This group is subdivided into those younger than 65 and those older than 65 years of age. *Previously admitted* patients are those who have been admitted to that facility before, as reported by PPHs since 1985, when the database was established. (Some PPHs began documenting those previously admitted in 1985, whereas others had historical records of previous admissions occurring before 1985.) *New admission, not referred* are those who are not tertiary care referrals, i.e. they are new to the facility and have not been referred either by another psychiatric facility or by the legal system. The definition of *may not require hospitalization (MNRH)* is similar to the CIHI designation. It groups the psychiatric diagnoses for which the need for inpatient admission cannot be understood by looking at diagnosis alone. Included are the anxiety, adjustment, personality, sexual dysfunction and miscellaneous psychiatric disorders. *Forensic* patients are those who at some time in their admission were mentally disordered offenders or on disposition/ assessment orders. *Substance abuse* patients are those with a primary diagnosis of alcohol or drug abuse.

For the general hospital and specialty sectors, *previously admitted, MNRH* and *substance abuse* are defined as they are for the PPHs. *Involuntary* cases are those admitted or certified as involuntary during their hospital stay. *Alternate level of care* is the CIHI variable that designates days when acute care is no longer required, as assessed by clinical staff. *Against medical advice* is defined by the method of discharge.

Given that a primary goal of mental health reform is to move care from inpatient settings, particular emphasis will be placed on the performance indicators reflecting LOS. (LOS is defined somewhat differently for PPHs, where it is the number of care episodes per filled bed that best describes this indicator.) However, LOS can be misleading if examined in isolation. Hospitals may decrease LOS but create a revolving-door population and increase readmission rates instead. Some hospitals may serve more severe or specialized patient populations than others, making it more difficult for them to have a short LOS, while others may have difficulty because there are few community support services in their area. The available data do not always provide an exact measure of these factors, but they can be approximated. In the results section, the desired direction for each indicator will be described. However, because individual hospitals have unique sets of circumstances, the results must be interpreted accordingly. Where relevant, these special circumstances will be noted in our discussion.

Total Inpatient Use

Exhibit 10.8 summarizes total utilization in each hospital sector over time. From 1992/93 to 1994/95, there was a reduction in patient days per capita in all sectors. The magnitude of the decrease was greatest within the specialty hospitals (–30%) and the PPHs (–10.5%).

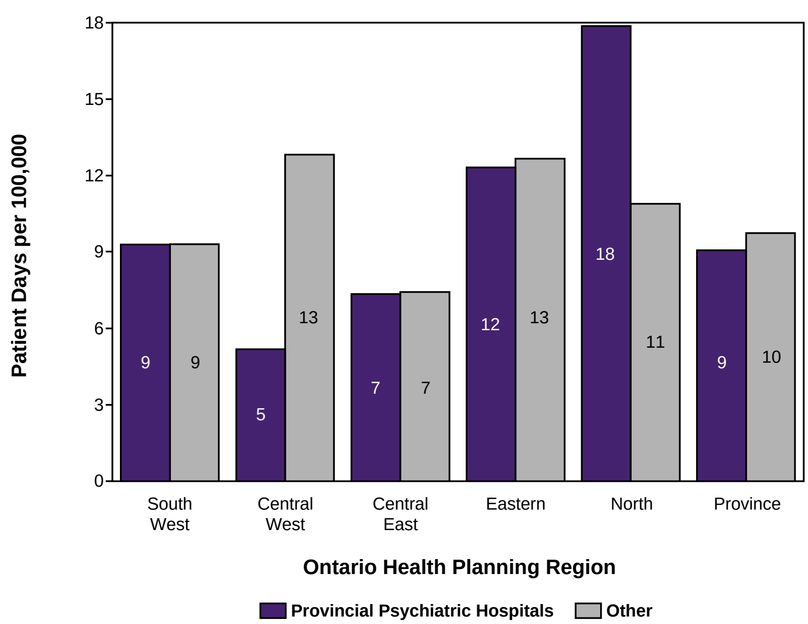
Exhibit 10.9 compares utilization in the PPHs and the combined other hospital sectors by planning region, using average patient days during the three year time period. There is a relationship between the 1992/93 per capita spending described in Exhibit 10.4 and levels of utilization, but the correspondence is not exact. There is some evidence of an offsetting effect between the two types of use; for example Central West has the lowest provincial level of PPH utilization and is the highest for

Exhibit 10.8: ***Trends in Patient Days for Mental Health Services per 100,000 Population in Ontario, 1992/93 - 1994/95***

	Patient Days/100,000		
	1992/93	1993/94	1994/95
Provincial Psychiatric Hospitals	9,471	9,318	8,478
General Hospitals with Psychiatric Units	6,536	6,410	6,225
General Hospitals without Psychiatric Units	1,059	1,023	1,129
Specialty Hospitals	2,635	2,317	1,896
Total	**19,701**	**19,068**	**17,728**

Data Source: Admissions, Discharges and Transfers, Central Patient Index, Provincial Psychiatric Hospitals, and Canadian Institute for Health Information (CIHI)

Exhibit 10.9: ***Patient Days per 100,000 Population by Ontario Health Planning Region, Provincial Psychiatric Hospitals and Other Facilities, 1992, 1993, and 1994****



** Data for Provincial Psychiatric Hospitals are averaged from snapshot databases for August 19, 1992; April 28, 1993 and August 17, 1994. Data for other databases are the average for three fiscal years, 1992/93 – 1994/95*

Data Source: Admissions, Discharges and Transfers, Central Patient Index, Provincial Psychiatric Hospitals, and Canadian Institute for Health Information (CIHI) other use. But this is not consistent (e.g., the North and Eastern regions have the highest levels of PPH utilization and their other use is also higher than the provincial average).

PPH Utilization and Performance Indicators

Exhibits 10.10 and 10.11 summarize data for the three one-day snapshot surveys that were conducted in 1992, 1993 and 1994 for each of the PPHs. There are large variations in utilization among the hospital catchment areas — with patient days per 100,000 ranging from 4,533 to 20,028. The hospitals with the lowest rates of utilization (Hamilton Psychiatric Hospital and Whitby Psychiatric Hospital) are of interest because they are closer to meeting mental health reform benchmarks. A major difference between them and the hospitals with the highest patient days is in the number of patients who have hospital stays longer than one year. For the province as a whole, 52% of PPH patient days can be attributed to a long-stay population. But this type of use varies a great deal from one facility to the next. Long stays by those age 65 and older range from l% to 13% of episodes and from 4% to 19% for those younger than 65. The hospitals with lower rates of utilization typically have fewer long-stay patients.

Provincially, there are 3.2 episodes of care per year for each PPH filled bed. In some facilities the ratio is higher — Hamilton Psychiatric Hospital, Lakehead Psychiatric Hospital and London Psychiatric Hospital all have close to four episodes of care per year. This indicates higher turnover and perhaps a more efficient use of resources. A negative consequence of shorter hospital stays can be higher readmission rates — the expansion of a revolving-door population. It is therefore important to consider this possibility (as indicated by the percentage previously admitted) when monitoring and comparing facilities.

In a reformed system of care, PPHs will often have a tertiary care role for the most severely ill. This means that they should have few new admissions who are not referred, and rates of MNRH should be low (unless there are specialized programs for the more severely ill within those diagnostic groupings, as is the case with personality disorders at Whitby Psychiatric Hospital and the Mental Health Centre in Penetanguishene). Facilities which officially provide secondary as well as tertiary care are Brockville Psychiatric Hospital, North Bay Psychiatric Hospital, the Mental Health Centre in Penetanguishene, Queen Street Mental Health Centre in Toronto and St. Thomas Psychiatric Hospital. Data from Exhibit 10.10 show that there is not always a match between the pattern of utilization and the specified role.

PPHs with higher proportions of forensic patients have less freedom to reduce utilization since the LOS for these patients is often determined by external legal decisions. This is particularly an issue for the Mental Health Centre in Penetanguishene which includes Oakridge, a maximum security forensic program, but it also is a factor that varies among facilities and catchment areas. Typically, individuals with a primary substance abuse problem are admitted to addiction treatment services rather than to PPHs, but individuals with dual disorders (i.e. substance abuse and mental disorder) have unique needs. There are four facilities (Mental Health Centre in Penetanguishene, Brockville Psychiatric Hospital, Lakehead Psychiatric Hospital and St. Thomas Psychiatric Hospital) with specialized programs for this patient group. In the remaining facilities, variations are probably related to the availability of appropriate addiction services in the catchment area.

General and Specialty Hospital Utilization and Performance Indicators

Exhibit 10.12 describes utilization in 1994/95 for general hospitals with psychiatric units (teaching and non-teaching) and the specialty hospitals. An additional table in the electronic edition provides the same information for all general hospitals without psychiatric units reporting 20 or more psychiatric discharges.

The provincial average LOS for psychiatric patients in general hospitals with psychiatric units is 15 days. In general, LOS is higher in teaching hospitals, where it ranges from 8 to 28 days. (Teaching hospitals in the South West and Eastern regions typically discharge patients more quickly than those in Central West and Central East.) In non-teaching hospitals, the range is from 8 to 25 days, with most facilities discharging patients in less than two weeks, but there is considerable variation within all regions. In specialty hospitals, the provincial average is 33 days. In hospitals without psychiatric units, stays are briefer, averaging around one week.

As with PPHs, it is important to consider whether shorter hospital stays are associated with higher rates of readmission in the acute care sector. Facilities with both lower than average hospital stays and lower previous admission rates are avoiding this negative consequence.

When evaluating LOS in acute care settings, it is also important to consider the nature of the patient population admitted. It is not in keeping with mental health reform to admit patients with less severe illnesses who require less intense treatment. This dimension is difficult to assess in psychiatry with existing information. Still, both involuntary status and type of diagnosis give some indication of the level of severity of illness in the populations served. For the province, close to 30% of admissions are involuntary, but there is considerable variation among facilities. There is also considerable variation in diagnostic composition. On average, 26% of the episodes in general hospitals with psychiatric units fall into the MNRH category of diagnoses, a higher average than in general hospitals without psychiatric units (23.7%). General hospitals with psychiatric wards that treat more involuntary and fewer MNRH patients, and also have shorter stays, are operating closest to their prescribed role.

Exhibit 10.10: *Provincial Psychiatric Hospital Utilization* by Ontario Health Planning Region, 1992, 1993 and 1994*

Institution by Region	Average Population Served	Average Daily Census	No. of Care Episodes /Year	Patient Days /100,000	Length of Stay Greater than 1 Year: Less than 65 Years % Episodes	% Days	Patient Days/100,000	65+ Years % Episodes	% Days	Patient Days/100,000
South West:										
London Psychiatric	1,210,000	263	1,081	7,923	4.1	17.0	1,347	3.2	13.2	1,046
St. Thomas Psychiatric	730,000	231	754	11,567	12.8	41.6	4,817	3.7	12.0	1,383
Central West:										
Hamilton Psychiatric	1,400,000	199	772	5,188	7.2	28.0	1,451	3.0	11.6	600
Central East:										
Mental Health Centre, Penetanguishene	570,000	276	868	17,695	15.9	50.1	8,858	1.1	3.5	619
Queen Street Mental Health Centre, Toronto	2,260,000	452	1,535	7,295	10.3	35.1	2,557	4.0	13.7	1,001
Whitby Psychiatric	2,040,000	253	815	4,533	11.3	36.4	1,652	4.1	13.2	596
Eastern:										
Brockville Psychiatric	1,020,000	273	757	9,781	11.1	30.9	3,018	10.3	28.4	2,779
Kingston Psychiatric	710,000	313	758	16,074	14.1	34.1	5,484	12.7	30.7	4,935
North East:										
North Bay Psychiatric	610,000	283	708	16,954	19.1	47.8	8,098	8.3	20.7	3,510
North West:										
Lakehead Psychiatric, Thunder Bay	260,000	143	575	20,028	4.6	18.5	3,697	5.6	22.7	4,539
Ontario	**10,810,000**	**2,686**	**8,623**	**9,070**	**10.9**	**34.9**	**3,168**	**5.3**	**16.9**	**1,536**

Exhibit 10.11: *Provincial Psychiatric Hospital Utilization* by Ontario Health Planning Region and Admission Category, 1992, 1993 and 1994*

Institution by Region	Previously Admitted % Episodes	% Days	Patient Days /100,000	New Admission Not Referred % Episodes	% Days	Patient Days /100,000	May Not Require Hospitalization % Episodes	% Days	Patient Days /100,000	Forensic % Episodes	% Days	Patient Days /100,000	Substance Abuse % Episodes	% Days	Patient Days /100,000
South West:															
London Psychiatric	64.2	64.7	5,128	15.5	14.2	1,126	9.3	7.7	613	3.7	4.2	332	2.6	2.3	181
St. Thomas Psychiatric	63.2	61.4	7,100	7.3	4.0	467	12.2	9.8	1,133	15.7	24.1	2,783	9.1	4.9	567
Central West:															
Hamilton Psychiatric	71.0	70.5	3,659	8.9	8.7	452	4.2	3.5	183	11.9	10.4	539	2.7	3.9	200
Central East:															
Mental Health Centre, Penetanguishene	60.1	69.7	12,337	17.4	11.5	2,028	12.3	16.4	2,903	28.2	39.6	7,001	15.6	6.8	1,195
Queen Street Mental Health Centre, Toronto	79.1	76.8	5,604	5.3	5.8	420	7.3	6.4	468	10.1	9.8	716	1.6	2.1	156
Whitby Psychiatric	70.0	69.7	3,161	11.5	8.9	406	14.1	11.4	519	10.4	11.4	519	2.8	2.6	119
Eastern:															
Brockville Psychiatric	64.7	61.6	6,024	9.2	8.3	811	13.7	10.7	1,050	15.1	16.3	1,598	12.6	7.0	680
Kingston Psychiatric	64.6	63.2	10,162	15.8	13.9	2,228	11.0	7.8	1,251	7.7	7.9	1,268	4.2	4.1	651
North East:															
North Bay Psychiatric	64.1	57.5	9,753	19.1	22.4	3,790	13.2	5.4	917	11.9	11.9	2,014	4.5	2.9	499
North West:															
Lakehead Psychiatric, Thunder Bay	83.2	81.3	16,285	9.3	8.2	1,638	5.0	4.2	842	8.9	7.7	1,544	3.4	3.0	608
Ontario	**68.9**	**67.5**	**6,124**	**11.6**	**10.6**	**963**	**10.0**	**8.5**	**771**	**12.1**	**14.3**	**1,297**	**5.6**	**3.9**	**352**

* Data are based on a census methodology, summarized from one-day snapshots in each of the years noted; algorithms used to calculate episodes and patient days are included in Appendix A10.1

Data Source: Admissions, Discharges and Transfers, Central Patient Index, Provincial Psychiatric Hospitals

Exhibit 10.12: *Mental Health Utilization in Hospitals with Psychiatric Units in Ontario, 1994/95*

Institution by Size and Region	Number of Separations	Average Length of Stay	Previously Admitted		May Not Require Hospitalization (MNRH)		Alternate Level of Care (ALC)	Involuntary	Discharged Against Medical Advice	Substance Abuse
			% Cases	% Days	% Cases	% Days	% Days	% Cases	% Cases	% Cases
TEACHING										
Central East										
Hospital for Sick Children, Toronto	66	16.0	53.0	42.2	30.3	4.8	0.0	0.0	4.5	4.5
Mount Sinai Hospital, Toronto	291	25.3	55.3	44.1	14.8	6.5	25.6	19.2	2.4	2.1
Sunnybrook Health Science Centre, Toronto	653	24.3	55.9	55.2	9.0	3.2	9.5	20.8	5.5	7.5
Toronto Hospital	964	19.4	47.7	49.4	19.8	7.4	0.6	21.4	8.4	8.2
Wellesley Hospital, Toronto	725	21.2	46.1	50.5	18.9	8.2	14.4	37.4	13.5	15.7
Women's College Hospital, Toronto	465	14.4	51.6	60.0	35.9	19.9	15.3	18.9	9.5	2.8
Central West										
Chedoke-McMaster Hospitals, Hamilton	388	24.1	29.6	26.7	17.0	9.1	6.7	35.6	4.1	7.0
Hamilton Civic Hospitals	448	28.6	56.9	57.5	14.1	9.3	22.6	21.7	7.6	14.1
St. Joseph's Hospital, Hamilton	897	14.5	75.4	77.4	23.3	10.4	16.3	31.9	4.1	5.6
Eastern										
Children's Hospital of Eastern Ontario, Ottawa	111	21.0	70.3	67.4	57.7	41.5	0.0	12.6	10.8	3.6
Hotel Dieu Hospital, Kingston	411	15.0	63.3	65.6	31.4	25.3	2.6	8.8	10.5	13.1
Kingston General Hospital	697	14.5	66.1	70.0	40.5	31.9	1.4	19.2	6.9	11.3
Ottawa Civic Hospital	919	23.8	10.2	9.7	35.7	18.4	20.4	36.5	12.0	5.7
Ottawa General Hospital	1,031	16.8	56.5	58.1	23.4	11.8	10.3	22.9	8.1	7.4
South West										
Children's Hospital of Western Ontario, London	38	7.6	55.3	74.3	65.8	51.4	0.0	0.0	2.6	7.9
St. Joseph's Health Centre of London	811	14.6	63.7	66.3	34.5	24.4	5.6	13.8	6.4	10.2
University Hospital, London	356	16.4	–	–	20.5	13.8	1.6	6.2	2.0	3.9
Victoria Hospital Corporation, London	734	15.1	66.9	75.3	31.3	12.8	3.1	31.1	6.5	10.5
NON-TEACHING										
Central East										
Centenary Health Centre, Scarborough	1,206	13.4	62.4	66.7	25.0	9.6	13.8	32.3	11.7	9.3
Credit Valley Hospital, Mississauga	518	14.2	57.1	61.6	17.4	12.5	2.5	56.0	6.0	12.5
Etobicoke General Hospital	850	18.8	58.5	54.4	19.4	8.5	21.0	32.9	4.6	13.9
Humber Memorial Hospital, Weston	802	13.7	47.3	52.5	14.1	5.9	25.4	33.0	14.8	30.2
Markham Stouffville Hospital	605	12.6	56.5	57.6	26.6	12.2	6.4	22.5	5.1	6.0
Mississauga Hospital	1,138	14.8	67.5	74.8	26.6	12.4	10.4	19.0	6.2	11.8
North York Branson Hospital	589	17.9	53.1	55.1	8.0	2.4	33.7	20.7	8.5	3.4
North York General Hospital	835	15.4	62.8	66.5	35.6	13.1	15.2	26.6	6.5	5.3
Northwestern General Hospital, Toronto	760	15.8	52.8	55.7	28.4	11.8	36.9	42.6	13.3	14.2
Oshawa General Hospital	1,199	13.9	–	–	25.4	12.4	8.5	17.3	9.2	8.6
Peel Memorial Hospital, Brampton	1,061	13.0	69.1	70.0	30.0	14.0	2.5	30.2	6.3	12.0
Peterborough Civic Hospital	637	17.9	74.7	74.6	20.9	10.8	13.8	15.9	9.4	6.6
Queensway General Hospital, Etobicoke	412	17.1	48.5	53.6	25.2	16.0	20.5	23.5	6.8	10.7
Royal Victoria Hospital, Barrie	806	12.5	63.5	71.5	16.4	5.2	5.9	37.8	15.8	15.1
Salvation Army Grace General, Scarborough	633	16.6	52.0	54.8	22.6	7.8	14.7	30.6	6.8	6.5
Scarborough General Hospital	1,146	10.1	64.4	64.9	13.4	5.4	10.3	33.9	5.1	14.0
St. Joseph's Health Centre, Toronto	1,026	13.3	59.6	60.3	11.4	5.9	20.8	38.2	8.5	13.8
Toronto East General and Orthopedic Hospital	1,434	12.7	64.6	68.3	30.0	15.4	14.7	31.0	8.6	13.0
York Central Hospital, Richmond Hill	453	8.9	62.7	69.9	38.4	26.9	2.1	2.0	7.9	9.9
York County Hospital, Newmarket	818	13.3	69.8	72.3	16.9	9.5	0.0	29.1	7.8	10.4
York-Finch General Hospital, North York	471	11.9	65.4	69.4	36.5	27.0	20.9	46.7	26.5	11.3
Central West										
Brantford General Hospital	1,003	11.7	78.0	80.0	44.0	35.5	1.3	31.5	14.9	16.0
Greater Niagara General Hospital	887	11.3	83.7	91.2	15.0	9.2	21.1	31.8	5.9	13.4
Joseph Brant Memorial Hospital, Burlington	624	16.3	66.7	74.1	19.1	6.0	24.0	27.6	2.4	8.7
Grand River Hospital Corporation	1,126	15.6	62.4	62.6	30.8	20.7	6.1	17.0	12.1	9.9
Oakville Trafalgar Memorial Hospital	658	17.5	73.3	75.0	10.3	2.8	29.2	19.8	8.7	8.7
St. Catharines General Hospital	633	14.6	80.9	81.4	18.3	6.8	2.6	30.2	5.8	7.0
Welland County General Hospital	573	11.0	73.3	74.3	22.7	9.7	14.6	26.5	5.9	11.3
Eastern										
Belleville General Hospital	606	9.5	67.7	72.5	42.2	30.7	0.9	46.4	9.7	15.5
Cornwall General	754	14.8	73.3	76.4	35.7	22.0	11.1	31.8	6.2	18.4
Hopital Montfort, Ottawa	431	20.1	35.5	25.2	22.0	12.2	6.7	17.4	6.5	6.3
Queensway-Carleton Hospital, Nepean	548	19.7	52.6	51.5	23.9	12.5	16.2	13.3	6.9	8.2

(Continued on next page)

Exhibit 10.12: ***(Cont'd)***

Institution by Size and Region	Number of Separations	Average Length of Stay	Previously Admitted		May Not Require Hospitalization (MNRH)		Alternate Level of Care (ALC)	Involuntary	Discharged Against Medical Advice	Substance Abuse
			% Cases	% Days	% Cases	% Days	% Days	% Cases	% Cases	% Cases
North East										
Notre Dame Hospital, Hearst	111	8.0	–	–	31.5	32.0	8.0	0.0	0.9	11.7
Plummer Memorial Public Hospital, Sault Ste Marie	969	14.8	76.5	78.2	25.9	13.3	32.4	19.6	9.4	11.2
Sudbury General Hospital of the Immaculate Heart of Mary	606	17.8	82.7	88.6	21.1	12.6	15.5	35.1	12.0	16.2
Timmins and District Hospital	535	11.4	87.9	88.4	28.8	17.8	2.4	33.3	14.6	14.0
North West										
Lake of the Woods District Hospital, Kenora	430	8.6	67.0	68.0	24.0	17.8	4.0	24.9	16.3	34.0
McKellar General Hospital, Thunder Bay	409	24.6	78.7	77.6	17.6	6.8	13.4		10.3	13.9
South West										
Alexandra Marine and General Hospital, Goderich	429	14.2	69.2	69.4	38.9	36.7	0.5	6.3	2.3	13.5
Grey Bruce Regional Health Centre, Owen Sound	1,387	13.6	76.9	76.2	38.6	26.2	0.4	25.2	9.4	14.9
Hotel Dieu of St. Joseph's Hospital, Windsor	703	19.9	71.4	77.6	19.9	14.5	11.2	20.1	12.9	6.8
Metropolitan General Hospital, Windsor	754	12.5	41.1	43.0	15.4	7.8	1.3	21.1	5.7	5.4
Public General Hospital, Chatham	1,000	9.5	17.2	17.3	37.1	29.5	5.4	23.6	12.9	15.2
Sarnia General Hospital	765	9.7	68.4	73.6	32.9	19.3	9.4	38.7	10.6	17.4
Stratford General Hospital	405	15.4	15.6	16.3	23.2	16.8	0.2	10.9	3.5	8.6
Windsor Western Hospital	1,490	12.1	67.9	72.5	46.6	40.2	4.6	34.0	17.7	9.1
Woodstock General Hospital	409	11.2	67.7	64.6	17.8	11.2	3.0	16.9	3.9	9.8
Ontario	**45,649**	**15.0**	**61.6**	**62.5**	**26.1**	**14.4**	**11.9**	**26.8**	**9.0**	**11.3**
SPECIALTY										
Central East										
Clarke Institute of Psychiatry, Toronto	1,038	25.1	59.9	59.9	13.9	8.0	0.0	23.5	12.1	3.9
Central West										
Homewood Sanitarium, Guelph (long term psychiatric)	15	1,376.3	86.7	73.9	0.0	0.0	0.0	0.0	0.0	13.3
Homewood Sanitarium, Guelph (short term psychiatric)	2,239	35.0	37.7	37.4	21.9	18.1	0.0	16.8	7.8	44.8
Eastern										
Royal Ottawa Health Care Group	2,335	26.4	57.7	65.3	16.8	7.9	0.0	25.7	11.0	20.3
North East										
Sudbury Algoma Hospital	634	32.2	2.1	1.3	21.6	8.1	0.0	41.5	6.5	8.8
Ontario	**6,261**	**33.1**	**45.3**	**48.6**	**18.6**	**11.0**	**0.0**	**23.7**	**9.6**	**25.2**

May Not Require Hospitalization - Includes anxiety, adjustment, personality, sexual dysfunction and miscellaneous psychiatric disorders
Alternate Level of Care - Days when acute care is no longer required, as assessed by clinical staff

Data Source: Canadian Institute for Health Information (CIHI)

One factor that makes it difficult to reduce LOS is the lack of adequate community placements. Although alternate level of care is a designation that is not routinely reported, it has the potential to give information about this contributing factor. It is reported more often for patients with dementia who are admitted to general medical beds. Where levels are high, it probably indicates a paucity of appropriate alternative settings in that community for the placement of patients with a psychiatric diagnosis.

Attempts to achieve greater efficiencies should not ignore patient outcomes. The proportion of patients who discharge themselves against medical advice is an indirect indicator of patient satisfaction and of the degree of acceptability of the inpatient treatment program. It needs to be considered in concert with legal status, since patients who do not voluntarily admit themselves are more likely to choose this method of discharge. The provincial average is close to 10%, but many facilities have lower levels of Against Medical Advice (AMA) discharges even though they are admitting more involuntary patients. Their policies and practices should be compared with facilities with high percentages of this type of discharge.

The proportion of patients with a primary diagnosis of substance abuse is higher in general hospitals than in the PPH sector, with an average of one in ten discharges in this category. There are some facilities with two to three times as many cases of substance abuse, particularly hospitals without psychiatric units. In some instances, this is due to the existence of specialized treatment programs, but in others it may reflect practice patterns of local providers or it may be a stopgap measure when detoxification or addiction treatment services are unavailable, particularly for those with dual disorders.

Discussion

A continued reduction in the use of inpatient psychiatric resources is in keeping with the aims of mental health reform. The relative decline in rates for the PPH and general hospital sectors are consistent with the emphasis on long-term rather than acute care as the primary target for bed reductions. Utilization within general hospitals without psychiatric units is relatively small, often not part of a formalized program and not a protected MOH service. A reduction in designated inpatient resources could lead to increased use of general hospitals without psychiatric units, so it is important that trends over time be monitored carefully.

The wide regional variations in inpatient service utilization reflect differences in the number of available beds, not differences in prevalence of illness. It is clear that some regions (e.g., Central East) are much closer to reform objectives than are others (e.g., North and Eastern). Reducing the number of long-stay patients, those older than 65 with psychogeriatric disorders, and those younger than 65 with persistent mental illnesses, will be essential to attempts to reallocate resources. Other jurisdictions have successfully moved such long-stay patients into more normalized, less restrictive settings.[21] The dramatic differences within our own province in rates of long-stay institutionalization demonstrate that alternative scenarios are possible.

Pressures to reduce the LOS for psychiatric acute care patients have been present for some time and are likely to continue. The CIHI database national average LOS for psychiatric inpatients was 16 days in 1993/94, having dropped two days over a period of five years.[22] The 1994/95 average stay of 15 days in Ontario is close to the national average. Most studies of short- and long-stay psychiatric hospitalizations have found no differences in outcome,[23] but there continues to be controversy over the most appropriate LOS.[24] Some crisis units are demonstrating that ultra-short (three day) hospitalizations can be a successful substitute for traditional inpatient units treating severely mentally ill populations.[25] The concern that shorter hospital stays will be associated with higher readmission rates has not been supported by recent evidence.[22,26,27] Still, a proper assessment of the effects of reducing LOS is contingent on better assessments of outcome and value.[28]

Comparisons of the performance of individual facilities within each sector should take into account differences in the defined roles and surrounding service delivery systems that can influence utilization. Some facilities are serving more severely ill patients yet have fewer total inpatient days. This may in part be due to different utilization of outpatient services, which we are unable to describe. A shift from inpatient treatment is one characteristic of a reformed system of care. Nonetheless, the ability of an individual institution to achieve this depends on a number of internal and external factors.

Summary

The picture that has been presented in this chapter can be summarized by nine main points:

- The prevalence of mental illness and its associated disability is far greater than is usually recognized. Nearly 20% of residents of Ontario households met criteria for a mental disorder in the year prior to the survey.
- Less than 10% of the health care budget is allocated to mental health. Most of the current mental health budget goes to physician and hospital services.
- Government policy directions are aimed at major reforms in service delivery. A more even geographic distribution of resources and a shift from inpatient to community services are a part of the planned changes. For these changes to occur in the present fiscal climate, there will need to be reallocations of funding among and within communities. This will be difficult unless there is reasonable protection of mental health services budgets and greater flexibility in funding patterns.
- A province-wide community survey showed that there are marked variations in need by sex and age, but not by geographic region.
- Variations in the groups using physician-provided mental health services do not match the pattern of variations for need. Family physicians provide a considerable amount of mental health services. There are wide regional variations in mental health OHIP billings which are clearly related to the concentration of psychiatrists in major metropolitan areas.
- There are also wide regional variations in the use of PPHs which are not offset by lower utilization of other hospital sectors. Use, for the most part, parallels the distribution of expenditures and beds. There has been a continuing reduction in PPH use over time, and some regions are much closer than others to meeting the targets for mental health reform.
- Individual PPHs with high utilization rates have considerably more long-stay patients for whom alternative placements will have to be found, as the number of beds decreases.
- There are wide variations among acute care general hospitals in utilization patterns. Those facilities that treat the severely ill with shorter hospital stays and average or lower readmission rates are performing closest to their prescribed role in a reformed system.
- Descriptions such as this can encourage modifications of service provision to better meet mental health needs and assess how patterns of delivery relate to current policy priorities. Still, there is an urgent need for more and better information along with more detailed studies of the appropriateness and effectiveness of services.

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Appendix A10.1: *OHIP Fee Schedule Codes Pertaining to Mental Health Services*	
Assessment and Consultation Codes Used Exclusively by Psychiatrists:	
A191	Minor Assessment
A193	Specific Assessment
A194	Partial Assessment
A195	Consultation
A196	Repeat Consultation
A395	Limited Consultation
A197	Consultation on behalf of disturbed child - Consultative interview with parents
A198	Consultation on behalf of disturbed child - Consultative interview with child
Note: Assessment and consultation fee codes used by other physicians for mental health-related diagnoses have not been included because of unavailability of diagnostic information	
Hospital Visit Codes Used Exclusively by Psychiatrists	
C192	Hospital Subsequent Visit (up to 5 weeks)
C193	Hospital Specific Assessment
C194	Hospital Specific Reassessment
C195	Hospital Consultation
C196	Hospital Repeat Consultation
C197	Hospital Subsequent Visit (from 6th to 13th week)
C198	Hospital Concurrent Care
C199	Hospital Subsequent Visit (after 13th week)
C121	Further Fees for Visits Due to Intercurrent Illness
C395	Hospital Limited Consultation
W195	Long-term Institutional Care - Consultation
W196	Long-term Institutional Care - Repeat Consultation
W395	Long-term Institutional Care - Limited Consultation
Note: Hospital visit fee codes used by other physicians for mental health-related diagnoses have not been included because of unavailability of diagnostic information	
Psychotherapy and Counselling	
Psychotherapy - General Practice (per 1/2 hour)	
K007	Individual
K012	Group - four people
K024	Group - five people
K025	Group - 6 to 12 people
K010	Group - per member (seventh hour onward per day)
K004	Family (two or more family members in attendance at same time)
Psychotherapy and Psychiatric Care - Psychiatrists (per 1/2 hour)	
K190	Psychotherapy - individual patients
K193	Family Therapy - inpatients (2 or more family members)
K195	Family Therapy - outpatients (2 or more family members)
K197	Psychotherapy - individual outpatients (including psychoanalysis, narcoanalysis, aversive conditioning)
K198	Psychiatric Care
K200	Group Psychotherapy - inpatients (up to six hours per day) - four people
K201	Group Psychotherapy - inpatients (up to six hours per day) - five people
K202	Group Psychotherapy - inpatients (up to six hours per day) - 6 to 12 people
K207	Group Psychotherapy - inpatients per member (seventh hour onward per day)
K203	Group Psychotherapy - outpatients (up to six hours per day) - four people
K204	Group Psychotherapy - outpatients (up to six hours per day) - five people
K205	Group Psychotherapy - outpatients (up to six hours per day) - 6 to 12 people
K206	Group Psychotherapy - outpatients per member (seventh hour onward per day)
Hypnotherapy (per 1/2 hour)	
K006	Individual
K011	Group
K192	Individual (by psychiatrist)
K194	Group (by psychiatrist)

Appendix A10.1: *(cont'd)*	
Psychotherapy and Counselling - (cont'd)	
Counselling (per 1/2 hour)	
K013	One or More People
K014	For Transplant Recipients, Donors and Families of Recipients and Donors - one or more people
K015	Counselling Relatives - one or more
Interviews (per 1/2 hour)	
K002	Interviews with Relatives on Behalf of a Patient
K003	Interviews with CA or Legal Guardian on Behalf of a Patient
K008	Diagnostic Interview and Counselling with Child and/or Parent
Assessments Under the Mental Health Act	
K623	Applications for Psychiatric Assessment
K624	Certification and Re-certification of Involuntary Admission
K629	All Other Re-certification(s) of Involuntary Admission
K620	Consultation for Involuntary Psychiatric Treatment (per 1/2 hour)
Genetic Assessments (per 1/2 hour)	
K016	Genetic Assessment - patient or family direct contact (per 1/2 hour)
K019	Genetic Counselling - individual or family
K020	Genetic Counselling - with relatives
Surgical Procedures	
N110	Lobectomy and/or Excision of Cortical Scar for Epilepsy
Diagnostic and Therapeutic Procedures	
Z458	Electroconvulsive Therapy (ECT) - cerebral - single or multiple
Data Source: Ministry of Health, Schedule of Benefits, October 1, 1992	

Appendix A10.2: Inpatient Mental Health Utilization

Provincial Psychiatric Hospitals

Inclusion/Exclusion Criteria

- **Provincial psychiatric hospital data includes all data from the Admissions Discharge Transfers/Central Patient Index snapshot databases. Data for all facilities was summarized from the August 19, 1992, April 28, 1993 and August 17, 1994 snapshots.**

Variable Algorithms

- ***Average Population —*** Average population in the hospital catchment area over the 3-year period, 1992/93 - 1994/95.
- ***Average Daily Census —*** Number of inpatients in the facility on the day of the snapshot, averaged over the three years.
- ***Number of Care Episodes in Year —*** The formula used to calculate episodes of care within the PPHs is described below.

  For patients with a LOS of one year or more **—** The number of care episodes (P) within the year equals the number of patients on census with a LOS of one year or more (C_{12+}).

  (a) $P = C_{12+}$

  For patients with a LOS less than one year **—** The snapshots provide LOS data broken down into three categories: 0 to 3 months; 3 to 6 months; and 6 to 12 months. The amount of turnover related to LOS can be calculated by dividing the number of days in a year by the midpoints of these time periods — 45, 135, and 270 — to produce the constants, 8.1, 2.7 and 1.4. The average daily census (C) in each LOS time period is then multiplied by the constant to provide the number of care episodes (P).

  (b) $P = 8.1xC_{0\text{-}3} + 2.7xC_{3\text{-}6} + 1.4xC_{6\text{-}12}$

  Total number of care episodes by provincial hospitals equals (a) + (b).

  $P = 8.1xC_{0\text{-}3} + 2.7xC_{3\text{-}6} + 1.4xC_{6\text{-}12} + C_{12+}$

- ***Total Patient Days /100,000 —*** The average daily census times 365 days (in year) divided by the population of the hospital catchment area.
- ***Previously Admitted —*** Ever admitted previously to that facility, i.e. number of admissions in last seven or more years is greater than one.
- ***New Admission Not Referred —*** Number of admissions is equal to one and referral source is other than forensic or another psychiatric facility (codes 10, 20, 30, 56, 82)
- ***May Not Require Hospitalization —*** As per CIHI Case Mix Group designation. Primary ICD-9 diagnosis is one of: 300.0, 300.2, 300.3, 307.9, 308.3, 308.4, 308.9, 312.3, V70.1, V70.2, V71.0, 307.0, 307.3, 307.4, 307.6, 307.7, 312.2, 313.1, 313.3, 313.9, 784.6, 301.0, 301.2, 301.3, 301.4, 301.5, 301.6, 301.7, 301.8, 301.9, 302, 309, 315, 316, V40, V62, V79, 295.5, 298.0, 298.1, 298.2, 299.1, 300.4, 300.5, 300.9, 308.0
- ***Forensic —*** Legal status is 300, 400 or 500.
- ***Substance Abuse —*** Primary ICD-9 diagnosis is one of 291, 292, 303, 304, 305.

Appendix A10.2 (Cont'd): Inpatient Mental Health Utilization

General and Specialty Hospitals

Inclusion/Exclusion Criteria

- **The CIHI datasets describing all discharges during the years 1992/93, 1993/94 and 1994/95 were analysed. Most responsible diagnosis was used to identify all psychiatric discharges regardless of the type of hospital or ward to which the patient was admitted. All ICD-9 codes in Clinical Category 19, Mental Diseases and Disorders (1994) were included. All psychiatric discharges ages 18 or over, were included. Discharges having only a secondary psychiatric diagnosis were excluded.**

- **General hospitals with a psychiatric unit includes all facilities of type AP facilities (acute care treatment hospital with psychiatric unit). Specialty hospitals include type MP institutes (miscellaneous psychiatric hospitals and units of hospitals) that are formally designated as mental health speciality hospitals by the Ministry of Health. Addiction and forensic facilities (Addiction Research Foundation and METFORS) were excluded as were Baycrest Centre for Geriatric Care, Institute of Psychotherapy Ltd and Victoria Hospital Corp., London. General Hospitals without a psychiatric unit include all type AT facilities (acute care treatment hospital without psychiatric unit). Listing of individual hospitals is restricted to those with more than 20 discharges during the year.**

Variable Algorithms

- ***Number of Separations —*** Number of separations that year with most responsible diagnosis of mental disorder, no exclusions.

- ***Previously Admitted —*** Readmit coded as other than 0 or 8, i.e. readmitted within one year or more regardless of diagnosis.

- ***May Not Require Hospitalization —*** As per Provincial Psychiatric Hospital. Primary ICD-9 diagnosis is one of: 300.0, 300.2, 300.3, 307.9, 308.3, 308.4, 308.9, 312.3, V70.1, V70.2, V71.0, 307.0, 307.3, 307.4, 307.6, 307.7, 312.2, 313.1, 313.3, 313.9, 784.6, 301.0, 301.2, 301.3, 301.4, 301.5, 301.6, 301.7, 301.8, 301.9, 302, 309, 315, 316, V40, V62, V79, 295.5, 298.0, 298.1, 298.2, 299.1, 300.4, 300.5, 300.9, 308.0

- ***Alternate Level of Care Days —*** The number of days assigned to the Alternate Level of Care patient service during the patient's hospitalization.

- ***Against Medical Advice —*** Number of separations where exit alive code is S.

- ***Substance Abuse —*** As per Provincial Psychiatric Hospitals. Primary ICD-9 diagnosis is one of: 291, 292, 303, 304, 305.

- ***Average Length of Stay —*** Total number of patient days divided by number of separations (untrimmed).

- ***Involuntary —*** Method of admission was coded 3 or 4 (Form 1, 3 or 4) or change in legal status coded 5 (informal/voluntary to Form 3).

Chapter 11

Pediatric Health Service Utilization

Introduction

Many studies have been conducted that examine health services utilization in the adult population, yet relatively few have focused on children.[1–3] According to a recent report published by the Canadian Institute of Child Health[4] more than 67,000 preschool children (between one and four years) are admitted to hospital every year in Canada due to respiratory disease. One-quarter of these are due to asthma. Almost 900 youths, aged 15 to 19, died of injury-related causes in 1990, of whom three-quarters were young men. Nearly half of all injury deaths are caused by motor vehicle accidents. More than 38,000 women younger than 21 became pregnant. Many children use health services each year for these and several other common conditions. Yet, despite our general awareness of the burden that some of these conditions present, there has been relatively little research into utilization patterns of these health services for children.

OHIP Fee-for-service Billings for Children

Introduction

This section uses Ontario Health Insurance Plan (OHIP) data from fiscal years 1989/90 to 1994/95 for children younger than 20. The fee codes were grouped into the following broad categories: outpatient assessments and consultations; hospital visits; diagnostic and therapeutic procedures; laboratory medicine; psychotherapy and counselling; surgery; and special premiums. In 1994/95, OHIP billings for children under 20 years of age totalled $667 million — a 7.7% overall increase from 1989/90. Also of note is that the number of children increased from 2.77 million in 1989/90 to 2.92 million in 1994/95 — a 5.4% increase. Laboratory medicine accounted for the greatest increase in billings (a 23.7% relative increase from 1989/90 to 1994/95). Of major interest is the fact that billings for hospital visits gradually decreased between 1989/90 and 1994/95, and billings for surgery have been decreasing since 1992/93 (Exhibit 11.1). We divided children into the four main age groups used by the Canadian Institute of Child Health[4]: infants (younger than one year); preschoolers (aged one to four years); school-age children (aged 5 to 14 years); and youth (aged 15 to 19 years), as reflected in Exhibit 11.2. Since there are significant sex differences in the health issues facing youth,[4] we examined their health care utilization by sex. The following sections provide a detailed profile by age group, highlighting services billed to OHIP from 1989/90 to 1994/95.

Exhibit 11.1: ***Total Price-adjusted Billings to OHIP for Children 0 to 19 Years in Ontario, 1989/90 - 1994/95***

Fee Code Categories	Adjusted Billings ($ million)					
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Diagnostic and Therapeutic Procedures	72.3	75.0	77.2	80.8	80.8	78.7
Hospital Visits	26.0	23.3	22.0	20.3	21.0	18.7
Laboratory Medicine	37.6	39.7	43.8	44.0	44.0	46.5
Assessments and Consultations	368.9	392.7	408.4	408.0	412.0	412.2
Psychotherapy and Counselling	30.2	31.1	32.6	34.6	36.0	36.0
Surgery	59.8	61.3	62.2	61.0	60.8	52.3
Special Premiums	24.1	25.2	24.9	24.0	23.7	22.6
Total	**619.0**	**648.3**	**671.1**	**672.6**	**678.3**	**666.9**

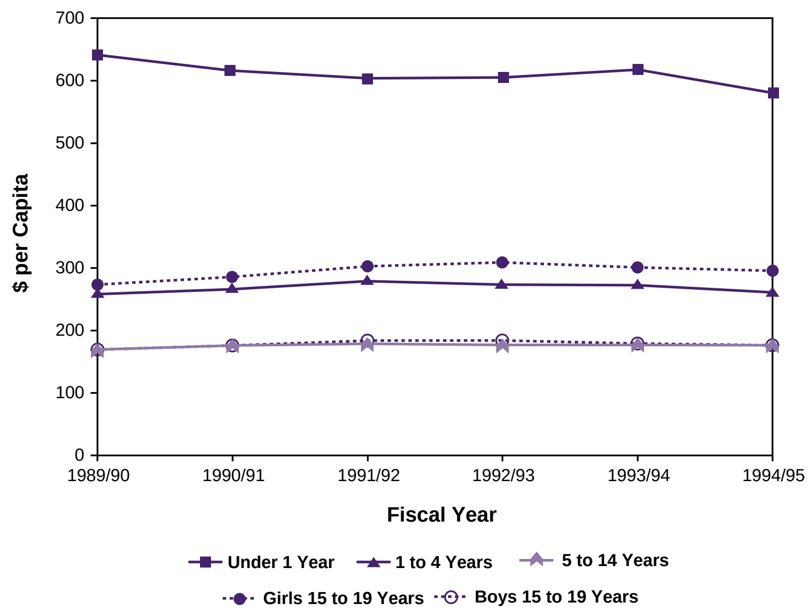
Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Profile

Infants (Younger than One Year)

Total OHIP billings for this age group amounted to $85.6 million in 1994/95 — a 5.6% decrease from the $90.7 million billed in 1989/90 (Exhibit 11.3). This is the only age group for which there was a decrease in OHIP billings during the six years studied. Billings for hospital visits dropped by $3.1 million — a 22.1% decrease. Surgery billings also decreased substantially, from $4.7 million in 1989/90 to $2.3 million in 1994/95 — a 51.1% reduction. The decreases in these services accounted for most of the decrease in billings among this age group. The billings per capita for this age group, however, were the highest among all children — $579.9 in 1994/95. The majority of the billings were related to outpatient assessments and visits to consultants (65.3% in 1994/95).

Exhibit 11.2: ***Price-adjusted per Capita OHIP Billings for Children Under 20 Years in Ontario, 1989/90 – 1994/95***



Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Preschoolers (Aged 1 to 4 Years)

Total OHIP billings for this age group amounted to $158.2 million in 1994/95 — an 8.4% increase, up from $145.9 million in 1989/90 (Exhibit 11.4). Billings for hospital visits and surgery showed substantial decreases from 1989/90 (38.5% and 17.77% relative decreases, respectively). Billings for diagnostic and therapeutic procedures, and psychotherapy and counselling both increased from 1989/90 (17.5% and 21.1%, respectively). In 1994/95, billings per capita for this age group were $259.7 (Exhibit 11.2). As with infants, the majority of the billings among the preschool children were related to outpatient assessments and visits to consultants (75.0% in 1994/95).

School Age Children (Aged 5 to 14 Years)

Children aged 5 to 14 make up almost half of the population of children younger than 20. The population in this age group also increased from 1989/90, growth of 8.4% since 1994/95. Total OHIP billings increased from $223.5 million in 1989/90 to $258.0 million in 1994/95 (the highest expenditure for all children) — a 15.3% increase (Exhibit 11.5). Billings for laboratory medicine increased from $13.6 million in 1989/90 to $18.5 million in 1994/95 — a 36.0% increase. As with younger children, 1994/95 billings for hospital visits and surgery were lower than they were in 1989/90. The billings per capita for this age group were $177.2 in

Exhibit 11.3: *Total Price-adjusted Billings to OHIP for Children Under 1 Year in Ontario, 1989/90 - 1994/95*

Fee Code Categories	Adjusted Billings ($ million)					
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Diagnostic and Therapeutic Procedures	12.3	10.5	9.9	11.3	11.7	11.1
Hospital Visits	14.0	13.1	12.5	11.8	12.1	10.9
Laboratory Medicine	1.7	1.8	1.7	1.6	1.5	1.5
Assessments and Consultations	53.4	57.1	58.9	58.8	57.9	55.9
Psychotherapy and Counselling	0.7	0.6	0.5	0.6	0.6	0.7
Surgery	4.7	4.8	4.3	4.5	4.3	2.3
Special Premiums	3.9	4.1	3.8	3.7	3.6	3.2
Total	**90.7**	**92.2**	**91.6**	**92.3**	**91.7**	**85.6**

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 11.4: *Total Price-adjusted Billings to OHIP for Children 1 to 4 Years in Ontario, 1989/90 - 1994/95*

Fee Code Categories	Adjusted Billings ($ million)					
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Diagnostic and Therapeutic Procedures	9.7	10.5	11.1	11.8	12.1	11.4
Hospital Visits	3.9	3.1	3.2	2.6	2.9	2.4
Laboratory Medicine	6.4	6.4	7.1	6.9	7.2	7.4
Assessments and Consultations	105.1	111.6	118.7	118.7	121.3	118.7
Psychotherapy and Counselling	1.9	1.9	2.0	2.1	2.4	2.3
Surgery	12.4	12.8	13.3	12.9	12.8	10.2
Special Premiums	6.5	6.6	6.8	6.5	6.4	5.9
Total	**145.9**	**152.9**	**162.2**	**161.5**	**165.2**	**158.2**

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 11.5: *Total Price-adjusted Billings to OHIP for Children 5 to 14 Years in Ontario, 1989/90 - 1994/95*

Fee Code Categories	Adjusted Billings ($ million)					
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Diagnostic and Therapeutic Procedures	27.7	30.0	31.1	31.8	32.1	31.9
Hospital Visits	4.1	3.5	3.1	2.9	3.1	2.8
Laboratory Medicine	13.6	14.4	15.9	16.1	16.7	18.5
Assessments and Consultations	134.1	145.5	149.0	148.9	153.9	159.6
Psychotherapy and Counselling	14.6	14.9	15.9	16.6	17.3	17.4
Surgery	21.2	21.8	22.5	21.7	22.3	19.5
Special Premiums	8.2	8.7	8.6	8.3	8.3	8.2
Total	**223.5**	**238.8**	**246.1**	**246.4**	**253.6**	**258.0**

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

1994/95 — the lowest per capita among children of all age groups (Exhibit 11.2). As with younger children, the majority of the billings were related to outpatient assessments and visits to consultants (61.9% in 1994/95).

Youth (Aged 15 to 19 Years)

Total OHIP billings for this age group amounted to $165.2 million in 1994/95 — a 3.9% increase from $159.0 million in 1989/90 (Exhibits 11.6 and 11.7). The billings per capita for this age group were $233.70 (Exhibit 11.2). The majority of the billings related to outpatient assessments and visits to consultants (47.2% in 1994/95). In this age group, services provided to young women accounted for over 60% of the billings. In 1994/95, per capita billings for young women ($295.2) were 1.7 times higher than those for young men ($175.2). As with younger children, billings for hospital visits decreased substantially over the six years studied (decreases of 32.6% for young women and 34.5% for young men). As well, in 1994/95, a majority of the billings were related to outpatient assessments and visits to consultants (45.4% for young women and 50.0% for young men). Young women had higher proportional billings for laboratory medicine than young men (13.9% vs. 5.1% in 1994/95). This difference can be explained by laboratory tests that are specific to women, such as cervical/vaginal cultures, smear and yeast identification, and chlamydia isolation. These two tests alone totalled $1.5 million in 1994/95 (more than 10% of the total cost for laboratory medicine in young women).

Providers of Care

Exhibit 11.8 shows the percentages of billings to OHIP by physician specialty groups in 1994/95. It appears that the primary provider of care varies, depending on the age of the population. Among preschoolers aged one to four, over half of the OHIP billings (55.5% in 1994/95) were claimed by GP/FPs, whereas pediatricians accounted for slightly more than 20% of the total billings in 1994/95. The billings attributed to services provided by pediatricians decreased according to the age of the children, from a high of 38.3% for children younger than one year, to 3.5% for youth aged 15 to 19.

Discussion

OHIP claims currently represent the best available source of information regarding the utilization of outpatient physician services by children in Ontario. To date, there has been relatively little analysis of trends in, or determinants of, outpatient pediatric health service utilization. These data demonstrate striking differences in the use of services by age, with per capita billings decreasing from just under $600 for children younger than one year, to slightly over $175 per capita for young men (15 to 19 years old).

With the exception of infants, which was the group with the highest per capita billings among children younger than 20, per capita OHIP billings were lower for children ($237.0) than for the overall population ($423.0), according to published 1991/92 data[5].

The overall per capita billings for children stayed relatively stable over time — from $223.8 in 1989/90 to $228.8 in 1994/95. This implies that the more than 7.7% increase in OHIP billings for children between 1989/90 and 1994/95 was largely explained by the 5.4% growth in the pediatric population. This increase may also have been affected by changes in the number and mix of services provided.

For children of all ages, the majority of billings were attributed to physician outpatient assessments and consultations. There was a substantial decrease in billings for both hospital visits and surgery (a $14.8 million decrease between 1989/90 and 1994/95).

The recent increase is largely related to increased billings for diagnostic and therapeutic procedures (an increase of $6.4 million since 1989/90), and laboratory medicine (an increase of $8.8 million since 1989/90). Together they accounted for more than one-third of the increase in OHIP billings during the study period. The growth in billings for these services may signal either the shift of some laboratory services from hospital budgets to OHIP or a real increase in testing because of better availability, or because of newer or more expensive tests. It is important that future research looks at the impact of these services on the accuracy of diagnosis and effectiveness of treatment.

Hospitalizations Among Children in Ontario

Introduction

Previous studies on health service utilization by children were based primarily on data from the 1980s. Due to changing patterns of pediatric morbidity and treatment approaches, the need for hospital beds appears to be decreasing while ambulatory requirements increase. Studies of specific procedures suggest that unnecessary hospitalization of children and youth persists.[6-12] Other studies have shown large geographic variations in pediatric admissions for conditions such as gastroenteritis and croup.[1-3] These large variations suggest that factors affecting the decision concerning whether to treat these children as inpatients or outpatients contributes significantly to the level of hospitalization for the pediatric population. However, the causes of these variations have not been examined in depth.

Studies that have examined utilization patterns for medical and surgical services for children have relied largely on retrospective chart audits from a single hospital. These studies are limited in their generalizability. In this section, we use Ontario hospital discharge data from CIHI to document the patterns of hospitalization among children in Ontario. These data cover all hospital discharges in Ontario and therefore allow more complete documentation of pediatric hospital use than has previously been possible.

Exhibit 11.6: ***Total Price-adjusted Billings to OHIP for Female Children 15 to 19 Years in Ontario, 1989/90 - 1994/95***

Fee Code Categories	Adjusted Billings ($ million)					
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Diagnostic and Therapeutic Procedures	13.1	13.9	14.6	15.2	14.5	14.3
Hospital Visits	2.3	2.1	1.9	1.8	1.7	1.5
Laboratory Medicine	11.7	12.6	14.0	14.3	13.7	13.9
Assessments and Consultations	44.9	46.1	48.1	48.3	46.9	46.2
Psychotherapy and Counselling	8.3	8.6	9.2	9.8	10.1	10.0
Surgery	13.2	13.5	13.5	13.7	13.5	12.8
Special Premiums	3.0	3.1	3.1	3.1	3.0	2.9
Total	**96.5**	**99.8**	**104.5**	**106.1**	**103.4**	**101.7**

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 11.7: ***Total Price-adjusted Billings to OHIP for Male Children 15 to 19 Years in Ontario, 1989/90 - 1994/95***

Fee Code Categories	Adjusted Billings ($ million)					
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Diagnostic and Therapeutic Procedures	9.6	10.0	10.5	10.7	10.3	10.0
Hospital Visits	1.7	1.5	1.3	1.2	1.2	1.1
Laboratory Medicine	4.2	4.5	5.1	5.1	4.9	5.1
Assessments and Consultations	31.4	32.5	33.7	33.2	32.1	31.8
Psychotherapy and Counselling	4.8	5.0	5.1	5.5	5.7	5.7
Surgery	8.3	8.5	8.5	8.3	7.9	7.5
Special Premiums	2.6	2.6	2.6	2.4	2.3	2.3
Total	**62.5**	**64.5**	**66.7**	**66.3**	**64.5**	**63.5**

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Exhibit 11.8: ***OHIP Billings by Age Group and Physician Specialty in Ontario, 1994/95***

Physician Specialty	Under 1 Year (%)	1 to 4 Years (%)	5 to 14 Years (%)	15 to 19 Years (%)
General Practice/Family Medicine	49.6	55.5	48.3	46.2
Pediatrics	38.3	22.1	15.7	3.5
Diagnostic Radiology	2.3	3.3	6.2	8.4
General Surgery	1.8	1.3	1.6	2.4
Anesthesia	1.5	2.2	1.9	2.8
Pathology	1.2	2.8	4.1	6.7
Orthopedic Surgery	0.7	1.1	2.4	2.9
Ophthalmology	0.7	1.2	1.8	1.3
Internal Medicine	0.6	1.3	2.8	5.2
Otolaryngology	0.6	4.7	4.3	1.4
Others	2.5	4.6	10.8	19.0

Data Source: National Physician Database, Canadian Institute for Health Information (CIHI)

Methods

We use CIHI discharge data for Ontario children younger than 20 from fiscal years 1985/86 to 1994/95. In this section we report hospital data for the most recent three years (i.e. 1992/93 to 1994/95). Ten years of data are available in electronic format. Surgical and non-surgical diagnoses were examined separately. Discharges were also analysed in detail using 25 Major Clinical Categories (MCCs) listed in appendix A11.1.

All rates are calculated per 1,000 children based on the 1991 Canada Census population. Rates are calculated for a three-year period — 1992/93 to 1994/95 — to ensure stability of the rates. Annual rates for each of the MCCs are available in electronic format. Since the rates are for discharges per 1,000 children, multiple discharges for a child during a fiscal year are included in the calculation.

Discussion

Over 10 years, total discharge rates per 1,000 population fell by 11.3% for infants, 33.1% for children aged one to four, 32.2% for children aged 5 to 14 and 25.5% for children aged 15 to 19. Medical discharge rates showed little change over the decade in any of the age groups. In general, the medical discharge rates among all age groups are almost four times those of the surgical discharge rates. The most recent three-year hospital utilization data are shown in Exhibit 11.9.

Surgical discharge rates, however, declined substantially, especially among children between 1 and 14 years of age. Over 70% of the decline in surgical discharges was the result of reduced rates of discharge for tonsil and adenoid surgery. Over the past 10 years, there has been a major shift in tonsil and adenoid surgery from inpatient care to day surgery. There was a 61% decline in the rate of tonsil and adenoid surgery performed on an inpatient basis. The inpatient rates were consistently higher among children younger than 10 years of age. Conversely, the rate of tonsillectomies performed as day procedures increased from 2.5 per 1,000 children in 1991/92 to 3.9 per 1,000 children in 1994/95 (for details see the Tonsil and Adenoid section of this chapter). However, the total rate for inpatient and day surgery tonsil and adenoid procedures remained relatively stable (8.9 per 1,000 in 1991/92 and 8.6 per 1,000 in 1994/95).

Diseases and disorders of the respiratory system topped the reasons for hospitalization among children under 15 years of age; and, among hospitalizations for respiratory ailments, asthma was the single most prevalent cause of hospitalization over the decade (Exhibit 11.10). Boys are admitted at a rate almost twice that of girls. There is a pressing need to identify and modify

Exhibit 11.9: *Measures of Inpatient Hospital Utilization Among Children in Ontario, 1992/93 - 1994/95*

	Discharges per 1,000			Days of Care per 1,000			Average Length of Stay (Days)		
	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95	1992/93	1993/94	1994/95
Medical Cases									
Under 1 Year *	185.9	195.7	185.5	962.7	996.2	957.5	5.2	5.1	5.2
1 to 4 Years	61.4	71.9	61.6	186.3	189.5	162.1	3.0	2.6	2.6
5 to 14 Years	22.0	26.0	25.6	78.2	97.0	78.2	3.6	3.7	3.1
15 to 19 Years:	45.9	47.2	46.4	197.6	190.0	176.7	4.3	4.0	3.8
Female	69.1	70.8	68.9	282.8	268.8	250.0	4.1	3.8	3.6
Male	24.1	24.8	25.2	117.0	115.4	107.5	4.9	4.6	4.3
Total	**44.8**	**49.8**	**46.7**	**177.5**	**187.3**	**167.0**	**4.0**	**3.8**	**3.6**
Surgical Cases									
Under 1 Year *	25.9	24.5	24.1	389.0	318.5	300.6	15.0	13.0	12.5
1 to 4 Years	16.4	7.9	7.2	53.8	44.9	42.5	3.3	5.7	5.9
5 to 14 Years	14.0	7.7	7.5	47.0	36.1	33.9	3.4	4.7	4.5
15 to 19 Years:	23.3	17.3	16.4	95.5	76.5	71.3	4.1	4.4	4.3
Female	27.9	20.0	19.2	101.7	82.2	76.8	3.7	4.1	4.0
Male	19.0	14.8	13.9	89.6	71.2	66.0	4.7	4.8	4.8
Total	**17.5**	**11.0**	**10.5**	**78.8**	**63.1**	**59.3**	**4.5**	**5.7**	**5.6**
Total Cases									
Under 1 Year *	211.8	220.2	209.2	1,351.7	1,314.7	1,258.1	6.4	6.0	6.0
1 to 4 Years	77.8	79.8	68.8	240.1	234.4	204.7	3.1	2.9	3.0
5 to 14 Years	36.0	33.7	33.1	125.2	133.1	112.1	3.5	4.0	3.4
15 to 19 Years:	69.3	64.5	62.9	293.1	266.5	248.0	4.2	4.1	3.9
Female	96.9	90.8	88.1	384.6	351.0	326.8	4.0	3.9	3.7
Male	43.1	39.7	39.0	206.6	186.6	173.5	4.8	4.7	4.4
Total	**62.3**	**60.8**	57.3	**256.2**	**250.4**	**226.3**	**4.1**	**4.1**	**4.0**

***** Excludes deliveries

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

risk factors (such as air quality in the environment, second-hand smoke and viral infections) for childhood asthma.[13] It is also important to educate parents about appropriate early treatment for children with asthma, in an attempt to prevent hospital admission.

Among young women aged 15 to 19, pregnancy and childbirth was the leading cause for hospitalization over the decade (an average of 33 per 1,000). This accounted for more than 40% of all hospitalizations in this group.

Small Area Variation Analysis

General Approach

In this section we report rates for three surgical procedures (circumcision for infants under 28 days, myringotomy with insertion of ventilation tubes for children aged 1 to 19 years, and tonsillectomy for children aged 1 to 19 years) and gastroenteritis and asthma for those aged 1 to 19 per 1,000 by DHC. These procedures and diagnoses were selected because they were the most commonly performed surgical procedures or most common diagnoses responsible for hospitalization of children. Detailed information on the International Classification of Diseases, 9th Revision (ICD-9) codes used in defining the above procedures and diagnoses is found in appendix A11.2. The data sources for this section are the CIHI database and Statistics Canada census information.

In general, we followed the methodology described in Chapter 5 for analysis of geographic variations in the rates of procedures.

The denominator for most of the analyses was all children in Ontario who were younger than 20 in 1991, as determined by the Canada Census. Again, there are exceptions for some procedures, such as circumcision (which included only boys under 28 days old). All age/sex-adjusted rates used the 1991 population of Canada as the standard.

Selection of Patient Cohorts

Circumcision of Neonates

All newborn boys with a CIHI entry code of NB (newborn) and who were circumcised within the first 28 days of life were included.

Myringotomy with the Insertion of Ventilation Tubes

All children younger than 20 having myringotomy with insertion of tubes (procedure code 32.01) and with any one of the following diagnoses: disorders of external ear; nonsuppurative otitis media and eustachian tube disorders; or suppurative and unspecified otitis media were included.

Tonsillectomy and Adenoidectomy

All children younger than 20 with any one of the following procedures was included: tonsillectomy with or without adenoidectomy; adenoidectomy without tonsillectomy. Additionally, children with excision of tonsil tag, and any one of the following diagnoses was also included: chronic or acute tonsillitis; hypertrophy of tonsils and adenoids; or unspecified tonsillitis.

Asthma

All children younger than 20 admitted as medical patients with the most responsible diagnosis being asthma were included.

Gastroenteritis

All children younger than 20 admitted as medical patients with any one of the following diagnoses were included: viral enteritis; infectious enteritis; infectious diarrhea; and other non-infectious gastroenteritis.

Exhibit 11.10: ***Top Three Medical and Surgical Pediatric Hospitalization Rates per 1,000 by Major Clinical Category and Age Group in Ontario, 1992/93 - 1994/95***

Age Group	Medical	Rate per 1,000	Surgical	Rate per 1,000
Infants	Respiratory System	55.7	Conditions in the Perinatal Period	7.3
	Conditions in Perinatal Period	53.6	Digestive System	6.3
	Digestive System	19.7	Musculoskeletal System	2.6
1 to 4 Years	Respiratory System	20.4	Ear, Nose, Mouth and Throat	3.4
	Ear, Nose, Mouth and Throat	13.9	Male Reproductive System	1.4
	Digestive System	9.5	Musculoskeletal System	1.3
5 to 14 Years	Ear, Nose, Mouth and Throat	4.8	Ear, Nose, Mouth and Throat	2.6
	Respiratory System	4.2	Musculoskeletal System	2.3
	Digestive System	3.2	Digestive System	2.0
Females 15 to 19 Years	Pregnancy and Childbirth	32.8	Pregnancy and Childbirth	5.5
	Mental Health	7.7	Musculoskeletal System	3.6
	Digestive System	4.9	Ear, Nose, Mouth and Throat	3.6
Males 15 to 19 Years	Mental Health	4.1	Musculoskeletal System	5.4
	Ear, Nose, Mouth and Throat	2.9	Digestive System	3.5
	Nervous System	2.5	Ear, Nose, Mouth and Throat	2.3

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Surgical Procedure
Circumcision

Introduction

Circumcision remains controversial, yet studies show that it is still a relatively common surgical operation. Currently, approximately one-sixth of the world's males are circumcised, mostly on religious grounds.[14] Circumcision is also performed for a variety of medical reasons, such as correction of phimosis or prevention of potential recurrent urinary tract infection.

It is the most frequent surgical operation performed on boys in the United States. According to the National Center for Health Statistics, 61% of the 1.95 million boys born during 1987 in the United States were circumcised.[15] A declining trend has been observed by others. Wiswell reported that the new-born circumcision rate in military hospitals involving a large, widely dispersed population base had substantially decreased — from approximately 85% in 1975 to 70.5% nine years later.[16]

Although circumcision remains a common surgical procedure, enormous geographic variation in circumcision rates has been observed. In the United Kingdom, the variation in rates was between 5% and 6%[17-20] and in the United States it was between 80% and 90%.[21,22] This large discrepancy exists despite recommendations from both the British Medical Association and the American Academy of Pediatrics that routine circumcision should be performed only for definite medical reasons.[14]

Canadian data on circumcision rates for infant boys have not been examined. In this section, we describe the 10-year trend for circumcision in Ontario and examine the variability in its use, by DHC.

Overall Trends

Over 22,000 circumcisions are performed annually in Ontario — the total rate in 1992/93 to 1994/95 was 365.1 per 1,000. The provincial rate of circumcision performed in hospital within 28 days of birth increased from a low of 342.7 per 1,000 in 1985/86 to a high of 416.4 per 1,000 in 1991/92 (Exhibit 11.11) — a 21.5% relative increase. There was a slow decline from 1991/92 to 1994/95 to a rate of (299.1 per 1,000).

In 1994/95, among infant boys who had circumcision performed in hospital (excluding day surgery cases), the median length of stay in hospital was three days, one day longer than that for uncircumcised male infants.

Geographic Variations

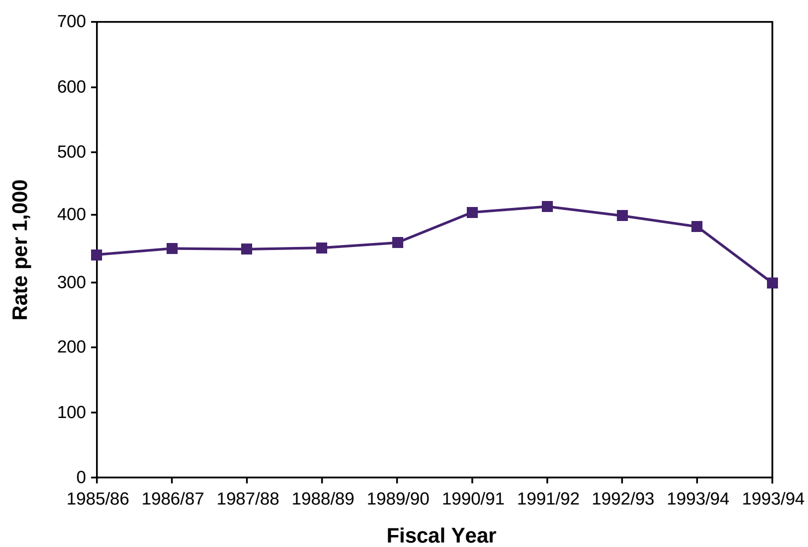
Based on detailed DHC-specific data from 1992/93 to 1994/95 (Exhibit 11.12), Essex County had the highest rate of circumcision (742.1 per 1,000) and Kingston, Frontenac and Lennox & Addington had the lowest (62.4 per 1,000) — an extremal quotient of 11.9. The overall variation among the DHCs in Ontario was large, as summarized by the statistics at the bottom of Exhibit 11.12 and the map (Exhibit 11.13).

Comments

The heated debate over the value of routine circumcision for infants was further intensified by the findings reported by Wiswell and associates in the mid-1980s.[23] In a cohort of 200,000 infant boys, they observed a protective effect of circumcision against urinary tract infections during the first year of life. Today, the most common medical rationale listed for circumcising infant boys are: 1) to prevent phimosis, paraphimosis and balanitis; 2) to decrease the incidence of cancer of the penis; and 3) to decrease the incidence of urinary tract infection among infants.

Others have questioned the cost-effectiveness of newborn circumcision as a routine procedure.[24,25] The cost-utility analysis result reported by Ganiats and associates[24] suggested that the net, discounted, lifetime dollar cost of routine circumcision in the United States was $102 per person, whereas the net, discounted, lifetime health benefit is 14 hours of healthy life. This implies that the financial and medical advantages and disadvantages of routine circumcision of infants nullify each other and that factors other than cost or health

Exhibit 11.11: ***Provincial Trends in Circumcision Rates per 1,000 Male Infants Under 28 Days in Ontario, 1985/86 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

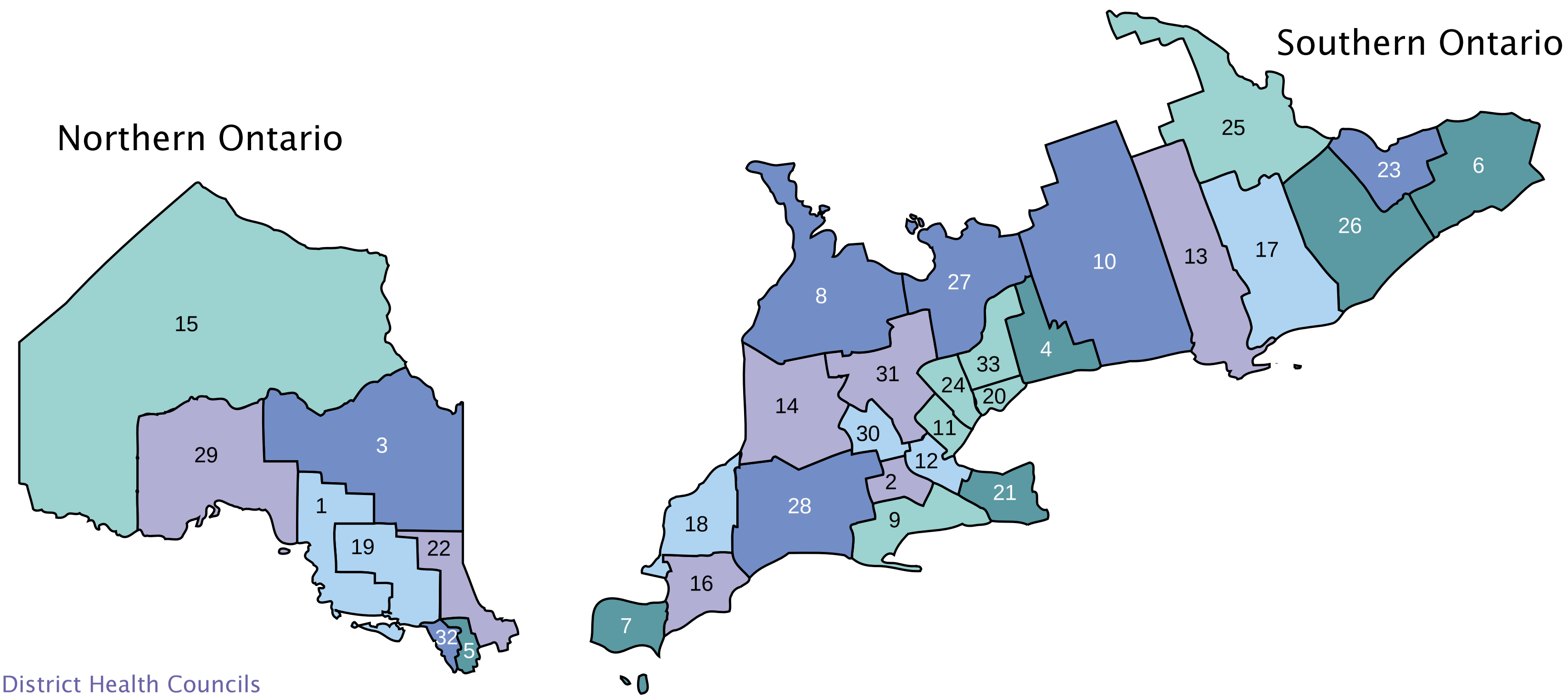
Exhibit 11.12: *Age-adjusted Circumcision Rates (inpatient only) per 1,000 Male Infants Under 28 Days by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age-adjusted Rate per 1,000	Rank	Number of Procedures/Year	Age-adjusted Rate per 1,000	Rank	p-value	Number of Procedures	Age-adjusted Rate per 1,000
Algoma	52.0	33	149	184.6	30	++	291	379.4
Brant	506.8	9	347	412.0	18	*	299	371.4
Cochrane	511.1	7	358	552.1	8	++	263	422.2
Durham Region	448.4	16	2,088	583.1	3	++	1,727	471.5
East Muskoka-Parry Sound	411.2	19	204	569.8	5	++	183	446.3
Eastern Ontario	529.9	4	710	527.6	10	++	591	478.5
Essex County	741.4	1	1,718	742.1	1	++	1,639	649.9
Grey-Bruce	394.5	20	506	546.4	9	++	420	501.2
Haldimand-Norfolk	376.6	23	164	254.5	25	++	87	132.2
Haliburton, Kawartha & Pine Ridge	624.2	2	996	591.1	2	++	906	570.2
Halton	389.3	22	567	249.4	26	++	258	110.2
Hamilton-Wentworth	358.2	24	306	97.3	32	++	52	16.0
Hastings & Prince Edward Counties	525.5	5	436	466.5	16	++	305	318.4
Huron/Perth	449.9	15	351	413.0	17	*	316	375.3
Kenora-Rainy River	312.6	26	238	311.1	22	*	244	328.8
Kent County	491.7	11	275	379.8	20		207	283.2
Kingston, Frontenac and Lennox & Addington	133.7	31	66	62.4	33	++	42	37.5
Lambton	132.7	32	91	108.5	31	++	74	90.4
Manitoulin-Sudbury	227.6	30	292	206.2	29	++	192	149.4
Metropolitan Toronto:	282.8	28	4,706	265.6	24	++	3,806	212.4
Borough of East York	396.1		288	351.6			244	274.8
City of Etobicoke	299.3		719	292.6			600	244.3
City of North York	273.8		1,040	239.8			845	192.4
City of Scarborough	332.8		1,342	309.5			1,014	228.0
City of Toronto	235.5		1,060	235.3			916	204.2
City of York	229.0		257	203.5			187	149.8
Niagara	597.3	3	1,441	560.1	6	++	1,224	499.8
Nipissing/Timiskaming	329.9	25	329	386.2	19		249	328.9
Ottawa-Carleton Regional:	478.7	12	2,474	493.0	12	++	2,262	450.7
City of Ottawa	451.6		1,102	450.9			943	405.4
Ottawa, Eastern Region	494.3		581	527.9			524	470.0
Ottawa, Western Region	507.8		792	536.6			795	503.8
Peel:	294.1	27	1,543	219.7	27	++	1,178	161.5
City of Brampton	285.0		354	138.7			237	91.0
City of Mississauga	299.5		1,189	265.9			941	200.6
Renfrew County	440.5	17	230	367.4	21		137	200.6
Rideau Valley	451.9	14	547	577.4	4	++	502	490.7
Simcoe County	433.5	18	1,191	512.3	11	++	1,000	423.0
Thames Valley	510.3	8	2,274	558.0	7	++	2,035	493.7
Thunder Bay	471.4	13	507	477.3	14	++	472	458.7
Waterloo Region	499.4	10	636	212.2	28	++	324	109.8
Wellington-Dufferin	393.8	21	712	473.3	15	++	656	405.7
West Muskoka-Parry Sound	519.1	6	57	490.0	13	*	55	413.5
York Region	272.7	29	1,274	310.9	23	++	937	227.5
Total Ontario	391.3		27,782	365.1			22,933	299.1
Coefficient of Variation (%) [CV]	34.0			44.9				
Extremal Quotient [EQ]	14.3			11.9			Spearman Correlation	R=0.700 (p<0.0001)
Systematic Component of Variation [SCV]	133.5			216.0				
Adjusted Chi-square (likelihood ratio)	6,024.4 (d.f. 32, p<0.0001)			9,154.1 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age-adjusted Circumcision Rates (inpatient only) per 1,000 Male Infants under 28 days by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Exhibit 11.13

outcomes (e.g., cultural, religious, personal) are considered when the decision to circumcise is made.

Clearly circumcision will remain a common surgical procedure among infant boys, as it has for centuries. In Ontario, 22,000 infant boys are circumcised annually. A 10-year trend analysis reflected declining circumcision rates in Ontario since 1991/92. The uncertainty regarding the medical indications for, and benefits of, circumcision, combined with the relatively large geographic variation in Ontario, raises questions about the utilization of this procedure. The role of cultural factors in the variation has not been evaluated in this study. Future research should focus on identifying factors that affect variations in circumcision rates and on clarifying the medical indications for circumcision.

Surgical Procedure

Myringotomy with the Insertion of Ventilation Tubes

Introduction

Otitis media is an infection of the middle ear common in children.[26,27] By the time a child reaches the age of one, 30% to 60% will have experienced at least one episode, and by seven years, 90% may have been affected.[28,29] It is one of the most common reasons for physician visits, with health costs estimated at $3.5 billion annually in the United States.[30,31]

While many treatments for otitis media have been advocated, including antihistamines, decongestants, antibiotics, steroids and surgery, myringotomy with ventilation tubes (MVT) has become a frequent surgical intervention,[32] and is currently among the most common day surgery procedures performed in Canada.[33] MVT is a minor operation — a small cut is made in the child's eardrum, fluid in the middle ear is gently drained, and a small metal or plastic tube is put into the slit in the eardrum. The tube is left in place until it falls out or until the child's health care provider feels it is no longer needed.[34] In the United States, the prevalence of MVT in children younger than 18 was estimated at 13 per 1,000 in 1988,[35] while in Denmark 16% to 20% of children have had the operation.[36]

Wide geographic variations in the use of medical and surgical procedures in treating children with otitis media have been reported.[37-51] Surgery rates in the United Kingdom exhibit up to a sevenfold variation among health districts.[52,53] An assessment of the appropriateness of proposed MVT surgery in children in the United States, using indications derived by an expert panel, concluded that up to 25% of all proposed surgeries were inappropriate.[54] Given the disagreement about the best clinical treatment for otitis media, considerable room exists for variation in the use of MVT. The rates at which procedures are conducted vary significantly among geographic regions, whether countries[46,48,55] are compared or whether "large"[39,56] or "small"[37,38,49,50,57] areas within a given country are examined. These variations, when unrelated to disease prevalence or patient and family preferences, raise concerns about access to care and appropriate treatment.[41,58,59]

Overall Trends

Between 1992/93 and 1994/95 in Ontario, more than 30,000 children younger than 20 were hospitalized annually for MVT. Approximately 85% of these procedures were performed on a day surgery basis. Exhibit 11.14 shows the four-year trend for MVT surgery in Ontario. The total rate dropped from a high of 11.5 per 1,000 in 1991/92 to a low of 10.5 per 1,000 in 1994/95 — an 8.7% decrease. The rate of MVT performed on a day surgery basis increased from 9.2 per 1,000 in 1991/92 to 9.4 per 1,000 in 1994/95 — a 2% increase. The total-provincial age/sex-adjusted rate of MVT between 1992/93 and 1994/95 was 10.6 per 1,000. Since most of the MVT procedures were performed on a day surgery basis, the day surgery rate of 9.2 per 1,000 was almost 87% of the total rate. From 1992/93 to 1994/95, a total of 12,141 such procedures were performed on an inpatient basis. The inpatient MVT hospitalization rate was only 1.4 per 1,000. Younger children have higher

Exhibit 11.14: ***Overall and Age-specific Myringtomy with Ventilation Tube Rates per 1,000 Children by Age Group in Ontario, 1991/92 - 1994/95***

Fiscal Year	Overall Number	Overall Rate per 1,000	0 to 4 Years	5 to 9 Years	10 to 14 Years	15 to 19 Years
Inpatient and Day Surgery						
1991/92	32,614	11.5	26.5	15.9	2.2	0.5
1992/93	29,668	10.3	24.9	13.2	1.9	0.5
1993/94	31,683	10.9	25.7	14.4	2.1	0.5
1994/95	30,776	10.5	23.8	14.7	2.3	0.5
Day Surgery Only						
1991/92	25,981	9.2	21.4	12.3	1.8	0.5
1992/93	24,935	8.7	21.0	10.9	1.7	0.5
1993/94	27,550	9.5	22.4	12.4	1.9	0.4
1994/95	27,501	9.4	21.3	13.1	2.0	0.5

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

rates of MVT. The rates are bimodal, peaking at one year of age and again at four years (Exhibit 11.15). Boys have a higher rate of MVT at all ages. Exhibit 11.16 shows the distribution of MVT performed in Ontario by month of the year. Winter and spring (January through June) were the peak times of the year for MVT hospitalizations.

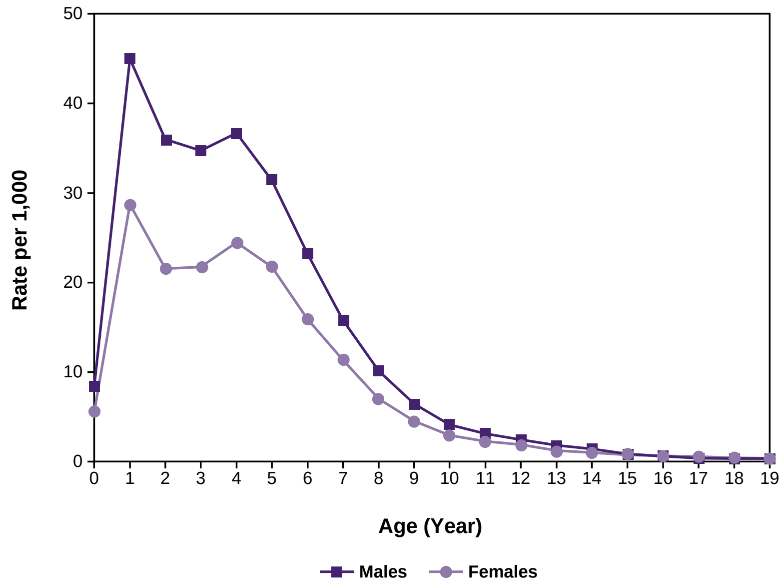
Geographic Variations

Exhibits 11.17, 11.18 and 11.19 show detailed DHC-specific data. In 1992/93 to 1994/95, Hastings & Prince Edward Counties remained the DHCs with the highest rate of MVT surgery (21.3 per 1,000) and Kenora-Rainy River remained the lowest (3.3 per 1,000) — a high-low rate ratio of 6.4 (Exhibit 11.17).

Comments

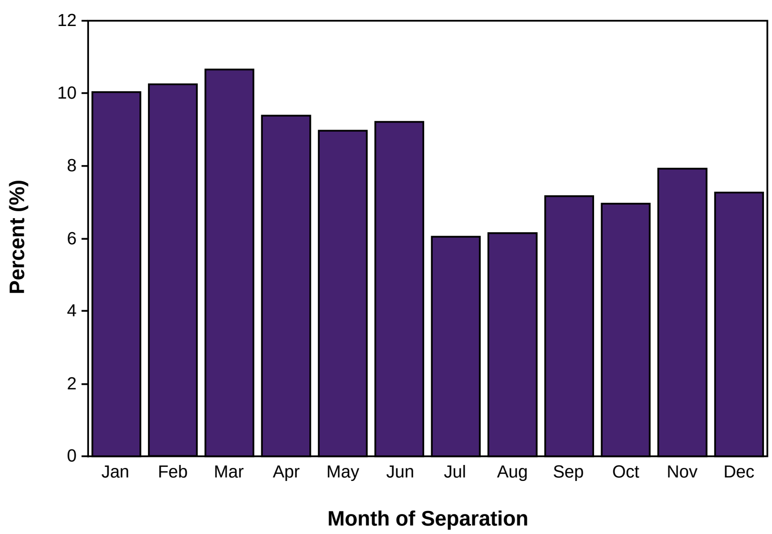
The degree of area variation in MVT hospitalization rates across Canada is currently unknown. The only relevant Canadian study reported that elevated rates of surgical intervention in Quebec between 1981 and 1983 were associated with a higher frequency of otitis media rather than with more aggressive patterns of intervention.[60] Our results indicate a sixfold variation in MVT rates across DHCs in Ontario. The average annual MVT hospitalization rate (including inpatient and day surgery data) in Ontario for children younger than 19 was 10.6 per 1,000. This rate was lower than estimates of MVT prevalence in US children,[35] and was similar to the proportion of children in Montreal aged three to seven with surgery for otitis media,[60] but was more than double the UK rate (4.7 per 1,000).[52,53] The health services research literature has shown that while the prevalence of disease may be associated with utilization, it is not generally the dominant factor. Rather, provider practice styles are often the main explanation.[38] In turn, such practices are thought to be based on differences in clinical opinions about indications for intervention, the merits of alternatives, and associated benefits and risks.

Exhibit 11.15: ***Age/Sex-specific Myringotomy with Ventilation Tube Rates per 1,000 Children 0 to 19 Years in Ontario, 1992/93 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 11.16: ***Proportion of Separations by Month for Myringotomy with Ventilation Tubes Among Children 0 to 19 Years in Ontario, 1992/93 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

In Ontario, it was observed that winter and spring (January through June) were the peak times of the year for MVT hospitalizations. Given that episodes of otitis media often arise during the fall (September to December), the high rate of MVT surgery in the first six months of the year in Ontario may reflect patients meeting criteria for surgery (i.e., three episodes of otitis media in six months, or fluid persisting for more than three months) and waiting time to assessment or surgery itself.

Bisset and associates [38] reported a negative relationship between deprivation scores, based on regional data that

Exhibit 11.17: ***Age/Sex-adjusted Myringotomy with Ventilation Tube Rates (inpatient and day surgery) per 1,000 Children 0 to 19 Years by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95***

District Health Council	1992/93 - 1994/95				1994/95	
	Number of Procedures/Year	Age/Sex-adjusted Rate per 1,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 1,000
Algoma	299	8.4	25	✢✢	294	8.3
Brant	484	13.7	11	✢✢	485	13.8
Cochrane	279	9.8	21		233	8.2
Durham Region	1,740	11.9	15	✢✢	2,024	13.7
East Muskoka-Parry Sound	170	9.4	23		179	9.9
Eastern Ontario	549	9.9	19		561	10.1
Essex County	983	10.7	17		1,036	11.3
Grey-Bruce	578	13.5	12	✢✢	528	12.3
Haldimand-Norfolk	319	10.6	18		243	8.2
Haliburton, Kawartha & Pine Ridge	1,388	18.1	3	✢✢	1,470	19.2
Halton	1,504	16.3	5	✢✢	1,474	16.0
Hamilton-Wentworth	955	7.7	27	✢✢	953	7.6
Hastings & Prince Edward Counties	842	21.3	1	✢✢	929	23.4
Huron/Perth	481	12.4	14	✢✢	410	10.6
Kenora-Rainy River	99	3.3	33	✢✢	89	2.9
Kent County	515	16.4	4	✢✢	541	17.5
Kingston, Frontenac and Lennox & Addington	404	8.9	24	✢✢	350	7.7
Lambton	521	14.1	10	✢✢	483	13.2
Manitoulin-Sudbury	413	7.6	28	✢✢	436	8.1
Metropolitan Toronto:	4,268	7.7	26	✢✢	4,508	7.9
Borough of East York	269	11.3			255	10.3
City of Etobicoke	606	8.0			679	8.7
City of North York	933	6.9			1,033	7.4
City of Scarborough	984	6.8			1,017	6.8
City of Toronto	1,192	8.8			1,231	8.8
City of York	280	7.8			288	7.8
Niagara	793	7.4	29	✢✢	806	7.6
Nipissing/Timiskaming	548	15.9	6	✢✢	542	15.8
Ottawa-Carleton Regional:	844	4.5	32	✢✢	847	4.5
City of Ottawa	249	4.1			250	4.0
Ottawa, Eastern Region	300	4.6			296	4.6
Ottawa, Western Region	294	4.9			299	4.9
Peel:	2,424	9.9	20	**	2,531	10.2
City of Brampton	764	8.1			678	7.1
City of Mississauga	1,659	11.0			1,851	12.1
Renfrew County	193	7.1	30	✢✢	207	7.6
Rideau Valley	288	6.8	31	✢✢	314	7.4
Simcoe County	1,847	19.1	2	✢✢	1,761	18.1
Thames Valley	1,914	11.8	16	✢✢	1,731	10.6
Thunder Bay	567	12.8	13	✢✢	539	12.2
Waterloo Region	1,822	15.6	8	✢✢	1,768	15.0
Wellington-Dufferin	973	15.3	9	✢✢	858	13.5
West Muskoka-Parry Sound	78	15.7	7	✢✢	61	12.3
York Region	1,626	9.7	22	✢✢	1,585	9.4
Total Ontario	30,709	10.6			30,776	10.5
Coefficient of Variation (%) [CV]		37.1				
Extremal Quotient [EQ]		6.4				
Systematic Component of Variation [SCV]		164.7				
Adjusted Chi-square (likelihood ratio)		4,186.0 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

summarize an array of socioeconomic factors and the rate of childhood MVT surgery. These authors suggest that people who live in regions with low deprivation scores may be more aware of the relative benefits of alternative treatments for their children, and may accordingly articulate these beliefs when interacting with health professionals. If regional variations in MVT surgery were attributable to a lack of parental information, a strategy of information dissemination to parents may help to reduce variations in utilization.

The relatively wide variations among DHCs in Ontario may have implications for the quality and cost of health care services received by children with otitis media. Future research efforts should measure the management of patients post-MVT, the prevalence of acute and long-term complications and readmissions of children with MVT, and estimate the overall health care utilization from events related to consultations and assessments attributable to otitis media.

Exhibit 11.18: *Age/Sex-adjusted Myringotomy with Ventilation Tube Rates (day surgery only) per 1,000 Children 0 to 19 Years by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95*

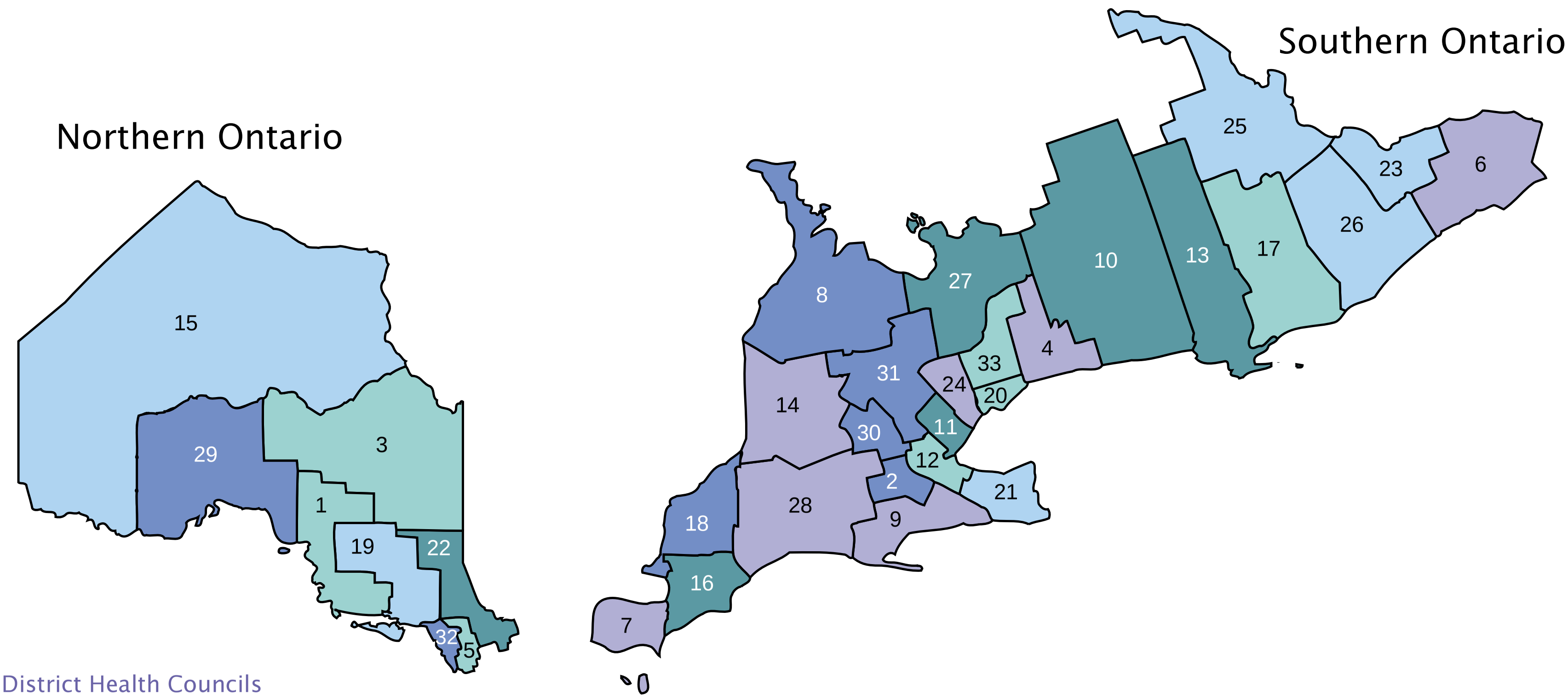
District Health Council	1992/93 - 1994/95				1994/95	
	Number of Procedures/Year	Age/Sex-adjusted Rate per 1,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 1,000
Algoma	249	6.7	24	✢✢	258	7.3
Brant	467	13.3	9	✢✢	468	13.3
Cochrane	248	8.7	20		211	7.4
Durham Region	1,607	11.0	11	✢✢	1,910	12.0
East Muskoka-Parry Sound	138	7.6	23	*	146	8.1
Eastern Ontario	526	9.5	16		531	9.6
Essex County	773	8.4	21	*	804	8.8
Grey-Bruce	452	10.6	12	**	410	9.6
Haldimand-Norfolk	281	9.4	17		210	7.1
Haliburton, Kawartha & Pine Ridge	1,181	15.4	3	✢✢	1,276	16.6
Halton	1,360	14.7	5	✢✢	1,405	15.2
Hamilton-Wentworth	818	6.6	29	✢✢	890	7.1
Hastings & Prince Edward Counties	671	17.0	1	✢✢	767	19.4
Huron/Perth	380	9.8	14		361	9.3
Kenora-Rainy River	79	2.7	33	✢✢	70	2.3
Kent County	434	13.8	7	✢✢	460	14.9
Kingston, Frontenac and Lennox & Addington	302	6.7	27	✢✢	277	6.1
Lambton	436	11.8	10	✢✢	454	12.4
Manitoulin-Sudbury	347	6.4	30	✢✢	365	6.8
Metropolitan Toronto:	3,766	6.8	26	✢✢	4,138	7.3
Borough of East York	254	10.7			244	9.8
City of Etobicoke	514	6.8			607	7.8
City of North York	800	5.9			923	6.6
City of Scarborough	888	6.1			968	6.5
City of Toronto	1,092	8.0			1,152	8.2
City of York	214	6.0			239	6.5
Niagara	702	6.6	28	✢✢	718	6.7
Nipissing/Timiskaming	532	15.4	4	✢✢	520	15.1
Ottawa-Carleton Regional:	820	4.4	32	✢✢	821	4.3
City of Ottawa	289	3.9			281	3.8
Ottawa, Eastern Region	243	4.5			243	4.4
Ottawa, Western Region	287	4.8			295	4.9
Peel:	2,136	8.7	19	*	2,310	9.3
City of Brampton	666	7.1			629	6.6
City of Mississauga	1,468	9.7			1,679	11.0
Renfrew County	186	6.8	25	✢✢	199	7.3
Rideau Valley	252	6.0	31	✢✢	265	6.3
Simcoe County	1,533	15.9	2	✢✢	1,473	15.2
Thames Valley	1,596	9.8	15	**	1,496	9.2
Thunder Bay	364	8.2	22	*	333	7.6
Waterloo Region	1,650	14.1	6	✢✢	1,645	14.0
Wellington-Dufferin	854	13.5	8	✢✢	778	12.2
West Muskoka-Parry Sound	50	10.1	13		43	8.6
York Region	1,471	8.7	18	*	1,489	8.8
Total Ontario	26,662	9.2			27,501	9.4
Coefficient of Variation (%) [CV]		36.2				
Extremal Quotient [EQ]		6.4				
Systematic Component of Variation [SCV]		152.5				
Adjusted Chi-square (likelihood ratio)		3,436.2 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 11.19

Age/Sex-adjusted Myringotomy with Ventilation Tubes Rates (inpatient and day surgery) per 1,000 Children 0 to19 Years by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

15.9 to 21.3
12.8 to 15.7
9.9 to 12.4
7.7 to 9.8
3.3 to 7.6

Surgical Procedure

Tonsil and Adenoid Surgery

Introduction

Tonsillectomy is an operation commonly performed on children. Controversy has existed over the precise indications for this procedure, and changes in both the frequency and the indications for tonsillectomy over the past decade have been noted.[61] As reported in the literature, complications associated with tonsil and adenoid procedures performed on a day surgery basis were relatively rare. The reported complication rates ranged from 0.28% to 4.4% for hemorrhage[62-67] and 1.3% to 14.4% for protracted emesis (vomiting).[64,65] While most authors have advocated that tonsil and adenoid procedures be performed as a day surgery procedure, the debate over the appropriateness of this suggestion for very young children continues.

Publications concerning adenotonsillectomy in children under three years of age report complication rates similar to those for older children.[68-70] While adenotonsillectomy in children may be performed safely on a day surgery basis in a majority of cases without an increase in complication rates, some have observed a higher risk of post-surgical complications (such as airway problems, hemorrhage and dehydration) among very young children. It has accordingly been recommended that children younger than three be carefully selected before being offered the procedure on a day surgery basis. Children younger than three have demonstrated an increased incidence of post-operative airway complication, manifested by oxygen desaturation and transient upper airway obstruction.[71] Tom and associates [72] also suggested that pre-operative apnea, age younger than 12 months, and the presence of accompanying medical conditions were associated with a higher incidence of post-operative airway complications. They also recommended that tonsillectomy in patients younger than three be performed as an inpatient procedure.

The purpose of this section is to describe inpatient and day surgery utilization for tonsil and adenoid surgery and to measure variation in utilization among DHCs in Ontario.

Overall Trends

Since day surgery data were only available from 1991/92, a four-year trend for tonsil and adenoid surgery in Ontario was examined. Exhibit 11.20 shows that between 1991/92 and 1994/95, the age/sex-adjusted inpatient tonsil and adenoid surgery rates ranged from a high of 8.9 per 1,000 children (in 1991/92) to a low of 8.6 per 1,000 children (in 1994/95). There has been a slow decline in tonsil and adenoid inpatient surgery rates over the last decade. The rates were consistently higher among children younger than 10.

Exhibit 11.20: ***Rate per 1,000 and Distribution by Age Group for Tonsillectomy for Children 0 to 19 Years in Ontario, 1991/92 - 1994/95***

Age Group	Day Surgery Only		Inpatient Only		Percent Day Surgery (%)	Inpatient Length of Stay (days)	
	Number	Rate per 1,000	Number	Rate per 1,000		Average	Total
1991/92							
0 to 4 Years	2,636	3.6	5,961	11.8	30.7	1.4	8,328
5 to 9 Years	3,097	4.3	7,114	14.3	30.3	1.4	9,978
10 to 14 Years	818	1.2	2,509	4.9	24.6	1.5	3,689
15 to 19 Years	381	0.5	2,658	4.3	12.5	1.7	4,403
Total	**6,932**	**2.5**	**18,242**	**8.9**	**27.5**	**1.4**	**26,398**
1992/93							
0 to 4 Years	3,011	4.1	4,625	10.3	39.4	1.2	5,545
5 to 9 Years	3,238	4.5	5,463	12.1	37.2	1.2	6,609
10 to 14 Years	1,042	1.5	2,104	4.6	33.1	1.2	2,625
15 to 19 Years	533	0.8	2,445	4.2	17.9	1.4	3,384
Total	**7,824**	**2.8**	**14,637**	**7.9**	**34.8**	**1.2**	**18,163**
1993/94							
0 to 4 Years	3,694	4.9	3,897	10.1	48.7	1.2	4,578
5 to 9 Years	4,396	6.0	4,619	12.3	48.8	1.1	5,264
10 to 14 Years	1,293	1.8	1,801	4.4	41.8	1.2	2,172
15 to 19 Years	748	1.1	2,007	3.9	27.2	1.3	2,536
Total	**10,131**	**3.5**	**12,324**	**7.8**	**45.1**	**1.2**	**14,550**
1994/95							
0 to 4 Years	4,827	6.4	3,111	10.5	60.8	1.2	3,661
5 to 9 Years	6,499	8.8	4,189	14.5	60.8	1.2	4,895
10 to 14 Years	2,026	2.8	1,792	5.3	53.1	1.2	2,075
15 to 19 Years	991	1.4	1,818	4.0	35.3	1.2	2,245
Total	**14,343**	**3.9**	**10,910**	**8.6**	**56.8**	**1.2**	**12,876**

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Conversely, the rate of tonsillectomies performed on a day surgery basis increased from 2.5 per 1,000 children in 1991/92 to 3.9 per 1,000 children in 1994/95.

Between 1992/93 and 1994/95 in Ontario, 23,390 children younger than 20 were hospitalized annually for tonsil and adenoid surgery. Over 40% of these operations were performed as day surgery cases. The total provincial age/sex-adjusted rate of hospitalization for tonsil and adenoid surgery was 8.1 per 1,000 children from 1992/93 to 1994/95 (Exhibit 11.21). In general, younger children have higher rates of tonsil and adenoid surgery. The rates peaked among children between five and nine years of age (Exhibit 11.20). Younger boys especially have higher tonsil and adenoid surgery rates.

Geographic Variations

Exhibits 11.21 and 11.22 show that the Niagara DHC has the highest total tonsil and adenoid surgery rate (13.4 per 1,000) and the Ottawa-Carleton DHC has the lowest rate (4.2 per 1,000) — a high-low rate ratio of 3.2. The overall variation among the DHCs in Ontario was moderate, as summarized by the statistics at the bottom of Exhibit 11.21.

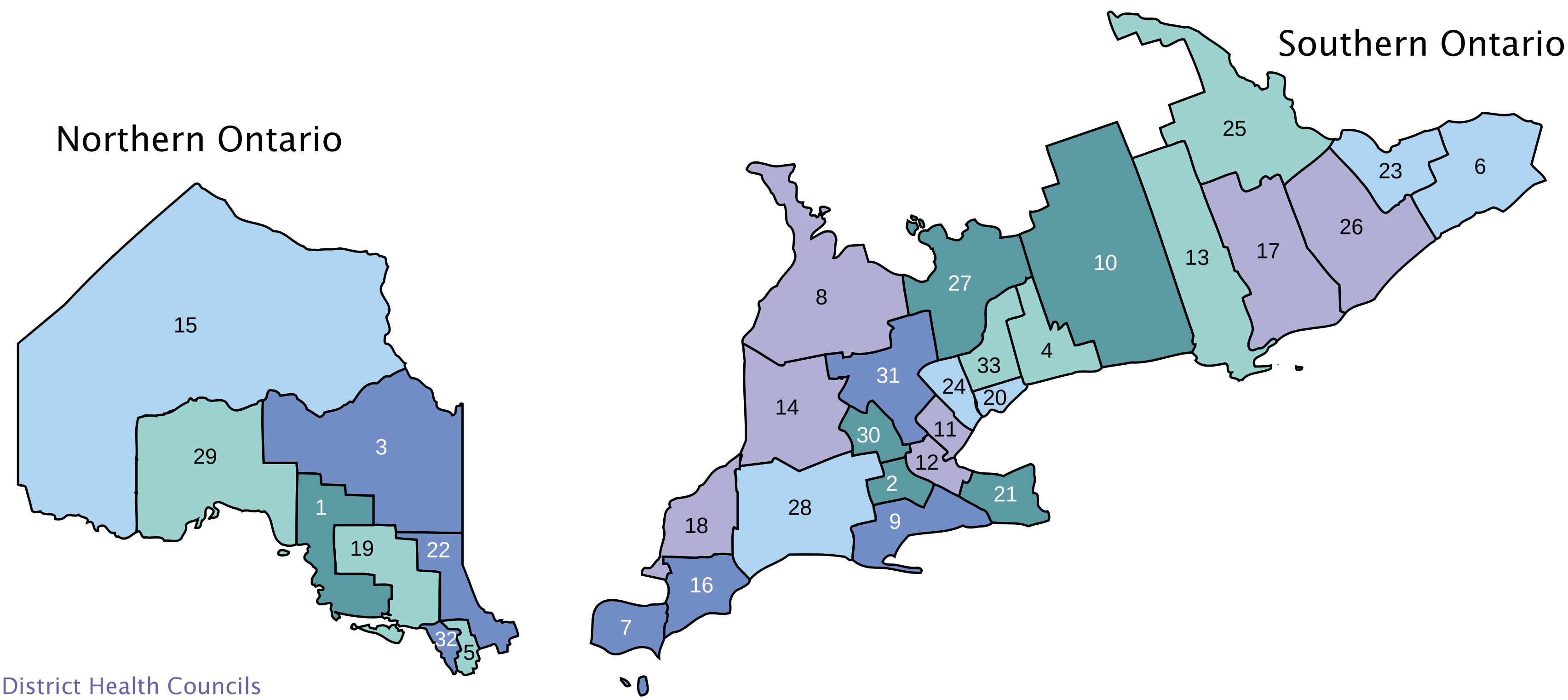
Exhibit 11.21: ***Age/Sex-adjusted Tonsillectomy Rates (inpatient and day surgery) per 1,000 Children 0 to 19 Years by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95***

District Health Council	1992/93 - 1994/95				1994/95	
	Number of Procedures/Year	Age/Sex-adjusted Rate per 1,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 1,000
Algoma	468	12.7	4	✢✢	517	14.2
Brant	463	13.1	3	✢✢	501	14.1
Cochrane	300	10.2	8	✢✢	300	10.3
Durham Region	1,160	8.2	23		1,405	9.9
East Muskoka-Parry Sound	156	8.4	21		184	9.9
Eastern Ontario	344	6.2	30	✢✢	384	7.0
Essex County	945	10.1	9	✢✢	1,024	10.9
Grey-Bruce	389	8.7	18		366	8.2
Haldimand-Norfolk	296	9.6	13	**	277	9.0
Haliburton, Kawartha & Pine Ridge	1,037	13.3	2	✢✢	1,118	14.3
Halton	795	8.6	20		904	9.7
Hamilton-Wentworth	1,069	8.6	19	*	1,088	8.7
Hastings & Prince Edward Counties	320	7.9	25		336	8.3
Huron/Perth	357	9.0	17	*	305	7.6
Kenora-Rainy River	138	4.7	32	✢✢	148	4.9
Kent County	328	10.0	10	✢✢	370	11.4
Kingston, Frontenac and Lennox & Addington	415	9.1	15	*	388	8.5
Lambton	352	9.1	16	*	381	9.9
Manitoulin-Sudbury	477	8.3	22		567	9.9
Metropolitan Toronto:	3,271	6.1	31	✢✢	3,644	6.6
Borough of East York	132	6.1			162	7.2
City of Etobicoke	486	6.6			503	6.7
City of North York	791	5.9			880	6.4
City of Scarborough	817	5.7			984	6.7
City of Toronto	804	6.3			854	6.5
City of York	240	7.1			260	7.5
Niagara	1,445	13.4	1	✢✢	1,594	14.8
Nipissing/Timiskaming	356	9.9	11	✢✢	361	10.1
Ottawa-Carleton Regional:	782	4.2	33	✢✢	846	4.5
City of Ottawa	303	4.2			300	4.1
Ottawa, Eastern Region	205	3.8			220	4.0
Ottawa, Western Region	273	4.6			326	5.4
Peel:	1,522	6.3	29	✢✢	1,727	7.0
City of Brampton	651	7.0			727	7.7
City of Mississauga	870	5.9			1,000	6.6
Renfrew County	184	6.6	27	**	204	7.3
Rideau Valley	384	9.2	14	*	427	10.1
Simcoe County	1,145	12.2	5	✢✢	1,267	13.3
Thames Valley	1,028	6.4	28	✢✢	1,053	6.5
Thunder Bay	362	8.0	24		375	8.2
Waterloo Region	1,288	11.0	6	✢✢	1,356	11.6
Wellington-Dufferin	621	9.9	12	✢✢	617	9.7
West Muskoka-Parry Sound	52	10.3	7		45	9.0
York Region	1,143	6.6	26	✢✢	1,174	6.8
Total Ontario	23,390	8.1			25,253	8.6
Coefficient of Variation (%) [CV]		30.7				
Extremal Quotient [EQ]		3.2				
Systematic Component of Variation [SCV]		91.0				
Adjusted Chi-square (likelihood ratio)		2,161.9 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Age/Sex-adjusted Tonsillectomy Rates (inpatient and day surgery) per 1,000 Children 0 to 19 Years by DHC Area of Patient Residence in Ontario - 1992/93 - 1994/95



District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Age/Sex-adjusted Rate
(quintiles)

- 11.0 to 13.4
- 9.6 to 10.3
- 8.6 to 9.2
- 6.6 to 8.4
- 4.2 to 6.4

Exhibit 11.22

In 1991/92 (Exhibit 11.20), less than one-third (27.5%) of the tonsil and adenoid surgery was performed as day surgery. In 1994/95, the proportion of tonsil and adenoid surgery done on a day surgery basis doubled, to 56.8%. In 1991/92, only one-third of the tonsil and adenoid surgery performed on younger children (between zero and four years and five to nine years of age) were day surgery cases. By 1994/95, this proportion increased by two times. The tonsil and adenoid day surgery rate shows more variation than the inpatient surgery rate (Exhibit 11.23).

The proportion of inpatient tonsil and adenoid surgery steadily declined, from 72.5% in 1991/92 to 43.2% in 1993/94. The corresponding total inpatient days also declined, from 26,398 days to 12,876 days — a 51.2% decrease in patient days. The average length of hospital stay decreased from 1.4 days in 1991/92 to 1.2 days in 1994/95.

Exhibit 11.24 shows the relationship between the inpatient and day surgery tonsil and adenoid rates among the DHCs in Ontario. DHCs with high inpatient tonsil and adenoid surgery rates tended to have low day surgery rates, with a calculated Spearman rank correlation coefficient of –0.48 (p<0.05).

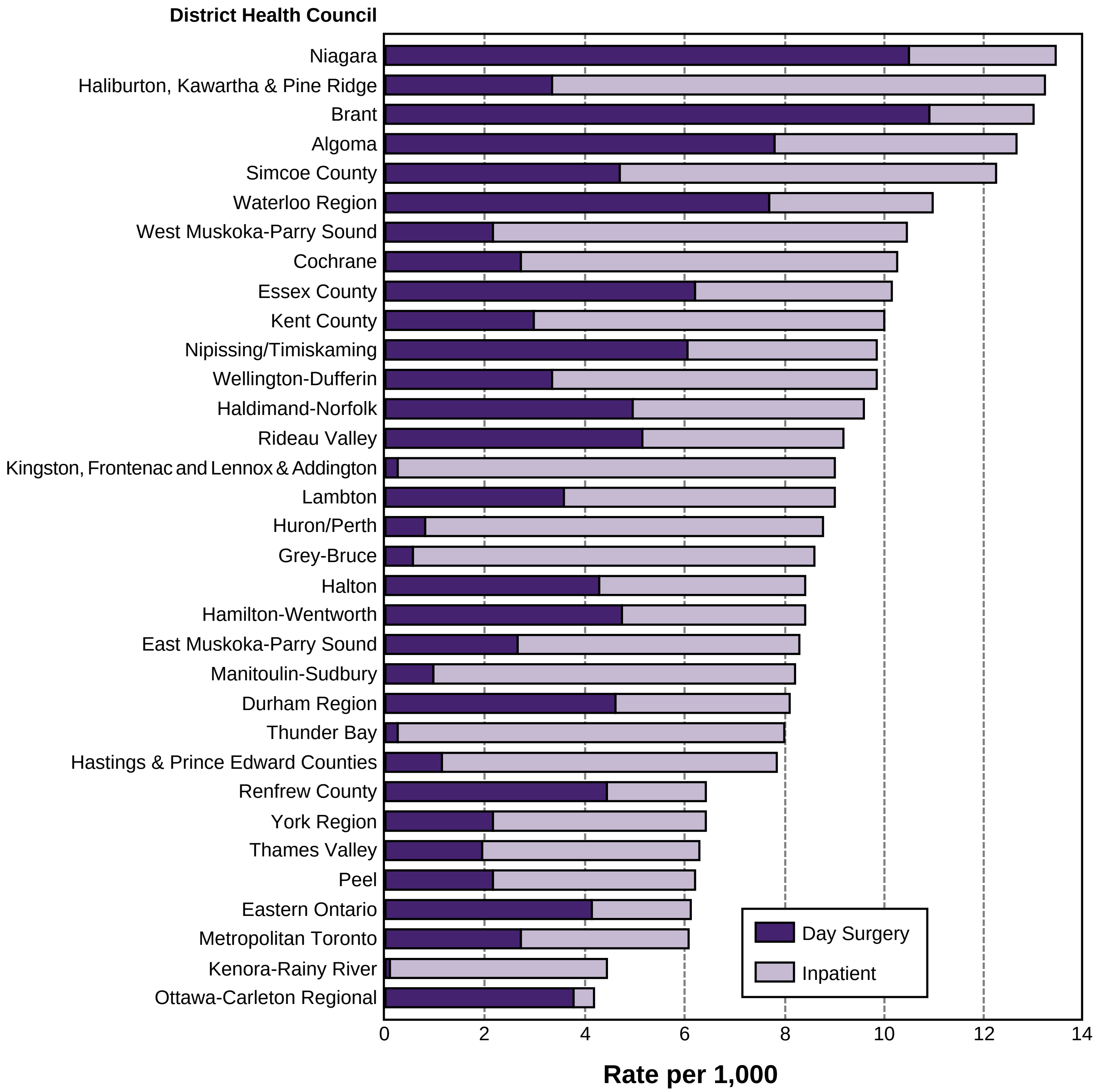
Exhibit 11.23: ***Age/Sex-adjusted Tonsillectomy Rates (day surgery only) per 1,000 Children 0 to 19 Years by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95***

District Health Council	1992/93 - 1994/95				1994/95	
	Number of Procedures/Year	Age/Sex-adjusted Rate per 1,000	Rank	p-value	Number of Procedures	Age/Sex-adjusted Rate per 1,000
Algoma	283	7.7	3	✢✢	420	11.5
Brant	381	10.7	1	✢✢	383	10.7
Cochrane	80	2.8	22	**	106	3.7
Durham Region	676	4.8	10	✢✢	1,014	7.1
East Muskoka-Parry Sound	52	2.8	21	*	60	3.3
Eastern Ontario	229	4.1	14		252	4.5
Essex County	588	6.3	5	✢✢	630	6.7
Grey-Bruce	31	0.7	30	✢✢	37	0.8
Haldimand-Norfolk	154	5.0	8	✢✢	187	6.1
Haliburton, Kawartha & Pine Ridge	257	3.3	18	*	320	4.1
Halton	386	4.2	13	*	679	7.3
Hamilton-Wentworth	610	4.9	9	✢✢	881	7.1
Hastings & Prince Edward Counties	59	1.5	27	✢✢	76	1.9
Huron/Perth	32	0.8	29	✢✢	81	2.0
Kenora-Rainy River	3	0.1	33	✢✢	6	0.2
Kent County	97	3.0	19	*	129	4.0
Kingston, Frontenac and Lennox & Addington	14	0.3	32	✢✢	11	0.2
Lambton	129	3.4	16		220	5.8
Manitoulin-Sudbury	68	1.2	28	✢✢	85	1.5
Metropolitan Toronto:	1,495	2.8	20	✢✢	2,258	4.1
Borough of East York	83	3.9			123	5.5
City of Etobicoke	171	2.3			257	3.4
City of North York	290	2.2			460	3.4
City of Scarborough	491	3.4			792	5.4
City of Toronto	383	3.0			509	3.9
City of York	75	2.2			116	3.3
Niagara	1,115	10.4	2	✢✢	1,312	12.2
Nipissing/Timiskaming	221	6.2	6	✢✢	214	6.0
Ottawa-Carleton Regional:	683	3.7	15		764	4.1
City of Ottawa	260	3.6			268	3.6
Ottawa, Eastern Region	174	3.2			193	3.5
Ottawa, Western Region	248	4.2			303	5.0
Peel:	517	2.1	23	✢✢	900	3.7
City of Brampton	243	2.6			441	4.6
City of Mississauga	273	1.8			459	3.0
Renfrew County	129	4.6	12	**	163	5.8
Rideau Valley	219	5.2	7	✢✢	192	4.6
Simcoe County	456	4.8	11	✢✢	537	5.6
Thames Valley	323	2.0	26	✢✢	567	3.5
Thunder Bay	14	0.3	31	✢✢	18	0.4
Waterloo Region	885	7.5	4	✢✢	1,016	8.6
Wellington-Dufferin	212	3.3	17		275	4.3
West Muskoka-Parry Sound	11	2.1	24		9	1.8
York Region	358	2.1	25	✢✢	541	3.1
Total Ontario	10,766	3.7			14,343	4.9
Coefficient of Variation (%) [CV]		61.7				
Extremal Quotient [EQ]		96.0				
Systematic Component of Variation [SCV]		487.8				
Adjusted Chi-square (likelihood ratio)		3,831.0 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ✢✢ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 11.24: *Inpatient vs. Day Surgery Tonsillectomy Rates per 1,000 Children 0 to 19 Years in Ontario, 1992/93 – 1994/95*



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Comments

In Ontario, the tonsil and adenoid day surgery rate doubled from 1991/92 to 1994/95. Today, over half of all tonsil and adenoid surgery is performed as day procedures. Over 60% of children younger than five had their tonsil and adenoid surgery performed on an outpatient basis. A total of 32,298 tonsil and adenoid day surgery cases were performed in Ontario between 1992/93 and 1994/95. If these procedures had been performed on an inpatient basis, a total of 38,112 patient days would have been incurred over the three-year period (assuming an average hospital stay of 1.18 days). This translates into a $7.9 million inpatient cost per year (based on the Resource Intensity Weight method of estimating costs).[73]

Tonsillectomy remains one of the most common operations performed on children. An estimated 250,000 tonsillectomies and adenoidectomies are performed annually in the United States.[74,75] Since numerous studies have indicated a low rate of complications associated with tonsil and adenoid surgery, day surgery is increasingly being advocated as a safe and cost-efficient procedure.[63–67] Improvements in anesthetic agents available for use in children may further enhance the acceptance of this as a day surgery procedure. The choice between inpatient and day surgery tonsillectomy is not only dependent on medical factors (such as dysphagia, hemorrhage, airway difficulties and age), but is also a function of physician preference, patient and parent preference, distance between the hospital and the patient's home, and the perceived reliability of the parents.[76]

While most studies in the literature agree that tonsil and adenoid surgery is a relatively safe outpatient procedure, varying recommendations for selecting appropriate candidates for tonsil and adenoid day surgery exist. In general, most investigators suggested that tonsil and adenoid day surgery should not be considered for patients with pre-existing medical conditions or for children younger than three years. British Columbia has established a more extensive list of criteria for selecting suitable patients for day surgery tonsillectomy or adenoidectomy.[77] Their criteria include medical and personal factors, such as distance between the patient's home and the hospital, available accommodation in town, and parental attitudes about assuming responsibility for their child's care following discharge. Given the significant variability in rates, further research to examine these differences is warranted. Barring this, adoption of guidelines for tonsil and adenoid surgery indications warrants further discussion. Adoption of a protocol similar to that used in British Columbia[77] may decrease the variation in tonsil and adenoid surgery in Ontario.

Medical Condition

Hospitalization for Childhood Asthma

Introduction

Asthma is an increasingly prevalent childhood condition that is responsible for a significant amount of morbidity and is a leading cause of hospital admission for children.[78,79] Recent analysis of hospital discharge data by To and associates [80] indicates that, in 1992/93 in Ontario, 12,663 children younger than 18 were discharged after being hospitalized for asthma. The discharge rate in Ontario is decreasing for those between 5 and 18 years of age. However, the majority of discharges are accounted for by children four years old and younger, and the discharge rates for this age group have clearly not reached a plateau or begun to decrease, as they have in the older group.

A recent US publication has described hospitalization rates for asthma patients from 0 to 35 years old in New York City.[81] This study revealed striking small area variations in crude hospitalization rates (a 16-fold difference exists between the neighbourhood with the highest rate and that with the lowest rate). As well, it described significant and independent correlations between hospitalization rates and low income and racial composition. Only two prior publications have described geographic area variation in discharge rates for childhood asthma. Senthilselvan[82] recently described a higher rate of hospitalization for childhood asthma in rural Saskatchewan than in urban Saskatchewan, but did not carry out a small area variation analysis. Wennberg described a five-fold difference in discharge rates for childhood bronchitis and asthma in a small area variation analysis in the Rochester area.[3] It is unclear to what extent variation in the number of hospitalizations reflects such health service characteristics as outpatient therapy or provider type, as opposed to differences in classification, prevalence or severity, hospital bed availability, or criteria for admission.[3,44]

Recent evidence from randomized controlled trials suggests that therapeutic and management strategies can lower the risk of hospitalization for asthma in children. Children with asthma exacerbations treated in the emergency department with systemic steroids appear to have lower admission rates and are discharged from hospital earlier.[83,84] In addition, children diagnosed with asthma and treated with long-term inhaled steroids have fewer asthma symptoms, and fewer visits to the emergency department.[85–87]

Overall Trends

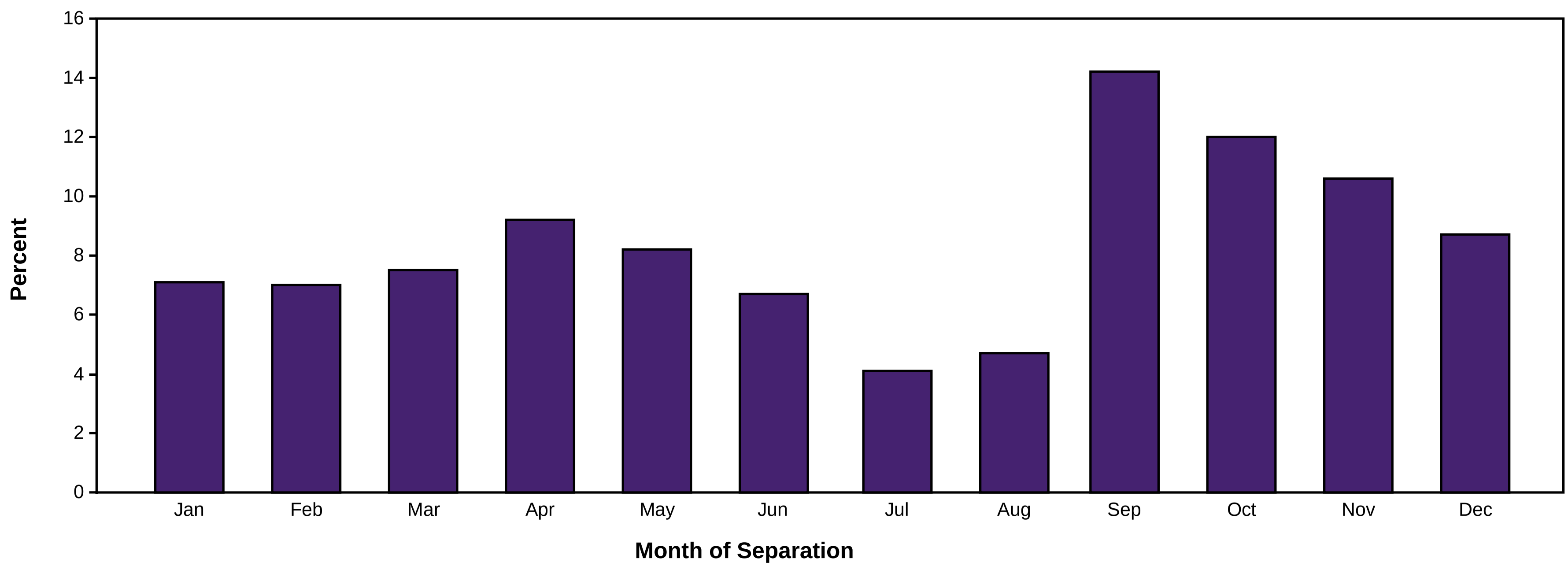
Over 12,200 children under the age of 20 are hospitalized annually for asthma in Ontario. Exhibit 11.25 shows the trend for asthma hospitalizations among children in Ontario between 1985/86 and 1994/95. Similar to what has been observed by others, the discharge rates slowly increased, from a low of 4.3 per 1,000 children in 1985/86 to a high of 5.3 per 1,000

Exhibit 11.25: ***Overall and Age/Sex-specific Asthma Hospitalization Rates per 1,000 Children 0 to 19 Years in Ontario, 1985/86 - 1994/95***

Fiscal Year	Overall		Total Rate per 1,000				Female Rate per 1,000				Male Rate per 1,000			
	Number	Rate per 1,000	0 to 4	5 to 9	10 to 14	15 to 19	0 to 4	5 to 9	10 to 14	15 to 19	0 to 4	5 to 9	10 to 14	15 to 19
1985/86	11,128	4.3	9.5	4.4	2.4	1.4	6.3	3.3	2.0	1.9	12.6	5.4	2.7	1.0
1986/87	13,317	5.0	11.5	4.6	2.8	1.6	7.9	3.3	2.4	2.1	15.0	5.9	3.2	1.1
1987/88	14,159	5.3	11.7	4.9	3.0	1.8	7.8	3.7	2.6	2.4	15.3	6.1	3.3	1.2
1988/89	14,057	5.3	12.3	4.1	2.7	1.7	8.4	3.1	2.7	2.3	16.0	5.2	2.6	1.1
1989/90	12,610	4.6	10.4	3.6	2.3	1.8	7.2	2.5	2.4	2.4	13.6	4.6	2.3	1.2
1990/91	14,105	5.1	12.0	3.6	2.5	1.7	7.8	2.6	2.4	2.3	16.0	4.5	2.6	1.2
1991/92	12,993	4.6	10.7	3.3	2.2	1.8	7.2	2.5	2.2	2.4	14.1	4.1	2.3	1.2
1992/93	13,095	4.6	11.1	3.2	2.0	1.7	7.2	2.2	2.0	2.4	14.8	4.1	2.0	1.1
1993/94	12,350	4.3	10.1	3.1	1.9	1.6	6.7	2.4	1.9	2.3	13.3	3.9	1.8	0.9
1994/95	11,272	3.9	9.5	2.8	1.6	1.3	6.2	2.1	1.5	1.8	12.5	3.5	1.6	0.9

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 11.26: ***Proportion of Separations by Month for Asthma Among Children 0 to 19 Years in Ontario, 1992/93 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

children in 1988/89 — a 23.3% relative increase. The discharge rates decreased by 26.4%, to 3.9 per 1,000 children in 1994/95.

The discharge rates were further examined by age group (0 to 4 years, 5 to 9 years, 10 to 14 years and 15 to 19 years) and sex. The trend to declining discharge rates observed from 1990/91 to 1994/95 were most common in the 10 to 19 year olds. Younger children had consistently higher discharge rates between 1985/86 and 1994/95 than the older children. Among the youngest children (0 to 4 years), the discharge rate for boys was twice as high as it was for girls. The median age of admission gradually decreased from four years in 1985/86 to three years in 1994/95. The median length of stay (LOS) also decreased from three days in 1985/86 to two days in 1994/95. There are two seasonal peaks in asthma hospitalization (Exhibit 11.26), spring (March through May) and early fall (September to November).

Geographic Variations

Hospital data from 1992/93 to 1994/95 were used to study geographic variations. The total rate of asthma hospitalization from 1992/93 to 1994/95 was 4.2 per 1,000 (Exhibits 11.27 and 11.28). The detailed DHC data show that Kent County had the highest rate of asthma hospitalization (8.3 per 1,000) and Hamilton-Wentworth had the lowest (2.2 per 1,000) — a high-low rate ratio of 3.7. The overall variation among the DHCs in Ontario was moderate, as summarized by the statistics at the bottom of Exhibit 11.27.

Comments

Hospitalization for childhood asthma represents a substantial burden of illness for children. Aside from the cost to society, hospitalization of young children for asthma reflects both substantive intervention and significant morbidity. A very conservative analysis of direct hospital costs alone would suggest a provincial burden of over $16 million per year (based on 11,272 discharges in 1994/95 and the Resource Intensity Weight method of estimating costs).[73] Since asthma deaths in Canada are rare,[78] hospitalization may be a more practical outcome indicator for moderate and severe childhood asthma. Clearly, even a small relative reduction in the outcome of hospitalization through more effective and efficient health service provision could have a significant impact on morbidity and could lead to substantial savings.

Studies of individuals with childhood asthma suggest that therapeutics, education, and type of health care provider may have a significant effect on admission to hospital. Whether these determinants, or proxies for these determinants, have a recognizable relationship with hospitalization rates and patterns of hospitalization (duration of hospitalization, readmissions, etc.) needs to be established. Moreover, environmental factors and pollution may play an important role in the geographic variation identified. Further reseach in this area may prove enlightening.

Medical Condition

Hospitalization for Gastroenteritis

Introduction

In the United States and Canada, gastroenteritis is among the leading causes of hospitalization in young children.[88,89] The inpatient treatment of gastroenteritis is estimated to cost in excess of $300 million in the United States and $50 million in Canada.[90,91]

Dramatic geographic differences in hospitalization rates for gastroenteritis have been reported. For example, Connell and associates [11] found that there was a 16-fold variation in admission rates. Perrin and associates [92] compared 1,982 hospitalization rates for gastroenteritis in three cities in the United States and found that the rates varied from a low of 151 per 100,000 to a high of 374 per 100,000 children.

Researchers have speculated that the differences in geographic variation may be related to differences in the level of sanitation in the homes, differences in the parents' ability to follow instructions, differences in socioeconomic status, or differences in the way physicians make the decision to admit a patient to the hospital.[11] To and associates [2] attempted to examine the relationship between some of these variables and admission rates in Ontario. Based on a single year (1991/92) of data from CIHI, they concluded that the variability in hospitalization for childhood gastroenteritis observed in a Canadian setting with universal health care is comparable to the variability observed in the United States[2]. The Ontario provincial age/sex-adjusted rate of 4.1 per 1,000 children is similar to the rate of 3.7 per 1,000 children reported by Perrin and associates for Boston.[92] The 14-fold variation among DHCs is close to the 16-fold variation reported by Connell and associates.[11] They also concluded that this variability appeared to be unrelated to measures of socioeconomic status, but may have some association with the availability of pediatric beds.

In this section, we use the most recent Ontario data available to re-examine geographic variations in hospitalization for gastroenteritis among children in Ontario.

Overall Trends

Over 6,800 children younger than 20 are hospitalized annually for gastroenteritis in Ontario. Exhibit 11.29 shows the trend for gastroenteritis discharges among children in Ontario over the last decade (from 1985/86 to 1994/95). The discharge rates slowly decreased, from a high of 4.6 per 1,000 children in 1986/87 to a low of 2.3 per 1,000 children in 1994/95 — a 50.0% relative decrease.

The majority of children hospitalized for gastroenteritis were children

Exhibit 11.27: *Age/Sex-adjusted Asthma Hospitalization Rates per 1,000 Children 0 to 19 Years by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

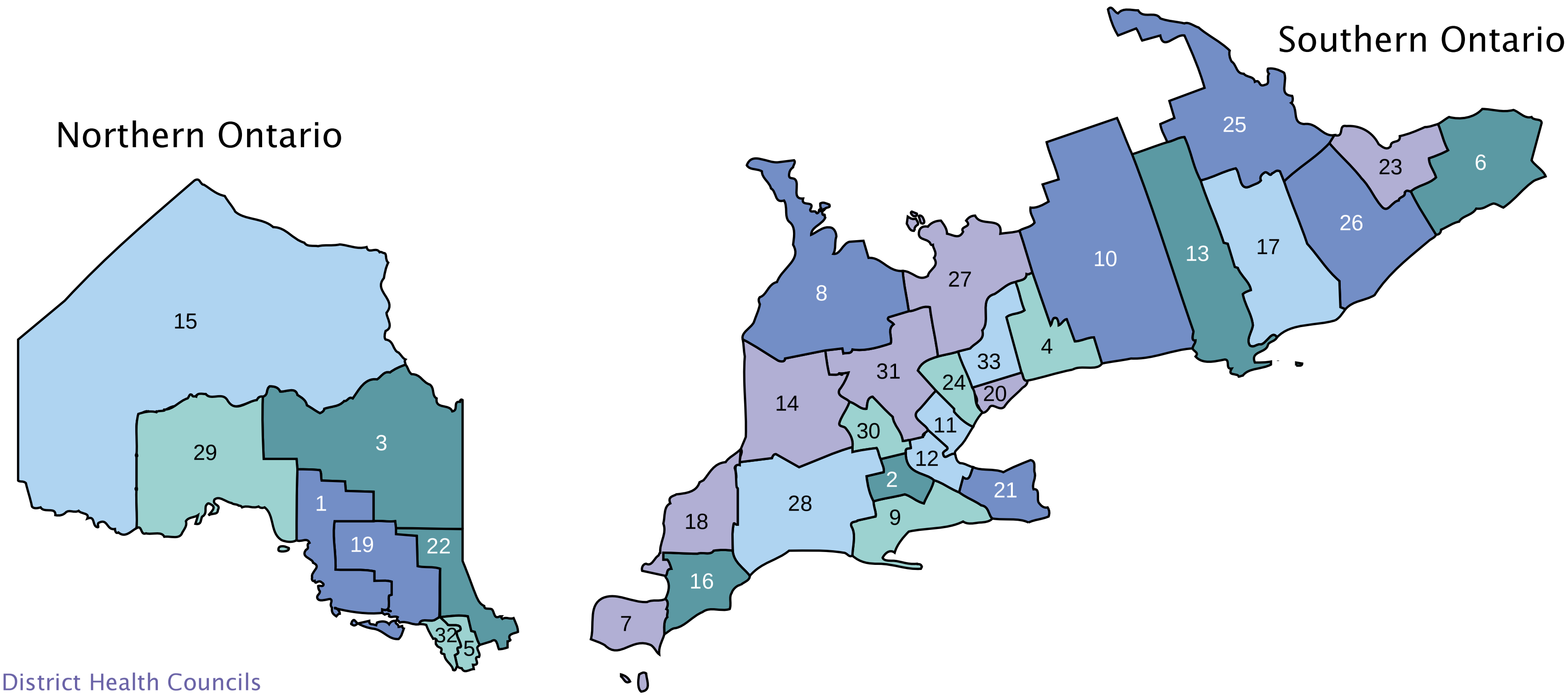
District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 1,000	Rank	Number of Hospitalizations/Year	Age/Sex-adjusted Rate per 1,000	Rank	p-value	Number of Hospitalizations	Age/Sex-adjusted Rate per 1,000
Algoma	6.4	4	170	4.7	13		144	4.1
Brant	7.6	2	232	6.7	2	++	222	6.5
Cochrane	6.1	8	166	5.8	4	++	151	5.4
Durham Region	4.4	25	579	4.1	24		594	4.1
East Muskoka-Parry Sound	5.2	16	76	4.2	21		66	3.7
Eastern Ontario	7.1	3	313	5.7	5	++	294	5.3
Essex County	4.7	23	398	4.3	19		383	4.2
Grey-Bruce	4.8	21	205	4.8	12		186	4.3
Haldimand-Norfolk	4.2	27	115	4.0	26		102	3.5
Haliburton, Kawartha & Pine Ridge	5.3	13	399	5.3	9	++	315	4.2
Halton	4.1	28	276	3.0	30	++	258	2.8
Hamilton-Wentworth	2.0	33	277	2.2	33	++	235	1.9
Hastings & Prince Edward Counties	6.1	7	238	6.0	3	++	237	6.0
Huron/Perth	3.6	30	181	4.7	15		159	4.1
Kenora-Rainy River	4.0	29	114	3.9	28		87	2.9
Kent County	11.0	1	256	8.3	1	++	211	6.9
Kingston, Frontenac and Lennox & Addington	5.2	15	177	3.9	29		147	3.2
Lambton	5.2	14	171	4.6	16		192	5.2
Manitoulin-Sudbury	4.9	19	297	5.5	8	++	286	5.3
Metropolitan Toronto:	4.6	24	2,368	4.3	20		2,241	3.9
Borough of East York	4.3		89	3.8			81	3.3
City of Etobicoke	4.2		274	3.6			233	3.0
City of North York	4.3		501	3.7			463	3.3
City of Scarborough	6.3		848	5.8			868	5.8
City of Toronto	3.7		516	3.8			468	3.3
City of York	3.4		141	3.9			128	3.4
Niagara	6.2	6	546	5.1	10	++	491	4.6
Nipissing/Timiskaming	5.8	9	199	5.6	6	++	175	5.0
Ottawa-Carleton Regional:	4.7	22	815	4.3	18		741	3.9
City of Ottawa	5.4		217	5.3			174	5.2
Ottawa, Eastern Region	4.2		392	4.0			385	3.2
Ottawa, Western Region	4.4		206	3.4			182	3.0
Peel:	5.1	17	968	3.9	27		962	3.9
City of Brampton	6.3		439	4.7			465	4.9
City of Mississauga	4.4		529	3.5			497	3.2
Renfrew County	5.6	10	151	5.6	7	++	143	5.3
Rideau Valley	6.3	5	205	4.9	11		161	3.9
Simcoe County	4.3	26	430	4.5	17		394	4.1
Thames Valley	2.9	32	473	2.9	31	++	429	2.7
Thunder Bay	5.0	18	186	4.2	23		173	4.0
Waterloo Region	5.5	11	489	4.2	22		378	3.3
Wellington-Dufferin	5.5	12	295	4.7	14		255	4.1
West Muskoka-Parry Sound	4.8	20	20	4.1	25		16	3.3
York Region	3.1	31	454	2.7	32	++	444	2.6
Total Ontario	4.7		12,239	4.2			11,272	3.9
Coefficient of Variation (%) [CV]	27.2			23.6				
Extremal Quotient [EQ]	5.6			3.7			Spearman Correlation	R=0.793 (p<0.0001)
Systematic Component of Variation [SCV]	106.4			76.7				
Adjusted Chi-square (likelihood ratio)	961.5 (d.f. 32, p<0.0001)			668.0 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 11.28

Age/Sex-adjusted Asthma Hospitalization Rates per 1,000 Children 0 to19 Years by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



Age/Sex-adjusted Rate
(quintiles)

- 5.6 to 8.3
- 4.7 to 5.6
- 4.3 to 4.7
- 3.9 to 4.2
- 2.2 to 3.9

District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
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9. Haldimand-Norfolk
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24. Peel
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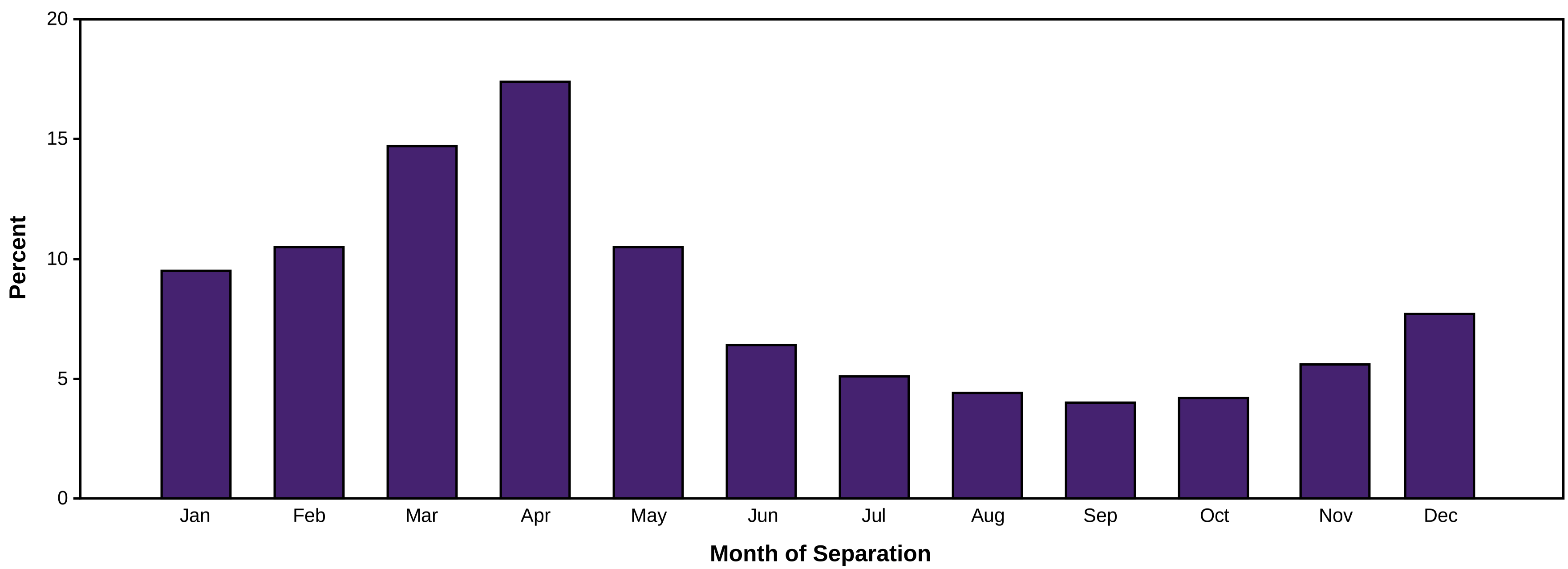
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

Exhibit 11.29: ***Overall and Age/Sex-specific Gastroenteritis Hospitalization Rates per 1,000 Children 0 to 19 Years in Ontario, 1985/86 - 1994/95***

Fiscal Year	Overall		Total Rate per 1,000				Female Rate per 1,000				Male Rate per 1,000			
	Number	Rate per 1,000	0 to 4	5 to 9	10 to 14	15 to 19	0 to 4	5 to 9	10 to 14	15 to 19	0 to 4	5 to 9	10 to 14	15 to 19
1985/86	10,729	4.2	13.4	1.7	1.0	0.9	12.2	1.6	1.0	1.0	14.6	1.7	1.0	0.8
1986/87	12,093	4.6	14.8	1.9	1.0	0.9	13.7	1.7	1.0	1.1	15.9	2.0	1.1	0.8
1987/88	9,931	3.7	11.4	1.6	0.9	0.9	10.6	1.4	0.9	1.1	12.3	1.8	1.0	0.7
1988/89	10,427	3.9	12.2	1.5	0.9	0.8	11.4	1.5	0.8	1.0	12.9	1.5	0.9	0.6
1989/90	9,782	3.6	10.8	1.5	0.9	0.8	9.9	1.5	0.8	1.0	11.7	1.5	0.9	0.6
1990/91	8,997	3.2	9.6	1.4	0.8	0.8	8.8	1.4	0.8	1.0	10.3	1.4	0.8	0.6
1991/92	10,742	3.8	11.3	1.8	0.9	0.8	10.5	1.7	0.9	0.9	12.1	1.9	0.9	0.7
1992/93	7,950	2.8	7.9	1.5	0.8	0.7	7.4	1.5	0.8	0.9	8.4	1.5	0.7	0.5
1993/94	8,413	2.9	8.6	1.5	0.6	0.6	8.1	1.4	0.6	0.8	9.0	1.5	0.7	0.5
1994/95	6,856	2.3	6.7	1.3	0.5	0.6	6.1	1.3	0.4	0.7	7.3	1.4	0.7	0.5

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 11.30: ***Proportion of Separations by Month for Gastroenteritis Among Children 0 to 19 Years in Ontario, 1992/93 – 1994/95***



Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

younger than five (77.6%). Their rate of hospitalization declined from 13.4 per 1,000 in 1985/86 to 6.7 per 1,000 children in 1994/95 — a 50.0% decrease. The median length of their hospital stay was stable at two days over the past 10 years. The peak for gastroenteritis discharges was in the winter months and early spring, January through May (Exhibit 11.30).

Geographic Variations

Hospital data from 1992/93 to 1994/95 were used to study geographic variations. The total rate for gastroenteritis hospitalization from 1992/93 to 1994/95 was 2.7 per 1,000 (Exhibit 11.31). The detailed DHC-specific data (Exhibits 11.31 and 11.32) showed that the Brant DHC had the highest rate of gastroenteritis hospitalization (5.3 per 1,000) and the Thames Valley DHC had the lowest (1.1 per 1,000) — a high-low rate ratio of 4.8. The overall variation among the DHCs in Ontario was moderate, as summarized by the statistics at the bottom of Exhibit 11.31.

Comments

Gastroenteritis is a very common acute infection in childhood. It is a major cause of childhood morbidity and mortality worldwide. However, for developed countries such as Canada, where clean water, good nutrition and medical services are readily available, and public sanitation is good, the rates of infection, complications and mortality are relatively low.

The Ontario provincial age/sex-adjusted rate of hospitalization (2.7 per 1,000 children), is similar to the rate of 3.7 per 1,000 children reported by Perrin and associates for Boston.[92] The 4.8-fold variation among DHCs is much lower than the 18-fold variation reported by Connell and associates.[11] However, this may be related to the difference in the years studied, since we used more recent data. There may also be coding differences between regions that account for differences in discharges. By examining all seven codes associated with rotavirus, we believe that we have controlled for the impact of this.

In 1994, the Canadian Paediatric Society published an official statement recommending that oral rehydration therapy and early refeeding in the management of childhood gastroenteritis is as safe and perhaps more efficient than intravenous therapy.[93] Over the past decade, major advances have been made in treating acute gastroenteritis with oral rehydration solutions. Some of the decrease in hospitalization over the past decade in Ontario may reflect at least in part the effect of oral rehydration solution use in preventing and managing dehydration, the main reason children with this condition are admitted to hospital. To lower the rate of hospitalization due to gastroenteritis, physicians have to consider oral rehydration therapy a safe and efficient alternative,[94,95] and they also have to educate parents about gastroenteritis (especially about what they should do before calling the physician). The Canadian Paediatric Society is currently distributing a handout for parents that addresses this issue. The moderate geographic variability in discharge rates in Ontario suggests more research is necessary to evaluate local factors, such as the use of oral rehydration solution, as potentially modifiable determinants of admission and length of hospital stay.

Exhibit 11.31: *Age/Sex-adjusted Gastroenteritis Hospitalization Rates per 1,000 Children 0 to 19 Years by DHC Area of Patient Residence in Ontario, 1989/90 - 1994/95*

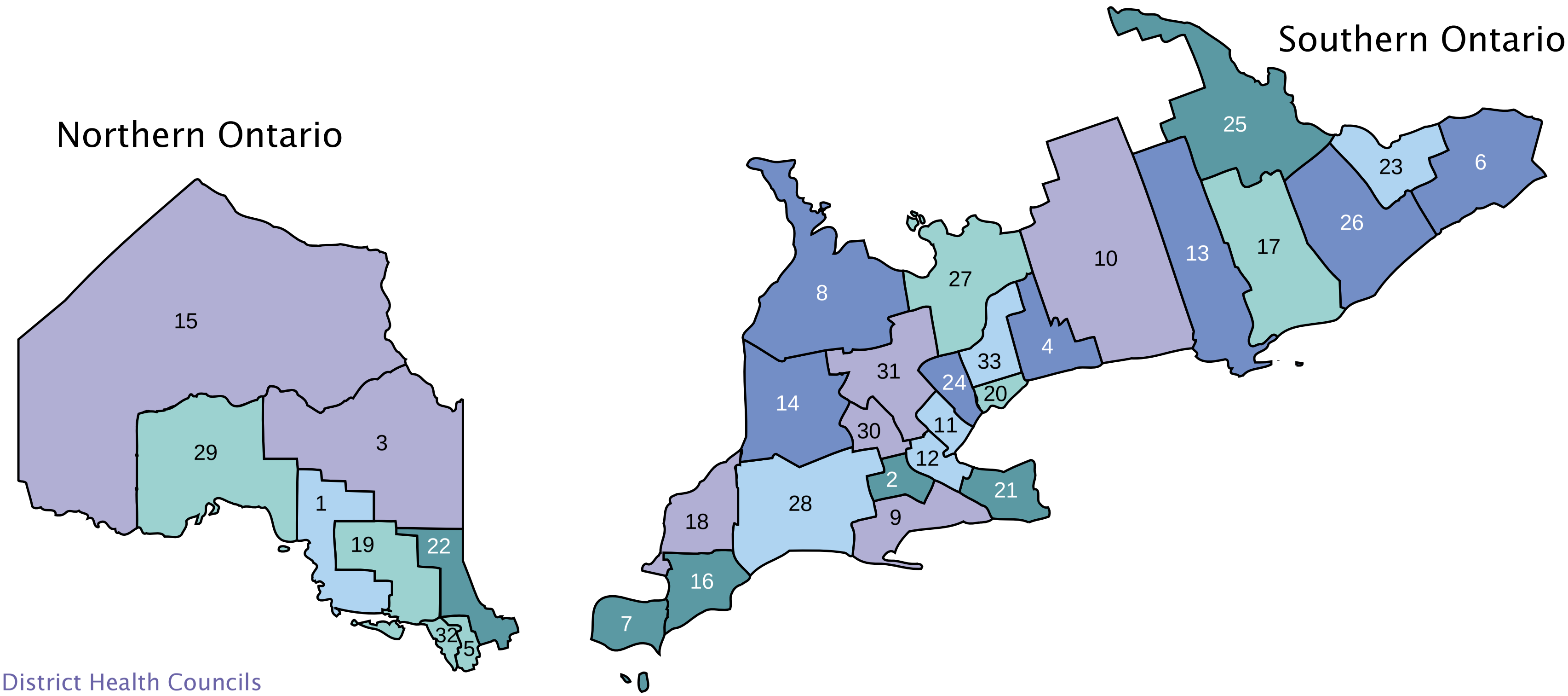
District Health Council	1989/90 - 1991/92		1992/93 - 1994/95				1994/95	
	Age/Sex-adjusted Rate per 1,000	Rank	Number of Hospitalizations/Year	Age/Sex-adjusted Rate per 1,000	Rank	p-value	Number of Hospitalizations	Age/Sex-adjusted Rate per 1,000
Algoma	4.2	14	65	1.9	30	**	54	1.5
Brant	5.9	4	183	5.3	1	++	159	4.6
Cochrane	7.0	3	81	2.9	15		76	2.7
Durham Region	3.8	18	422	2.9	13		392	2.7
East Muskoka-Parry Sound	2.6	30	44	2.5	25		35	2.0
Eastern Ontario	4.6	10	189	3.4	8	++	163	3.0
Essex County	5.8	6	388	4.3	4	++	400	4.4
Grey-Bruce	3.9	16	138	3.3	9	*	98	2.3
Haldimand-Norfolk	4.0	15	83	2.9	14		75	2.6
Haliburton, Kawartha & Pine Ridge	3.6	19	217	2.9	16		231	3.1
Halton	2.9	25	183	2.0	29	++	179	1.9
Hamilton-Wentworth	2.8	28	229	1.8	31	++	160	1.3
Hastings & Prince Edward Counties	4.6	11	122	3.1	10		99	2.5
Huron/Perth	3.9	17	113	2.9	12		84	2.2
Kenora-Rainy River	2.9	26	83	2.8	17		83	2.8
Kent County	4.8	9	121	3.9	5	++	97	3.2
Kingston, Frontenac and Lennox & Addington	2.7	29	96	2.1	27	*	73	1.6
Lambton	4.4	13	101	2.7	18		88	2.4
Manitoulin-Sudbury	3.4	21	127	2.3	26		97	1.8
Metropolitan Toronto:	2.8	27	1,449	2.6	23		1,405	2.4
Borough of East York	2.2		48	1.9			38	1.5
City of Etobicoke	2.8		198	2.5			184	2.3
City of North York	3.0		363	2.6			366	2.6
City of Scarborough	4.2		575	3.9			584	3.9
City of Toronto	1.4		188	1.4			175	1.2
City of York	2.3		77	2.0			58	1.5
Niagara	5.8	5	409	3.9	6	++	342	3.2
Nipissing/Timiskaming	7.3	2	159	4.7	3	++	150	4.4
Ottawa-Carleton Regional:	2.1	31	378	2.0	28	++	283	1.5
City of Ottawa	2.4		190	2.6			144	1.9
Ottawa, Eastern Region	2.1		97	1.8			71	1.3
Ottawa, Western Region	1.7		91	1.5			68	1.1
Peel:	3.6	20	752	3.0	11	++	640	2.6
City of Brampton	4.6		391	4.1			374	3.9
City of Mississauga	3.0		361	2.4			266	1.7
Renfrew County	8.0	1	132	5.0	2	++	101	3.8
Rideau Valley	5.2	7	150	3.6	7	++	107	2.6
Simcoe County	3.2	23	244	2.5	24		219	2.3
Thames Valley	1.8	33	178	1.1	33	++	122	0.8
Thunder Bay	4.9	8	115	2.6	22		75	1.7
Waterloo Region	4.5	12	316	2.7	20		304	2.6
Wellington-Dufferin	3.2	24	170	2.7	19		157	2.5
West Muskoka-Parry Sound	3.4	22	13	2.6	21		7	1.5
York Region	2.0	32	287	1.7	32	++	301	1.8
Total Ontario	3.5		7,740	2.7			6,856	2.3
Coefficient of Variation (%) [CV]	37.1			30.7				
Extremal Quotient [EQ]	4.5			4.8			Spearman Correlation	R=0.812 (p<0.0001)
Systematic Component of Variation [SCV]	198.4			119.3				
Adjusted Chi-square (likelihood ratio)	1,259.8 (d.f. 32, p<0.0001)			708.4 (d.f. 32, p<0.0001)				

* Significant at 5% level ** Significant at 1% level ++ Significant at 0.1% level

Data Source: Canadian Institute for Health Information (CIHI), Ontario Ministry of Health

Exhibit 11.32

Age/Sex-adjusted Gastroenteritis Hospitalization Rates per 1,000 Children 0 to19 Years by DHC Area of Patient Residence in Ontario, 1992/93 - 1994/95



Age/Sex-adjusted Rate
(quintiles)

- 3.9 to 5.3
- 2.9 to 3.6
- 2.7 to 2.9
- 2.1 to 2.6
- 1.1 to 2.0

District Health Councils

1. Algoma
2. Brant
3. Cochrane
4. Durham Region
5. East Muskoka-Parry Sound
6. Eastern Ontario
7. Essex County
8. Grey-Bruce
9. Haldimand-Norfolk
10. Haliburton, Kawartha & Pine Ridge
11. Halton
12. Hamilton-Wentworth
13. Hastings & Prince Edward Counties
14. Huron/Perth
15. Kenora-Rainy River
16. Kent County
17. Kingston, Frontenac and Lennox & Addington
18. Lambton
19. Manitoulin-Sudbury
20. Metropolitan Toronto
21. Niagara
22. Nipissing/Timiskaming
23. Ottawa-Carleton Regional
24. Peel
25. Renfrew County
26. Rideau Valley
27. Simcoe County
28. Thames Valley
29. Thunder Bay
30. Waterloo Region
31. Wellington-Dufferin
32. West Muskoka-Parry Sound
33. York Region

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Appendix A11.1: *Major Clinical Categories (MCC)*

Code	MCC
1	Diseases and Disorders of the Nervous System
2	Diseases and Disorders of the Eye
3	Diseases and Disorders of the Ear, Nose, Mouth and Throat
4	Diseases and Disorders of the Respiratory System
5	Diseases and Disorders of the Circulatory System
6	Diseases and Disorders of the Digestive System
7	Diseases and Disorders of the Hepatobiliary System and Pancreas
8	Diseases and Disorders of the Musculoskeletal System and Connective Tissue
9	Diseases and Disorders of the Skin, Subcutaneous Tissue and Breast
10	Endocrine, Nutritional and Metabolic Diseases and Disorders
11	Diseases and Disorders of the Kidney and Urinary Tract
12	Diseases and Disorders of the Male Reproductive System
13	Diseases and Disorders of the Female Reproductive System
14	Pregnancy and Childbirth
15	Newborn and Other Neonates with Conditions Originating in the Perinatal Period
16	Diseases and Disorders of Blood and Blood Forming Organs and Immunological Disorders
17	Lymphoma, Leukemia or Unspecified Site Neoplasms
18	Multisystemic or Unspecified Site Infections
19	Mental Diseases and Disorders
20	Alcohol/Drug Use and Alcohol/Drug Induced Organic Mental Disorders
21	Injury, Poisoning and Toxic Effects of Drugs
22	Burns
23	Other Reasons for Hospitalization
24	HIV Infections (AIDS)
25	Multiple Significant Trauma
98	Unrelated Operating Room Procedures
99	Ungroupable Data

Appendix A11.2: *Surgical Procedure/Medical Diagnosis, Description and Canadian Classification of Procedure (CCP) and International Classification of Diseases Diagnosis Codes – 9th Revision (ICD-9)*

Procedure	CCP Code	Description	Diagnosis Name	ICD-9 Code
Circumcision	76.0	Circumcision		
Myringotomy with Insertion of Ventilation Tubes	32.01		Disorders of external ear Nonsuppurtative otitis media and eustachian tube disorders Suppurtative and unspecified otitis media	380.0-380.9 381.0-381.9 382.0-382.9
Tonsillectomy	40.1 40.2 40.3 40.5	Tonsillectomy without adenoidectomy Tonsillectomy with adenoidectomy Excision of tonsil tag Adenoidectomy without tonsillectomy	Chronic tonsillitis Hypertrophy of tonsils and adenoids Unspecified Acute tonsillitis	474.0 474.1 474.9 463.0
Medical Diagnosis		**Description**		**Diagnosis Code**
Gastroenteritis		Viral enteritis not elsewhere classified (NEC) Viral enteritis not otherwise specified (NOS) Infectious enteritis NOS Enteritis of an infectious origin Infectious diarrhea (NOS) Diarrhea of infectious origin Other noninfectious gastroenteritis		008.6 008.8 009.0 009.1 009.2 009.3 558
Asthma				493

Appendix A11.3: *Breakdown of Excluded Cases and Missing Data by Procedure for Ontario*

Circumcision (includes only male babies with circumcision at birth, inpatient data only)

Year	Number of Procedures	Out of Province	Number of Eligible Procedures	Missing Residence	Ineligible or Missing Age	Missing Sex	Total Missing	Remaining Records for Analysis
1989/90	27,775	231	27,544	53	0	0	53	27,491
1990/91	32,057	236	31,821	5	0	1	6	31,815
1991/92	32,655	260	32,395	11	0	0	11	32,384
Total 1989/90 to 1991/92	**92,487**	**727**	**91,760**	**69**	**0**	**1**	**70**	**91,690**
1992/93	31,325	245	31,080	8	0	0	8	31,072
1993/94	29,617	269	29,348	8	0	0	8	29,340
1994/95	23,162	219	22,943	10	0	0	10	22,933
Total 1992/93 to 1994/95	**84,104**	**733**	**83,371**	**26**	**0**	**0**	**26**	**83,345**

Myringotomy with Ventilation Tubes (includes children 0 to 19 Years, inpatient and day surgery data combined)

1989/90 *	6,075	57	6,018	2	0	0	2	6,016
1990/91 *	6,958	34	6,924	1	0	0	1	6,923
1991/92	35,971	194	35,777	3,162	1	0	3,163	32,614
Total 1989/90 to 1991/92	**49,004**	**285**	**48,719**	**3,165**	**1**	**0**	**3,166**	**45,553**
1992/93	30,919	174	30,745	1,076	0	1	1,077	29,668
1993/94	31,995	158	31,837	154	0	0	154	31,683
1994/95	30,976	157	30,819	43	0	0	43	30,776
Total 1992/93 to 1994/95	**93,890**	**489**	**93,401**	**1,273**	**0**	**1**	**1,274**	**92,127**

Tonsillectomy (includes children 0 to 19 years, inpatient and day surgery data combined)

1989/90 *	21,574	138	21,436	8	0	1	9	21,427
1990/91 *	19,706	73	19,633	4	0	0	4	19,629
1991/92	25,832	207	25,625	451	0	0	451	25,174
Total 1989/90 to 1991/92	**67,112**	**418**	**66,694**	**463**	**0**	**1**	**464**	**66,230**
1992/93	22,936	157	22,779	315	2	1	318	22,461
1993/94	22,722	159	22,563	107	1	0	108	22,455
1994/95	25,471	176	25,295	41	0	1	42	25,253
Total 1992/93 to 1994/95	**71,129**	**492**	**70,637**	**463**	**3**	**2**	**468**	**70,169**

Asthma (includes children 0 to 19 years, inpatient data only)

1989/90	12,852	233	12,619	8	1	0	9	12,610
1990/91	14,347	236	14,111	5	1	0	6	14,105
1991/92	13,247	251	12,996	3	0	0	3	12,993
Total 1989/90 to 1991/92	**40,446**	**720**	**39,726**	**16**	**2**	**0**	**18**	**39,708**
1992/93	13,328	228	13,100	5	0	0	5	13,095
1993/94	12,602	244	12,358	7	1	0	8	12,350
1994/95	11,451	175	11,276	3	1	0	4	11,272
Total 1992/93 to 1994/95	**37,381**	**647**	**36,734**	**15**	**2**	**0**	**17**	**36,717**

Gastroenteritis (includes children 0 to 19 years, inpatient data only)

1989/90	9,947	153	9,794	4	7	1	12	9,782
1990/91	9,115	99	9,016	3	16	0	19	8.997
1991/92	10,956	201	10,755	6	7	0	13	10,742
Total 1989/90 to 1991/92	**30,018**	**453**	**29,565**	**13**	**30**	**1**	**44**	**29,521**
1992/93	8,057	104	7,953	1	2	0	3	7,950
1993/94	8,551	128	8,423	3	7	0	10	8,413
1994/95	6,961	101	6,860	2	2	0	4	6,856
Total 1992/93 to 1994/95	**23,569**	**333**	**23,236**	**6**	**11**	**0**	**17**	**23,219**

* For Myringotomy and Tonsillectomy, only inpatient data was available for fiscal years 1989/90 and 1990/91

Appendix A11.4: *Summary of Health Services Provided to Children in Ontario, 1994/95*

Age Group	Population	Leading Cause of Admission		Total Discharges/ 1,000	Days of Care	Average Length of Stay (days)	Price-adjusted per Capita OHIP Billings
		Non-surgical	Surgical				
Under 1 Year	147,600	Respiratory Diseases	Conditions in the Perinatal Period	209.2	1,258.1	6.0	579.9
1 to 4 Years	609,000	Respiratory Diseases	Ear, Nose, Mouth and Throat	68.8	204.7	3.0	259.8
5 to 14 Years	1,455,500	Ear, Nose, Mouth and Throat	Ear, Nose, Mouth and Throat	33.1	112.1	3.4	177.3
Females 15 to 19 Years	344,400	Pregnancy and Childbirth	Pregnancy and Childbirth	88.1	326.8	3.7	295.3
Males 15 to 19 Years	362,500	Mental Disorders	Musculoskeletal System	39.0	173.5	4.4	175.2
Total	**2,915,500**			**57.3**	**226.3**	**4.0**	**228.7**

Appendix A11.5: *Summary of Common Surgical Procedures for Children in Ontario, 1994/95*

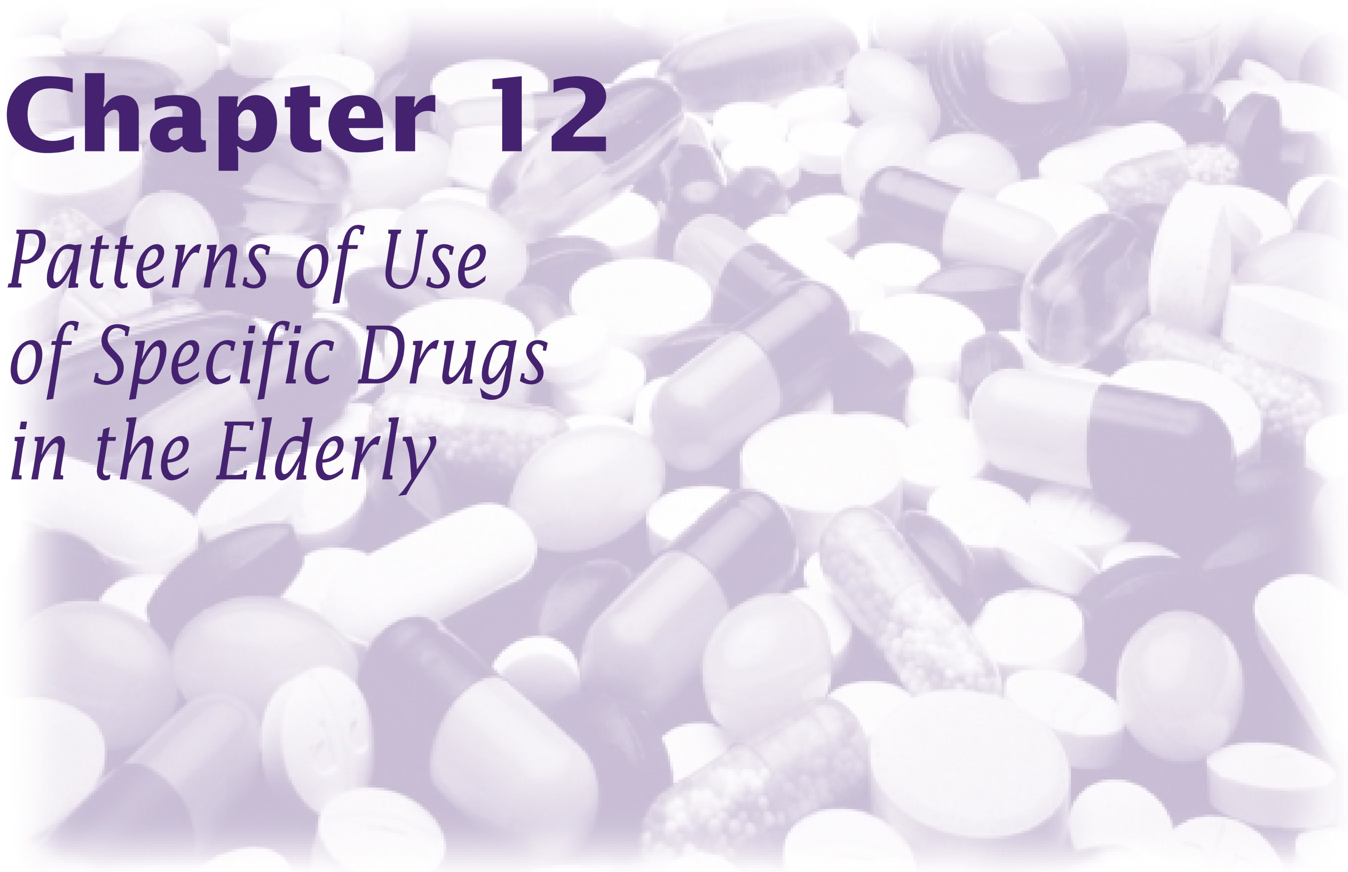
Procedure	# of Cases	Inpatient and Day Surgery Rate/ 1,000	Day Surgery Rate/ 1,000	Average Length of Stay (days)	Rate Variation - Inpatient and Day Surgery 1992/93- 1994/95 (high-low ratio)	Trend in Use
Neonatal Circumcision	22,933	299.1	N/A	N/A	11.9	Decline
Myringotomy with the Insertion of Ventilation Tubes	30,776	10.5	9.4	N/A	6.4	Shifting to Day Surgery
Tonsils and Adenoids Surgery	25,253	8.6	4.9	1.2	3.2	Shifting to Day Surgery

Appendix A11.6: *Summary of Non-surgical Hospitalizations for Children in Ontario, 1994/95*

Reason for Hospitalization	Number Hospitalized Annually	Age/Sex-adjusted Rate/1,000	Regional Rate Variation 1992/93 - 1994/95 (high-low ratio)	Trends
Asthma	11,272	3.9	3.7	Declining, especially in the older age group
Gastroenteritis	6,856	2.3	4.8	Declining slowly

Chapter 12

Patterns of Use of Specific Drugs in the Elderly



Introduction

Chapter 3 provided an overview of Ontario Drug Benefit (ODB) expenditures for prescription drugs for the elderly. The focus was primarily financial — determining which drug categories and drugs were responsible for the increasing prescription drug costs borne by ODB. Further examination of trends in the use of specific drug categories can help to highlight some of the important issues related to prescription drug use.

If used properly, prescription drugs can be among the most cost-effective forms of medical care. On the other hand, inappropriate use of prescription drugs can waste limited resources and, in some cases, even be harmful. Given the high burden of disease faced by the elderly, they have the most to gain from the appropriate use of effective prescription drugs. But, because of their sensitivity to adverse reactions, they also have the most to lose from inappropriate use.

Therapeutics is perhaps the fastest changing component of medical care. New drugs are constantly being developed and approved for use. Even if new drugs are more expensive than existing drugs, they may be a good investment for the health care system if they are used appropriately. In addition to improving patient outcomes in some cases, appropriate use may provide an overall saving to the health care system by reducing costs for other services such as hospital and physician care. However, if newer, more expensive drugs are used for patients when there is likely to be no improvement in outcome or reduction in costs, they represent a poor health care investment. The challenge for the health care system is to ensure that new drugs are used appropriately and to promote a change from the use of older drugs to newer drugs when appropriate.

This challenge is highlighted by data on three specific drug categories. The first category of drugs examined is antidepressants. Depression is a common condition in the elderly. Recently, a new type of antidepressant, selective serotonin reuptake inhibitors (SSRI), has been approved for the treatment of depression. This analysis describes the changing pattern in the use of antidepressants for the elderly after the introduction of SSRI.

The second category of drugs examined is antibiotics. There are a large number of antibiotics listed in the ODB formulary, and there are enormous differences in the costs of these drugs. Recently, ODB released a set of guidelines that indicate the preferred antibiotic treatment for common infections. This analysis describes trends in the use of antibiotics during the periods before and shortly after the release of these guidelines.

The third category of drugs examined is a set of drugs that, according to a panel of experts in psychopharmacology, pharmacoepidemiology,

Exhibit 12.1: ***Defined Daily Doses (DDD) for Antidepressants***

Drug Class	DDD (mg)
Tricyclic Agents	
• Amitriptyline	75
• Clomipramine	100
• Desipramine	100
• Doxepin	100
• Imipramine	100
• Nortriptyline	75
• Trimipramine	150
Atypical Agents	
• Trazodone	300
• Maprotiline	100
• Amoxapine	150
Monoamine Oxidase Inhibitors (MAOIs)	
• Phenelzine	60
• Tranylcypromine	10
Selective Serotonin Reuptake Inhibitors (SSRIs)	
• Fluoxetine	20
• Fluvoxamine	150
• Sertraline	75

Source: N. Mittman, Sunnybrook Health Science Centre

clinical geriatric pharmacology, general clinical geriatrics and long-term care, should not be used in the elderly.[1,2] These drugs result in a higher incidence of side effects when given to the elderly or are less effective than newer drugs. A description of trends in their use over time provides some insight into important drug-selection issues.

Data Source & Methods

Overview

All analyses were completed with the use of the ODB claims files for fiscal years 1990/91, 1992/93 and 1994/95 provided to ICES by the Ministry of Health (MOH). Details regarding the structure of the claims files can be found in Chapter 3. The analyses include claims for solid, oral dosage forms and exclude expenditures on injectable, rectal or topical dosage forms. Unique Drug Identification Numbers (DINs) listed in the ODB formulary were used to identify all drugs from the categories of interest, regardless of the specific dose or the manufacturer.

Antidepressants

Methods

The antidepressant drugs were grouped into four general pharmacological classes (Exhibit 12.1). The number of elderly patients who were prescribed the drugs in any of these four classes was determined with the use of the unique scrambled Health Care Number (HCN) contained on each ODB claim.

Dosages were standardized with the use of a technique employing defined daily doses of drugs. Defined daily dosage has been used as a unit of measure in drug utilization studies since the early 1970s; it defines the normal or average adult daily therapeutic maintenance dose for the drug being reviewed.[3] For the purposes of our analyses, a defined daily dose was assigned to each drug in the antidepressants group (N. Mittman, Sunnybrook Health Science Centre: personal communication, 1996) and the total quantity of each drug was calculated as the total number of defined daily doses. The defined daily dose does not take into account the differences in doses prescribed for different indications or the fact that the recommended doses for the elderly are often lower than the usual adult dose. It would, therefore, be incorrect to use the defined daily dose to assess the appropriateness of a prescribed dose of a medication for a particular patient, and we do not attempt to do so here. This method, therefore, provides a fixed technical unit of measurement, allowing comparisons over time that are independent of differences in price and pharmaceutical form. The defined daily dose provides a

Exhibit 12.2: ***Number of Defined Daily Doses (DDD), Average Cost per DDD and per Capita Expenditures for Antidepressants for People Aged 65 Years and Older in Ontario, 1990/91 and 1994/95***

	1990/91			1994/95		
Antidepressant Group	No. of DDD/Person	Average Cost per DDD ($)	Per Capita Expenditure ($)	No. of DDD/Person	Average Cost per DDD ($)	Per Capita Expenditure ($)
Atypical Agents	0.74	1.41	1.04	0.69	1.51	1.04
MAOIs	0.03	1.21	0.04	0.18	0.49	0.09
Tricyclic Agents	7.39	0.46	3.40	6.95	0.45	3.13
SSRIs	0.96	1.58	1.52	4.45	2.01	8.94
Overall	**9.12**	**0.66**	**6.00**	**12.27**	**1.08**	**13.25**

Exhibit 12.3: ***Exposure to Antidepressants Among People 65 Years and Older in Ontario, 1990/91 and 1994/95***

	1990/91		1994/95	
Number of Different Antidepressant Classes	Number Exposed	% of Population 65 Years and Older Exposed	Number Exposed	% of Population 65 Years and Older Exposed
One	92,014	7.91	118,305	9.03
Two	6,144	0.53	12,478	0.95
More than two	496	0.04	729	0.06
Total	**98,654**	**8.48**	**131,512**	**10.04**

reasonable mechanism for aggregating drug use across the different dosages of a specific drug (e.g., 50-mg and 100-mg tablets of desipramine) and aggregating use of a class of drugs (e.g., tricyclic antidepressants or SSRIs).

Findings

The amount spent on antidepressants per elderly resident of Ontario increased 120%, from $6.00 per person to $13.25 per person, between 1990/91 and 1994/95 (Exhibit 12.2). In 1990/91, tricyclic antidepressants accounted for 56% and SSRIs for 25% of expenditures on antidepressants, but by 1994/95 use of the tricyclics accounted for only 24% whereas SSRIs accounted for 68% of expenditures. In 1990/91 SSRIs accounted for 10.5% of the total defined daily doses of antidepressants. By 1994/95, this proportion had increased to 34%.

The increase in expenditures for antidepressants was the result of both an increase in the number of defined daily doses for these drugs and their average cost per defined daily dose. In 1990/91, there was an average of just over nine defined daily doses of antidepressants per elderly person in Ontario, with an average cost of $0.66 per dose. By 1994/95, the quantity of antidepressants used had increased by 35% to just more than 12 doses per person and the average cost per dose had increased 64% to $1.08 (Exhibit 12.2).

In 1990/91, about 100,000 people, or 8.5% of the elderly population, were exposed to one or more antidepressant drugs (Exhibit 12.3). In 1994/95, this increased to just more than 130,000 people, or 10% of the elderly population. The vast majority of elderly people who were prescribed antidepressants received only one class of antidepressants during a year, and only a very small number were prescribed more than two classes of antidepressants. In 1990/91, approximately 6% of those who received a single antidepressant prescription received an SSRI. By 1994/95, this proportion had increased to 27%.

Comment

The ODB classification system lists the drugs examined in this section of the ICES *Practice Atlas* as antidepressants. However, these drugs may be used for other indications: for example, tricyclics can be used to treat chronic pain syndromes and SSRIs have a role in the treatment of obsessive–compulsive disorders. There is no diagnostic information available from ODB claims, and it was therefore impossible to examine the specific indications for which drugs were prescribed. However, the overwhelming majority of these drugs would presumably be prescribed for depression.

Depression is a common psychiatric disorder in the elderly; more than

Exhibit 12.4: ***Ontario Drug Benefit Prescriptions per Capita, Cost per Prescription and per Capita Expenditures for Antibiotics for People 65 Years and Older, in Ontario, 1990/91, 1992/93 and 1994/95***

	1990/91			1992/93			1994/95		
Antibiotic Group	No. of Prescriptions Per Capita	Average Cost per Prescription ($)	Per Capita Expenditures ($)	No. of Prescriptions Per Capita	Average Cost per Prescription ($)	Per Capita Expenditures ($)	No. of Prescriptions Per Capita	Average Cost per Prescription ($)	Per Capita Expenditures ($)
Fluoroquinolones	0.12	50.65	6.08	0.19	55.12	10.47	0.22	55.57	12.22
Cephalosporins	0.12	21.97	2.64	0.14	25.31	3.54	0.15	26.52	3.98
Penicillins	0.34	4.78	1.63	0.36	5.31	1.91	0.35	5.70	2.00
Erythromycins and Tetracyclines	0.21	5.76	1.21	0.18	5.84	1.05	0.17	6.42	1.09
Sulfonamides and Trimethoprim	0.15	5.01	0.75	0.15	5.18	0.78	0.14	5.00	0.70
Urinary Tract Anti-infectives	0.03	16.41	0.49	0.03	18.13	0.54	0.03	18.76	0.56
Others	0.01	10.19	0.10	0.01	13.22	0.13	0.02	14.35	0.29
Overall	**0.98**	**13.03**	**12.77**	**1.06**	**17.44**	**18.49**	**1.08**	**19.38**	**20.93**

10% of elderly people living in the community have been found to have significant symptoms of depression.[4] Effective treatment of depression can dramatically improve quality of life and social function. Between 1990/91 and 1994/95 there was an increase in the number and proportion of the elderly who received any anti-depressant. There was a major change in the treatment of depression in Ontario's elderly during this period. In 1990/91, the vast majority of patients with depression were treated with tricyclic antidepressants; since then an increasing proportion of patients received SSRIs. On average, SSRIs cost about four to five times as much per dose as tricyclic antidepressants. The overall impact of the shift toward SSRIs, combined with the greater use of antidepressants, resulted in the rapid increase in expenditures on antidepressants in Ontario.

In theory, SSRIs have advantages over tricyclic antidepressants or monoamine oxidase inhibitors (MAOI's) in terms of fewer side effects. Thus, the increase in the number of seniors receiving treatment for depression may indicate physicians' greater willingness to prescribe these agents than to prescribe the other two groups of drugs. The result could be better quality of life for the affected people. However, SSRIs have their own unique set of side effects, and relatively little is known about their safety and efficacy in the elderly. If SSRIs truly represent a breakthrough in the treatment of depression in the elderly, then they may be worthwhile. Until there is more information on the risks and benefits of SSRIs in the elderly and a more detailed analysis of how they are being used, it is impossible to determine whether they are a cost-effective alternative to more traditional agents.

Antibiotics

Methods

The Pharmacologic-therapeutic Classification Group (PCG) system in the ODB formulary was used as the basis for classifying antibiotics. Erythromycins and tetracyclines, two separate groups in the formulary, are grouped together in this analysis. Cephalosporins are analysed as a separate group, although they are contained in the "other" PCG in the formulary. Metronidazole has been included in the "other" PCG in our analysis, along with clindamycin, lincomycin and neomycin. Trimethoprim, alone and in combination, is found in the "miscellaneous agents" group in the formulary. For our purposes, it is included with the sulfonamides. Sulfasalazine, a gastrointestinal anti-inflammatory agent, has been excluded from the sulfonamides group. Two PCG categories (antitubercular and antiparasitic agents) were not included in this analysis due to their highly specific indications.

Findings

Expenditures on antibiotics for the elderly increased 65%, from $12.77 per capita in 1990/91 to $20.93 per capita in 1994/95 (Exhibit 12.4). The amount spent on fluoroquinolones more than doubled during that period to an average of $12.22 per capita, and this category of antibiotics, combined with the cephalosporins, accounted for more than three-quarters of total antibiotic expenditures in 1994/95.

The increase in expenditures on antibiotics is the result of an increase in both the number of prescriptions for these drugs and the average cost per prescription. In 1990/91 the average cost of an antibiotic prescription was $13.03. This cost increased by 49%, to $19.38 in 1994/95 (Exhibit 12.4). At the same time, the average number of prescriptions per person increased by 11%. In 1990/91 fluoroquinolones and cephalosporins accounted for 24% of the total number of antibiotic prescriptions for the elderly in Ontario. This proportion increased to 34% in 1994/95.

Comment

There has been a rapid increase in the amount spent on antibiotics for the elderly in recent years, driven in part by a greater number of prescriptions for these drugs but primarily by a shift toward the use of more expensive drugs. Although antibiotics can be life-saving in many clinical situations, there is growing concern that overuse of these agents will lead to an increasing prevalence of drug-resistant bacteria. For this reason, the increased use of antibiotic agents is a concern. The shift to more expensive antibiotic drugs is also an important issue.

The recent Anti-infective Guidelines for Community-acquired Infections[5] list first-line agents for the treatment of most common infections. Fluoroquinolones, the most expensive and fastest growing class of antibiotics, are not listed as a first-line drug for the common infections afflicting those older than 65 years of age, such as respiratory or urinary-tract infections. The rapid increase in the use of fluoroquinolones indicates either that bacteria resistant to less expensive agents pose a growing problem or that there has been a shift in practice that may not be consistent with accepted clinical practice guidelines. More work needs to be done to determine whether the increase in the use of these expensive agents is driven by changes in the patterns of infectious disease or by shifts in practice style.

Developing and disseminating practice guidelines is an important first step in improving prescription practice, but these initiatives alone are often not enough to change behaviour. Research shows that although disseminating practice guidelines may predispose physicians to change their behaviour, such changes in practice usually require a guideline implementation strategy that coordinates specific initiatives to enable and reinforce behaviour change.[6] ICES is now working with ODB and researchers in the Faculty of Medicine at the University of Toronto to develop and evaluate strategies to implement the anti-infective guidelines. The results of this experiment will be helpful in designing future ODB initiatives.

Drugs to be Avoided in Treating Elderly People

Methods

Exhibit 12.5 shows the specific drugs that the expert panel defined as inappropriate for use in the elderly.[1,2] The drugs are divided into four categories: sedative/hypnotics, nonsteroidal anti-inflammatory drugs (NSAIDs), oral hypoglycemics, and analgesics. The number of elderly people exposed to drugs in any of these categories was determined from the unique scrambled HCN on each ODB claim. The number exposed to at least one drug in the category, divided by the population of elderly in the province that year, was used to measure the proportion of the elderly population exposed to each category of drugs.

Findings

In 1990/91, 8.5% of the elderly in Ontario received one or more prescriptions for a sedative/hypnotic that the expert panel felt should not be used in this age group (Exhibit 12.5). The proportion of the population exposed to these drugs decreased steadily to 5.6% in 1994/95. In 1990/91, 4.4% of the elderly population took either phenylbutazone or indomethacin, two NSAIDS that the panel felt were

Exhibit 12.5: ***Percentage of People Age 65 and Older in Ontario Exposed to Drugs That Should be Avoided, 1990/91, 1992/93 and 1994/95***

	% of Population Exposed		
Type of Medication	1990/91	1992/93	1994/95
Sedatives and Hypnotics *	8.52	7.12	5.60
NSAIDs **	4.43	3.92	3.27
Oral Hypoglycemics +	1.02	0.74	0.51
Analgesics ++	0.87	1.21	1.21

* *Includes chlordiazepoxide, diazepam, flurazepam, pentobarbital, secobarbital and meprobamate*

** *Includes indomethacin and phenylbutazone*

\+ *Includes chlorpropamide*

++ *Includes pentazocine and propoxyphene* not appropriate for the elderly. The proportion of the elderly taking these drugs decreased steadily, to 3.3% in 1994/95. In 1990/91, 1.0% of the elderly population received at least one prescription for chlorpropamide. The use of this drug, deemed inappropriate for the elderly, was halved by 1994/95. The use of the two analgesics also deemed inappropriate for the elderly, pentazocine and propoxyphene, increased between 1990/91 and 1992/93 and then remained stable between 1992/93 and 1994/95.

Comment

Analysis of the appropriateness of drug selection with the use of explicit criteria developed by a panel is only as valid as the criteria themselves. The criteria used in this analysis are based on an expert panel's view of the overall risks and benefits of these drugs compared with alternatives; they cannot capture the complex clinical intricacies that shape individual decisions. Without detailed clinical data, it is impossible to judge whether the physician made the appropriate choice in prescribing a specific drug to a particular patient.

However, there is evidence that supports the identification of these drugs as generally inappropriate choices for treatment of the elderly. The sedative/hypnotics identified as inappropriate have long-lasting effects that can result in prolonged drowsiness and lack of coordination; their use has been shown to increase the risk of hip fracture in the elderly.[7] The use of the NSAIDs phenylbutazone and indomethacin in the elderly is considered potentially inappropriate because phenylbutazone is associated with bone marrow suppression[8] and indomethacin causes more central-nervous-system side effects in this age group than do other NSAIDs.[9] Chlorpropamide has a longer half-life than other oral hypoglycemic agents, putting the elderly at greater risk of prolonged hypoglycemia.[10] Propoxyphene is no more efficacious than acetylsalicylic acid or acetaminophen, and can cause dependency and renal injury.[11] Pentazocine is an opiate analgesic with a mix of agonist (morphine-like) effects and antagonist (morphine-blocking) effects. This agent should be avoided because it may cause more delirium and agitation in the elderly than other narcotic analgesics.[12]

The results indicate that there are problems with appropriate drug selection for the elderly in Ontario. However, it is important to place the results in context. Problems concerning appropriate prescribing for the elderly are not unique to Ontario. A recent study in Quebec, which used similar criteria, identified substantial problems with prescribing for the elderly in that province.[13] Another study of drug selection for the elderly that used data from the National Medical Expenditure Survey (NMES) for more than 6,000 people aged 65 years and older in the United States and used the same criteria for inappropriateness as our study, showed that 7% of the elderly were exposed to inappropriate sedative/hypnotics, 3% to inappropriate NSAIDs, 2% to chlorpropamide and 5% to inappropriate analgesics.[14]

With the exception of analgesics, there has been a steady decrease in the use of the inappropriate drugs that we examined. This is a positive sign; it may reflect the growing concern over prescription drug use by the elderly and the effort to deal with that concern. However, we need to know more about current patterns of practice and ways to ensure that the elderly receive the best care possible.

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Chapter 13

Conclusions and Reflections

In the conclusion of the first edition of the ICES *Practice Atlas*, we noted that Ontario's health care system was in the throes of an affordability crisis, compounded by an ongoing lack of the information tools necessary for health systems restructuring. Two years later, public spending on health care in Ontario has been held steady at around $17.5 billion dollars. An end to 25 years of steady growth in public expenditures on health care is readily understandable, given the enormous debt burden and continued operating deficit of the provincial government. Nonetheless, with a growing and aging population, and with the pressures of new medical technologies, a freeze is equivalent to a funding reduction in real terms.

As predicted then, those working in the health care system are having to learn how to do more with less. Furthermore, in the last six months, with the formation of the Health Services Restructuring Commission and discussion of primary care reform, formal restructuring of Ontario's health system is under way.

Restructuring the health system is tantamount to retooling an engine on an airplane aloft with a full load of passengers. These enormous challenges have intensified the already-evident need for information that will help in managing and rebuilding the health system at all levels. We expect that the electronic edition of the Atlas will increase the applicability and local generalizability of the findings developed in this publication. However, as with the previous edition, the ICES *Practice Atlas* is likely to meet only some of the myriad information needs of the Ontario health system. To that end, the Institute is continuing to develop new information tools, as are many other agencies and research groups in the province. The Atlas series will also continue to be published on an 18 month to two year cycle.

In drawing the current edition of the Atlas to a close, it seems reasonable to pause and ask: What have the preceding pages told us about the Ontario health care system?

Findings and Implications

The Health of Ontarians

The first edition of the Atlas noted fairly limited interregional and urban-rural disparities in health status and self-reported service consumption. The interprovincial and international comparisons in this second edition are much more detailed. As well, drawing on the Community Health Profile, this edition provides information on a wide range of demographic, social and economic indicators. These are broken down across health planning regions. The analysis confirms that the overall health of Ontarians measures up well against national and international comparators. Differences in health status measures across Ontario regions are relatively small compared to interprovincial and international differences. Nonetheless, these inter-regional differences are important. Disparities in incomes, household composition, health-related practices and health status indicators are all evident. In some cases, the concentration of indicators suggests regional disadvantages. For example, Northern Ontario has the highest infant mortality rate, shortest life-expectancy at birth and at age 15, the highest proportion of persons with chronic health problems or fair or poor self-reported health status, more female smokers, and more men who are overweight and sedentary.

Many of these indicators highlight the importance of the broader determinants of health, and reflect socioeconomic and environmental factors outside the health care system. On the other hand, the data in Chapter 2 again illustrate that acute illnesses, injuries, and a variety of chronic conditions take an enormous toll on our population. Many of these conditions are amenable to interventions — be they preventive, palliative, or curative — that can indeed be delivered through the health care system. As noted in the conclusion of the last Atlas, the impact of health services on these conditions is best measured by condition-specific outcome measures. However, without ongoing collection and analysis of community health indicators, we will not be in a position to assess the overall health needs of our population.

More generally, we believe that the patterns of regional and institutional funding in the Ontario health system have not historically matched community health needs. We urge that restructuring of the health system be population-based and needs-oriented, with close and continued analysis of a wide variety of demographic, social, economic, and health status indicators to guide planning and funding.

The Hospital Sector

While official restructuring is only now formally under way, it is obvious that Ontario's hospitals have been undergoing their own transformation. Within the hospital sector, the total inpatient caseload is almost identical to what it was 10 years ago, despite definite growth and aging of the population. There has been remarkable growth in outpatient services of all kinds, a shift to shorter lengths of stay, and a 25% rise in day surgery utilization. In consequence, with appropriate age and sex adjustment, hospital separations have fallen by 22%. Coupled with a 25% decrease in the average length of stay, the age/sex-adjusted rate of patient days for the population is down by 40%. Several thousand beds have been taken out of service, and the bed days used per 1,000 population across Ontario have been driven to a level that we project at under 650 for 1996 — a benchmark that seemed unimaginable even five years ago.

The review of expenditure trends in Chapter 3 highlighted the shift of funds away from the hospital and physician sectors, and towards community and public health and long-term care. These trends mirror stated government policy, and will continue in 1996, 1997, and 1998, with planned reductions in hospital funding of 5%, 6%, and 7%. Without profound and rapid restructuring of the sector, this reallocation of funds could negatively affect the quality and accessibility of Ontario's hospital services.

Given these continuing dramatic reductions in hospital utilization, as well as the looming budgetary reductions, we repeat the question posed in the conclusion to the last Atlas: Why have no institutions closed? More generally, why have the mergers and rationalizations been so limited thus far? The Ontario hospital system cannot afford the continued diversion of resources away from patient care into overhead expenditures for aging physical plants, administrative costs, and overlapping programs that inefficiently duplicate services within the same locale. Rationalizing, coordinating, and integrating the hospital sector must be given high priority.

This concern with sectoral restructuring should not detract from the real achievements of individual institutions. As shown in Chapter 8, hospital efficiency continues to improve with across-the-board increases in the use of day surgery and continuing declines in lengths of stay for a wide range of procedures and conditions. Chapter 11 also highlights the major shifts that have taken place in hospital care for children specifically. While there remains a potential for further transition to day surgery for some procedures, other procedures are already at maximal levels of ambulatory delivery. A logical question then becomes: How much manoeuvering room remains?

In fact, while overall average and benchmark levels have decreased for both day surgery and length of stay, interhospital differences have remained fairly constant for most diagnoses and procedures. The leading institutions in various categories have changed in some cases as compared to the first edition of the Atlas, but the gaps between the leaders and the majority of peer institutions remain. In comparing practices across institutions, it is important to note that some observed differences may be attributed to differences in the use or availability of concurrent or follow-up services such as rehabilitation, home care or long-term care. But even to raise this caveat illustrates a fundamental deficiency in the Ontario health system. Care should ideally be provided across a continuum, with seamless transitions from the acute care sector to other sectors. Acute care hospital services must be integrated with ambulatory and home care, as well as a variety of longer-term institutional services. The current funding and management of acute care hospitals does little to promote these cross-linkages. In contrast, American organizations that have integrated these levels of care are able to achieve dramatically lower utilization of acute hospital beds. Many managed care chains report bed days per 1,000 that are well under 400, with further declines predicted.

One recurrent concern with such dramatic reductions in bed days is the impact on patient outcomes. Chapter 8 provides a first look at this issue in Ontario through analysis of readmission rates. It appears that there is only a weak relationship between levels of day surgery or short lengths of stay and readmission rates. Given the major declines in bed days across the system, these readmissions are obviously not cancelling out the efficiency gains achieved. However, the existence of even a weak relationship highlights the need for a better integrated system and some potential limits to restructuring under current models of funding and organizing health care in Ontario. Chapter 8 also shows some differences in readmission rates among hospitals. These rates have wide confidence intervals and should be interpreted with caution. As well, many of the effects of shortened length of stay and day surgery, such as the impact on patients and their families and on the utilization of community resources, cannot be assessed with administrative data alone.

Chapter 7 presents four case studies of hospital level utilization analyses. Laparoscopic cholecystectomy illustrates the phenomenon of rapid technology diffusion, with the proportion of gallbladder removals performed laparoscopically rising from 1% in 1990/91 to over 85% in 1994/95. There were wide variations in the rate of bile duct injury and intra-operative conversions from laparoscopic to open procedures. Appendectomy data suggest steady increases in preoperative diagnostic accuracy, with declining lengths of stay and extremely low case fatality rates. However, some inter-institutional variations in diagnostic accuracy persisted, and we noted marked variation in the use of incidental appendectomy, a procedure that is viewed as obsolete by many general surgeons. Breast cancer surgery trends are also revisited. At a provincial level the proportion of breast-conserving surgery (BCS) has risen from 57.1% in 1991/92 to 63.5% in 1994/95. Inter-hospital variations in BCS utilization have diminished, but are moderate in size and unexplained. Last, cesarean section remains the most common inpatient surgical procedure in Ontario. Overall cesarean rates have fallen to 17.3%, driven in part by a rise in vaginal births after previous cesarean sections, as recommended by the guidelines of the Society of Obstetrics and Gynecology. However, there is still marked interhospital variation in cesarean rates and indications, and the overall rates are still much higher than many European nations.

The data from Chapter 7 were shared with individual institutions well before their publication, and corrections were submitted to us. However, these case studies must all be interpreted cautiously in light of the known limits to administrative data in characterizing patients as to indications for procedures and outcomes thereof. The analyses of appendectomy and cholecystectomy are further limited by the statistically unstable results for some rare complications. These caveats, considered in the context of the variations across all four procedures, highlight the importance of developing province-wide quality improvement projects, with dedicated data collection and systematic implementation of "best practices" to enhance the efficiency and effectiveness of hospital services.

Ontario's Physician Sector

Physicians play a key role in allocating health care resources by virtue of their influence on hospital expenditures and prescription drug utilization. Actual payments to physicians are also noteworthy, totalling around $3.8 billion dollars from the Ontario Health Insurance Plan (OHIP). Obviously, the billing data reviewed in Chapters 3, 4 and 9 do not provide any information on the quality of services provided by physicians. These billings do not allow one to estimate professional income since some sources of income are excluded and we cannot take account of overhead expenses. Further, it should be emphasized that Chapters 3, 4 and 9 deal primarily with services billed, not payments to physicians and certainly not physician income.

The overall payments, however, have undergone dramatic changes in the last few years. Billings and payments grew steadily until the early 1990s, when the growth was arrested by the introduction of expenditure control measures. In the face of a growing and aging population, per capita price- and age-adjusted billings for physician services were down 2.5% in 1994/95 as compared to 1992/93. This decrease was seen in virtually all categories of physician services, and is unprecedented.

The billing data illustrate a steady aging of the physician population, with the supply of older physicians growing more rapidly than the supply of recent graduates in both relative and absolute terms. While the proportion of women physicians is rising, older and male physicians showed faster growth in individual average billings than other subgroups examined.

We also noted marked regional differences in physician services. While the numbers of GP/FPs and specialists were roughly equal across southern Ontario, the two northern regions had lower specialist-to-GP/FP ratios than other parts of the province. Total per capita expenditures on specialists in the north were only about half the levels seen in southern regions, despite higher average billings per northern specialist and the availability of threshold exemptions for some specialists in remote regions.

The distributions of billings over time and among clinical subgroups are also worthy of notice. Billings have tended to rise in almost all categories except hospital visits, with increases in psychotherapy

(40% higher costs) and miscellaneous non-surgical diagnostic/therapeutic procedures (>30%) leading the way. Specialties with the highest average billings included dermatology, otolaryngology, ophthalmology and urology. In 1994/95, 3% of full time GP/FPs billed more than $400,000, accounting for 6.3% of total OHIP billings for GP/FPs. The 13% of specialists billing over $400,000 accounted for 27% of specialty billings.

The current payment system combines a fixed cap of $3.8 billion on the overall amount of money available for physicians, with an open-ended fee-for-service billing system. In the most recent fiscal year (1995/96), there has been resumption of rapid growth in billings, and as a result, practitioners face major "clawbacks" by OHIP to ensure that the overall OHIP budget is balanced. The over-run is projected at $509 million by March 1997.

From the standpoint of Ontario's taxpayers and the Ministry of Health, OHIP costs have finally been stabilized, and more services are being provided for a fixed amount of money. However, the result is constant conflict with the medical profession whose members perceive that they are working harder, only to be paid less on an individual basis. The profession, for its part, can point to an aging and growing population, as well as the expansion of medical technology, in arguing strongly for more money in the OHIP pool. For example, the population has grown by 700,000 since 1992, office expenses and malpractice premiums continue to rise, and, as documented in this Atlas, the steadily growing numbers of older Ontarians are more likely to need and receive medical services. The Ministry, conversely, can pose pointed questions. Do the anticipated marginal improvements in the health of Ontarians warrant incremental expenditures on physician services, or might those improvements be achieved by reallocating the existing funds, e.g. away from some of the diagnostic services that have captured a growing fraction of the OHIP pool? Why do a minority of specialists and general practitioners account for such a high fraction of the billings, and why is the fraction attributable to the high-billing group growing? Does the growth in claims for "counselling" reflect appropriate professional attention to the pyscho-social needs of Ontarians, or use of the payment schedule to maximize dollars billed for patient encounters?

We do not know what the level of the OHIP pool should be, but four points can be made forcibly. First, the current arrangement combines two irreconcilable principles: a volume incentive for individual billings and a fixed pot of funds. It is a prescription for conflict and frustration. Second, this arrangement is likely to magnify any inequities or perverse incentives in the fee-for-service system. There is no reward for the majority of practitioners who have behaved responsibly and attempted to limit utilization in response to a fixed OHIP pool. Fundamental specialties such as general surgery appear to be undercompensated relative to some surgical subspecialties, while procedurally-oriented specialties continue to be paid much more than those with a non-procedural basis. Third, many of our clinical colleagues continue to contact ICES with ideas for efficiency enhancement. If mechanisms could be developed to share with physicians some of the non-OHIP savings that they generate in other expenditure sectors, then presumably the current gridlock would ease. Fourth, and as a corollary of the third point, there must be better alignment of incentives so that physicians are rewarded, not just for the volume of procedures performed or services provided, but also for the quality of their work and for the prudent use of health care resources in general. It is particularly important that primary care reform proceed with blended payment options, so that general practitioners who wish to step off the current fee-for service treadmill can do so.

Regional Utilization Profiles and Market Share Analyses

As in the first edition of the Atlas, Chapter 5 analysed trends and variations in a number of surgical procedures, broken down by site of patient residence. The temporal trends in patterns of selected surgical services by region are encouraging. They reflect the desired changes, given the evolution of evidence about indications for many of these procedures. For example, we observed declines in hysterectomy and transurethral prostatectomy rates, reflecting the availability of alternative management strategies, changes in surgical practice styles, and shifting consumer expectations. Conversely, rates of hip and knee replacements have increased, reflecting recognition of the role that these procedures play in improving functional status and quality of life. The overall rates for most procedures, while generally lower than those observed in the United States, are in the middle to high range as compared to most industrialized countries. These figures do not support the concept that severe implicit rationing is already occurring, or that many patients are now denied important and beneficial services.

While the absolute extent of inter-regional variability has declined for many surgical procedures, moderate to large variations by site of residence were found for procedures such as coronary artery bypass grafting, carotid endarterectomy, cataract extraction, radical prostatectomy, and orchidectomy for prostate cancer. We also found that the relative rankings of service rates for DHCs were fairly consistent when comparing patterns for 1989/90-1991/92 to those for 1992/93-1994/95. It appears that while overall rates may move upwards or downwards in response to evidence or availability of resources, high- and low-rate regions tend to hold their ranks.

As we have repeatedly cautioned, surgical variations by site of patient residence must be regarded as tantamount to screening tests. The relationship between rates of service and quality of care is not consistent, and many factors other than hospital resources or physician decision-making may impact on the utilization profiles that emerge for a given region. Local follow-up is crucial, and must begin with a review of data to determine whether there are obvious mitigating factors not captured with administrative databases. It is appropriate to quote here from the conclusion to the first edition of the Atlas: "Eventually, practice variations will be addressed by disease-specific registries, guideline development exercises, assessment of practice patterns in light of explicit criteria, waiting-list systems, and the development of patient decision aids." However, Ontario does not have a body to catalyse, support, and coordinate the type of local self-examination that is required as effective follow-up to rate variation analyses. We believe such a body is needed.

Also in Chapter 5, an analysis of "ambulatory care sensitive conditions" shows variability for asthma and congestive heart failure admissions to be less than for most surgical procedures. However, there is a strong correlation in regional patterns between the two conditions examined, with higher-rate regions tending to be predominantly rural. These hospitalizations are thought to be amenable to prevention through the provision of high quality primary and ambulatory specialist care. The question therefore becomes: Are the regions with high hospitalization rates underserviced with the requisite ambulatory care services? Again, this is fertile ground for further research and local self-examination.

Most of the specific variations analyses in the Atlas focus on site of patient residence (Chapters 5 and 11), or on the location of care (Chapters 7, 8 and 10). Chapter 6 combines these two factors to review patient origin and "market share" captured by multiple institutions within the same region. Such analyses are well known in the retail field, where an understanding of market penetration and customer loyalties is a prerequisite to commercial survival. Chapter 6 introduces readers to several key concepts from commercial geography that may be useful in hospital and regional planning. While such analyses have been conducted in the past for specific hospitals or regions, the case studies in this chapter provide a wider perspective on patient flow and hospital market share. Coupled with the data in the electronic edition of the Atlas, these methods offer a powerful tool for local planning. We hope these data will help inform the hospital restructuring exercises now under way across Ontario.

Prescription Drugs for Ontario's Seniors

Along with home care, the Ontario Drug Benefit [ODB] program has remained one of two publicly funded sectors without a fixed annual cap on expenditures. As illustrated by Chapter 3, total expenditures on ODB tripled between 1984/85 and 1994/95. In the more recent period (fiscal years 1990/91 to 1994/95), drug ingredient costs for seniors showed a per capita increase from $420 to $524, with an associated increase in overall costs from $489.29 million to $686.60 million. Most of this per capita growth, however, occurred between 1990/91 and 1992/93; growth was only 3% between 1992/93 and 1994/95. Cardiovascular drugs were the fastest growing group, and now account for 40% of all drug expenditures for the elderly under the ODB program.

Chapter 12 continues the pattern set in the first edition, offering a case study of patterns of use of some specific drugs in the elderly. Sir William Osler (1849-1919) wrote facetiously that he preferred to use drugs when they were novel and still appeared to work. Indeed, physicians through the decades have often been attracted to new compounds that promise more benefits and fewer risks. In the case of the new SSRI antidepressants for the elderly, we demonstrated a sharp increase in ODB costs that may be warranted given the improved side-effect profile and implications for cost-savings elsewhere in the health system. But for flouroquinolone antibiotics, the growth in per capita expenditures from $6.08 to $12.22 between 1990/91 and 1994/95 is hard to explain. As well, although the overall trends are positive, the analysis shows some continued prescription of drugs defined by experts as inappropriate for use in the elderly. These case studies underscore the importance of both setting and implementing guidelines to promote best prescribing practices.

Because ODB covers only seniors and recipients of social assistance, its data provide a limited window on prescription drugs in Ontario. The majority of expenditures are made through private insurance plans or out-of-pocket by consumers. Using careful confidentiality safeguards, ICES has recently begun working with major employers to analyse drug claims rendered to private insurers by employees and their families. These analyses should increase our understanding of drugs prescribed to Ontarians in the workforce and their dependents. Another new initiative catalysed by ICES will bring multiple stakeholders together in a regular forum with a view to enhancing the quality and efficiency of prescription drug utilization. Given the nature of funding for prescription drugs, a co-operative approach involving the public and private sectors will be important to move this sector forward.

Pediatric and Mental Health Services

This edition of the Atlas features analyses pertaining to two groups with special needs — citizens with mental health problems, and Ontario's children and youth. In Chapter 10, our colleagues from the Clarke Institute of Psychiatry have provided a novel and helpful data-intensive overview of the organization and delivery of mental health services in Ontario. Survey evidence suggests that the burden of major and minor mental illness is large, with 20-30% of the public reporting mental health problems serious enough to qualify as formal disorders and impairing day-to-day functioning. Of this group, between 50 and 75% did not seek or receive medical attention. The burden of mental illness is fairly evenly distributed across the health regions, but the availability and utilization of mental health services is not. For example, there is almost fourfold variation in OHIP expenditures for mental health across the regions, with the lowest levels in the North. There is also considerable regional variability in the availability of psychiatric beds which leads to moderate differences in both hospitalization rates and bed days used on a population basis. The data do not allow us to determine whether these service patterns are to some extent countervailing, e.g. whether higher expenditures on inpatient services by salaried staff in specialty hospitals in one region are mitigated by higher OHIP expenditures for ambulatory mental health care in another. Regardless, the patterns illustrate the highly uneven organization of mental health services, and suggest an acute need for organizational reform on a provincial scale.

The analysis of pediatric health services in Chapter 11 again represents an ICES partnership with researchers at a leading specialty institution — the Hospital for Sick Children. We note that children under the age of one have high levels of OHIP expenditures ($584 per capita in 1994/95). A proportion of these expenditures are attributable to visits for well-baby care and immunization; could some of these services be provided more cost-efficiently by other health professionals? Among females aged 15 to 19 years, the leading cause of hospital separations is pregnancy and childbirth — an obvious source of concern. The regional variations demonstrated for adults in Chapter 5 are mirrored in Chapter 11. Specifically, when analysed by site of the child's residence, regional rates of circumcision, myringotomy with insertion of ventilation tubes, and tonsillectomy all show definite variations. These variations reflect, in part, a lack of consensus for many of the indications for these procedures. But if the evidence is limited and indications uncertain, how much variation is tolerable? Considering that it is children who are the subjects of these surgical procedures, a conservative approach may be most prudent. On the medical side of the ledger, while hospitalization rates for asthma are declining, this condition still accounted for 12,200 admissions in 1994/95. Aggressive ambulatory therapy of asthma can prevent hospitalizations in patients of all ages, and there may well be room for more efficient and effective management of this common disease. Last, pediatric issues also figure in Chapter 8, where readmission of newborns was examined. This analysis suggests that most of the readmissions are related to jaundice, and that there are strong seasonal effects in the expected direction, i.e. fewer readmissions in months when ambient sunshine mitigates the need for in-hospital phototherapy.

Overall Regional Utilization

From the perspective of overall regional utilization, hospital separation rates remain higher in the north than the south of the province, and among the southern regions remain highest in the South West. Conversely, estimated per capita billings for physician services to OHIP are the lowest in those regions where hospital expenditures are highest. Drug expenditures for the elderly are highest in the South West and lowest in the North West. When expenditures in all three categories are combined and compared for the elderly, the relative differences in expenditures across the regions are greatly diminished. This finding highlights the importance of developing population-based approaches to funding that roll together the different health sectors. The current system is dotted with "expenditure silos"; for example, investments in effective drugs that keep elderly patients out of hospital are registered as costs to the ODB program, without capturing the savings realized in the hospital sector. As noted in the comments in the physician sector, alignment of incentives — with appropriate accounting mechanisms — is now an essential part of restructuring health care systems.

Reflections

On Health Information for Ontario

There has been a steady increase in the availability of health-related information for Ontario since the publication of the first ICES *Practice Atlas.* Many other research groups and agencies are actively contributing to our understanding of the health status of Ontarians and the structures, processes, and outcomes of the Ontario health care system. At the regional level, Health Intelligence Units have been funded by the Ministry of Health to assist local agencies with the analysis and interpretation of health data. At the provincial level, the Joint Policy and Planning Committee has released regular reports on hospital performance; the reliability and accuracy of these reports is strongly validated by the more detailed analyses in this Atlas. The Ministry of Health has been exploring data warehousing mechanisms, and improved information systems for the Ministry may be developed through private-public partnerships. All these developments are very welcome.

On the other hand, we must highlight several issues about health information for Ontario.

First, because of privacy and confidentiality concerns in relation to health data, Ontario has put various safeguards in place regarding access to public administrative databases and unique identifiers within such databases. We appreciate that in most instances, beneficiaries and providers alike have no idea that administrative data are being accessed. We believe that health services research should be conducted for the purposes of the greater good, with respect for the privacy of the individual and the intention of doing no harm. On the technical level of data processing, steps must be taken to ensure the confidentiality, security, and integrity of the data. Of equal importance is the requirement that researchers use the data with respect for persons and the acknowledgement of the responsibility with which they are entrusted. All these safeguards are in place at ICES for data handling, but in our experience, data access remains unduly difficult. Unfortunately, protection against potential violations of privacy rights can be carried to the point that communities will be handicapped by gaps in the information necessary to manage and improve public health care. Eventually it is the individual patient who will suffer. We urge the development of new regulations that will combine appropriate safeguards with improved access to health information in the interests of all Ontarians.

As the system is restructured, it will be crucial to ensure that patients who are socioeconomically disadvantaged do not become hidden victims. The first edition of the Atlas was able to relate self-reported health care utilization to socioeconomic factors at the individual level through analysis of the 1990 Ontario Health Survey (OHS). Such a survey has not been repeated with collection of local level data. Chapter 2 includes some data from the Ontario sample of the 1994 National Population Health Survey, but the total sample size is about one-tenth that of the OHS. Fortunately, National Population Health Survey respondents are completing follow-up questionnaires every two years, and most respondents have consented to linking their survey responses to health care utilization data. This linked data source, while smaller than we would like, should provide some useful insights.

A further concern is standardizing key indicators for health status assessment across regions so that interregional comparisons will be as meaningful as possible. This issue also arises at the national level, where there are several initiatives aimed at developing health indicators or population health information systems.

With the rapid shift to community-based and ambulatory services, hospital discharge abstracts provide an increasingly incomplete picture of health services utilization. Data on ambulatory and community-based services are essential if ICES and other agencies are to map the future patterns of health care in Ontario. At present, we are limited to data on ambulatory surgical procedures, to home care data files that are still being explored, and to OHIP claims files that are acquired in aggregated format from the National Physician Database maintained by Health Canada. Release of OHIP data at the individual patient level is urgently required, as these data can be combined with unique identifiers which exclude names to permit linkage across data files. Use of unique identifiers which exclude names mitigates any threat to the privacy rights of individuals. At the same time, the linkage procedures would allow ICES to move much further in profiling the efficiency and effectiveness of Ontario's health care system as it shifts to growing reliance on community and ambulatory services.

Even comprehensive data linkage procedures, however, are not a panacea. Because the diagnostic information on OHIP records is often inaccurate or incomplete, ambulatory visits and consultations can be characterized only by type of service billed (as is done here). The growth in non-fee-for-service payment plans is welcome from the standpoint of systems restructuring, but there are many unanswered questions as to what data will be captured to document activity within these Alternate Funding Plans, and how these data will be integrated with existing administrative data systems. As well, some types of community services are simply not documented into electronic data at the individual level.

All these concerns apply to the types of data available for systems research, management, and planning. We have not even mentioned data needs for more integrated patient care, such as electronic micro-records with summary data on key aspects of the patient's history and most recent diagnostic investigations. In short, Ontario's health information systems must themselves be restructured if they are to meet the requirements of a rapidly-evolving health care system.

Our final points concern the uses of the Atlas itself. The information in the Atlas must be used with awareness of both its inherent limitations and the influence of context on health services and health status. Nonetheless, in many cases the implications are more or less self-evident. For example, if a given hospital has a cesarean section rate strikingly higher than its peers, what should be done? The starting point is to confirm the basic validity of the data in the Atlas, and ensure that the observed pattern of care continues to persist in 1996. Thereafter, the administrative and clinical leadership have an obvious obligation to learn from the experiences of sister institutions, and to draw on relevant expertise in the clinical and research communities, with a view to promoting changes in practice. If a region has a particularly low rate of hip and knee replacement, what should be done? Here, as lamented above, we face the problem of diffuse accountability. Leadership will have to be exercised by the District Health Council, or by local medical societies, or by groups of musculoskeletal specialists, to ensure that the requisite follow-up occurs. That follow-up would involve several steps. First, by cross-referencing to the section of the Atlas on patient origins and market share for hip replacement patients, one can determine whether local capacity is being subsumed for out-of-region residents, or whether large numbers of local residents are leaving the region for operations elsewhere. Second, the District Health Council can run analyses using the most up-to-date Canadian Institute for Health Information (CIHI) files to determine the distribution of arthroplasty capacity within the region. Third, through local queries, it will be possible to explore other factors, such as caps on prosthesis budgets in local hospitals, lack of operating room time for local orthopedic surgeons, or insufficient numbers of orthopedists to serve the region.

Other sections of the Atlas may lead a hospital or District Health Council to undertake local audits using explicit process-of-care criteria. Here the goal is to review utilization on a retrospective or concurrent basis to ensure that procedures or resources are being used appropriately. Published criteria are available to assess the appropriateness of performing a wide variety of procedures, or to audit whether acute care beds are occupied by patients who no longer need to be hospitalized.

ICES welcomes queries from stakeholders about the implications of data in the Atlas, and, judging from our experience with the first edition, we can often advise on local follow-up or suggest further analyses that may resolve ambiguities.

On the Road Travelled and the Road Ahead

The Ontario health care system has been internationally admired, and it remains admirable in many respects. But as suggested by the findings in this Atlas and the implications we have drawn from them, fundamental changes are necessary to maintain a high-quality and affordable universal health care system for Ontarians.

For some working in health care, a call for restructuring will be unwelcome. Physicians, nurses, other health professionals, hospital workers, administrators, and policy-makers have already weathered several years in which, to paraphrase the Heraclitean adage, change has been the only constant. Certainly this edition of the Atlas documents the remarkable transformation that has taken place in the hospital sector of Ontario — and credit must again be given to those in the system who have made these efficiency gains possible. We have also documented some major shifts in clinical services that illustrate the rapid and widespread uptake of new evidence by the medical profession. Our overriding goal in compiling this second edition has been to provide information that will help decision-makers in health care adapt to the combined pressures of diminishing real resources, demographic change, and technological advance. Our sober conclusion, however, is that the current organization of the system is nearing the limits of its adaptability.

Looking backwards, one finds that Saskatchewan set the template for modern Medicare in 1962 by instituting universal coverage of physicians' services on a fee-for-service basis, coupling private practice in a small business mode to public payment. Three decades later, the gridlock around OHIP payments speaks volumes about the need for fundamental change.

It was in 1969 that Ontario jettisoned a longstanding system of per diem payments to general hospitals, adopting instead the basic framework of annual global budgets that endures to this day. There have been modifications at the margins: add-on funding for specialized services with some targetted reimbursement by the Ministry, and more recently, adjustments to funding that reflect caseload complexity, volumes, and relative efficiency. However, the basic budgets continue to reflect historical happenstance and, as noted above, are inadequately linked to the needs and sizes of populations served. We also noted earlier that incentives to integrate institutions or levels of care are inadequately developed. Again, fundamental changes are needed.

To foster service integration and reduce duplication, other provinces have embraced regionalization, and consolidated multiple hospital budgets under one management board. Saskatchewan has again been the leader in this respect. Ontario has rejected this option for the time being, re-emphasizing the role of District Health Councils. Ontario's District Health Councils have unquestionably played an important role in the planning of services at the local and regional level. At present, however, their role is restricted to planning and advising with final decisions made independently for each sector at the provincial level. Thus, in 1995/96, the Association of District Health Councils of Ontario publicly endorsed the concept of locally-integrated delivery systems, provided through and managed by, a network of providers of various levels of care.

In the continued absence of new structures that better align incentives and integrate health services, we believe the case is stronger than ever for an Ontario Health Services Council as proposed in the concluding chapter of the first Atlas. We suggested in 1994 that a multi-stakeholder agency was needed to help translate the findings of health service researchers into practice and policy, and to facilitate the sharing of information that could sustain and improve the system. We were concerned that Ontario lacked "any overarching forum to generate firmer accountability for quality, access and efficiency with a systemic orientation." The potential activities of the Council, as outlined in 1994, are recapitulated in Exhibit 13.1.

Two years later, intersectoral collaboration remains the exception rather than the rule. Health programs, including community and public health, home care, acute and chronic/rehabilitation hospitals, physician services, and drug benefits, are all largely managed independently of each other. New provider programs, such as midwifery and nurse practitioners' services, are searching for a systemic role; while some public health services are still managed through different agencies (Workers'

Compensation Board) or government ministries (some children's mental health services are under the aegis of the Ministry of Community and Social Services). Meanwhile, judging from the flow of queries to ICES, managers and clinical leaders on the front-lines of care delivery would welcome a dedicated agency to help them understand local practice variations, run an effective program of utilization audits, set benchmarks for underservicing and unacceptable waiting times, implement practice guidelines on a variety of topics, develop clinical registries for quality improvement and research, and prioritize technologies and services in the face of budgetary constraints.

We found widespread support among stakeholders for an Ontario Health Services Council in 1994. Assuming this support continues in 1996, we urge experimental establishment of a council with membership to include representative organizations of health professionals, the hospital sector, academic health science centres, District Health Councils, the regulatory bodies of major professions, and patient advocacy groups. Issue-specific subgroups could be struck to bring other stakeholders to the table. Council activities should obviously be monitored for their impact on the effectiveness and efficiency of the health system, and resources for its secretariat provided on a strict value-for-money basis.

What lies ahead for the Ontario health care system? At the outset, we must caution that the affordability crisis for health care has just begun. The federal government has yet to deliver a balanced budget; transfer payments to Ontario are shrinking steadily, and it will be exceedingly difficult for the province to sustain public health expenditures at even their current level for the next several years. These affordability concerns, of course, are shared by all provinces. Accordingly, about 30 citizens from across Canada volunteered a day-and-a-half of their time in January 1996, gathering at Langdon Hall in Cambridge to discuss national directions for health care reform and systems redesign. The group included CEOs from hospitals and the pharmaceutical and medical device sectors, academics and government officials, management consultants with health care expertise, and representatives of provider organizations. In our view, many of the principles for reform sketched by the Langdon Hall group are applicable to Ontario, and we paraphrase the seven most salient of them below.

◆ *Clarify the roles of government.*

These include: raising and channeling public revenues for provincial health care systems; consulting with citizens and providers in setting goals and standards for these systems; setting standards for systems performance, and catalysing evaluation to ensure that those standards are met; and providing the ultimate accountability for uses of public funds. Once goals and standards for the public system are set, the case for direct government involvement in delivering or managing services is reduced, and productive partnerships with the private sector can be developed.

◆ *Fund on the basis of populations served.*

Currently several provinces use capitation formulae wherein block funding is provided to a regional health authority based on the characteristics of the population it serves. A logical alternative for Ontario is to tie funding to individual patients who then enroll in integrated delivery organizations. In either case, funding based on utilization and historical precedent must give way to funding based on projected population needs.

◆ *Integrate services and budgets.*

Health care in Ontario should eventually be restructured to create integrated delivery subsystems that cut across levels of care, including primary care, acute and long-term institutional care, and home care. A single budgetary

Exhibit 13.1: ***Activities of an Ontario Health Services Council***

- **Implement selected quality improvement activities among the governing bodies of the various health professions, professional associations, and relevant institutions within the province**
- **Fund and evaluate specific quality improvement and/or utilization management initiatives**
- **Monitor accessibility to health services in the province and the diffusion of new technologies and procedures**
- **Disseminate research and program information to health professions and health care institutions**
- **Coordinate and broker health service research activities and identify unmet information needs**
- **Promote the consistent development of health information so that it is usable and comparable between health care institutions within the province and ideally outside of the province as well**
- **Catalyse multidisciplinary educational programs for facility administrators, health professionals, planners and policy makers**
- **Recommend appropriate structures and incentives for the system that will encourage the efficient, effective and equitable use of health resources**

envelope should encompass these services, including public drug benefits. Health professionals should be drawn into these integrated systems, compensated equitably, and rewarded for both quality and efficiency of care. There must be a degree of risk-sharing: i.e. the integrated delivery organization is expected to provide all the care its population needs drawing primarily on its global budget or capitation revenue, and arranging to purchase out-of-region tertiary or quaternary services as required.

◆ *Strengthen and reform primary care.*

Most policy analysts view primary care as a cornerstone of any successful health system. Desirable reforms would presumably give primary care providers a stronger care-coordinating role, and link the primary care practitioner to a range of community and social support services, including home care. Regardless of other health reform initiatives, it is feasible and desirable to fund urban primary care organizations by capitation with additional fees for attainment of specific delivery objectives.

◆ *Review systems performance on a continuous basis.*

Measurement and analysis of the processes and outcomes of key services should be performed on a systematic basis, with cross-referencing of clinical, population, and cost data. Health care reform also requires private-public partnerships to develop information systems that will provide access to the medical record by a health care professional no matter where the client receives care. These individual records must be dovetailed with a comprehensive population-based data system. Only then can management and planning — like funding — become population-oriented, with systems evaluation keyed to population needs.

◆ *Strengthen accountability.*

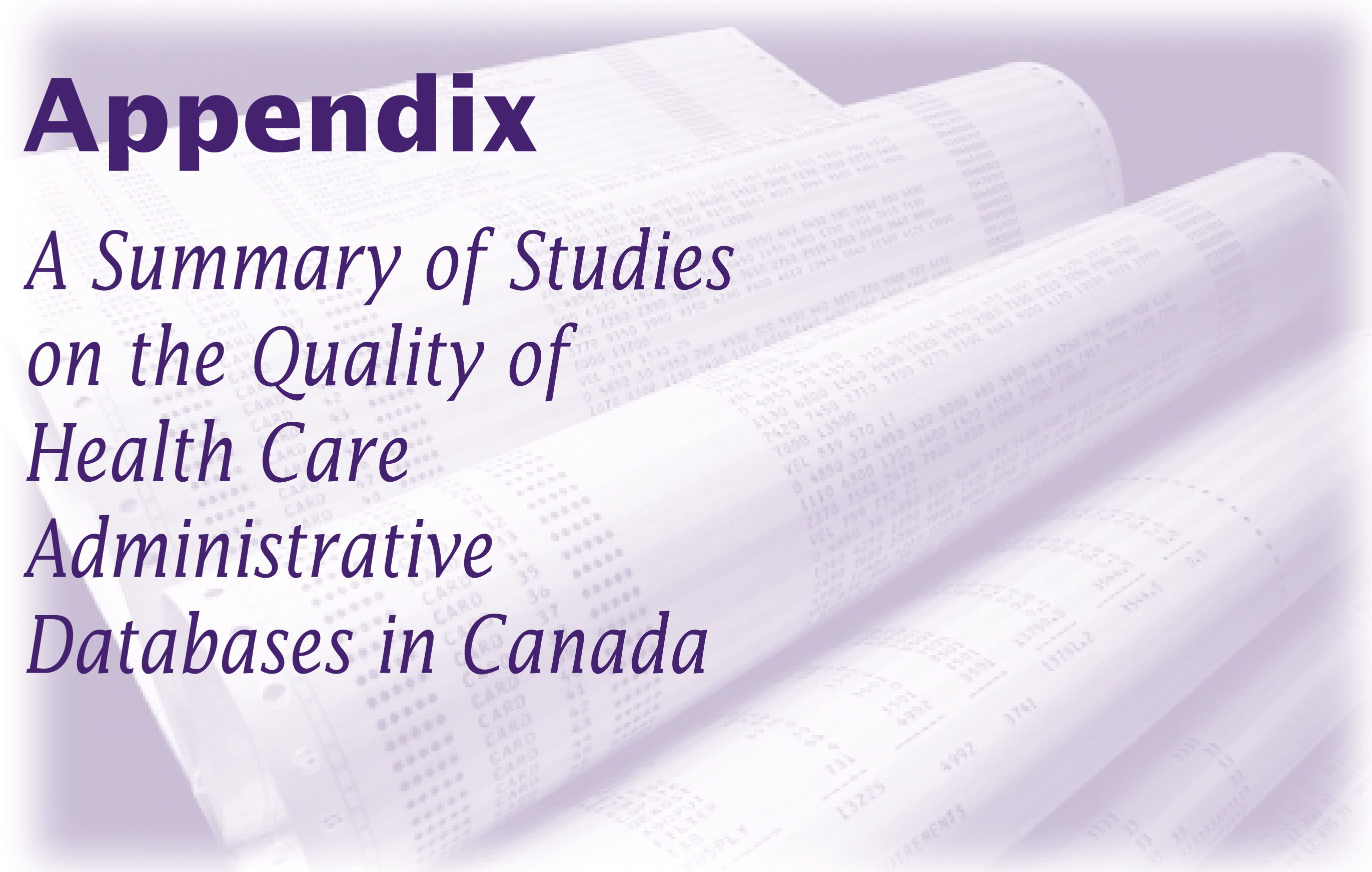
Explicit contractual relationships and, where feasible, competition should be used more widely to strengthen accountabilities within the health care system. For example, patient choice might be enhanced by structured competition among integrated care organizations in large urban areas if funding follows the patient. In rural areas where competition among delivery organizations is not feasible, accountability can still be enhanced by setting performance parameters, and determining whether they are being achieved.

◆ *Improve public information about health and health care.*

Providers continue to lament the public's unrealistic expectations of modern health care. Information tools are needed to promote shared decision-making in clinical situations, and to foster informed debate about the funding and organization of Ontario's health care system. We believe that the public deserves information on the costs and quality of health care at a local, provincial, and national level.

To these seven concepts, we would add an eighth: Give credit where it is due. The Ontario health care system is undergoing a major transformation. The credit for that transformation ultimately belongs to the hundreds of thousands of citizens who work in the health care system. The pace of change has palpably taxed their goodwill and energy, and morale among those working in the system is flagging. Some providers are advocating more funding from public or private sources; others are quietly acknowledging that the system itself has become a constraint, and that new modes must be found to fund, organize, and deliver care.

We concluded the first edition of the *Practice Atlas* by urging movement into what has been termed the "third revolution" in health care — the era of assessment and accountability. To those two themes, we can now add others such as integration of levels of care, alignment of incentives, management by objectives, budgetary devolution and integration, and partnerships with the private sector to meet public goals. The time for fundamental restructuring has come.



Appendix

A Summary of Studies on the Quality of Health Care Administrative Databases in Canada

Introduction

Most of the information in the Atlas is based on health care data collected for administrative reasons such as determining the eligibility of beneficiaries of public insurance programs, documenting discharges from hospital, and paying providers' claims for medical services or prescriptions filled under provincial drug plans. Researchers use the data to study the utilization of health care even though the databases were not created for these purposes. There have been extensive studies and reviews on the quality of health care data in the United States,[1] but there has not been a systematic review of studies on the quality of health care data published in Canada. In preparing for the second Atlas, ICES conducted a review of published and unpublished studies in Canada to assess the completeness of data and the levels of agreement across databases. This Appendix summarizes our findings. A more comprehensive technical paper is available from ICES.

Researchers basically work with three levels of information from health care databases. The first level of data comprises demographic characteristics of patients, particularly age, sex, and place of residence. The second level of data includes information on diagnoses. The most responsible diagnosis defines the reason for patients receiving health services. The secondary diagnoses provide information on concomitant health problems (comorbidity) and complications arising from the disease and the management of it. Diagnosis is usually coded according to the 9th revision of the International Classification of Disease (ICD-9). The third major level of data includes information on the diagnostic, medical and surgical procedures provided by physicians. There are two classification systems for coding procedures in Canada — the Classification of Diagnostic, Therapeutic and Surgical Procedures (CCP) developed by Statistics Canada, and the Clinical Modification of the ICD-9 (ICD-9-CM) developed for use in the United States. As hospitals in Canada may use either classification system, the Canadian Institute for Health Information (CIHI) has tables for translating ICD-9-CM codes into CCP codes for use on hospital discharge summaries. The 10th revision of the ICD will be introduced by 1998, and both procedure coding systems will be revised and updated as well.

In undertaking the review, we employed three criteria for assessing the quality of the data. The first criterion was completeness of the data. The completeness of the data was judged by the extent to which the database covered the population and the availability of information on demographic characteristics, diagnoses and procedures. The second criterion was agreement of information when data from one database was compared to the same information obtained from reabstraction of original records by a health records technologist, another database, or clinical records. The third criterion pertained to agreement of diagnosis with expert criteria. For explicit reviews, researchers have extracted clinical information from medical records, applied explicit criteria developed by groups of experts to derive the diagnosis, and compared the "standard" diagnosis with the coded diagnosis on the record. A second approach, involving implicit review, has been to ask "expert" clinicians to review the information in the records and assess whether or not they considered the diagnosis on the abstract to be the "correct" diagnosis.

Completeness of Data

Hospital Discharge Data

Most Canadian provinces and territories submit hospital discharge data to CIHI that describes the services patients receive from a hospital on an inpatient or day surgery basis. In Manitoba, the data are submitted to the government, but hospitals may voluntarily report to CIHI as well. CIHI collects discharge data for about 34% of hospital patients in Manitoba. The government of Quebec maintains its own databases with none of the hospitals submitting data to CIHI. All provinces and territories submit hospital discharge data to Statistics Canada, but the timeliness of the data is reduced by delays in submissions before the database is complete for a given year.

Residents who go out of province for hospital services are not included in the provincial database. Coyte and associates[2] estimate that services received outside of Ontario comprise less than 0.5% of all procedures performed for Ontario residents.

Researchers at ICES routinely check the databases for missing information when conducting analyses. Typically, they have found that less than 1% of the records have missing information for age, sex, and residence codes (Exhibit A.1). Similar results have been reported for other provinces[3].

Physician Billings Data

It is estimated that 95% of all physicians in Canada are paid on a fee-for-service basis. Claims are submitted to provincial health insurance plans for payment. Services provided by physicians on salary or paid for by patients, Workers' Compensation, or other third party payers are not included in the medical claims database. In Ontario, physicians whose services are covered by Alternate Funding Plans do not file claims, so their services are excluded from the OHIP claims database as well.

Researchers at ICES and in other provinces have found that less than 1% of the demographic information on physicians' claims is missing.[4-7] Most provinces do not require a diagnosis on claims for payment, so it is essentially an optional field on the claim. Each province and territory has its own Schedule of Benefits that lists a fee and fee code for each service provided. The service codes are specific to the specialty of the physician and do not necessarily relate to classification systems used in other health care databases. Alberta requires an ICD-9 diagnosis code and a CCP procedure code for payment, and Nova Scotia is moving in this direction as well.

For each physician who submits claims, all provinces and territories create statistical summaries on the age and gender of their patients and the services received by patients. The statistical summaries are sent to CIHI for inclusion in the National Physician Database (NPDB). The codes in the provincial schedule of benefits are translated into slightly over 100 service codes. The NPDB can be used to provide

Exhibit A.1: ***Summary of Canadian Studies Reviewing Completeness of Demographic Data***

Author	Database	Years Examined	Population Covered by Database	Completeness of Demographic* Data (%)
Hospital Discharge Data				
Chen [19]	Ontario inpatients	1989 - 1992	100% of residents	97
Jha [30]	Ontario inpatients	1992 - 1993	100% of residents	99
Mustard [5]	Manitoba Health Services	1989 - 1991	100% of residents	99
Ugnat [31]	Ontario inpatients	1991 - 1992	100% of residents	99
Physician Billings				
Platt [6]	Alberta Health Care Insurance	1984 - 1989	100% of residents	99
Svenson [32]	Alberta Health Care Insurance	1984 - 1989	100% of residents	99
Provincial Drug Plans				
Anderson [8]	British Columbia Pharmacare	1981 - 1982 1986 - 1987 1988 - 1989	100% of 65+ years	96 - 97
Davidson [9]	New Brunswick Drug Plan	1990 - 1991	100% of 65+ years	100
Guess [10]	Saskatchewan Drug Plan	1983	95% of residents	100
Rawson [33]	Saskatchewan Drug Plan	1976 - 1987	95% of residents	100
Tamblyn [7]	Régie de l'Assurance Maladie du Quèbec	1990	100% of 65+ years	99
Thiesson [12]	Saskatchewan Drug Plan	1984	95% of residents	100

* Demographic information includes the patient's age, sex and place of residence

basic profiles of the age/sex-specific rates of service utilization by region of the province.

Provincial Drug Plans

All provinces and territories have plans that pay for prescription drugs for seniors, but they vary in the coverage they provide other residents. Saskatchewan and British Columbia are the only two provinces with plans that cover the entire population. In all provinces, the plans are for prescribed drugs dispensed from community pharmacies and do not include drugs provided through hospitals or other facilities that pay for drugs out of their global budgets. The provinces also vary in the drugs that they choose to insure and the types of data included in the drug plan databases. Researchers have found that less than 1% of the basic information on patients is missing in the drug plan databases.[8-12] There is no national drug claims file.

The Ontario Drug Benefit (ODB) program contains information about the beneficiaries, the dispensers, and the prescribers of medications. Each claim contains information about the drugs prescribed, the dose, the cost of the product, and the date the prescription was filled. ICES researchers have found that there is very little missing information.

Agreement of Hospital Discharge Data with Reabstraction Studies or Data from Other Records

Reabstraction Studies

There were six reabstraction studies included in the review. The reabstraction studies by the Ontario Hospital Association, the Ministry of Health in Newfoundland and Doctors Hospital in Toronto, Ontario were reviews of records selected at random from the participating facilities. The study by the Ontario Hospital Association[13] included 3,000 records from 43 hospitals. The reabstraction study conducted by the Ministry of Health in Newfoundland[14] included 850 records from six acute care hospitals. Doctors Hospital[15] conducted its own reabstraction study of 300 records. In all three studies, the agreement on demographic and administrative data was 95% or higher. The rate of agreement on most responsible diagnosis was 81% in the OHA study, 74% in the Newfoundland study, and 96% in the Doctors Hospital review. The rates of agreement for secondary diagnoses were lower — 37% in the OHA study, 59% in the Newfoundland study, and 95% in the Doctors Hospital study. The rates of agreement for procedures were high, ranging from 88% in the OHA study to 96% at Doctors Hospital.

We reviewed four studies where researchers reabstracted charts as part of clinical studies. These are summarized in Exhibit A.2. Delfino and associates,[16] and Rawson and Malcolm[11] found that rates of agreement on demographic data ranged from 88% to 100%. The rates of agreement

Exhibit A.2: ***Summary of Canadian Reabstraction* Studies of Hospital Records***

Author	Province	Records Abstracted	Years Examined	Data	Agreement (%)
General Studies **					
Ontario Hospital Association [13]	Ontario	3,000 records in 43 hospitals	1988 - 1989	Demographic Diagnosis *** Procedure	93 - 100 37 - 81 88 - 95
Newfoundland Department of Health [14]	Newfoundland	850 records in six hospitals	1994	Demographic Diagnosis *** Procedure	98 - 100 59 - 74 93
Doctors Hospital, Toronto [15]	Ontario	300 records in one hospital	1992	Demographic Diagnosis *** Procedure	100 95 - 96 96
Specific Studies					
Delfino [16]	Quebec	1,279 records with a respiratory diagnosis in 14 hospitals	Not stated	Demographic Diagnosis	88 - 99 75 - 95
Malenka [18]	Manitoba	485 records with a prostatectomy procedure in one hospital	1974 - 1980	Comorbidity	42 - 71
Rawson [11]	Saskatchewan	444 records with a cholecystectomy or hysterectomy procedure in 14 large hospitals	1986	Demographic Diagnosis Procedure	95 - 100 42 - 71 97 - 100
Ray [17]	Saskatchewan	236 records of hip fracture in 10 large hospitals	1984 - 1985	Diagnosis	99

* Reabstraction studies of hospital records assess the agreement between the abstracted information in the database and the information in the chart that was recorded by the physician and then coded by health records staff.
** General studies are based on a random sample of all diagnoses and procedures.
*** Top end of range reflects agreement for most responsible diagnosis; bottom end of range reflects agreement for secondary diagnosis.

on diagnoses were varied. Rawson and Malcolm[11] reabstracted the records of patients who had a hysterectomy or cholecystectomy and found the rates of agreement for procedures were over 95%. The rates of agreement for the most responsible diagnosis were between 42% and 71%. Delfino and associates[16] reabstracted the records of patients in Montreal hospitals with respiratory diseases as the most responsible diagnoses, and the rates of agreement by hospital ranged from 75% to 95%. The highest rate of agreement for most responsible diagnosis was 99% for hip fracture.[17] In a study of comorbidity related to prostatectomy, Malenka and associates[18] found the rates of agreement for secondary diagnoses were between 42% and 71%.

Hospital Discharge Data Compared to Data From Other Sources

We found six studies in which researchers compared information in the hospital discharge summary with data from other administrative or clinical databases. The data are summarized in Exhibit A.3. For example, in reviewing obstetrical records from three hospitals, Chen[19] found the rate of agreement to be 95% or over for type of delivery. There were generally high levels of agreement, 90% or greater, for primary procedures. There was one exception to this general finding. In comparing medical claims to hospital data for patients undergoing 11 procedures, Roos and associates[20] found that while the overall agreement was 90%, the rates varied from 77% (vascular surgery) to over 98% for several procedures. The rates of agreement for most responsible diagnoses ranged from 20% to 80%, with an average of 75%. Iron and associates[21] compared OHIP records and hospital data for women and found the rates of agreement to be 94% for hysterectomy and 93% for cholecystectomy.

Researchers[18,22] in Manitoba have undertaken a number of comparisons to examine the completeness of recording of secondary diagnoses for patients undergoing cholecystectomy, prostatectomy, and other procedures. Generally speaking, the recording of secondary diagnoses was substantially lower on the hospital discharge summary than on medical claims or clinical databases. Agreement on secondary diagnoses is important if researchers are to use comorbidities in comparisons of clinical outcomes across hospitals or jurisdictions.

Matching Diagnoses in Hospital Records with Expert Clinical Criteria

Eight studies compared the diagnoses on hospital records with expert clinical criteria. These studies are summarized in Exhibit A.4. They provide an estimate of the usefulness of hospital data for formal epidemiologic research and the clinical evaluation of medical interventions.

The rate of agreement for diagnosis was lowest for the diagnosis of Guillain-Barré Syndrome in Ontario, at 21%.[23] Using the World Health Organization's criteria for acute myocardial infarction, which are reasonably well established, the rates of agreement were 80% or better in an Ontario hospital,[24] and in studies conducted in Nova Scotia and Saskatchewan.[25] The Nova Scotia-Saskatchewan Group assessed acute myocardial infarction for the years 1977, 1981, and 1985 in both provinces. They found the rates of agreement with the World Health Organization's criteria for recorded acute myocardial infarction improved over time, from 81% in 1977 to 89% in 1985. The rates in 1985 were better for Saskatchewan (92%) than Nova Scotia (87%).

There is more ambiguity around the diagnoses of stroke and asthma,

Exhibit A.3: ***Summary of Canadian Studies Comparing Diagnoses and Procedures Between Hospital Discharge Data and Another Source***

Author	Province	Records Abstracted	Years Examined	Variable Examined	Data Against Which Database Being Checked	Agreement (%)
Chen [19]	Ontario	3,357 obstetrical records in three hospitals	1989 - 1992	Procedure	Clinical dataset	95 - 99
Roos [34]	Manitoba	3,131 hysterectomy and cholecystectomy records in all hospitals	1974	Procedure	Physician claims	89 - 91
Roos [20]	Manitoba	61,310 records for 11 procedures in all hospitals	1979 - 1983	Procedure	Physician claims	77 - 98
Iron [21]	Ontario	8,467 records of women who had a hysterectomy or cholecystectomy in all hospitals	1991 - 1992	Procedure	Physician claims	93 - 94
Malenka [18]	Manitoba	485 records with a prostatectomy procedure in one hospital	1974 - 1980	Comorbidity	Physician claims	35
Roos [22]	Manitoba	112,000 records from all adult surgical procedures except obstetrics in one hospital	1979 - 1984	Comorbidity	Clinical dataset	17 - 90

where the levels of agreement between hospital records and experts ranged from 69% to 80%.[26,27] Using the World Health Organization's strict definition of stroke in a study at a teaching hospital in Nova Scotia, Phillips and associates[28] found the agreement with hospital diagnosis dropped to 35%. Rheumatoid arthritis can also be difficult to diagnose precisely. Tennis and associates[29] applied five criteria from the American Rheumatism Association to Saskatchewan hospital patients with a diagnosis of rheumatoid arthritis; only 45% of the charts met all five criteria. Another 16% of the charts listed three or four of the criteria.

It should be understood that these levels of disagreement reflect not only the coding process, but also the vagaries of clinical diagnosis for some conditions where physicians must work around nosological ambiguities. In any event, depending upon the disease entity under investigation, one may or may not be able to rely solely upon the diagnostic information in the hospital discharge summary.

Comment

We draw the following conclusions from our review of Canadian studies of data quality in administrative databases.

- Demographic information on patient age, sex and residence is complete and reliable.
- Generally, there are high levels of agreement on specific surgical procedure codes found in hospital discharge data and medical claims. The use of drugs, laboratory tests, and X-rays is not routinely recorded or abstracted on hospital databases.
- Hospital data on the most responsible diagnosis vary in completeness and accuracy. Diagnoses such as acute myocardial infarction or fracture are reasonably reliable. Diagnostic data for conditions such as stroke are substantially less reliable, and the greatest disagreement with expert criteria-based reviews occurs with diagnoses such as rheumatoid arthritis where clinicians themselves may disagree.
- Clinical data on secondary diagnoses, comorbidities, and complications are less likely to be recorded accurately and comprehensively in hospital discharge abstracts, and the rates of agreement on case-mix may be accordingly low.
- The ICD-9-CM and CCP codes have not kept pace with developments in technology and clinical practice, and this limits the degree to which certain procedures are specified in the discharge database.
- Billing claims for physician services typically provide complete capture of procedure codes but these codes may not necessarily match those used in hospital records.

Exhibit A.4: ***Summary of Canadian Studies Comparing Diagnoses Between Hospital Discharge Data and External Criteria***

Author	Province	Records Abstracted	Years Examined	Diagnosis	External Criteria	Agreement (%)
Tennis [29]	Saskatchewan	432 records from all hospitals	1978 - 1980	Non-arthritic Osteoarthritis Rheumatoid Arthritis	American Rheumatism Association	100 99 45
Young [35]	Manitoba	817 records in one diabetic program	1986	Diabetes	Expert Judgement	93
Van Walraven [24]	Ontario	25 records in one hospital	1987 - 1988	Acute Myocardial Infarction	World Health Organization	80
Nova Scotia - Saskatchewan Cardiovascular Disease Epidemiology Group [25] *	Nova Scotia and Saskatchewan	2,869 records in two provinces in all hospitals	1977 1981 1985	Acute Myocardial Infarction	World Health Organization	78 - 94
Mayo [26]	Quebec	96 records from five hospitals	Not stated	Stroke	Expert Judgement Claims	70 - 80
Sweet [27]	Prince Edward Island	423 records from five hospitals	1984 - 1988	Asthma	Expert Judgement	69
Phillips [28]	Nova Scotia	381 records from one hospital	1988 - 1989	Stroke	World Health Organization	35
McLean [23]	Quebec and Ontario	2,333 records from all hospitals	1983 - 1989	Guillain-Barré Syndrome	Expert Judgement	21 - 26

* Studies conducted in 1991. Authors chose three points in time respectively

Improving the quality of these databases requires attention to several issues:

- Physicians and other health professionals must be fastidious in recording relevant information, and be educated about some of the controversies in disease and procedure classification. Linkage possibilities would be expanded if both fee-for-service and non-fee-for-service clinical encounters were coded in the manner now accepted in Alberta and under consideration in Nova Scotia.
- Epidemiologists, health records technologists, and clinicians should meet to address some of the areas where current coding and classification systems are ambiguous.
- The quality of coding for procedures and diagnoses must be improved to the greatest extent possible. Continuing education and regular audits, which are already integral to the operations of health records departments of large hospitals, must be augmented and extended to institutions of all sizes.

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Electronic Edition

Electronic Atlas Tables

Chapter 2

- ♦ Vital Statistics (1992), Life Expectancy (1990) and Census (1991) health indicators by District Health Council and Public Health Unit
- ♦ Ontario Health Survey (1990) health indicators by District Health Council and Public Health Unit
- ♦ Leading causes of mortality (1992) and hospital morbidity (1994) by age, sex and District Health Council
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