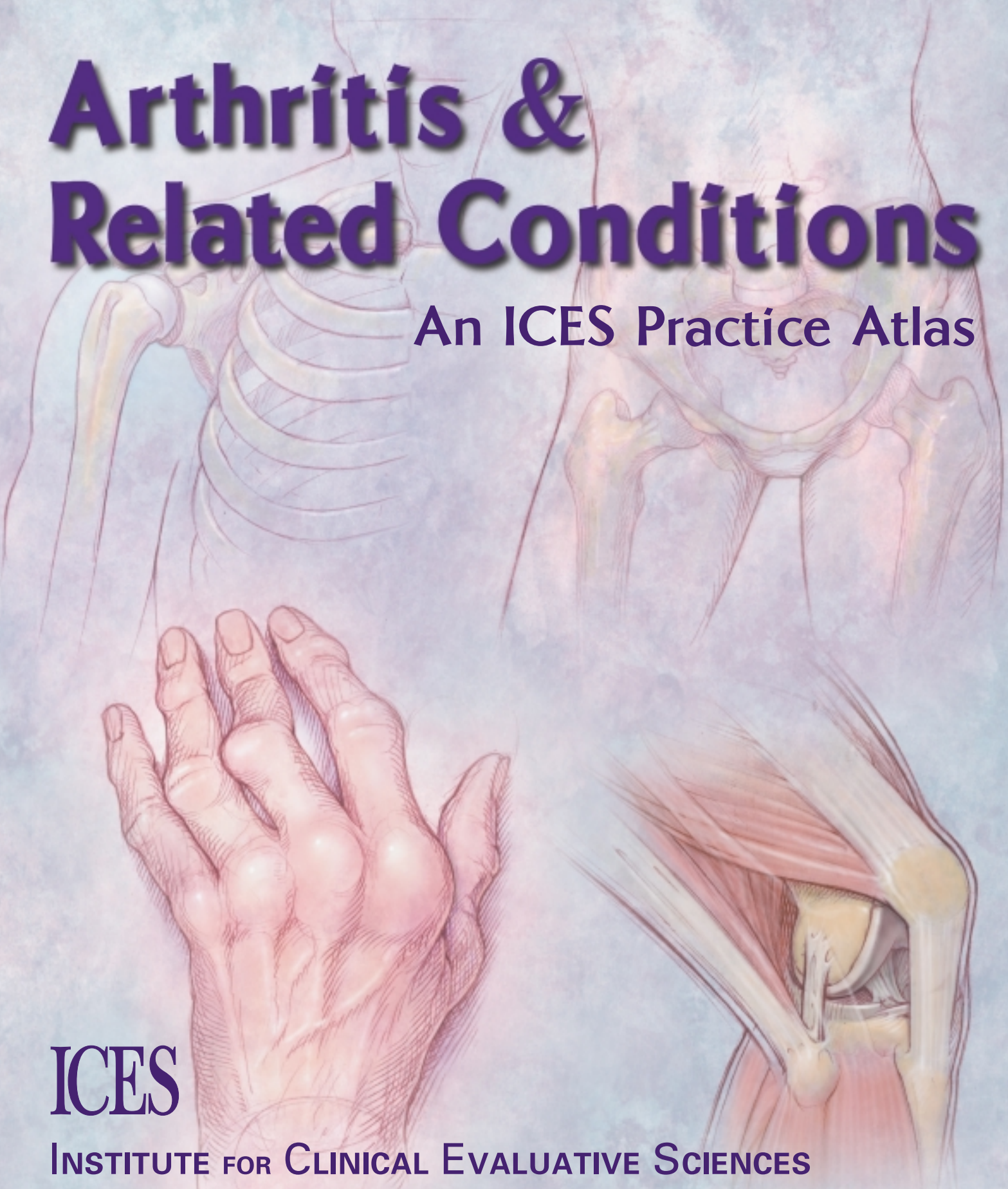
PATTERNS OF HEALTH CARE IN ONTARIO

Arthritis & Related Conditions

An ICES Practice Atlas



ICES

INSTITUTE FOR CLINICAL EVALUATIVE SCIENCES

PATTERNS OF HEALTH CARE IN ONTARIO

Arthritis & Related Conditions

An ICES Practice Atlas

Editors

Elizabeth M. Badley

J. Ivan Williams

ICES Institute for Clinical Evaluative Sciences

Published by
Institute for Clinical Evaluative Sciences

Cover design by
Laura Benben – Graphic Designer, ICES

Interior design and page layout by
Laura Benben – Graphic Designer, ICES and
Rick Eskins, Freelance Graphic Designer

Printed by Continental Press

Canadian Cataloguing in Publication Data

Patterns of health care in Ontario: arthritis & related conditions: an ICES practice atlas

Includes bibliographical references and index.
ISBN 0-9699405-3-X

1. Arthritis–Ontario.
2. Osteoporosis–Ontario.
3. Medical care–Utilization–Ontario.
4. Health services accessibility–Ontario.
I. Badley, Elizabeth M. (Elizabeth Mary), 1946-.
II. Williams, J. Ivan (Jack Ivan), 1939-.
III. Institute for Clinical Evaluative Sciences in Ontario.
IV. Title: Arthritis & related conditions.
V. Title: Arthritis and related conditions.

RC933.P38 1998 362.1'96722'009713 C98-900900-9

How to cite the ICES Practice Atlas:

The production of the ICES Practice Atlas was a collaborative venture. Accordingly, to give credit to individual authors, please cite individual chapters using chapter authors and title, in addition to editors and book title. For example, for Chapter 9: Coyte P, Axcell T, The Use of and Regional Variations in Post-Acute Rehabilitation Services for Musculoskeletal Patients. In Williams JI, Badley EM (eds). *Patterns of Health Care in Ontario: Arthritis and Related Conditions.*

Additional copies are available from:

Institute for Clinical Evaluative Sciences
G 106, 2075 Bayview Avenue
North York, Ontario
M4N 3M5

Telephone: (416) 480-4055

Fax: (416) 480-6048

E-mail: info@ices.on.ca

Table of Contents

Patterns of Health Care in Ontario: Arthritis and Related Conditions

Contributors

Practice Atlas Contributors

Julie Arnold
Arthritis Community Research and Evaluation Unit

Carl Asche
Department of Economics, University of Surrey, England
Health Economics and Outcomes Research,
Bristol Myers Squibb Canada Inc., Montreal

Tami Axcell
Institute for Clinical Evaluative Sciences

Elizabeth Badley
Arthritis Community Research and Evaluation Unit
The Toronto Hospital
Department of Public Health Sciences
Graduate Departments of Community Health and
Rehabilitation Sciences; and Institute of Medical Sciences
University of Toronto

Mary Bell
University of Toronto
Sunnybrook Health Science Centre
Arthritis Community Research and Evaluation Unit

Rachelle Buchbinder
Monash Medical School, Melbourne Australia

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

Mark Cheung
Institute for Clinical Evaluative Sciences

Peter Coyte
Institute for Clinical Evaluative Sciences
Clinical Epidemiology Unit,
Sunnybrook Health Science Centre
Department of Health Administration,
University of Toronto
Arthritis Community Research and Evaluation Unit

Ruth Croxford
Clinical Epidemiology Unit,
Sunnybrook Health Science Centre

Dawn Dalby
Arthritis Community Research and Evaluation Unit

Donald DeBoer
Institute for Clinical Evaluative Sciences

Richard Glazier
Department of Family and Community Medicine, University of Toronto
Clinical Epidemiology and Health Care Research Program, University of Toronto
Arthritis Community Research and Evaluation Unit, The Toronto Hospital
St. Michael's Hospital Inner City Health Program

Elaine Gort
Institute for Clinical Evaluative Sciences

Gillian Hawker
Women's College Hospital
Faculty of Medicine, University of Toronto
Arthritis Community Research and Evaluation Unit

Karey Iron
Institute for Clinical Evaluative Sciences

Susan Jaglal
M.E Müller Program in Research, Sunnybrook Health Science Centre
Clinical Epidemiology and Health Care Research Unit, Sunnybrook Health Science Centre
Institute for Clinical Evaluative Sciences
Department of Public Health Sciences, University of Toronto

Albert J. Kirshen
Kunen-Lunenfeld Applied Research Unit, Baycrest Centre for Geriatric Care
Institute for Clinical Evaluative Sciences
Division of Geriatric Medicine, Faculty of Medicine, University of Toronto

Hans Kreder
Division of Orthopedic Surgery, University of Toronto
Sunnybrook Health Science Centre
Institute for Clinical Evaluative Sciences
Clinical Epidemiology and Health Care Research Program, University of Toronto

Sydney Lineker
The Arthritis Society, Ontario Division
Arthritis Community Research and Evaluation Unit

Sara McConnell
Arthritis Community Research and Evaluation Unit

Michael Paterson
Institute for Clinical Evaluative Sciences

Linda Rothman
Arthritis Community Research and Evaluation Unit
Department of Occupational Therapy, University of Toronto

Marlene R. Stephens
Arthritis Community Research and Evaluation Unit

J. Ivan Williams
Institute for Clinical Evaluative Sciences
Clinical Epidemiology and Health Care Research Unit, Sunnybrook Health Science Centre
Departments of Family and Community Medicine, Public Health Sciences, Community Denistry; Graduate Departments of Community Health, Nursing Science and Rehabilitation Science; and, Institute of Medical Science, University of Toronto

Micheline Wong
Arthritis Community Research and Evaluation Unit

Keyi Wu
Institute for Clinical Evaluative Sciences

Exhibits & Appendices

Introduction

Chapter 2

Estimating the Impact of Arthritis on the Burden of Disability and the Costs of Health Services

Chapter 3

The Economic Cost of Arthritis and Rheumatism in Canada

Chapter 4

The Availability of Services for People with Arthritis

Chapter 5

The Role of Primary Care Physicians in Treating Arthritis

Chapter 6

Use of Medication for Arthritis and Related Conditions

Chapter 7

Surgical Services for Total Hip and Total Knee Replacements

Chapter 8

Osteoporotic Fractures: Incidence and Impact

Chapter 9

The Use of and Regional Variation in Post-Acute Rehabilitation Services for Musculoskeletal Patients

Technical Appendix

Index

Acknowledgements

The research, development and production of this Atlas is the result of the cooperative efforts of many individuals involved in all phases of this project.

We would like to acknowledge the contributions made by our colleagues at the Institute for Clinical Evaluative Sciences (ICES) and the Arthritis Community Research and Evaluation Unit (ACREU) whose teamwork made this project possible. We would also like to thank The Arthritis Society of Ontario for their generous sponsorship of this Atlas.

A special thanks to Laura Benben and Rick Eskins for their skillful work on the design and layout, to Cathy Cameron for coordinating development and production, and to Lawrence Stevenson for his assistance during the development stage. Thanks also to Anne Stilman and Greg Ioannou for their thorough copyedit of the text.

The following lists additional individuals who helped contribute to the success of this project. Without their dedication, hard work and determination, this publication could not have been possible. We apologize in advance for any unintentional omissions.

ICES External Reviewers

We gratefully acknowledge the work of our external reviewers who reviewed one or more chapters.

Nancy Ambrogio, St. Joseph's Health Centre

Gerry Blunt, Family Physician

Claire Bombardier, Institute for Work and Health

Arthur Bookman, The Toronto Hospital

Alex Borgiel, Applehill Medical Centre

Larry Chambers, Hamilton Wentworth Department of Public Health

Adel Fam, Sunnybrook Health Science Centre

Paul Fortin, Montreal General Hospital

Janet Jeffrey, York University

Dafna Gladman, Toronto Hospital

Judith GlynWilliams, Agency Reform Project

Steve Gottesman, Mount Sinai Hospital and Baycrest Centre for Geriatric Care, Toronto

Gordon Hardacre, The Toronto Hospital

Gillian Hawker, Women's College Hospital

Jacek A. Kopec, University of Toronto

Nancy Kreiger, Cancer Care Ontario

Heather Lawson, Signature Vacations

Peter Lee, Wellesley Hospital

Marion Leslie, Providence Centre

Barb Liu, Sunnybrook Health Science Centre

Cam Mustard, Institute for Work and Health

Peter Norton, Sunnybrook Health Science Centre

Truls Ostbye, University of Western Ontario

Brenda Ross, Wellesley Central Hospital, University of Toronto

Ted Rumble, North York General Hospital

Perry Rush, Mount Sinai Hospital, Toronto

Moira Stewart, University of Western Ontario

Barbara Stokes, Arthritis Society, Ontario Division

Carter Thorne, York County Hospital, Newmarket

ICES Administrative Support

Administrative support was ably provided by members of the ICES Administrative Support group.

Margaret Brady, Secretary to Director

Dermot Brennan

ICES Information Systems

J-R Kidston, Manager Information Systems

Donna Polyak, Information Systems Analyst

Jackson Wong, Systems Administrator

ICES Research Coordinators

Ruth Croxford, Research Coordinator

Elaine Gort, Research Coordinator

Patricia Pinfold, Manager, Research Coordinators

Joan Porter, Research Coordinator

ICES Research Transfer Unit

Patty Bell, Communications Officer, Editorial Services

Laura Benben, Graphic Designer

Cathy Cameron, Evaluation Coordinator

Kathy Knowles Chapeskie, Manager

Donna Hoppenheim, Administrative Secretary

Lawrence Stevenson, Communications Officer

ICES Technical Team

The collective expertise of the ICES technical team made the Atlas possible. Team members provided methodologic support, data production and analysis.

Tami Axcell, Research Coordinator

Ruth Croxford, Research Coordinator

Don DeBoer, Senior Biostatistician

David Fielding, Programmer/Analyst

Karey Iron, Research Coordinator

Claus Wall, Manager, Technical Team

Keyi Wu, Biostatistician

Arthritis Community Research and Evaluation Unit

The Authors wish to extend additional thanks to the following people for their contributions to the development of the Atlas.

Linda Rothman, Research Associate

Jackie Fry, Research Associate

Peter Wang, Research Associate

Foreword

The publication of *Patterns of Health Care in Ontario: Arthritis and Related Conditions* is very timely. It occurs at a time in the history of the disease when significant trends and events are forcing everyone involved in arthritis health care to review and redesign the entire system of services available to people with arthritis in Ontario.

What we decide today will be critical both to sustaining the progress that has been made to date, and to meeting future demands which will escalate at an unprecedented rate. The single largest determinant of future arthritis care needs is demography, specifically the aging of the baby boom generation. Even if we assume that the percentage of the total population with arthritis will stay the same, the actual numbers will more than double by the year 2020, from 1.4 million to more than 3 million in Ontario, evenly split between those aged 45-64 and those over 65. The implications of this explosive growth in disease numbers and the resulting demand for services affect the whole spectrum of arthritis care. The key to meeting these future demands successfully is for arthritis health care providers and policy-makers to plan and work together.

This Atlas reveals what is essentially a patchwork quilt of services that meets the needs of some patient populations, but leaves others out in the cold. Our aim must be to create an effective network of care in Ontario that provides exactly the right service, at the right time, wherever it is needed, while remaining within a cost structure that we can afford.

This report raises major issues about equity of access and quality of services in Ontario. It identifies what is working well in the current system, and focuses attention on areas where improvements are needed. It also highlights the scope and magnitude of the economic consequences of arthritis and other related diseases.

Hospital, medical and drug costs for arthritis are significant. However, the true economic burden of the disease is apparent in the cost of income lost due to arthritis disability, amounting to one-third of all chronic and one-fifth of all short-term income loss due to disability. As more people of working age develop arthritis, those costs will rise steeply over the next twenty years. The prevention of disability must, therefore, be a principal goal of any arthritis management strategy.

The Atlas notes that parts of the existing system work well and have improved over the last 15 years. For example, hospitals are able to do more total joint replacement procedures because they have shortened the length of stay. While shorter stays during the acute phase of treatment cut costs and allow more procedures to be performed, they also necessitate a more comprehensive and flexible range of rehabilitation and supportive services during the post-acute phase. With the burgeoning demand from

an aging population, both acute and post-acute services will need to increase, as will physician education to assure more effective diagnosis and timely treatment, and public education to promote better self-management of the disease.

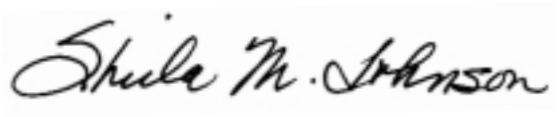
The Atlas pinpoints areas that prevent the system from working in harmony, and need improvement. These include: raising the current low level of musculoskeletal training in Ontario medical schools; directing appropriate levels of funding toward arthritis research; increasing the number of relevant specialists in rural parts of the province and in the north; standardizing the types of prostheses used in all Ontario hospitals; introducing a triage system to ensure the least deterioration during waiting times for surgery that are often unacceptably long; providing accessible and appropriate rehabilitation services; and delivering individualized mixes of care that will get people back to normal functioning as quickly and cost-effectively as possible, rather than automatically using whatever range of services happens to be available in the area.

Current cost-of-illness studies identify the potential benefit to society if a program capable of reducing disease were to exist. Such a program or strategy would form an umbrella over all aspects of arthritis health care in Ontario, providing an integrated approach to service delivery and cost containment. The need for this kind of approach to managing arthritis has also been highlighted by the rapid pace of health services restructuring, whose emphasis on hospital restructuring for acute care raises concerns about the capacity of the post-acute care system to accommodate current and future needs appropriately.

A further concern is the lack of information systems other than those provided by hospitals, which relate only to acute care. Comparable post-acute and rehabilitation data are not currently being systematically gathered. There is clearly a need to establish information systems to capture these data, which are essential to the development of effective arthritis services.

An integrated arthritis management system would bring together all the health care partners. Primary physician and specialist services, hospital care, rehabilitation, home care, long-term care, community care and public education would all work together in a flexible, streamlined system based on consistent practice standards and outcome measures. This would create a more systematic continuum of referral and treatment which would be more responsive to the individual, as well as maximizing the return on publicly invested dollars.

Patterns of Health Care in Ontario: Arthritis and Related Conditions explores issues that have not been adequately addressed before. It identifies the demographic, geographic and economic factors that will influence the future of arthritis and it alerts us to the crisis that will come if we ignore them. If we correctly use the information in the Atlas, we will be able to overcome a major health care challenge and emerge with a better, stronger system for all Ontarians with arthritis.



Sheila Johnson
Executive Director

The Arthritis Society of Ontario

September 1998

Executive Summary

Arthritis and related conditions comprise a large group of disorders affecting the joints, ligaments, tendons, bones and other components of the musculoskeletal system. These conditions are highly prevalent and are major causes of morbidity, disability and health care utilization in Ontario. The burden associated with these conditions will increase with the aging of the population. The Arthritis Community Research and Evaluation Unit (ACREU) and the Ontario Division of The Arthritis Society of Canada, joined the Institute for Clinical Evaluative Sciences (ICES) in a partnership to produce this ICES Practice Atlas under the editorship of Elizabeth M. Badley and J. Ivan Williams. Scientists affiliated with ACREU and ICES reported on their research on the impact of arthritis and related conditions on the health status and health care utilization patterns of Ontario residents. The Atlas presents the findings and charts a course for changes in the health care system and future health services research.

In Chapter 1, Gillian Hawker reviews the epidemiology of arthritis and osteoporosis. Estimates of the prevalence of arthritis range from 15% to 20% of adults. Osteoarthritis, characterized by the destruction and loss of cartilage in the joints, is the most common type of arthritis and affects more than 10% of the population. Rheumatoid arthritis, a systemic autoimmune disease, is found in 1% of adults. The treatment of arthritis includes drug therapy, rehabilitation therapy, education and, in cases of severe damage to the joints, surgery. Osteoporosis is a systemic skeletal disease characterized by reduced bone mass and a change in bone tissue, which results in bone fragility and susceptibility to fracture. Osteoporosis contributes to fractures of the hip, vertebrae and wrist, and has associated costs for subsequent hospital and rehabilitative care.

The burden of illness and costs of care associated with arthritis are explored in Chapter 2 by J. Ivan Williams, Karey Iron and Keyi Wu. Participants in the 1994 National Population Health Survey agreed to have their responses linked to health care data for purposes of research. Respondents with arthritis were more likely to report fair or poor health, pain, activity restrictions and disability than persons without arthritis. Fifteen percent of individuals had arthritis and they accounted for 33% of the costs of health services in the two years following the interview.

The research presents two profiles of arthritis: its absolute impact and its relative impact. In absolute terms the direct burden and costs of the disease increased with age, and they were greater for women than for men. In relative terms, the burden and costs of arthritis were greatest in young and middle-aged adults, and were of similar magnitude for men and women.

In Chapter 3, Peter Coyte and colleagues[1] present estimates of the total economic costs to society of arthritis and rheumatism for Canadians, regardless of the payor, in 1994 dollars. The estimated societal costs were $5.8 billion and ranged from $4.3 billion to $7.3 billion. The majority of the costs ($3.7 billion) were indirect costs associated mainly with the loss of productivity from persons with arthritis who were unable to work. One-third of the cost ($2.1 billion) stemmed from the direct costs of health care. They note that, in a study by Health Canada, musculoskeletal conditions accounted for 13.8% of the total economic burden of illness but only 2.9% of expenditures for health science research. They concluded there may be an inequity in research funding. The total cost represented 0.8% of Canada's Gross Domestic Product. Cost-of-illness studies identify the potential benefit that could be achieved by reducing the prevalence of disease or its burden, for example, by enhancing the use of the health care strategies discussed in this Atlas.

Elizabeth Badley and her colleagues[2] present data in Chapter 4 on the regional variation in the distribution of rheumatology and orthopedic surgery services, the numbers of physiotherapists, occupational therapists, chiropractors and family physicians, and the services provided by The Arthritis Society's Consultation and Rehabilitation Service. There were large regional variations in these services across Ontario. Physicians, occupational therapists and physiotherapists tended to cluster in the same communities while chiropractors were located somewhat independently of other health care services. Rheumatology and orthopedic services were concentrated in health science centres and large communities. Four District Health Council areas were without rheumatology services (all in Southern Ontario) and orthopedic services were absent in two districts. The variations in access to services across Ontario warrants further investigation.

Rick Glazier and colleagues[3] present the results of three studies about primary care for arthritis in Chapter 5. According to the 1990 Ontario Health Survey, people with arthritis made almost double the number of primary care visits than did those without arthritis. The visits were related to long-term disability, recent activity restriction, recent onset and possession of supplementary health insurance. In analyzing the claims from Ontario Health Insurance Plan (OHIP) for fiscal 1996/97, they found that about one-fifth of adults in Ontario had visited primary care physicians for musculoskeletal problems.

A survey of family physicians showed that most of them were practising in accordance with current standards of practice. There were some problem areas of practice, including delay in referral to specialists for early presentations of rheumatoid arthritis and inappropriate prescribing of non-steroidal anti-inflammatory drugs (NSAIDs). Respondents reported low levels of confidence in performing the musculoskeletal examination (the keystone of making a correct diagnosis). They also identified barriers including unacceptably long waiting times in referring patients for orthopedic, physiotherapy and rheumatology services. Improving musculoskeletal training in Ontario's medical schools, family medicine residency and continuing medical education would be a first step towards improving primary care management of arthritis and related conditions. The time given to these conditions in medical training is not commensurate with the amount of chronic illness and disability they cause.

The Ontario Drug Benefit program pays most costs for prescription drugs for seniors who live in the community or in nursing homes and homes for the aged. In chapter 6, Albert Kirshen analyzed the claims for the fiscal years 1994/95 through 1996/97 to examine the use and costs of drugs commonly prescribed for the management of arthritis and related conditions, and examined trends in prescribing patterns.

Total drug costs for arthritis and related conditions in fiscal 1995/96, the year preceding the introduction of copayments and deductibles, were $81.9 million for women and $50.2 million for men (15.1% of the cost of all prescriptions dispensed to community-dwelling seniors). Costs for long-term care residents were $4.6 million for women and $1.6 million for men (12.4% of the cost of prescriptions dispensed to long-term care residents).

Nearly 40% of the seniors in the community and 13% of residents of nursing homes and homes for the aged had prescriptions for NSAIDs. However, as NSAIDs can be purchased without a prescription, the figures may underestimate the true use of the drugs. The use of prescribed NSAIDs has declined over time, whereas the rate of exposure to drugs for the prevention of gastrointestinal bleeds associated with NSAID use increased over the period of the study, particularly among long-term care residents. Joint replacement surgery appears to reduce, although not eliminate, the post-operative use of NSAIDs. There was a significant increase in the use of bone-protective agents for women but not for men. In general, drug prescribing to Ontario seniors for arthritis and related conditions appears to follow recommendations in the literature, but the patterns of drug use call for further investigation.

Total hip and total knee replacements are the success stories of arthritis treatment; the procedures are a very cost-effective means of improving quality of life. In Chapter 7, J. Ivan Williams and researchers at ICES[4] report on surgical services. Between fiscal years 1981/82 and 1996/97, age-adjusted rates per 100,000 residents of Ontario over the age of 20 doubled for total hip replacements from 44 to 84 and appear to have stabilized. Rates for total knee replacements increased sevenfold from 14 to 91 which was sustained.

The increases were made possible, in part, by dramatic declines in average lengths of stay for procedures. Considerable area rate variation were found within the province.

A study of 76 hospitals providing joint replacement surgery showed marked variations in the prices paid for prostheses. In 1993, there was substantial room for hospitals to save money, even using the same makes and models of implants. Further investigation is warranted to determine whether changes in purchasing and prices for implants have occurred.

Researchers studied the relationships between outcomes of total hip and total knee replacements and hospital volumes and surgeon volumes for these procedures. The findings suggest that surgeons should perform a minimum number of total joint replacements annually to maintain skills and competencies, and that low-volume hospitals providing less than 25 procedures a year were less likely to achieve optimal patient outcomes than higher-volume hospitals. Hospitals, surgeons and researchers need to consider the evidence in deciding how to designate the hospitals and surgeons who should provide the procedures.

Waiting times between consultation visits with orthopedic surgeons and dates of surgery varied markedly across the province. The median times in the surgical queue ranged from 17 weeks for primary total hip replacements to 22 weeks for primary total knee replacements; 17% of hip patients and 22% of knee patients waited over a year for their total joint replacements.

The Health Services Restructuring Commission has recommended the total number of total joint replacements be increased by one-third over the next five years so that the rates for all areas of the province reach the provincial averages for fiscal year 1995/96. To this point, the Ministry of Health has been funding the purchase of prostheses to increase the number of total hip and total knee replacements being provided. The Ministry is being pressured to broaden its support and cover the other hospital costs for these procedures.

The incidence and impact of the three most common osteoporotic fractures, wrist, vertebral and hip, are discussed by Susan Jagal in Chapter 8. Fractures are considered osteoporotic when they result from minimal trauma. Wrist fractures are the most common fracture until age 80. Although few require hospitalization, they serve as an important marker for future fracture. As most vertebral fractures are treated outside hospital settings, accurate records of their incidence and cost were not available.

Hip fractures are costly to the health care system because of the need for surgical intervention, lengthy hospital stays (which accounts for the largest proportion of medical care costs) and high rates of subsequent institutionalization. There was considerable regional variation in discharge to home or rehabilitation, which was not related to length of stay in acute-care hospitals. The outcome of hip fracture in relation to discharge destination needs to be investigated. Studies that evaluate patient outcomes and alternative care delivery methods are also needed. While more cost-effective treatment and rehabilitation offer modest hope of curtailing costs, any substantial reduction in the burden of hip fracture depends on prevention of falls and reduction of osteoporotic risk factors.

In chapter 9, Peter Coyte and Tami Axcell identified four factors that contribute to variations in the use of post-acute rehabilitation services: the number of individuals discharged from hospital, the proportion of patients receiving home care, the types of home care service received and the intensity or amount of services used. They analyzed the hospital discharge abstract and data from the Home Care Program for fiscal years 1993/94 and 1994/95. Patients discharged after joint replacement and fracture were more likely to receive home care than those discharged with a diagnosis of arthritis and rheumatism or other medical or surgical diagnoses. More than 70% of these patients received rehabilitation visits, compared with less than half of patients discharged with other musculoskeletal diagnoses. There were variations in all four factors across the major clinical categories of hospitalization and the Home Care Program areas across the province. Providers and planners of health care need to measure and assess the impact of all these factors if they are to narrow the variations in utilization and develop and support pathways to care for musculoskeletal patients following hospitalization.

In the final chapter, Elizabeth Badley and J. Ivan Williams review issues in health care for arthritis and related conditions in Ontario. Although there is at present no known cure for arthritis, appropriate treatment, rehabilitation and self-management helps prevent disability and maintain function. This chapter presents an outline of a comprehensive strategy for the control of these conditions which has six major components: primary care, specialist and hospital services, rehabilitation and community support services, health education and health promotion, and health policy and planning. The ultimate goal of care is to improve the situation of those affected and their families.

Most of these components are in place, although as the rest of the Atlas indicates, there are considerable provincial variations in the adequacy, availability and accessibility of these services. A major element, and one which needs

particular attention as the health care system is restructured, is how these parts of the health care system work together to give integrated care.

The information in the Atlas was governed by availability of data which mainly related to the acute-care sector. There is a lack of adequate information systems relating to the major areas of service use by people with arthritis and related conditions, namely ambulatory and primary care, rehabilitation care and care in the community. This Atlas reveals only the tip of the iceberg of the impact of these conditions. Commitment to the development of information systems, research and enhanced service delivery is urgently needed as part of a comprehensive health strategy to reduce the burden of arthritis and related conditions in the population.

---

1 Carl Asche, Ben Chan, Ruth Croxford

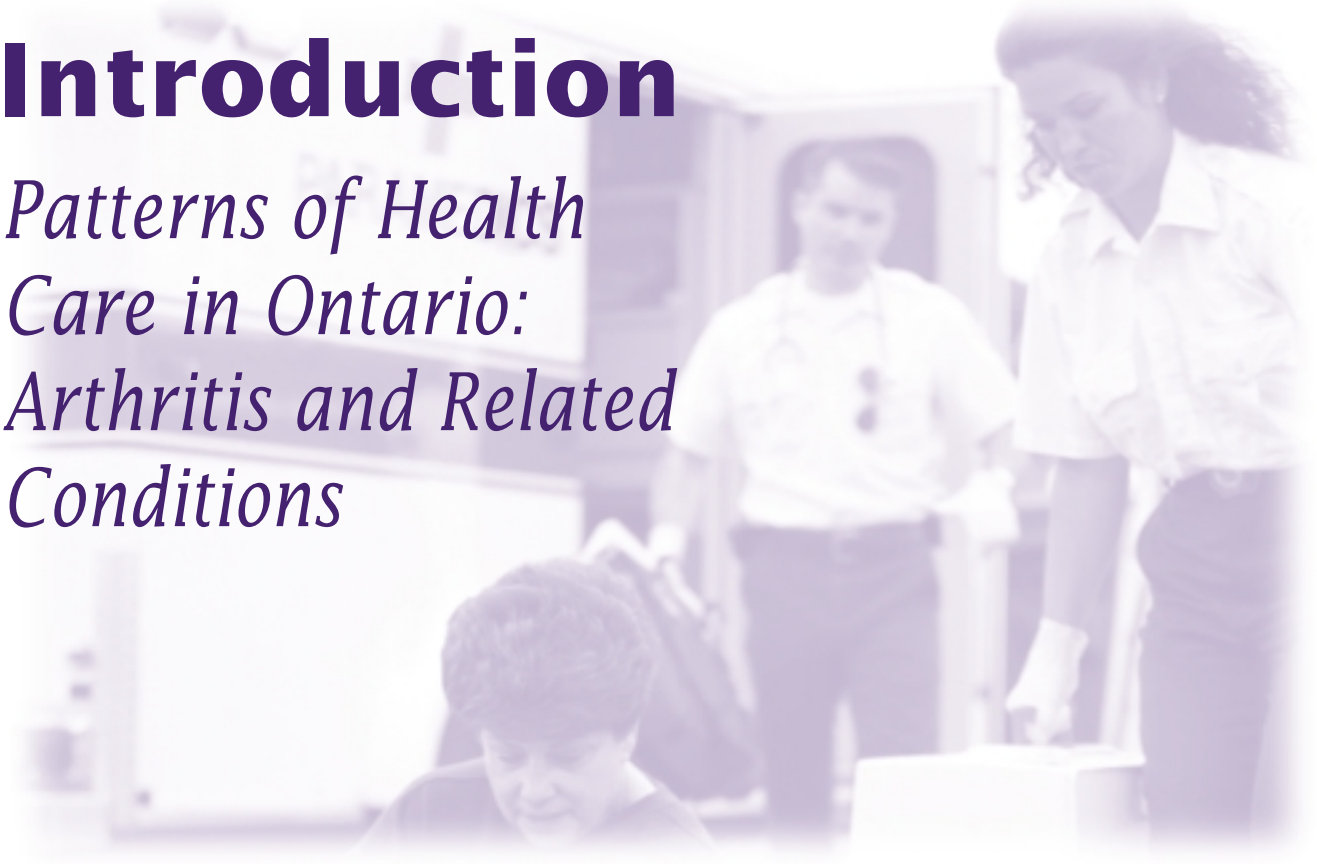
2 Linda Rothman, Marlene Stephens, Micheline Wong

3 Julie Arnold, Elizabeth Badley, Mary Bell, Rachelle Buchbinder, Dawn Dalby, Gillian Hawker, Sydney Lineker, Sara McConnell

4 Tami Axcell, Mark Cheung, Don DeBoer, Elaine Gort, Hans Kreder, Michael Paterson

Introduction

Patterns of Health Care in Ontario: Arthritis and Related Conditions



Introduction

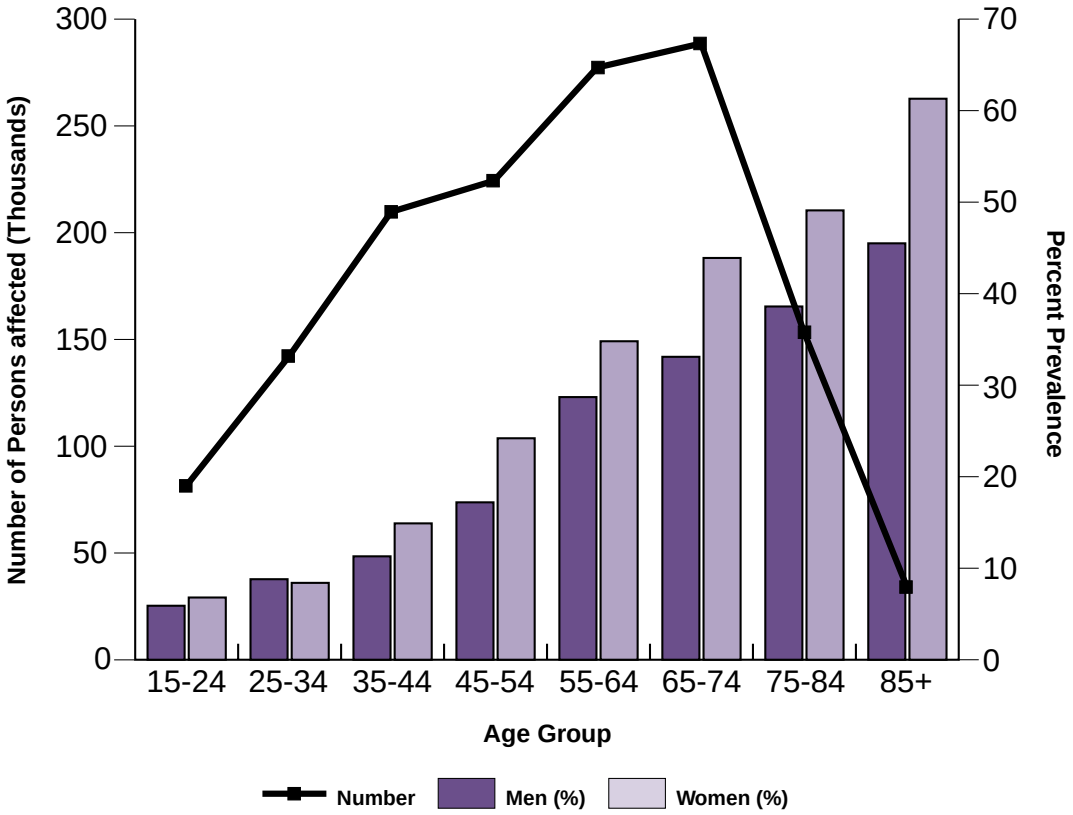
Arthritis and related conditions are important members of the larger family of musculoskeletal disorders which include diseases and disorders of the muscles, bones and connective tissues. This Practice Atlas reviews patterns of health care for these conditions, and presents information on current and projected needs and the services available to meet them.

Arthritis and related conditions challenge the health care system. Arthritis is an archetypical chronic condition associated with aging. Almost one in five Canadians report having arthritis and the prevalence increases with increasing age (Exhibit 1). The condition is generally lifelong, and more women than men are affected at all ages. The increasing prevalence with age suggests that arthritis and related conditions are disorders of predominantly older people, and indeed this tends to be the stereotype. However, when the age structure of the population is taken into account, the reality is somewhat different: in terms of numbers, the major impact of arthritis in the population is in the middle years of life. According to the 1990 Ontario Health Survey, the median age of people with arthritis was 57 years: half the people with arthritis were younger than 57 years, and only 13% were aged 75 years and over. Arthritis is associated with considerable morbidity and progressive disability, with 2.5% of the population reporting disability specifically due to arthritis. The issue for health care is the long-term management of a chronic condition. The disabling nature of arthritis means that rehabilitation and the management of disability are important components of care.

Chapter 1 sets the scene by introducing the major types of arthritis and osteoporosis and their epidemiology. It reviews the major types of treatment for these conditions. Arthritis and related conditions have generally received relatively little attention in the current debate about health and the need for health care. A commonly held misperception about arthritis is that it is often an inevitable consequence of aging for which no effective treatments are available. This is not true: although there is at present no known cure, appropriate treatment has been shown to prevent disability, maintain function and reduce pain. The exact nature of medical treatment will vary according to the particular type of arthritis, but general management and rehabilitation strategies are similar for all types. The disease is typically lifelong and tends to follow a fluctuating course, with exacerbations and remissions; therefore, care needs to be accessible over the full span of the disease, with the realization that the type of care needed for a given patient may change over time. Relevant issues for osteoporosis include prevention of both bone loss and of falls, and the prompt and appropriate treatment and rehabilitation of people with osteoporotic fractures.

Chapter 2 looks at a range of impacts of arthritis in the population using data from the National Population Health Survey, and presents information about the costs of medical

Exhibit 1: ***Prevalence of and Number of Persons with Arthritis Aged 15 Years and Over in Ontario, 1990***



Data Source: Ontario Health Survey

services. The chapter highlights how arthritis is associated with the experience of pain, disability, reduced health status, diminished labour force participation and increased stress, especially in the middle-age population. By linking the survey responses to the health care administrative data for hospital services, medical service and the Ontario Drug Benefit program for the elderly, the burden of arthritis is expressed in terms of increased costs of health care.

The macro economic costs of arthritis and rheumatism in Canada is presented in Chapter 3. In 1994 Canadian dollars, the estimated costs of arthritis and rheumatism were $5.9 billion, including $2.1 billion for the direct costs of hospital, medical and other health services. Over 60% of the costs were attributed to the indirect costs of disability and premature mortality.

Rheumatologists, orthopedic surgeons, primary care physicians, chiropractors, physiotherapists, occupational therapists, and The Arthritis Society are the key providers of services for arthritis and related conditions. The availability of these services across District Health Councils in Ontario is discussed in Chapter 4, and there is a special emphasis on the geographic variations in the supply of these services. There are considerable inequities in the availability of rheumatology and orthopedic services, which are hospital-based, with the highest concentration of practitioners found in Districts with the academic health sciences centres. This chapter also reports the variation in the per capita availability throughout the province of other relevant health professionals. A particularly relevant service for people with arthritis is offered by the Consultation and Rehabilitation Service, which is funded by the Ministry of Health and administered by The Arthritis Society, and provides rehabilitation and social work services for people with arthritis. The chapter draws attention to imbalances in the service and care for people with arthritis across the province.

Primary care physicians are the front line of medical services for people with arthritis. Chapter 5 presents three perspectives on primary care services for arthritis and related conditions: reports by respondents to the Ontario Health Survey (OHS) with and without arthritis, Ontario Health Insurance Plan (OHIP) claims for consultations and visits, and a survey of how family physicians manage arthritis and some of the issues they face in providing services. Respondents to the OHS who indicated that they had arthritis were twice as likely to have seen primary care physicians in the past two weeks than other respondents, and rates of visits

increased markedly if persons with arthritis had restrictions in their activity. Examination of the OHIP claims for one year demonstrated that a broad range of arthritis and related conditions were the second leading reason for consultations and visits to primary care physicians, and women and men of all ages had relatively high rates of consultation and visits for these conditions. Primary care physicians can be viewed as gatekeepers who may either manage the problem themselves or make referrals to specialist medical, surgical, and rehabilitation services. They are also important players in patient education about the management of arthritis symptoms. It is important therefore that these professionals have the training and experience to carry out appropriate investigations, to make correct diagnoses, and to prescribe appropriate treatments, including advice about self-management techniques. Data from a survey of Ontario family physicians suggests that there may be deficiencies in this management, as well as barriers to referral and access to specialist care and rehabilitation professionals.

Medication is an important part of the treatment of arthritis. Chapter 6 provides an overview of the prescription and costs of medications for arthritis and related conditions for people over the age of 65 in Ontario living in the community or residing in nursing homes and homes for the aged. The chapter presents data on how medication usage over time varies with changes in prescribing practice and with the introduction of copayments in 1993. There are specific reports on non-steroidal anti-inflammatory drug (NSAID) use and gastrointestinal bleeds, NSAID use before and after total joint replacements, and use of bone protective agents prior to hip fracture. While drug prescribing for arthritis and related conditions generally follows guidelines for medication use, there are areas for improvement.

In the first two editions of the ICES Practice Atlas, we reported on the trends in total hip and total knee replacements over time and the variations in access to these surgical services across the province. Chapter 7 focuses on surgical services for total joint replacements and updates the data on trends and variations. The increase in volumes of total hip and total knee replacements are related to declines in average lengths of stay for these procedures. The chapter shows there are important variations across the province that persist in waiting times for surgery, average lengths of stay, and prices paid for prostheses. New information is presented on the relationship between volumes of services, hospital and surgeon, and the outcomes achieved for total hip and total knee replacements. The results suggest that low volume hospitals and surgeons achieve less than optimal results. These are issues orthopedic surgeons and hospitals need to address jointly in planning services for total joint replacements in an era of restructuring of health services.

Osteoporosis is a major risk factor for fracture, particularly in older people. Osteoporotic fracture, especially fracture of the neck of the femur (hip), tends to be a sudden event presenting as a medical emergency, which may result in death or severe disability. Survival may be associated with considerable disability affecting the ability to live independently. This may result in admission to institutions or need for high levels of supportive care.

Chapter 8 examines the magnitude and burden of the three most common fractures: wrist, vertebral and hip, on the health care system. Osteoporotic fractures are more common in women than in men and will continue to increase with the aging of the population and increases in life expectancy. The major emphasis of the chapter is on hip fractures as they account for the greatest morbidity, mortality and cost of all osteoporotic fractures. Most patients with this type of fracture are admitted to hospital and many subsequently receive rehabilitation care in rehabilitation hospitals or through home care services. There are considerable variations in length of stay and in the use of home care. This chapter also raises issues about strategies to reduce the burden of osteoporotic fracture, including primary prevention.

Both arthritis and osteoporotic fractures may result in disability; therefore, rehabilitation is an important component of therapy to maximize and maintain function and everyday living skills. It may be an important factor in helping individuals live independently in the community and in preventing hospitalization. There is an overall lack of information about rehabilitation services as current information systems do not comprehensively cover this sector. However, there is limited information about home care services. Chapter 9 presents information on the services provided through home care to people who have been discharged from hospital after medical or surgical treatment of arthritis and related conditions. The chapter details the wide regional and clinical variation in the use of post-acute rehabilitation services, and draws attention to the need for the development and evaluation of care and support policies that might be consistently applied to patients with arthritis and related conditions following hospitalization.

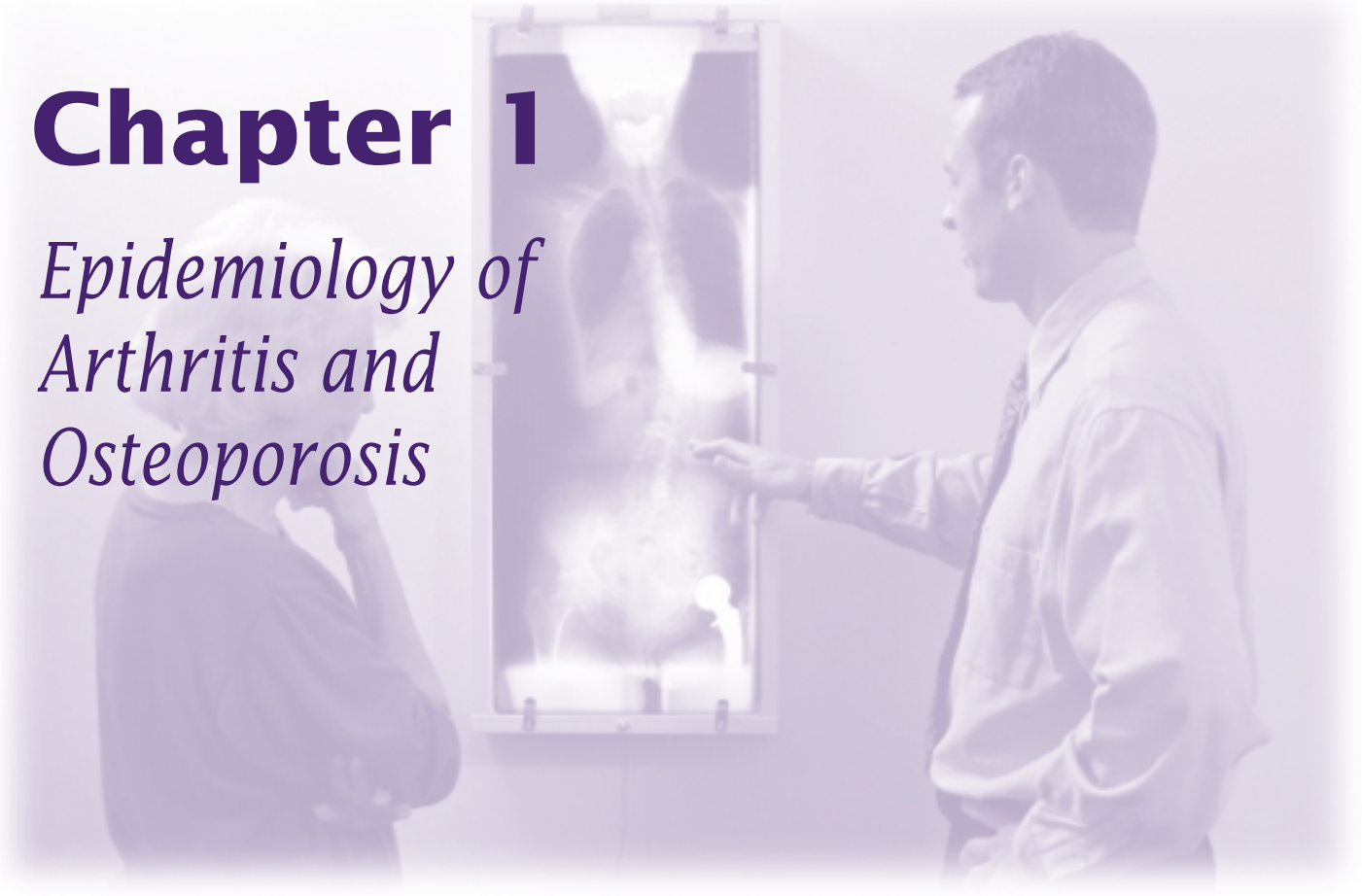
In arthritis care, the prevention of pain and disability, and the management of disability when it occurs are the challenges. Overall, the services available for arthritis are piecemeal, and there is considerable geographic variation. Continuity is an important feature of arthritis care. A health care system that is geared to respond to acute episodes, as is the current system, is arguably not the best way to deal with conditions that are long-term and evolving. For any long-term condition, education of patients and their families is important: self-management and self-care have important roles to play, and have been shown to reduce pain, disability and health care utilization.

In chapter 10, we discuss issues in health care for arthritis and related conditions, and draw together the findings in this Atlas in the context of developing an integrated care strategy to reduce the impact of these conditions on individuals, their families and on the health care system.

The purpose of this Atlas is to raise awareness of the issues around the care of people with arthritis and related conditions in Ontario, and to present information on what is known of the current situation. Inevitably, there are gaps in our knowledge, and this work is only a first step. We hope that it will lead to improvements in the provision of care and in health information systems, and also provide a platform for considering more generally the health care needs of people with chronic disabling disorders.

Chapter 1

Epidemiology of Arthritis and Osteoporosis



Arthritis and Rheumatism in the Population

The term "arthritis" is used in this Atlas to include essentially all disorders other than osteoporosis that affect the joints, ligaments, tendons and other components of the musculoskeletal system. Although strictly speaking it means inflammation of the joints, the term is commonly used to encompass a variety of joint disorders, including those resulting from degenerative disease, inflammatory disease, and post-traumatic damage. The most common symptoms of arthritis and related conditions are pain, stiffness, swelling, muscle weakness and limitation of joint movement.

The 1990 Ontario Health Survey (OHS), based on a stratified cluster sample of the household-dwelling population, yielded estimates of the prevalence of various disorders including "arthritis and rheumatism." The survey consisted of an interview with one responsible household member concerning the health of all household members and a subsequent self-completed questionnaire to all household members. Data from 45,650 people aged 16 years and older were analyzed. Information on musculoskeletal conditions were coded according to a scheme developed by Statistics Canada (arthritis in any joint categorized as "arthritis and rheumatism").

Based on the OHS, 18.5% of the population aged 16 years and over reported arthritis,[1] with 15.2% reporting it as a chronic health problem.[2] The prevalence of arthritis increased with age from 6.3% in those aged 16-24 years to 51.2% for those 75 years and over, with a similar trend for chronic arthritis. The overall prevalence of arthritis and rheumatism in women was 21.1% and 15.7% in men. The median duration of arthritis was 5 years[1] and three-quarters of respondents had consulted a health professional in the previous two years for their arthritis.

Arthritis and rheumatism are leading causes of permanent incapacity and result in extensive utilization of health care resources.[3-8] Although not a major cause of hospitalization or mortality, these conditions are associated with morbidity and disability, and have a major impact on functioning and independence.[1,9] Alleviation of the effects of these diseases would have important consequences for the overall health of Ontarians and the costs of the Ontario health care system.

There are more than 100 different types of arthritis and related conditions; this chapter will focus on the most common ones.

Osteoarthritis

The most common type of arthritis is osteoarthritis,[10-12] a degenerative disorder characterized mainly by destruction and loss of the articular cartilage together with changes in the underlying (subchondral) bone. Typically, osteoarthritis affects the small joints of the hands and feet, spine (both neck and back), hips, and knees. Current understanding

suggests that it may be a heterogeneous group of conditions that share common pathological features. The chief complaint is progressive pain, most often related to joint use, together with joint stiffness and reduced range of movement. The result is loss of physical function, interruption of sleep, psychological stress, and a reduction in quality of life. Osteoarthritis in the lower back region generally causes pain localized to the buttocks or radiating to the leg; the pain may be unilateral or bilateral, and is generally relieved by lying down. With back pain, the impact of changes in position helps to identify whether the pain is arising from abnormalities of the discs or of the facet joints. There may often be associated neurologic symptoms, such as numbness or weakness. Radiologic features of osteoarthritis include a narrowing of joint space due to a loss of articular cartilage and a remodelling of bone beneath the joint surface resulting in subchondral sclerosis and cyst formation, and the formation of bony spurs, called osteophytes, at the joint margins.

Prevalence and Incidence

Estimates of the prevalence of osteoarthritis are imprecise, due to the difficulties associated with diagnosis: there is no clear disease marker and there is great heterogeneity in the nature of the disease.[13] Since the disease presents differently in the knee, hip and hand, separate criteria have been developed for each of these joints. The American College of Rheumatology has developed criteria for the classification of osteoarthritis[14,15] that incorporate radiologic, clinical and laboratory parameters, and provide approximately 90% sensitivity and 90% specificity. No consistent relationship has been found between the presence of radiologic features of osteoarthritis and the presence of symptoms. At any given time, only a proportion of joints with obvious osteoarthritis on X-ray (approximately 50%) will be clinically troublesome. It is unknown why so many people with radiographic evidence of osteoarthritis have no symptoms or disability.

Prevalence studies show that in populations aged 65 years and over, 60 to 70% show signs of osteoarthritis based on radiographic assessment,[10,16-21] and 33% have symptomatic osteoarthritis. In a study of adults aged 24 to 75 years, the U.S. National Health and Nutrition Examination Survey (NHANES I) reported that 16.3% were found on clinical examination to have some form of arthritis or rheumatism.[10,11,22] The confirmed diagnosis was osteoarthritis for 75% of these individuals (12.3% of the population), and rheumatoid arthritis for 5% (0.8% of the population). Similar ratios of osteoarthritis to rheumatoid arthritis have been reported with other population-based surveys.[12] Regional lower back pain, most often due to osteoarthritis, affects approximately 2% of the overall population and 3% of people between the ages of 45 and 64. The prevalence of osteoarthritis has consistently been shown to increase with increasing age. There are also marked racial differences in prevalence and distribution.

Several prospective studies that used standardized clinical and radiographic criteria to estimate the incidence of osteoarthritis have confirmed a higher incidence in women than in men.[21,23] In a large sample of Health Maintenance Organization (HMO) enrollees in Massachusetts, the age- and sex-standardized incidence rates for hand osteoarthritis were 100 per 100,000 person-years; for hip osteoarthritis, 88 per 100,000 person-years; and for knee osteoarthritis, 240 per 100,000 person-years.[23] The ratio of women to men was approximately 2:1 for each type of osteoarthritis, suggesting similar sex and age predilection for disease in these joints. Since no standard protocol was used to document osteoarthritis symptoms in this study, these numbers may represent underestimates of the actual incidence of disease.[23] In the Framingham prospective cohort, the age-adjusted odds ratios for incident radiographic knee osteoarthritis and symptomatic knee osteoarthritis (symptoms plus radiographic change) were higher in women than in men.[24] Rates did not vary by age within this sample. Among women, about 2% a year developed incident knee osteoarthritis, 1% a year developed symptomatic knee osteoarthritis, and about 4% a year experienced progression of existing knee osteoarthritis.

Recognized risk factors for the development of osteoarthritis include advanced age, heredity, obesity, female sex and trauma or repetitive stress to a joint.[16,25,26] Osteoarthritis may also be the consequence of inflammatory arthritis or congenital joint incongruency.

Impact in the Population

Even though osteroarthritis results in disability in a smaller proportion of people than does rheumatoid arthritis, it is the most frequent cause of disabling arthritis because of its higher overall prevalence. Data from both American and British population studies show that for every person with rheumatoid arthritis that is accompanied by severe disability (for example, restricted independence in activities of daily living), there are more than seven with osteoarthritis with a similar level of disability.[12,27] In particular, osteoarthritis of the knee is more likely to result in disability than is osteoarthritis of any other joint.[13] Osteoarthritis of the hand is the most common disease affecting hand function in the elderly. Osteoarthritis of the knee or hip is the most common condition for which knee and hip replacement procedures are performed in North America.

Management

Osteoarthritis is often thought of as a degenerative disease caused by aging and excessive use of the joints ("wear and tear") for which nothing can be done. However, while there is currently no known cure for this condition, effective therapies are available. The medical management of osteoarthritis is directed principally toward methods of pain relief and measures

to preserve and improve joint mobility and physical function. Recent U.S. guidelines for the medical management of hip and knee osteoarthritis have been published,[28] and similar guidelines are being developed by the Canadian Rheumatology Association using an evidence-based approach. Both guidelines recommend a hierarchical cumulative approach, emphasizing the importance of educating patients about the disease and teaching them self-management.

First-line treatment is largely non-pharmacologic, and includes: the use of physical therapy and exercise programs to strengthen the muscular support for the joint as well as to reduce associated depression and anxiety; occupational therapy to evaluate the individual's ability to perform activities of daily living, teach joint protection and energy conservation skills and provide assistive devices as needed; and use of orthotics to correct abnormal biomechanics of walking and to reduce the shock of weight-bearing.

First-line pain therapy is with acetaminophen, but a variety of other drug therapies are used for pain relief as well, including intra-articular corticosteroid and hyaluronic acid injections,[29] topical analgesics, non-steroidal anti-inflammatories, and opioid analgesics such as codeine.

Finally, surgical procedures are increasingly being performed to slow the progression of disease or defer the need for joint replacement. Current procedures include irrigation and debridement of the joint, and other, novel treatments are being developed. Since osteoarthritis is believed to predominantly affect the chondrocyte and to result in cartilage loss, clinical trials are investigating newer chondroprotective agents and cartilage transplants.

When these measures fail to control the pain, or when quality of life becomes unacceptable, joint replacement surgery has been shown to be a cost-effective treatment.[30,31] Of all hip and knee replacement recipients, approximately 80% have osteoarthritis, up to 10% have rheumatoid arthritis and 10% have other disorders, including post-traumatic arthritis. Pain is most often the primary reason for undergoing hip or knee replacement, followed by difficulty walking. Up to seven years after knee replacement and at least one year after hip replacement, patients report significant improvement in their joint pain and physical functioning and use significantly fewer medications for their pain symptoms.[32] Joint replacement surgery significantly improved patients' quality of life as measured by the standard gamble technique of utility assessment.[33] Patient characteristics, such as age, gender or body mass index (BMI), do not appear to be correlated with the long-term outcomes of joint replacement surgery.

Rheumatoid Arthritis

Rheumatoid arthritis is a systemic autoimmune disease of unknown etiology. Its major distinctive feature is chronic, destructive (erosive) inflammation of the joints which typically affects the joints symmetrically on opposite sides of the body. Typically, people with rheumatoid arthritis experience joint pain associated with stiffness and swelling. The stiffness is generally made worse by rest (resulting in prolonged morning stiffness) and improved with activity. Additionally, there may be associated fatigue, anorexia and weight loss. While the disease course is unpredictable, it is usually characterized by fluctuations in disease activity, resulting over time in the progressive development of various degrees of joint destruction, deformity and disability. Only a minority of people with rheumatoid arthritis will ever experience complete remission. People with rheumatoid arthritis may also develop serious involvement of other organ systems, including the blood vessels, heart, lungs and nervous system; and the disease is associated with a significant age-adjusted increase in mortality.[34]

Prevalence and Incidence

As with osteoarthritis, it is difficult to estimate the prevalence of rheumatoid arthritis due to the lack of an established etiologic agent or unique clinical or laboratory feature that can be used to define it. Again, diagnosis must be based on the presence or absence of combinations of clinical and laboratory abnormalities according to predefined criteria. The 1987 modified criteria for the diagnosis of rheumatoid arthritis distinguish it from other conditions with a specificity of 89% and a sensitivity between 91% and 94%. Estimates of prevalence based on these criteria indicate that between 1% and 2% of the general population worldwide is affected with definite or classic rheumatoid arthritis, with the prevalence increasing with age in both men and women. The NHANES I survey[22] found a prevalence of rheumatoid arthritis of 0.3% in adults aged 24 to 35, compared with a prevalence of over 10% in adults over the age of 65. The peak onset is in mid-life.

The sex ratio of rheumatoid arthritis also varies with age, but is consistently higher in women; the overall ratio of women to men is approximately 2.5:1. Sex hormones may play a role in predisposition: nulliparous women have an increased risk of developing the disease; pregnancy is associated with remission and the postpartum period with exacerbation;[35,36] symptomatic onset at menopause is not uncommon;[36] and use of oral contraceptives may reduce the risk.[35] Other factors that have been found to be positively associated with prevalence and severity include low socioeconomic status, a low level of education and psychological stress.[37] Although climate, geography and altitude do not appear to play a role, there is evidence that the prevalence rates vary between racial populations, with particularly low rates found among Orientals and high rates found among Native Americans. The reasons for this variability have not been well defined.

Genetic factors other than sex are felt to play a significant role in the

development of rheumatoid arthritis as well, based on studies that have shown that concordance for the disease is higher among identical than fraternal twins.[37] While the specific genetic loci responsible for disease susceptibility are not clear, substantial evidence suggests that the major histocompatibility complex (MHC) on chromosome 6 encodes important disease-predisposing genes. Specifically, most patients with rheumatoid arthritis have the class II MHC alleles DR4 and DR1 or both; class II molecules are involved in antigen presentation to CD4 positive T-cells. Observations from genetic studies suggest that these common epitopes may determine susceptibility[38,39] and possibly disease severity, in response to a variety of triggers. The role of class II molecules in the immune response has been the impetus behind extensive, ongoing research which seeks to evaluate the effect on disease progression of therapeutic strategies directed at modification of the immune response.

Management

Since the potential impact of rheumatoid arthritis is significant, early and aggressive treatment is recommended.[36] Treatment aims to reduce joint inflammation and provide pain relief, and to maintain or restore joint function through prevention of bone and cartilage destruction. The basic treatment program consists of patient education, a balance between rest and exercise (often with physical and occupational therapy), and the use of a combination of non-steroidal anti-inflammatory drugs (NSAIDs) and slow-acting, potentially disease-modifying anti-rheumatic drugs (DMARDs). For DMARDs, there may be a delay of up to six months, depending on the drug, before the benefits are felt. These drugs are occasionally associated with serious adverse effects, so their use should be monitored carefully. A recent comparison of DMARDs and NSAIDs using a standardized toxicity index[40] suggests that they have similar therapeutic effect: toxicity ratios. Corticosteroids may also have a place in treatment (particularly in elderly-onset rheumatoid arthritis), either systemically or through injection into the inflamed joints. Surgical treatment may be recommended when significant joint deformity or instability occurs and when quality of life is affected through pain and/or loss of physical function. Some of the more frequently employed surgical measures are joint replacement of the hips and knees, tendon repair and carpal tunnel release.

Polymyalgia Rheumatica

Polymyalgia rheumatica is a clinical syndrome characterized by aching pain and stiffness in the neck, shoulder and pelvic girdles, often accompanied by symptoms such as fever, weight loss, fatigue and anorexia.[41] Stiffness, the predominant feature, is particularly severe after rest and may prevent the patient from getting out of bed in the morning. Muscular pain is often diffuse and is accentuated by movement. Pain at night is common.

Prevalence and Incidence

Polymyalgia rheumatica is a condition primarily affecting the elderly. The mean age at onset is approximately 70 years, with a range of about 50 to 90 years. It is seldom diagnosed in people under the age of 50. Women are affected two to three times more frequently than men. It is difficult to estimate prevalence and incidence rates, as the signs and symptoms lack specificity, but the annual incidence rate has been estimated at 50 per 100,000[13] for the population over the age of 50. There may be a genetic predisposition to the disease, as there appears to be familial aggregation. Most patients are Caucasian, and the disease appears to be more common in the northern U.S. and Canada than in the southern states.

Diagnosis and Management

Polymyalgia rheumatica is diagnosed through a combination of clinical presentation, laboratory testing and exclusion of other conditions. Its possible presence is signalled by an elevated sedimentation rate (a non-specific measure of inflammation). The diagnosis is then confirmed through a test trial of low-dose corticosteroid therapy, which results in very abrupt—in some cases immediate—relief of symptoms and a return to baseline status. Rarely, polymyalgia rheumatica is associated with a second condition, temporal arteritis, which may be associated with inflammation of the ophthalmic and other large arteries. If not treated aggressively with high-dose corticosteroids, this condition can result in blindness or vascular complications such as stroke.

Seronegative Spondyloarthropathies

The spine is a multicurved flexible column consisting of linked, interdependent motion segments, which in turn consist of adjacent vertebrae joined in the back by the facet joints and in the front by intervertebral discs. The facet joints are lined with synovium, and therefore may also be affected in inflammatory arthritis. The spine (spondylo-) is most often involved in a group of conditions known as the seronegative spondyloarthropathies, an interrelated group of multisystem inflammatory disorders that affect the spine, peripheral joints, or periarticular structures, or all three.[42] Enthesitis—inflammation at the sites of insertion of tendinous or ligamentous attachments to bone—is a pathognomonic hallmark of the spondyloarthropathies. These conditions are also associated with extra-articular manifestations involving the bowel (diarrhea), genitourinary tract (urethritis, cystitis, prostatitis), eyes (non-infectious conjunctivitis, anterior uveitis) and skin, and rarely heart (carditis, aortitis) and lungs (pulmonary fibrosis); as well as with a specific genetic marker, the HLA-B27 gene. The seronegative spondyloarthropathies include ankylosing spondylitis, Reiter's syndrome, and spondylitis or peripheral arthritis associated with psoriasis or inflammatory bowel disease.

In none of these conditions is the pathogenesis or etiology well understood.

Ankylosing Spondylitis

The estimated prevalence of ankylosing spondylitis in North American Caucasians is 0.1 to 0.2%.[13] In large population surveys, risk is increased by 1 to 2% in those who carry the HLA-B27 gene, and is higher in men than women. In contrast, in families with ankylosing spondylitis, 10–20% of adult first-degree relatives inheriting this gene will have the disease.[13] Although the peak onset of disease is generally during adolescence and early adulthood, diagnosis may be delayed for many years.

Reiter's Syndrome

This syndrome develops in genetically susceptible individuals as a result of infection by a specific bacteria in the gastrointestinal or genito-urinary tract. In its complete form, it is characterized by a reactive inflammatory arthritis, urethritis and conjunctivitis. Its incidence has been estimated at 3.5 per 100,000 for men under the age of 50.[43] Reiter's syndrome is rare in blacks, and is about five times more common in men than women.

Psoriatic Arthritis

The prevalence and incidence of psoriatic arthritis are not well defined. Its incidence peaks in young to middle-aged adults, and is equal between the sexes. Joint involvement can be present in a number of patterns, from exclusive spinal involvement (5% of people affected with this condition), to oligoarthritis, or to an asymmetical polyarthritis involving the peripheral joints (up to 95% of people affected with this condition). Extra-articular involvement is largely limited to the eye, with 30% of patients experiencing anterior uveitis.[13]

Diagnosis and Management

The diagnosis and management of the seronegative spondyloarthropathies is in many ways similar to those for rheumatoid arthritis, but important distinctions must be made. Specifically, in this group of conditions, it is critical that physical therapy be directed at the maintenance of normal spinal posture. The DMARDs have been found to be relatively less efficacious in the absence of peripheral joint involvement. Treatment must also be directed, where appropriate, at the underlying condition (for instance, inflammatory bowel disease or psoriasis).

Systemic Lupus Erythematosus

Systemic lupus erythematosus (SLE) is an autoimmune disease characterized by specific laboratory abnormalities and a diverse array of clinical features.[44] Systemic symptoms such as fatigue, malaise and skin rashes occur as frequently as arthritis. There is a wide spectrum of disease severity, from mild involvement of the skin and joints to life-threatening involvement of the heart, kidney, blood or brain. Arthralgias and arthritis are the most common presenting manifestations of SLE. Acute arthritis usually affects the small joints of the hands, wrists and knees, and may be migratory or persistent and chronic.[45] Unlike rheumatoid arthritis, the arthritis associated with SLE is typically not erosive or destructive of bone; however, joint deformities may occur as a result of inflammation of the supporting structures around the joints.

Prevalence and Incidence

SLE is primarily a disease of young women, with a peak incidence between the ages of 15 and 40. In a general outpatient population, it affects approximately 1 in 2,000 individuals, although its prevalence varies by ethnic and racial groups.[13] In the U.S., blacks and Hispanics have a higher frequency of disease than whites.[45] The ratio of women to men is between 5:1 and 8:1, depending on age. As with rheumatoid arthritis, hormonal factors appear important in the pathogenesis. The prevalence is also affected by socioeconomic status, and both genetic and environmental factors.

Management

Management of SLE is generally directed at the clinical manifestations, and often requires a combination of corticosteroids or an NSAID together with immunosuppressive therapy. Drug therapy is generally guided by changes in disease activity. Standardized scoring systems have been developed to facilitate this. More so than in almost any other rheumatic condition, corticosteroids play an essential role in the management of SLE disease activity. Treatment may range from the use of topical or intralesional corticosteroids for SLE-related rash, to low-dose oral therapy for mildly active disease, to high-dose oral or intravenous infusions for acute, severe manifestations.[46] The administration of corticosteroids usually results in the prompt resolution of most manifestations of SLE and in some cases may be lifesaving.

Common Non-inflammatory Musculoskeletal Syndromes

Fibromyalgia

Fibromyalgia is a form of non-articular rheumatism characterized by widespread muscular aching and stiffness together with tenderness on palpation at characteristic sites. It may be considered either primary (i.e. no significant underlying condition that might explain the signs or symptoms), secondary to another medical condition, such as rheumatoid arthritis, or concomitant (i.e. co-existent with another medical condition). Prevalence estimates range from 1% to 10% of the population[47] and are significantly higher in women. The pathophysiology remains unclear,[48] and laboratory investigations are usually unremarkable. There may be an associated sleep disorder (non-restorative sleep) such that there is repeated alpha intrusion of the non-Rapid Eye Movement phases of deep sleep, resulting in a sense of exhaustion.

In 1990, the American College of Rheumatology established the following criteria for the diagnosis of fibromyalgia:[49] widespread pain (above and below the waist, both sides of the body, and including the axial spine) and tenderness on palpation in at least 11 of 18 tender point sites. Individuals with fibromyalgia describe diffuse muscle pain and tenderness to touch, morning stiffness (which may mimic rheumatoid arthritis), general fatigue, a sensation of swelling of the soft tissues (usually in the hands and feet), paresthesias of the hands and feet (in the context of normal nerve conduction studies), weight gain and chronic headaches (due to referred neck pain). These symptoms may be exacerbated by vigorous physical activity, inactivity, poor sleep, emotional stress or changes in the weather.[50]

On physical examination, these individuals are tender all over, but particularly in predefined tender point areas and with only moderate pressure.[48] The joint examination is unremarkable. Conditions that must be differentiated from fibromyalgia syndrome include polymyalgia rheumatica, hypothyroidism, axial arthritis, non-articular rheumatism and chronic fatigue syndrome.

Drug therapy alone is insufficient for the management of fibromyalgia syndrome but not enough is known yet about effective non-pharmacologic therapies. There is preliminary evidence to support the use of cardiovascular fitness training,[51] electromyogram (EMG) biofeedback training[52] and cognitive behaviour therapy,[53] but more research is needed. In clinical trials to date, pharmacologic treatments including non-steroidal anti-inflammatory drugs, muscle relaxants, antidepressants and analgesics have not been proven useful in the management of fibromyalgia-associated pain[54,55] although they may improve sleep.

The prognosis in fibromyalgia varies, but is generally poor, frequently resulting in loss of work and long-term disability. In one study, only 5% of patients experienced sustained remission of all their symptoms during a 3-year period of follow-up.[56]

Osteoporosis

Osteoporosis is a systemic skeletal disease characterized by reduced bone mass and a change in the microarchitecture of the bone tissue. Together with a reduction in the number and thickness of the bony trabeculae, there is a loss of trabecular connectivity, resulting in increased bone fragility and susceptibility to fracture.[57] The World Health Organization (WHO) has adopted the following definitions based on the results of bone density testing: osteopenia is defined as a bone density result between 1.0 and 2.5 standard deviations below the mean for healthy young controls, and osteoporosis is defined as a bone density more than 2.5 standard deviations below the mean. Severe osteoporosis is defined as osteoporosis in the presence of at least one fragility fracture.

Osteoporosis can be classified as either primary or secondary. Primary osteoporosis falls into two subsets. Type I or post-menopausal osteoporosis, occurring in up to 20% of women within two decades of the onset of menopause, is characterized by accelerated loss of trabecular bone leading to vertebral fractures.[58] Type II or senile osteoporosis, generally seen in women and men over the age of 70, is characterized by a proportionate loss of both trabecular and cortical bone, as occurs with normal aging, and results in femoral neck and peripheral fractures (rib and wrist) in addition to vertebral fractures.[58] Secondary osteoporosis occurs as a sequela of a variety of medical conditions, including endocrine disorders, inflammatory arthritis, renal and liver disease, malabsorptive states and some cancers, notably multiple myeloma. Additional causes of secondary osteoporosis include medications (in particular corticosteroid therapy), prolonged immobilization and poor nutrition.

Unfortunately, osteoporosis is a silent condition with no symptoms felt by the affected individual until its sequela, a fracture, occurs. Osteoporotic fractures can be both painful and disabling.

Prevalence and Incidence

Approximately 1.4 million Canadians are affected by osteoporosis, and this number is increasing as the population ages. There is a well-known relationship between age, level of bone mass (bone mineral density, as measured by bone densitometry) and risk for osteoporotic fracture. In both men and women, the prevalence and incidence of all fractures increases with age due to a progressive decline in bone mineral density. In women, there is also an abrupt increase in fractures associated with estrogen deficiency at menopause. At age 50, approximately one in four women and one in eight men will have significant bone loss (osteopenia or osteoporosis).[59] By age 65, one in two women will have osteoporosis; by age 75, one in two will have experienced an osteoporotic fracture; and by age 90, one in three (32%) will have experienced a hip fracture, approximately twice the risk for men, which is 17%.[60] The incidence of vertebral fractures is more difficult to estimate, since these fractures may occur asymptomatically. For this reason, depending on the method of detection, prevalence estimates for vertebral fractures can vary significantly.

The number of individuals affected by osteoporosis and its sequelae is increasing with the shifting demographics of the population. In 1988 in Canada, 15,000 hip fractures were recorded in both women and men, of which 70% were considered attributable to osteoporosis. In 1993, this figure rose to 25,000.[60] It is estimated that by 2021 the annual incidence of hip fractures will be 28,000.

A number of risk factors for osteoporotic fractures have been identified through epidemiologic studies. These can be divided into risk factors for

reduced bone mass and independent risk factors for fractures.[61] Risk factors for low bone mass include advanced age; racial origin (Asian or Caucasian); factors that result in premenopausal estrogen deficiency (premenopausal menorrhea, premature menopause, premenopausal oophorectomy etc.); positive family history for osteoporosis; medications such as chronic corticosteroids and phenytoin; lifestyle factors (cigarette smoking, excessive caffeine, lack of exercise, high alcohol intake and low dietary calcium); and prolonged bedrest (immobilization). Independent risk factors for fracture include advanced age; reduced bone mass; history of a prior fracture; psychotropic medications and comorbid conditions associated with unsteadiness on the feet, reduced visual acuity or muscle weakness, which may increase the risk of falling. Finally, conditions that result in poor bone quality, such as vitamin D deficiency resulting in osteomalacia, further increase the likelihood of fracture.

Due to the high prevalence of osteoporosis and its sequelae, osteoporosis results in significant use of health care resources. When repeated fractures occur in the spine, they may cause chronic back pain, increased thoracic kyphosis or "dowager's hump," loss of height and, when the rib cage abuts on the pelvic brim, both gastrointestinal and respiratory complaints due to a change in skeletal shape. The long-term morbidity associated with hip fracture has also been clearly defined. Of those who experience a hip fracture, between 12% and 20% will die of related complications, primarily thromboembolic disease due to immobilization, pneumonia and decubitus ulceration leading to septicemia. In the United Kingdom in 1985, the number of hospitalization days due to hip fracture exceeded that for myocardial infarction, diabetes mellitus and chronic lung disease.[62] Two-thirds of individuals with hip fractures were able to walk without assistance prior to their fracture, compared with only one-third of those who survived to one year. The proportion who were wheelchair-bound or bed-ridden increases from 6% prior to hip fracture to 23% in one-year survivors.[63] The direct cost of hip fractures to the health care system is staggering, estimated at almost $400 million in 1990 for Canadians over the age of 60 (1987 estimates of the cost per hip fracture adjusted for inflation and including rehabilitation). Direct costs for non-hip fractures—and indirect costs for all osteoporotic fractures—have not been studied extensively.

Diagnosis and Management

It is relatively easy to make a diagnosis of osteoporosis when an individual presents with back pain, a history of fractures and an obvious loss of height with spinal deformity. The goal, however, is to make a diagnosis and initiate treatment before this scenario occurs. For this reason, as noted above, extensive research has been carried out to delineate risk factors before osteoporotic fractures occur. Unfortunately, risk factor assessment is not sufficiently sensitive or specific to identify all individuals at increased risk for fracture.[64,65] Approximately one in four women at the age of 50 will have a significant reduction in bone mass as measured by bone densitometry. Only 70% of these women will be correctly identified by risk factor assessment alone,[65,66] while 30% will be missed. However, as already noted, a very clear relationship has been demonstrated between bone mass and risk for future fractures. As such, for patients considered at risk for osteoporosis, or who are concerned about their risk for osteoporosis, it is recommended that measurement of bone mineral density using bone densitometry be carried out to get the best estimate of future fracture risk.

Currently, the "gold standard" for measurement of bone density is dual X-ray absorptiometry, or DEXA.[67-69] Based on the consensus of the Scientific Advisory Board of the Osteoporosis Society of Canada,[70] recommendations for bone densitometry have been developed. Unfortunately, bone density testing is not uniformly available across Ontario.

Once bone loss has been diagnosed, there are three general principles of management. The first is to prevent further bone loss through the use of weight-bearing exercise, modification of lifestyle factors including alcohol intake, smoking and diet, and use of drug therapy. The second is to prevent falls through modalities of occupational and physical therapy and reduction of polypharmacy in the geriatric population. The third is to relieve pain and other symptoms associated with chronic fractures through the use of analgesics, back supports and corsets, exercise and medications. The mainstays of drug therapy for postmenopausal osteoporosis are estrogen replacement therapy and bisphosphonates. In both observational studies and randomized controlled trials, these therapies have proven effective in the prevention of further bone loss and fractures. In the very elderly, nutritional supplementation along with calcium and vitamin D has been proven effective in reducing rates of bone loss and subsequent fractures.[71,72] Many new therapies are currently under investigation.

Discussion

Arthritis and related conditions comprise a large group of conditions affecting the joints, ligaments, tendons, bones and other components of the musculoskeletal system. These conditions are highly prevalent and are responsible for significant utilization of health care resources. Overall, osteoarthritis—when affecting the hips, knees and lower back—and osteoporosis, likely account for the majority of the morbidity and health care costs associated with this group of medical conditions. As the proportion of elderly individuals in the population increases, the number of individuals susceptible to, and affected by, osteoarthritis

and osteoporosis is expected to increase. Greater attention must be focused on prevention and treatment strategies in order to improve these individuals' quality of life, while at the same time helping to contain health care costs.

References

1. Badley EM, Webster GK, Rasooly I. The impact of musculoskeletal disorders in the population: Are they aches and pains? Findings from the 1990 Ontario Health Survey. *J Rheumatol* 1995; 22(4): 733-739.

2. Badley EM, Crotty M. Quantitative estimates of the impact of the aging population on the need for rheumatological services: An international comparison. *Arthritis Rheum* 1994; 35(suppl): S177.

3. Verbrugge LM. Physical and social disability in adults. In Hibbard HH, Nutting PA, Grady ML, editors. *Functional and Health Status Measures for Primary Care.* Washington, D.C.: U.S. Dept of Health and Human Services, 1991.

4. Peyron JG, Altman RD. The epidemiology of osteoarthritis. In Moskowitz RW, Howell DS, Goldberg VM, et al editors. *Osteoarthritis: Diagnosis and Medical/Surgical Management.* 2nd ed. Toronto: WB Saunders Company, 1992: 15-37.

5. Kramer JS, Yelin EH, Epstein WV. Social and economic impacts of four musculoskeletal conditions: A study using national community-based data. *Arthritis Rheum* 1983; 26: 901-907.

6. Liang MH, Larson M, Thompson M et al. Costs and outcomes in rheumatoid arthritis and osteoarthritis. *Arthritis Rheum* 1984; 27: 522-529.

7. Liang MH, Cullen KE, Larson MG et al. Cost-effectiveness of total joint arthroplasty in osteoarthritis. *Arthritis Rheum* 1986; 29: 937-943.

8. Pincus T, Mitchell JM, Burkhauser RV. Substantial work disability and earnings losses in individuals less than age 65 with osteoarthritis: Comparisons with rheumatoid arthritis. *J Clin Epidemiol* 1989; 42: 449-457.

9. Reynolds DL, Chambers LW, Badley EM et al. Physical disability among Canadians reporting musculoskeletal diseases. *J Rheumatol* 1992; 19: 1020-1030.

10. Kelsey JL, Hockberg MC. Epidemiology of chronic musculoskeletal disorders. *Am Rev Public Health* 1980; 91: 379-401.

11. Miles TP, Flagal K, Harris T. *Musculoskeletal Disorders: Time Trends, Comorbid Conditions, Self Assessed Health Status and Associated Activity Limitations: United States, 1992.* U.S. Department of Health and Human Vital and Health Statistics on Older Americans; Series 03; No. 27.

12. LaPlante MP. *Data on Disability from the National Health Interview Survey 1983-1985: An InfoUse Report.* Washington, DC: U.S. National Institute on Disability and Rehabilitation Research, 1988.

13. Schumacher HR, Klippel JH, Koopman WJ (eds). *Primer on the Rheumatic Diseases.* 10th ed. Atlanta: Arthritis Foundation, 1993.

14. Altman R, Alarcon G, Appelrouth D et al. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. *Arthritis Rheum* 1991; 34: 505-514.

15. Altman R, Asch E, Bloch D et al. Development of criteria for the classification and reporting of osteoarthritis: Classification of osteoarthritis of the knee. *Arthritis Rheum* 1986; 29: 1039-1049.

16. Mikkelsen WM, Duff IF, Dodge HJ. Age-sex specific prevalence of radiographic abnormalities of the joints of the hands, wrists and cervical spine of adult residents of the Tecumseh, Michigan, Community Health Study area, 1962-1965. *J Chronic Dis* 1970; 23: 151-159.

17. Gordon T. Osteoarthrosis in U.S. adults. In Bennett PH, Wood PH, editors. *Population Studies of the Rheumatic Disease.* Amsterdam: Excerpta Medica Foundation, 1968.

18. Bergstrom G, Bjelle A, Sorensen LB et al. Prevalence of rheumatoid arthritis, osteoarthritis, chondrocalcinosis and gouty arthritis at age 79. *J Rheumatol* 1986; 13 (3): 527-534.

19. Felson DT, Naimark A, Anderson J et al. The prevalence of knee osteoarthritis in the elderly: The Framingham Osteoarthritis Study. *Arthritis Rheum* 1987; 30(8): 914-918.

20. Hart DJ, Leedham-Green M, Spector TD. The prevalence of knee osteoarthritis (OA) in the general population using different clinical criteria: The Chingford Study [abstract]. *Br J Rheumatol* 1991; 30 (Suppl 2): 72.

21. Rosenthal AM, Ainsley J. Effect of arthritis on hand function in the elderly. *Postgrad Med* 1970; 48 (4): 224-229.

22. Tepper S, Hockberg MC. Factors associated with hip osteoarthritis: Data from the first National Health and Nutrition Examination Survey (NHANES 1). *Am J Epidemiol* 1993; 137: 1081-1088.

23. Oliveria SA, Felson DT, Reed JI et al. Incidence of symptomatic hand, hip, and knee osteoarthritis among patients in a health maintenance organization. *Arthritis Rheum* 1995; 38: 1134-1141.

24. Felson DT, Zhang Y, Hannan MT et al. The incidence and natural history of knee osteoarthritis in the elderly. *Arthritis Rheum* 1995; 38: 1500-1505.

25. Anderson JJ, Felson DT. Factors associated with osteoarthritis of the knee in the first National Health and Nutrition Examination Survey (NHANES 1): Evidence for an association with overweight, race, and physical demands of work. *Am J Epidemiol* 1988; 127: 179-189.

26. Felson DT, Anderson JJ, Naimark A et al. Obesity and knee osteoarthritis: The Framingham Study. *Ann Intern Med* 1988; 109: 18-24.

27. Badley EM, Tennant A. Impact of disablement due to rheumatic disorders in a British population: Estimates of severity and prevalence from the Calderdale Rheumatic Disablement Survey. *Ann Rheum Dis* 1993; 52(1): 6-13.

28. Hochberg MC, Altman RD, Brant KD et al. Guidelines for the medical management of osteoarthritis. Part I: Osteoarthritis of the hip; Part II: Osteoarthritis of the knee. *Arthritis Rheum* 1995; 38: 1535-1546.

29. Lussier A, Cividino AA, McFarlane CA et al. Viscosupplementation with Hylan for the treatment of osteoarthritis: Findings from clinical practice in Canada. *J Rheumatol* 1996; 23: 1579-1585.

30. Insall JN, Binazzi R, Soudry M et al. Total knee arthroplasty. *Clin Orthop* 1985; 192: 13-22.

31. Harris WH, Sledge CB. Total hip and total knee replacement. *N Engl J Med* 1990; 323: 801-807.

32. Hawker GA, Wright JG, Coyte PC et al. Health-related quality of life after knee replacement operations—Results from the Knee PORT Study. *J Bone Joint Surg (Am)* 1998; 80-A: 163-183.

33. Bunker JP, Frazier HS, Mostellar F. Improving health: Measuring effects of medical care. *Milbank Quarterly* 1994; 72: 225-258.

34. Pincus T, Callahan LF. Early mortality in RA predicted by poor clinical status. *Bull Rheum Dis* 1992; 41: 1-4.

35. Dugowson CE, Koepsell TD, Viogt LF et al. Rheumatoid arthritis in women: Incidence rate in group health cooperative, Seattle, Washington, 1987-1989. *Arthritis Rheum* 1991; 34: 1502-1507.

36. Goemaere S, Ackerman C, Goethals K et al. Onset of symptoms of rheumatoid arthritis in relation to age, sex, and menopausal transition. *J Rheumatol* 1990; 17: 1620-1622.

37. Mitchell DM. Epidemiology, Rheumatoid Arthritis, Etiology, Diagnosis and Treatment. Edited by PD Utsinger, NJ Zvaifler, GE Ehrlich. Philadelphia: JB Lippincott Co., 1985: 133-150.

38. Harris ED Jr. Mechanisms of disease: Rheumatoid arthritis—pathophysiology and implications for therapy. *N Engl J Med* 1990; 322: 1277-1289.

39. Walport MJ, Ollier WER, Silman AJ. Immunogenetics of rheumatoid arthritis and the Arthritis and Rheumatism Council's National Repository. *Br J Rheumatol* 1992; 31: 701-705.

40. Fries JF, Williams CA, Ramey DR et al. The relative toxicity of alternative therapies for rheumatoid arthritis: Implications for the therapeutic progression. *Semin Arthritis Rheum* 1993; 23 (Suppl 1): 68-73.

41. Fitzcharles MA, Esdaile JM. Atypical presentations of polymyalgia rheumatica. *Arthritis Rheum* 1990; 33: 403-406.

42. Khan MA, editor. Ankylosing spondylitis and related spondylarthropathies. In *Spine: State of the Art Reviews.* Philadelphia: Hanley and Belfus, Inc., 1990: 497-688.

43. Michet CJ, Machado EBV, Ballard DJ et al. Epidemiology of Reiter's syndrome in Rochester, Minnesota: 1950-1980. *Arthritis Rheum* 1988; 31: 428-431.

44. Fessel WJ. Systemic lupus erythematosus in the community: Incidence, prevalance, outcome, and first symptoms: The high prevalence in black women. *Arch Intern Med* 1974; 134: 1027-1035.

45. Reveille JD, Bias WB, Winkelstein JA et al. Familial systemic lupus erythematosus: Immunogenetic studies in eight families. *Medicine* 1983; 62: 21-35.

46. Kimberly RP. Treatment: Corticosteroids and anti-inflammatory drugs. *Rheum Dis Clin N Amer* 1988; 14: 203-221.

47. Forseth KO, Gran JT. The prevalence of fibromyalgia among women aged 20-49 years in Arandal, Norway. *Scand J Rheumatol* 1992; 21: 74-78.

48. Smythe HA. Non-articular rheumatism and psychogenic musculoskeletal syndromes. In McCarty DJ, editor. *Arthritis and Allied Conditions: A Textbook of Rheumatology.* Philadelphia: Lea and Febiger, 1979: 881-891.

49. Wolfe F, Smythe HA, Yunus MB et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia: Report of the Multicenter Criteria Committee. *Arthritis Rheum* 1990; 33: 160-172.

50. Yunus MB, Masi AT, Aldag JC. A controlled study of primary fibromyalgia syndrome: Clinical features and association with other functional syndromes. *J Rheumatol* 1989; 16 (Suppl 19): 62-71.

51. McCain GA. Role of physical fitness training in the fibrositis/fibromyalgia syndrome. *Am J Med* 1986; 81 (Suppl 3A): 73-77.

52. Furaccioli G, Chirelli L, Scita F et al. EMG-biofeedback training in fibromyalgia syndrome. *J Rheumatol* 1987; 14: 820-825.

53. Nielson WR, Walker C, McCain GA. Cognitive behavioural treatment of fibromyalgia syndrome: Preliminary findings. *J Rheumatol* 1991; 19: 98-103.

54. Goldenberg DL, Felson DT, Dinerman H. A randomized, controlled trial of amitriptyline and naproxen in the treatment of patients with fibromyalgia. *Arthritis Rheum* 1986; 29: 1371-1377.

55. Bennett RM, Gatter RA, Campbell SM et al. A comparison of cyclobenzaprine and placebo in the management of fibrositis. *Arthritis Rheum* 1988; 31: 1535-1542.

56. Felson DT, Goldenberg DL. The natural history of fibromyalgia. *Arthritis Rheum* 1986; 29: 1522-1526.

57. Anonymous. Proceedings of a symposium, Consensus Development Conference on Osteoporosis. Oct 19-20, 1990, Copenhagen, Denmark. *Am J Med* 1991; 91(5B): 15-68S.

58. Kanis JA. Pathogenesis of osteoporosis and fracture. In Kanis JA, editor. *Osteoporosis.* Oxford (UK): Blackwell Science Ltd., 1994: 34.

59. Melton LJ, Chrischilles EA, Cooper C et al. Perspective: How many women have osteoporosis? *J Bone Miner Res* 1992; 7: 1005-1010.

60. Tennenhouse AM. Overview of epidemiology, morbidity and mortality of osteoporosis in Canada: A look to the 90s symposium; Canadian update on osteoporosis: Diagnosis and management for the 90s in Ontario. 1991.

61. Stevenson JC, Lees B, Devenport M et al. Determinants of bone density in normal women: Risk factors for future osteoporosis. *Br Med J (Clin Res)* 1989; 298: 924-928.

62. Department of Health and Social Security, Office of Population Censuses and Surveys, United Kingdom, 1985.

63. Paiment GD, Chevrier N, Lorrain J et al. Osteoporosis: A preventable consequence of menopause. *J Soc Obstet Gynecol C* 1993; 15: 985-993.

64. Wasnich RD, Ross PD, Vogel JM et al. The relative strengths of osteoporotic risk factors in a prospective study of postmenopausal osteoporosis. *J Bone Miner Res* 1987; 2 (Suppl 1): 343.

65. Johnston CC, Melton LJ III, Lindsay R et al. Clinical indications for bone mass measurement: A report from the Scientific Advisory Board of the National Osteoporosis Foundation. *J Bone Miner Res* 1989; 4 (Suppl 2); 1-28.

66. Slemenda CW, Hui SL, Longscope C et al. Predictors of bone mass in perimenopausal women: A prospective study of clinical data using photon absorptiometry. *Ann Int Med* 1990; 112: 96.

67. Genant HK, Block JE, Steiger P et al. Appropriate use of bone densitometry. *Radiology* 1989; 170: 817-822.

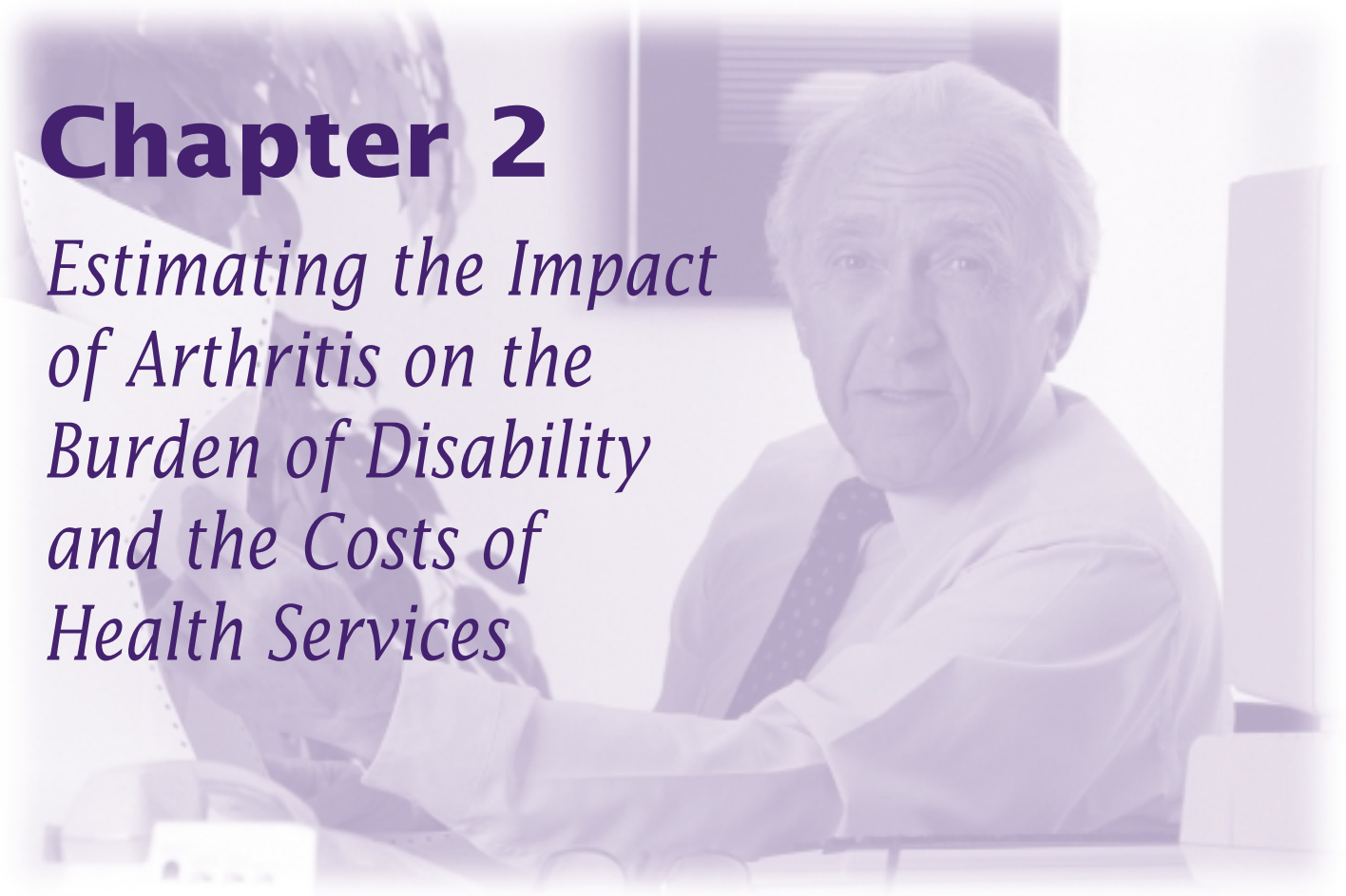
68. Wahner HW, Dunn WL, Brown ML et al. Comparison of dual energy X-ray absorptiometry and dual photon absorptiometry for bone mineral measurements of the lumbar spine. *Mayo Clin Proc* 1988; 63: 1075-1084.

69. Mazess R, Collick B, Trempe J et al. Performance evaluation of a dual energy X-ray bone densitometer. *Calcif Tissue Int* 1989; 44: 228-232.

70. Osteoporosis Society of Canada. Prevention and management of osteoporosis: Consensus statements from the Scientific Advisory Board of the Osteoporosis Society of Canada. 1996; 155 (Suppl): 921-965.

71. Dawson-Hughes B, Harris SS, Krall EA et al. Effect of calcium and vitamin D supplementation on bone density in men and women 65 years of age or older. *N Engl J Med* 1997; 337: 670-676.

72. Chapuy MC, Arlot ME, Duboeuf F et al. Vitamin D3 and calcium to prevent hip fractures in elderly women. *N Engl J Med* 1992; 327: 1637-1642.



Chapter 2

Estimating the Impact of Arthritis on the Burden of Disability and the Costs of Health Services

Overview

Surveys in Canada, England, and the United States[1-4] have consistently demonstrated that arthritis and related conditions are among the most common chronic medical conditions. Their impact is seen in self-perceptions of health, role limitations, restrictions in activities and functional limitations.[5] In this chapter, we obtained personal health information provided by individuals with and without arthritis, and combined it with information about the respondents' subsequent use of health services in order to directly estimate the relative burden and costs of the disease.

Data Source and Methods

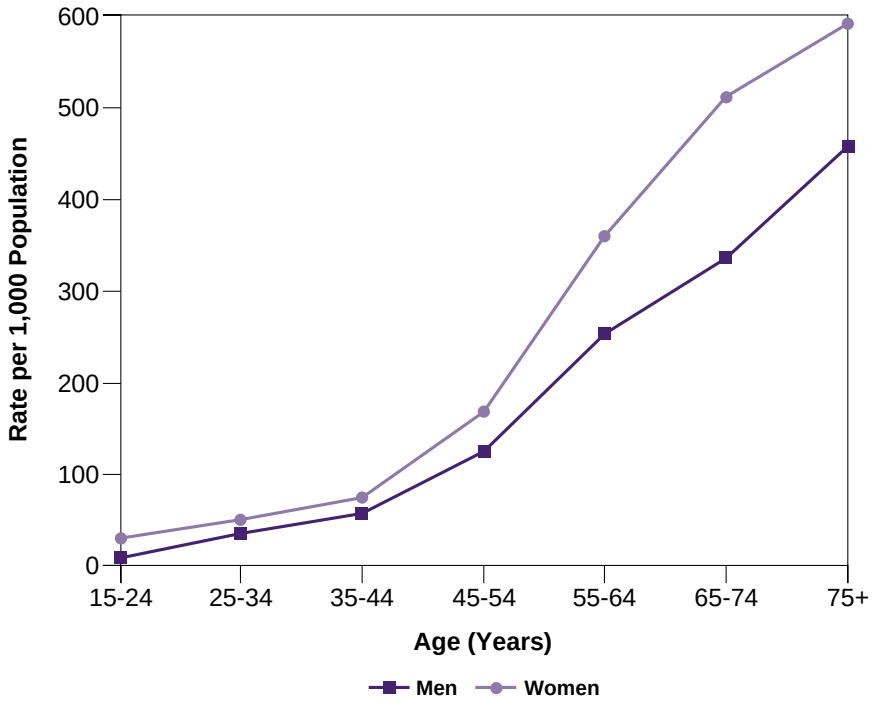
Our data source for the personal health information was the National Population Health Survey (NPHS), which was conducted by Statistics Canada between June 1994 and June 1995.[6] This survey was carried out across Canada excluding people living on Native Indian reserves, in remote areas and in institutions. Technical information about the methods can be found in Appendix A2.1. The NPHS had two parts. In the first part, one person in each participating household provided demographic and health information about all members of the household. In the second part, one person in each household, 12 years of age and over, completed a detailed questionnaire about their health. The individual was also asked for their health card number and permission to link the questionnaire responses to health care administrative data for research purposes. In collaboration with provincial ministries of health, Statistics Canada created files, called NPHS sharing files, with the questionnaire responses and the health card numbers. Through a special research agreement with the Ontario Ministry of Health, we obtained a copy of the NPHS sharing file for Ontario, and extracted information from health care administrative data for the 4,473 respondents with valid health card numbers who were 15 years of age or over at the time of the interview. In response to the question "Do you have arthritis/rheumatism diagnosed by a health professional?" 19% of the respondents answered yes. From this, we calculated age- and sex-specific rates for arthritis. In addition, we selected variables from the NPHS that are related to both the prevalence of arthritis and the uses of health services.[1-4] These variables included demographic factors (age, sex, highest level of education attained, total household income, marital status, current main activity and work status in the past year) and health factors (self-reported health status, restrictions in activity, long-term disability, severity of pain, pain medications used, concurrent chronic conditions, chronic stress, depression and score on the Health Utility Index).

We then linked the data in the NPHS sharing file for Ontario with health care administrative data for the 24 months following the survey interview dates. These data included: the Discharge Abstract Data for hospital inpatients and same-day surgery patients, obtained from the Canadian Institute for Health Information (CIHI); claims data for professional and laboratory services, obtained from the Ontario Health Insurance Plan (OHIP); and prescription drug claims for respondents 65 years of age and over, obtained from the Ontario Drug Benefit program (ODB).

We searched the CIHI Discharge Abstract Data to identify all separations from hospitals during the two-year follow-up period. The diagnosis most responsible for hospitalization is coded according to the International Classification of Diseases-9th revision (ICD-9), so we used the ICD-9 codes provided by the hospitals to group patients broadly by reason for hospital stay. Services related to pregnancy can skew utilization rates for younger women; therefore we flagged hospital separations for all diagnoses related to pregnancy and excluded them from the study.

Four steps were required to estimate the costs of hospital services. The first step was to group the reasons for hospital use into clinically homogeneous categories. For inpatient services, CIHI developed Case Mix Groups® for clustering ICD-9 codes for most responsible diagnosis for admission into clinically meaningful categories. For same-day surgery services, CIHI groups patients into Day Procedure Groups®.[7] The second step was to indicate the level of resources required for typical patients. CIHI developed two sets of Resource Intensity Weights® (RIWs®) for this purpose, one for Case Mix Groups® (CMGs®) and one for Day Procedure Groups® (DPGs).[8] For the third step, the Joint Planning and Policy Committee of the Ministry of Health and the Ontario Hospital Association related the Resource Intensity Weights® to the global budget of each hospital in Ontario, to derive the Actual Cost per Weight Case with the Resource Intensity Weight® of 1.0.[9] For the fourth and last step, we identified hospitals that provided inpatient and same-day surgery services to NPHS respondents and multiplied the hospital-specific Actual Cost per Weighted Cost by each Resource Intensity Weight® to estimate the costs of acute hospital services for the participants in the study. (It should be noted that admissions to rehabilitation facilities, chronic hospitals and other long-term care settings were excluded from this analysis.)

Exhibit 2.1: ***Age/Sex-specific Arthritis Rates per 1,000 Population 15 Years and Over in Ontario, 1994/95***



Data Source: National Population Health Survey

The costs for professional services and laboratory services were calculated from the fees claimed in the OHIP billings. It should be noted that the cost estimates come from the fees billed, not from the actual amounts paid to the professionals and laboratories. As we had done with the hospital data, we flagged all claims for pregnancy-related services and excluded them from the analysis.

The cost estimates for drugs included both the drug costs and the prescription fees included in ODB claims. Nearly all seniors in the survey had at least one prescription claim submitted to the ODB. In addition to obtaining the total number of prescriptions, we grouped the drugs into broad Pharmaceutical Classification Groups. We were not able to obtain information about the uses and costs of nonprescription drugs consumed during the study period. Drug use data for persons under 65 years of age were not available.

In our analyses of these data, we calculated age- and sex-specific rates of utilization of health services for individuals with and without arthritis. As arthritis is not an isolated condition but is concomitant with other chronic conditions and related health states, we did not attempt to statistically control for these conditions and states. The analyses have been weighted for the design effects of the NPHS. From weighted analyses, we can generalize the uses of services and their costs for the Ontario population with and without arthritis.

Exhibit 2.2: ***Demographic, Social and Economic Indicators of National Population Health Survey Respondents With and Without Arthritis by Sex in Ontario, 1994/95***

	Arthritis		No Arthritis	
	Women (%)	Men (%)	Women (%)	Men (%)
Age in Years				
15 to 24	2.8	1.5	19.4	19.3
25 to 34	5.8	7.1	24.5	24.2
35 to 44	8.6	10.6	23.4	22.7
45 to 54	13.8	17.2	15.1	15.8
55 to 64	21.6	23.2	8.6	9.0
65 to 74	27.0	25.8	5.8	6.8
75 and Over	20.4	14.6	3.2	2.3
Marital Status				
Married	51.0	78.1	55.9	57.8
Common Law	2.8	1.7	3.9	4.8
Single	6.0	7.0	26.0	30.5
Separated, Divorced, Widowed	40.2	13.2	14.2	6.9
Highest Level of Education				
High School Incomplete	39.4	33.7	25.7	25.1
High School Complete	17.6	75.5	17.7	15.1
Some Post Secondary	19.1	22.4	26.4	24.1
College or University Degree	23.9	36.4	30.1	35.5
Not Stated	0.0	0.0	0.1	0.2
Total Household Income				
Under $10,000	6.8	4.8	4.8	3.7
$10,000 to $19,999	24.6	15.4	13.4	7.4
$20,000 to $29,999	21.7	21.2	10.0	11.6
$30,000 to $39,999	11.6	14.6	12.6	12.1
$40,000 to $49,999	8.9	11.6	12.1	13.6
$50,000 to $59,999	4.7	6.7	13.4	13.0
$60,000 to $79,999	9.5	13.4	14.4	15.3
$80,000 +	9.8	9.7	16.0	18.0
Not Stated	2.3	2.6	3.4	5.5
Current Main Activity				
Caring for Family	24.9	1.2	24.3	1.4
Working for Pay	12.9	33.7	26.8	56.7
Working/Caring for Family for Pay	8.2	7.8	23.0	10.1
Going to School	0.7	1.6	13.3	13.4
Recovering From Illness, Disability	6.9	7.1	1.8	2.0
Looking for Work	1.4	1.2	1.6	4.2
Retired	43.1	45.8	8.4	10.8
Other	2.0	1.7	0.9	1.5
Not Stated	0.0	0.0	0.0	0.0
Number of Respondents	**574**	**277**	**1,907**	**1,715**
Population Estimates	**806,716**	**490,794**	**3,589,413**	**3,705,267**

Data Source: National Population Health Survey, Statistics Canada

Findings

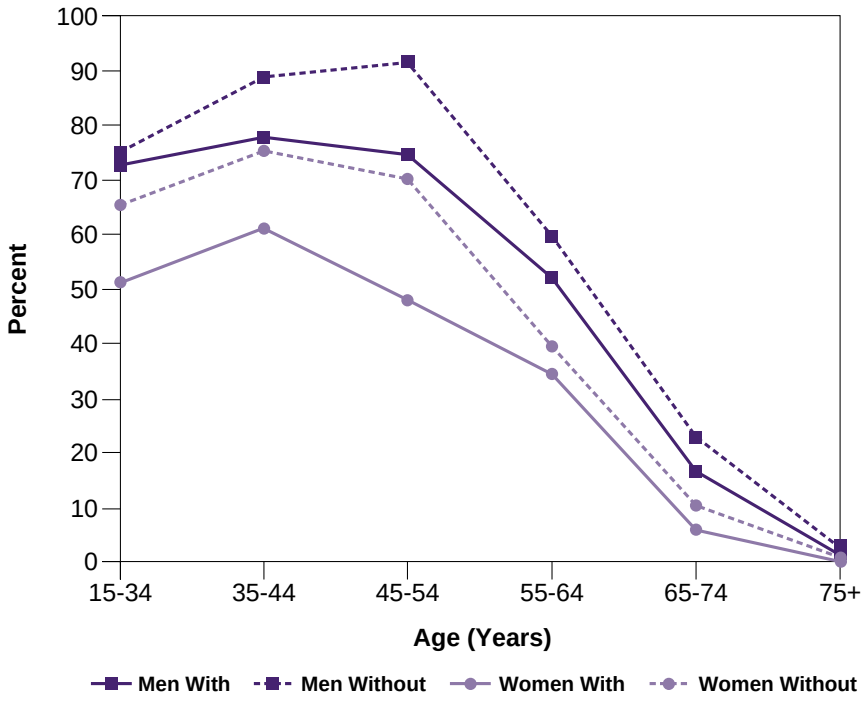
Exhibit 2.1 shows the prevalence rates of arthritis for men and women by age. The prevalence increases markedly after age 45. The rates are higher for women than men at all ages, and this difference increases in the older age groups. Among respondents 75 years or over, 46% of the men and 59% of the women reported that they have arthritis.

Exhibit 2.2 displays the demographic characteristics of respondents. While slightly more than half of those without arthritis were women (53%), there were more women (67%) than men (33%) among those with arthritis. Individuals who had arthritis were markedly older than those who did not. In the arthritis group, 45% were 65 years of age and over, whereas in the group without arthritis 45% were under 35. Of those with arthritis, 47% of the women versus 40% of the men were 65 years of age or over.

With respect to marital status, about 60% of people without arthritis were either married or in a common-law relationship. Men with arthritis were more likely to be married. With respect to education and income, compared to people without arthritis, people with arthritis were more likely to have less than a secondary education and to have a lower level of income. With respect to current main activity, of those without arthritis, about half of the women and two-thirds of the men were working for pay, about 25% of the women were caring for their families and 13% of both men and women were going to school. Of those with arthritis, about 45% were retired, while about 40% of the men and 21% of the women were working for pay.

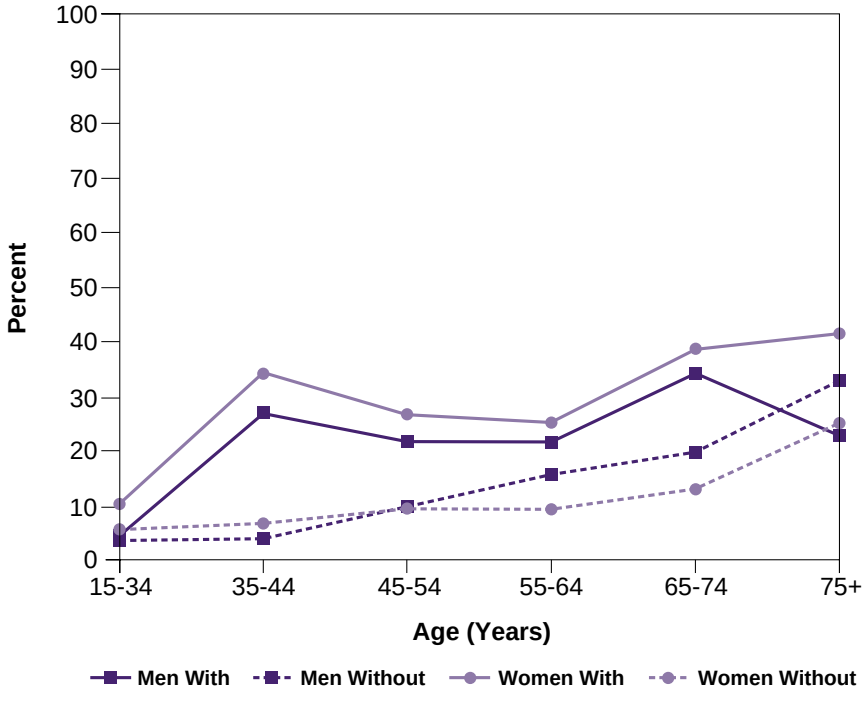
In addition to the data displayed in Exhibit 2.2, we determined that almost all of the respondents spoke English, with two-thirds speaking English only. About 70% of respondents had been born in Canada; of the remainder, the majority had immi-

Exhibit 2.3: ***Age/Sex-specific Percentages of Persons With and Without Arthritis Who Worked in the Past Year 15 Years and Over in Ontario, 1994/95***



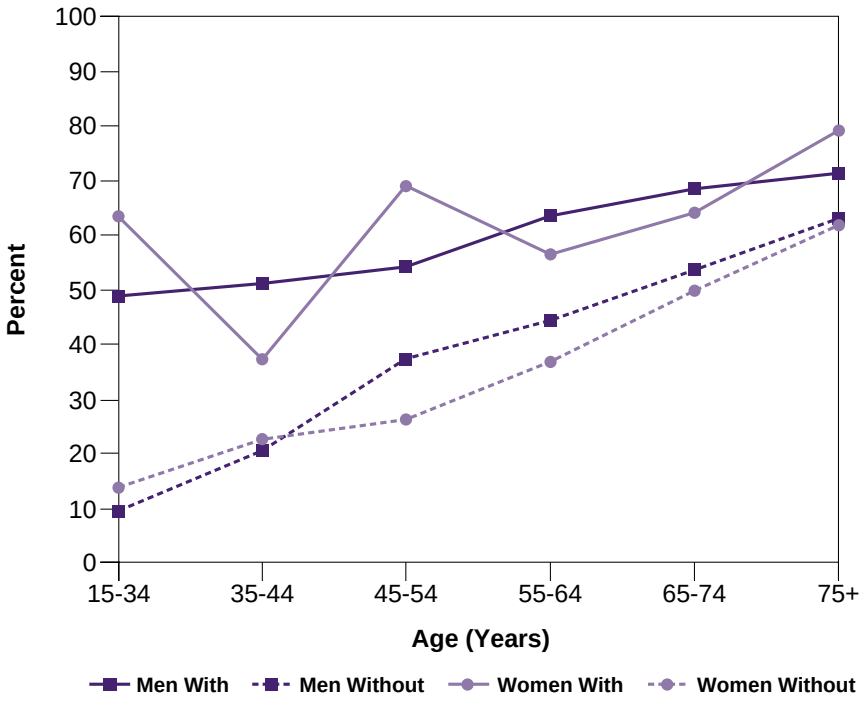
Data Source: National Population Health Survey

Exhibit 2.4: ***Age/Sex-specific Percentages of Persons With and Without Arthritis Who Rate Health as Fair or Poor 15 Years and Over in Ontario, 1994/95***



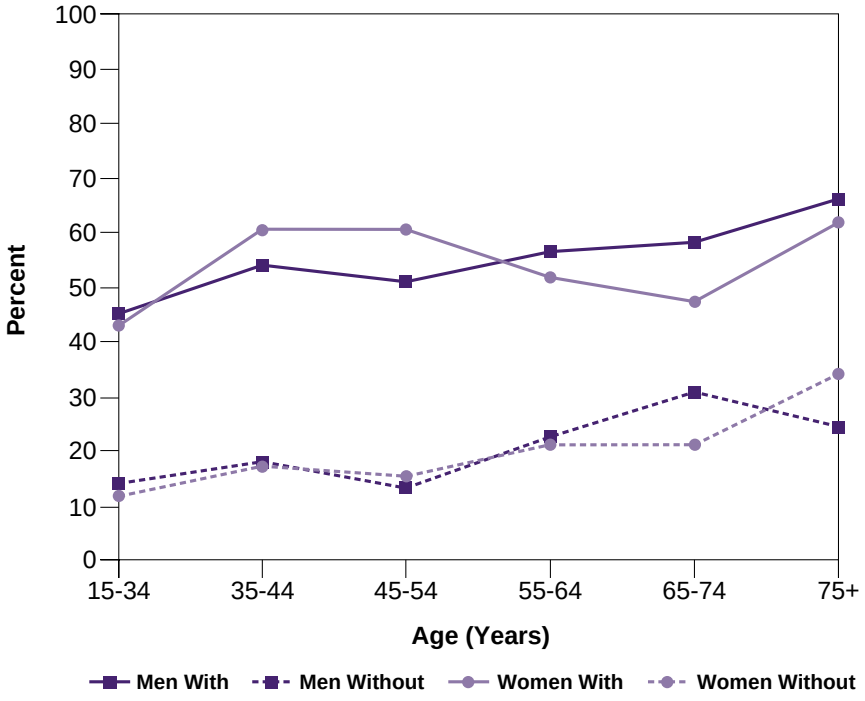
Data Source: National Population Health Survey

Exhibit 2.5: ***Age/Sex-specific Percentages of Persons With and Without Arthritis with Chronic Conditions 15 Years and Over in Ontario, 1994/95***



Data Source: National Population Health Survey

Exhibit 2.6: ***Age/Sex-specific Percentages of Persons With and Without Arthritis with Restrictions in Activity 15 Years and Over in Ontario, 1994/95***



Data Source: National Population Health Survey

grated from Europe, the United States, Mexico and the other Americas. There were no significant differences in these demographic factors between the arthritis and the non-arthritis groups.

Exhibit 2.3 displays the rates of respondents who worked for pay in the past year. Given the small number of people under 35 with arthritis, we combined the age categories of 15 to 24 years and 25 to 34 years into one age group. By age 45, the work rate began to decline in all groups and at all ages, with the rates being lower for women than for men. Overall, people who had arthritis worked less than people who did not have it. These differences diminish after age 65.

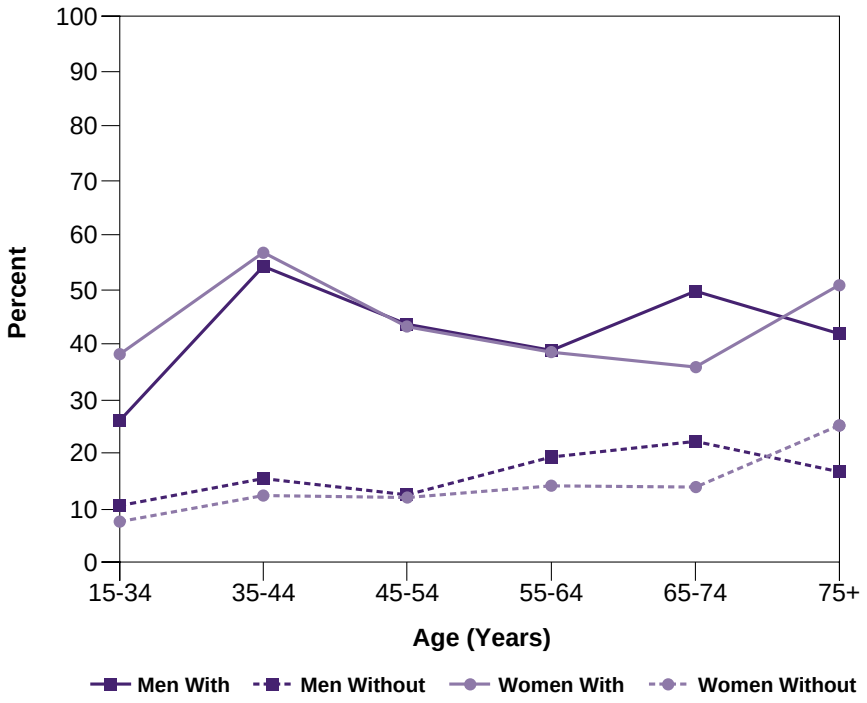
Respondents were asked to rate their health as "excellent", "very good", "good", "fair" or "poor". Ratings of very good and excellent correspond to "normal" health, while ratings of fair or poor indicate health mitigated by illness or chronic conditions.[10] Exhibit 2.4 shows the percentages of respondents who gave self-ratings of fair or poor. For people without arthritis, the percentages reporting fair or poor health increased slightly with age. Men over the age of 45 without arthritis rated their health as being fair or poor more often than women did. For people with arthritis, the proportion with self-ratings of fair or poor health were generally higher than for people without arthritis. For arthritic women, the rates increased to 42% for those 75 years of age and over, while for arthritic men, the reported rates of poorer health did not increase with age.

Respondents were asked about a range of chronic conditions in addition to arthritis. In analyses of the National Health Interview Survey in the United States for selected years from 1969 through 1993, Verbrugge[11] identified a series of conditions more commonly found in people with arthritis than in the general population. These included high blood pressure, hearing impairment, vision disease, ischemic heart disease and

diabetes. Among the chronic conditions listed in the NPHS, we found that persons with arthritis were more likely to report they had back pain, diabetes, high blood pressure, heart disease and ulcers than persons without arthritis. We counted the number of these five conditions reported by people with and without arthritis. The reported presence of these existing conditions are displayed in Exhibit 2.5. In the youngest age group, 49% of men and 63% of women with arthritis had one or more of these conditions, as compared to 10% of men and 14% of women without arthritis. The rates increased significantly with age in men and women without arthritis, but increased only marginally for those with arthritis. By age 75, over half of all people had one or more of these conditions, but those with arthritis were still more likely to have them.

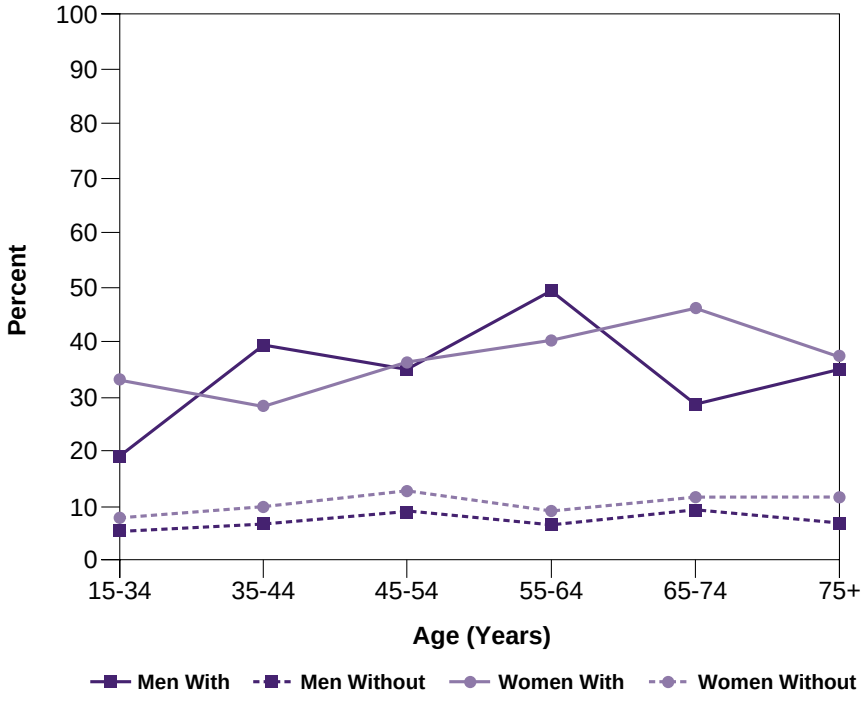
Questions in the NPHS that related to activity restrictions and long-term disability are displayed in Appendix A2.1. Respondents were classified as having activity restrictions if they reported being limited at home, at school, at work or in other activities by physical conditions, mental conditions or health problems lasting six months or longer. They were classified as having long-term disabilities if they stated that they had long-term disabilities or handicaps. Exhibit 2.6 shows the age-specific rates of activity restrictions for men and women with and without arthritis, and Exhibit 2.7 displays the same data for long-term disability. For people with arthritis, the rates of restricted activity in the youngest age category were 43% for women and 45% for men, and increased to over 60% for those 75 years and over. For people without arthritis over the same ages, the rates increased from 11% to 34% for women and from 14% to 25% for men. A different pattern holds for long-term disability rates: about 40% of both women and men with arthritis reported long-term disability, with the rates being lower for those in the youngest age group.

Exhibit 2.7: ***Age/Sex-specific Percentages of Persons With and Without Arthritis with Long-Term Disability 15 Years and Over in Ontario, 1994/95***



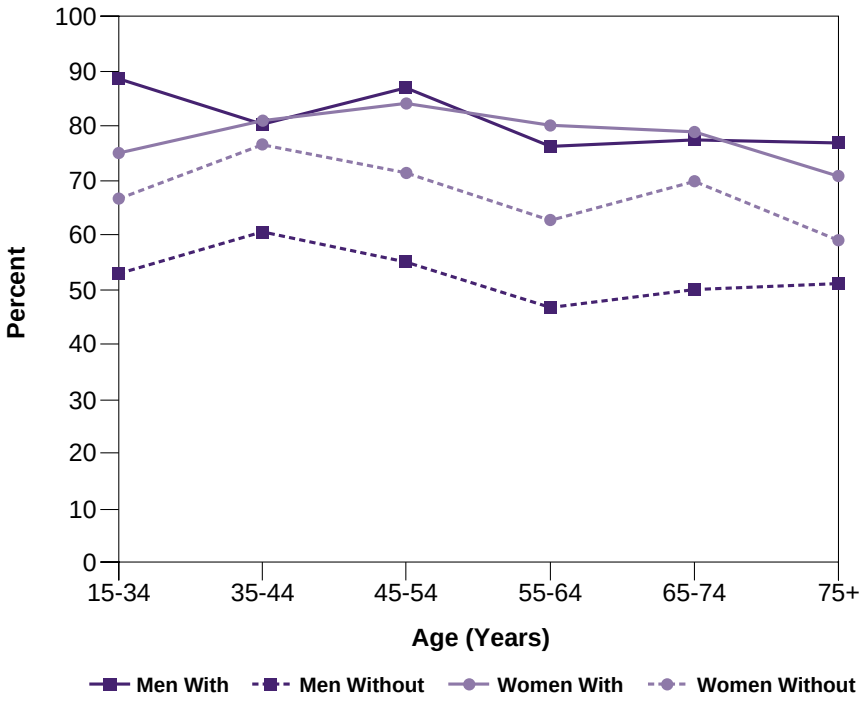
Data Source: National Population Health Survey

Exhibit 2.8: ***Age/Sex-specific Percentages of Persons With and Without Arthritis with Moderate to Severe Pain 15 Years and Over in Ontario, 1994/95***



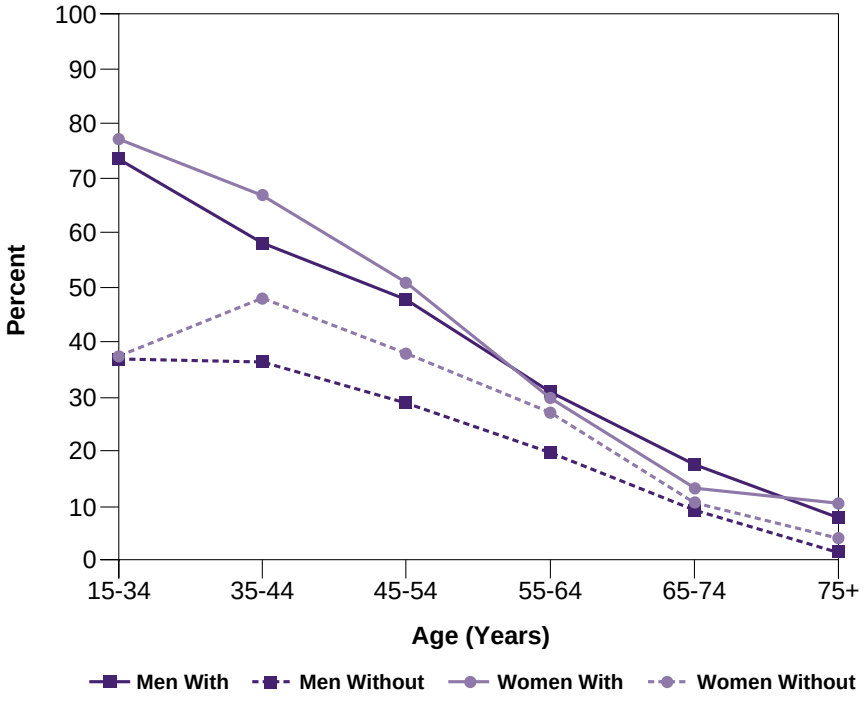
Data Source: National Population Health Survey

Exhibit 2.9: ***Age/Sex-specific Percentages of Persons With and Without Arthritis Taking Medication for Pain 15 Years and Over in Ontario, 1994/95***



Data Source: National Population Health Survey

Exhibit 2.10: ***Age/Sex-specific Percentages of Persons With and Without Arthritis Experiencing Some Chronic Stress 15 Years and Over in Ontario, 1994/95***



Data Source: National Population Health Survey

The rates were substantially lower for people without arthritis at all ages.

Responses to the questions about severity of pain are displayed in Exhibit 2.8. For people without arthritis, the percentages of individuals reporting moderate or severe pain ranged between 5% and 13%, at all ages. The rates of moderate or severe pain were three to four times higher for people with arthritis, and did not change markedly with age. Respondents were also asked if they had taken medication to relieve pain within the last month. The rates for reporting use of pain medication are displayed in Exhibit 2.9. About 65% of women and 50% of men without arthritis reported using pain medication, compared to about 75% to 80% of both men and women with arthritis, regardless of age.

Measures of stress and depression were used to estimate the psychological and social dimensions of health. Respondents were asked a series of questions related to personal, familial and social sources of stress in their lives, and the responses were aggregated into the Derived Chronic Stress Index, which has scores ranging from 0 (no stress) to 11 (high stress). We defined a score of 3 or higher as indicating some chronic stress; 40% of all respondents scored below 3. The percentages of people experiencing stress are shown in Exhibit 2.10. Chronic stress declined with age. In the younger age groups, people with arthritis were more likely to report stress than people without arthritis, but by age 55, the differences were minimal. There were no systematic differences by sex.

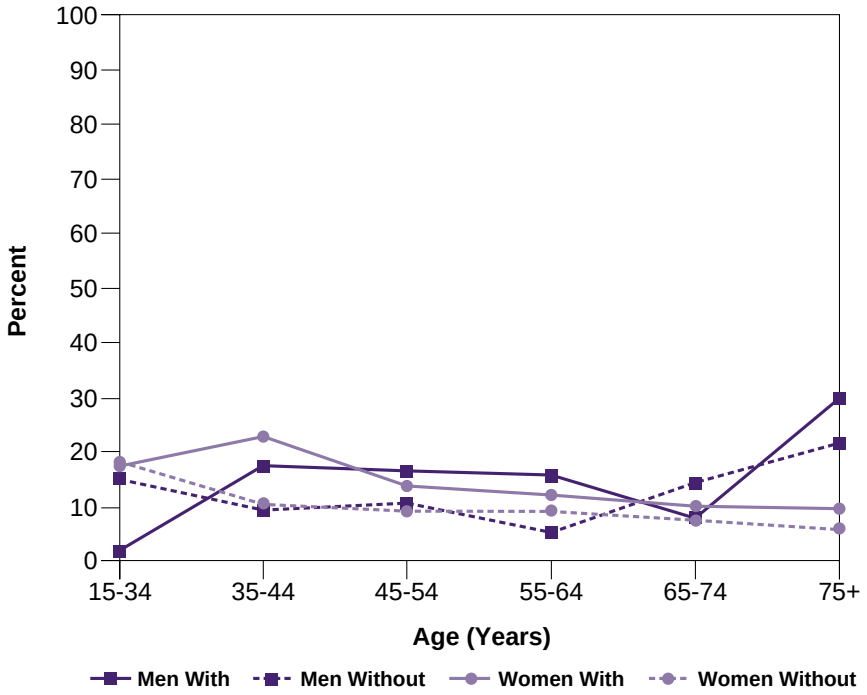
Kessler and Mroczek[12] selected a subset of items from the Composite International Diagnostic Interview (CIDI) to define a major depressive episode. The CIDI was designed to produce diagnoses according to the definitions and criteria of both DSM-III-R and the Diagnostic Criteria for Research of the ICD-10. Kessler and Mroczeck translated the scores for the Depression Scale into probabilities

of "caseness" of depression. Fewer than 10% of the respondents had probabilities of caseness equal to or greater than 0.25. Exhibit 2.11 shows the percentages of respondents with probabilities of caseness of 0.25 or higher. For women, the percentages declined with age, while for men they fluctuated with age and increased for those 75 years of age or older. There were no apparent differences in these trends between people with and without arthritis.

The Health Utility Index (HUI)[13-14] is a generic health status measure designed to assess quantitative and qualitative aspects of life. This index has items to describe functional states with respect to vision, hearing, speech, mobility, dexterity, cognition, emotion, pain and discomfort. The responses are weighted, and the derived score describes the individual's overall functional health status. The scores range from 0.0 (worst health state, death) to 1.0 (best state, full health). Kopec and his colleagues[15] are exploring various cutoffs for the HUI and their interpretation, and suggest that scores less than 0.830 be taken as indicative of disability. Using this cutoff, we looked at the rates of disability in people with and without arthritis by age and sex; the results are displayed in Exhibit 2.12. For people with arthritis, the rates of disability started at 25% for the youngest age category and increased to over 50% for those 75 years of age or older. There was no clear pattern by sex. For people without arthritis, the rates were lower, less than 15%, and did not increase with age until after age 55; the rates were marginally higher for women than men, and this difference increased with age.

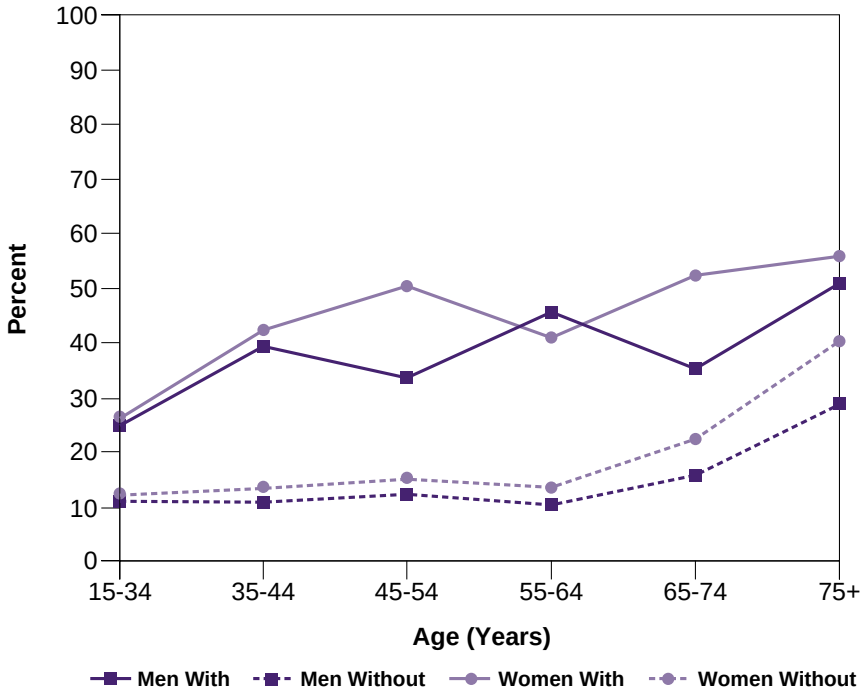
There were four patterns that emerged from the reports on personal health information. First, the prevalence of arthritis increased with age, with the preponderance of cases seen in people 65 years of age and over. Second, the rates were higher for women than men. Third, disabilities concomitant with arthritis were relatively high at

Exhibit 2.11: ***Age/Sex-specific Percentages of Persons With and Without Arthritis with Case Depression 15 Years and Over in Ontario, 1994/95***



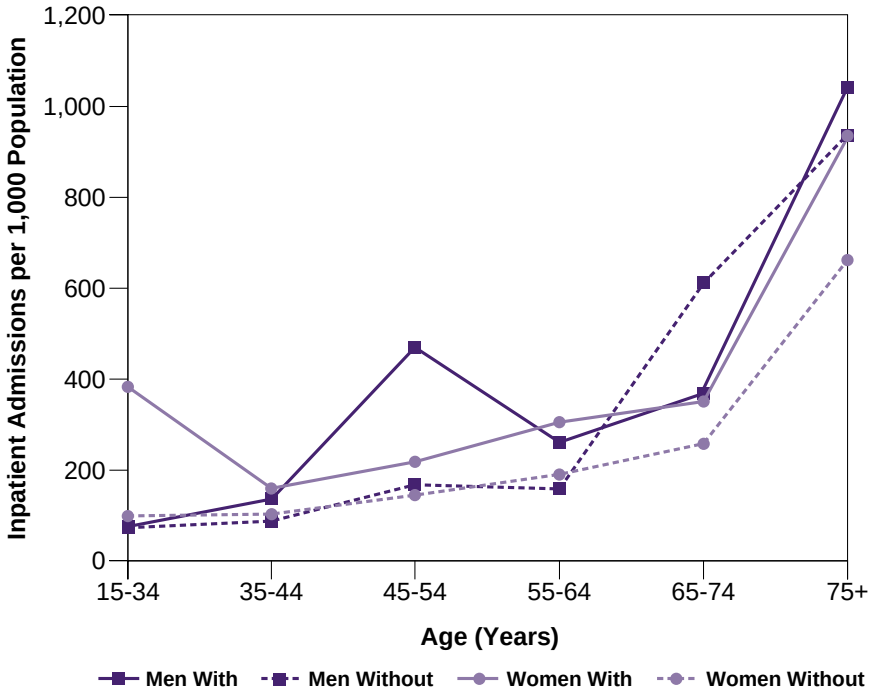
Data Source: National Population Health Survey

Exhibit 2.12: ***Age/Sex-specific Percentages of Persons With and Without Arthritis with Disability Score on Health Utility Index (<0.830) 15 Years and Over in Ontario, 1994/95***



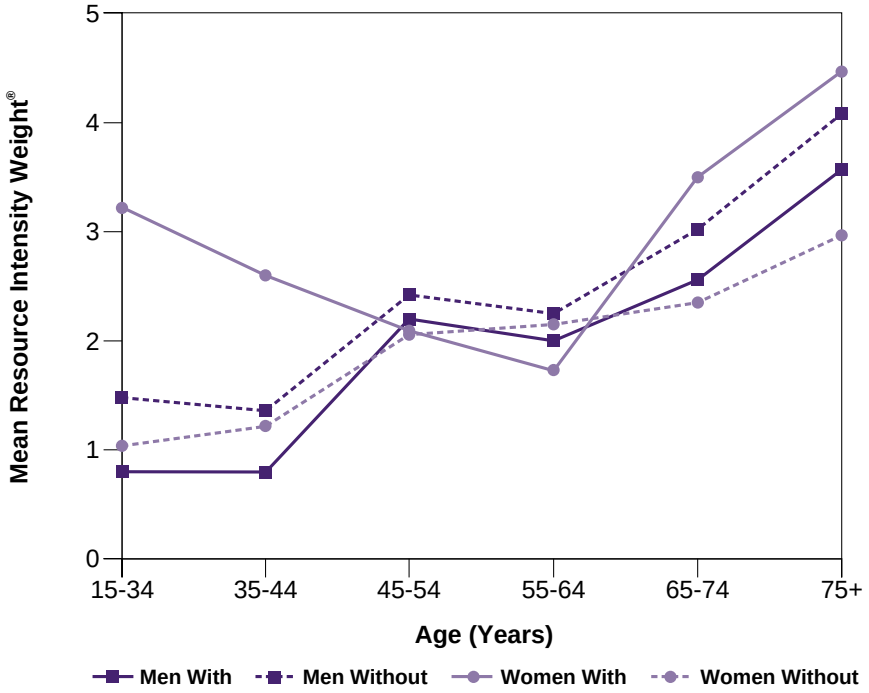
Data Source: National Population Health Survey

Exhibit 2.13: ***Age/Sex-specific Percentages of Inpatient Admissions Over Two Years per 1,000 Persons With and Without Arthritis 15 Years and Over in Ontario, 1994/95 – 1996/97***



Data Source: Canadian Institute for Health Information, National Population Health Survey

Exhibit 2.14: ***Age/Sex-specific Percentages of Mean Resource Intensity Weights® per Inpatient Admission for Persons With and Without Arthritis 15 Years and Over in Ontario, 1994/95 – 1996/97***



Data Source: Canadian Institute for Health Information, National Population Health Survey

all ages, but the disparities between people with and without arthritis were greatest in the younger age groups and declined with age. Last, the burden of arthritis manifested itself in pain, impaired physical functioning and restriction of activities, and was compounded by the presence of co-morbid chronic conditions.

About 25% of people with arthritis and 10% of people without arthritis had at least one hospital inpatient admission during the two-year follow-up period; after adjusting for marked age and sex differences in the two groups, these figures were 17.1% and 11.0%, respectively. When all hospital admissions were considered, including people with multiple overnight admissions, the inpatient rates were 281 admissions per 1,000 people with arthritis and 171 per 1,000 people without arthritis, after adjusting for age and sex.

Exhibit 2.13 displays total inpatient admissions. As expected, the admission rates for all respondents increased with age. For women, the rates were higher for those with arthritis than for those without it, at all ages; for men, the rates were higher for those with arthritis at some ages and higher for those without it at other ages.

We looked at the discharge records, which indicated the diagnosis most responsible for the hospital stay, to gain some insight regarding the conditions for which people with arthritis were more likely to have higher inpatient admission rates. There were a large number of diagnoses listed and, for most of them, the number of admissions was too small for the rates to be statistically reliable. However, some comparisons by diagnostic groupings by ICD-9 chapter were possible. In examining the age- and sex-adjusted rates, we found that people with arthritis were more likely to be hospitalized for circulatory, digestive and psychiatric problems than were those without arthritis. The circulatory problems reflected ischemic heart disease in general and acute myocardial infarction in

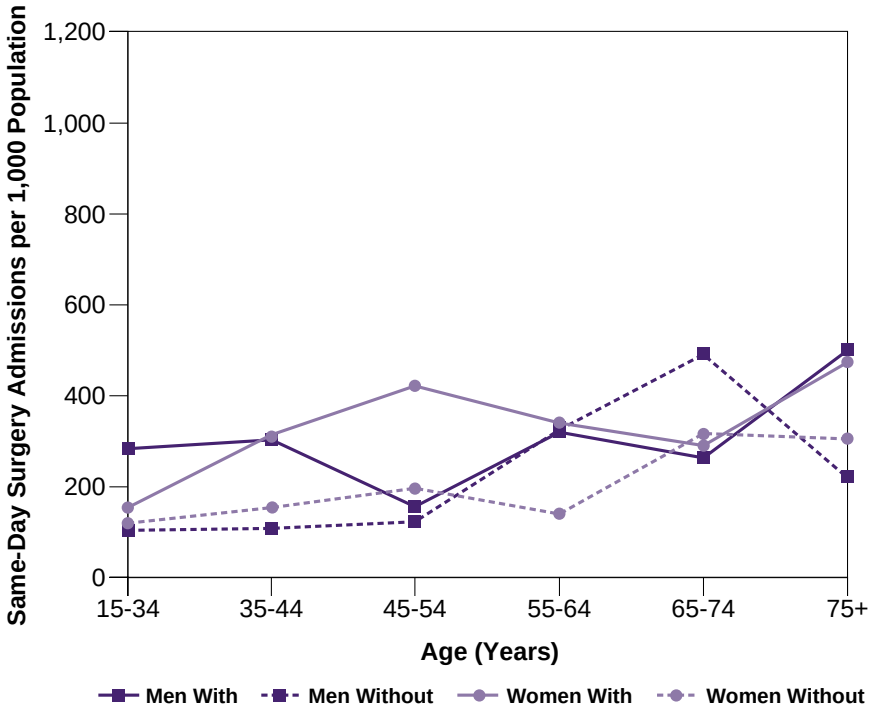
particular; the digestive disorders were related to hemorrhage and gastritis; and the psychiatric problems were reactive disorders in general and depression in particular.

We examined the Resource Intensity Weights® to determine if the admissions for people with arthritis were more complex and called for more resources than admissions for those without arthritis. Exhibit 2.14 displays the mean Resource Intensity Weights® per inpatient admission. For women, these values were higher for those with arthritis than for those without it, particularly in the youngest and oldest age groups. For men, the values were marginally higher for those without arthritis at all ages.

With regard to same-day surgery rates, we found that 23% of respondents with arthritis had at least one admission, compared to 11.9% of those without arthritis. The age- and sex-adjusted rates were 21.7% and 12.3%, respectively. In looking at the total number of admissions for same-day surgery, we found there were 291 admissions per 1,000 people with arthritis compared to 172 admissions per 1,000 people without arthritis, after adjusting for age and sex. Exhibit 2.15 displays the same-day surgery admission rates by age and sex for the two groups. For women, the rates for those with arthritis were generally higher at all ages than the rates for those without it, while for men there was no clear pattern of differences.

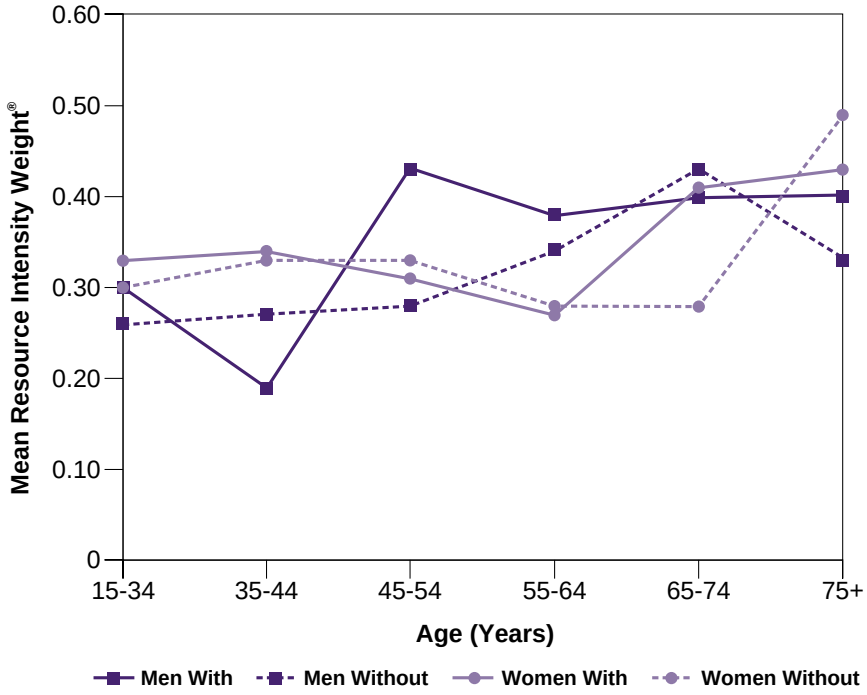
In examining the Day Procedure Groupings®, we found that individuals with arthritis were more likely to have investigative procedures of the digestive tract and procedures related to cataracts than were people without arthritis. Again, the comparisons were limited because of the small number of individuals undergoing any one group of procedures. Exhibit 2.16 displays the mean Resource Intensity Weights® for the Day Procedure Groupings® by age and sex for the two groups.

Exhibit 2.15: ***Age/Sex-specific Same-Day Surgery Admissions per 1,000 Persons With and Without Arthritis 15 Years and Over in Ontario, 1994/95 – 1996/97***



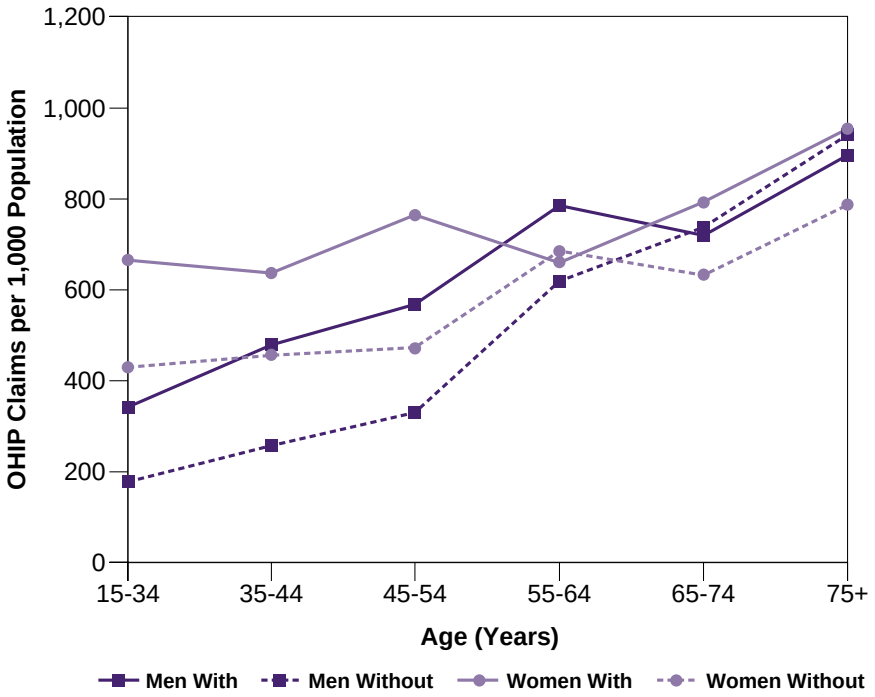
Data Source: Canadian Institute for Health Information, National Population Health Survey

Exhibit 2.16: ***Age/Sex-specific Mean Resource Intensity Weights® per Same-Day Surgery Procedure for Persons With and Without Arthritis 15 Years and Over in Ontario, 1994/95 – 1996/97***



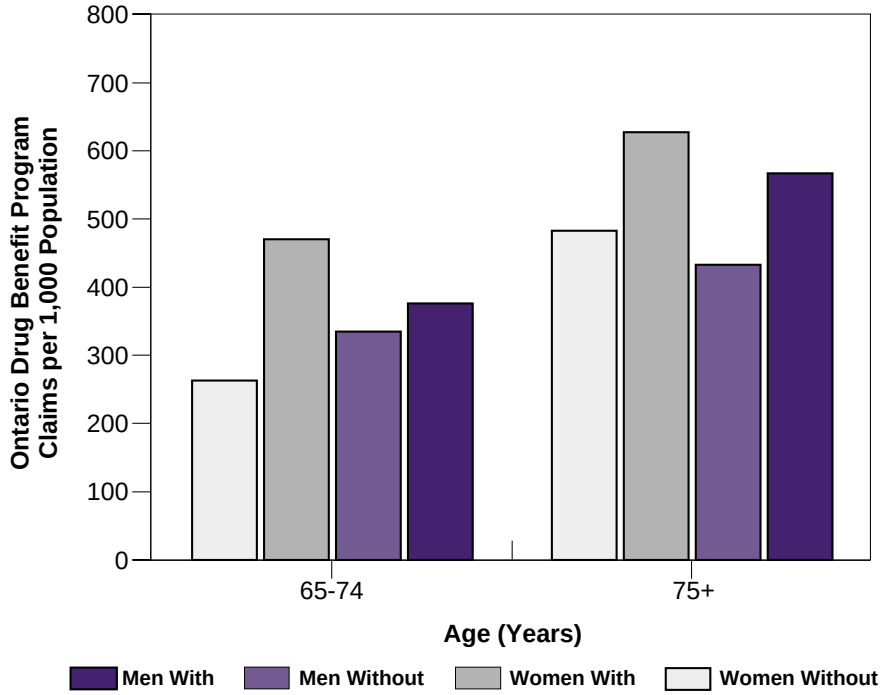
Data Source: Canadian Institute for Health Information, National Population Health Survey

Exhibit 2.17: ***Age/Sex-specific Ontario Health Insurance Plan Claims per 1,000 Persons With and Without Arthritis 15 Years and Over in Ontario, 1994/95 – 1996/97***



Data Source: Ontario Health Insurance Plan, National Population Health Survey

Exhibit 2.18: ***Age/Sex-specific Ontario Drug Benefit Program Claims per 1,000 Persons With and Without Arthritis 65 Years and Over in Ontario, 1994/95 – 1996/97***



Data Source: Ontario Drug Benefit Claims File, National Population Health Survey

Generally, there were no discernible differences among the respondents.

With regard to the use of professional medical services, we found that over 95% of respondents had OHIP claims in the two-year follow-up period. The age- and sex-adjusted rates of claims per 1,000 people were 619 for those with arthritis and 425 for those without. OHIP claim rates are displayed in Exhibit 2.17. The rates increased with age, and were higher for those with arthritis than those without until age 55, at which point the differences diminished. Women had higher claim rates than men at all ages, but the differences were greater for women under 55 than for those over 55.

OHIP claims provide minimal information about the reason for service, so it is difficult to compare the nature of the services across respondents. One approach is to focus on the type of provider responsible for professional services, and exclude OHIP claims for laboratory services. The age- and sex-adjusted claim rates for professional services were 404 per 1,000 people with arthritis and 269 per 1,000 people without arthritis. The differences were greatest for visits to general practitioners and family physicians (135 for those with arthritis versus 94 for those without), diagnostic radiologists (28 versus 19) and chiropractors (20 versus 10).

With regard to the use of prescription drugs, nearly all respondents who were 65 years of age or over had submitted ODB claims. After adjusting for age and sex differences, we found that the claims were 486 per 1,000 for those with arthritis compared to 352 for those without. The rates are displayed in Exhibit 2.18, divided into two age groups (65 to 74 and 75+). The claim rates were higher for people 75 years and over, for women, and for people with arthritis.

We placed the drugs into pharmaceutic/therapeutic classification groups in order to determine which types of drugs were being consumed. People

Exhibit 2.19: ***Sex-specific Average Annual Cost for Health Services for Persons With and Without Arthritis in Ontario, 1994-95 – 1996/97***

Age	Ontario Health Insurance Plan	Canadian Institute for Health Information	Ontario Drug Benefit Program
Women With Arthritis			
15-34	$711	$785	N/A
35-44	$668	$437	N/A
45-54	$844	$619	N/A
55-64	$671	$685	N/A
Age-Adjusted Per Person <65	$717	$665	N/A
65-74	$790	$1,208	$559
75+	$1,045	$2,760	$687
Age-Adjusted Per Person >65	$890	$1,875	$614
Women Without Arthritis			
15-34	$414	$138	N/A
35-44	$453	$206	N/A
45-54	$490	$360	N/A
55-64	$568	$443	N/A
Age-Adjusted Per Person <65	$456	$228	N/A
65-74	$593	$620	$401
75+	$703	$1,493	$429
Age-Adjusted Per Person >65	$640	$995	$413
Men With Arthritis			
15-34	$397	$159	N/A
35-44	$606	$147	N/A
45-54	$557	$708	N/A
55-64	$747	$619	N/A
Age-Adjusted Per Person <65	$514	$301	N/A
65-74	$764	$976	$537
75+	$936	$2,671	$505
Age-Adjusted Per Person >65	$824	$1,572	$526
Men Without Arthritis			
15-34	$197	$112	N/A
35-44	$264	$162	N/A
45-54	$390	$432	N/A
55-64	$512	$475	N/A
Age-Adjusted Per Person <65	$283	$220	N/A
65-74	$882	$1,520	$500
75+	$897	$2,897	$570
Age-Adjusted Per Person >65	$887	$2,004	$525

Data Source: Ontario Health Insurance Plan, Canadian Institute for Health Information, Ontario Drug Benefit Claims File

with arthritis had higher rates of usage than those without arthritis of central nervous system drugs, which include nonsteroidal anti-inflammatory drugs (NSAIDs), cardiovascular drugs, hormones and substitutes, gastrointestinal drugs and anti-infectives. It should be noted that NSAIDs and other drugs are available over the counter, and may be bought without a prescription. Therefore, the conclusions about relative drug usage are based on only those purchases that involved ODB claims.

In our estimates of the average costs of all health services, since the costs increase with age and ODB coverage only begins at age 65, we conducted separate analyses for people under 65 and those over 65. We also made comparisons by sex, because of gender differences in patterns of morbidity and utilization.

The results are shown in Exhibit 2.19. For arthritic women under 65, the average annual costs per woman for medical services (OHIP) and hospital services (CIHI) were $717 and $665, respectively. The costs were relatively

constant across the age categories. By comparison, the average annual costs per woman under 65 without arthritis, adjusted for age, were $456 for medical services and $228 for hospital services. For arthritic women over 65, the average annual cost of OHIP claims and hospital services jumped to $890 and $1,875, respectively, while drug costs averaged $614. For those without arthritis, the annual costs were $640 for medical services, $995 for hospital care and $413 for drugs. For both groups, all costs were higher for respondents 75 and over than for those aged 64 to 74.

For men under the age of 65, the annual cost estimates were $514 for medical services and $301 for hospital services for those with arthritis, compared with $283 and $220 for those without. For both groups, the costs increased with age: For men over 65 the annual costs for those with arthritis were $824 for medical services, $1,572 for hospital services and $526 for drug benefits, compared to $887, $2,004 and $525 for those without arthritis. As with women, the costs were higher for men over 75 than for those between the ages of 65 and 74.

These data made it clear that respondents with arthritis had different patterns of utilization of health services from those without arthritis. From the NPHS, we can estimate that 1.3 million Ontarians over the age of 15 and living in the community had arthritis, compared to 7.3 million residents without arthritis. The estimated direct costs of CIHI, OHIP and ODB for these individuals were $2.8 billion for those with arthritis and $5.6 billion for those without arthritis. It should be remembered that we excluded the costs related to pregnancy and reproductive care, services for children under 15 years of age, outpatient rehabilitation services, and long-term care, as well as all health costs for services covered by private insurers and out-of-pocket expenses paid the respondents. Even so, with these estimates, individuals with arthritis accounted for 15% of the population but 33% of the direct health care costs.

Discussion

The National Population Health Survey provides a broad range of measures on demographic and health characteristics. We have used these data to describe how arthritis affects perceived health status, functional limitations and disability.[5] By linking the responses in the survey to health care administrative data, we were able to correlate arthritis and related conditions to the utilization of health services over a two-year follow-up period.

It is now well established that arthritis and related conditions are among the most common disabling medical conditions in the population. As described in the Introduction, the prevalence of these conditions increases with age, and the rates are higher for women than men at all ages. It is also well established that arthritis is a major driver of health status and health care utilization. To the best of our knowledge, the present study is the first to estimate the burden of disability and the costs of utilization based on survey data linked with administrative data.

The prevalence of arthritis increases with age; however, we found that its effects on perceptions of health, limitation and disability are relatively constant across age. The difference between individuals with and without arthritis is greatest in the youngest age group and declines thereafter, due to the cumulative burden of other diseases in older people.

Chronic medical conditions impact on burden of illness, use of health services and, in some cases, life expectancy. Within the literature, chronic conditions are treated as independent determinants of health outcomes of interest. Verbrugge challenged the assumption of independent effects of chronic conditions in people with arthritis.[11,16-17] It can be noted that while Boult[3] found that arthritis, cerebrovascular disease and heart disease were predictors of functional limitations as well as mortality, they found the effects of these conditions independent of each other. Information derived from the NPHS showed that most of the respondents with arthritis, at all ages, reported suffering from one or more of the following chronic conditions: high blood pressure, heart disease, diabetes and back pain. Accordingly, we did not test for the separate effects of multiple chronic conditions.

People with arthritis were more likely than those without it to report fair or poor health, activity restriction and long-term disability, and to have lower HUI scores. The rates at which these problems were reported did not vary by age for people with arthritis, whereas they generally increased with age for those without it. Accordingly, the difference in the relative burden of disability between the two groups decreased with age. Levels of chronic stress were greater for respondents with arthritis in the younger age groups, but reports of chronic stress dropped for both groups with age, and the differences largely disappeared after age 55. While the burden of arthritis remained in those in the older age groups, its impact faded into the background as other illnesses entered their lives. At all ages, people with arthritis reported much higher rates of pain and use of pain medication than did respondents without arthritis.

The burden of disability associated with arthritis was generally higher for women than for men at all ages, although it is a significant problem for men as well. Of those people with arthritis, the costs of medical services, hospital care and (for those over 65) prescription drugs were higher for women than for men.

There were several major limitations to the study. First, we relied on self-reports of medical conditions, activity restrictions and disability, and the health status of respondents was not verified by health professionals. Second, the limited questions in the

survey did not allow us to estimate the costs of arthritis associated with inability to work, forgone opportunities to participate actively in community life or the indirect costs of pain and suffering. Third, the profile of the use of health services is incomplete, as it does not include services outside public health insurance. Individuals may seek care from alternative sources or from health professionals whose fees are not covered by OHIP; and most of the prescribed and over-the-counter drugs consumed in Ontario are not covered by ODB. Fourth, while we could track the use and costs of health services over time, we could not relate them to changes in perceptions of health, restrictions of activity, disability and medical conditions. (A second cycle of the NPHS was carried out in 1996 and 1997, and respondents in the first survey were asked to participate again; thus, future research will enable us to follow the respondents over time to track changes in health and the use of health services.) Finally, while the databases to which we had access provide comprehensive coverage of medical care and acute-care hospital services, they do not include information on rehabilitation or chronic-care hospitals and long-term care facilities. Residents of chronic-care hospitals and long-term care facilities were also unlikely to have been included in the NPHS, since the survey included only people living in the community.

Despite these limitations, the linking of the NPHS with health care administrative data has provided evidence of the burden of arthritis and related conditions and their related costs of health care. It presents two profiles of arthritis: its absolute impact and its relative impact. In absolute terms, we found, as have other studies, that the direct burden and costs of arthritis and related conditions increase with age and are disproportionately greater for women than for men. In relative terms, we found that these burdens and costs are greatest in young and middle-aged adults, and are about as great for men as they are for women. Arthritis and related conditions are important health problems to be addressed, regardless of the age, sex or other circumstances of the individuals who suffer from them.

References

1. Badley EM, Rasooly I, Webster GK. Relative importance of musculoskeletal disorders as a cause of chronic health problems, disability, and health care utilization: Findings from the 1990 Ontario Health Survey. *J Rheumatol* 1994; 21(3): 505-514.
2. Badley EM, Tennant A. Impact of disablement due to rheumatic disorders in a British population: Estimates of severity and prevalence from the Calderdale Rheumatic Disablement Survey. *Ann Rheum Dis* 1993; 52(1): 6-13.
3. Boult C, Kane RL, Louis TA et al. Chronic conditions that lead to functional limitation in the elderly. *J Gerontol* 1994; 49(1): M28-M36.
4. Morbidity and Mortality Weekly Report. Prevalence and impact of arthritis among women – United States, 1989-1991. [published erratum appears in *MMWR Morb Mortal Wkly Rep* 1995 Jul 14; 44 (27): 517-518] *JAMA* 1995; 273 (23): 1820-1821.
5. Pope GC. Medical conditions, health status, and health services utilization. *HSR: Health Services Research* 1988; 22(6): 857-877.
6. Statistics Canada. *National Population Health Survey, NPHS.* Public Use Microdata Documentation. Ottawa: Statistics Canada, 1995.
7. Canadian Institute for Health Information (CIHI). *DPG Booklet.* Toronto: Canadian Institute for Health Information, 1996.
8. Canadian Institute for Health Information (CIHI). Resource Intensity Weights: Summary of methodology, 1994/95 [editorial]. Toronto: Canadian Institute for Health Information, 1996.
9. JPPC Hospital Funding Committee. Methodology used to calculate 1996/97 transfer payments to Ontario Hospitals. Toronto, Ontario. Joint Policy and Planning Committee. 1996; 3-6: 1-25.
10. Williams JI, Naylor CD. How should health status measures be assessed? Cautionary notes on procrustean frameworks. *J Clin Epidemiol* 1992; 45: 1347-1351.
11. Verbrugge LM. Women, men, and osteoarthritis. *Arthritis Care & Research* 1995; 8(4): 212-220.
12. Kessler RC, Personal Communication 1998
13. Cadman D, Goldsmith C, Torrance GW et al. Development of a Health Status Index for Ontario children. *In Final Report to the Ontario Ministry of Health.* Hamilton: McMaster University, 1986.
14. Feeney D, Torrance GW, Furlong WJ et al, editors. Health Utilities Index. In *Quality of Life and Pharmaeconomics in Clinical Trials.* 2nd ed. Philadelphia: Lippincott-Raven, 1996: 239-252.
15. Kopec JA, Williams JI, To T et al. *Cross-cultural Validity of the Health Utility Index (HUI).* Toronto, 1998.
16. Verbrugge LM, Lepkowski JM, Konkol LL. Levels of disability among US adults with arthritis. *J Gerontol* 1991; 46 (2): 571-583.
17. Verbrugge LM, Lepkowski JM, Imanaka Y. Comorbidity and its impact on disability. *Milbank Q* 1989; 67(3-4): 450-484.
18. Pink GH, Bolley HB. Physicians in Health Care Management: 3 Case Mix Groups and Resource Intensity Weights: An overview for physicians. *CMAJ* 1994; 150(6): 889-894.

Appendix A2.1

The National Population Health Survey (NPHS) was conducted between June 1994 and June 1995. It is the first in a series of national health surveys planned by Statistics Canada and the provinces to improve the availability of population health information.[6] The national sample excluded people living in Native Indian reserves, remote areas and institutions. This study only included the respondents from Ontario.

The survey was conducted in two parts. The first part was an interviewer-administered questionnaire to a proxy who responded on behalf of all residents in the sample household. In this section, there were 17,221 respondents in Ontario. In the second part of the survey, one person 12 years of age or over in each sample household completed a detailed questionnaire. There were 5,187 respondents in Ontario. Each respondent was asked to provide their health number, share the responses to the questionnaire with the provincial Ministry of Health, and permit the Ministry to link the responses with health care administrative databases for research purposes. Statistics Canada, in collaboration with the provincial ministries, created NPHS sharing files for each province.

Of the 5,187 Ontario respondents who completed the second part of the survey, 4,813 (93%) provided their health numbers and consented to the linkage of records. The Ontario Ministry of Health considered 4,621 of the numbers to be valid for linkage. The Institute for Clinical Evaluative Sciences (ICES) obtained a copy of the NPHS sharing file for Ontario through a Special Research Agreement with the Ministry of Health. We focused on the 4,473 respondents with valid health numbers who were 15 years of age and over. The health numbers were encrypted and replaced with a unique identifier created by ICES for purposes of data linkage.

We linked the NPHS with health care data for 24 months following the survey interview dates. The health care data included the Discharge Abstract Data for inpatients and same-day surgery patients from the Canadian Institute for Health Information (CIHI), claims data from the Ontario Health Insurance Plan (OHIP), and prescription claims from the Ontario Drug Benefit program (ODB) for respondents 65 years of age and over. The NPHS interviews ended June 1995. We have complete OHIP and ODB data for the 24 month follow-up period ending in June 1997. ICES has the CIHI Discharge Abstract Data Files for fiscal years 1995/96 through 1996/97, but not hospital separations occurring in the first quarter of the 1997/98 fiscal year (April through June). The hospital separation data are incomplete for 3.5% of the respondents.

We searched the inpatient and same-day surgery files of the Discharge Abstract Data from CIHI to identify NPHS respondents who had one or more separations from hospital during the two year follow-up period. Overall, 623 respondents had 1,109 discharges from inpatient services. The most responsible diagnosis for each hospitalization was coded according to the International Classification of Diseases-9th revision (ICD-9). We grouped them into ICD-9 chapters to give broad reasons for hospital stay.

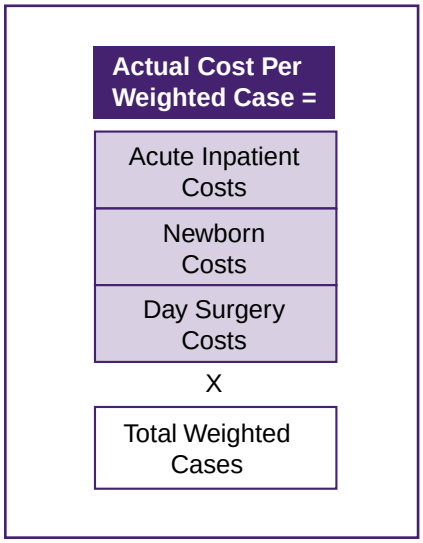
We used the Case Mix Groups® and Resource Intensity Weights®, created by the Hospital Management Research Institute and developed by the Canadian Institute for Health Information,[8] to estimate relative resources required for clinically homogenous groups of patients. The methods relate back to the Diagnosis Related Groups, developed by a group at Yale University, for comparing the mix and volume of patients across hospitals in the United States. Since 1983, the United States Health Care Financing Administration has been using the Diagnosis Related Groups to determine hospital reimbursement for Medicare patients. The Hospital Management Research Institute originally created the Case Mix Groups® for use in Canada for three reasons: Diagnosis Related Groups are based on the clinical modification extension of the ICD-9 whereas most hospitals in Canada do not use the clinical modification of the ICD-9; Diagnosis Related Groups are based on principal diagnosis while the Case Mix Group® is based on the most responsible diagnosis; and, Case Mix Groups® encode information about additional diagnosis, comorbid conditions and complications that impact on length of stay while the Diagnosis Related Groups do not.[8] The Hospital Management Research Institute employed the 1985 New York State database for 55 hospitals for developing the 567 Case Mix Groups® and 25 Major Clinical Groupings Categories which are now in use.[18]

The next step was to assign Resource Intensity Weights® to Case Mix Groups® to measure the expected use of resources. The records in the New York State database were grouped into Case Mix Groups®. The Resource Intensity Weights® were derived to estimate the resource intensity for a Case Mix Group® relative to the average cost of inpatient care.[7] CIHI now uses the database of the Health Services Cost Review Committee of Maryland which includes all 53 acute care hospitals in the state. The commission actively uses the database to manage utilization which includes patient care costs, same-day surgery services, and inpatient care. While the Resource Intensity Weight® values are derived from U.S. cost data, they are adjusted to reflect Case Mix Groups® and lengths of stay in Canadian hospitals.

CIHI worked with the 1991 Maryland database to develop Day Procedure Groups® to classify 1,650 same-day surgery procedures into 67 groups. The Day Procedure Groups® are based on procedure codes only, not diagnoses.

CIHI also derived Resource Intensity Weights® for Day Procedure Groups®. Revisions were made to the Case Mix Groups®, Day Procedure Groups®, and Resource Intensity Weights® based on the 1991 Maryland database.[7] It can be noted that 677 respondents had 932 admissions for same-day surgery procedures.

The Ministry of Health/Ontario Hospital Association Joint Policy and Planning Committee, through the Hospital Funding Committee, is responsible for developing the allocation formula for funding hospital services in Ontario. The actual cost per weighted case is calculated as follows:



The Actual Cost per Weighted Case is calculated for each acute care hospital in the province.[9] We multiplied the Actual Cost per Weighted Case by each Resource Intensity Weight® to estimate the costs of their acute hospital services.

It should be noted that admissions into rehabilitation facilities, chronic hospitals and other long-term care settings are excluded from the study. The findings are limited to the use of acute care services.

We flagged hospital services related to pregnancy, abortion and childbirth (ICD-9 630 – 676; complications of pregnancy, childbirth, and the puerperium). There were 199 women who had 277 hospital separations for these services. Similarly, we identified 230 women who had 2,996 related OHIP claims. Health services related to pregnancy were excluded from the utilization data.

The OHIP claims files include billings for professional services and laboratory services. A claim for professional services indicates who provided the service, the procedure performed, and the fee billed. Over 96% of the respondents had one or more OHIP claims.

Seniors in the survey are beneficiaries under the ODB, and almost all of them had one or more claims for prescription drugs. In addition to looking at the total numbers of prescriptions, we have classified the drugs prescribed into broad Pharmaceutical Classification Groups. The comparisons included total drug and the costs of the prescriptions.

We show age- and sex-specific rates of utilization of the health services for individuals with and without arthritis. We flagged hospital discharge records and OHIP claims related to pregnancy as non-events so as to avoid skewed information for younger women. The rates were then adjusted for age and sex differences to indicate overall differences in levels of utilization.

For each part of the survey, Statistics Canada calculated sample weights so that responses were representative of the entire Ontario population. Statistics Canada calculated new sampling weights for the shared file for deriving population estimates. The analyses have been weighted for the design effects of the NPHS. From the weighted analyses we can generalize the use of services and their costs for the Ontario population.

Chapter 3

The Economic Cost of Arthritis and Rheumatism in Canada

Overview

Arthritis and rheumatism affect a sizable proportion of the population[1,2] and represent a significant burden to Canadians and to their health system.[3] These diseases are more prevalent in older people[4-10] and are a leading cause of illness and disability.[11-13] People afflicted with arthritis or rheumatism suffer pain, lose physical function and have reduced quality of life,[11-19] particularly with respect to their social, psychological and financial well-being.[7-12]

The economic burden of arthritis and rheumatism is significant and will grow with the projected aging of the population.[20] In the United States, recent research has reported that the economic cost of arthritis and rheumatism in 1992 amounted to $64.8 billion (U.S.) or 1.1% of the Gross Domestic Product.[21,22] In Canada, the most comprehensive (and recent) study, using 1993 data, reported that all musculoskeletal conditions including but not distinguishing arthritis and rheumatism, accounted for 4.9% of hospital expenditures, 6.5% of medical expenditures and 6.8% of drug expenditures and for 35.2% and 10.0% of all lost income due to chronic and short-term disability, respectively.[23] This may be an underestimate as some costs, such as Workers' Compensation expenditures, were not ascribed to musculoskeletal conditions.[4,24] The economic burden of musculoskeletal conditions is clearly substantial.

The purpose of this chapter is to estimate the total economic cost of arthritis and rheumatism for Canadians in 1994 dollars and to assess how sensitive these cost estimates are to variations in both the discount rate and costing scenarios. Despite the high prevalence of arthritis and rheumatism and the importance of its economic burden, there has been a lack of current and comprehensive cost estimates. Yelin and colleagues[21] extrapolated estimates from a 1988 U.S. study[22] to 1992 by using the consumer price index, while recent Canadian estimates[23] included all International Classification of Diseases 9th revision (ICD-9), diagnosis codes of the World Health Organization's diagnostic classification scheme (1977) that pertained to diseases of the musculoskeletal system and connective tissue. Neither of these studies assessed the sensitivity of its results to modifications in the underlying assumptions.

Data Source and Methods

We used a prevalence-based approach to quantify the economic costs related to arthritis and rheumatism in 1994, so that all costs pertaining to arthritis and rheumatism occurring within that year, irrespective of the time of onset were assessed.[25] A societal perspective was taken, meaning that all costs were assessed regardless of payor.[26,27] We did not consider transfer payments as a cost, as the benefit of these transfers to some individuals was offset by the costs incurred by others, thereby resulting in a net societal cost of zero.[23,28]

Our definition of arthritis and rheumatism was based on a slight modification[29] of recent U.S. methods[21,22] which specified an array of 5-digit ICD-9-CM diagnostic codes[30] to identify individuals with arthritis and rheumatism. We translated these 5-digit ICD-9-CM diagnostic codes to the 4-digit ICD-9 codes[31] that are used by most health care institutions in Canada. Thus, the methods are comparable to recent U.S. research. Unfortunately, a standard definition for arthritis and rheumatism does not currently exist in the literature.[29] Appendix A3.1 lists the ICD-9 diagnosis codes[31] that we used in our definition.

Standard methods were used to identify direct and indirect costs, the two main components of the economic cost of arthritis and rheumatism.[28] Direct costs comprised those resources used in the research, prevention, detection and treatment of arthritis and rheumatism, such as the labour of health professionals, equipment, buildings and supplies. Health Canada[32] provided data on total direct costs for all diseases categorized by hospitals, other institutions, physician services, other health professional services, capital expenditures and other items. By measuring utilization by diagnostic groups, we apportioned total direct costs to those attributable to arthritis and rheumatism (Appendix A3.1).

The indirect costs of arthritis and rheumatism result from lost productivity due to disability and premature mortality. We estimated these costs using the human capital approach; i.e., by applying current average earnings by age and gender to lost market time and imputing the market value of time withdrawn from leisure or homemaking. This method of valuation is controversial, but no estimate of the economic value of disability and life is value-free. Robinson[33] and Hodgson and colleagues[34] have provided useful reviews of alternative methods.

We calculated premature mortality as the number of arthritis and rheumatism-related deaths in 5-year age-gender groups, derived from vital statistics data.[35] Because arthritis and rheumatism conditions are rarely reported as the primary cause of death, the use of such data may lead to an underestimate of arthritis and rheumatism-related mortality costs. Notwithstanding, we based the average economic value of life for each age-gender group on average forgone earned income based on national household pre-tax income survey data.[36] Transfer payments and investment income were excluded from these calculations, as they do not constitute an economic loss from a societal perspective. The economy and wages were assumed to grow at an annual rate of 2%, and future income losses were discounted to the present. We used a conventional discount rate of 6%[27] and performed sensitivity analyses for discount rates between 2% and 10%.

While the income data were representative of the Canadian population,[36] some individuals in the sample would have been disabled, unable to work at their regular occupation, and without earned income. Under ideal conditions, the calculation of forgone income due to illness should be based on incomes of all individuals free of disease. To partially correct for the presence of disabled persons in the population, and hence in the income data, we added disability payments from Canada and Quebec Pension Plans[37,38] and from private sources[39] to the average earned income data. Employee benefits are a component of the value of labour in addition to wages, but there were no precise national estimates of the value of benefits relative to wages; thus, we used previous estimates whereby benefits were defined to be 20% of average earned income.[28]

The income data do not capture economic output attributable to household work and other non-market labour, the value of which has been estimated to be between 0.4 and 0.6 of potential earned income.[40,41] We obtained data by age and gender to estimate the number of people outside the labour force,[42] and used these estimates to compute lost income under three scenarios in which non-labour force participants had imputed earnings of 0.0, 0.4 and 0.6 times the earnings of employed individuals in matched age-gender groups.

Estimates for the indirect cost of disability attributable to arthritis and rheumatism were based on the 1990 Ontario Health Survey (OHS).[43,44] This survey, which was based on a stratified cluster sample of Ontario households, asked the 61,239 respondents whether their activities were restricted or completely limited by either short-term or long-term disability.[43,44] We applied the projected disability rates attributable to arthritis and rheumatism for Ontario by age and gender to the Canadian population to yield national estimates for disability. These estimates were used to compute the total indirect cost of disability under the assumption that the losses in productivity for individuals restricted or completely limited by disability resulted in earnings 0.4 or 0.5 times those of employed individuals in matched age-gender groups, respectively.[23,45] We conducted sensitivity analyses to analyze the impact of variations in the underlying assumptions on the cost estimates of arthritis and rheumatism, and derived separate cost estimates reflecting low, baseline and high estimates of the economic cost for Canadians. The assumptions underlying these cost estimates for each cost category and for each costing scenario are reported in Appendix A3.2.

Findings

We report low, baseline and high estimates of the total cost of arthritis and rheumatism for Canadians in 1994 Canadian dollars in Exhibit 3.1. The estimates represent conservative, plausible and liberal economic cost scenarios, respectively.

The baseline estimate of the total cost of arthritis and rheumatism for

Exhibit 3.1: ***Economic Cost of Arthritis and Rheumatism for Canadians Under Various Costing Scenarios in 1994 Canadian Dollars***

	Low Estimate	Baseline Estimate	High Estimate
Direct Costs			
Hospitals	$ 667,793,220	$ 724,389,754	$ 724,389,754
Other Institutions	$ 69,143,448	$ 136,411,039	$ 203,678,630
Physicians	$ 581,018,310	$ 683,550,953	$ 786,083,596
Other Professionals	$ 6,046,497	$ 7,113,526	$ 8,180,555
Drugs	$ 221,341,066	$ 260,401,253	$ 299,461,441
Research	$ 7,335,721	$ 10,652,582	$ 10,652,582
Other Expenditures	$ 143,672,172	$ 295,953,333	$ 448,234,494
Total Direct Costs	**$ 1,696,350,434**	**$ 2,118,472,440**	**$ 2,480,681,052**
Indirect Costs			
Disability	$ 2,622,054,879	$ 3,717,751,409	$ 4,813,447,939
Premature Mortality	$ 21,523,647	$ 28,309,292	$ 31,702,114
Total Indirect Costs	**$ 2,643,578,526**	**$ 3,746,060,701**	**$ 4,845,150,053**
Total Costs	**$ 4,339,928,960**	**$ 5,864,533,141**	**$ 7,325,831,105**

Data Source: See Appendix A3.1

Canadians was $5.86 billion (in 1994 Canadian dollars, $1.00 CDN ≈ $0.75 U.S.) or 0.8% of the Gross Domestic Product (GDP), with direct and indirect costs estimated at $2.12 billion and $3.75 billion, respectively. Hospitals, physicians, and drug costs represented the largest components of the direct costs at 34.2%, 32.3%, and 12.3%, respectively. Since Canadian health expenditures in 1994 were $72.5 billion (or 9.7% of GDP),[32] direct costs attributable to arthritis and rheumatism accounted for 2.9% of total Canadian health expenditures. The indirect costs of arthritis and rheumatism were 76.8% greater than equivalent direct costs. Under the baseline scenario, the economic cost of lost productivity due to disability was $3.72 billion, or 63.4% of total arthritis and rheumatism costs, while the economic cost of premature mortality was $28.3 million, or 0.5% of total costs.

The lower- and upper-bound estimates derived from the sensitivity analysis (with a 6% discount rate) were $4.34 billion and $7.33 billion, respectively. The variation in cost estimates was primarily attributed to differences in the estimated cost of lost productivity due to disability. Specifically, variation between low and high estimates for this cost component was $2.19 billion and accounted for over 70% of the $2.99 billion difference in costs between the upper-and lower-bound estimates. The lower bound estimates of the cost of lost productivity due to disability were based on a narrow definition of disability due to arthritis and rheumatism derived from an Ontario population survey,[43] while the upper bound estimates were based on a broad definition as reported in Appendix A3.2.

Since variation in the discount rate directly affects the magnitude of the economic cost of forgone productivity due to premature mortality, it too affects the overall cost of arthritis and rheumatism. Our sensitivity analysis demonstrated that the upper-bound estimate of the total cost of arthritis and rheumatism for Canadians varied only from $7.27 billion to $7.25 billion for discount rates of 2% and 10%, respectively, while the baseline and lower-bound estimates varied from $5.81 billion to $5.80 billion and from $4.30 billion to $4.29 billion respectively, for equivalent discount rates. Consequently, while the economic cost of arthritis and rheumatism for Canadians was not sensitive to variations in the discount rate used (as the economic cost of premature mortality due to arthritis and rheumatism was small), the cost estimates were sensitive to the costing scenarios.

Discussion

This prevalence-based analysis adopted a societal perspective in examining the total cost of arthritis and rheumatism for Canadians in 1994 dollars and assessing how sensitive these cost estimates were to variations in both the discount rate and costing scenarios. The annual economic burden of arthritis and rheumatism for Canadians was estimated to be $5.86 billion in 1994, or 0.8% of the GDP of Canada: $2.12 billion in direct costs and $3.75 billion in indirect costs associated with lost (or forgone) productivity due to disability and premature mortality. Sensitivity analysis demonstrated that the various costing scenarios influenced the magnitude of the cost estimates for arthritis and rheumatism.

Our study differs from previous ones in terms of the methods used to identify, measure and value the

economic burden of arthritis and rheumatism as well as in its assessment of how sensitive these cost estimates were to variations in both the discount rate and the costing scenarios. Indeed, our analysis demonstrated considerable uncertainty in the cost of arthritis and rheumatism, ranging from $4.34 billion to $7.33 billion. This degree of uncertainty is not surprising, given variation in the underlying assumptions and in the quality of data on health costs. While some progress has been made to improve the quality of national health expenditure data[32] further refinements are required, particularly in the area of diagnosis- and patient-specific data for many cost components.

Our estimates of the economic cost of arthritis and rheumatism and its share in GDP (0.8%) were smaller than recent estimates for the United States[21,22] (1.1%) and were substantially lower than the estimates for Canada[23] that had been based on all ICD-9 diagnosis codes pertaining to diseases of the musculoskeletal system and connective tissue.[31] Canadian estimates suggest that the cost of musculoskeletal conditions was equivalent to 2.5% of Canada's GDP. These results demonstrate the importance of introducing a standard diagnostic definition for cost-of-illness studies, and they highlight the difficulties associated with international comparisons of the economic cost of arthritis and rheumatism. For example, in comparing Canadian cost-of-illness estimates with those reported for the United States, adjustments would need to be made for differences in clinical patterns of practice and utilization as well as differences in the financing and delivery of services that result in larger U.S. administration costs, higher U.S. physician fees, and greater U.S. daily service intensity.[46-49] Moreover, adjustments would also need to be made to the differing impacts of arthritis and rheumatism on indirect costs which may be attributed to an array of labour market and caregiving practices in the two countries.

While the human capital approach is widely used in cost-of-illness studies, there are three main limitations to its use.[50] First, use of current labour market earnings as a measure of lost production hinges on an array of labour market assumptions,[51] the most crucial being that lost production is proportional to earnings. This assumption may not always be valid, as a deceased or absent employee may be replaced from the pool of unemployed individuals, and thereby need not imply a reduction in productivity. Second, use of earnings in valuing lost production places more emphasis on diseases prevalent amongst persons with high incomes, many of whom are men, than on diseases suffered by the poor, the elderly and women. Consequently, blindly using the human capital approach for setting health priorities may be inconsistent with societal objectives and could exacerbate societal inequalities in health. Finally, this approach does not account for the intangible costs of pain and suffering, and the benefits from good health, per se, are ignored.[27,50] In light of these criticisms, cost estimates using the human capital approach should be interpreted with caution.

Cost-of-illness studies identify the potential benefit to society that a program capable of reducing disease would bring if it were to exist. In setting priorities for research or prevention programs, decision-makers must evaluate the actual benefits that these programs will provide and compare them to their costs. Nonetheless, since the economic burden of musculoskeletal conditions in Canada was recently demonstrated by Health Canada[23] to account for 13.8% of the total economic burden of all illnesses but only 2.9% of all health science research there exists significant potential to alter this inequity in research funding.

While cost-of-illness studies are useful as tools to inform policy-makers about the financial burden associated with a particular disease or a specific group of patients,[52-54] they do not identify which treatments should be funded. Moreover, while it is tempting to use cost-of-illness data for cost-containment purposes, such studies do not reveal whether services currently directed towards arthritis and rheumatism provide savings to society in terms of reduced mortality and morbidity. Indeed, our estimates of the indirect costs of arthritis and rheumatism represent potential reductions in morbidity and mortality if the prevalence of arthritis and rheumatism were reduced, and are silent on whether existing services represent a net economic benefit.

Our study highlights the scope and magnitude of the economic consequences of arthritis and rheumatism for Canadians. While these cost estimates do not offer insight into the appropriateness of current health expenditures on arthritis and rheumatism, they may provide guidance in the setting of priorities for research and prevention activities to alleviate current inequities in the funding of musculoskeletal research.

References

1. Statistics Canada. *Health Status of Canadians, Report of the 1991 General Social Survey.* Catalogue No. 11-612E, No. 8. Ottawa: Statistics Canada, 1994a.

2. Lee P. The economic impact of musculoskeletal disorders. *Quality of Life Research.* 1994; 31: S85-S91.

3. Felts W, Yelin E. The economic impact of rheumatic diseases in the United States. *J Rheumatol* 1989; 16: 867-884.

4. Badley EM, Arnold J, Webster G. *Arthritis in Ontario: A Study of Intra-Provincial Variation* [working paper 94-1]. Arthritis Community Research and Evaluation Unit, February 1994.

5. Felson DT, Naimark A, Anderson J et al. The prevalence of knee osteoarthritis in the elderly: The Framingham Osteoarthritis Study. *Arthritis Rheum* 1987; 30(8): 914-918.

6. Gordon T. Osteoarthritis in U.S. adults. In Bennett PH, Wood PH, editors. *Population Studies of Rheumatic Disease.* Amsterdam: Excerpta Medica Foundation, 1968.

7. Mikkelsen WM, Duff IF, Dodge HJ. Age/sex-specific prevalence of radiographic abnormalities of the joints of the hands, wrists and cervical spine of adult residents of the Tecumseh, Michigan, Community Health Study area, 1962-1965. *J Chron Dis* 1970; 23: 151-159.

8. Badley EM, Webster GK, Rasooly I. The impact of musculoskeletal disorder in the population: Are they aches and pains? *J Rheumatol* 1995; 22(4): 733-739.

9. Reynolds DL, Chambers LW, Badley EM et al. Physical disability among Canadians reporting musculoskeletal diseases. *J Rheumatol* 1992; 19: 1020-1030.

10. Cunningham LS, Kelsey JL. Epidemiology of musculoskeletal impairments and associated disability. *Am J Pub Health* 1984; 74: 574-579.

11. Verbrugge LM. Physical and social disability in adults. In Hibbard HH, Nutting PA, Grady ML, editors. *Functional and Health Status Measures for Primary Care.* Washington, D.C.: US Department of Health and Human Services, 1991: 31-57.

12. McAlindon TE, Cooper C, Kirwan JR et al. Knee pain and disability in the community. *Br J Rheumatol* 1992; 31: 189-192.

13. Bridges-Webb C, Britt H, Miles DA et al. Morbidity and treatment in general practice in Australia 1990-1991. *Med J Aus* 1992; 157 (Supp l): 1-56.

14. Peyron JG, Altman RD. The epidemiology of osteoarthritis. In Moskowitz RW, Howell DS, Goldberg VM et al., editors. *Osteo-arthritis Diagnosis and Medical/Surgical Management.* 2nd ed. Toronto: WB Saunders Company, 1992: 15-37.

15. Kramer JS, Yelin EH, Epstein WV. Social and economic impacts of four musculoskeletal conditions: A study using national community-based data. *Arthritis Rheum* 1983; 26: 901-907.

16. Liang MH, Larson M, Thompson M et al. Cost and outcomes in rheumatoid arthritis and osteoarthritis. *Arthritis Rheum* 1984; 27: 522-529.

17. Pincus T, Mitchell JM, Burkhauser RV. Substantial work disability and earnings losses in individuals less than age 65 with osteoarthritis: Comparisons with rheumatoid arthritis. *J Clin Epidemid* 1989; 42: 449-457.

18. Hadler NM. Osteoarthritis as a public health problem. *Clin Rheum Dis* 1985; 11: 175-185.

19. Moskowitz RW, Howell DS, Goldberg VM et al. *Osteoarthritis Diagnosis and Medical/Surgical Management.* 2nd ed. Toronto: WB Saunders Company, 1992.

20. Badley EM, Wang PP. Arthritis and the aging population: Projections of arthritis prevalence in Canada, 1991-2031. *J Rheumatol* 1998; 25(12): 138-144.

21. Yelin E, Callahan LF. The economic cost and social and psychological impact of musculoskeletal conditions. National Arthritis Data Work Groups. *Arthritis Rheum* 1995; 38(10): 1351-1362.

22. Rice DP. Cost of musculoskeletal conditions. In Praemer A, Furner S, Rice DP, editors. *Musculoskeletal Conditions in the United States.* Chicago: American Academy of Orthopaedic Surgeons, 1992.

23. Moore R, Mao Y, Zhang J et al. *Economic Burden of Illness in Canada,* 1993. Ottawa: Canadian Public Health Association, 1997.

24. Badley EB. The economic burden of musculoskeletal disorders in Canada is similar to that for cancer, and may be higher. *J Rheumatol* 1995; 222: 204-206.

25. Rice DP. Cost-of-illness studies fact or fiction? *Lancet* 1994; 344: 1519-1520.

26. Boyle MH, Torrance GW, Sinclair J et al. Economic evaluation of neonatal intensive care of very low birth weight infants. *N Engl J Med* 1983; 308(22): 1330-1337.

27. Drummond MF, Stoddart GL, Torrance GW. *Methods for the Economic Evaluation of Health Care Programs.* Oxford: Oxford University Press, 1988.

28. Chan B, Coyte PC, Heick C. The economic costs of cardiovascular disease in Canada. *Can J Cardiol* 1996; 1210: 1-7.

29. Asche C, Coyte PC, Chan B et al. The economic cost and social and psychological impact of musculoskeletal conditions [comment on the article by Yelin et al, National Arthritis Data Work Group]. *Arthritis Rheum* 1996; 39(11): 1931.

30. World Health Organization. *International Classification of Diseases.* 9th revision, Clinical Modification. Geneva: World Health Organization, 1986.

31. World Health Organization. *International Classification of Diseases.* Geneva: World Health Organization, 1977.

32. Health Canada. *National Health Expenditures in Canada 1975-1993.* Ottawa: Supply and Services Canada, 1994.

33. Robinson JC. Philosophical origins of the economic evaluation of life. *Milbank Quarterly* 1986; 641: 133-155.

34. Hodgson T, Meiners M. Cost-of-illness methodology: A guide to current practices and procedures. *Milbank Quarterly* 1982; 603: 429-462.

35. Statistics Canada. *Causes of Death, 1993-1994.* Ottawa: Supply and Services Canada, Special Request Unit, 1996.

36. Statistics Canada. *Income Distributions by Size in Canada, 1993.* Catalogue No. 13-207. Ottawa: Statistics Canada, Household Surveys Division, 1994.

37. Canada Pension Plan/Old Age Security. *Statistical Bulletin 1994.* January 1994, 11-12.

38. Regie des Rentes du Quebec. *Le Regime des Rentes du Quebec Statistique 1993.* Quebec: Regie des Rentes du Quebec, 1994.

39. Canadian Life and Health Association. *Health Insurance Benefits in Canada.* Ottawa: Canadian Life and Health Association, 1993.

40. Schulpher MJ, Buxton MJ, Ferguson BA et al. Screening for diabetic retinopathy: A relative cost-effectiveness analysis of alternative modalities and strategies. *Health Econ* 1992; 1: 39-51.

41. Torgerson DJ, Donaldson C, Reid DM. Private versus social opportunity cost of time valuing time in the demand for health care. *Health Econ* 1994; 3: 149-155.

42. Statistics Canada. *Individuals Outside the Labour Force by Age and Gender, 1992/93* [unpublished data]. Statistics Canada, Health Statistics Division, Client Customer Services, 1996.

43. Ontario Ministry of Health. *Ontario Health Survey User's Guide* [microdata manual]. Volume 2. Toronto: Queen's Printer, 1993.

44. Badley EM, Rasooly I, Webster GK. Relative importance of musculoskeletal disorders as a cause of chronic health problems, disability and health care utilization: Findings from the 1990 Ontario Health Survey. *J Rheumatol* 1994; 21(3): 505-514.

45. Wilkins R, Adams OB. *Healthfulness of Life: A Unified View of Mortality, Institutionalization, and Non-institutionalized Disability in Canada, 1978.* Montreal: Institute for Research on Public Policy, 1983.

46. Himmelstein DU, Woolhandler S. Cost without benefit: Administrative waste in U.S. health care. *N Engl J Med* 1986; 3147: 441-445.

47. Evans RG, Lomas J, Barer ML et al. Controlling health expenditures: The Canadian reality. *N Engl J Med* 1989; 3209: 571-577.

48. Redelmeier DA, Fuchs VR. Hospital expenditures in the United States and Canada. *N Engl J Med* 1993; 328(11): 772-778.

49. Woolhandler S, Himmelstein DU, Lewontin JP. Administrative costs in U.S. hospitals. *N Engl J Med* 1993; 3296: 400-403.

50. Scitovsky AA. Estimating the direct costs-of-illness. *Milbank Quarterly* 1982; 603: 463-491.

51. Glied S. Estimating the indirect cost of illness: An assessment of the foregone earnings approach. *Am J Pub Health* 1996; 86(12): 1723-1728.

52. Sheill A, Gerard K, Donaldson C. Cost-of-illness studies no aid to decision making? *Health Policy* 1987; 8: 317-323.

53. Behrens C, Henke KD. Cost-of-illness studies no aid to decision making? [reply]. *Health Policy* 1988; 10: 137-141.

54. Hodgson TA. Cost-of-illness studies no aid to decision making? [comment]. *Health Policy* 1989; 11: 57-60.

55. Intercontinental Medical Statistics Canada. Canadian Disease and Therapeutic Index Diagnosis, 1994. Montreal: Intercontinental Medical Statistics Canada, Unpublished Data, 1996.

56. Canadian Pharmaceutical Association. Provincial Drug Benefit Management Programs and Provincial Pharmaceutical Associations. Ottawa: Canadian Pharmaceutical Association, Unpublished Data, 1996.

57. Statistics Canada. Hospital Morbidity Data. Ottawa: Statistics Canada, Health Statistics Division, Client Customer Services, Unpublished Data, 1996.

58. Manitoba Health. Medical Services and Costs by Diagnostic Classification, Sex and Age Group, 1993/94. Winnipeg: Health Information Systems Branch, Unpublished Data, 1996.

59. Medical Research Council of Canada. Reference List of Health Science Research in Canada 1993-1994. Ottawa: Medical Research Council of Canada, Catalogue No. MRI-71/1994, 1994.

60. Statistics Canada. Residential Care Facilities-Aged, 1992/93. Ottawa, Supply and Services Canada, Catalogue No. 83-237, 1994.

Appendix A3.1: *Definitions and Data Sources for Health Care Cost Categories*[✣]

Cost Category	Services Included In Category	Source for Total Costs	Source and Method for Attributing Proportion to Arthritis and Rheumatism	Main Limitations of Method
Hospitals	Ward costs, same day and outpatient service costs, procedure supplies, diagnostic tests, drugs, and administration for general hospitals, specialty hospitals, pediatric hospitals, psychiatric hospitals, rehabilitation centres, extended care, remote outposts.	NHEC[✶]	HM[✶]: Arthritis and Rheumatism proportion calculated as per cent of total hospital days in Canada for arthritic and rheumatic conditions.	Cost per bed day assumed constant for all diagnoses; only primary diagnoses used.
Other Institutions	Homes for the aged (including nursing homes).	RCF[✶]	Upper and lower bounds set by using highest and lowest measured proportion of costs attributable to Arthritis and Rheumatism in other categories (i.e. physician services and drugs, respectively).	Source for total costs based on incomplete survey (80% response): no direct measurement of proportion attributable to Arthritis and Rheumatism.
Capital	Construction and maintenance for hospitals and other institutions.	NHEC[✶]	Capital allocated to 'Hospitals' and 'Other Institutions', in proportion to their operating expenditures.	Exact breakdown of capital for 'Hospitals' and 'Other Institutions' not known.
Physicians	Physician services; laboratory services; diagnostic procedures.	NHEC[✶]	Manitoba Health collects diagnostic information on all physician claims for Arthritis and Rheumatism, and portion of general expenditures (e.g., annual physicals, prevention) allocated to Arthritis and Rheumatism.	Proportion of costs attributable to Arthritis and Rheumatism in Manitoba may not be generalizable nationwide.
Other Professionals	Private nursing, physiotherapy.	NHEC[✶]special request to Health Canada for expenditures by subcategory; professions unrelated to Arthritis and Rheumatism (e.g., dentistry) excluded.	Proportion attributable to Arthritis and Rheumatism. Assumed equivalent to that for physicians.	Exact proportion attributable to Arthritis and Rheumatism not measured directly.
Drugs	Outpatient prescription and non-prescription drugs, and professional (dispensing) fees.	CPA[✶] unpublished data on dispensing fees.	CDTI[✶] measures the frequency with which a drug is used for a particular diagnostic group.	CDTI[✶] is based on survey of physicians with small sample size.
Research	Federal and provincial sources, granting agencies, non-profit groups, post-secondary institutions, foreign sources.	MRC[✶] figures based on Statistics Canada survey data prepared by special request.	MRC[✶] lists percentage of grants directly attributable to Arthritis and Rheumatism, portion of Medical Research Council grants for basic research (e.g., physiology, biochemistry) allocated to Arthritis and Rheumatism; total proportion attributable to Arthritis and Rheumatism applied to other funding sources where information on grants by diagnosis unavailable.	Only MRC[✶] has detailed statistics on grants by diagnostic group.
Other	Home care, ambulances, home appliances, public health, administration, miscellaneous.	NHEC[✶]special data request to Health Canada for expenditures by subcategory; items unrelated to Arthritis and Rheumatism (e.g. eyeglasses, hearing aids etc…) excluded.	Upper and lower bounds set by using highest and lowest measured proportion of costs attributable to Arthritis and Rheumatism in other categories (i.e. physician services and drugs, respectively)	Proportion attributable to Arthritis and Rheumatism not directly measured.

✣ ICD-9 diagnosis codes 98.5, 99.3, 274, 696, 710-720, 725-729, v13.4, v43.6

✶ (CDTI) Canadian Disease and Therapeutic Index database, Intercontinental Medical Statistics (55); (CPA) Canadian Pharmaceutical Association (56); (HM) Hospital Morbidity (57); (MH) Manitoba Health (58); (MRC) Medical Research Council (59); (NHEC) National Health Expenditures in Canada (32); and (RCF) Residential Care Facilities - Aged (60).

Appendix A3.2: *Alternative Assumptions Used in the Cost-of-illness Sensitivity Analysis*

	Costing Scenarios		
Cost Category	**Low**	**Baseline**	**High**
Hospitals	Capital expenditures not included.	Capital expenditures included.	Capital expenditures included.
Other Institutions	Lowest proportion of Arthritis and Rheumatism calculated for other categories.	Average of low and high estimates.	Highest proportion of Arthritis and Rheumatism calculated for other categories.
Physicians	Baseline minus 15%.	Arthritis and Rheumatism expenditures plus portion of general expenditures for health maintenance.	Baseline plus 15%.
Other Professionals	Baseline minus 15%.	Arthritis and Rheumatism expenditures plus portion of general expenditures for health maintenance.	Baseline plus 15%.
Drugs	Baseline minus 15%.	Arthritis and Rheumatism expenditures.	Baseline plus 15%.
Research	Arthritis and Rheumatism expenditures only.	Arthritis and Rheumatism expenditures plus portion of basic research.	Arthritis and Rheumatism expenditures plus portion of basic research.
Other Expenditures	Lowest Arthritis and Rheumatism proportion calculated for other categories.	Average of low and high estimates.	Highest Arthritis and Rheumatism proportion calculated for other categories.
Lost Productivity, Disability	Disability survey method using Ontario Health Survey;** No adjustment for household labour.	Disability survey method using Ontario Health Survey;* Average of low and high estimates.	Disability survey method using Ontario Health Survey;*** 0.6 weight applied to household labour.
Lost Productivity, Premature Mortality	No adjustment for household labour.	0.4 weight applied to household labour, 6% discount rate.	0.6 weight applied to household labour.

* Section G of the Ontario Health Survey (Restriction of Activities) was used to identify respondents who suffered complete or partial long-term disability due to arthritis and rheumatism. This section contains 10 questions probing for the extent of long-term disability. The answers to these questions were used to classify respondents as having a complete, a partial, or no long-term disability. Section G provides three opportunities for a respondent to indicate the health problem(s) causing the long-term disability. The first question asks, "What is the 'main' health problem causing (name of respondent) to be limited in … activities." The second question asks, "Are there any other health problems which limit activities." The third question asks, "Does (name of respondent) have …" followed by a list of 19 disease categories.

** Lower bound considers 'only respondents who identified an arthritis and rheumatism in the first of these three questions {see note *}. This question clearly links the disorder to the disability.

*** High estimate considers respondents who identified an arthritis and rheumatism in any of these three questions {see note *}.

Chapter 4

Availability of Services for People with Arthritis

Overview

Chronic musculoskeletal conditions, such as arthritis and rheumatism, are among the leading causes of morbidity and disability in Ontario.[1] Population studies have suggested that arthritis affects up to 20% of the adult population and is the most frequent cause of physical disability among older adults.[2-5] Arthritis-related disability has been estimated to affect approximately 2.5% of Canadians aged 16 and over, with the incidence increasing with age.[2,6-8] Given the aging population in Canada, current estimates suggest that the number of people with arthritis will more than double by the year 2020, with the increase evenly split between those aged 45-64 and those aged 65 and over.[9] It is therefore timely to focus attention on the provision and availability of the health care services that will be required to meet the needs of this population in the future.

People with arthritis have a number of services available to them. The first health professional they contact about this problem is often a family physician or general practitioner. They may then be referred to one of various specialists, usually a rheumatologist or orthopedic surgeon or they may also receive treatment from a physiotherapist, occupational therapist or a chiropractor. Some patients also receive treatment from community-based care agencies such as The Arthritis Society's Consultation and Rehabilitation Service, which is funded by the Ontario Ministry of Health and provides physiotherapy, occupational therapy and social work services in the home, workplace, school or clinic setting. (It should be noted that in addition to assisting people with arthritis, all these professionals deal with other types of musculoskeletal conditions as well, such as tendinitis and back pain).

In this chapter we present data on the regional variation of the medical and health specialists who most commonly provide arthritis-related clinical services to people in Ontario. In 1992, a survey on the distribution of rheumatologists in Ontario was carried out by the Arthritis Community Research and Evaluation Unit (ACREU).[10,11] The work reported here updates that earlier study, and adds information on the distribution of orthopedic surgeons. The current study consisted of sending questionnaires to rheumatologists and orthopedic surgeons that asked about their practice location and volume of practice. Other data sources were used to determine the numbers and regional locations of occupational therapists, physiotherapists, chiropractors, family physicians and general practitioners. We did not seek information about other health care professionals who provide services to patients with arthritis, such as sports medicine specialists, osteopaths, massage therapists, homeopaths, herbalists, nutritionists etc., due to difficulties in obtaining relevant data.

Data Sources and Methods

Data were obtained through a variety of sources (Appendix A4.1). General practitioners were identified through information available from the Ontario Ministry of Health,[12] and all the other physicians and health care specialists studied were identified through membership or directory listings from their respective professional associations. Information about the number of therapists and clients involved with the Consultation and Rehabilitation Service was provided by The Arthritis Society, and we used the number of clients who were referred and treated between April 1, 1995 and March 31, 1996 as a measure of service volume. The survey data obtained from rheumatologists and orthopedic surgeons were analyzed using Microsoft Excel (v. 5.0)[13] and SPSS (v 6.0).[14] Ethics approval for the surveys was obtained from the Wellesley Hospital Research Ethics Committee.

The Ontario Survey of Rheumatologists, 1997

Using the mailing list of the College of Physicians and Surgeons of Ontario, the directory listings of the Canadian Rheumatology Association and of recent graduates from Rheumatology Disease Units across Ontario (Appendix A4.1), we identified 168 rheumatologists with clinical practices. This number included all physicians who had received training in rheumatology and whose practice consisted of rheumatology care, even if they did not have fellowship accreditation in rheumatology (this accreditation did not exist prior to 1972). The questionnaire was sent out in February 1997. It was faxed to all those whose listings gave a fax number, and mailed, along with a stamped and pre-addressed return envelope, to the remainder. Follow-up of non-responders was done by fax and mail two weeks later and by telephone at four and six weeks.

The self-administered questionnaire was based on a subset of questions used in the first ACREU survey of rheumatologists in 1992[10,11] and had been piloted with four Toronto rheumatologists to assess its face and content validity. It consisted of questions that asked physicians about their practice, education, and geographic location, and took approximately one minute to complete. The volume of rheumatology service was measured by asking respondents how many clinic half-days they held a week (a typical half-day was considered to be four hours). For example, a rheumatologist who held clinic hours four days a week, two half-clinics a day, would be contributing 8 half-days a week. We summed the contribution of each rheumatologist to get the total service provision for each District Health Council and for the province as a whole. We felt that this was a more reliable measure of service provision than the number of clinic locations held by physicians per 100,000 population, as it provides some indication of the volume of the practice. The accessibility of rheumatology services to new patients was measured by asking about the mean usual waiting time for a new non-urgent patient to be seen, expressed in number of weeks.

The Ontario Survey of Orthopedic Surgeons, 1997

Using the membership listing of the Ontario Orthopedic Association and the mailing list of the College of Physicians and Surgeons of Ontario (Appendix A4.1), we identified 363 orthopedic surgeons. The design and implementation of the questionnaire sent to this group were identical to those for the questionnaire sent to rheumatologists. The content of the questionnaire was approved by the secretary of the Ontario Orthopedic Association. Respondents were asked about the location and volume of their office and surgical practices (expressed as the number of half-days per week). They were not asked about waiting time for new patients.

Other Health Professionals

Appendix A4.1 describes the data sources for the other health professionals studied. Chiropractors, physiotherapists, and occupational therapists were identified through their colleges, with the exception of therapists employed by the Consultation and Rehabilitation Service, who were identified through their office address listings. Information on the number and geographic distribution of general practitioners in Ontario was obtained from a recently published paper by Coyte et al,[12] in which data were acquired from the Ontario Ministry of Health's Physician/Practitioner/Group Demographic File. All Ontario physicians who had active and unrestricted status codes, who had a specialty code of general practice (including family medicine) and whose age and sex were known in 1990 were included.

For all of these practitioners, we were unable to take into account that they might practice in more than one location. Also, it was unclear whether some of the addresses supplied by the professional colleges referred to practice addresses or personal residences. In these cases, the assumption was made that the personal residence was in the same geographical location as the practice. It was also not possible to obtain full-time equivalents for any of these professions, except for the Consultation and Rehabilitation Service staff. The unit of analysis that we used for all groups except general practitioners was, therefore, the number of health professionals per 100,000 population, which does not take into account volume of practice. For general practitioners, the measure of density included an adjustment for general practitioner practice intensity and patterns of health care use. Coyte et al[12] reported that adjusted and unadjusted densities were mainly congruent. As only county data were available, conversions to District Health Councils were made for the present analysis; however, this was not possible for the East and West Muskoka-Parry Sound District

Health Councils (these geographic boundaries are described in "Mapping"). General practitioner data for these two regions are therefore designated as missing.

In the case of physiotherapists, a more detailed analysis was possible, since the College of Physiotherapists was able to provide information regarding specific types of practice. In order to estimate the number of therapists providing direct patient care, we excluded those in academic/research or administrative positions, as well as those who were not employed in 1996. We developed a further subset of practice types to indicate therapists who were likely to be treating at least some patients with arthritis. This subset included therapists who worked in general practice, gerontology, hand injuries, hydrotherapy, orthopedics, pain management, prevention/health promotion, rheumatology, sports medicine, and pediatric assessment (a total of 3,906). All the analyses contained in this section refer to this subset of physiotherapists.

Mapping

The administration of medical services in Ontario is divided among six geographical Health Planning Regions: Central East, Central West, East, North West, North East, and South West (see Technical Appendix TA.1). Each of these regions incorporates a number of regional District Health Councils. We used both these administrative divisions as units of analysis to assess intra-provincial geographic variations in the distribution of arthritis-related health care services. The District Health Councils are useful because they can detect regional variations in resource availability that would not be evident when looking at the larger Planning Regions. Until recently there were 33 District Health Councils, but on April 1, 1998 many of these were merged, and there are now 16 (See Technical Appendix TA.2). The results of the analyses are presented in the tables by both the original 33 District Health Councils and the current 16, but the text refers only to the original 33.

Technical Appendix TA.3 lists the 1996 population figures for both the Planning Regions and the District Health Councils. These data were based on the 1996 Statistics Canada post-census estimates, which adjust for the under-enumeration of Native Ontarians.

All the health providers studied, except for those employed by the Consultation and Rehabilitation Service, were categorized by both District Health Council and Planning Region, according to the postal code or the city name of their mailing address. In the case of therapists employed by the Consultation and Rehabilitation Service, the only information available about service location was the address of the main administrative office in each Planning Region. (The Arthritis Society in Ontario is organized into these six regions, and its therapists may travel to clients' homes or workplaces within a Planning Region.) Therefore, these services were analyzed according to Planning Region only, and not by District Health Council.

Service-to-population Ratios

For each Planning Region, we obtained the service-to-population ratios (number of practitioners per 100,000 population), which are traditionally used in health resource planning. Although these ratios have their limitations, they can provide useful benchmarks for comparison purposes, particularly with respect to relative access to health care services.[15] Maps of the location of services were prepared using the software program MapInfo (v.2.0). In the District Health Council analyses, we grouped the service-to-population ratios into five ranges defined by the natural break method, which divides the data into ranges (determined according to an algorithm) such that the difference between the data values and the average of the data values is minimized on a per range basis. This ensures that the data values within each of the ranges are fairly close together, and enables a truer representation of the data.[16] Where applicable, we included a sixth range in order to identify regions where no services were provided. Pearson correlation co-efficients were used to measure the relationship between the locations of individual services.

Findings

Geographic Variation in Provision of Arthritis-Related Services

Rheumatology Services

Of the 168 rheumatologists surveyed, 167 (99.4%) responded. We excluded the data of seven respondents who were either retired, exclusively doing research or not currently practising clinical medicine (e.g. were on sabbatical). Of the remaining 160 physicians, 76% reported seeing only adults and 17.5% saw both adults and children. Most (69%) reported no clinical subspecialty. (See the ACREU Working Report[17] for more detailed results of this survey).

The provincial rate for rheumatology service was 8.9 half-days a week (all rheumatologists) per 100,000 population. The Planning Region data (Exhibits 4.1 and 4.2) show that the rates were relatively low in the North East, North West and South West regions, and highest in the East. It was evident that services were centred mainly in the District Health Councils (Exhibit 4.1) where large teaching centres are located (Ottawa-Carleton, Kingston-Frontenac, Lennox & Addington, Metropolitan Toronto, Hamilton-Wentworth and Thames Valley, with the highest level in Ottawa-Carleton). The District Health Councils immediately surrounding these regions often had a much lower provision of rheumatology service or none at all (see Exhibit 4.3). Other District Health Councils with relatively high rates of service (greater than 7.8 half-days a week per 100,000) were Haliburton, Kawartha & Pine Ridge, Kent, Manitoulin-Sudbury,

Exhibit 4.1: ***Availability of Rheumatology and Orthopedic Services by Health Planning Region and District Health Council Per 100,000 Population in Ontario, 1997***

Health Planning Region/ District Health Council	Rheumatology Half Days/ Week	Rheumatology Wait Time (Weeks)	Orthopedic Office Half Days/Week	Orthopedic Surgery Half Days/Week	Orthopedic Office and Surgery Half Days/ Week
Central East					
• Durham Region	6.32	5.43	10.41	4.32	14.73
• Haliburton, Kawartha & Pine Ridge	12.67	6.38	11.54	4.96	16.50
• Metropolitan Toronto	14.68	5.08	20.45	12.55	33.00
• Peel	7.32	5.40	8.18	4.39	12.57
• Simcoe County	1.60	5.00	10.91	6.33	17.24
• York Region	5.06	8.29	8.73	5.90	14.63
Total	**10.41**	**5.43**	**14.73**	**8.65**	**23.38**
Central West					
• Brant	4.79	9.75	15.98	14.18	30.15
• Haldimand-Norfolk	1.38	5.25	2.31	0.00	2.31
• Halton	9.12	3.70	15.65	6.39	22.04
• Hamilton-Wentworth	18.12	6.36	21.76	13.51	35.27
• Niagara	6.39	6.00	22.42	8.53	30.95
• Waterloo Region	5.84	5.50	8.99	2.80	11.79
• Wellington-Dufferin	2.86	8.00	11.49	9.21	20.70
Total	**8.67**	**6.21**	**15.95**	**8.14**	**24.09**
East					
• Eastern Ontario	2.70	3.00	5.46	2.70	8.16
• Hastings and Prince Edward Counties	0.00	N/A	17.58	8.26	25.84
• Kingston, Frontenac, Lennox and Addington	9.13	13.50	25.39	19.37	44.76
• Ottawa-Carleton Regional	18.91	7.47	24.57	11.70	36.27
• Renfrew County	3.14	10.29	6.44	0.03	6.47
• Rideau Valley	1.53	5.50	12.46	6.67	19.13
Total	**11.05**	**8.36**	**19.12**	**9.82**	**28.94**
North East					
• Algoma	1.31	24.00	26.35	13.38	39.73
• Cochrane	0.52	18.00	11.64	6.69	18.32
• East Muskoka-Parry Sound	0.68	3.00	0.00	0.00	0.00
• Manitoulin-Sudbury	9.26	10.33	14.99	7.97	22.96
• Nipissing/Timiskaming	0.04	20.00	17.42	6.43	23.85
• West Muskoka-Parry Sound	0.00	N/A	0.00	0.00	0.00
Total	**3.35**	**14.25**	**15.13**	**7.44**	**22.57**
North West					
• Kenora-Rainy River	0.72	12.00	3.51	0.94	4.45
• Thunder Bay	6.03	27.00	15.83	9.71	25.54
Total	**4.13**	**19.50**	**11.42**	**6.57**	**17.99**
South West					
• Essex County	2.72	6.50	11.91	8.88	20.79
• Grey-Bruce	0.00	N/A	9.80	9.18	18.97
• Huron/Perth	0.00	N/A	9.72	4.34	14.06
• Kent County	9.49	12.00	3.99	4.31	8.30
• Lambton	7.91	3.75	16.07	9.96	26.03
• Thames Valley	7.66	14.50	17.76	16.72	34.48
Total	**5.11**	**11.59**	**13.56**	**11.33**	**24.89**
Minimum District Health Council:	**0.00**	**3.00**	**0.00**	**0.00**	**0.00**
Maximum District Health Council:	**18.91**	**27.00**	**26.35**	**19.37**	**44.76**
Median* District Health Council:	**5.84**	**6.50**	**11.91**	**7.33**	**20.70**
Ontario	**8.89**	**7.08**	**15.36**	**8.95**	**24.31**

* District Health Councils with no service were excluded from calculation

Data Source: See Appendix A4.1

Exhibit 4.2: *Availability of Rheumatology and Orthopedic Services by Health Planning Region and New District Health Council Per 100,000 Population in Ontario*

Health Planning Region/ New District Health Council	Rheumatology Half Days/ Week	Rheumatology Wait Time (Weeks)	Orthopedic Office Half Days/Week	Orthopedic Surgery Half Days/Week	Orthopedic Office and Surgery Half Days/ Week
Central					
• Durham, Haliburton, Kawartha & Pine Ridge	8.76	5.93	10.85	4.57	15.41
• Halton-Peel	7.83	4.83	10.30	4.95	15.25
• Metropolitan Toronto	14.68	5.08	20.45	12.55	33.00
• Simcoe-York	3.82	7.88	9.51	6.06	15.57
Total	**10.32**	**5.36**	**14.79**	**8.50**	**23.29**
Central West					
• Grand River	3.20	8.25	9.62	7.58	17.20
• Hamilton-Wentworth	18.12	6.36	21.76	13.51	35.27
• Niagara Region	6.39	6.00	22.42	8.53	30.95
• Waterloo Region-Wellington-Dufferin	4.80	6.00	9.86	5.02	14.88
Total	**8.59**	**6.64**	**16.01**	**8.48**	**24.49**
East					
• Champlain	14.44	7.75	19.30	8.91	28.20
• Quinte, Kingston, Rideau	3.81	11.21	18.74	11.77	30.51
Total	**11.05**	**8.36**	**19.12**	**9.82**	**28.94**
North East					
• Algoma, Cochrane, Manitoulin & Sudbury	4.93	15.17	17.70	9.33	27.03
• Muskoka, Nipissing, Parry Sound & Timiskaming	0.25	11.50	10.06	3.72	13.78
Total	**3.35**	**14.25**	**15.13**	**7.44**	**22.57**
North West					
• Northwestern Ontario	4.13	19.50	11.42	6.50	17.99
Total	**4.13**	**19.50**	**11.42**	**6.50**	**17.99**
South West					
• Essex, Kent and Lambton	5.13	5.2	11.35	8.27	19.61
• Grey, Bruce, Huron, Perth	0.00	N/A	9.76	6.94	16.70
• Thames Valley	7.66	14.50	17.76	16.72	34.48
Total	**5.11**	**11.59**	**13.56**	**11.33**	**24.89**
Minimum District Health Council:	**0.00**	**5.08**	**9.51**	**3.72**	**13.78**
Maximum District Health Council:	**18.12**	**19.50**	**22.42**	**16.72**	**34.48**
Median* District Health Council:	**5.13**	**7.75**	**11.38**	**7.92**	**18.80**
Ontario	**8.89**	**7.08**	**15.36**	**8.95**	**24.31**

* District Health Councils with no service were excluded from calculation

Data Source: See Appendix A4.1

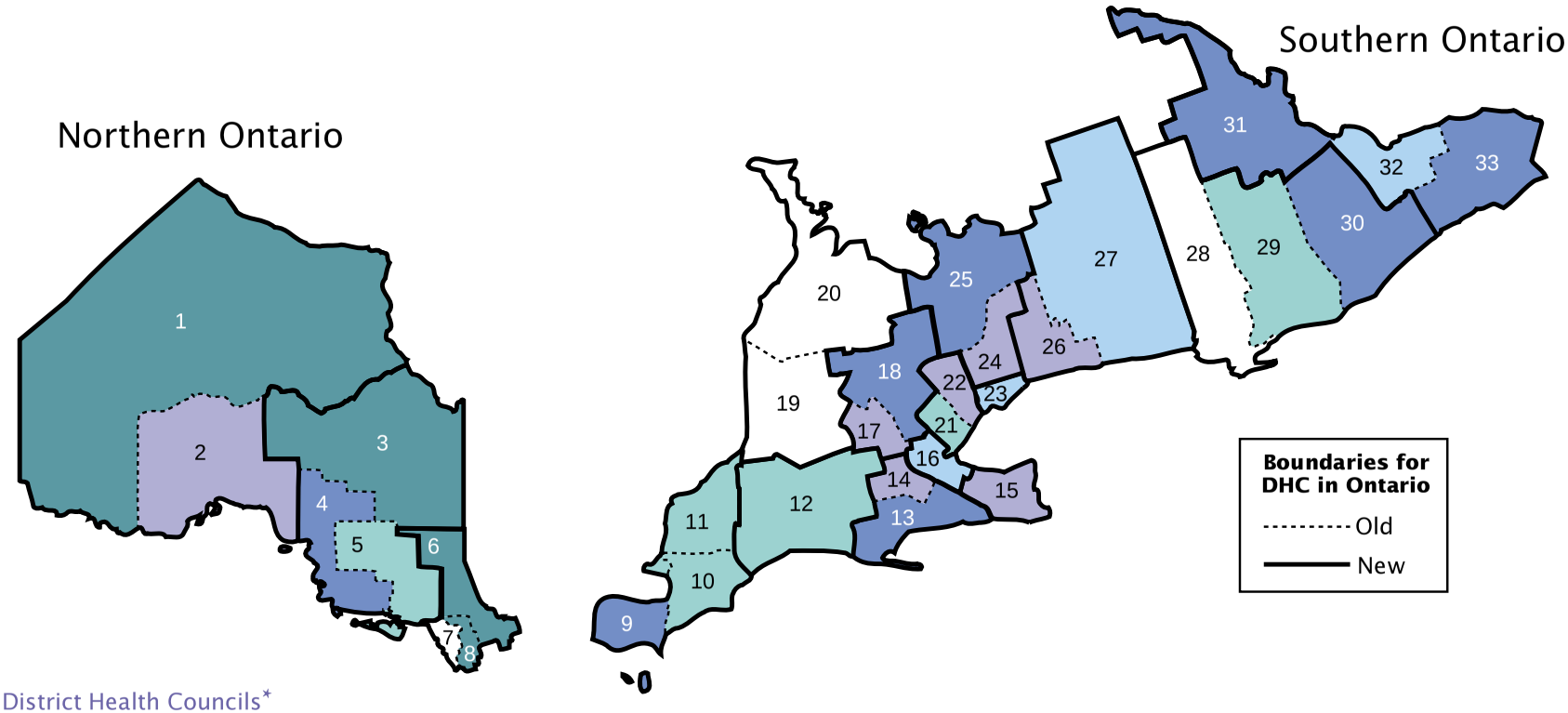
Halton and Lambton. Four District Health Councils had no rheumatology services: Hastings & Prince Edward Counties, West Muskoka-Parry Sound, Grey-Bruce and Huron/Perth.

The provincial mean waiting time was 7.1 weeks. Regional waiting times ranged from a high of 19.5 weeks in the North West region to a low of 5.4 weeks in the Central East (Exhibit 4.1). Exhibit 4.1 indicates that the mean waiting time for the most northern District Health Council, Kenora-Rainy River (12 weeks), was considerably shorter than those in the other northern District Health Councils, such as Thunder Bay (27 weeks), Algoma (24 weeks), Nipissing/Timiskaming (20 weeks) and Cochrane (18 weeks). Unexpectedly, some District Health Councils in the southern part of the province had waiting times as long as those in the north; these included Kingston, Frontenac, and Lennox & Addington (13.5 weeks), Thames Valley (14.5 weeks), and Kent (12 weeks). The shortest waiting times (4 weeks or less) were in Eastern Ontario, East Muskoka-Parry Sound, Lambton and Halton (Exhibit 4.4).

Orthopedic Surgery Services

Of the 374 orthopedic surgeons surveyed, 372 (99.5%) responded. Of the 339 who were eligible after the exclusion of 35 who were retired, were doing research exclusively, or had left to go to the U.S., 330 (97.3%)

Availability of Rheumatology Services Half-Days/Week per 100,000 Population (all ages) by District Health Council in Ontario, 1997



District Health Councils*

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

❖ *Numbering indicates old DHCs*

* *Newly merged DHCs indicated by change of shading*

Half Days/Week per 100,000

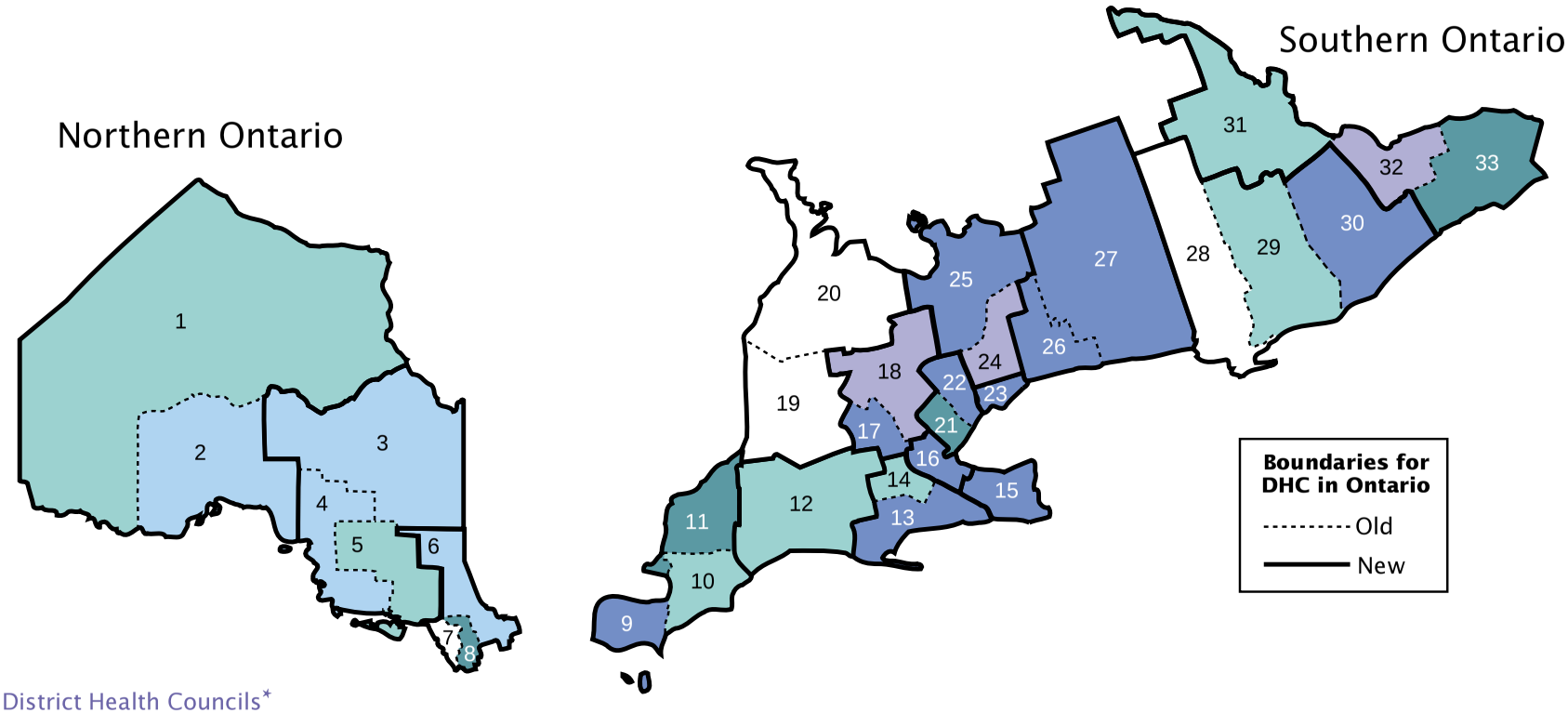
no rheumatology service	(4)+
0.04 to 0.72	(4)
1.31 to 3.14	(8)
4.79 to 7.32	(7)
7.66 to 9.49	(6)
12.67 to 18.91	(4)

+Value in brackets is the number of DHCs in each category

Data Source: ACREU Ontario Survey of Rheumatologists

Exhibit 4.3

Mean Wait Time (Weeks) for Rheumatology Services by District Health Council in Ontario, 1997



District Health Councils*

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

❖*Numbering indicates old DHCs*

**Newly merged DHCs indicated by change of shading*

Mean Wait Time (Weeks)

no rheumatology service	(4)+
3.00 to 4.00	(4)
5.00 to 6.50	(11)
7.47 to 8.29	(3)
9.75 to 14.50	(7)
18.00 to 27.00	(4)

+Value in brackets is the number of DHCs in each category

Data Source: ACREU Ontario Survey of Rheumatologists

reported having a patient population that included people with arthritis-related disorders. (See ACREU working report[17] for more details on this survey).

The provincial rate for orthopedic services (combined office and surgery) was 24.3 half-days a week per 100,000 population (all orthopedic surgeons); for office alone it was 15.4 half-days a week per 100,000 population; and for surgery alone it was 9.0 half-days a week per 100,000 population. The highest combined rate of service was in the East region (28.9 half-days a week) and the lowest was in the North West region (18.0 half-days a week) (Exhibit 4.1). Generally, the ratio of surgery:office half-days for the Planning Regions was 1:2, except for the South West region, where it was 1:1.2. The South West region had a much greater rate of surgery than the other regions. There appeared to be some variability between Planning Regions in terms of the distribution of orthopedic office and surgery half-days a week, considered separately and combined. The District Health Council data are mapped in Exhibits 4.5, 4.6, and 4.7. Kingston, Frontenac and Lennox & Addington had the highest rates of orthopedic service for both combined office/surgery (44.8) and surgery-only (19.4) half-days per week. Two District Health Councils in the North East Planning Region (East Muskoka-Parry Sound and West Muskoka-Parry Sound) had no office or surgery services, and one in the Central West region (Haldimand-Norfolk) had office services only.

General Practitioner Services

In 1990, the provincial general practitioner density was 100 per 100,000 population. This density was highest in the East Planning Region (114 per 100,000) and lowest in the North West (77 per 100,000) (Exhibits 4.8 and 4.9). The District Health Council map (Exhibit 4.10) shows that the most northern District Health Council, Kenora-Rainy River, had a higher level of service provision compared to many southern districts (e.g. Haldimand-Norfolk, Durham, Essex, Lambton, Kent and Eastern). Generally, there appeared to be a significant amount of variability among the southern District Health Councils. The District Health Council with the highest density was the region including Kingston, Frontenac and Lennox & Addington (146 per 100,000), and that with the lowest was Haldimand-Norfolk (58 per 100,000). District Health Council data were missing for East and West Muskoka-Parry Sound (as described in the Methods section). At the county level, general practitioner densities were 77 per 100,000 population for Parry Sound and 100 per 100,000 population for Muskoka.

Allied Health Care Services

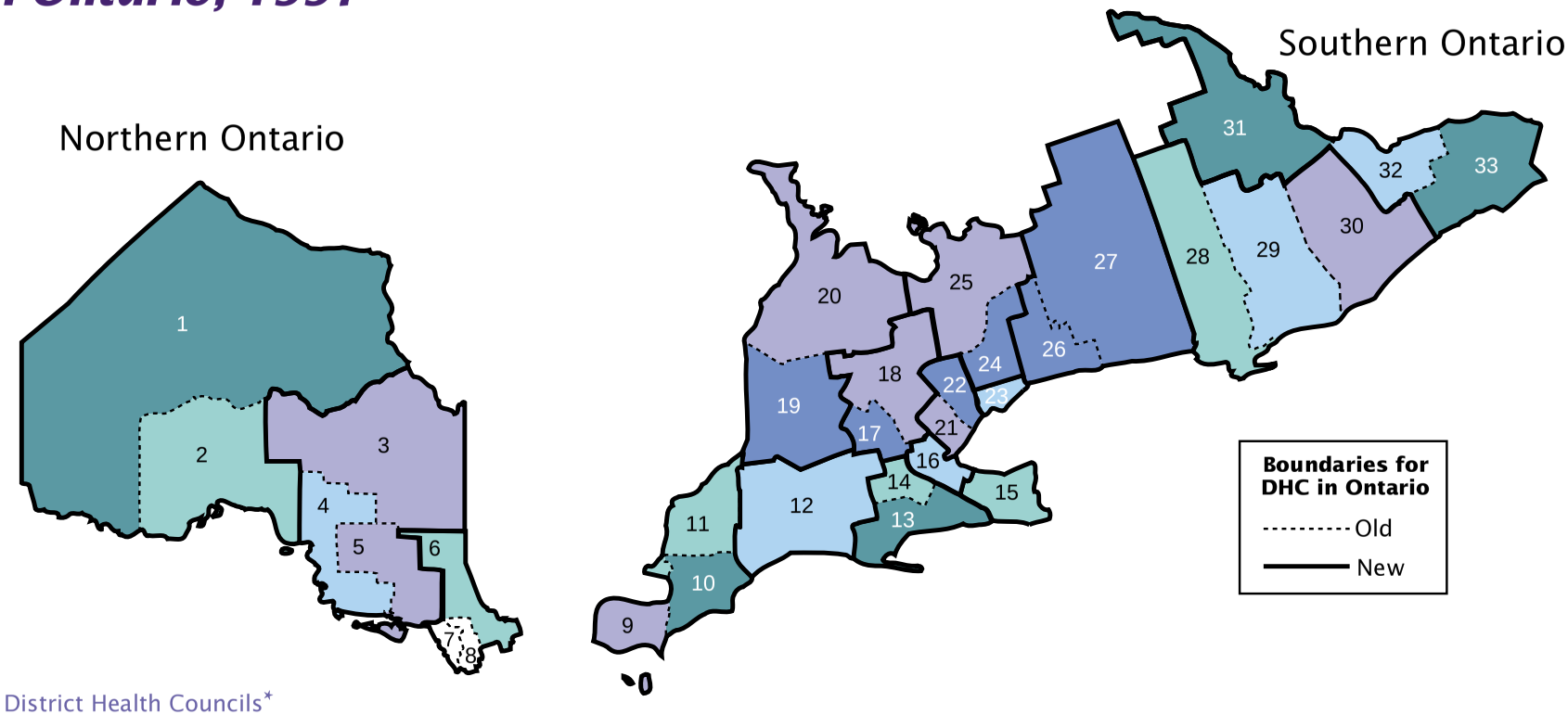
Chiropractors: The provincial rate for chiropractors was 16.6 per 100,000 population. The Planning Region rates ranged from a high of 18.2 per 100,000 population in the Central West region to a low of 12.1 per 100,000 population in the East (Exhibit 4.8). The District Health Councils (Exhibit 4.11) with the highest rates were Grey-Bruce (26.1 per 100,000), East Muskoka-Parry Sound (23.3 per 100,000) and York Region (17.7 per 100,000). There were no District Health Councils without any chiropractic service.

Physiotherapists: The provincial rate for physiotherapists in arthritis-related practice was 34.7 per 100,000 population. The highest rate was in the East region (42.1 per 100,000), followed closely by the North West region (41.0 per 100,000) (Exhibit 4.8). The lowest rate was in the North East region (29.8 per 100,000). The District Health Council map (Exhibit 4.12) shows substantial variability within the North East region, with a high rate of service in West Muskoka-Parry Sound (46.7 per 100,000) and a much lower one in East Muskoka-Parry Sound (15.1 per 100,000). In the southern part of the province, physiotherapy service tends to be more available in major centres (e.g. Metropolitan Toronto, Hamilton-Wentworth, Ottawa-Carleton Regional), whereas the District Health Councils immediately surrounding these centres tend to be not as well served. All District Health Councils had some physiotherapist service for people with arthritis. The one with the least service was East Muskoka-Parry Sound (15.1 per 100,000) and the one with the most was Ottawa-Carleton (54.9 per 100,000).

Occupational Therapists: The provincial rate for occupational therapy was 23.0 per 100,000 population. Although there were no available data on the geographic distribution of occupational therapists who practice in arthritis-related fields, 21.1% of the specialties reported by the Ontario members of the Canadian Association of Occupational Therapists (n= 2,492), can be considered relevant to arthritis practice: rheumatology, orthopedic surgery, repetitive strain injury and hand rehabilitation.[18] The rate of occupational therapists was highest in the East region (27.4 per 100,000), followed closely by the North West (27.1 per 100,000), and lowest in the North East (17.2 per 100,000) (Exhibit 4.8). As with the physiotherapists, there was much variability in occupational therapist service levels in the District Health Councils in the southern part of the province (Exhibit 4.13). In the East region, Kingston, Frontenac and Lennox & Addington had the highest rate of service (67.0 per 100,000), while Rideau Valley had the lowest (7.4 per 100,000).

The Arthritis Society: The provincial rate for therapists employed by the Consultation and Rehabilitation Service was 0.4 per 100,000 population and the rate of clients seen was 47.5 per 100,000 population. For therapists, the highest rate was in the North West region (0.8) and the lowest rate was in the Central East (0.3 per 100,000) (Exhibits 4.8 and 4.14). For clients, the highest rate was in the South West and North West regions (83.0 per 100,000), and the lowest was in the Central East (28.3 per 100,000).

Availability of Orthopedic Services Office & Surgery Half-Days/Week per 100,000 Population (all ages) by District Health Council in Ontario, 1997



District Health Councils*

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

❖ *Numbering indicates old DHCs*

* *Newly merged DHCs indicated by change of shading*

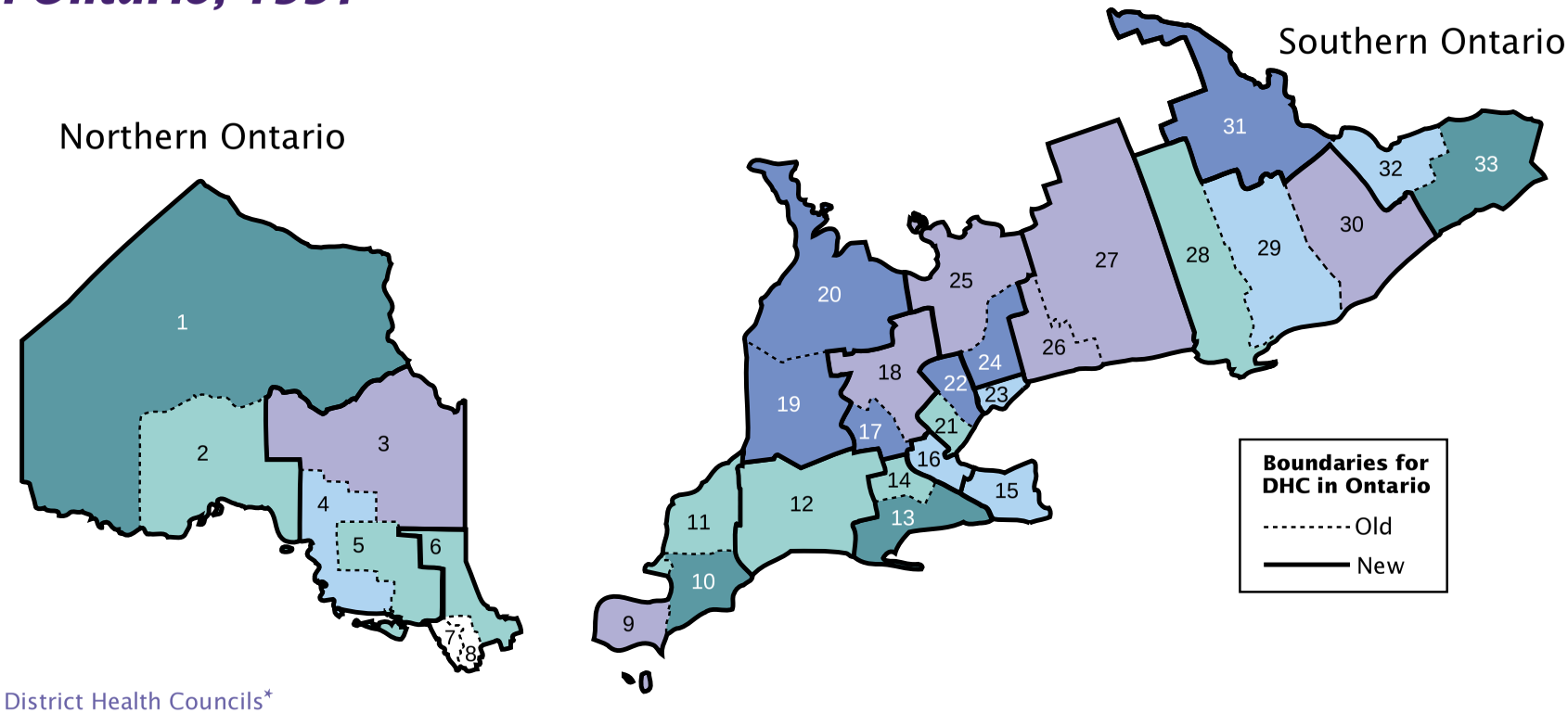
Office and Surgery Half Days/Week per 100,000

no orthopedic service	(2)+
2.31 to 8.30	(5)
11.79 to 16.50	(6)
17.24 to 22.96	(8)
23.85 to 30.95	(6)
33.00 to 44.76	(6)

+Value in brackets is the number of DHCs in each category

Data Source: ACREU Ontario Survey of Orthopedic Surgeons

Availability of Orthopedic Services Office Half-Days/Week per 100,000 Population (all ages) by District Health Council in Ontario, 1997



District Health Councils*

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

❖ *Numbering indicates old DHCs*

* *Newly merged DHCs indicated by change of shading*

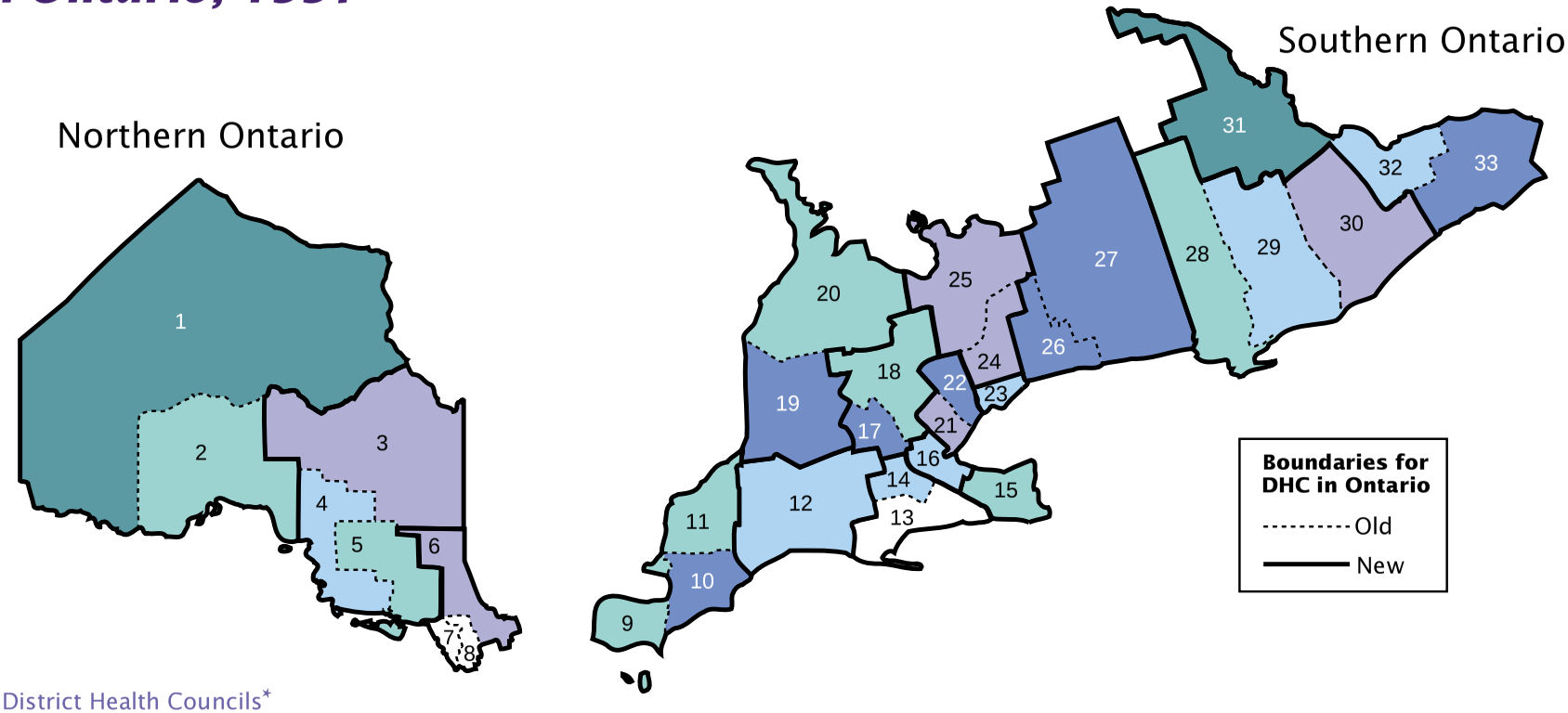
Office Half Days/Week per 100,000

	no orthopedic office	(2)+
	2.31 to 5.46	(4)
	6.44 to 9.80	(6)
	10.41 to 12.46	(7)
	14.99 to 17.76	(8)
	20.45 to 26.35	(6)

+Value in brackets is the number of DHCs in each category

Data Source: ACREU Ontario Survey of Orthopedic Surgeons

Availability of Orthopedic Surgery Half-Days/Week per 100,000 Population (all ages) by District Health Council in Ontario, 1997



District Health Councils*

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

❖ *Numbering indicates old DHCs*

* *Newly merged DHCs indicated by change of shading*

Surgery Half Days/Week per 100,000

	no orthopedic surgery	(3)+
	0.03 to 0.94	(2)
	2.70 to 4.96	(7)
	5.90 to 6.69	(6)
	7.97 to 9.96	(8)
	11.70 to 19.37	(7)

+Value in brackets is the number of DHCs in each category

Data Source: ACREU Ontario Survey of Orthopedic Surgeons

Exhibit 4.8: ***Availability of Selected Services by Health Planning Region and District Health Council Per 100,000 Population in Ontario***

Health Planning Region/ District Health Council	General Practi-tioner	Chiro-practor	Physio-therapist (Arthritis)	Occupa-tional Therapist	Consultation & Rehabilitation Service Therapist	Consultation & Rehabilitation Service Therapist Clients
Central East						
• Durham Region	64	18.11	25.82	11.24	–	15.41
• Haliburton, Kawartha & Pine Ridge	82	17.33	25.67	16.67	–	82.00
• Metropolitan Toronto	138	19.42	44.27	33.32	–	29.03
• Peel	79	10.76	22.08	15.64	–	27.07
• Simcoe County	88	17.69	28.72	9.86	–	9.57
• York Region	86	22.16	24.57	11.24	–	21.84
Total	**109**	**17.86**	**34.05**	**22.84**	**0.29**	**28.32**
Central West						
• Brant	80	14.38	47.13	14.38	–	7.19
• Haldimand-Norfolk	58	11.02	21.12	10.10	–	26.63
• Halton	98	20.21	30.88	13.19	–	31.72
• Hamilton-Wentworth	108	15.72	42.45	38.78	–	40.00
• Niagara	78	21.06	32.89	18.69	–	47.80
• Waterloo Region	80	19.14	32.44	20.54	–	51.82
• Wellington-Dufferin	86	18.47	27.71	15.83	–	33.87
Total	**89**	**18.16**	34.33	**21.73**	**0.39**	**39.28**
East						
• Eastern Ontario	80	9.77	25.19	9.77	–	47.29
• Hastings and Prince Edward Counties	91	13.60	27.21	8.42	–	125.68
• Kingston, Frontenac, Lennox and Addington	146	11.62	37.08	66.96	–	121.75
• Ottawa-Carleton Regional	128	13.24	54.92	32.64	–	58.98
• Renfrew County	82	4.81	38.48	12.51	–	54.84
• Rideau Valley	93	13.49	23.92	7.36	–	90.15
Total	**114**	**12.12**	**42.06**	**27.38**	**0.60**	**74.38**
North East						
• Algoma	69	18.71	33.67	14.97	–	82.31
• Cochrane	82	16.54	34.10	10.33	–	85.78
• East Muskoka-Parry Sound	–	23.27	15.06	12.32	–	16.43
• Manitoulin-Sudbury	73	10.94	21.89	20.93	–	70.41
• Nipissing/Timiskaming	91	17.80	41.02	21.67	–	31.73
• West Muskoka-Parry Sound	–	14.02	46.74	14.02	–	135.55
Total	**79**	**16.11**	**29.81**	**17.16**	**0.50**	**63.68**
North West						
• Kenora-Rainy River	95	7.57	39.99	14.05	–	96.19
• Thunder Bay	68	19.29	41.59	34.35	–	75.34
Total	**77**	**15.09**	**41.01**	**27.08**	**0.77**	**82.80**
South West						
• Essex County	69	11.98	23.14	15.52	–	48.46
• Grey-Bruce	86	26.13	35.46	16.18	–	42.30
• Huron-Perth	82	20.25	34.71	15.19	–	48.45
• Kent County	71	14.66	26.73	14.66	–	136.26
• Lambton	68	9.50	29.22	18.27	–	10.96
• Thames Valley	109	14.41	35.02	33.01	–	129.34
Total	**88**	**15.17**	**31.00**	**22.62**	**0.44**	**82.98**
Minimum District Health Council:	**58**	**4.81**	**15.06**	**7.36**	**–**	**7.19**
Maximum District Health Council:	**146**	**26.13**	**54.92**	**66.96**	**–**	**136.26**
Median* District Health Council:	**82**	**15.72**	**32.44**	**15.19**	**–**	**48.45**
Ontario	**100**	**16.59**	**34.71**	**22.99**	**0.40**	**47.51**

* District Health Councils with no service were excluded from calculation – Not available

Data Source: See Appendix A4.1

Exhibit 4.9: *Availability of Selected Services by Health Planning Region and New District Health Council Per 100,000 Population in Ontario*

Health Planning Region/ New District Health Council	General Practitioner	Chiropractor	Physiotherapist (Arthritis)	Occupational Therapist	Consultation & Rehabilitation Service Therapist	Consultation & Rehabilitation Service Therapist Clients
Central						
• Durham, Haliburton, Kawartha & Pine Ridge	–	17.81	25.76	13.33	–	41.01
• Halton-Peel	–	13.44	24.57	14.95	–	28.39
• Metropolitan Toronto	–	19.42	44.27	33.32	–	29.03
• Simcoe-York	–	20.57	26.05	10.75	–	17.47
Total	**–**	**18.01**	**33.84**	**22.21**	**–**	**28.54**
Central West						
• Grand River	–	12.81	35.03	12.39	–	16.23
• Hamilton-Wentworth	–	15.72	42.45	38.78	–	40.00
• Niagara Region	–	21.06	32.89	18.69	–	47.80
• Waterloo Region-Wellington-Dufferin	–	18.91	30.80	18.91	–	45.59
Total	**–**	**17.71**	35.01	**23.41**	**–**	**40.78**
East						
• Champlain	–	11.78	47.86	26.47	–	56.43
• Quinte, Kingston, Rideau	–	12.85	29.71	29.31	–	112.62
Total	**–**	**12.12**	**42.06**	**27.38**	**0.60**	**74.38**
North East						
• Algoma, Cochrane, Manitoulin & Sudbury	–	14.53	28.14	16.80	–	77.40
• Muskoka, Nipissing, Parry Sound & Timiskaming	–	19.23	33.09	17.88	–	36.66
Total	**–**	**16.11**	**29.81**	**17.16**	**0.50**	**63.68**
North West						
• Northwestern Ontario	–	15.09	41.01	27.08	–	82.80
Total	**–**	**15.09**	**41.01**	**27.08**	**0.77**	**82.80**
South West						
• Essex, Kent and Lambton	–	11.93	25.16	15.96	–	56.60
• Grey, Bruce, Huron, Perth	–	23.41	35.11	15.72	–	45.15
• Thames Valley	–	14.41	35.02	33.01	–	129.34
Total	**–**	**15.17**	**31.00**	**22.62**	**0.44**	**82.98**
Minimum District Health Council:	**–**	**11.78**	**24.57**	**10.75**	**–**	**17.47**
Maximum District Health Council:	**–**	**23.41**	**47.86**	**38.78**	**–**	**129.34**
Median* District Health Council:	**–**	**15.40**	**32.99**	**18.29**	**–**	**45.37**
Ontario	**100**	**16.59**	**34.71**	**22.99**	**0.40**	**47.51**

* District Health Councils with no service were excluded from calculation – Not available

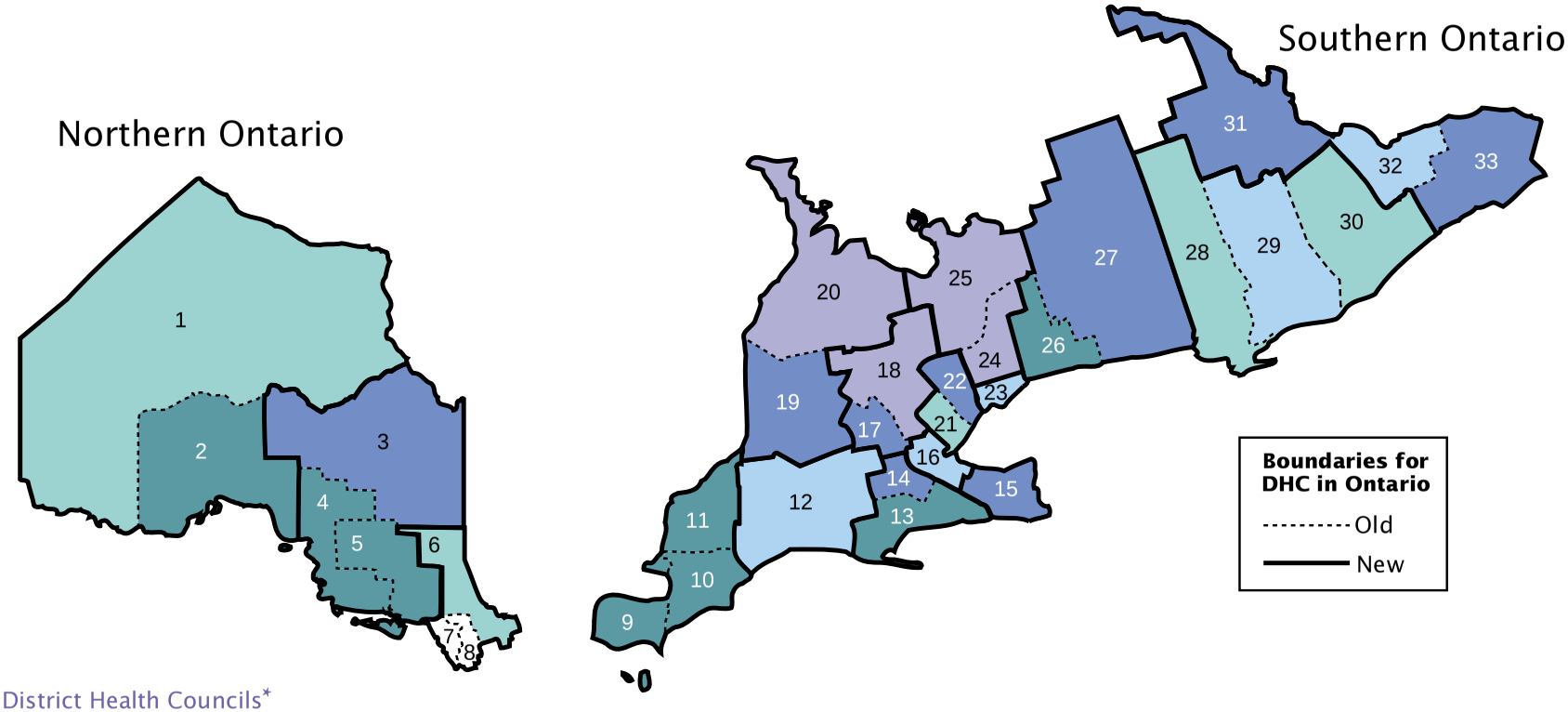
Data Source: See Appendix A4.1

When analyzed by District Health Council, the highest rate of clients was in Kent County (136.3 per 100,000, South West) and the lowest was in Brant (7.2 per 100,000, Central West). The District Health Council map for clients (Exhibit 4.15) demonstrates that service was available in every District Health Council, although there was a wide range in the rates.

Summary of Findings

There was considerable variation in the availability of arthritis-related services throughout Ontario. Exhibit 4.16 summarizes the rankings of each service by Planning Region (per 100,000 population). In comparison to the rest of the province, the North West region (which includes Thunder Bay), appeared to be much less serviced by physicians but had relatively high rates of therapy services. Generally, the North East region (which includes Sudbury) did not have high levels of service by any practitioners. The East region (which includes Ottawa and Kingston) had consistently high rates of all services except chiropractic. In the Central West region (which includes Kitchener-Waterloo), where chiropractic services were the highest, all other services were relatively low (except for orthopedic surgeons' offices). Of particular note,

Availability of General Practitioners per 100,000 Population (all ages) by District Health Council in Ontario, 1990



District Health Councils*

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

❖ *Numbering indicates old DHCs*

* *Newly merged DHCs indicated by change of shading*

General Practitioners per 100,000

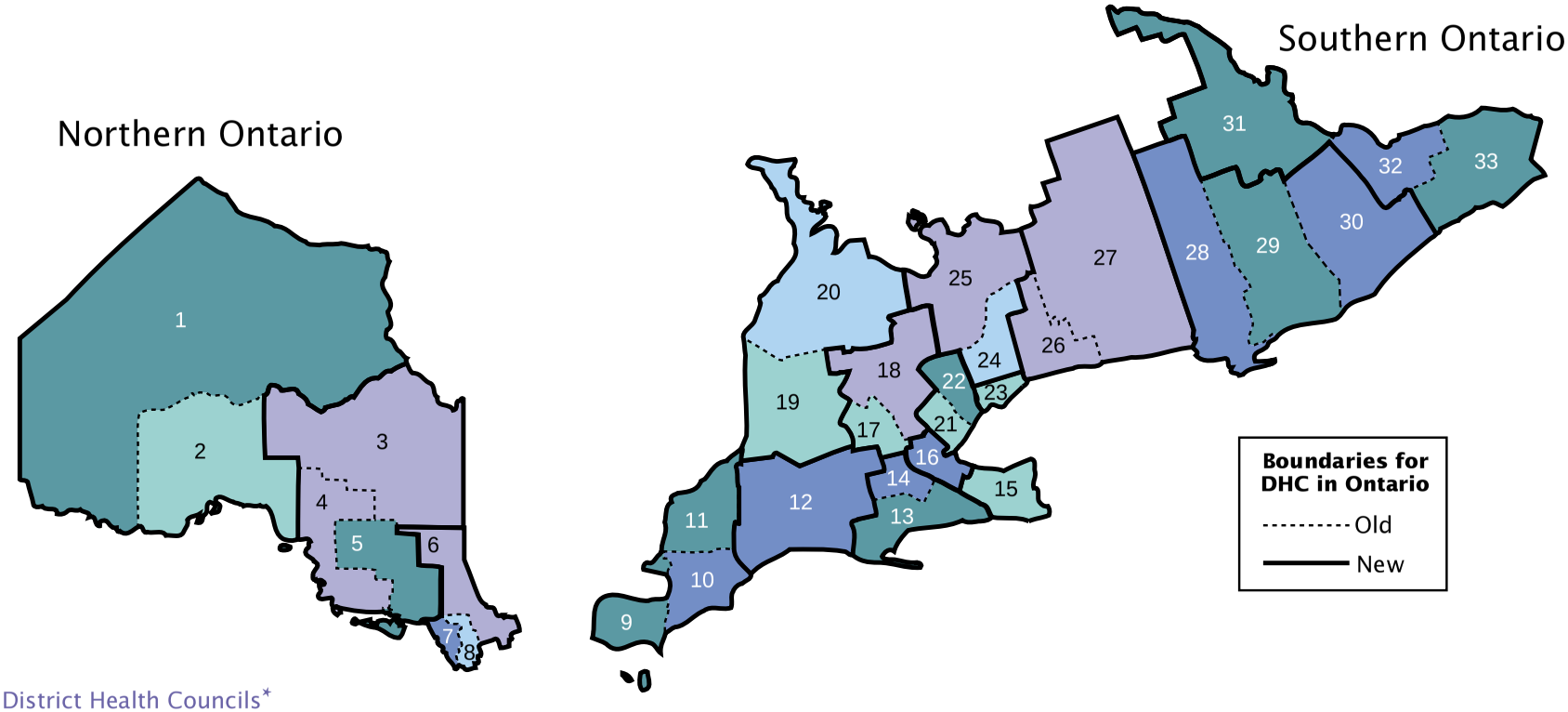
	not available	(2)+
	58 to 73	(8)
	78 to 82	(9)
	86 to 88	(4)
	91 to 98	(5)
	108 to 146	(5)

+Value in brackets is the number of DHCs in each category

Data Source: Coyte PC[12]

Exhibit 4.10

Availability of Chiropractors per 100,000 Population (all ages) by District Health Council in Ontario, 1996



District Health Councils*

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

❖*Numbering indicates old DHCs*

**Newly merged DHCs indicated by change of shading*

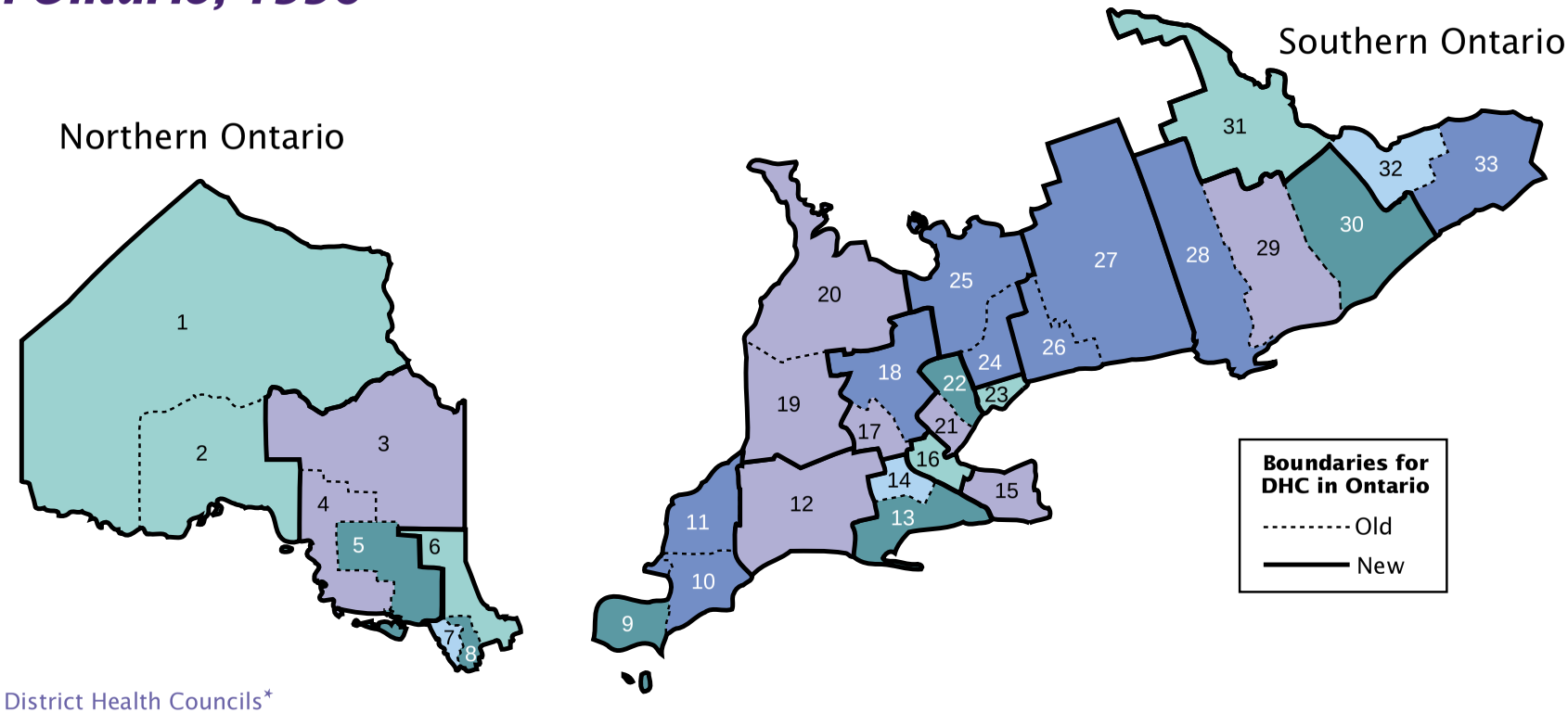
Chiropractors per 100,000

4.81 to 11.98	(9)+
13.24 to 15.72	(8)
16.54 to 18.71	(7)
19.14 to 21.06	(6)
22.16 to 26.13	(3)

+Value in brackets is the number of DHCs in each category

Data Source: Canadian Memorial Chiropractic College Directory

Availability of Physiotherapy Services (Arthritis-Related Practice) per 100,000 Population (all ages) by District Health Council in Ontario, 1996



District Health Councils*

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

❖ *Numbering indicates old DHCs*

* *Newly merged DHCs indicated by change of shading*

Physiotherapists (arthritis practice) per 100,000

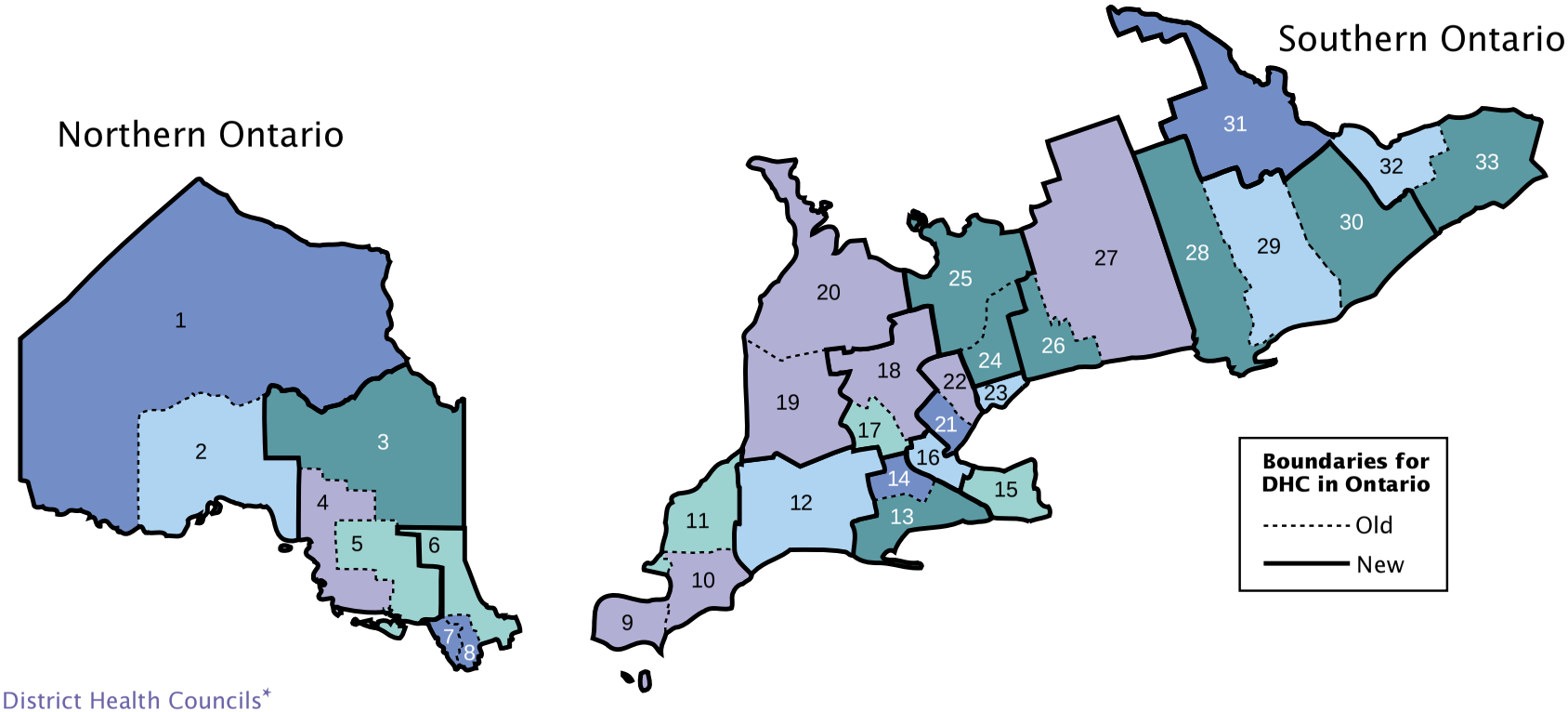
15.06 to 23.92	(6)+
24.57 to 29.22	(9)
30.88 to 37.08	(9)
38.48 to 44.27	(6)
46.74 to 54.92	(3)

+Value in brackets is the number of DHCs in each category

Data Source: College of Physiotherapists of Ontario Membership List

Exhibit 4.12

Availability of Occupational Therapists per 100,000 Population (all ages) by District Health Council in Ontario, 1997



District Health Councils*

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

❖*Numbering indicates old DHCs*

**Newly merged DHCs indicated by change of shading*

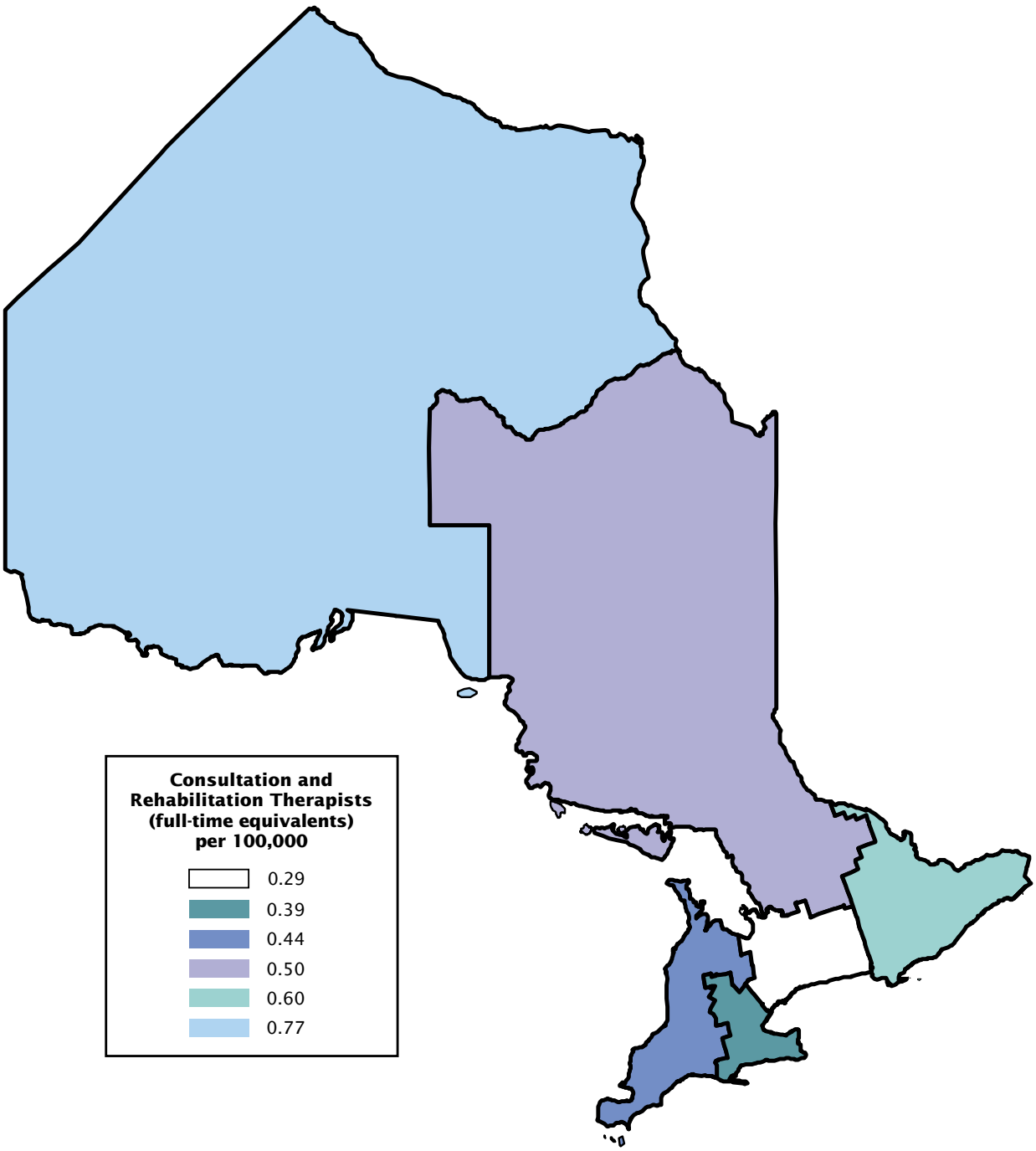
Occupational Therapists per 100,000

7.36 to 11.24	(8)+
12.32 to 14.38	(6)
14.66 to 16.67	(8)
18.27 to 21.67	(5)
32.64 to 66.96	(6)

+Value in brackets is the number of DHCs in each category

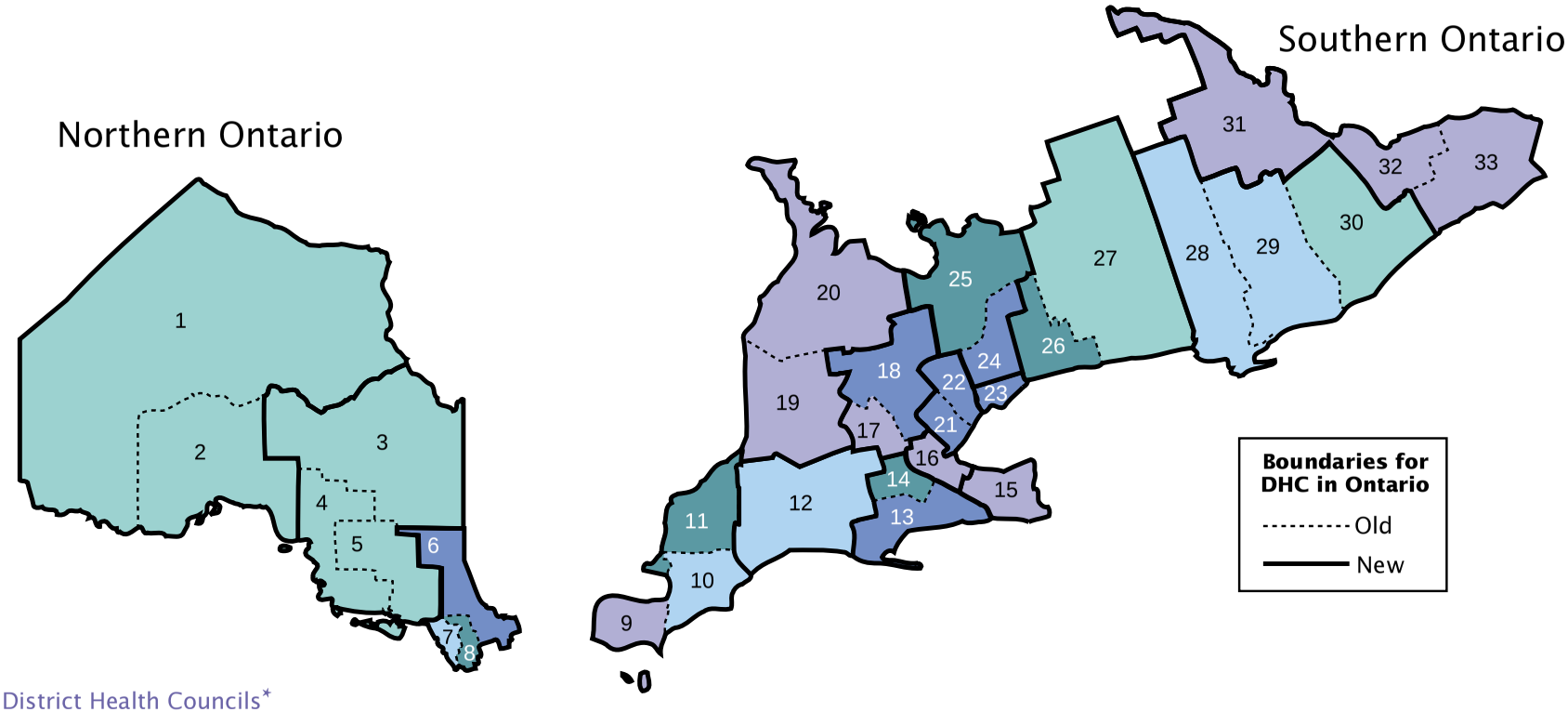
Data Source: College of Occupational Therapists of Ontario Membership List

Exhibit 4.14 Consultation and Rehabilitation Service Therapists per 100,000 Population by Health Planning Region in Ontario, 1997



Data Source: The Arthritis Society, Consultation and Rehabilitation Service Staff List

Consultation and Rehabilitation Service Clients per 100,000 Population (all ages) by District Health Council in Ontario, 1995 – 1996



District Health Councils*

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

❖*Numbering indicates old DHCs*

**Newly merged DHCs indicated by change of shading*

Consultation and Rehabilitation Service Clients per 100,000

7.19 to 16.43	(5)+
21.84 to 33.87	(7)
40.00 to 58.98	(9)
70.41 to 96.19	(7)
121.75 to 136.26	(5)

+Value in brackets is the number of DHCs in each category

Data Source: The Arthritis Society, Consultation and Rehabilitation Service Client Database

Exhibit 4.16: ***Ranking of Service Rates by Health Planning Region Per 100,000 Population in Ontario***

Service	Health Planning Region					
	North West	North East	East	Central East	Central West	South West
Rheumatology Half-Days per Week	5	6	1	2	3	4
Rheumatology Wait Time*	6	5	3	1	2	4
Orthopedic Surgery Office Half-Days per Week	6	3	1	4	2	5
Orthopedic Surgery Half-Days per Week	6	5	2	3	4	1
Orthopedic Surgery Office and Surgery Half-Days per Week	6	5	1	4	3	2
General Practitioners	6	5	1	2	3	4
Chiropractors	5	3	6	2	1	4
Physiotherapists (arthritis)	2	6	1	4	3	5
Occupational Therapists	2	6	1	3	5	4
Consultation Rehabilitation Service Full Time Equivalents	1	3	2	6	5	4
Consultation Rehabilitation Service Clients	2	4	3	6	5	1

1 (best) = highest provision or shortest wait time (* For rheumatology wait time, decreasing numbers represent shorter wait times)
6 (worst) = lowest provision or longest wait time

Data Source: See Appendix A4.1

the South West region (which includes London and Windsor) is generally not well served compared to the rest of the province, except for orthopedic surgery and the Consultation and Rehabilitation Service (as indicated by client rates) where it ranked number one.

When looking at service delivery at the District Health Council level, it appeared that, generally, the five District Health Councils with teaching health science centres (Ottawa-Carleton, Kingston-Frontenac and Lennox & Addington, Metropolitan Toronto, Hamilton-Wentworth, and Thames Valley) ranked within the highest ranges for health service provision except for chiropractic services. District Health Councils with low rates in at least two areas of service provision were located throughout the province: Haldimand-Norfolk (low orthopedic office/surgery, general practice, physiotherapy, occupational therapy and Consultation and Rehabilitation Service clients), West Muskoka-Parry Sound (no rheumatology or orthopedic surgery), East Muskoka-Parry Sound (no orthopedic office/surgery, low rheumatology, physiotherapy and chiropractic), Renfrew (low orthopedic office/surgery and chiropractic), Hastings (no rheumatology and low occupational therapy), Eastern (low occupational therapy and chiropractic) and Manitoulin (low general practice, chiropractic and physiotherapy).

When looking at the individual maps of services, it appeared that some services were clustered geographically. To analyze this further, we calculated correlation coefficients to examine the relationship between different services by District Health Council (Exhibit 4.17). The closer the value in the table to 1.00, the greater the geographical relationship between two services. According to this table, the rates of all physician services (rheumatology, orthopedic surgery and general practice) were geographically related to each other and to occupational therapy. The location of physiotherapists was related to that of orthopedic surgeons and general practitioners, but not to that of rheumatologists. The location of occupational therapists was related to that of all service providers except chiropractors, whose location was not related to that of any other service. To summarize, it appears that at the District Health Council level, physician services tend to cluster; the location of occupational therapists and, to a certain extent, physiotherapists, is related to the location of physician services; and chiropractors appear to be located independent of other health care services. We were not able to correlate the location of the Consultation and Rehabilitation Service therapists and clients with any of the other services, since the location of these therapists was not available at the District Health Council level. Another correlation not presented in the table was rheumatology waiting time, which interestingly, was not significantly related with rheumatology half-days per week.

Discussion

The study of intra-provincial variation in the supply of arthritis-related health care services has a number of useful purposes. It can be used to target regions that may be relatively underserviced or in need of different services and, in conjunction with the earlier report on rheumatology

Exhibit 4.17: *Pearson Correlation Coefficients of Services for Persons with Arthritis in Ontario*

	Rheumatology (Half-Days per Week)	Orthopedic Office and Surgery (Half-Days per Week	Orthopedic Office (Half-Days per Week)	Orthopedic Surgery (Half-Days per Week)	General Practitioners	Chiropractors	Physiother-apists (Arthritis)	Occupational Therapists	Consultation and Rehabilitation Service Clients
Rheumatology (Half-Days per Week)	1.00								
Orthopedic Office and Surgery (Half-Days per Week	.49**	1.00							
Orthopedic Office (Half-Days per Week	.49**	.98***	1.00						
Orthopedic Surgery (Half-Days per Week	.44**	.95***	.86***	1.00					
General Practitioners	.49**	.56***	.53**	.56***	1.00				
Chiropractors	N.S.	N.S.	N.S.	N.S.	N.S.	1.00			
Physiotherapists (Arthritis)	N.S.	.42*	.42*	.38*	.56***	N.S.	1.00		
Occupational Therapists	.57***	.66***	.59***	.69***	.70***	N.S	.45**	1.00	
Consultation and Rehabilitation Service Clients	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	1.00

* $p \leq .05$ ** $p \leq .01$ *** $p \leq .001$ N.S. Not significant

Data Source: See Appendix A4.1

services,[10] can be used to observe and describe shifts that may occur in the distribution of health care services over time. It can also raise questions about the overall coverage and balance of care for people with arthritis.

It is clear from our findings that there are considerable variations in the per capita provision of arthritis-related services within Ontario. It is important to view these variations within the context of potential need. Data from the 1990 Ontario Health Survey[19] indicated that arthritis and rheumatism were reported as long-term health problems by 14% of the population.[20] When examined by Planning Region, these reported rates varied from a low of 12.8% in the Central East region to a high of 18.4% in the North East region (Exhibit 4.18). The sampling design of the Ontario Health Survey was such that results could be generalized to the 43 Public Health Units, which were local planning areas for public health services. When the data were examined at the smaller level of the 43 Public Health Units, there was again considerable variation, ranging from a low of 9.5% in Peel to 23.5% in Timiskaming. It should be noted that the prevalence was higher in the northern part of the province, where there is generally a low provision of medical services (rheumatology, orthopedic surgery and general practice). However, despite variations in prevalence, the number of people with arthritis (the potential client group for service) tended to be higher in areas of high population, and the highest number was found in Metropolitan Toronto. Little is understood about reasons for the variation in arthritis prevalence. As expected, age has been found to be a significant predictor.[10] Attempts to model the variation in prevalence of arthritis and rheumatism that was found in the Ontario Health Survey using regression analysis showed that age (percentage of the Public Health Unit population over the age of 65) alone accounted for 27.8% of the variation. Other factors considered in modelling included low socioeconomic status (low income and low education). The best model, which accounted for 65.7% of the variation, included the per cent of the population with low income and the per cent out of the workforce (the latter variable includes those who were not working because of arthritis or for other reasons, as well as those who had reached the age of retirement). The implication is that although the determinants of arthritis are not known, at least some of the potential need for service in the population might be predicted from a combination of knowledge of the age structure of the population and its socioeconomic status.

A study by Coyte et al,[21] which examined the relationship between the number of knee replacements performed in Ontario and various demographic characteristics (age and gender), disease prevalence and regional factors, found that age was the most significant factor, accounting for 38% of the variation explained by the full model. The strong relationship between age and arthritis has implications for the prediction of future need for services. As the population ages, it is anticipated that the number of people with arthritis will increase dramatically.[9] Less is known about future patterns with regards to variations in socioeconomic indicators.

There was an inconsistent relationship between the proportion of people aged 65 and over and service provision. According to the 1991 census for Ontario, the proportion of people aged 65 and over was 12.84%, ranging from 6.36% in the Peel Public Health Unit to 16.65% in East York.[10] The two main areas in Ontario with the highest proportion of people aged 65 and over were the South West region (which includes the Bruce, Grey, Haliburton, Huron and Muskoka Public Health Units) and the East region (which includes the Leeds, Hastings, Peterborough, and East York Public Health Units). The South West region is not well served by rheumatologists, orthopedic office services (it did better on surgical services), chiropractors and physiotherapists. Conversely, the East is consistently well served except by chiropractors.

There are vast differences between District Health Councils in terms of geographical area and population size and density, and it is important to consider these differences when looking at the provision of health care services. Three general scenarios can be identified within the province with regards to regional variations in specialist rheumatology and orthopedic services.

The first scenario applies to areas where the population is dense and the services are relatively plentiful. In Metropolitan Toronto, for instance, there is a wide array of both specialist and allied health services. A high density population, however, is potentially associated with a high need for service. Also, urban areas such as Toronto often serve as tertiary referral centres, so many of the available services may be "ultraspecialist" in nature, and patients may come from a wide geographic area. Indeed, with regards to joint replacement, we know that Metropolitan Toronto has some of the lowest per capita rates in the province.[22] The relatively low waiting time in Metropolitan Toronto (compared to the provincial average) for rheumatology is encouraging in terms of the potential availability of service.

The second scenario applies to areas where the population is of medium density but specialist services are not necessarily offered locally. This scenario applies to much of southern Ontario, where there is a moderate population density with much of the population concentrated in cities and towns. Specialist services tend to be located in population centres such as London, Hamilton, Kingston and Ottawa where there are major medical schools, as well as in other cities such as Kitchener-Waterloo. Services in the surrounding District Health Councils may be lacking or at best are concentrated near the population centres, although this may be masked when

Exhibit 4.18: ***Percent Prevalence and Number of Cases of Arthritis and Rheumatism* From the Ontario Health Survey** Converted to District Health Council in Ontario, 1990***

Health Planning Region/ Old District Health Council	Percent Prevalence	Number of Cases	Population (≥ 15 years)	Health Planning Region/ New District Health Councils	Percent Prevalence	Number of Cases	Population (≥ 15 years)
Central East				**Central**			
• Durham Region	13.2	38,798	293,955	• Durham-Haliburton, Kawartha & Pine Ridge	14.1	69,074	489,916
• Haliburton, Kawartha & Pine Ridge	15.5	30,276	195,961	• Halton-Peel	10.0	74,277	739,265
• Peel	9.5	48,632	511,853	• Metropolitan Toronto	13.8	252,663	1,835,647
• Metropolitan Toronto	13.8	252,663	1,835,647	• Simcoe-York	11.6	59,960	518,174
• Simcoe County	14.4	28,206	195,707				
• York Region	9.9	31,754	322,467				
Total	**12.8**	**430,329**	**3,355,590**	**Total**	**12.7**	**455,974**	**3,583,002**
Central West				**Central West**			
• Brant	15.3	12,864	84,203	• Grand River	15.2	23,484	154,825
• Haldimand-Norfolk	15.0	10,620	70,622	• Hamilton-Wentworth	16.6	57,084	344,116
• Halton	11.3	25,645	227,412	• Niagara Region	14.8	44,650	301,355
• Hamilton-Wentworth	16.6	57,084	344,116	• Waterloo Region-Wellington-Dufferin	12.8	53,351	415,287
• Niagara	14.8	44,650	301,355				
• Waterloo Region	11.6	31,859	275,321				
• Wellington-Dufferin	15.4	21,492	139,966				
Total	**14.2**	**204,214**	**1,442,995**	**Total**	**14.7**	**178,569**	**1,215,583**
East				**East**			
• Eastern Ontario	12.6	16,513	130,692	• Champlain	12.7	92,183	727,932
• Hastings and Prince Edward Counties	18.6	20,099	107,906	• Quinte, Kingston, Rideau	16.7	57,610	344,971
• Kingston, Frontenac, Lennox and Addington	15.2	18,928	124,624				
• Rideau Valley	16.5	18,583	112,441				
• Ottawa-Carleton Regional	11.6	61,247	527,000				
• Renfrew County	20.5	14,423	70,240				
Total	**14.0**	**149,793**	**1,072,903**	**Total**	**14.0**	**149,793**	**1,072,903**
North East				**North East**			
• Algoma	17.2	17,340	100,986	• Algoma, Cochrane, Manitoulin & Sudbury	17.8	56,117	315,305
• East Muskoka-Parry Sound***	–	–	–	• Muskoka, Nipissing, Parry Sound & Timiskaming	19.6	30,284	154,474
• West Muskoka-Parry Sound***	–	–	–				
• Nipissing/Timiskaming	20.4	20,812	101,874				
• Cochrane	17.6	12,308	69,933				
• Manitoulin-Sudbury	18.3	26,469	144,386				
Total	**18.4**	**76,929**	**417,179**	**Total**	**18.4**	**86,401**	**469,779**

Continued on next page

Exhibit 4.18: *(cont'd)*

Health Planning Region/ Old District Health Council	Percent Prevalence	Number of Cases	Population (≥ 15 years)	Health Planning Region/ New District Health Council	Percent Prevalence	Number of Cases	Population (≥ 15 years)
North West				**North West**			
• Kenora-Rainy River	17.3	10,786	62,389	• Northwestern Ontario	16.2	30,018	185,596
• Thunder Bay	15.6	19,232	123,207				
Total	**16.2**	**30,018**	**185,596**	**Total**	**16.2**	**30,018**	**185,596**
South West				**South West**			
• Grey-Bruce	15.3	15,895	103,917	• Essex, Kent and Lambton	14.7	64,709	439,315
• Thames Valley	15.2	60,478	398,208	• Grey, Bruce, Huron, Perth	15.3	30,379	198,114
• Essex County	14.1	36,517	258,407	• Thames Valley	14.6	60,478	398,208
• Huron/Perth	15.4	14,484	94,197				
• Kent County	16.5	14,001	84,701				
• Lambton	14.8	14,191	96,207				
Total	**15.0**	**155,566**	**1,035,637**	**Total**	**15.0**	**155,566**	**1,035,637**
All of Ontario	**14.0**	**1,046,849**	**7,509,900**	**All of Ontario**	**14.0**	**1,056,321**	**7,562,500**

* A responsible household member was asked to report if any of the residents including themselves had arthritis or rheumatism as a chronic health problem

** Estimates are weighted to be representative of the Ontario adult population 15 years of age and over, based on projections from the 1986 Census made by the Ministry of Treasury and Economics

*** Unable to convert Public Health Unit data for East and West Muskoka-Parry Sound, therefore these data are designated as missing

Data Source: Ontario Health Survey

the unit of analysis is the District Health Council. For example, although the Thames Valley District Health Council has a relatively high rate of rheumatology service provision, the service is concentrated in Middlesex county (London), whereas the other two counties in this region, Elgin and Oxford, have no rheumatological services, and patients there may have to travel to the major centres for their specialist appointments. Local accessibility of allied health care services may also be important. Allied health care services, particularly occupational therapy, also tend to be concentrated in the areas with the specialist services. This raises the issues of travelling time, inconvenience and discomfort, cost to the patient, and perhaps continuity in follow-up. The question then becomes one of balance between the location of services and the needs and abilities of patients to travel, as well as the amount of service provided. There seems to be room for improvement in the geographical availability of services in much of southern Ontario.

The third scenario is one where the population is dispersed and there are large distances between the centres where services are offered (often infrequently). In this scenario there is a large area of land, a low population, and a high prevalence rate of arthritis. These factors pose challenges to both the patient and the health care provider. Many rheumatology clinics in the north, for example, are offered only every few months, if at all, often by rheumatologists visiting from other areas of the province. Alternatively, patients may travel to southern Ontario for care. This raises questions of continuity of care, and other arrangements may need to be made for the ongoing monitoring and treatment of patients. Issues such as the availability of travel grants become important, given the generally low provision of local services and the high waiting times for rheumatological consultation. If a patient does attend a specialist service, consultation may involve a full day or more of travel

and possibly an overnight stay. Services provided by other health professionals or in partnership with general practitioners could play an important role in maintaining continuity of care and ensuring adequate monitoring of those patients with serious disease. For patients from areas with low population density, the importance of the balance between inpatient and outpatient care is emphasized. Although rheumatology is increasingly becoming an outpatient speciality, patients from remote areas may need to be hospitalized in order to receive adequate care.

A recent study[23] that addressed the issues around distance to the nearest physician of any type found that the smaller the community, the farther this distance, and that physicians tend to concentrate in high-income areas. For people living in low-income and rural areas where distances to physicians are far, difficulties may be compounded by lack of transportation. Ng et al made the important point that although only 0.4% of the population of Ontario lives 25 or more kilometres away from the nearest doctor, this number amounts to 40,000 people (compared with 24,000 people in the Northwest Territories). Canada-wide, the mean distance to a rheumatologist was found to be 68.9 km, with 37% of the population reporting living at least 25 km away; and the mean distance to an orthopedic surgeon was 25.9 km, with 21% of the population reporting living at least 25 km distant.

In the second and third scenarios described above, doctors may be reluctant to refer patients to specialists if the service is infrequent or far away. In a survey of Ontario family physicians that asked about barriers to referral (see Chapter 5), it was found that 42% of general practitioners reported waiting times to see a rheumatologist to be unacceptably long, and 9% reported access problems to rheumatologists (including unacceptably long travel time, no confidence in service, service not available, and unsure if available).

As expected, access to referral and waiting times were the most problematic in northern regions. Waiting time for orthopedic surgery was also a difficulty in the South West region, with 50.5% reporting a problem. It is important here to mention the role of Consultation and Rehabilitation Service therapists, who, according to this report, provide most of their services in the North West and South West regions. The results of this analysis seem to suggest that the Consultation and Rehabilitation Service plays an important role in providing continuity of care, monitoring and support in areas that have significant barriers to specialist care.

Services provided by orthopedic surgeons included office as well as surgical activities, with a ratio of two office half-days a week for each surgical half-day. The relatively high proportion of office half-days a week raises the question of the amount of clinical (non-surgical) care for arthritis provided by orthopedic surgeons. It should be noted that the number of office half-days a week provided by these specialists (15.3) is much higher than the overall number provided by rheumatologists (9.2). Although orthopedic surgeons do treat many other conditions besides arthritis, the role they play in providing advice on clinical management, particularly of osteoarthritis, is an area that deserves further exploration.

It is interesting to compare the patterns of arthritis service provision found here to ACREU's previous mapping report, which looked at rheumatologists, chiropractors, physiotherapists and Consultation and Rehabilitation Service staff.[10] The number of physicians having a clinical rheumatology practice in Ontario has increased from 136 in 1992 to 168 in 1997. Even though there is generally more service available in the province, large disparities remain. The range of service provision rates throughout the province continues to be wide, with Peterborough still having the highest level. In 1992, 10 of the 43 Public Health Units were without rheumatology service; in 1997, eight of these areas still reported no service. The provincial waiting time to see a new non-urgent rheumatology patient was consistent between the two reports: 7.9 weeks in 1992[10,11] and 7.1 weeks in 1997.

Regarding allied health care services, since 1990, the number of chiropractors in Ontario has increased from 1,704 to 1,867. In both 1990 and 1997, all District Health Councils were served by at least one chiropractor. The total number of physiotherapists in the province has increased from 3,788 in 1992[10] to 5,449. These figures refer to the overall number of practitioners, without regard to whether or not they are in full-time practice; data are not available for full-time equivalents of service. Again, all District Health Councils were covered by physiotherapists at the time of both reports. As the current report focused only on physiotherapists providing arthritis service, it is not possible to do any more specific regional comparisons. Unlike the other services studied, the number of Consultation and Rehabilitation Service full-time equivalent therapists has declined since 1993 from 54.4 (ranging from 2.3 in the North West to 15.9 in the Central East) to 44.5 (ranging from 2.0 in the North West to 14.8 in the Central East).

The large variation in service provision in Ontario raises the question of what constitutes adequate provision. A number of approaches have been taken. One is to statistically compare variations in provision with the average level of provision, and to identify areas that are significantly under- or overserved. Coyte et al[12] took this approach in looking at the provision of general practitioner services in Ontario, where they allocated each Ontario county to one of three groups based on whether their adjusted general practitioner densities were significantly above, below, or similar to the provincial average. This approach is limited insofar as it

assumes that the average provision is adequate. Also, for much of the data in this report, such as chiropractic, occupational therapy and to some extent orthopedic services, we have little information on the proportion of practitioners providing services specifically for people with arthritis. Although we currently have no data to support this, it is possible that the major areas of clinical interest and practice vary throughout the province.

A second approach is to employ an external standard. The issue here is a lack of data on desirable level of services. What is "desirable" tends to be based on what is found elsewhere. The 168 rheumatologists in Ontario represent 1.5 rheumatologists per 100,000 population. A 1990 estimate for the U.S. is 1.2 per 100,000 population,[24] and within the European Community, the rate is estimated to vary from 0.3 in the Republic of Ireland to 3.5 in Denmark.[25] These figures indicate that Ontario's provision is within the range found in other places. However, the per capita rheumatology provision may actually overestimate the amount of rheumatological care available, since in many cases, teaching, research and administrative commitments, particularly in university centres, may reduce the real availability of clinical care.[11]

The Ontario data showed a mean of 100 general practitioners per 100,000 population.[12] Physician densities that adjust for both the intensity of medical practice and pattern of health care utilization were computed for each county in Ontario. In Manitoba, the general practitioner to population ratios varied from 64 per 100,000 population in the rural regions to 68 per 100,000 population in Winnipeg.[26] United States' estimates of primary care physicians to population ratios were found to range from 31.9 per 100,000 population in rural regions to 116.0 per 100,000 population in large metropolitan areas. The U.S. average was 85.5 primary care physicians per 100,000 population.[27] The rates in Ontario, therefore, seem to approximate those found in the United States.

Most of the arthritis-related services covered in this report are also relevant to people with osteoporosis and osteoporotic fractures. General practitioner services are important for the management and prevention of osteoporosis, while orthopedics is an important speciality with regard to osteoporotic fracture, as people with fractures need orthopedic services for repair and possibly replacement of the hip. It is of concern that there are parts of the province not supplied with orthopedic surgical services, given the nature of the client group. A very high proportion of those with osteoporotic fracture are in the oldest age groups of the population, and are likely to be frail, with a number of health conditions. Thus, transportation to sources of care must be a concern for this client group.

This chaper is primarily concerned with the availability of arthritis-related health care services. Issues around these services, including barriers to their use and their general accessibility, are addressed elsewhere in this Atlas. Large disparities in the availability of arthritis services were found, with wide variation in the distribution of health care professionals among the different regions of Ontario. Rheumatology and orthopedic services were mostly found in areas with medical teaching centres and in the larger communities. Various allied health care services were found throughout the entire province, although at varying levels. Further studies are required to identify the factors associated with perceived and real under- and overserving of the different regions of Ontario by arthritis-related health care professionals. To ensure an effective and equitable heath care system for people with arthritis, it is necessary to consider demography and geography, as well as the adequacy of existing resources and where they are deployed.

References

1. Badley EM. Population projections and the effect on rheumatology. *Ann Rheum Dis* 1991; 50: 3-6.
2. Badley EM, Rasooly I, Webster GK. Relative importance of musculoskeletal disorders as a cause of chronic health problems, disability, and health care utilization: Findings from the 1990 Ontario Health Survey. *J Rheumatol* 1994; 21: 505-514.
3. Pope AM, Tarlow AR: Disability in America: Toward a national agenda for prevention. Washington DC: National Academy Press, 1991.
4. Lawrence RC, Hochberg MC, Kelsey JL et al. Estimates of the prevalence of selected arthritic and musculoskeletal diseases in the United States. *J Rheumatol* 1989; 16: 427-441.
5. LaPlante M. Data on Disability from the National Health Interview Survey, 1983-85. An InfoUse Report. Washington, DC: US National Institute on Disability and Rehabilitation Research, 1988.
6. Reynolds DL, Chambers LW, Badley EM et al. Physical disability among Canadians reporting musculoskeletal diseases. *J Rheumatol* 1992; 19: 1020-1030.
7. Centres for Disease Control and Prevention. Arthritis prevalence and activity limitations-United States, 1990. *MMWR* 1994; 43: 433-438.
8. Cunningham LS, Kelsey JL: Epidemiology of musculoskeletal impairments and associated disability. *Am J Public Health* 1984; 74: 574-579.
9. Badley EM, Wang PP. Arthritis and the aging population: Projections of arthritis prevalence in Canada, 1991-2031. *J Rheumatol* 1998; 25(12): 138-144.
10. Badley EM, Arnold J, Webster G. *Arthritis in Ontario: A Study of Intra-Provincial Variation* [working report (94-1)]. ACREU, 1994.

11. Hawker GA, Badley EM. The provision of specialist rheumatology care: Implications from a survey of rheumatologists in Ontario, Canada. *J Rheumatol* 1995; 22: 959-966.

12. Coyte P, Catz M, Stricker M. Distribution of physicians in Ontario. *Can Fam Physician* 1997; 43: 677-683, 733.

13. *Microsoft Excel* [computer program]. Version 5.0c. Microsoft Corporation, 1990.

14. *SPSS/PC* [computer program]. Version +4.0. Chicago Illinois: SPSS Inc., 1990.

15. Barer ML, Stoddart GL. Toward integrated medical resource policies for Canada: 8. Geographic distribution of physicians. *Can Med Assoc J* 1992; 147(5): 617-623.

16. *MapInfo User's Guide* [computer program]. Version 3.0. New York: MapInfo Corporation, 1992.

17. Badley EM, Wong M, Rothman L et al. *Intra-Provincial Variation in the Provision of Arthritis-Related Services in Ontario: 1996-1997* [working report (97-3)]. ACREU, 1997.

18. CAOT 1996 membership statistics. *CAOT Annual Report.* CAOT 1996.

19. Ontario Ministry of Health. *Ontario Health Survey Users' Guide* [documentation]. Vol. 1. Toronto: Ontario Ministry of Health, 1992.

20. Badley EM, Yoshida K. *Disablement and Chronic Health Problems in Ontario: A Report on the 1990 Ontario Health Survey* [working paper no. 5]. Ontario Ministry of Health; Premiers Council on Health, Well-Being and Social Justice, 1993.

21. Coyte PC, Wang PP, Hawker G et al. The relationship between variations in knee replacement utilization rates and the reported prevalence of arthritis in Ontario, Canada. *J Rheumatol* 1997; 24: 2403-2412.

22. Naylor CD, DeBoer DP. Total hip and knee replacement, variations in selected surgical procedures and medical diagnoses by year and region. In Goel V, Williams JI, Anderson GM et al, editors. *Patterns of Health Care in Ontario. The ICES Practice Atlas.* 2nd ed. Ottawa: Canadian Medical Association, 1996: 54-63.

23. Ng E, Wilkins R, Pole J et al. How far to the nearest physician? *Health Reports* 1997; 8: 19-31.

24. Meenan RF. Rheumatology manpower: The US perspective [editorial]. *Br J Rheumatol* 1991: 30(2): 81-85.

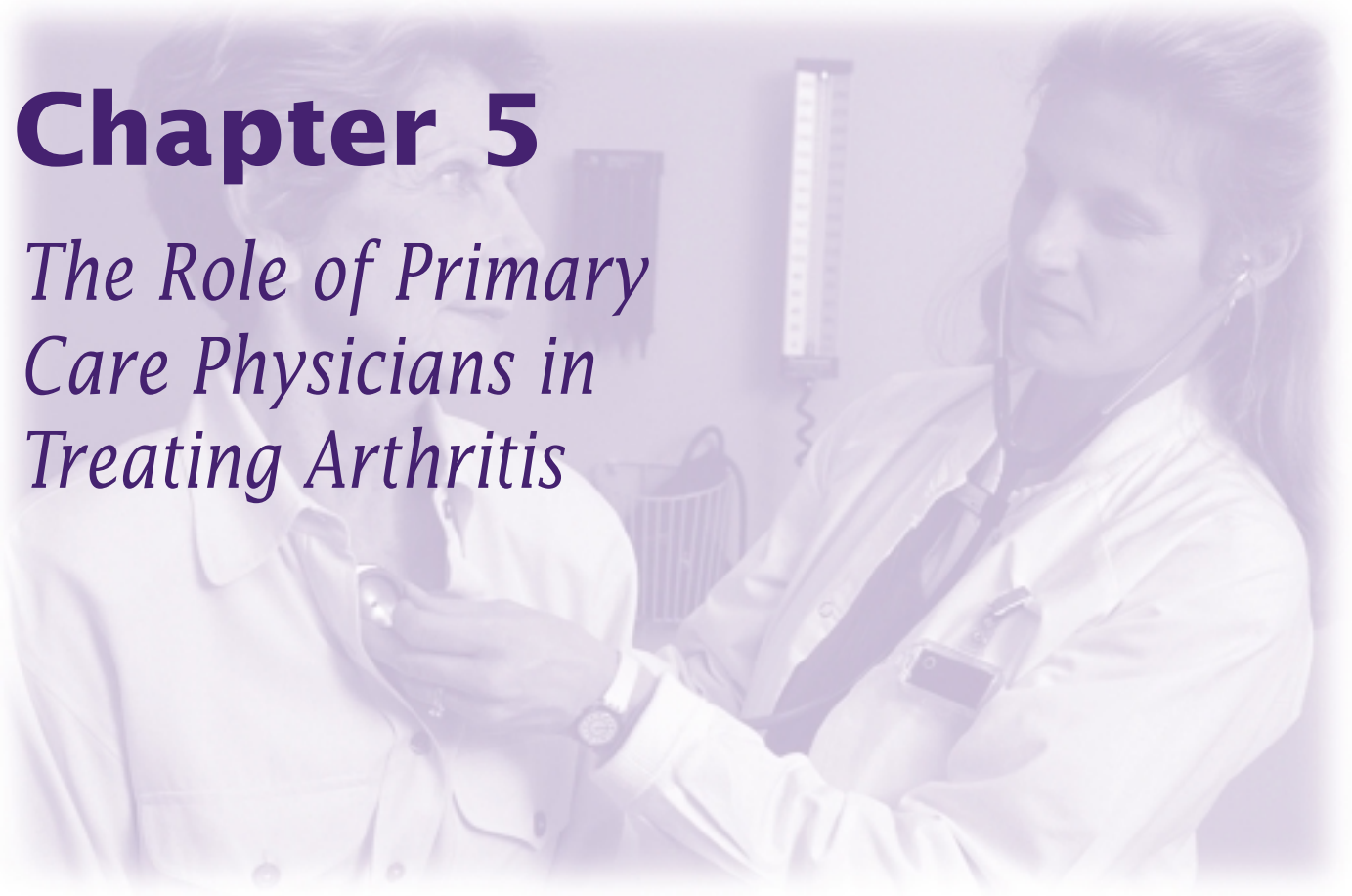
25. Simmons DPM, Bankhead CR, Shipley M. Changing patterns of rheumatology manpower and practice in the UK in the 1990s. *Br J Rheumatol* 1996; 35: 483-488.

26. Fakhoury WKH, Roos L. Access to and use of physician resources by the rural and urban populations in Manitoba. *Can J Public Health* 1996; 87(4): 248-252.

27. Frenzen PD. The increasing supply of physicians in US urban and rural areas, 1975-1988. *Am J Public Health* 1991; 81: 1141-1147.

Appendix A4.1: ***Data Sources For Arthritis-related Health Care Specialists***

Specialist	Data Source	Year	Number of Specialists
Rheumatologists	Canadian Rheumatology Association Directory Listing	1996	168
	College of Physicians and Surgeons of Ontario Mailing List	1997	
	Directory Listing of Recent Graduates from Rheumatology Disease Units across Ontario	1997	
Orthopedic Surgeons	Ontario Orthopedic Association Membership Listing	1997	363
	College of Physicians and Surgeons of Ontario Mailing List	1997	
General Practitioners	Coyte et al., 1997[11]	1990	10,499
Chiropractors	Canadian Memorial Chiropractic College Directory Listing of Active Chiropractors	1996	1,867
Physiotherapists (arthritis - only)	College of Physiotherapists of Ontario Database on Employment Information	1996	3,906
Occupational Therapists	College of Occupational Therapists of Ontario Mailing List	1997	2,587
Consultation and Rehabilitation Therapists	The Arthritis Society, Consultation and Rehabilitation Service Staff List	May, 1997	61
Consultation and Rehabilitation Therapy Clients	The Arthritis Society, Consultation and Rehabilitation Service Database	1995/96	5,346



Chapter 5

The Role of Primary Care Physicians in Treating Arthritis

Overview

For the general public in Ontario, primary care physicians are the most frequent point of contact with the health care system. The 1990 Ontario Health Survey (OHS) found that 81% of the population see their family doctor at least once a year, while 30% see a specialist that often.[1] This survey also showed musculoskeletal conditions were the most common reason for consulting a health professional within the previous two weeks, affecting 4.7% of the adult population and increasing slightly with age.[2] Approximately half of these visits were for arthritis and rheumatism. In a southern Ontario sample of the general population, arthritic and rheumatic complaints affected 6.2% to 8.8% of people,[3] but only 25% of complainants sought health services. A study of all adults seen by family physicians within a one-year period showed that 28% had an arthritic or rheumatic complaint although this may not have been their reason for consulting. In other settings, arthritic and rheumatic complaints have been shown to constitute the main reason for 9% of all physician visits[4] and 11% to 13% of office visits to general and family physician.[5,6] The burden of arthritis is expected to increase substantially with the aging of the population; it is projected that between 1991 and 2031, the number of people with arthritis will have increased by 124%.[7] Most people with arthritis will never be seen by a specialist, and will rely entirely on their family physician for treatment of this problem. In addition to bearing much of the responsibility for providing treatment themselves, primary care physicians serve as gatekeepers to many of the specialized services for arthritis, especially those provided by physicians such as rheumatologists and orthopedic surgeons. While regulations now permit direct public contact with physical therapists and occupational therapists, the majority of such contacts continue to occur through physician referral.

The central role that primary care physicians play in the diagnosis, treatment and referral of patients with arthritis requires that they be adequately prepared for this task, but there are often major gaps in their training. In many jurisdictions, there is little exposure to musculoskeletal problems through either undergraduate medical education or postgraduate residency training.[8-10] In the Canadian medical school curriculum, less than 3% of pre-clinical time is devoted to musculoskeletal problems, and only 12% of schools have mandatory training in a musculoskeletal area during the clinical years.[11] Despite widespread curriculum reform during the 1990s, there is little reason to believe that the traditional division of undergraduate exposure among specialties has changed substantially;[12] in 1996, senior medical students and residents at the University of Toronto had an average score on a comprehensive joint examination of less than 50%.[13] Little information is available about

how much experience family medicine residents get with musculoskeletal diseases during their training. When exposure to clinical cases does occur, it is usually hospital-based, stressing surgical or relatively rare conditions. And finally, continuing medical education (CME) for arthritis has often been inappropriate in both content and format.[14] The few published evaluations of it have shown generally positive results, but lacked scientific rigour in their methods.[15] The only rigorous study failed to show any impact on physician practices.[16]

Gaps in training may translate into suboptimal management practices for primary care physicians dealing with arthritis. Problems with diagnosis,[17-19] test ordering[20] and medication prescribing[21-23] have all been documented, as have delays of several years in referral of patients with ankylosing spondylitis and rheumatoid arthritis.[24,25] However, these studies have all used a specialist perspective to judge the appropriateness of primary care management, and have failed to take into account the different prevalence and spectrum of illnesses seen in primary care.

The purpose of this chapter is to examine the frequency and nature of visits in Ontario to primary care physicians for the treatment of arthritis and related conditions; the factors related to seeking care; barriers to referral to health professionals specializing in arthritis; and issues related to the quality of primary care. Three sources of data were employed. First, we used findings from the 1990 Ontario Health Survey to examine the occurrence of primary care visits among people with and without arthritis, and to determine the factors related to seeking care among those with the disease. We then used Ontario Health Insurance Plan (OHIP) physician claims for Ontario in 1996 to examine the annual frequency of primary care visits for various arthritic and rheumatic conditions and to compare the frequency of such visits with those for other types of problems. Finally, we used findings from an Ontario survey of family physicians to examine barriers to referral for patients with arthritis, confidence in managing musculoskeletal problems, interest in specific topics in continuing medical education, and issues in the management of specific types of patients with arthritis and rheumatism.

Primary Care and the Ontario Health Survey

Data Source and Methods

The Ontario Health Survey (OHS), conducted in 1990, was a stratified random cluster sample survey consisting of an interview with one member of each selected household and a self-completed questionnaire that was left behind for all household members 12 years or over. It was designed to cover the entire population with the exception of those living in institutions, on Native reserves and in remote areas. The survey had an overall response rate of 77%, resulting in data on over 61,000 people. There was no physical examination component, so information about disease and disability is based entirely on self-report.

One of the questions in the OHS asked respondents whether they had any contact with a general practitioner during the last two weeks. We used the answers provided to determine the frequency of this contact, and compared the responses of people with arthritis or rheumatism to those without. Using logistic regression, we controlled for the effects of age, sex, education, marital status, perceived health, comorbid conditions, income, possession of supplementary health insurance and use of nonprescription drugs.

For those respondents with arthritis, we compared the frequency of general practitioner contact due to arthritis for those with and without restricted activity days. We used logistic regression to control for the effects of arthritis disability, duration of arthritis, age, sex, education, living alone, perceived health, non-arthritic chronic conditions, income, possession of supplementary health insurance, use of nonprescription drugs and pain.

Findings

One-quarter of respondents with arthritis had contact with a general practitioner within the two weeks prior to the survey, a rate almost twice as high as that reported by respondents without arthritis (Exhibit 5.1). This was true for both men and women and across all age groups, and still held after we controlled for the effects of potentially confounding factors (Exhibit 5.2). Other factors that were independently related to contact with a general practitioner were female sex, low education, health other than very good or excellent, chronic conditions other than arthritis, low income and possession of supplementary health insurance.

Of the respondents with arthritis, those who had restricted activity days in the past two weeks were five times more likely to have contacted a general practitioner for this problem than were those who had no restricted activity days. This was true for both men and women and across all age groups (Exhibit 5.3), and did not change after we controlled for potentially confounding factors (Exhibit 5.4). Other factors independently associated with physician contact were arthritis disability, recent onset of arthritis and possession of supplementary insurance.

Discussion

The OHS is generalizable to most of the adult population of Ontario and provides detailed information about health care utilization. It demonstrates that, for the period surveyed, people with arthritis made almost double the number of primary care visits than did those without arthritis, and this effect appears to be independent of sex, age, socioeconomic factors and comorbidity. Among people with arthritis, visits due to this condition are mostly related to activity restriction during the previous two weeks, disability, recent onset of the disease, and possession of supplementary health insurance. These findings are similar to ones on overall health care utilization.[26] Frequent

Exhibit 5.1: *Age/Sex-specific Rates of Any Contact With a General Practitioner Within the Previous Two Weeks, 16 Years and Over With and Without Arthritis in Ontario, 1990*

	Total (7.64 million people*)	With Arthritis (1.41 million people*)	Without Arthritis (6.23 million people*)
General Practitioner Contact (%)	15.8	25.5	13.6
Men (%)	13.5	25.0	11.4
Women (%)	17.9	25.9	15.7
Age in Years (%)			
16-24	12.1	25.7	11.2
25-34	14.6	23.7	13.8
35-44	14.2	23.1	12.9
45-54	16.1	24.8	13.8
55-64	16.6	23.0	13.6
65-74	22.3	28.0	18.6
75+	23.9	30.4	18.2

* Weighted to reflect Ontario population

Data Source: Ontario Health Survey

Exhibit 5.2: *Logistic Regression Analysis for any Contact With a General Practitioner Within the Previous Two Weeks, 16 Years and Over With and Without Arthritis, in Ontario, 1990*

Variable	P-Value	Odds Ratio	95% Confidence Limits	
			Lower	Upper
With Arthritis	<0.001	2.87	2.58	3.20
Age (10 Year Increase)	0.380	1.01	0.99	1.04
Women	<0.001	1.26	1.16	1.37
Low Education*	<0.001	1.16	1.06	1.26
Live Alone	0.980	1.00	0.88	1.14
Very Good/Excellent Health	<0.001	0.72	0.66	0.78
Non-arthritis Chronic Condition(s)**	<0.001	3.09	2.80	3.40
Low Income***	0.001	1.21	1.08	1.36
Supplementary Health Insurance	<0.001	1.22	1.11	1.33
Non-prescription Drug Use⁘	0.301	1.04	0.96	1.14

* Secondary school not completed

** Includes back disorders, other musculoskeletal conditions, hypertension, heart disease, stroke and circulatory disorders, respiratory diseases, neoplasms, digestive disorders, urinary and kidney diseases, injuries and trauma, metabolic diseases, nervous system disorders, sensory disorders, skin diseases, allergies, ill-defined conditions, other conditions

*** Low household income as defined by Statistics Canada

⁘ During previous two weeks

Data Source: Ontario Health Survey

Exhibit 5.3: ***Age/Sex-specific Contact Due to Arthritis With a General Practitioner Within the Previous Two Weeks in Persons 16 years and Over With Arthritis in Ontario, 1990***

	All People With Arthritis (n=1.41 million*)	With Restricted Activity Days, Previous Two Weeks (n=0.10 million*)	Without Restricted Activity Days, Previous Two Weeks (n=1.31 million*)
General Practitioner Consultations (%)	7.0	28.9	5.3
Men (%)	7.4	32.4	5.4
Women (%)	6.7	26.2	5.3
Age in Years (%)			
16-24	7.9	31.9	5.9
25-34	11.4	33.7	8.4
35-44	6.7	30.3	4.9
45-54	8.0	31.9	6.3
55-64	5.6	28.4	3.9
65-74	6.0	19.6	4.9
75+	6.3	31.9	4.9

* weighted to reflect Ontario population

Data Source: Ontario Health Survey

Exhibit 5.4: ***Logistic Regression for Contact due to Arthritis With a General Practitioner Within the Previous Two Weeks, 16 Years and Over With Arthritis, in Ontario, 1990***

Variable	P-Value	Odds Ratio	95% Confidence Limits	
			Lower	Upper
Restricted Activity*	<0.001	4.70	3.33	6.64
Arthritis Disability	0.022	1.56	1.07	2.27
Arthritis <3 Months	<0.001	5.56	7.69	3.97
Age (10 Year Increase)	0.185	1.06	0.97	1.16
Women	0.677	1.06	0.80	1.40
Low Education**	0.838	1.03	0.78	1.37
Live Alone	0.316	0.82	0.56	1.21
Very Good/Excellent Health	0.909	1.02	0.74	1.40
Non-arthritis Chronic Condition(s)***	0.198	0.80	0.58	1.12
Low Income❖	0.132	0.74	0.50	1.10
Supplementary Insurance	0.009	1.58	1.12	2.23
Non-prescription Drug Use*	0.445	0.90	0.68	1.18
Pain	0.120	1.28	0.94	1.76

* During previous two weeks

** Secondary school not completed

*** Includes back disorders, other musculoskeletal conditions, hypertension, heart disease, stroke and circulatory disorders, respiratory diseases, neoplasms, digestive disorders, urinary and kidney diseases, injuries and trauma, metabolic diseases, nervous system disorders, sensory disorders, skin diseases, allergies, ill-defined conditions, other conditions

❖ Low household income as defined by Statistics Canada

Data Source: Ontario Health Survey

Exhibit 5.5: ***Age/Sex-specific Numbers and Rates of Ambulatory Visits to General and Family Practitioners for Arthritis and Rheumatism Per 1,000 Population 15 Years and Over in Ontario, 1996***

					Individuals Visiting Per 1,000 Population			
Condition	Number of Individuals (Thousands)	Number of Visits (Thousands)	Mean Visits Per Individual	Ratio Women:Men	All Ages 15+*	15 - 44	45 - 64	65+
Musculoskeletal Signs and Symptoms Not Yet Diagnosed	635	1,092	1.7	1.2	74.3	67.1	84.2	83.8
Osteoarthritis	398	756	1.9	1.5	46.6	13.2	63.3	140.1
Synovitis, Tenosynovitis, Bursitis, Bunion, Ganglion	302	459	1.5	1.1	35.4	30.8	45.2	35.1
Other Diseases of Musculoskeletal System and Connective Tissue	147	228	1.6	1.3	17.2	15.8	20.2	17.4
Fibrositis, Myositis, Muscular Rheumatism	69	119	1.7	1.6	8.1	6.5	11.1	8.6
Rheumatoid Arthritis, Still's Disease	56	131	2.3	1.9	6.5	2.7	9.1	16.1
Gout	44	69	1.5	0.3	5.2	2.1	8.1	11.6
Dupuytren's Contracture	40	61	1.5	1.2	4.7	4.7	5.3	4.1
Joint Derangement, Recurrent Dislocation, Ankylosis	27	39	1.5	0.9	3.1	2.8	3.7	3.4
Flat Foot, Pes Planus	6	8	1.4	1.2	0.7	0.6	0.8	0.6
Disseminated Lupus Erythematosus, Scleroderma, Dermatomyositis	4	7	2.0	2.4	0.4	0.3	0.5	0.8
Hallux Vagus, Hallux Varus, Hammer Toe	3	4	1.3	2.2	0.4	0.2	0.5	0.6
Ankylosing Spondylitis	3	5	1.6	0.7	0.4	0.3	0.4	0.4
Polyarteritis Nodosa, Temporal Arteritis	2	3	1.7	1.9	0.2	0.1	0.2	0.6
Pyogenic Arthritis	<1	1	1.4	1.3	0.1	0.0	0.1	0.2

* Denominator is 1996 Ontario population age 15 years and older (n=8,539,350)

Data Source: Ontario Health Insurance Plan

use of primary health care services may be one consequence of having arthritis, consistent with previous findings about the chronic nature of this disease and its impact on the Ontario population.[27] The main limitation of the OHS for current purposes is that its data are based on self-report, and no additional diagnostic information is available.

Ambulatory Primary Care Visits in Ontario

Data Source and Methods

For the 1996/97 fiscal year, we obtained all ambulatory primary care visit claims to the Ontario Health Insurance Plan (OHIP) for residents of Ontario. We defined primary care physicians as those so designated by OHIP according to their billing patterns. Ambulatory primary care visits were defined as those made to a general or family practitioner who claimed any of the OHIP fee codes listed in Appendix A5.1. Our analysis was limited to people aged 15 years or over. We examined the number of patients, the total number of visits, the mean visits per patient and the proportion of individuals in the population having at least one visit for a musculoskeletal problem. The diagnoses appearing in Exhibit 5.5 were considered to comprise arthritis and rheumatism (see Appendix A5.2 for the codes used). We then compared these numbers and rates with other major disease categories using OHIP's classification scheme, which is based on the International

Classification of Diseases, 9th Revision. A similar analysis was performed using the 20 most frequent specific OHIP diagnoses. We then examined the data by age and sex.

Findings

In 1996, adult Ontario residents made a total of 37.34 million ambulatory primary care visits to general and family practitioners, for an average of 4.4 visits per person. The most frequent diagnoses are shown in Exhibit 5.6. Visits for diseases of the musculoskeletal system and connective tissue were made by 1.78 million people, representing 21% of the adult population. The total number of visits made for this purpose was exceeded only by those made for diseases of the respiratory system. The number of musculoskeletal visits per person (2.2), was less than that made for circulatory problems (3.0), mental disorders (2.9) and endocrine disorders (2.3).

Four musculoskeletal diagnoses appear among the 20 most frequent specific OHIP diagnoses (Exhibit 5.7), including osteoarthritis and synovitis. Several of the most common diagnoses fall under the general category "signs and symptoms not yet diagnosed." Among these general categories, one of the most commonly used is for musculoskeletal problems, which ranks as the seventh most frequent OHIP diagnosis.

A total of 2.98 million visits were made for arthritis and rheumatism, representing 76.2% of visits for musculoskeletal conditions and 8% of all ambulatory primary care visits (Exhibit 5.5). If the category of musculoskeletal "signs and symptoms not yet diagnosed" is excluded, these diseases accounted for 48.3% of visits for musculoskeletal conditions and 5.1% of all ambulatory primary care visits. Among arthritis and rheumatism diagnoses, musculoskeletal "signs and symptoms not yet diagnosed" was responsible for the largest number of visits and affected the largest proportion of the population, followed by osteoarthritis and synovitis. Women made more visits than men for all diagnoses except gout, joint derangement and ankylosing spondylitis. The highest ratio of women to men were found for lupus, hallux valgus, rheumatoid arthritis and polyarteritis nodosa. When examined by age, the largest number of visits for arthritis and rheumatism was found in those aged 15 to 44 years (1,119,710 visits), followed by those 45 to 64 years (1,023,603 visits) and age 65 years and over (838,942 visits). The proportion of the population

Exhibit 5.6: ***Numbers and Rates of Ambulatory Primary Care Visits by Ontario Health Insurance Plan Chapter Per 1,000 Population 15 Years and Over in Ontario, 1996***

Ontario Health Insurance Plan Chapter	Number of Individuals (Thousands)	Number of Visits (Thousands)	Mean Visits Per Individual	Individuals Visiting Per 1,000 Population*
Respiratory System	2,882	6,037	2.1	337.6
Musculoskeletal System, Connective Tissue	1,782	3,914	2.2	208.7
Circulatory System	1,655	5,011	3.0	193.8
Mental Disorders	1,448	4,149	2.9	169.6
Genito-urinary System	1,349	2,340	1.7	158.0
Accidents, Poisonings, Violence	1,337	2,351	1.8	156.5
Nervous System, Sense	1,298	2,184	1.7	152.0
Skin, Subcutaneous Tissue	1,228	2,020	1.6	143.8
Digestive System	1,184	2,136	1.8	138.6
Endocrine, Nutritional, Metabolic, Immunity	917	2,139	2.3	107.4
Annual Health Exam	797	832	1.0	93.4
Infectious, Parasitic	792	1,248	1.6	92.7
Symptoms, Signs, Ill-defined Conditions	687	1,023	1.5	80.5
Family Planning	423	607	1.4	49.5
Neoplasms	238	440	1.9	27.8
Blood, Blood-forming Organs	152	277	1.8	17.9
Social, Marital, Family Problems	149	259	1.7	17.5
Immunization	144	175	1.2	16.8

* Denominator is 1996 Ontario population 15 years and over (n=8,539,350)

Data Source: Ontario Health Insurance Plan

Exhibit 5.7: ***Rates of Ambulatory Primary Care Visits by Common Diagnostic Code Per 1,000 Population 15 Years and Over in Ontario, 1996***

Diagnosis	Number of Individuals (Thousands)	Number of Visits (Thousands)	Mean Visits Per Individual	Individuals Visiting Per 1,000 Population*
1. Common Cold (Acute Naso-pharyngitis)	1,487	2,236	1.5	174.1
2. Anxiety (Neurosis, Hysteria, Neurasthenia, Obsessive Compulsive Neurosis, Reactive Depression)	1,148	2,951	2.6	134.5
3. Hypertension (Essential, Benign)	853	2,549	3.0	99.9
4. Annual Health Examination	797	832	1.0	93.4
5. Acute Bronchitis	738	1,072	1.5	86.5
6. Digestive Signs and Symptoms Not Yet Diagnosed (Anorexia, Nausea and Vomiting, Heartburn, Dysphagia, Hiccough, Hematemesis, Jaundice, Ascites, Abdominal Pain, Melena, Masses)	701	1,131	1.6	82.1
7. Musculoskeletal Signs and Symptoms Not Yet Diagnosed (Leg Cramps, Leg Pain, Muscle Pain, Joint Pain, Arthralgia, Joint Swelling)	635	1,092	1.7	74.3
8. Circulatory Signs and Symptoms Not Yet Diagnosed (Chest Pain, Tachycardia, Syncope, Shock, Edema, Masses)	491	714	1.5	57.5
9. Eczema (Atopic Dermatitis, Neurodermatitis)	472	632	1.3	55.2
10. Other Ill-defined Conditions	468	686	1.5	54.8
11. Lumbar Strain (Lumbago, Coccydynia, Sciatica)	428	803	1.9	50.1
12. Family Planning (Contraceptive Advice, Advice on Sterilization or Abortion)	423	607	1.4	49.5
13. Nervous Signs and Symptoms Not Yet Diagnosed (Convulsions, Ataxia Vertigo, Headache Except Tension Headache and Migraine)	407	610	1.5	47.7
14. Osteoarthritis	398	756	1.9	46.6
15. Acute Sinusitis	361	492	1.4	42.3
16. Disorders of Menstruation	355	507	1.4	41.5
17. Synovitis (Tenosynovitis, Bursitis, Bunion, Ganglion)	302	459	1.5	35.4
18. Diabetes Mellitus (Including Complications)	283	974	3.4	33.2
19. Asthma, Allergic Bronchitis	280	534	1.9	32.8
20. Atherosclerotic Heart Disease (Old Myocardial Infarction, Chronic Coronary Artery Disease or Arteriosclerotic Heart Disease, Without Symptoms)	179	509	2.8	21.0

* Denominator is 1996 Ontario population age 15 years and over (n=8,539,350)

Data Source: Ontario Health Insurance Plan

affected climbed steeply with age for osteoarthritis; a similar but less striking pattern was seen for rheumatoid arthritis and gout. Other conditions did not show dramatic changes with age.

Discussion

OHIP physician claims include only fee-for-service claims. They exclude alternate physician payment plans in Ontario, such as Community Health Centres, Health Service Organizations, and certain academic centres. The proportion of ambulatory visits missed in OHIP claims is not known, but is likely to be less than 5% of total visits. A more serious limitation of the OHIP data is that diagnostic information is not validated. Only one diagnosis is allowed per visit, limiting the usefulness of OHIP data to examine comorbidity. In primary care, many types of visits are not easily coded by diagnosis. For example, visits to discuss normal investigations, such as a negative X-ray, and visits for nonspecific symptoms such as generalized aching. Coding for these types of visits may be inconsistent or arbitrary (for instance, negative tests coded as anxiety). Physicians may preferentially remember and use a few common codes rather than use the entire range of codes available. It is not known how coding for musculoskeletal and arthritis is affected by these practice issues.

Our examination of population-based OHIP primary care physician claims in Ontario demonstrates that 10.5% of visits carry a musculoskeletal diagnosis. About a fifth of the population makes at least one primary care visit annually for a musculoskeletal problem. These estimates are remarkably similar to those collected elsewhere.[3-6] In the 1990 Ontario Health Survey, the equivalent of 1.42 million people reported having arthritis, rheumatism or other serious problems with their joints or bones. After adjusting for the population increase that occurred between 1990 and 1996, this figure is almost identical to the 1.78 million people found to be affected in the OHIP data. The age and sex distributions of specific conditions in the OHIP data are generally consistent with population estimates from other sources. Musculoskeletal system conditions are coded "not yet diagnosed" frequently and constitute 27.9% of musculoskeletal visits; this is by far the most common musculoskeletal diagnosis. Among specific conditions, osteoarthritis and soft tissue rheumatism (synovitis, tendinitis, bursitis) are most commonly diagnosed. As expected, women are generally affected more frequently than men. However, contrary to expectations, younger adults have more visits than older adults and for many conditions are affected in similar proportions to other age groups. A large burden of illness from arthritis and rheumatism among younger adults is also seen in the OHS.[28] The agreement between OHIP diagnoses and population estimates suggests that OHIP may be a more useful source than previously thought for estimating burden of illness, at least for arthritis and rheumatism.

ACREU Survey of Ontario Family Physicians

Data Source and Methods

In 1993, a Working Group formed by the Arthritis Community Research and Evaluation Unit (ACREU) developed and implemented a survey with the purpose of investigating barriers among Ontario family physicians for referral to arthritis professionals and to examine issues related to the quality of primary care for arthritis and rheumatism. Selected results of this survey have been published previously.[29-31] The survey was sent to 798 family physicians, whose names were obtained through a computer-generated random stratified (urban/rural) sample of active Ontario members of the College of Family Physicians of Canada (CFPC). We used the Statistics Canada definition of rural areas, with the exception of Kingston, which we deemed to be an urban area. As rural physicians constituted less than one-quarter of eligible members, they were over-sampled to allow urban-rural comparisons. We used a modified Dillman method[32] for the survey, including two follow-up mailings to nonresponders. Nonresponders and responders were compared using information in the Canadian Medical Directory.[33] Questionnaires were numerically coded to ensure confidentiality. The study protocol was approved by the Wellesley Hospital Research Ethics Committee.

The survey instrument was developed by a family physician, three rheumatologists, a physiotherapist and a rheumatic disease/community health specialist, all with training in epidemiology or clinical epidemiology. The questionnaire included scenarios that depicted typical presentations of early rheumatoid arthritis, late rheumatoid arthritis, a painful shoulder, and osteoarthritis of the knee. These scenarios were based on real patients who had not responded to nonsteroidal anti-inflammatory drugs (NSAIDs). We also included a scenario depicting an acutely inflamed, hot swollen knee. The scenarios appear in Appendix A5.3. For each scenario, respondents were asked to choose, from a standard list of items, which investigations, interventions (treatments) and referrals they would choose in the management of the patient depicted in the scenario. Space was also left for open-ended responses. In addition, we asked about barriers to referral to medical and nonmedical specialists, past training in musculoskeletal problems (medical school, residency rotations and continuing education), interest in continuing medical education for musculoskeletal problems, confidence in different aspects of musculoskeletal management, practice characteristics and demographics. The questionnaire was revised after each of two pretests on a convenience sample of 16 academic and community-based family physicians.

In order to define best current practice, we formed a multidisciplinary panel to consider the current standard of treatment for the conditions depicted in the scenarios. This panel consisted of 36 professionals who dealt with individuals and families affected by musculoskeletal problems, and included

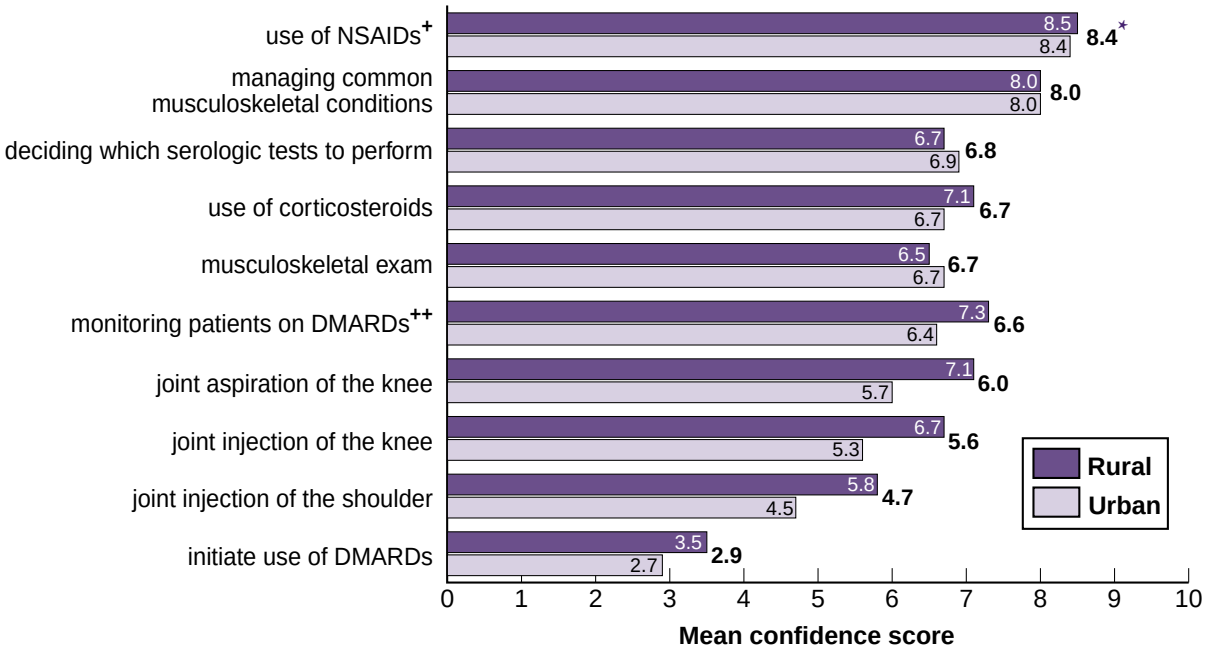
Exhibit 5.8: ***Demographic Characteristics of Survey Responders From a Stratified Random Sample of Ontario Members of the College of Family Physicians of Canada, 1993***

	Total (n=529)	Urban (n=251)	Rural (n=278)	Significance Level*
Full Time Practice (%)	85.2	81.7	88.5	NS
Group Practice (%)	61.6	66.5	57.2	NS
University Affiliation (%)	25.1	34.7	16.5	p<0.01
Average Age (Years)	40.3	41.0	39.7	NS
Men (%)	66.9	61.8	71.6	p<0.05
Years Since Graduation	14.2	14.5	13.0	NS
Certificant of College of Family Physicians of Canada (%)	88.3	86.8	89.6	NS

* Comparing urban and rural physicians; NS=not significantly different at p<0.05

Data Source: ACREU Survey of Ontario Family Physicians

Exhibit 5.9: ***Confidence Scores for Various Aspects of Arthritis and Related Conditions Management Strategies by Location in Ontario, 1993***



mean confidence score for the entire sample

NSAIDs+ – Non-steroidal anti-inflammatory drugs DMARDs++– Disease modifying anti-rheumatic drugs

Data Source: ACREU Survey of Ontario Family Physicians

family physicians, rheumatologists, physiatrists, orthopedic surgeons, social workers, physiotherapists, occupational therapists and social workers. Each panel member was asked to give an opinion regarding the optimal management, including investigations, interventions and referrals, by a competent family physician of the patient depicted in each scenario. A Delphi process[34] was conducted by mail, with consensus defined as 70% agreement after two rounds. Only physicians were asked about investigations and interventions, whereas all panelists were asked about referrals.

To adjust for the oversampling of rural physicians, all analyses except urban-rural comparisons were weighted according to the actual distribution of urban and rural physicians in Ontario. To account for multiple comparisons in the analysis, statistical significance for final results was set at p<0.01. The sample size had a power of 80%

(alpha<0.01, two-tailed) to detect a 15% difference in selecting recommended items between major subgroups, such as urban versus rural residence and male versus female physicians. Agreement with the "current practice" panel was analyzed in the categories of investigations, interventions and referrals, according to the percentage of recommended items chosen in each category. We used multiple linear regression to examine agreement with the panel in each category according to physician age, sex, practice location and type, confidence, previous training and interest in continuing medical education.

Findings

Of the 798 questionnaires mailed out to eligible subjects, six were returned by the post office and 17 responses were deemed ineligible because the respondents did not see patients with musculoskeletal conditions or because they were doing a locum for the regular physician. Of the remaining 775 questionnaires, we received completed responses from 529 physicians, for an overall response rate of 68.3%.

The demographic characteristics of the sample are outlined in Exhibit 5.8. Most respondents were practising in a full-time group setting and did not have a university affiliation. The average age was approximately 40 years, and was similar for urban and rural physicians. The majority were men (66.9%) and the average number of years since graduation from medical school was 14. Over 80% of the group were certificants of the College of Family Physicians of Canada.

Compared with respondents, non-respondents were significantly less likely to be certificants of the CFPC. They did not differ significantly from respondents in terms of location, medical school, year of graduation or sex.

Scenarios

The results for the scenarios are reported in Appendix A5.3. Each scenario includes a written description of the patient as well as the entire list of management items presented to the respondents. Items that were recommended by the current practice panel are shown in a separate column.

Scenario 1: Knee Osteoarthritis. A 64-year-old man with a six-month history of pain and stiffness in his right knee.

Most respondents were in agreement with the panel's recommendations for X-rays (88.5%), NSAID or high-dose aspirin (61.0%) and referral to physiotherapy (54.9%). Fewer agreed with the panel on recommending exercise (33.1%). Either exercises or referral to physiotherapy was selected by 64.1%. About half chose to do laboratory investigations that were not recommended by the panel.

In regression analysis, the recommended investigations were more likely to be chosen by physicians with more exposure to rehabilitation medicine during residency (p=0.003) and by women (p=0.002).

Scenario 2: Shoulder Problem. A 77-year-old woman with a six-month history of right shoulder discomfort.

Most respondents chose X-rays (67.9%), ice or heat (65.3%) and physiotherapy (81.7%), all recommended items. A majority appropriately recommended exercises. Contrary to panel recommendations, about 40% chose an NSAID, even though this scenario represented a patient who had taken a previous course of an NSAID. We further explored the demographic characteristics of those choosing an NSAID, and found that they were significantly younger (p<0.01) than those who did not choose it. There were no significant differences between the groups in terms of practice location, full-time/part-time status or sex.

Recommended investigations were more likely to be chosen by physicians who had had increased exposure to musculoskeletal training in medical school (p<0.001). Recommended interventions were more likely to be chosen by those who had more exposure to orthopedic surgery (p<0.001) and sports medicine (p=0.008) in their residency training. Recommended referrals were more likely to be made by women (p<0.001) and younger physicians (p=0.005). These relationships remained unchanged after we controlled for the effects of, and interactions with, age, sex, practice location and practice type.

Scenario 3: Hot Swollen Knee. A 30-year-old man with sudden onset of an extremely painful, hot swollen knee.

Unlike the other scenarios, this one did not portray a definitive diagnosis: it was intentionally worded to depict a diagnosis of either gout or infectious arthritis, the latter of which requires urgent aspiration of the joint and analysis of synovial fluid. A high proportion of respondents chose investigations such as serological tests for CBC and ESR, and 78.5% opted to aspirate the joint. Physicians who chose joint aspiration were younger than those who did not (40.2 years versus 42.6 years, p<0.01), but did not differ in terms of any other demographic or practice characteristic.

Among those who chose not to aspirate the joint, 74.1% selected referral to a medical specialist, while 15.9% did not. Those who chose to refer but not to aspirate were similar in characteristics to those who chose to do neither.

Over 85% also chose uric acid, indicating that many physicians were considering a diagnosis of gout. The most prominent interventions were rest (53.3%), ice/heat (35.6%) and NSAID (59.6%), the last of which was not recommended by the panel for this scenario.

In regression analysis, factors related to demographics, practice location or type, training, confidence, barrier to referral or interest in CME were not associated with selecting recommended items.

Scenario 4: Early Rheumatoid Arthritis. A 45-year-old woman with a six-week history of pain and swelling in her hands and wrists.

For this scenario, most respondents selected investigations, including bloodwork and X-rays. Just over half chose to start an NSAID, which was one of the items recommended by the panel. Approximately 40% recommended rest or ice/heat, both of which were recommended by the panel. In contrast to the recommendations of the panel, only 58.4% opted to refer this patient to a rheumatologist, 38.9% to a physiotherapist and 13.6% to an occupational therapist.

In regression analysis, physicians with more exposure to rheumatology in their residency training were more likely to choose the recommended investigations ($p=0.003$) and recommended interventions ($p<0.002$). No other relationships with recommendations were significant after controlling for potentially confounding factors.

Scenario 5: Late Rheumatoid Arthritis. A 42-year-old woman with a five-year history of symmetrical swelling and deformity of her hands, wrists and feet.

For this scenario, a large majority of physicians chose investigations. Compared with the early rheumatoid arthritis scenario, a higher proportion selected serological tests (CBC, ESR, RF) and X-rays. Fewer than 40% chose an NSAID, rest, or ice/heat as interventions, all of which were recommended by the panel; but 91.3% appropriately selected a referral to rheumatology, representing a much higher referral rate than for the early rheumatoid arthritis scenario (58.4%). About 40% recommended home-based physiotherapy, occupational therapy and social work, which were also recommended by the panel. Including ambulatory referrals, 67.2% referred to physiotherapy, 44.8% to occupational therapy and 46.9% to social work. These referrals were significantly higher than those for the early rheumatoid arthritis scenario. When combined, over half of the respondents chose a referral for home therapy.

In regression analysis, we found that the recommended interventions were more likely to be chosen by older physicians ($p<0.001$). For referrals, the recommended items were more likely to be chosen by physicians with residency exposure to orthopedic surgery ($p=0.002$), women ($p=0.002$) and those with an interest in CME for serological tests ($p=0.001$).

Confidence

Mean ratings of confidence in different aspects of musculoskeletal management were rated on a 10-point scale, where higher numbers indicated higher levels of confidence. These varied from 8.4 (use of NSAIDs) to 2.9 (initiate use of disease-modifying anti-rheumatic drugs [DMARDs]) (Exhibit 5.9). Confidence in the comprehensive musculoskeletal examination was 6.7, the same as that for the comprehensive neurological examination (6.7), but lower than that for the comprehensive cardiovascular examination (7.6). Rural physicians were significantly more confident than urban physicians in injection of the knee joint ($p=0.002$) and monitoring patients on DMARDs ($p<0.001$), after controlling for age, sex and practice characteristics.

Significant correlates of higher confidence in performing the musculoskeletal examination were past CME, medical school training in musculoskeletal conditions, and being male (Exhibit 5.10). There was an inverse relationship between confidence in performing a musculoskeletal examination and interest in CME for this task. Past CME in musculoskeletal conditions was also correlated with confidence in all other aspects of management of arthritis and related conditions included on the questionnaire, with higher levels of CME associated with higher confidence. Past training during medical school or residency was associated with greater confidence in the musculoskeletal examination, deciding which serological tests to perform and managing common musculoskeletal conditions (osteoarthritis, tendinitis, bursitis). Men were more confident than women in the musculoskeletal examination, joint injection or aspiration, NSAID use, and managing common musculoskeletal conditions, even after controlling for the effects of age, practice location and full or part-time practice. Older women and younger men were most confident using NSAIDs.

Interest in Continuing Medical Education

Confidence in different aspects of management of arthritis and related conditions was rated on a 10-point scale, where higher numbers indicated higher levels of interest. Mean ratings varied from 7.5 (managing common musculoskeletal conditions) to 6.1 (monitoring patients on DMARDs) (Exhibit 5.11). No significant rural-urban differences were found. For several aspects of management, there was an inverse relationship between interest in CME and confidence (musculoskeletal examination, NSAID use, use of serological tests), such that the least confident physicians were most interested in CME and vice versa. For monitoring patients who were already started on DMARDs, however, the least confident physicians were least interested in CME and vice versa.

Barriers to Referral

With the exception of general internal medicine, more than half of physicians reported one or more barriers to referral of patients with musculoskeletal problems (Exhibit 5.12). A barrier to service was considered to be a situation in which services were not available; services were available but waiting or travel times were unacceptably long; or services were available but physicians had no confidence in them.

More than half of physicians said that they found waiting times for outpatient physiotherapy and orthopedic surgery to be unacceptably long. One-fifth or more found waiting times to be unacceptably long for all other services, with the exception of general internal medicine. Access problems including

Exhibit 5.10: *Family Physicians' Confidence in Managing Musculoskeletal Conditions in Ontario, 1993*

Confidence in	Variables	Model R^2	Coefficient	P-value
Musculoskeletal Exam	Past CME*	0.28	0.30	<0.001
	Medical school training		0.24	<0.001
	Interest in CME–Musculoskeletal exam		–0.13	<0.001
	Sex		0.39	<0.01
Joint Injection/ Aspiration	Sex	0.21	1.87	<0.001
	Past CME		0.36	<0.001
	Access to rheumatology		1.69	<0.001
Non-steroidal Anti-inflammatory Drug Use	Past CME	0.12	0.15	<0.001
	Interest in CME–non-steroidal anti-inflammatory drug use		–0.08	<0.001
	Age		0.09	<0.05
	Sex		1.71	<0.01
	Age by sex**		–0.04	<0.01
Corticosteroid Use	Past CME	0.07	0.19	<0.001
	Sex		0.63	<0.001
Serologic Test	Medical school training	0.13	0.22	<0.001
	Interest in CME–serologic tests		–0.13	<0.001
	Past CME		0.11	<0.01
Managing Common Musculoskeletal Disorders	Past CME	0.14	0.16	<0.001
	Sex		0.51	<0.001
	Past training–orthopedic surgery during residency		0.08	<0.01
Monitoring Patients on Disease-modifying Antirheumatic Drugs	Past CME	0.14	0.24	<0.001
	Interest in CME–monitoring patients on disease-modifying antirheumatic drugs		0.22	<0.001
	Urban/rural location		–0.89	<0.001
	Age		0.03	<0.01

Note: n=529, weighted to reflect rural-urban distribution of Ontario physicians

* Continuing medical education (CME)

** Older women and younger men the most confident

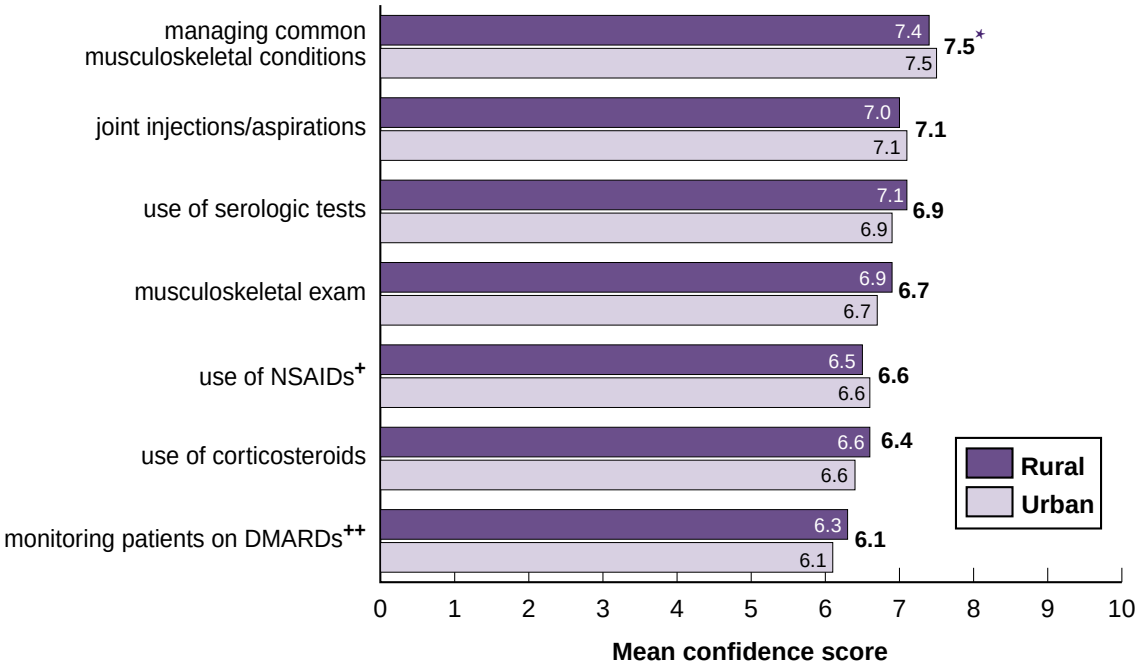
Data Source: ACREU Survey of Ontario Family Physicians

excessive travel time, lack of confidence in available services and unavailability of services were noted for all services. Access to social work (32.2% for home therapy, 25.4% for ambulatory), occupational therapy (23.1% for home therapy, 21.7% for ambulatory), home physiotherapy (16.8%) and rehabilitation medicine (17.4%) were the most problematic. The fewest access problems were reported for general internal medicine (3.6%), orthopedic surgery (5.1%) and rheumatology (9.0%).

Significant rural-urban differences were found for unacceptably long waiting times for outpatient physiotherapy (79% of rural physicians reported a barrier versus 48% of urban physicians). Rural physicians reported more access problems than their urban counterparts for outpatient social work (51% versus 20%), social work in the home (54% versus 30%), rheumatology (34% versus 3%), orthopedic surgery (15% versus 3%) and rehabilitation medicine (49% versus 10%). All of these rural-urban differences remained significant ($p<0.001$) after controlling for the effects of demographics and practice characteristics.

When considered by planning region (Appendix A5.4), waiting-time barriers to referral were significantly different by region for home-based physiotherapy (highest in Central East and Southwest) and home-based social work (highest in Central East and Central West) ($p<0.01$). Unacceptably

Exhibit 5.11: *Interest in Continuing Medical Education on Management Strategies for Arthritis and Related Conditions by Location in Ontario, 1993*



*mean confidence score for the entire sample

NSAIDs+ – Non-steroidal anti-inflammatory drugs DMARDs++– Disease modifying anti-rheumatic drugs

Data Source: ACREU Survey of Ontario Family Physicians

Exhibit 5.12: *Barriers to Referral Reported by Ontario Family Physicians, 1993*

Service	No Barriers (%)	Waiting Time Unacceptably Long (%)	Access Problems* (%)
Physiotherapy			
Ambulatory/Outpatient	40.1	52.2	9.4
Home Therapy	36.7	42.7	16.8
Occupational Therapy			
Ambulatory/Outpatient	36.4	37.4	21.7
Home Therapy	38.7	32.8	23.1
Social Work			
Ambulatory/Outpatient	42.7	27.1	25.4
Home Therapy	36.8	23.1	32.2
Rheumatology	47.6	42.0	9.0
Orthopedic Surgery	43.7	50.5	5.1
General Internal Medicine	79.8	13.3	3.6
Rehabilitation Medicine/Physiatry	42.7	38.7	17.4

Note: n=529, weighted to reflect rural-urban distribution of Ontario physicians

* Includes travel time unacceptably long, no confidence in service, service not available, and not sure if available

Data Source: ACREU Survey of Ontario Family Physicians

long waiting times were significantly higher ($p<0.01$) in the Southwest for rheumatology, orthopedic surgery and rehabilitation medicine.

Access barriers varied significantly by region for home-based physiotherapy, occupational therapy, and social work, and for rheumatology and rehabilitation medicine. All of these differences in access to referral were significantly higher ($p<0.01$) in the Northeast and Northwest.

Discussion

This survey of primary care physicians had a response rate of close to 70%. While this is a significant achievement for a physician survey, non-response bias is a serious concern, as it is likely to result in overestimates of the quality of care actually being delivered. Compared with all Ontario general practitioners and family physicians, CFPC members are younger, more likely to be female, more likely to practise in groups, and much more likely to have completed residency training in family medicine. It has been shown through chart reviews that physicians with residency training are likely to provide a better level of care than those without.[35]

Primary care physicians in Ontario are generally practising in accordance with the current practice standards set by a panel that included their peers. Problem areas included delay in referral to medical and non-medical specialists for the early presentation of rheumatoid arthritis, low levels of patient-centred modalities such as exercise for osteoarthritis, inappropriate NSAID prescribing (not enough in rheumatoid arthritis and too much in the case of a patient who had not responded to an earlier course of NSAID) and, in a few cases, missed diagnosis of a patient with an acute hot knee that could have been infectious in origin.

The most consistent correlate of appropriate investigations and interventions in primary care was previous training in musculoskeletal specialties. These specialties include rheumatology (for rheumatoid arthritis), orthopedic surgery and sports medicine (for shoulder problems) and rehabilitation medicine (for knee osteoarthritis). For referral to medical and non-medical specialists, women are more likely than men to be practising in accordance with panel recommendations, even after accounting for age, practice type and location. Physician age was inconsistently associated with appropriate management: older physicians were more likely to choose recommended interventions (for late rheumatoid arthritis), but less likely to refer (to physiotherapy for shoulder problem) or to choose joint aspiration (for acute hot knee). Few rural-urban differences were found for management of arthritis and related conditions, and none reached statistical significance after we controlled for demographic factors.

Higher confidence in musculoskeletal management was consistently associated with past training. Previous continuing medical education was independently associated with higher confidence for every aspect of management included on the questionnaire. Medical school training was associated with higher confidence in the examination of the musculoskeletal system and use of serological tests, consistent with the usual time at which these skills are learned. Residency training was associated with confidence only for the management of common musculoskeletal problems (osteoarthritis, tendinitis, bursitis) and was found only for orthopedic surgery. This suggests that fewer skills are learned in residency or that less exposure to musculoskeletal management occurs during residency than in continuing medical education. Men were more confident than women for many of the aspects of management included on the questionnaire after controlling for age, practice type and location. This finding is consistent with the existing literature on gender differences in confidence.[36,37] Confidence does not necessarily imply competence,[38,39] but lack of confidence may relate to lack of training, experience or interest and is likely to have implications for how problems are managed.

Interest in CME was highest for common musculoskeletal problems, reflecting the frequency of osteoarthritis and soft tissue rheumatism (including tendinitis and bursitis) in primary care. This finding may also reflect a lack of exposure to these problems in medical training. The relationship between interest in CME and confidence should be inverse. That is, those least confident managing a particular problem should be most interested in gaining more training. We found this to be the case for several aspects of management of arthritis and related conditions; however, it was not true for monitoring patients already started on DMARDs, for which we found bimodal distributions for confidence and for interest in CME. Physicians were either confident and interested or they were neither confident nor interested. This is likely to reflect practice patterns where some physicians share care with rheumatologists and others do not.

Summary

The findings reported in this chapter have implications for the delivery of primary care and specialty services in Ontario, for medical education and for further research. Use of primary care services for arthritis and rheumatism is extremely high but remains poorly defined in terms of who is seeking care, what are the diagnosis, prognosis and natural history of arthritic problems seen in primary care, and what is the quality of care being delivered, including the appropriateness of referral. The findings presented here represent early steps toward further clarifying these issues.

Several recommendations arise from our findings about primary care management, confidence and interest in continuing medical education. The consistent association between previous training in musculoskeletal conditions and appropriate management and confidence may not be causal, since interested, competent and confident physicians may seek out more training. Despite this, the current low levels of musculoskeletal training in Ontario medical schools and possibly also in family medicine residency programs suggest that strengthening these experiences would be a first step toward improving primary care management of arthritis and related conditions. Arthritis and related conditions should be receiving an amount of attention in training programs that is commensurate with the amount of chronic illness and disability that they cause in the population and the amount of health care utilization attributable to them. Increased attention to physical examination skills at the undergraduate level appears to be needed.

For physicians already in practice, behaviour change is often difficult and is little influenced by conventional CME programs.[40] Multi-faceted interventions are likely to be most promising, including hands-on learning of joint examination skills and joint injection techniques, use of office aids and reminders, educationally influential peers and/or peer detailing and patient-mediated interventions.

Barriers to referral for arthritis and related conditions appear to be universal in Ontario. The majority of these problems relate to unacceptably long waiting times, affecting virtually all relevant specialties in every region of the province and are particularly severe for physiotherapy, orthopedic surgery and rheumatology. In the survey of family physicians, the medical referrals for knee osteoarthritis and painful shoulder were unnecessary and might be a target for interventions to reduce waiting times. More widespread joint injection skills in primary care and referral between primary care physicians for joint injections might also help to reduce some waiting times. In addition, it would be desirable to establish triage mechanisms so that those most in need of early attention, such as patients needing joint replacement or suffering from early inflammatory arthritis, receive treatment in a timely way.

Access barriers to specialty services are less common than waiting-time barriers but are potentially more serious and less open to remedy. Both types of barriers may indicate a lack of sufficiently trained personnel. As expected, access problems are much more common in rural parts of the province and in the north. Improving the supply of relevant specialists in these areas should remain a priority. The Arthritis Society of Ontario, currently supports intermittent clinics in many underserviced areas using mostly urban-based staff, including rheumatologists, physiotherapists and occupational therapists. These efforts help reduce rural-urban disparities, but are clearly not adequate to ensure appropriate access to care. Strengthening these efforts and implementing other mechanisms to improve access to specialty care is needed.

These findings suggest several priorities for further research. The exact nature of arthritis and rheumatism presenting in primary care is not clear from currently available information and should be a priority area for further investigation. The quality of primary care for arthritis and rheumatism has been assessed only indirectly. The development of validated quality of care indicators that are readily measurable would be very desirable. Although improved medical training in arthritis and rheumatism is desirable and should not wait for further study, more could be known about the most appropriate timing, content and types of educational experiences. Effectiveness and dissemination studies may be helpful for this purpose. Strategies to improve access to specialty care and to reduce waiting times are needed and will require evaluation.

References

1. Ontario Ministry of Health. *Ontario Health Survey 1990: Highlights.* [Toronto]: Ontario Ministry of Health; 1992.

2. Badley EM, Rasooly I, Webster GK. Relative importance of musculoskeletal disorders as a cause of chronic health problems, disability, and health care utilization: Findings from the 1990 Ontario Health Survey. *J Rheumatol* 1994; 21: 505-514.

3. Spitzer WO, Harth M, Goldsmith CH, et al. The arthritic complaint in primary care: Prevalence, related disability, and costs. *J Rheumatol* 1976; 3: 88-99.

4. Felts W, Yelin E. The economic impact of the rheumatic diseases in the United States. *J Rheumatol* 1989; 16: 867-884.

5. Rosenblatt RA, Cherkin DC, Schneeweiss R, et al. The structure and content of family practice: Current status and future trends. *J Fam Pract* 1982; 15: 681-722.

6. Wood PHN, Badley E. Rheumatic disorders. In: Miller DL, Farmer RDT, editors. *Epidemiology of Diseases.* Oxford: Blackwell Scientific Publications; 1982. pp. 333-346.

7. Badley EM, Wang PP. Arthritis and the aging population: Projections of arthritis prevalence in Canada 1991 to 2031. *J Rheumatol* 1998; 25: 138-144.

8. Goldenberg DL, Mason JH, De Horatius R, et al. Rheumatology education in United States medical school. *Arthritis Rheum* 1981; 24: 1561-1566.

9. Renner BR, DeVellis BM, Ennett ST, et al. Clinical rheumatology training of primary care physicians: The resident perspective. *J Rheumatol* 1990; 17: 666-672.

10. Crotty M, Ahern MJ, McFarlane AC, Brooks PM. Clinical rheumatology training of Australian medical students: A national survey of 1991 graduates. *Med J Aust* 1993; 158: 119-120.

11. Craton N, Matheson GO. Training and clinical competency in musculoskeletal medicine: Identifying the problem. *Sports Medicine* 1993; 15: 328-337.

12. McLeod PJ. Undergraduate education in internal medicine at Canadian medical schools. *Acad Med* 1994; 69: 55-57.

13. Bell MJ, Badley EM, Glazier RH, Poldre P. A pilot study to determine the effect of patient educators on medical students' and residents' skills in joint examination. *Acad Med* 1997; 72: 919.

14. Badley EM, Lee J. The consultant's role in continuing medical education of general practitioners: The case of rheumatology. *BMJ* 1987; 294: 100-103.

15. Glazier R, Buchbinder R, Bell M. Critical appraisal of continuing medical education in the rheumatic diseases for primary care physicians. *Arthritis Rheum* 1995; 38: 533-538.

16. Sibley JC, Sackett DL, Neufeld V, Gerrard B, Rudnick KV, Fraser W. A randomized trial of continuing medical education. *N Engl J Med* 1982; 306: 511-515.

17. Sverdrup B, Allebeck P, Allander E. Tentative diagnoses among referrals versus diagnoses established at the department of rheumatology. [letter] Scand *J Rheumatol* 1983; 12: 377-378.

18. Bolumar F, Ruiz MT, Hernandez I, Pascual E. Reliability of the diagnosis of rheumatic conditions at the primary health care level. *J Rheumatol* 1994; 21: 2344-2348.

19. Sibley J, Peloso P, Blocka K, Haga M. The diagnostic accuracy of GP new referrals to rheumatologists [abstract]. *Arthritis Rheum* 1995; 38(9 Suppl): S395.

20. Lawlor K, Thompson J, Pope J. Arthritis testing by family physicians – Not enough bang for the buck? [abstract]. *Arthritis Rheum* 1996; 39(9 Suppl): S72.

21. Bellamy N, Gilbert JR, Brooks PM, Emmerson BT, Campbell J. A survey of current prescribing practices of anti-inflammatory and urate lowering drugs in gouty arthritis in the province of Ontario. *J Rheumatol* 1988; 15: 1841-1847.

22. Stross JK, Bole GG. The impact of a new rheumatologist on the management of rheumatic disease patients in community hospitals. *Arthritis Rheum* 1983; 26: 1033-1036.

23. Davis P, Suarez-Almazor M. An assessment of the needs of family physicians for a rheumatology Continuing Medical Educational program: Results of a pilot project. *J Rheumatol* 1995; 22: 1762-1765

24. Kidd BL, Cawley MI. Delay in diagnosis of spondarthritis. *Br J Rheumatol* 1988; 27: 230-232.

25. Hanly JG, McGregor A, Black C, Bresnihan B. Late referral of patients with rheumatoid arthritis to rheumatologists. *Ir J Med Sci* 1984; 153: 316-318.

26. Badley EM, Wang P. Determinants of consultation with health professionals for musculoskeletal disorders in a population with universal health insurance [abstract]. *Arthritis Rheum* 1996; 39(9 Suppl): S263.

27. Badley EM, Webster GK, Rasooly I. The impact of musculoskeletal disorders in the population: Are they just aches and pains? Findings from the 1990 Ontario Health Survey. *J Rheumatol* 1995; 22: 733-739.

28. Badley EM, Yoshida K, Webster G et al. *Disablement and Chronic Health Problems in Ontario: Report on the 1990 Ontario Health Survey* [working paper no.5]. Ontario Ministry of Health, Premiers Council of Health, Well-Being and Social Justice; 1993.

29. Glazier RH, Dalby DM, Badley EM, Hawker GA, Bell MJ, Buchbinder R. Determinants of physician confidence in the primary care management of musculoskeletal disorders. *J Rheumatol* 1996; 23: 351-356.

30. Glazier, RH, Dalby DM, Badley EM et al. Management of the early and late presentations of rheumatoid arthritis: A survey of Ontario primary care physicians. *Can Med Assoc J* 1996; 155: 679-687.

31. Glazier RH, Dalby DM, Badley EM et al. Management of common musculoskeletal problems: A survey of Ontario primary care physicians. *Can Med Assoc J* 1998; 158: 1037-1040.

32. Dillman DA. *Mail and Telephone Surveys: The Total Design Method.* Toronto: Wiley; 1978.

33. *Canadian Medical Directory.* Don Mills (ON): Southam Information and Technology Group; 1994.

34. Fink A, Kosecoff J, Chassin M, et al. Consensus methods: Characteristics and guidelines for use. *Am J Public Health* 1984; 74: 979-983.

35. Borgiel AE, Williams JI, Bass MJ et al. Quality of care in family practice: Does residency training make a difference? *Can Med Assoc* J 1989; 140: 1035-1043.

36. Chusmir LH, Koberg CS. Relationship between self-confidence and sex role identity among managerial women and men. *J Soc Psychol* 1991; 131: 781-790.

37. Kikness J. Gathering evidence. The 1993 student survey was not the first nor will it be the last of its kind. *University of Toronto Bulletin;* April 16.

38. Marteau TM, Johnston M, Wynne G, Evans TR. Cognitive factors in the explanation of the mismatch between confidence and competence in performing basic life support. *Psychology and Health* 1989; 3: 173-182.

39. Salem-Schatz SR, Avorn J, Soumerai SB. Influence of clinical knowledge, organizational context, and practice style on transfusion decision making. Implications for practice change strategies. *JAMA* 1990; 264: 476-483.

40. Davis DA, Thomson MA, Oxman AD et al. Changing physician performance: A systematic review of the effect of continuing medical education strategies. *JAMA* 1995; 274: 700-705.

Appendix A5.1: ***Primary Care Ambulatory Care Visits by Ontario Health Insurance Plan Fee Code, for Persons 15 Years and Over in Ontario, 1996***

Ontario Health Insurance Plan Fee Code	Description	Number of Visits
A007	Intermediate assessment	22,749,312
A001	Minor assessment	7,725,843
A003	General assessment	3,006,062
K007	Psychotherapy - individual	1,923,302
K013	Educational counselling	1,229,610
A004	General reassessment	290,845
A901	Housecall assessment	248,736
A008	Mini assessment	88,715
K004	Psychotherapy - family	62,248
K017	Annual health examination	14,891
Total		37,339,564

Data Source: Ontario Health Insurance Plan

Appendix A5.2: *Ontario Health Insurance Plan Diagnostic Codes*

Ontario Health Insurance Plan Chapter	Ontario Health Insurance Plan Diagnostic Codes
Respiratory System	460-519,786
Musculoskeletal System, Connective Tissue	710-739,781
Circulatory System	390-459,785
Mental Disorders	290-319
Genito-urinary System	580-629,788
Accidents, Poisonings, Violence	800-894,919-998
Nervous System, Sense	320-389,780
Skin, Subcutaneous Tissue	680-709
Digestive System	520-579,787
Endocrine, Nutritional, Metabolic, Immunity	240-279
Annual Health Exam	917
Infectious, Parasitic	001-139
Symptoms, Signs, Ill-defined Conditions	790-799
Family Planning	895
Neoplasms	140-239
Blood, Blood-forming Organs	280-289
Social, Marital, Family Problems	897-910
Immunization	896
Condition	
Musculoskeletal Signs and Symptoms Not Yet Diagnosed	781
Osteoarthritis	715
Synovitis, Tenosynovitis, Bursitis, Bunion, Ganglion	727
Other Diseases of Musculoskeletal System and Connective Tissue	739
Fibrositis, Myositis, Muscular Rheumatism	729
Rheumatoid Arthritis, Still's Disease	714
Gout	274
Dupuytren's Contracture	728
Joint Derangement, Recurrent Dislocation, Ankylosis	718
Flat Foot, Pes Planus	734
Disseminated Lupus Erythematosus, Scleroderma, Dermatomyositis	710
Hallux Vagus, Hallux Varus, Hammer Toe	735
Ankylosing Spondylitis	720
Polyarteritis Nodosa, Temporal Arteritis	446
Pyogenic Arthritis	711

Appendix A5.2: *(Cont'd)*

Diagnosis	Ontario Health Insurance Plan Diagnostic Codes
1. Common Cold (Acute Naso-pharyngitis)	460
2. Anxiety (Neurosis, Hysteria, Neurasthenia, Obsessive Compulsive Neurosis, Reactive Depression)	300
3. Hypertension (Essential, Benign)	401
4. Annual Health Examination	917
5. Acute Bronchitis	466
6. Digestive Signs and Symptoms Not Yet Diagnosed (Anorexia, Nausea and Vomiting, Heartburn, Dysphagia, Hiccough, Hematemesis, Jaundice, Ascites, Abdominal Pain, Melena, Masses)	787
7. Musculosketletal Signs and Symptoms Not Yet Diagnosed (Leg Cramps, Leg Pain, Muscle Pain, Joint Pain, Arthralgia, Joint Swelling)	781
8. Circulatory Signs and Symptoms Not Yet Diagnosed (Chest Pain, Tachycardia, Syncope, Shock, Edema, Masses)	785
9. Eczema (Atopic Dermatitis, Neurodermatitis)	691
10. Other Ill-defined Conditions	799
11. Lumbar Strain (Lumbago, Coccydynia, Sciatica)	724
12. Family Planning (Contraceptive Advice, Advice on Sterilization or Abortion)	895
13. Nervous Signs and Symptoms Not Yet Diagnosed (Convulsions, Ataxia, Vertigo, Headache Except Tension Headache and Migraine)	780
14. Osteoarthritis	715
15. Acute Sinusitis	461
16. Disorders of Menstruation	626
17. Synovitis (Tenosynovitis, Bursitis, Bunion, Ganglion)	727
18. Diabetes Mellitus (Including Complications)	250
19. Asthma, Allergic Bronchitis	493
20. Atherosclerotic Heart Disease (Old Myocardial Infarction, Chronic Coronary Artery Disease or Arteriosclerotic Heart Disease, Without Symptoms)	412

Data Source: Commission on Professional and Hospital Activities, International Classification of Diseases, 9th Revision Clinical Modification Volume 1-3. HCIA: 1995

Appendix A5.3: *Case Scenarios For Survey of Ontario Family Physicians*

Scenario 1: Osteoarthritis

A 64 year old man, a married middle-level manager for a life insurance company, presents in your office with a 6 month history of right knee stiffness after prolonged sitting, as well as pain and difficulty with the right knee going up or down stairs. He reports mild intermittent swelling in the right knee. He has continued to work without any serious limitation but he has recently given up golf as a result of this problem. On examination, there is moderate crepitus in the right knee and a small effusion. The remainder of the physical exam is normal. There is no history of trauma. He has been previously well with no history of peptic ulcer disease or any other serious illness. A previous physician prescribed a three week course of a non-steroidal anti-inflammatory drug without relief.

Survey Items	Weighted Percent Choosing the Item (n=529)	
	Recommended Items	Other Items
Investigations		
Complete Blood Count		51.2
Erythrocyte Sedimentation Rate		48.9
Rheumatoid Factor		12.2
Anti-nuclear Antibody		11.6
Uric Acid		46.2
Creatinine, Blood Urea Nitrogen		23.3
X-rays	88.5	
Joint Aspiration ± Synovial Fluid Analysis		23.1
Cultures of Blood ± Urethra		1.2
Interventions		
Acetaminophen		25.7
Acetaminophen With Codeine/Other Narcotic		13.5
Low Dose Acetylsalicylic Acid		6.0
High Dose Acetylsalicylic Acid	6.2	
Non-steroidal Anti-inflammatory Drug	54.8	
Allopurinol		0.9
Initiate Disease Modifying Agent (e.g. gold)		0
Oral Corticosteroids		0
Joint Injection With Corticosteroid		12.2
Recommend Exercises	33.1	
Recommend Rest		29.0
Recommend Ice or Heat		50.4
Referrals*		
Physiotherapy–Ambulatory or Outpatient	53.5	
Physiotherapy–Home Therapy (Homecare/The Arthritis Society)	1.4	
Occupational Therapy–Ambulatory or Outpatient		0
Occupational Therapy–Home Therapy (Homecare/The Arthritis Society)		0.4
Social Work–Ambulatory or Outpatient		0
Social Work–Home Therapy (Homecare/The Arthritis Society)		0.3
Rheumatology		2.5
Orthopedic Surgery		22.5
General Internal Medicine		0
Rehabilitation Medicine/Physiatry		1.0

* Referral to home-based physiotherapy, occupational therapy or social work was chosen by 1.5% of respondents

Appendix A5.3: *(cont'd)*

Scenario 2: Shoulder Problem

A 77 year old woman, a retired book-keeper living with her husband, presents with a 6 week history of right shoulder discomfort while sleeping, and difficulty doing her hair, putting on her coat, doing up her bra, and reaching up to high shelves. On physical examination, you find tenderness over the anterior aspect of the shoulder and pain on shoulder abduction in the mid-range. The remainder of the physical exam is normal. There is no history of trauma. She has been previously well with no history of peptic ulcer disease or any other serious illness. A previous physician prescribed a three week course of a non-steroidal anti-inflammatory drug without relief.

Survey Items	Weighted Percent Choosing the Item (n=529)	
	Recommended Items	Other Items
Investigations		
Complete Blood Count		45.7
Erythrocyte Sedimentation Rate		45.8
Rheumatoid Factor		14.1
Anti-nuclear Antibody		10.1
Uric Acid		17.5
Creatinine, Blood Urea Nitrogen		21.7
X-rays	67.9	
Joint Aspiration ± Synovial Fluid Analysis		0.6
Cultures of Blood ± Urethra		0
Interventions		
Acetaminophen		32.7
Acetaminophen With Codeine/Other Narcotic		13.6
Low Dose Acetylsalicylic Acid		8.5
High Dose Acetylsalicylic Acid		4.9
Non-steroidal Anti-inflammatory Drug Use		39.8
Allopurinol		0
Initiate Disease Modifying Agent (e.g. gold)		0
Oral Corticosteroids		1.0
Joint Injection With Corticosteroid		10.0
Recommend Exercises		55.2
Recommend Rest		22.2
Recommend Ice or Heat	65.3	
Referrals*		
Physiotherapy–Ambulatory or Outpatient	75.8	
Physiotherapy–Home Therapy (Homecare/The Arthritis Society)	5.9	
Occupational Therapy–Ambulatory or Outpatient		3.1
Occupational Therapy–Home Therapy (Homecare/The Arthritis Society)		1.2
Social Work–Ambulatory or Outpatient		0
Social Work–Home Therapy (Homecare/The Arthritis Society)		0
Rheumatology		3.5
Orthopedic Surgery		1.5
General Internal Medicine		0
Rehabilitation Medicine/Physiatry		2.0

* Referral to home-based physiotherapy, occupational therapy or social work was chosen by 6.3% of respondents

Appendix A5.3: *(cont'd)*

Scenario 3: Hot Swollen Knee

A 30 year old single man, an executive who travels extensively and who is a heavy social drinker, presents with the sudden onset overnight of an extremely painful hot swollen knee. On examination, there is a moderate effusion, extreme tenderness, and restricted range of motion. He walks with a marked limp. There is no history of trauma. He has been previously well with no history of peptic ulcer disease or hemophilia or any other serious illness.

Survey Items	Weighted Percent Choosing the Item (n=529)	
	Recommended Items	Other Items
Investigations		
Complete Blood Count	93.3	
Erythrocyte Sedimentation Rate	82.0	
Rheumatoid Factor		17.3
Anti-nuclear Antibody		14.8
Uric Acid	85.8	
Creatinine, Blood Urea Nitrogen		33.8
X-rays	57.7	
Joint Aspiration ± Synovial Fluid Analysis	78.5	
Cultures of Blood ± Urethra	58.4	
Interventions		
Acetaminophen		7.1
Acetaminophen With Codeine/Other Narcotic		22.2
Low Dose Acetylsalicylic Acid		0.9
High Dose Acetylsalicylic Acid		2.8
Non-steroidal Anti-inflammatory Drug Use		59.6
Allopurinol		12.2
Initiate Disease Modifying Agent (eg. gold)		4.2
Oral Corticosteroids		0
Joint Injection With Corticosteroid		0.9
Recommend Exercises		1.8
Recommend Rest	53.3	
Recommend Ice or Heat	35.6	
Referrals*		
Physiotherapy–Ambulatory or Outpatient		3.3
Physiotherapy–Home Therapy (Homecare/The Arthritis Society)		0.3
Occupational Therapy–Ambulatory or Outpatient		0
Occupational Therapy–Home Therapy (Homecare/The Arthritis Society)		0
Social Work–Ambulatory or Outpatient		0.2
Social Work–Home Therapy (Homecare/The Arthritis Society)		0
Rheumatology		16.7
Orthopedic Surgery		12.2
General Internal Medicine		11.5
Rehabilitation Medicine/Physiatry		0.4

* Referral to home-based physiotherapy, occupational therapy or social work was chosen by 0.3% of respondents

Appendix A5.3: *(cont'd)*

Scenario 4: Early Rheumatoid Arthritis

A 45 year old woman, a beauty counsellor separated from her husband and responsible for the care of three school-aged children, presents in your office with a 6 week history of pain, stiffness, and swelling of her hands and wrists. She also has some discomfort in her feet. She finds that she is worse in the morning with increased stiffness lasting about three hours. She has additional symptoms of fatigue and a 5 lb. weight loss. She has been unable to work for the past week. On examination, there is symmetrical swelling and tenderness of the small joints of the hands and wrists and tenderness of the metatarso-phalangeal joints. The remainder of the physical exam is normal. There is no history of trauma. She has been previously well with no history of peptic ulcer disease or any other serious illness. A previous physician prescribed a three week course of a non-steroidal anti-inflammatory drug without relief.

Survey Items	Weighted Percent Choosing the Item (n=529)	
	Recommended Items	Other Items
Investigations		
Complete Blood Count	96.0	
Erythrocyte Sedimentation Rate	96.2	
Rheumatoid Factor	95.8	
Anti-nuclear Antibody	89.2	
Uric Acid		36.5
Creatinine, Blood Urea Nitrogen		56.5
X-rays	65.5	
Joint Aspiration ± Synovial Fluid Analysis		6.3
Cultures of Blood ± Urethra		1.9
Interventions		
Acetaminophen		9.0
Acetaminophen With Codeine/Other Narcotic		9.2
Low Dose Acetylsalicylic Acid		8.9
High Dose Acetylsalicylic Acid	34.2	
Non-steroidal Anti-inflammatory Drug Use	51.9	
Allopurinol		0.1
Initiate Disease Modifying Agent (e.g. gold)		1.7
Oral Corticosteroids		3.2
Joint Injection With Corticosteroid		0.4
Recommend Exercises		16.8
Recommend Rest	41.4	
Recommend Ice or Heat	43.2	
Referrals*		
Physiotherapy–Ambulatory or Outpatient	32.8	
Physiotherapy–Home Therapy (Homecare/The Arthritis Society)	6.2	
Occupational Therapy–Ambulatory or Outpatient	9.1	
Occupational Therapy–Home Therapy (Homecare/The Arthritis Society)	4.4	
Social Work–Ambulatory or Outpatient		2.7
Social Work–Home Therapy (Homecare/The Arthritis Society)		5.1
Rheumatology	58.4	
Orthopedic Surgery		0
General Internal Medicine		0.8
Rehabilitation Medicine/Physiatry		0.1

* Referral to home-based physiotherapy, occupational therapy or social work was chosen by 10.3% of respondents

Appendix A5.3: *(cont'd)*

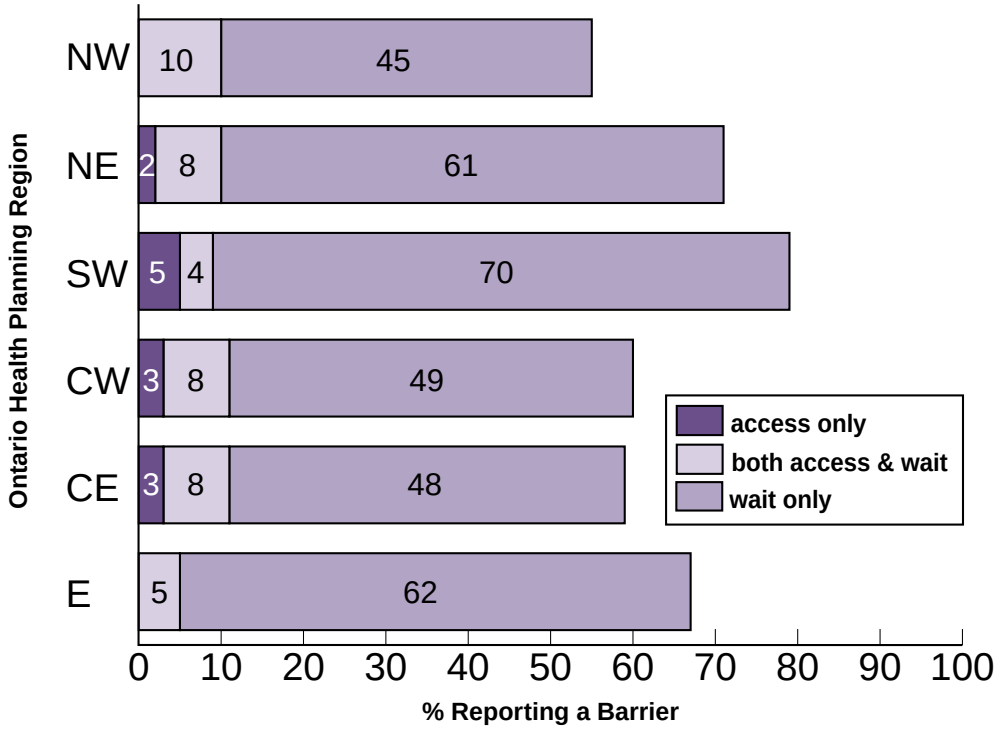
Scenario 5: Late Rheumatoid Arthritis

A 42 year old woman, a married factory worker with two school-aged children, presents in your office with a 5 year history of symmetrical joint swelling and pain in her hands, wrists and feet. She stopped work two months ago and now finds it difficult to get out of the house. She and her family are having problems coping with her illness and their financial situation has become difficult. On examination, she has obvious deformities in her hands, wrists and feet. There is marked swelling and tenderness over the metacarpo-phalangeal and metatarso-phalangeal joints and wrists. She has painful and restricted movement of her shoulders and nodules over her elbows. Her only previous medications have been various non-steroidal anti-inflammatory drugs. Notes from her previous physician reveal only the diagnosis of "arthritis"; you can find no evidence of previous investigations or referrals. There is no history of trauma. Other than this problem she has been previously well with no history of peptic ulcer disease or any other serious illness.

Survey Items	Weighted Percent Choosing the Item (n=529)	
	Recommended Items	Other Items
Investigations		
Complete Blood Count	98.3	
Erythrocyte Sedimentation Rate	98.9	
Rheumatoid Factor	99.1	
Anti-nuclear Antibody	92.2	
Uric Acid		46.5
Creatinine, Blood Urea Nitrogen	75.2	
X-rays	87.9	
Joint Aspiration ± Synovial Fluid Analysis		8.3
Cultures of Blood ± Urethra		0.5
Interventions		
Acetaminophen		9.5
Acetaminophen With Codeine/Other Narcotic		15.3
Low Dose Acetylsalicylic Acid		4.3
High Dose Acetylsalicylic Acid	34.0	
Non-steroidal Anti-inflammatory Drug Use	38.0	
Allopurinol		0.1
Initiate Disease Modifying Agent (e.g. gold)		17.9
Oral Corticosteroids		10.9
Joint Injection With Corticosteroid		4.1
Recommend Exercises		22.8
Recommend Rest	33.2	
Recommend Ice or Heat	34.3	
Referrals*		
Physiotherapy–Ambulatory or Outpatient		26.5
Physiotherapy–Home Therapy (Homecare/The Arthritis Society)	40.7	
Occupational Therapy–Ambulatory or Outpatient		9.0
Occupational Therapy–Home Therapy (Homecare/The Arthritis Society)	35.8	
Social Work–Ambulatory or Outpatient		7.8
Social Work–Home Therapy (Homecare/The Arthritis Society)	39.1	
Rheumatology	91.3	
Orthopedic Surgery		1.7
General Internal Medicine		0.5
Rehabilitation Medicine/Physiatry		7.3

* Referral to home-based physiotherapy, occupational therapy or social work was chosen by 52.3% of respondents

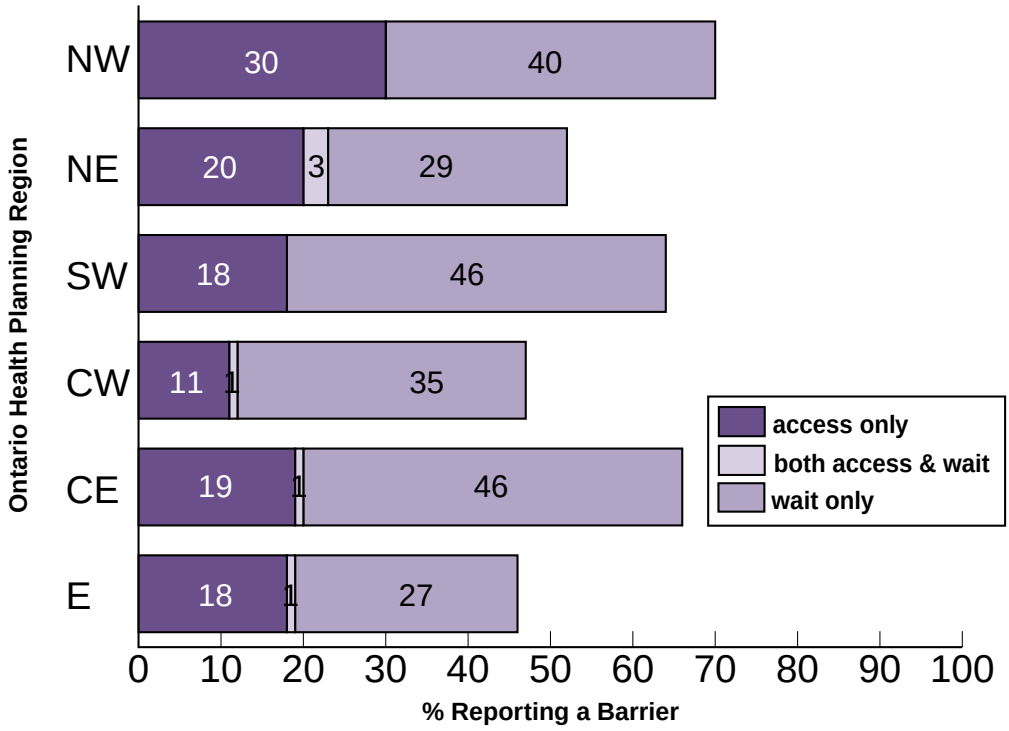
Appendix A5.4a: ***Perceived Barriers to Referral to Outpatient Physiotherapy Services* by Ontario Health Planning Region, 1993***



* ***wait time barriers significantly different between regions (p=.002)***

Data Source: ACREU Survey of Ontario Family Physicians

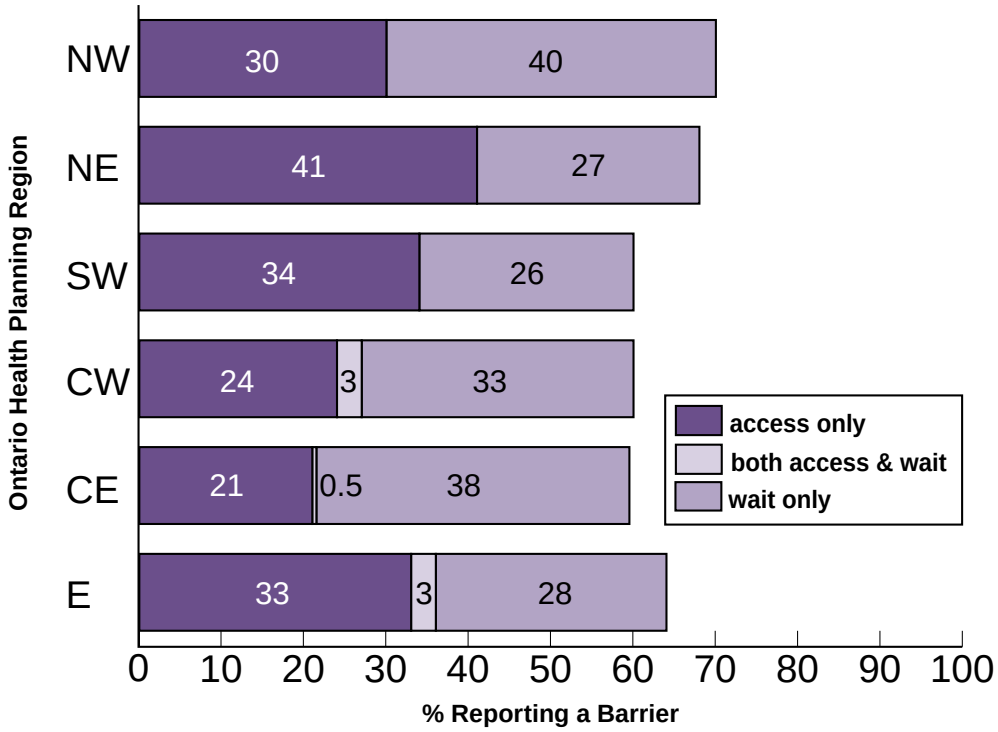
Appendix A5.4b: ***Perceived Barriers to Referral to Physiotherapy – Home-based Services* by Ontario Health Planning Region, 1993***



* ***wait time barriers significantly different between regions (p=.005)***

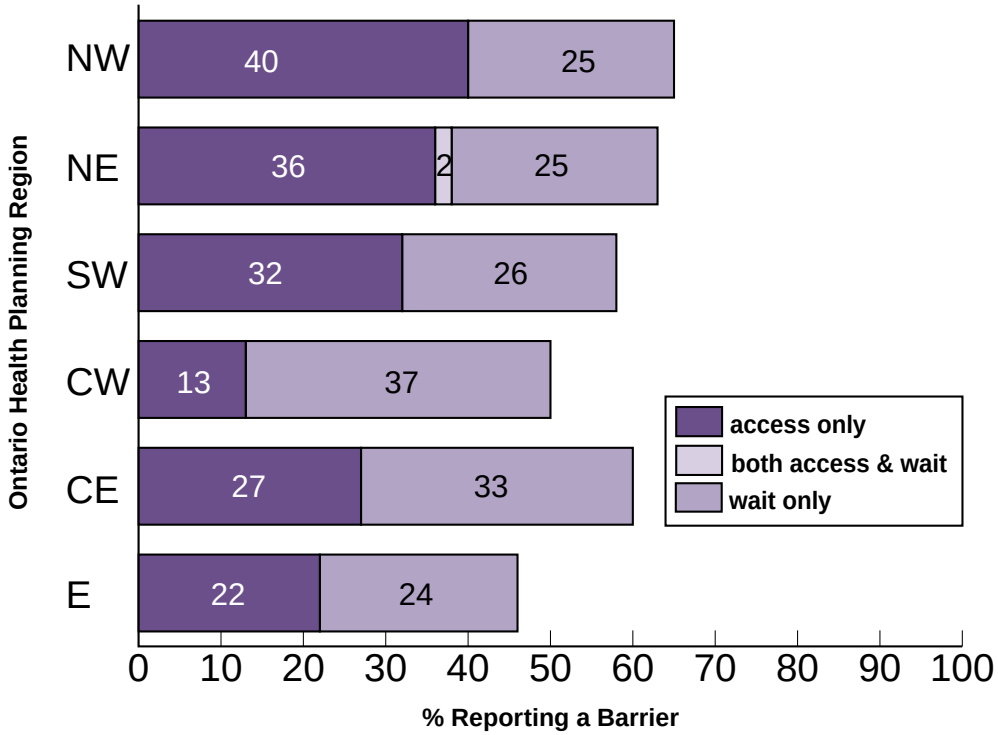
Data Source: ACREU Survey of Ontario Family Physicians

Appendix A5.4c: ***Perceived Barriers to Referral to Outpatient Occupational Therapy Services by Ontario Health Planning Region, 1993***



Data Source: ACREU Survey of Ontario Family Physicians

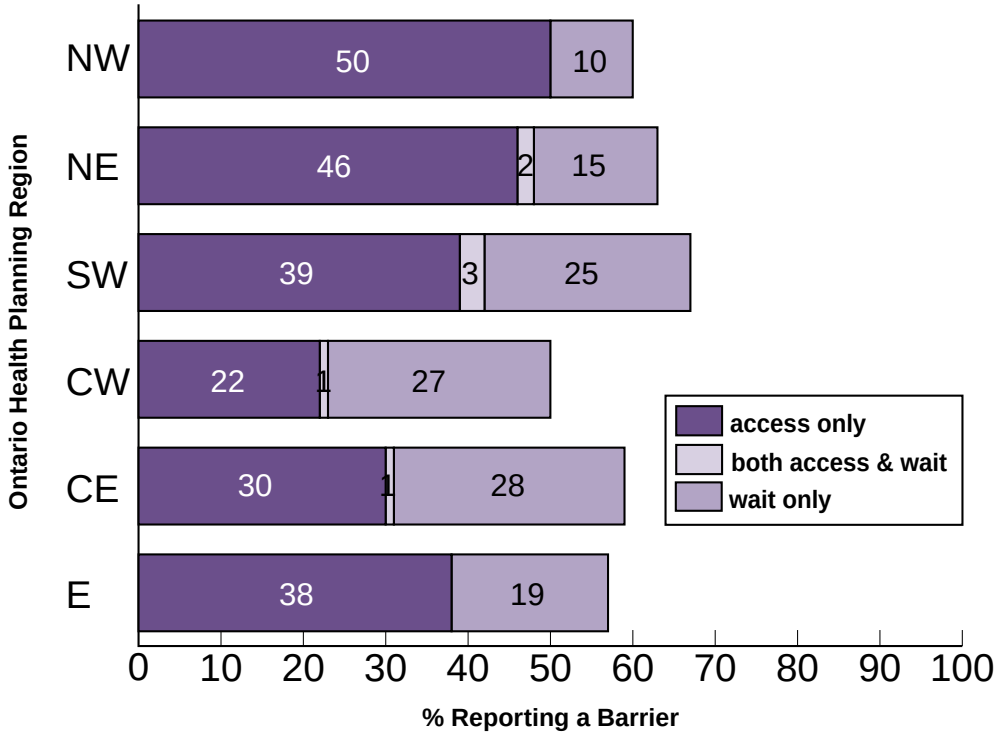
Appendix A5.4d: ***Perceived Barriers to Referral to Occupational Therapy – Home-based Services* by Ontario Health Planning Region, 1993***



**** access barriers significantly different between regions (p=.006)***

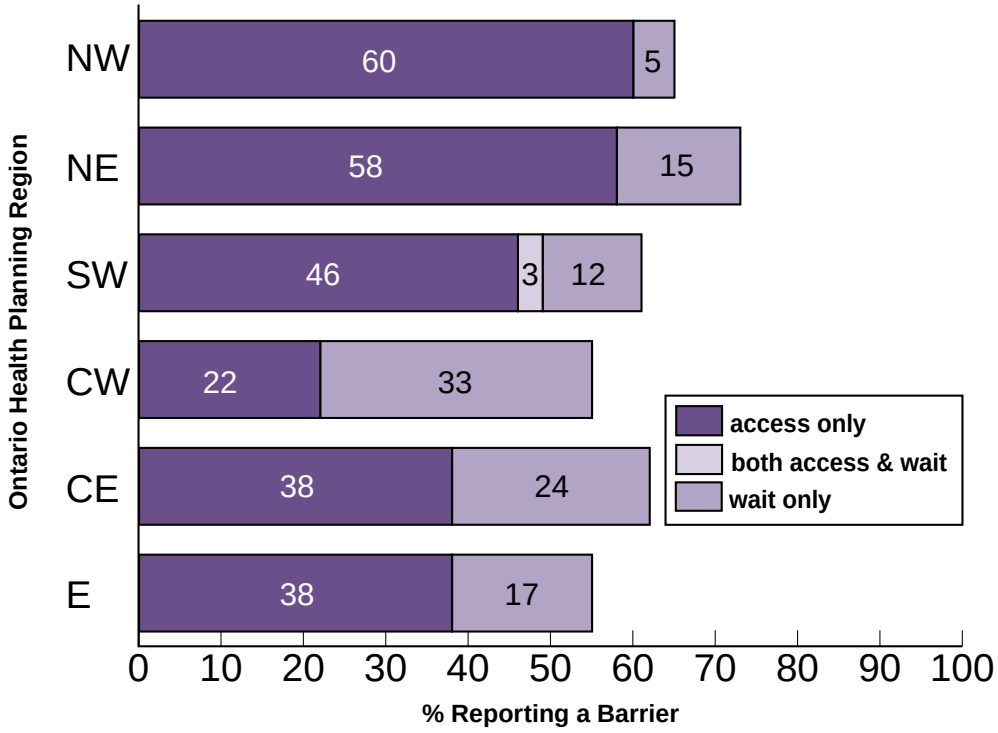
Data Source: ACREU Survey of Ontario Family Physicians

Appendix A5.4e: ***Perceived Barriers to Referral to Outpatient Social Work Services by Ontario Health Planning Region, 1993***



Data Source: ACREU Survey of Ontario Family Physicians

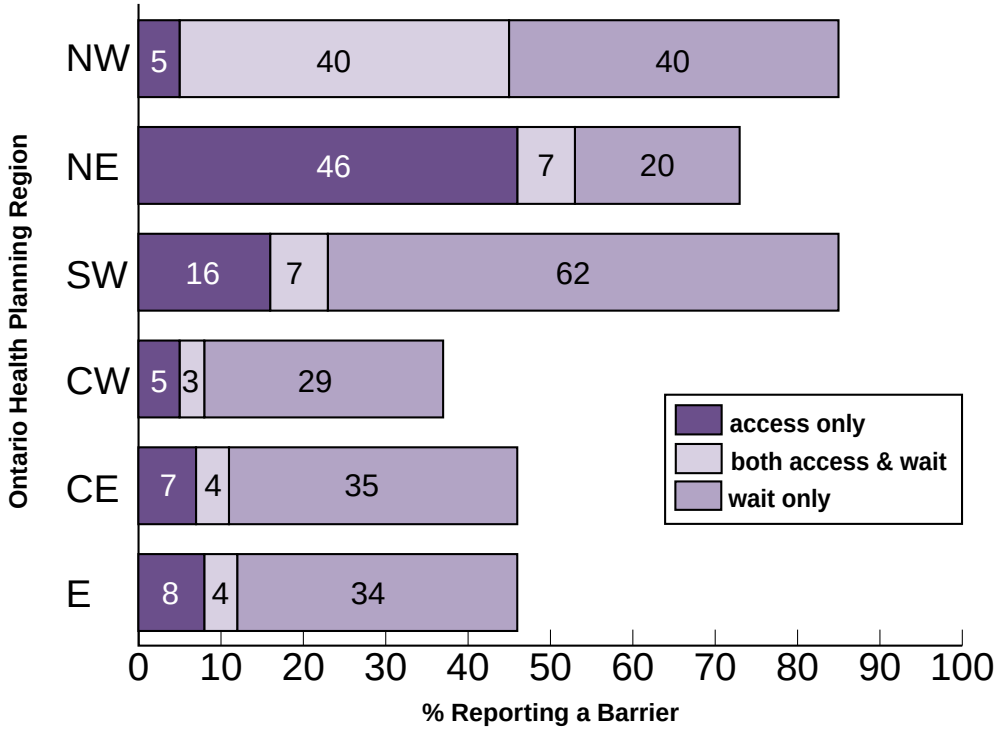
Appendix A5.4f: ***Perceived Barriers to Referral to Social Work – Home-based Services* by Ontario Health Planning Region, 1993***



** wait time (p=.006) and access barriers (p=.001) significantly different between regions*

Data Source: ACREU Survey of Ontario Family Physicians

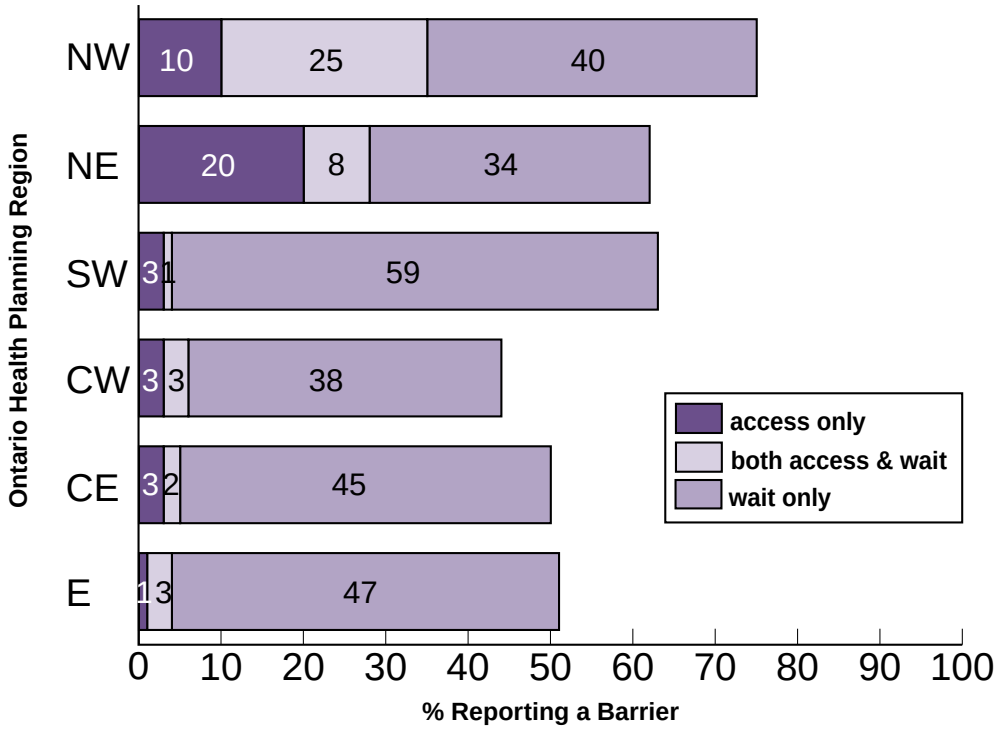
Appendix A5.4g: ***Perceived Barriers to Referral to Rheumatology Services* by Ontario Health Planning Region, 1993***



* ***wait time (p<.001) and access barriers (p<.001) significantly different between regions***

Data Source: ACREU Survey of Ontario Family Physicians

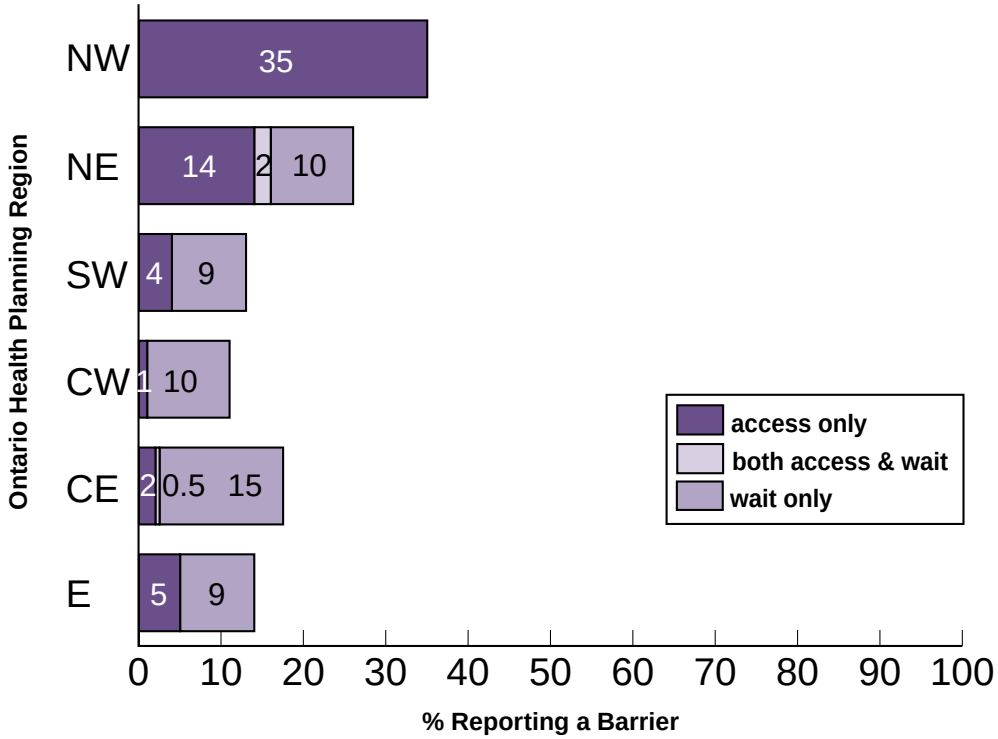
Appendix A5.4h: ***Perceived Barriers to Referral to Orthopedic Services* by Ontario Health Planning Region, 1993***



* ***wait time (p<.001) and access barriers (p<.001) significantly different between regions***

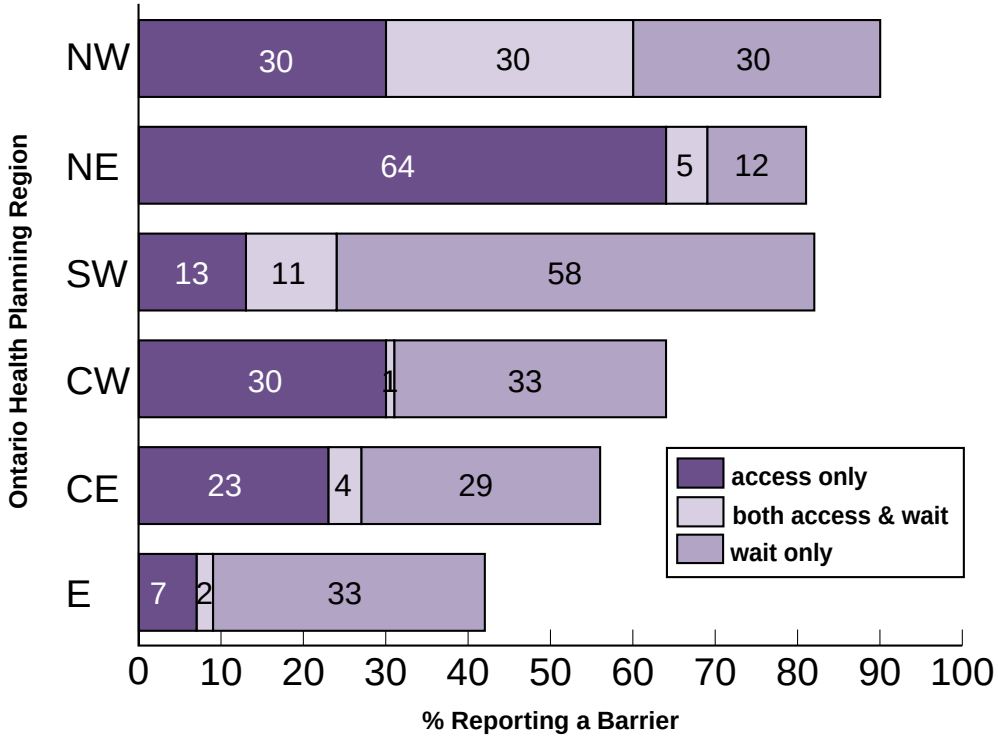
Data Source: ACREU Survey of Ontario Family Physicians

Appendix A5.4i: ***Perceived Barriers to Referral to Internal Medicine Services by Ontario Health Planning Region, 1993***



Data Source: ACREU Survey of Ontario Family Physicians

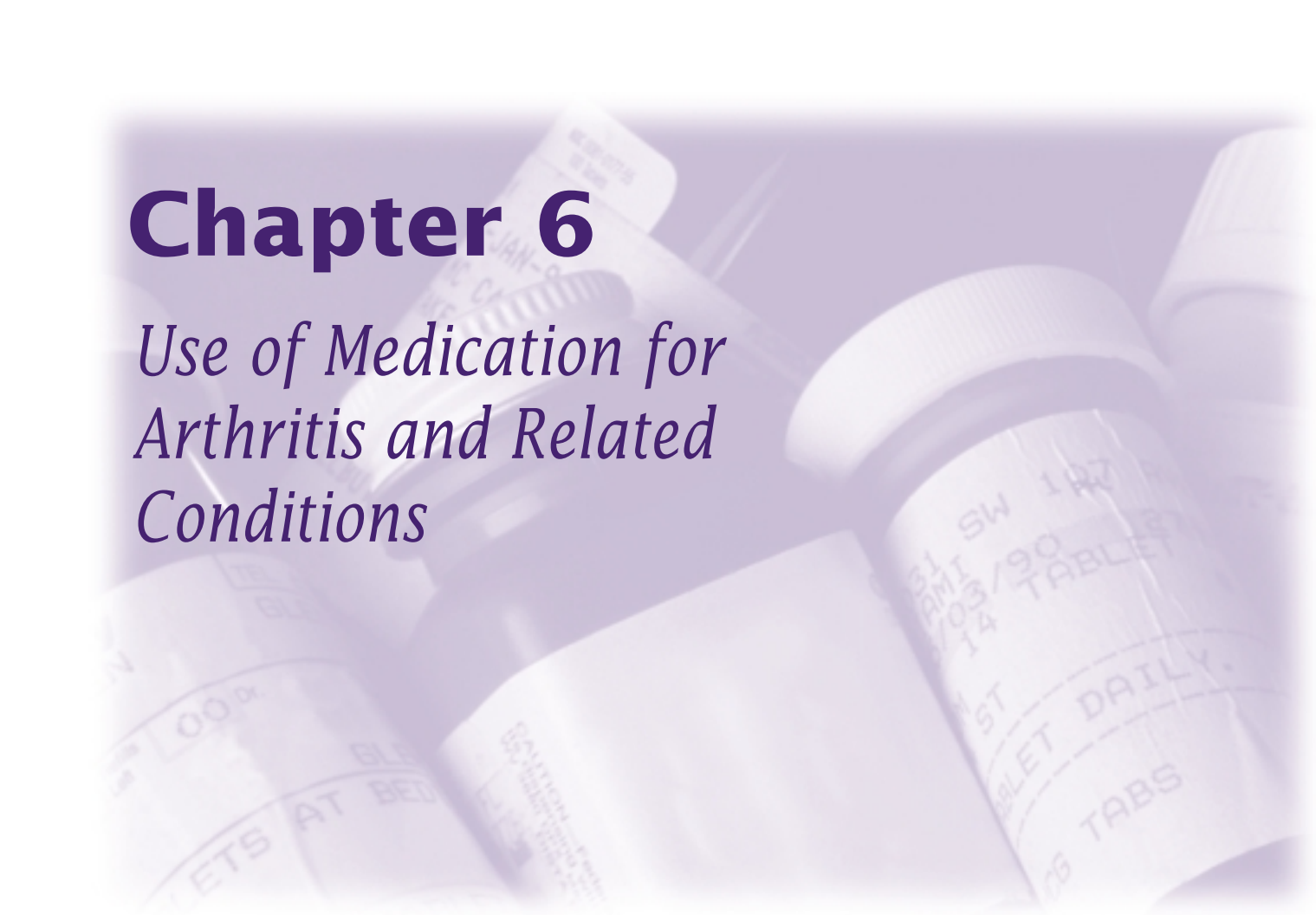
Appendix A5.4j: ***Perceived Barriers to Referral to Rehabilitation Medicine Services by Ontario Health Planning Region, 1993***



Data Source: ACREU Survey of Ontario Family Physicians

Chapter 6

Use of Medication for Arthritis and Related Conditions



Overview

The most common types of arthritis are rheumatoid arthritis and osteoarthritis. They differ in that rheumatoid arthritis is characterized by inflammation, while osteoarthritis has inflammatory components but is primarily a degenerative disease. Another common condition, osteoporosis, is not a form of arthritis but a disease of bone, and is characterized by a progressive loss of minerals (primarily calcium) together with a loss of the bone scaffolding; the resulting decrease in the quantity of bone can lead to fractures.[1]

The Ontario Drug Benefit program pays for prescription drugs for all seniors (age 65 years and over) in Ontario. This chapter looks at the types and costs of prescription drugs commonly used in the management of arthritis and related conditions. It compares the patterns of use by men versus women and by seniors living in the community versus those in long-term care facilities. As well, we examine the trends in drugs used for treatment; the trends in drugs used to prevent or control the complications arising from this treatment; the prescription of certain medications before and after elective total hip and total knee replacements; and the effectiveness of bone-protective agents in preventing hip fracture.

Overview of Drug Classes

The drugs used in the control and treatment of arthritis and related conditions fall into three major categories: those used in the relief of pain, those used in the treatment of the disease itself, and those used in preventing the progression of the disease process. In the course of using any medication, however, problems often arise due to side effects. Thus, a fourth important category of drugs is those used to prevent or control side effects.

Drugs Used in Treatment of Arthritis

Simple analgesics such as acetaminophen are first-line therapy for arthritis and related conditions where there is pain but not inflammation. Acetaminophen is safe and generally well tolerated. Because it is available without a prescription, its use is not captured in the Ontario Drug Benefit program database and will not be considered in this chapter.

Non-steroidal anti-inflammatory drugs (NSAIDs), of which ASA (Aspirin) is the most common, relieve both pain and inflammation.[2,3] NSAIDs are first-line drug therapy in rheumatoid arthritis, and are also prescribed for some cases of osteoarthritis as well as for a variety of other pain syndromes.[4] Since in low doses they inhibit platelet function in the arteries, they are also used in the prevention of strokes and heart attacks. Unfortunately, a common side effect of their use is bleeding from the stomach, esophagus, or duodenum.

Disease-modifying anti-rheumatic drugs (DMARDs) are also used to treat rheumatoid arthritis. DMARDs include gold compounds, D-penicillamine, anti-malarials, sulfasalazine, and methotrexate. Their therapeutic goal is to alter the course of the inflammatory process and if possible, to induce the remission of symptoms. Many of these drugs have significant side effects, and therapy must be monitored closely by a physician.

Corticosteroids, such as prednisone, have been used in the treatment of rheumatoid arthritis. These drugs may give dramatic relief of symptoms, but their long-term use is problematic because of substantial side effects. More potent immunosuppressive drugs, such as azathioprine and cyclophosphamide, may be used in patients who fail to respond to NSAIDs and DMARDs.

Drugs Used to Alleviate Side Effects

Normally the stomach is protected from its own acid by a layer of mucus that is produced in response to a chemical signal. NSAIDs block this chemical signal, leaving the stomach and duodenum vulnerable to damage. Gastritis or ulcers may result and may in turn lead to serious bleeding. These adverse effects of NSAIDs can be reduced in two ways: by blocking acid production or by replacing the chemical signal for mucus production. Histamine type 2 receptor blockers, such as cimetidine and ranitidine, and newer proton pump inhibitors, such as omeprazole, are two groups of drugs that work by reducing acid secretion; misoprostol is a drug that acts to replace the chemical signal for the production of protective mucus.

Drugs Used in Treatment of Osteoporosis

Current standards for treatment of osteoporosis involve the use of three main groups of drugs: estrogens, bisphosphonates and calcitonin.[1] Calcium and vitamin D may play a role in treatment as well.[5] Estrogens work by preventing the accelerated bone loss that occurs after menopause, and are regarded as the most effective agents for preventing and treating postmenopausal osteoporosis. Another effective group of medications is bisphosphonates, which prevent bone degradation and resorption by binding to bone surfaces and inhibiting bone breakdown. Calcitonin is a hormone that can be given to reduce the pain of osteoporotic vertebral compression fractures, which are a common complication of osteoporosis. Calcitonin increases bone density and may have a role in treating osteoporosis, but its use remains controversial.

Data Source and Methods

Data were obtained from the Ontario Drug Benefit program and the Discharge Abstract Data from the Canadian Institute of Health Information (CIHI) for the fiscal years 1994/95 through 1996/97. The prescription claims submitted to the Ontario Drug Benefit program each contain the unique identifying number of the beneficiary, the date the prescription was filled, the Drug Identification Number, the quantity of drug dispensed, the total cost of the prescription, the professional fees included in the total cost, and unique identifying numbers for the prescriber and the dispenser. Drug costs for seniors who are patients in acute-care hospitals or residents in chronic care institutions and rehabilitation facilities are paid out of the global budgets of those institutions, so these data were not available for inclusion in the study.

The drug benefit claims contain a flag for the approximately 5% of seniors who live in nursing homes and homes for the aged. This population is generally frailer and more ill than seniors living in the community, and their patterns of drug use should differ accordingly. In this study, trends in drug use were calculated separately for seniors living independently and those living in long-term care institutions, as well as for men and women.

On July 15, 1996, the provincial government introduced copayments for beneficiaries of the Ontario Drug Benefit program. Prior to this time, the plan covered the full cost of prescriptions. Now, seniors living in the community who have annual incomes above certain cutoffs (in 1996, these cutoffs were $16,018 for singles and $24,175 for couples) pay the first $100 of drug costs each year and a copayment of $6.11 on each prescription above the deductible. Seniors living in long-term care facilities or with incomes below the cutoffs pay $2.00 for each prescription that is filled. Following this policy change, many seniors began to substitute cheaper over-the-counter preparations for medications previously dispensed by prescription. This was particularly true for NSAIDS, which include ASA. Accordingly, claims data after July 1996 may substantially underestimate the use of NSAIDS by seniors, and the results are presented accordingly.

Determination of Drugs Used

Claims that involved drugs used in the treatment of arthritis and related conditions were identified by the Drug Identification Number in the Ontario Drug Benefit program dataset. The drugs of interest are listed in Appendix A6.1. Using a statistical program (SAS), we tallied the total number of people using each of these medications, as well as the total cost of prescriptions dispensed, for quarter-year intervals over the study period. Results are reported as the number of prescriptions per 1,000 population, to account for the difference in the sizes of the population of seniors in long-term care compared with those living in the community. The cost of medication use was summarized by category of medication used, and results are reported as overall costs. (Costs borne out-of-pocket by individuals under the cost-sharing arrangement introduced in

July 1996 were not included.) In order to put costs into context, background information is provided about overall costs of medications for all seniors.

The population demographics for community-dwelling seniors were derived from the 1991 Statistics Canada census using standard techniques. Population demographics for seniors in long-term care for 1995 were received from the Long Term Care Division, Ministry of Health.

The Relationship Between NSAID Use and Gastrointestinal Bleeds

To determine the rate of gastrointestinal bleeds potentially related to use of NSAIDs, we reviewed a cohort of all new NSAID users in 1995. All persons who were aged 66 and over by January 1, 1995, and who had received a prescription for an NSAID between January 1, 1995 and December 31, 1995 were eligible for inclusion. In order to eliminate previous users of NSAIDs, we did not include anyone who had received a prescription for an NSAID in the 12 months before January 1, 1995. We then determined which of these NSAID users had concomitant use of a gastrointestinal protective agent. Next, we searched the CIHI dataset to identify all individuals admitted to hospital with a gastrointestinal bleed in the 12 months following the initial prescription of an NSAID, and used the unique identifying number to link the data obtained from the Ontario Drug Benefit and CIHI datasets. Hospital records were selected using the methodology of Raiford et al, as outlined in Appendix A6.2.[6] Data that might include the period of the copayment (i.e. after July 15, 1996) were excluded, to avoid the potential effect of this policy change on drug utilization and reimbursement.

The cumulative incidence rate of gastrointestinal bleeds was calculated for two groups of NSAID users: those who had been prescribed gastrointestinal protective agents in the six months prior to hospital admission and those who had not. The agents studied included cytoprotective agents (misoprostol), H2 blockers (cimetidine, ranitidine, nizatidine, famotidine), and proton pump inhibitors (omeprazole, lansoprazole). Only aggregate data were abstracted from the final dataset, in order to protect individual confidentiality. The proportion of each group requiring admission to hospital with a gastrointestinal bleed was calculated.

Use of NSAIDs Before and After Elective Joint Replacement Surgery

Using the International Classification of Diseases–9th revision (ICD-9) codes in Appendix A6.3, we identified all individuals who underwent elective total hip and total knee replacements in the period from April 1, 1995 to September 30, 1995. (Data after September 30 were excluded in order to avoid the effect of the copayment period on the completeness of data on medication use.) The encrypted identifying number was used to link these individuals to the Ontario Drug Benefit dataset without otherwise identifying them. From these two sources, we calculated the proportion of recipients of joint prostheses who used NSAIDs within the three-month interval and the four-to-six-month interval prior to the date of admission for surgery, and the proportion who used them within the three-month interval and the four-to-six-month interval after the date of discharge.

Hip Fracture and Prior Use of Bone-Protective Agents

Criteria for hip fracture as outlined in Chapter 8 are presented in Appendix A6.3. Using these criteria, we identified all patients who underwent emergency repair of a hip fracture in Ontario hospitals during the fiscal year 1995/96, and used the encrypted identifying number to link these individuals back to the Ontario Drug Benefit dataset. From these two sets of data, we determined the number of people with hip fracture who had used bone-protective agents (bisphosphonates, estrogens, or calcitonin) during the six-month interval prior to admission for the fracture. The analysis did not include use of calcium or vitamin D, as these treatments were not routinely reimbursed by the Ontario Drug Benefit program during the interval of interest.

Findings

Between 1994/95 and 1996/97, there were approximately 1.3 million seniors in Ontario living in the community and 53,000 living in long-term care settings. Women constituted 57.7% of the first group and 74.8% of the latter.

Exhibit 6.1 provides an overview of the prescriptions reimbursed through the Ontario Drug Benefit program for this interval. Community-dwelling seniors received 27 million prescriptions in 1994/95 and 26.5 million in 1996/97. Although the number of prescriptions decreased over these years, the number of pills dispensed and the cost per prescription both increased, as a result of the copayment introduced in July 1996.

Seniors living in long-term care settings, which excludes residents of chronic care facilities and retirement housing, constituted only 4.3% of all Ontario seniors in 1994/95 and 4.1% in 1996/97; however, this group received 7.9% of all Ontario Drug Benefit prescriptions (2.3 million prescriptions) in 1994/95, almost double its proportion in the population. Potential explanations include a greater burden of illness in this population, or prescribing patterns that warrant review. By 1996/97, prescriptions to this group increased to 9.2% of the total (2.7 million prescriptions). This increase may have been an artifact due to altered patterns of usage by community-dwelling seniors brought on by the government copayment regulations.

Costs for all prescriptions to residents in long-term care increased from $47 million (5.6% of total charges) in 1994/95 to $55.2 million (6.2% of total charges) in 1996/97. The average cost

Exhibit 6.1: ***Overall Use of Prescription Drugs Among People 65 Years and Over in Ontario, 1994/95 - 1996/97***

Characteristics	Fiscal Year	Prescriptions	Pills per Prescription	Total Paid ($ million)	Cost per Prescription ($)
Community-dwelling Seniors	94/95	27,046,820	69.16	793.9	29.35
(n= 1,344,145)	95/96	28,092,357	69.03	874.8	31.14
	96/97	26,484,290	74.22	830.1	31.34
Seniors in Long-term Care	94/95	2,331,308	72.89	47.2	20.24
(n= 53,769)	95/96	2,458,702	71.46	51.2	20.81
	96/97	2,677,294	71.35	55.2	20.61
All Ontario Seniors	94/95	29,378,128	69.46	841.1	28.63
	95/96	30,551,059	69.23	926.0	30.31
	96/97	29,161,584	73.96	885.3	30.36

Data Source: Ontario Drug Benefit Claims File

Exhibit 6.2: ***Exposure to Arthritis and Related Conditions Medications per 1,000 Population 65 Years and Over in Ontario, 1995/96***

	Community		Long-term Care	
Type of Drug	Women	Men	Women	Men
Arthritis Drugs	**406.4**	**425.0**	**188.4**	**192.8**
NSAIDs	379.5	397.7	138.3	128.0
Non-immunosuppressive Agents	5.6	4.4	2.3	1.6
Immunosuppressive Agents	2.2	1.7	1.3	1.0
Corticosteroids	46.4	47.4	58.0	73.1
Gold	1.5	0.9	0.7	0.1
GI Protective Drugs	**268.8**	**244.3**	**317.5**	**369.2**
Cytoprotectives	77.2	56.6	66.6	56.4
H2 blockers	185.1	176.5	230.5	279.3
Proton Pump Inhibitors	50.6	45.5	57.9	73.8
Bone Protective Drugs	**21.7**	**2.1**	**7.4**	**2.9**
Bisphosphonates	15.6	1.8	5.7	2.4
Estrogen	5.8	0.1	0.5	0.1
Calcitonin	0.7	0.3	1.4	0.4
Overall	**548.3**	**551.7**	**499.5**	**577.4**

Data Source: Ontario Drug Benefit Claims File

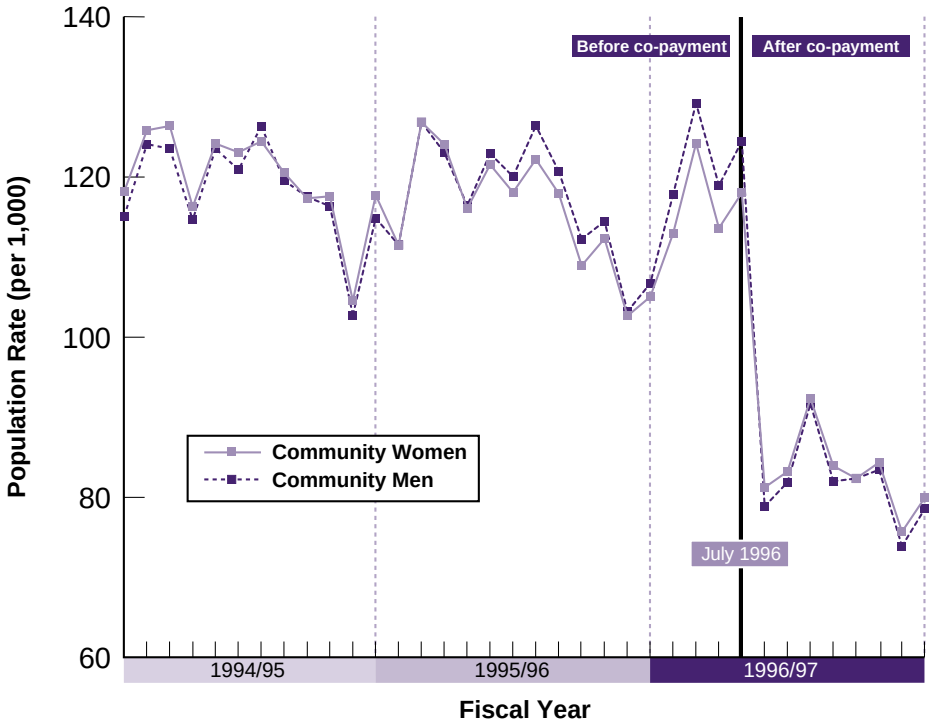
of a prescription rose from $20.24 in 1994/95 to $20.81 in 1995/96, but dropped to $20.61 in 1996/97 after implementation of the copayment regulations. The average cost per prescription for seniors in long-term care was lower than for seniors in the community. Potential explanations include provision of a standard one-month supply of medications to long-term care residents or the preferential use of older, less expensive medications.

Use of Drugs for Arthritis and Related Conditions

Exposure Rates

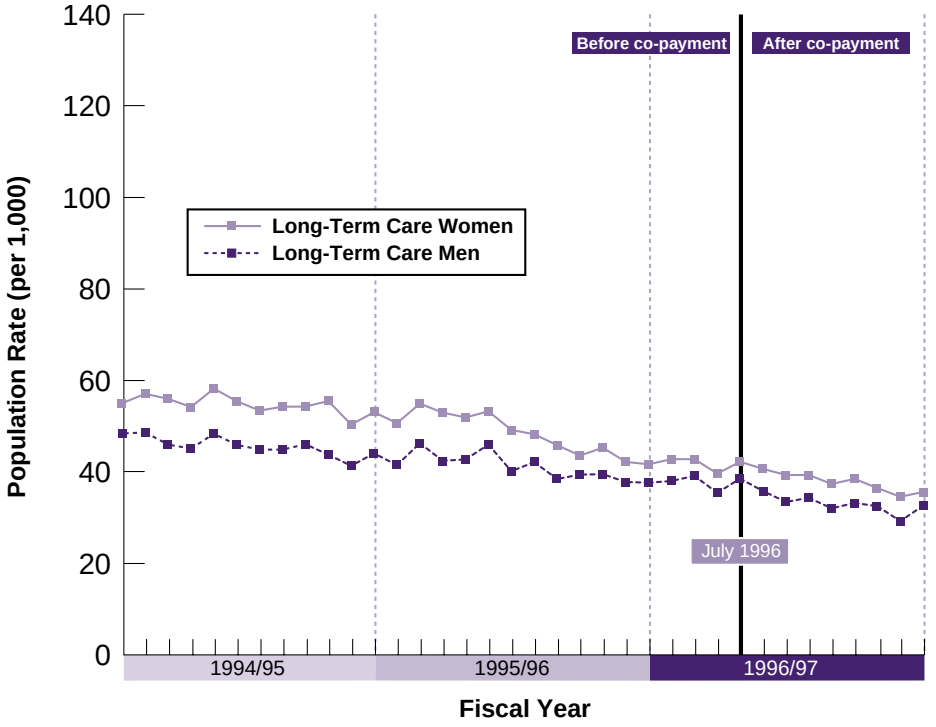
NSAIDS were the most commonly used of the drugs prescribed for arthritis and related conditions, with 38% of women and 40% of men who lived in the community receiving at least one prescription in 1995/96. The rate was much lower for seniors living in long-term care, as seen in Exhibit 6.2. Potential explanations for the lower use by seniors in long-term care include a lower prevalence of arthritis (unlikely), greater use of non-drug therapies, less aggressive treatment

Exhibit 6.3: ***Exposure to NSAIDs per 1,000 Population/Month, Among Community-dwelling Ontario Residents 65 Years and Over, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



Data Source: Ontario Drug Benefit Claims File

Exhibit 6.4: ***Exposure to NSAIDs per 1,000 Population/Month, Among Residents of Long-term Care Facilities 65 Years and Over, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



Data Source: Ontario Drug Benefit Claims File

of arthritis, closer compliance to the American Rheumatology Association guidelines, significant use of non-NSAID drug therapies, decreased intensity of the disease state ("burned out"), or mandatory medication reviews carried out at regular intervals by the pharmacist, nurse, and physician team in long-term care environments.[2]

Women who lived in the community were prescribed more bisphosphonates than were those who lived in long-term care. This may suggest a targeted response by physicians to changes in the medical literature, or neglect of preventive interventions within chronically ill populations.[7,8]

Seniors living in long-term care, especially men, were prescribed more corticosteroids than were seniors living in the community. Possible explanations include different prevalence of arthritis or chronic obstructive pulmonary disease (COPD), or different practice patterns in prescribing corticosteroids.

Seniors in long-term care also received more gastrointestinal protective agents than did seniors living in the community, particularly H2 blocker drugs and proton pump inhibitors. Possible explanations include increased risk of gastrointestinal bleeding in this population, intrusiveness of gastrointestinal symptoms affecting quality of life (a primary outcome in long-term care facilities) or different rates of risk of gastrointestinal side effects of drugs.

Exhibits 6.3 and 6.4 chart the exposure to NSAID agents between April 1994 and March 1997. The monthly exposure rates per 1,000 population were consistent among both community-dwelling and long-term care seniors of both sexes. A dramatic drop in claims for NSAIDs, from 120 to 80 per 1,000 population, occurred among community-dwelling seniors in July 1996, when the copayment was instituted. It is likely that in many cases the drop is accounted for by substitution of over-the-counter preparations rather than by discontinuation of therapy. No such dramatic change was observed for seniors in long-term care. An ongoing slow decline is noted in prescription of NSAIDs to both groups before and after implementation of the copayment, suggesting increasing compliance with American Rheumatology Association guidelines.[2]

Use of corticosteroids is shown in Exhibits 6.5 and 6.6. For community-dwelling seniors, the rate per 1,000 population was about 20 prescriptions per month for both men and women, declining slightly after implementation of the copayment. For those in long-term care, however, these rates were approximately 60 prescriptions per month for men and 50 for women. The sex difference can be explained by the greater frequency of chronic lung disease among men, which is a more common reason for use of corticosteroids among this age group than is arthritis. Exposure to corticosteroids among male long-term care residents appears to have slowly risen over the period studied.

Exhibits 6.7 and 6.8 show that long-term care residents are prescribed gastrointestinal protective agents more often than are community-dwelling seniors, and their rate of use is rising more quickly. Men in long-term care have higher rates of usage than do women. Among community-dwelling seniors, the sex difference is less evident and the increase not seen. An expected drop in the exposure rate is noted with implementation of the copayment in July 1996, predominantly among seniors in the community. The group differences may relate to differences in prescribing practices among physicians caring for the two groups, or to increased risk of gastrointestinal bleeds in the frail elderly. An alternate explanation could be the greater professional monitoring in long-term care compared with community settings: that is, in a monitored setting, problems affecting quality of life may be more likely to be brought to the attention of a physician and action being taken to assuage symptoms.

The use of bone-protective agents is presented in Exhibits 6.9 and 6.10. As expected, women are more likely to use these agents than men. Research in this area has concentrated on women.[7] Between April 1994 and March 1997, the use of bone-protective agents by community-dwelling women increased from 4 per 1,000 population per month to 11, and the use by women in long-term care increased from 1.5 per 1,000 population per month to 6.1. Little usage was seen among community-dwelling men, and only a minor increment among men in long-term care. Copayment had no appreciable long-term effect on exposure to these agents.

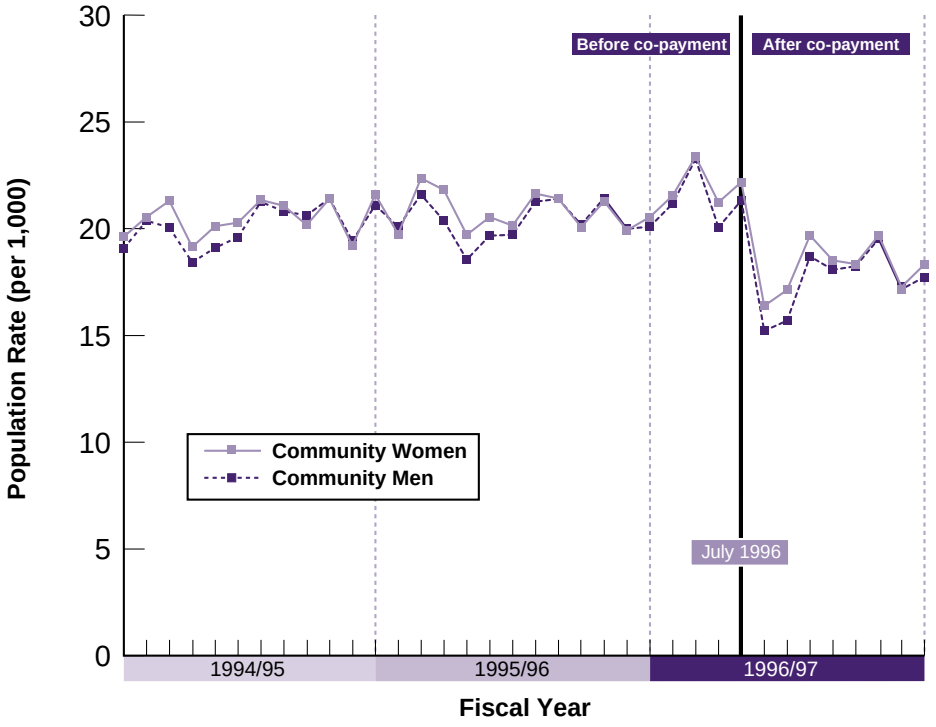
Costs of Prescriptions

Medication costs for community-dwelling seniors are presented in Exhibit 6.11. Total drug costs for arthritis and related conditions in the fiscal year 1995/96 were $81.9 million for women and $50.3 million for men; for long-term care residents, these costs were $4.7 million for women and $1.7 million for men. These medications accounted for 15.1% of the cost of all prescriptions dispensed to community-dwelling seniors and 12.4% of the cost of those dispensed to long-term care residents. These costs are lower than the proportion of the population receiving these medications under the Ontario Drug Benefit program, suggesting the use of less expensive medications in comparison with other diseases, such as heart failure.

For seniors living in the community, overall expenditures for arthritis drugs were $23.7 million for women and $14.0 million for men. Among long-term care residents, these figures were $720,000 for women and $204,000 for men. The greatest expenditure was for NSAIDs, followed by corticosteroids and immunosuppressive agents.

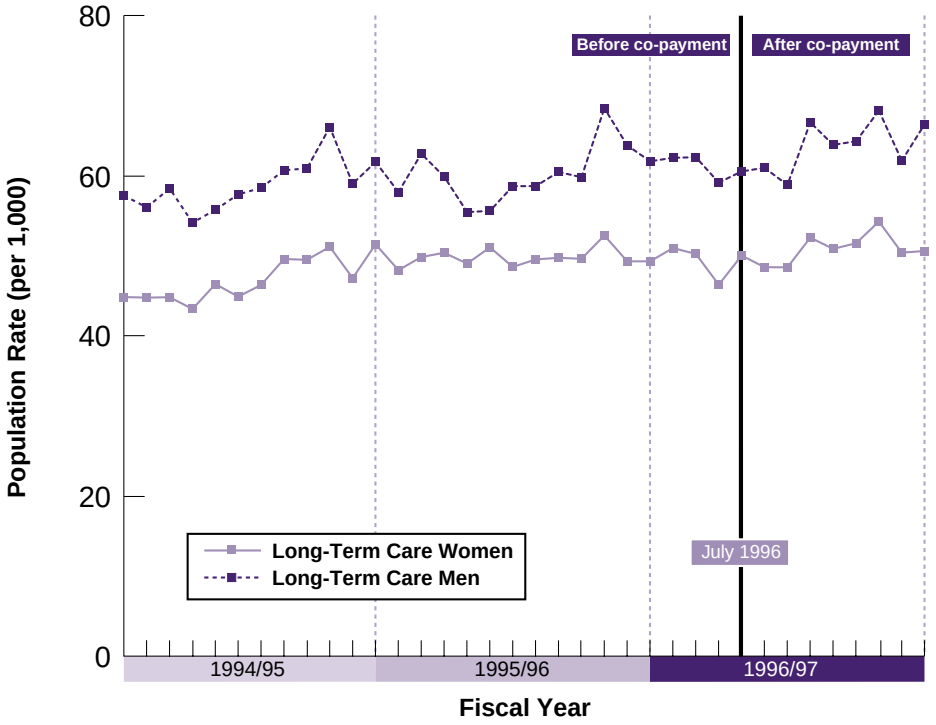
Among community-dwellers, the costs for immunosuppressive agents were $554,000 for women and $346,000 for men, and the costs for gold therapy were $368,000 for women and $166,000 for men. The greatest cost was for gastrointestinal protective agents and the lowest was for bone-protective agents.

Exhibit 6.5: ***Exposure to Corticosteroids per 1,000 Population/Month, Among Community-dwelling Ontario Residents 65 Years and Over, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



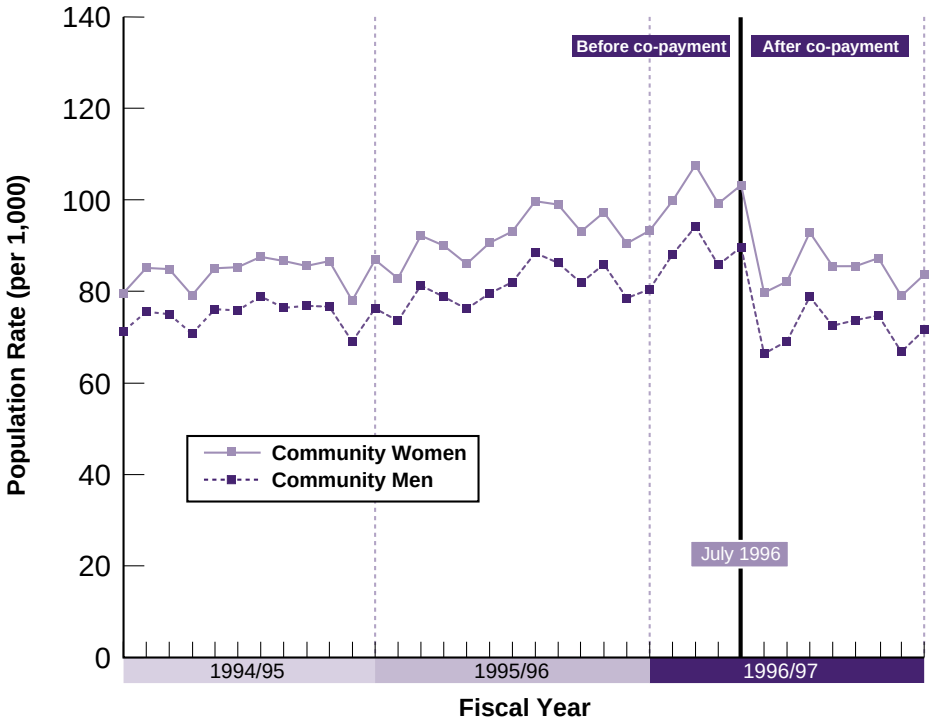
Data Source: Ontario Drug Benefit Claims File

Exhibit 6.6: ***Exposure to Corticosteroids per 1,000 Population/Month, Among Residents of Long-term Care Facilities 65 Years and Over, Before and After Co-Payment Implementation,1994/95 – 1996/97***



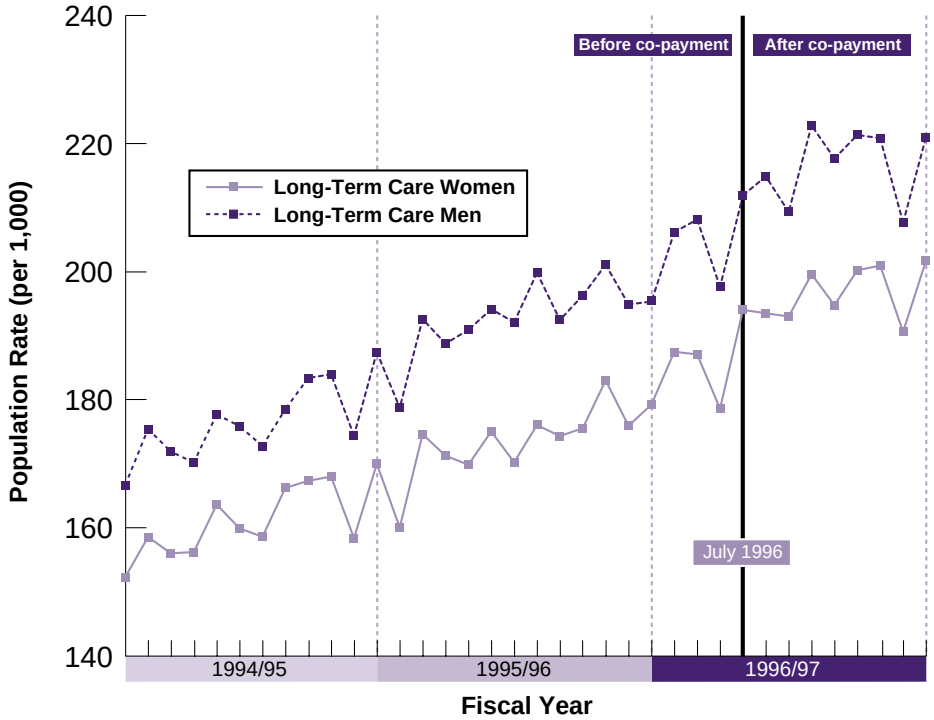
Data Source: Ontario Drug Benefit Claims File

Exhibit 6.7: ***Exposure to Gastrointestinal Protective Agents per 1,000 Population/Month, Among Community-dwelling Ontario Residents 65 Years and Over, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



Data Source: Ontario Drug Benefit Claims File

Exhibit 6.8: ***Exposure to Gastrointestinal Protective Agents per 1,000 Population/Month, Among Residents of Long-term Care Facilities 65 Years and Over, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



Data Source: Ontario Drug Benefit Claims File

Exhibits 6.12 and 6.13 present total monthly costs of NSAIDs. These costs were already dropping significantly among both community-dwelling and long-term care resident seniors prior to July 1996; then, following implementation of the copayment, there was a dramatic drop for community-dwelling seniors: $1 million per month for women and $0.5 million per month for men. No such dramatic decline in costs was seen among long-term care residents. Seasonal variation in usage is noted in both groups, with small drops in cost during the winter.

Exhibits 6.14 and 6.15 show costs for cytoprotective agents. The costs for these drugs (e.g. misoprostol) show a steady dramatic increase, the opposite of costs of NSAID use. The only group not to show an increase was men in long-term care. The explanation for this difference is unknown.

Bisphosphonate use is reviewed in Exhibits 6.16 and 6.17. The costs of this medication among men remained stable throughout the interval studied. Increasing costs were noted for community-dwelling women beginning in April 1994, and tripled, from $100,000 to $300,000 per month between April 1994 and March 1997. Cost increases began among long-term care resident women in the winter of 1996, and also tripled, from $3,000 to $9,000 per month. A temporary decline in the cost of bisphosphonate therapy was noted following implementation of the copayment, with a return to the anticipated costs within three months. The overall cost of bisphosphonate therapy for long-term care residents was negligible.

NSAID Use and Gastrointestinal Bleeds

Exhibit 6.18 provides information about persons newly receiving NSAIDs in 1995 who were admitted to hospital in the ensuing 12 months. During this interval, 0.72% of seniors using NSAIDs but not using gastrointestinal protective agents were admitted to hospital with a gastrointestinal bleed, compared with 0.84% of those using both NSAIDs and gastrointestinal protective agents. An explanation for these differing rates of admission may relate to targeted prescribing by physicians to patients who are at high risk of gastrointestinal bleeds.

NSAID Use and Elective Joint Replacement

Exhibit 6.19 presents the use of NSAIDs in the six months prior to and following elective hip or knee joint replacement. Between April 1 and September 30, 1995, 3,099 women and 2,013 men received elective joint replacements. The proportion using NSAIDs increased in the months prior to surgery and decreased after surgery. This finding is consistent with the literature, which suggests that marked symptomatic improvement with surgery cannot rule out that patients may have switched to other drugs post-operatively.

Hip Fracture and Prior Use of Bone-Protective Agents

Between April 1 and September 30, 1995, 3,186 women and 1,073 men sustained a fractured hip. As shown in Exhibit 6.20, only 1.4% of the women and 0.3% of men had been taking any bone-protective agent in the six months prior to the fracture. Possible explanations for these low rates include a failure to incorporate evidence into practice; a lack of resources for objectively tracking bone density before and during therapy; or more problems with side effects of the drugs experienced by individuals in the general population than by the individuals who had participated in the randomized clinical trials that provided evidence for efficacy. Further study of the gap between evidence and practice may be warranted.

Discussion

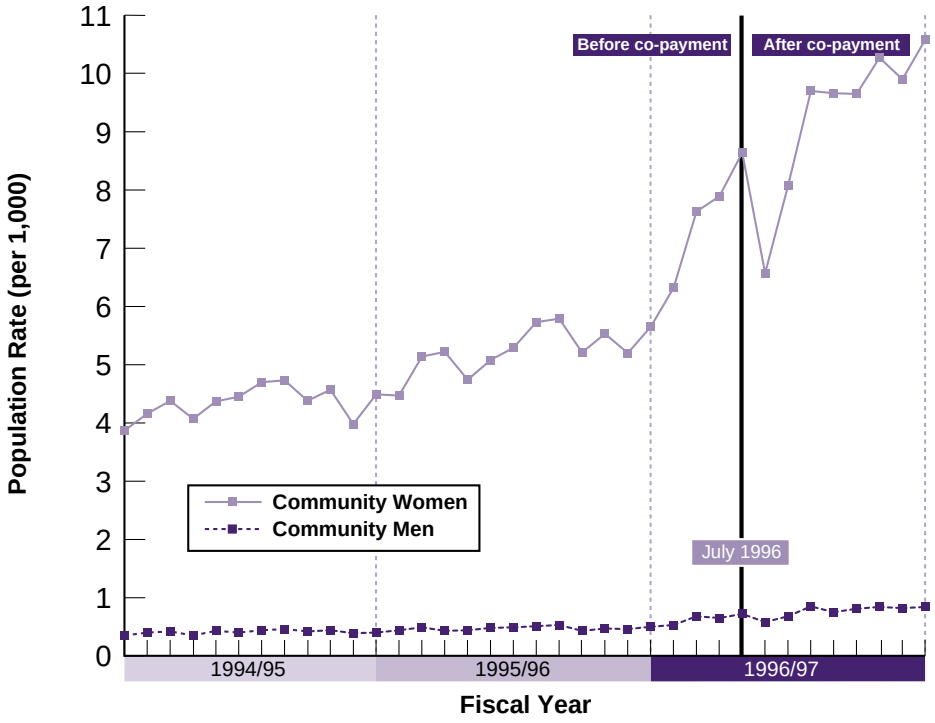
Trends in drug use for arthritis and related conditions among Ontario seniors appear to reflect evidence in the literature and responses to policy changes. The present study demonstrated a decline in the use of medications for the control of arthritis. A drop in NSAID usage explains most of this decline. Temporally, this decline coincided with both the publication of guidelines from the American Rheumatology Association, and the introduction of a copayment policy by the Ontario government.[2]

Exposure to other medications also fell, reflecting changing prescribing practices. The prescription rate for gold compounds declined, while more effective immunosuppressive drugs, such as methotrexate, took their place. Continual incremental changes in medical knowledge likely also contributed to this change in practice.

In looking at overall medication use for these conditions, there was a difference in the patterns among community-dwelling seniors and the patterns among seniors in long-term care. For instance, residents in long-term care were prescribed NSAIDs considerably less often than were seniors living in the community. This lower exposure rate was also seen for other arthritis therapies, raising questions about the reasons behind the difference. There are several potential explanations. Residents in long-term care may be receiving insufficient treatment, or community-dwelling seniors may be overtreated. Alternately, seniors in long-term care may be experiencing better control because of a more structured environment, because of the use of non-pharmacologic therapies, because they are less mobile, or because they have fewer symptoms. Some combination of these answers is also possible. Further study may help define the reasons behind these differences in treatment.

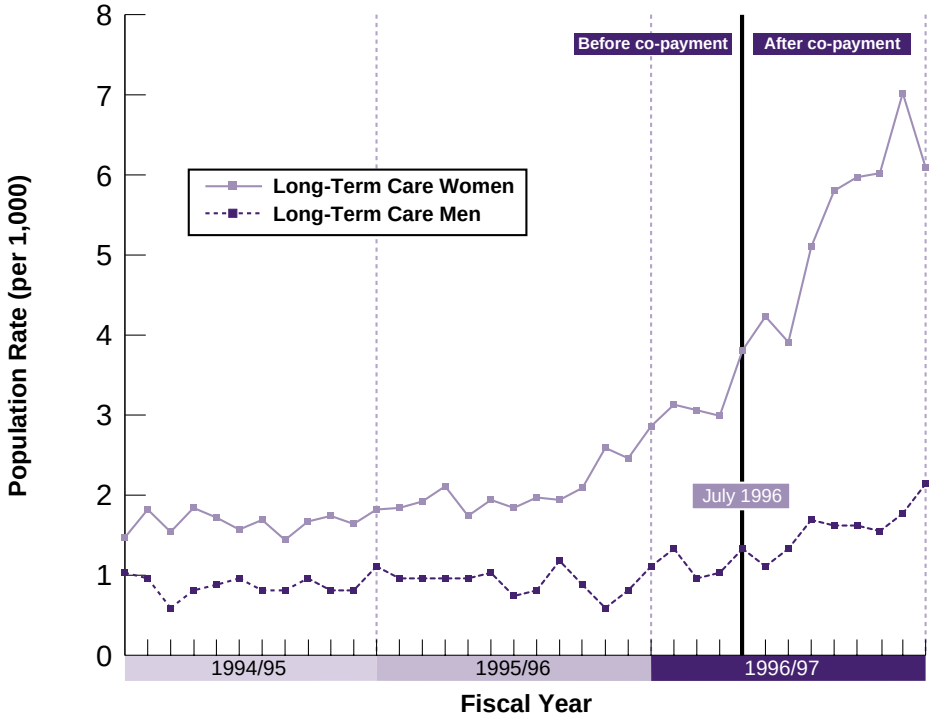
At the same time that exposure to NSAIDs fell, there was an increase in the rate of exposure to drugs used in the prevention of gastrointestinal bleeds. The reason for these trends is not readily apparent. It is possible that more appropriate prescribing of

Exhibit 6.9: ***Exposure to Bone Protective Agents per 1,000 Population/Month, Among Community-dwelling Ontario Residents 65 Years and Over, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



Data Source: Ontario Drug Benefit Claims File

Exhibit 6.10: ***Exposure to Bone Protective Agents per 1,000 Population/Month, Among Residents of Long-term Care Facilities 65 Years and Over, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



Data Source: Ontario Drug Benefit Claims File

Exhibit 6.11: *Total Cost of Prescribing Arthritis and Related Conditions Medications to People 65 Years and Over in Ontario, 1995/96*

	Community		Long-term Care	
Type of Drug	Women ($)	Men ($)	Women ($)	Men ($)
Arthritis Drugs	**23,744,825**	**14,045,015**	**720,027**	**203,674**
NSAIDs	20,976,372	12,325,596	573,061	158,499
Non-immunosuppressive Agents	681,630	321,397	16,687	2,797
Immunosuppressive Agents	553,865	346,083	14,888	3,604
Corticosteroids	1,164,973	885,972	106,997	38,338
Gold	367,984	165,967	8,395	435
GI Protective Drugs	**55,068,315**	**35,811,651**	**3,840,038**	**1,457,503**
Cytoprotectives	7,185,857	3,711,624	438,160	124,296
H2 blockers	27,448,950	19,255,604	2,083,495	814,339
Proton Pump Inhibitors	20,433,508	12,844,422	1,318,382	518,868
Bone Protective Drugs	**3,132,353**	**417,075**	**101,243**	**10,846**
Bisphosphonates	1,786,005	224,690	39,021	7,755
Estrogen	876,913	6,256	2,700	60
Calcitonin	469,434	186,129	59,522	3,030
Overall	**81,945,493**	**50,273,740**	**4,661,308**	**1,672,023**

Data Source: Ontario Drug Benefit Claims File

protective agents has occurred, following publications in the medical literature.[9] Further studies may better elicit an explanation.

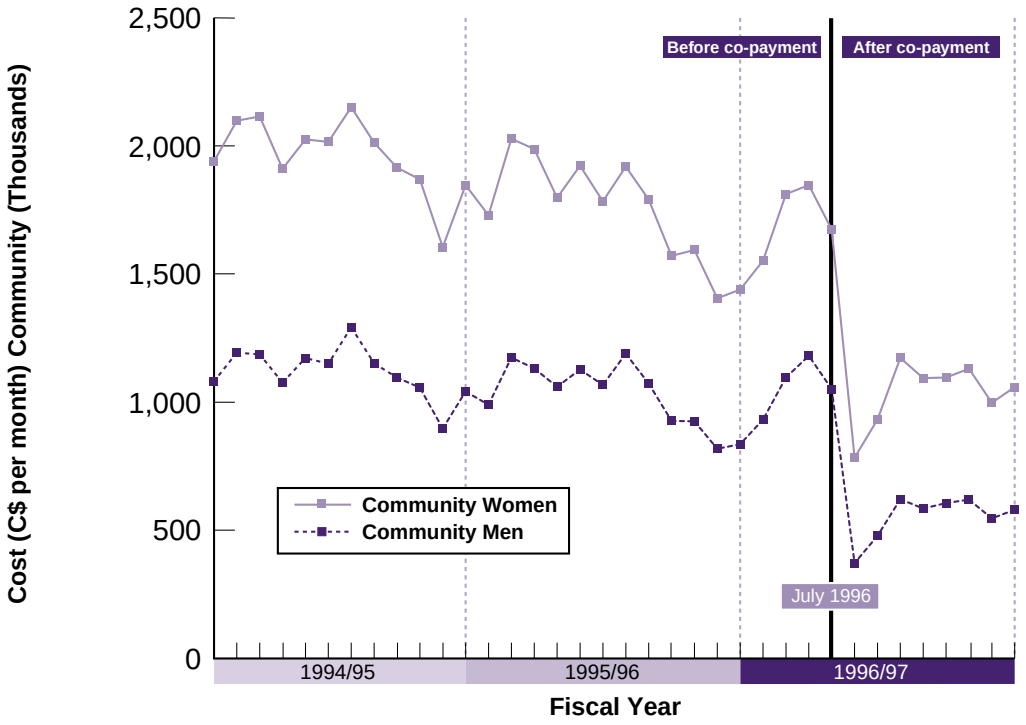
Increasing community recognition of osteoporosis has coincided with dramatic increases in the use of bone-protective agents, especially among women. The greatest increase occurred in the use of bisphosphonates among community-dwelling women, although women in long-term care also benefitted from this change in practice. Rising bisphosphonate exposure reflects recent developments in the management of osteoporosis.[1,10]

The small difference in hip fracture rates between community-dwelling seniors exposed to bone-protective agents and those not exposed needs explanation. One possibility relates to physicians' targeting of an osteoporotic group at a higher risk of fracture. Alternatively, it may reflect the short time frame for study, and a longer study interval might have demonstrated a greater difference. Repetition of this study with a longer follow-up interval may offer different results.

Over the study interval, elective hip repair recipients showed a steady post-operative decline in NSAID exposure, as would be expected if surgery were ameliorating their pain. The size of the decrease, however, suggests either that not all pain is relieved or that seniors are receiving treatment with NSAIDs post-operatively for different reasons than the ones for pre-operative exposure. Further investigation may help elucidate the reasons for these differences.

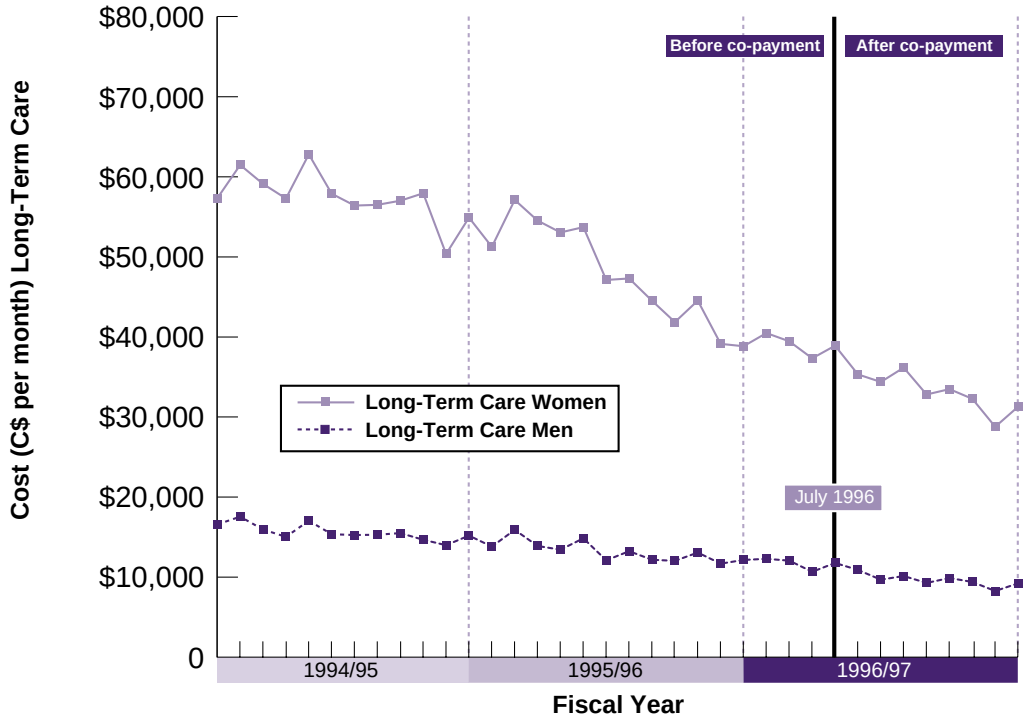
Seniors with arthritis and related conditions are prescribed drugs in a fashion that appears to follow recommendations cited in the literature, with varying rates of complication. As well, joint replacements tend to reduce, but not eliminate, the post-operative use of NSAIDs. Finally, a negative trend in the rate of hip fractures can be linked to exposure to bone-protective agents.

Exhibit 6.12: ***Total Cost of NSAIDs Use Among Community-dwelling Ontario Residents 65 Years and Over, in Total Dollars Paid Per Month, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



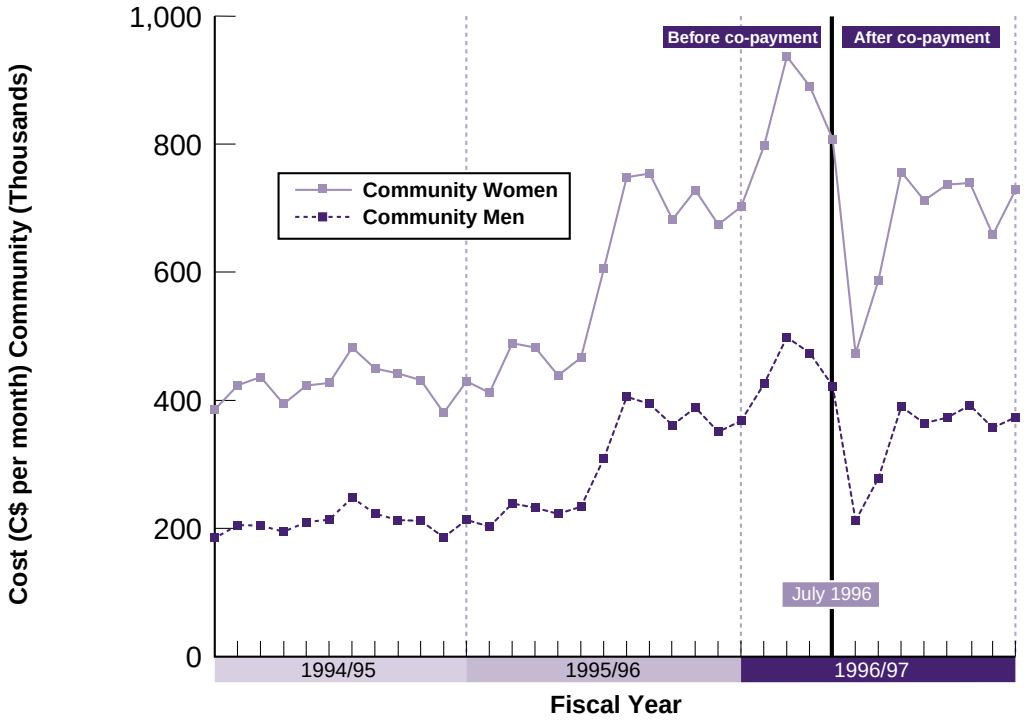
Data Source: Ontario Drug Benefit Claims File

Exhibit 6.13: ***Total Cost of NSAIDs Use Among Residents of Long-term Care Facilities 65 years and Over, in Total Dollars Paid Per Month, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



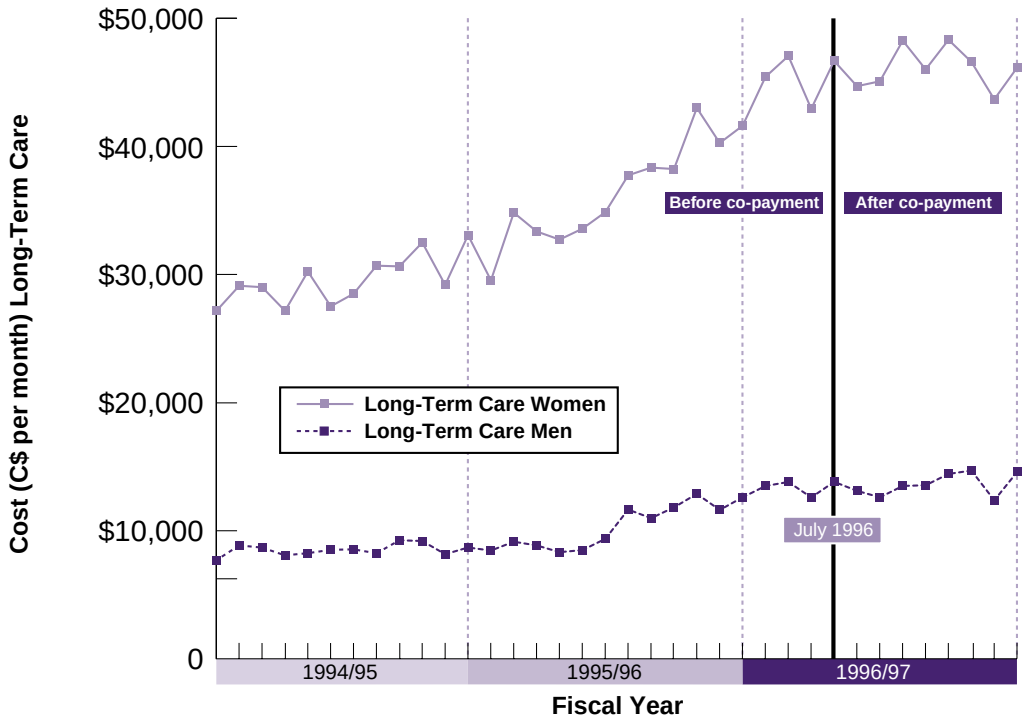
Data Source: Ontario Drug Benefit Claims File

Exhibit 6.14: ***Total Cost of Cytoprotective Treatments Among Community-dwelling Ontario Residents 65 Years and Over, in Total Dollars Paid Per Month, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



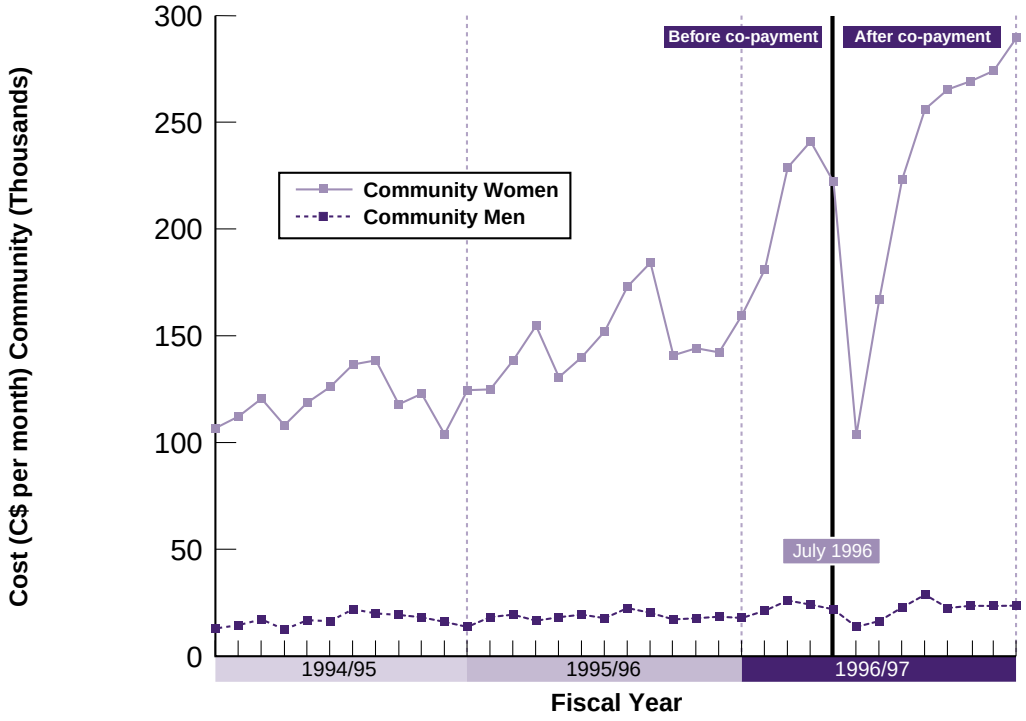
Data Source: Ontario Drug Benefit Claims File

Exhibit 6.15: ***Total Cost of Cytoprotective Treatments Among Residents of Long-term Care Facilities 65 Years and Over, in Total Dollars Paid Per Month, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



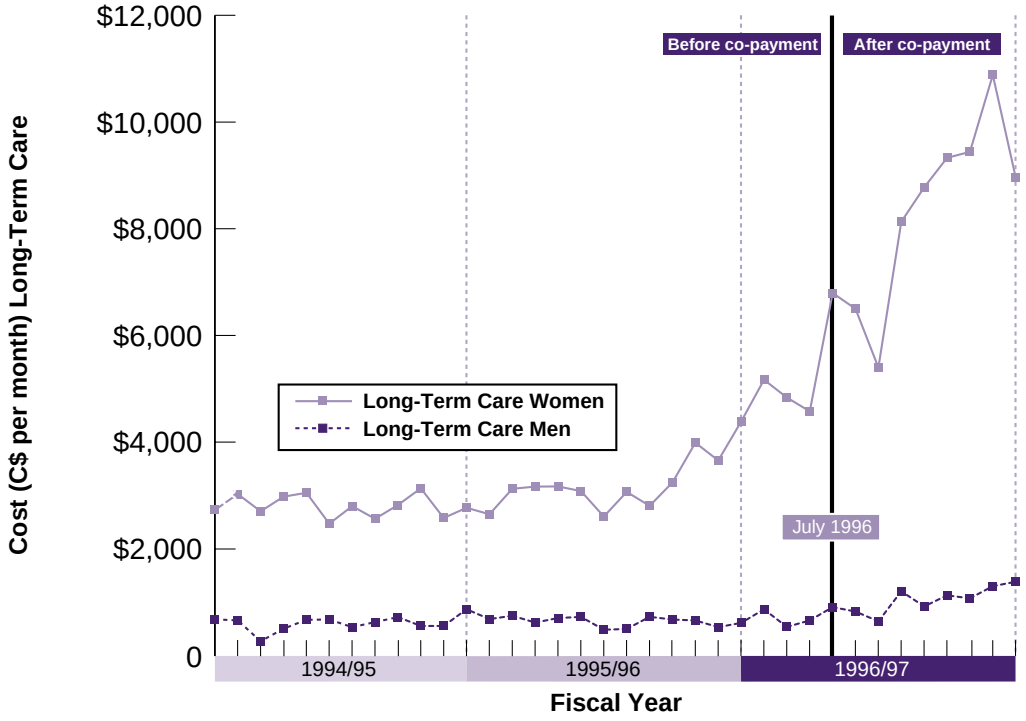
Data Source: Ontario Drug Benefit Claims File

Exhibit 6.16 ***Total Cost of Bisphosphonate Treatments Among Community-dwelling Ontario Residents 65 Years and Over, in Total Dollars Paid Per Month, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



Data Source: Ontario Drug Benefit Claims File

Exhibit 6.17: ***Total Cost of Bisphophonate Treatments Among Residents of Long-term Care Facilities 65 Years and Over, in Total Dollars Paid Per Month, Before and After Co-Payment Implementation, 1994/95 – 1996/97***



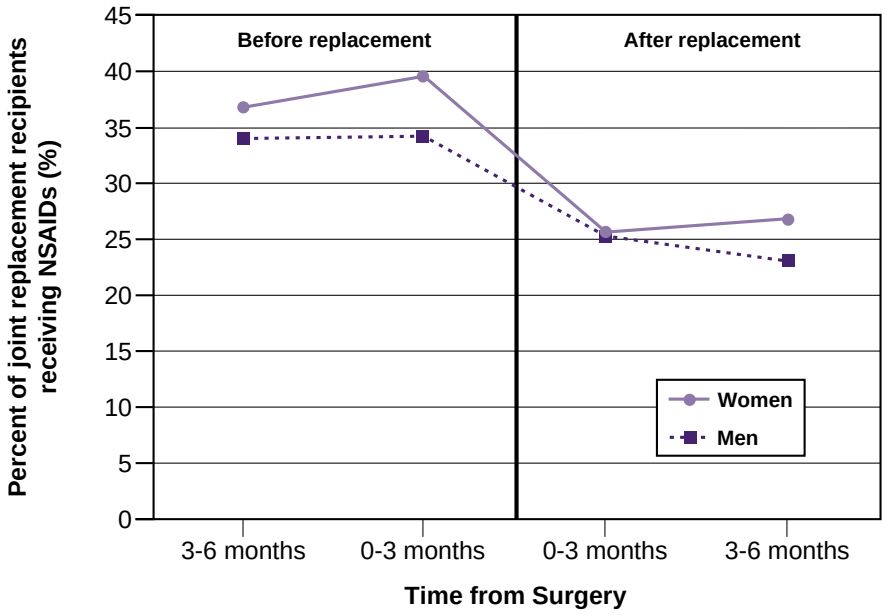
Data Source: Ontario Drug Benefit Claims File

Exhibit 6.18: ***Number of Patients with Gastrostintestinal (GI) Bleeding Among New NSAID Users Who Did and Did Not Recieve Protective Agents in the Twelve Months Following NSAID Prescription, 65 Years and Over, April 1, 1995 - September 30, 1995***

Type of Drug	No GI Bleed	GI Bleed	NSAID Users with GI Bleed
NSAID without GI-protective drugs	98,271	707	0.72%
NSAID with GI-protective drugs	59,858	503	0.84%

Data Source: Canadian Institute for Health Information, Ontario Drug Benefit Claims File

Exhibit 6.19: ***Sex-specific Rates of NSAID+ Use Among Elective Hip and Knee Replacement Recipients in Ontario, April 1, 1995 — September 30, 1995***



+NSAID – Non-steroidal anti-inflammatory drugs

Data Source: Canadian Institute for Health Information, Ontario Drug Benefit Claims File

Exhibit 6.20: ***Hip Fracture Patients Receiving Bone Protective Agents Six Months Prior to Repair Surgery, 65 Years and Over, April 1, 1995 - September 30, 1995***

	Prevention Prior to Admission (%)	Total
Women	1.4	3,186
Men	0.3	1,073
Overall	**1.1**	**4,259**

Data Source: Canadian Institute for Health Information, Ontario Drug Benefit Claims File

References

1. Scientific Advisory Board, Osteoporosis Society of Canada. Clinical practice guidelines for the diagnosis and management of osteoporosis. *CMAJ* 1996; 155(8): 1113-1133.

2. Brandt KD. Should nonsteroidal anti-inflammatory drugs be used to treat osteoarthritis? *Rheumatic Diseases Clinics of North America* 1993; 19(1): 29-44.

3. Hochberg MC, Altman RD, Brandt KD et al. Guidelines for the medical management of osteoarthritis. Part I: Osteoarthritis of the hip. American College of Rheumatology. *Arthritis Rheum* 1995; 38(11): 1535-1540.

4. Buckley CD. Treatment of rheumatoid arthritis. *BMJ* 1997; 315: 236-238.

5. Dawson-Hughes B, Haris SS, Krall EA et al. Effect of calcium and vitamin D supplementation on bone density in men and women 65 years of age or older. *N Engl J Med* 1997; 337(10): 670-676.

6. Raiford DS, Gutthann SP, Garcia-Rodriguez LA. Positive predictive value of ICD-9 codes in the identification of cases of complicated peptic ulcer disease in the Saskatchewan Hospital automated database. *Epid* 1996; 7(1): 101-104.

7. Black DM, Cummings SR, Karpf DB et al. Randomized trial of effect of alendronate on risk of fracture in women with existing vertebral fractures. Fracture Intervention Trial Research Group. *Lancet* 1996; 348(9041): 1535-1541.

8. Redelmeier DA, Siew HT, Booth GL. The treatment of unrelated disorders in patients with chronic medical diseases. *N Engl J Med* 1998; 338(21): 1516-1520.

9. Gabriel SE, Jaakkimainen RL, Bombardier C. The cost-effectiveness of misoprostol for nonsteroidal anti-inflammatory drug-associated adverse gastrointestinal events. *Arthritis Rheum* 1993; 36(4): 447-459.

10. Raisz LG. The osteoporosis revolution. *Ann Int Med* 1997; 126(6): 458-462.

Appendix A6.1: *List of Drugs Included in Analysis*

Type of Drug

NSAID Agents

Older

Naproxen
Indomethacin
Acetylsalicylic Acid
Ketoprofen
Ibuprofen

Newer

Diclofenac
Keterolac
Tolmetin
Piroxicam
Flurbiprofen
Trisalicylate
Floctafenine
Tiaprofenic Acid
Sulindac
Mefenamic Acid
Tenoxicam
Choline Magnesium
Diflusinal
Nabumetone

Oral Corticosteroids

Betamethasone
Cortisone
Dexamethasone
Hydrocortisone
Methylprednisolone
Prednisolone
Prednisone
Triamcinolone

Estrogens

Ethinyl Estradiol
Mestranol
Estradiol-17b

as well as any combination drug including any of these ingredients

Cytoprotectives

Misoprostol

H2 Blockers

Cimetidine
Ranitidine
Nizatidine
Famotidine

Immunosuppressive Agents

Cyclosporine
Cyclophosphamide
Azathioprine
Penicillamine
Methotrexate

Proton Pump Inhibitors

Omeprazole
Lansoprazole

BisPhosphonates

Etidronate
Alendronate

Gold

Auranofin
Aurothioglucose
Aurothiomalate

Non-immunosuppressive Agents

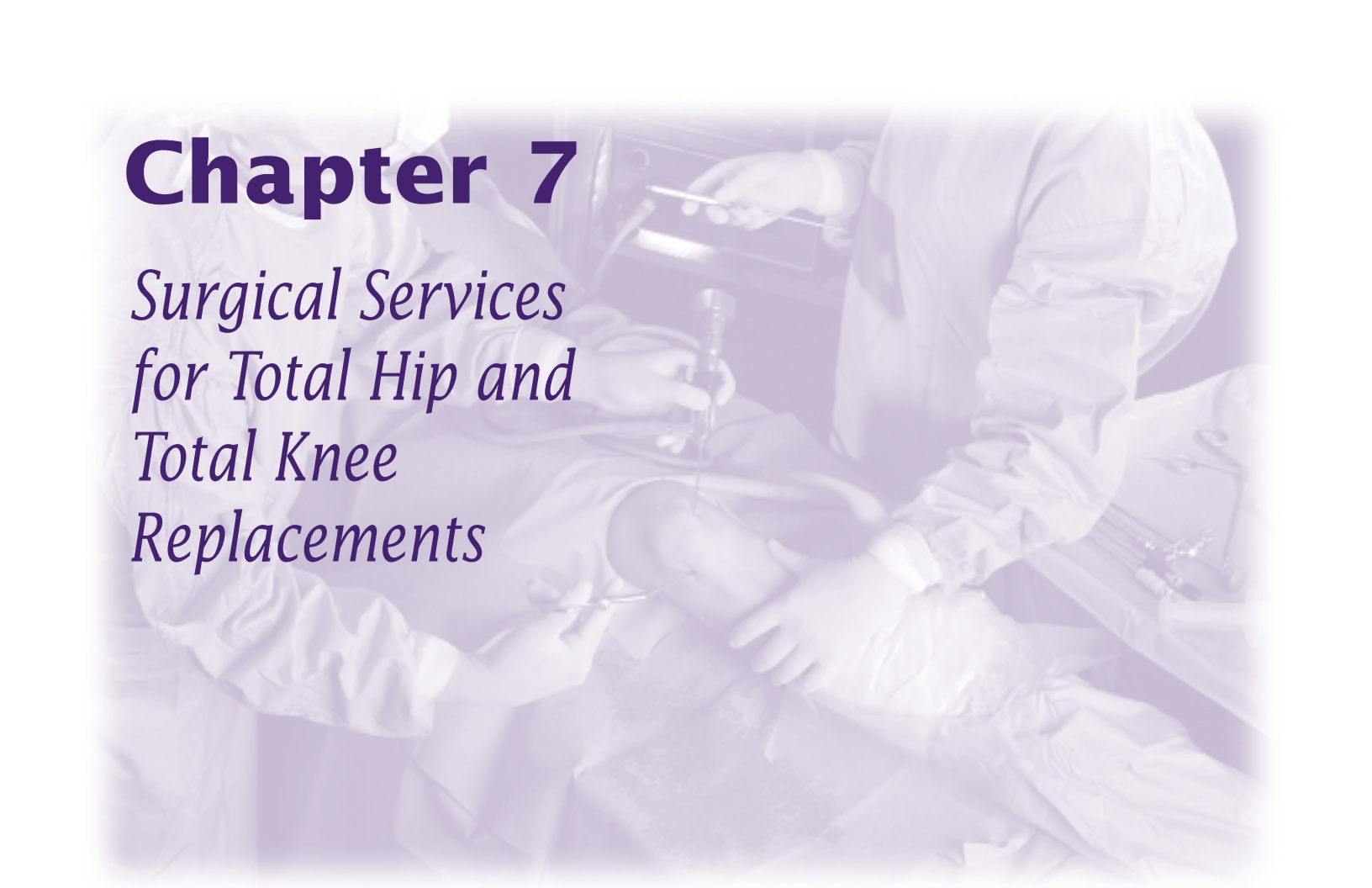
Chloroquine
Sulfasalazine

Appendix A6.2: *Criteria for Abstracting Diagnosis of Gastrointestinal Bleed*

ICD-9 Codes Excluded				ICD-9 Codes Included	
Liver			(a)	531.x - 531.6	532.x - 532.6
571.0 - 571.9				533.x - 533.6	534.x - 534.6
				535.0	578.0
Alcohol				578.1	578.9
291.x - 291.9	535.3	572.2			
572.3	572.8	573.0			
Esophagus					
456.0	456.1	456.2			
530.1	530.2				
Tumours					
211.0	211.1	211.2			
211.3	211.4				
150.x - 157.9	158.x	158.0			
158.8	158.9	159.0			
159.9	159.x				
Mallory Weiss Tear					
530.7					

Data Source: Raiford DS[6]

Appendix A6.3: *Criteria for Abstracting Diagnosis of Hip and Knee Replacement and Hip Fracture*		
	ICD-9 Codes Excluded	**ICD-9 Codes Included**
Elective Hip Replacement	**Emergency Replacement Revisions:** 906.4 920.4	**Hemiarthroplasty** 936.1 - 936.4 936.9 **Total Hip Arthoplasty** 935.1 935.9
Elective Knee Replacement		934.1
Hip Fracture Repair		**Transcervical Hip** 820.0 820.1 **Pertrochanteric** 820.2 820.3 **Unspecified Neck** 820.8 820.9



Chapter 7

Surgical Services for Total Hip and Total Knee Replacements

Overview

As noted in Chapter 1, osteoarthritis and rheumatoid arthritis are common conditions. In the United States' National Health and Nutrition Examination Survey, they were found to affect 12% and 5% of the population between the ages of 24 and 75 years, respectively.[1-3] The prevalence rates increase with age, and women are twice as likely as men to have either of these conditions. The knees are more likely to be diseased than the hips.

The first line of treatment for a knee or hip that has deteriorated through osteoarthritis or rheumatoid arthritis includes drugs, exercise and physiotherapy; surgery is considered only when these measures have failed. It is difficult to estimate the percentages of individuals whose hips or knees will deteriorate to the extent that total joint replacement becomes necessary. Hip or knee arthroplasty generally results in dramatic reductions in disability and pain and improvement in quality of life,[4] and their provision remains a priority service for the Ministry of Health, hospitals, and surgeons in Ontario.

This chapter is divided into five sections that look at various aspects of hip and knee replacement surgery in Ontario. Section 1 looks at trends and regional variations in the utilization of hip and knee replacements, and examines whether geographical variations have diminished as the total number of procedures provided has increased. In the first two editions of the ICES Practice Atlas we reported on these trends and variations for the fiscal years 1981/82 through 1994/95, and the current study updates these trends to 1996/97.[5,6] As well as examining the rates of primary joint replacement, this study looks at the rates of revisions. These are necessary when a joint replacement fails because of infection or loosening due to cumulative wear and tear on the prosthesis.

The increase in total joint replacements is in part a function of the number of hospitals performing the procedures and the reduction in the time that patients stay in hospital. While the overall lengths of stay have dropped dramatically since 1980, significant variations remain. Section 2 reviews the trends in hospital volumes of procedures performed and the lengths of stay for both primary procedures and revisions.

Section 3 looks at the costs of prostheses. In Ontario, total hip and total knee replacements are two of the more common elective surgical procedures in Ontario and they cost between $7,000 and $10,000. Surgeons' fees, operating room costs and costs per day of acute care have not changed markedly over the past few years. There are marked variations in costs across hospitals related to the costs of prostheses as well as the variations in length of stay. There are a number of implants for hip and knee arthroplasty on the market, and their prices vary across regions and countries. The cost of the prosthesis can account for up to

Exhibit 7.1a: *Age/Sex-specific Hip Replacement Rates per 100,000 Population 20 Years and Over in Ontario, 1981/82 - 1996/97*

	Overall	Women					Men				
Year	Rate	20-34	35-49	50-64	65-74	75+	20-34	35-49	50-64	65-74	75+
1981/82	44.1	1.8	9.3	66.6	172.9	237.1	2.1	8.2	57.1	164.1	171.4
1982/83	52.7	2.1	10.4	81.2	218.4	267.7	2.6	10.3	71.1	189.8	196.5
1983/84	57.6	2.0	12.2	86.6	238.2	299.9	2.6	10.1	79.6	192.3	238.4
1984/85	61.1	2.6	13.6	89.9	252.2	307.6	3.9	10.3	86.5	220.2	229.2
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
1995/96	83.2	4.2	19.1	110.6	361.3	411.3	2.9	20.0	108.9	300.5	338.6
1996/97	83.4	4.7	19.6	112.9	360.2	408.7	4.4	18.0	105.7	291.1	367.5

Exhibit 7.1b: *Age/Sex-specific Knee Replacement Rates per 100,000 Population 20 Years and Over in Ontario, 1981/82 - 1996/97*

	Overall	Women					Men				
Year	Rate	20-34	35-49	50-64	65-74	75+	20-34	35-49	50-64	65-74	75+
1981/82	14.0	0.0	2.7	23.6	78.7	76.8	0.5	1.2	9.2	40.8	61.6
1982/83	15.3	0.4	1.9	26.3	84.0	87.9	0.4	0.9	13.5	39.2	65.5
1983/84	19.2	0.7	3.0	27.4	108.3	103.2	0.4	1.8	15.5	68.9	69.2
1984/85	24.5	0.8	3.2	37.7	146.0	128.7	0.6	1.1	20.1	85.3	82.5
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
1995/96	87.6	1.3	9.5	125.4	471.2	396.8	1.6	4.9	86.6	375.5	387.8
1996/97	91.5	1.1	8.8	136.7	497.6	414.7	0.8	6.6	86.7	393.5	387.8

Data Source: Canadian Institute for Health Information

one-third of the total cost of the procedure. This section reports on a survey that asked hospitals about the brands of prostheses purchased, the prices paid, and the policies and procedures involved.

There is debate as to whether the outcomes of total joint replacements are related to the volume of procedures provided by hospitals and surgeons. Proponents of "centres of excellence" argue that outcomes are best when the procedures are concentrated in a few hospitals to achieve economies of scale and to build teams of health professionals with the expertise, skills, and experience to produce the best results. Proponents of decentralization argue that the procedures are well established, and that as long as orthopedic surgeons maintain their skills and expertise, they can achieve good outcomes in community hospitals. There is further debate over whether revisions are more complicated than primary total joint replacements. Some argue that this procedure should be provided in regional centres even if primary total joint replacements are not; others argue that most revisions are straightforward procedures that can be performed effectively by the same surgeons who provide primary procedures.

Section 4 reports on a study in which medical claims were linked with hospital discharge data in order to relate the volume of total hip and total knee replacements, for both surgeons and hospitals, with the outcomes, where the outcomes included mortality, complications, revisions, and lengths of stay. Finally, queues are used to ration access to specialized services, and there is an ongoing concern about the length of waiting lists for total joint replacements in Ontario. Section 5 looks at the queuing times for primary total hip and total knee procedures, using the distributions and medians for the length of time between the last consultation with the surgeon and the time of surgery as indicators. We evaluated the relationships between waiting times for these procedures and the rates at which the procedures are performed across the regions.

Section 1. Overall Trends in Hip and Knee Replacements

Between 1981/82 and 1996/97, the age-adjusted rates per 100,000 persons 20 years of age and over for total joint replacements have almost doubled for hips, from 44 to 83, and increased almost sevenfold for knees, from 14 to 92. As shown in Exhibit 7.1, the rates for total hip replacements increased until about 1991/92 and leveled off somewhat thereafter. As the increase for total knee replacements has continued unabated, the number of total knee replacements in 1996/97 (7,548) was greater than the number of total hip replacements (6,375). At most ages, the rates were higher for women than for men, and the gender difference in rates increased with age.

Total Hip Replacements

In Exhibit 7.2 and 7.3, we show the variations in total hip replacements (all cases) by the old and new DHC areas. Through mergers and realignments, the number of District Health Councils (DHCs) in Ontario was reduced from 33 to 16, effective April 1, 1998, as explained in the Technical Appendix. The outlier DHCs with low rates were Cochrane, Peel, Ottawa-Carleton, and Metropolitan Toronto. (Other areas also had low rates, but with the smaller numbers of procedures, the variations were not statistically significant.) The outlier DHCs with high rates were Grey-Bruce, Haliburton/Kawartha/Pine Ridge, Kingston/Frontenac/Lennox/Addington, Rideau Valley and Thames Valley.

As in our reports in the two previous Practice Atlases, we characterized the degree of inter-area variation as being relatively small. The variation in rates across the redefined DHCs have been somewhat stable over the three study periods, and the rankings of total hip replacement rates for DHCs have remained fairly consistent, with a Spearman rank correlation coefficient of 0.87 ($p<0.001$) between the last two time periods.

Total Knee Replacements

Variations in total knee replacement rates continued to be relatively small, as can be seen in Exhibit 7.4 and the map in Exhibit 7.5. Six DHCs in Southwest Ontario had high rates: Essex, Grey-Bruce, Huron/Perth, Kent, Lambton, and Thames Valley; as did Haliburton/Kawartha/Pine Ridge in the Southeast region. The DHCs with low rates included: Metropolitan Toronto, Ottawa-Carleton, Thunder Bay and Waterloo. Grey-Bruce, Haliburton/Kawartha/Pine Ridge, Kent, and Thames Valley had high outlier rates for both hip and knee replacements, while Metropolitan Toronto and Ottawa-Carleton were districts with low outlying rates for both procedures.

In the second Practice Atlas we noted some evidence of a reduction of regional variations in rates for knee replacements as the absolute numbers of procedures increased. The numbers of total knee replacements increased for the most recent fiscal years, but the variation in rates across DHCs did not change. However, the relative ranking of DHCs has persisted somewhat; the Spearman rank correlation coefficient between the two time periods was 0.71 ($p<0.001$).

For the first time, we have excluded total joint replacements for repair of fractures and cancer, and separated the surgeries into "primary procedures" and "revisions". Trend lines for the data are displayed in Exhibit 7.6. The rates for primary hip replacements doubled between 1981/82 and 1993/94, and leveled off thereafter. The rates for primary knee replacements surpassed those for hips in 1992/93 and have continued to rise. In 1996/97, the rate for primary knee replacement was one-third higher than that for primary hip replacements.

In a sense, revisions of total joint arthroplasty are required surgery, not elective; while the rates for primary procedures best reflect changing demands. The age-adjusted rates for primary replacements of hips and

Exhibit 7.2: ***Age/Sex-adjusted, Hip Replacement Rates (Primary and Revision) per 100,000 Population by District Health Council in Ontario 1989/90 - 1996/97***

District Health Council	1989/90-1991/92		1992/93-1994/95			1995/96-1996/97			
	Age/Sex-adjusted Rate per 100,000	Rank	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of procedures / year	Age/Sex-adjusted Rate per 100,000	Rank	p-value
Algoma/Cochrane/Manitoulin/Sudbury	74.0	10	76.1	14		238	73.0	16	*
Algoma	71.6		76.8			88	83.5		
Cochrane	79.0		80.2			40	60.7		
Manitoulin-Sudbury	73.2		74.3			111	71.3		
Champlain	71.9	15	70.7	16	**	596	77.3	12	*
Eastern Ontario	63.9		70.0			115	77.8		
Ottawa-Carleton Regional	73.6		70.0			401	75.3		
Renfrew County	77.1		77.8			80	92.4		
Durham/Haliburton/Kawartha/Pine Ridge	75.9	9	89.7	6	*	557	97.1	5	**
Durham Region	62.5		82.0			247	86.4		
Haliburton/Kawartha/Pine Ridge	87.8		97.0			311	107.7		
Essex/Kent/Lambton	83.8	5	94.5	3	**	480	97.5	4	**
Essex County	78.0		94.7			261	92.8		
Kent County	77.7		91.1			112	114.9		
Lambton	104.5		97.1			108	93.1		
Grand River	88.8	4	91.7	5		177	96.1	6	
Brant	81.2		98.4			91	94.0		
Haldimand-Norfolk	97.3		83.9			87	98.6		
Grey/Bruce/Huron/Perth	102.4	1	105.0	1	***	276	105.4	2	***
Grey-Bruce	103.4		101.3			161	113.0		
Huron-Perth	101.4		109.4			115	97.4		
Halton-Peel	76.8	8	84.4	7		550	77.0	13	
Halton	90.1		94.0			220	89.4		
Peel	68.3		78.7			330	69.7		
Hamilton-Wentworth	73.4	12	82.9	9		362	90.4	7	
Metropolitan Toronto	67.7	16	73.4	15	***	1,484	73.3	15	***
Muskoka/Nipissing/Parry Sound/Timiskaming	81.6	6	84.1	8		175	89.7	8	
East Muskoka-Parry Sound	80.8		83.4			73	104.6		
Nipissing-Timiskaming	78.7		83.7			84	81.2		
West Muskoka-Parry Sound	97.7		90.2			19	87.0		

Continued on next page

Exhibit 7.2: *(cont'd)*

District Health Council	1989/90-1991/92 Age/Sex-adjusted Rate per 100,000	Rank	1992/93-1994/95 Age/Sex-adjusted Rate per 100,000	Rank	p-value	1995/96-1996/97 Number of procedures /year	Age/Sex adjusted Rate per 100,000	Rate	p-value
Niagara Region	72.2	14	76.2	13		319	85.0	9	
Northwestern Ontario	79.3	7	78.6	11		139	74.1	14	
Kenora-Rainy River	81.2		84.4			45	72.8		
Thunder Bay	78.4		75.8			94	74.8		
Quinte/Kingston/Rideau	91.0	2	95.4	2	⋆⋆	455	107.0	1	⁘
Hastings and Prince Edward Counties	93.0		93.0			135	98.9		
Kingston/Frontenac/Lennox and Addington	101.6		109.1			178	120.5		
Rideau Valley	79.2		84.4			142	100.8		
Simcoe-York	73.0	13	79.1	10		524	85.0	10	
Simcoe County	72.7		83.9			243	91.6		
York Region	75.4		77.2			281	79.9		
Thames Valley	89.8	3	92.3	4	⋆	444	97.7	3	⋆⋆
Waterloo Region/Wellington/Dufferin	73.7	11	78.4	12		376	84.6	11	
Waterloo Region	72.6		76.9			234	81.7		
Wellington-Dufferin	75.9		81.1			143	90.1		
Total Ontario	**76.2**		**81.5**			**7,149**	**84.4**		
Coefficient of variation (%)	10.7		10.7				12.8		
Extremal Quotient	1.5		1.5				1.5		
Systematic Component of Variation	11.8		9.9				14.3		
Adjusted Chi-square (likelihood ratio)	69.0(d.f. 15,p<0.0001)		76.7(d.f. 15,p<0.0001)				115.4(d.f. 15,p<0.0001)		

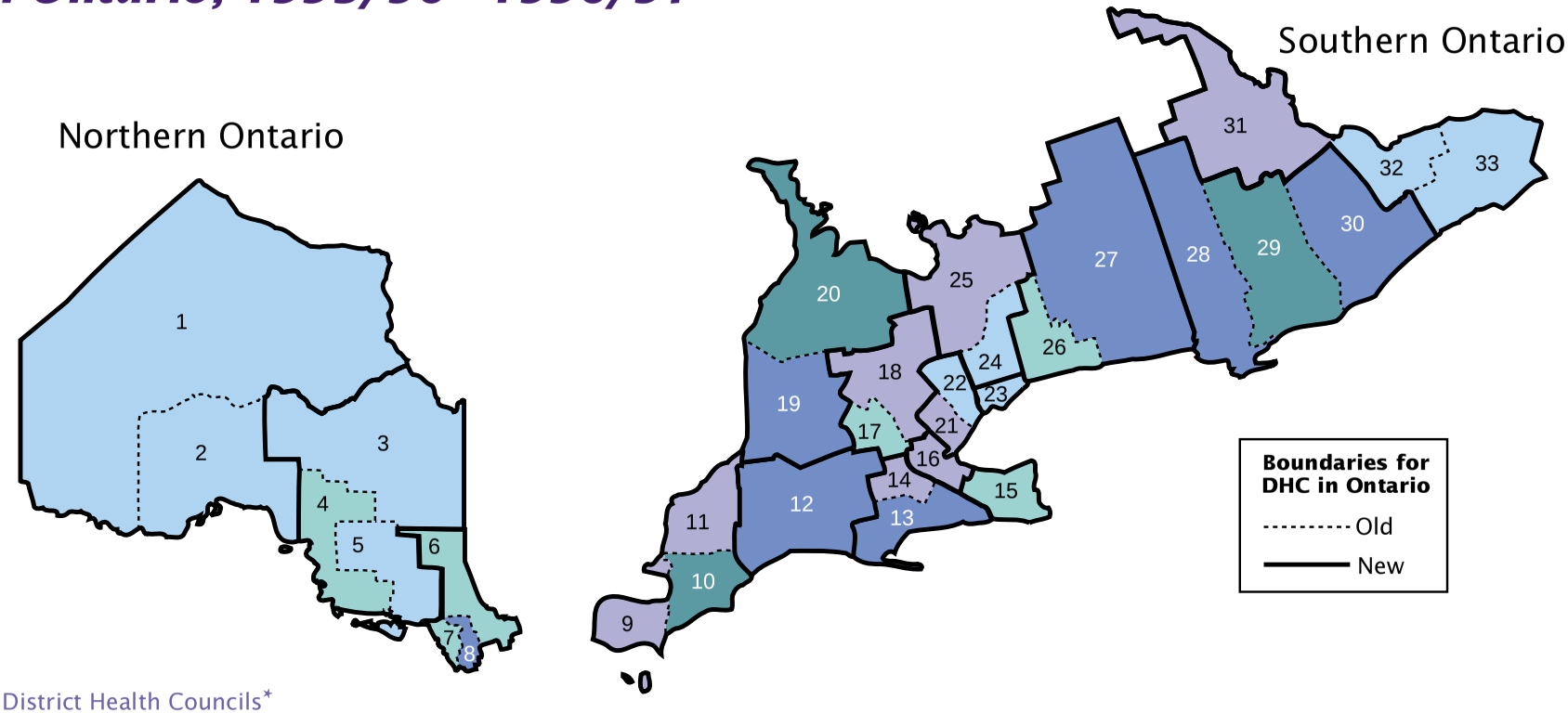
⋆ Significant at 5% level ⋆⋆ Significant at 1% level ⁘ Significant at 0.1% level

Rank Correlation:

	89/90-91/92	92/93-94/95	95/96-96/97
89/90-91/92	1		
92/93-94/95	0.891	1	
95/96-96/97	0.697	0.865	1

Data Source: Canadian Institute for Health Information

Hip Replacements Rates (Natural Break Version) per 100,000 Population 20 Years and Over by District Health Council in Ontario, 1995/96 - 1996/97



District Health Councils*

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

*Newly merged DHCs indicated by shading
❖Were not merged with any other DHCs

Hip Replacement Rates per 100,000

107.72 to 120.50	(4)+
97.40 to 107.71	(6)
89.35 to 97.39	(8)
79.92 to 89.34	(7)
60.71 to 79.91	(8)

+Value in brackets is the number of DHCs in each category

Data Source: Canadian Institute for Health Information

Exhibit 7.3

Exhibit 7.4: ***Age/Sex-adjusted Knee Replacement Rates (Primary and Revision) per 100,000 Population by District Health Council in Ontario 1989/90 - 1996/97***

District Health Council	1989/90-1991/92		1992/93-1994/95			1995/96-1996/97			
	Age/Sex-adjusted Rate per 100,000	Rank	Age/Sex-adjusted Rate per 100,000	Rank	p-value	Number of procedures / year	Age/Sex-adjusted Rate per 100,000	Rank	p-value
Algoma, Cochrane, Manitoulin and Sudbury	61.1	7	74.9	9		272	82.9	13	
Algoma	56.2		68.7			95	88.3		
Cochrane	60.3		81.4			50	76.7		
Manitoulin-Sudbury	64.5		76.6			128	81.7		
Champlain	56.7	10	67.8	14	*	575	74.9	15	**
Eastern Ontario	63.1		72.0			125	83.3		
Ottawa-Carleton Regional	52.9		64.7			366	69.2		
Renfrew County	70.7		79.4			84	94.6		
Durham/Haliburton, Kawartha and Pine Ridge	47.1	14	68.6	12		553	95.9	7	
Durham Region	40.7		68.2			233	84.8		
Haliburton, Kawartha and Pine Ridge	53.0		70.0			321	107.8		
Essex, Kent and Lambton	82.5	2	108.3	2	**	668	135.7	1	**
Essex County	81.4		101.0			368	130.6		
Kent County	79.1		131.3			147	153.4		
Lambton	88.0		106.5			154	133.0		
Grand River	78.7	5	94.0	4	**	190	101.4	5	
Brant	86.9		102.7			100	102.1		
Haldimand-Norfolk	69.0		83.5			90	101.2		
Grey Bruce Huron Perth	104.6	1	119.8	1	**	359	131.7	2	**
Grey-Bruce	91.5		106.1			191	128.4		
Huron-Perth	120.3		136.9			168	135.4		
Halton-Peel	50.5	12	66.8	15	*	594	86.6	11	
Halton	47.5		61.4			215	87.8		
Peel	52.0		69.7			380	85.5		
Hamilton-Wentworth	59.6	9	68.3	13		373	91.8	8	
Metropolitan Toronto	40.1	16	57.8	16	**	1,529	74.9	14	**
Muskoka, Nipissing, Parry Sound and Timiskaming	59.9	8	88.1	5	*	209	104.3	4	
East Muskoka-Parry Sound	64.4		94.2			72	99.1		
Nipissing-Timiskaming	53.2		82.6			109	105.0		
West Muskoka-Parry Sound	78.2		94.1			29	122.5		

Continued on next page

Exhibit 7.4: *(cont'd)*

District Health Council	1989/90-1991/92 Age/Sex-adjusted Rate per 100,000	Rank	1992/93-1994/95 Age/Sex-adjusted Rate per 100,000	Rank	p-value	1995/96-1996/97 Number of procedures / year	Age/Sex-adjusted Rate per 100,000	Rank	p-value
Niagara Region	46.0	15	75.1	8		345	89.1	10	
Northwestern Ontario	79.7	4	81.5	6		130	68.8	16	⋆⋆
Kenora-Rainy River	83.0		90.0			52	83.5		
Thunder Bay	78.2		77.4			78	61.6		
Quinte Kingston Rideau	66.1	6	81.3	7		423	98.5	6	
Hastings and Prince Edward Counties	81.7		85.6			146	105.6		
Kingston, Frontenac, Lennox and Addington	58.5		86.7			149	100.1		
Rideau Valley	59.1		71.9			129	90.3		
Simcoe-York	52.3	11	71.0	10		544	90.0	9	
Simcoe County	60.0		80.7			241	90.0		
York Region	46.4		63.2			303	90.6		
Thames Valley	79.9	3	102.2	3	⋆⋆⋆	553	122.3	3	⋆⋆⋆
Waterloo Region-Wellington-Dufferin	48.5	13	69.0	11		371	84.6	12	
Waterloo Region	46.8		64.8			222	78.5		
Wellington-Dufferin	51.3		76.3			149	95.7		
Total Ontario	**56.7**		**74.2**			**7,684**	**90.7**		
Coefficient of variation (%)	27.7		21.6				19.6		
Extremal quotient	2.6		2.1				2.0		
Systematic component of variation	96.3		52.5				42.1		
Adjusted Chi-square (likelihood ratio)	327.3(d.f. 15,p<0.0001)		275.3(d.f. 15,p<0.0001)				284.7(d.f. 15,p<0.0001)		

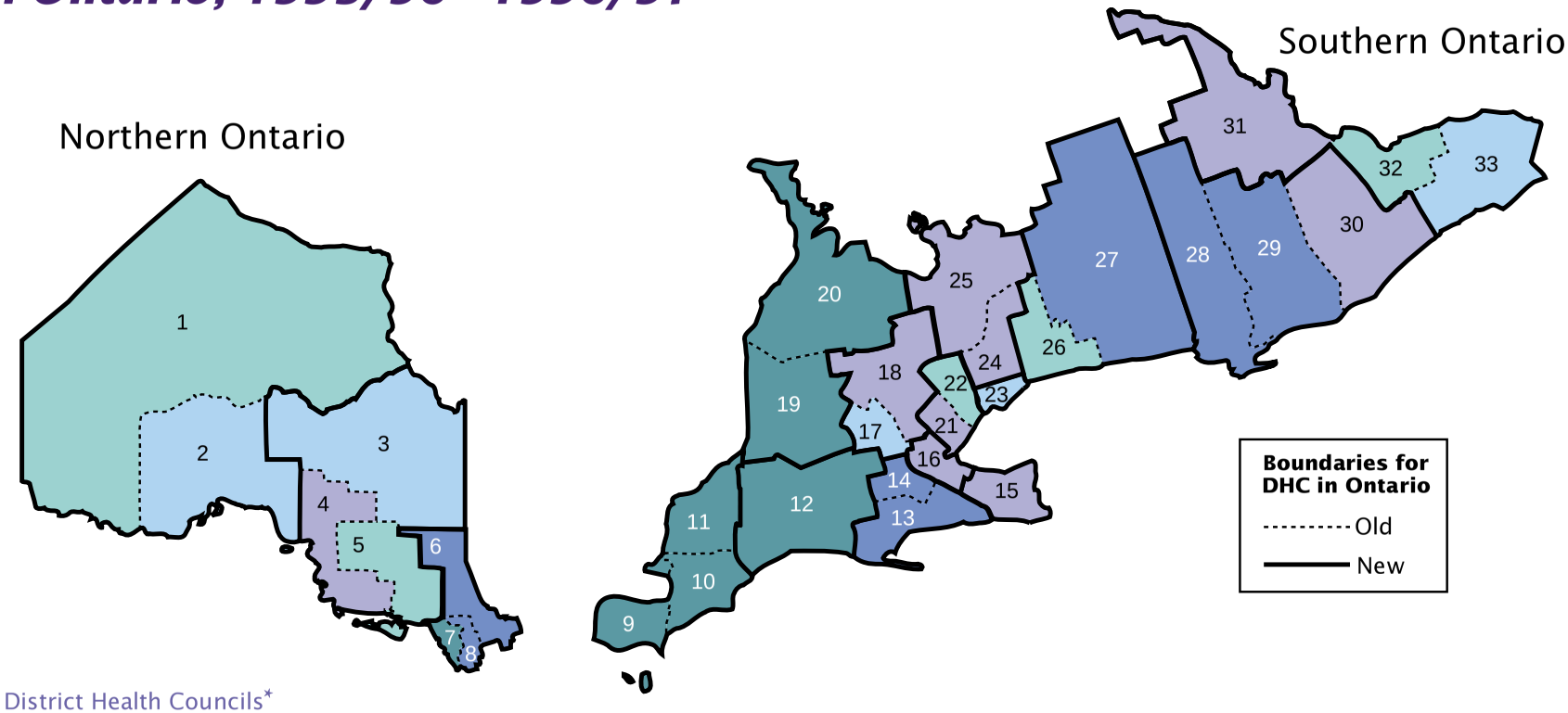
⋆ Significant at 5% level ⋆⋆ Significant at 1% level ⋆⋆⋆ Significant at 0.1% level

Rank Correlation:

	89/90-91/92	92/93-94/95	95/96-96/97
89/90-91/92	1		
92/93-94/95	0.827	1	
95/96-96/97	0.547	0.709	1

Data Source: Canadian Institute for Health Information

Knee Replacements Rates (Natural Break Version) per 100,000 Population 20 Years and Over by District Health Council in Ontario, 1995/96 - 1996/97



District Health Councils*

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

*Newly merged DHCs indicated by shading
❖Were not merged with any other DHCs

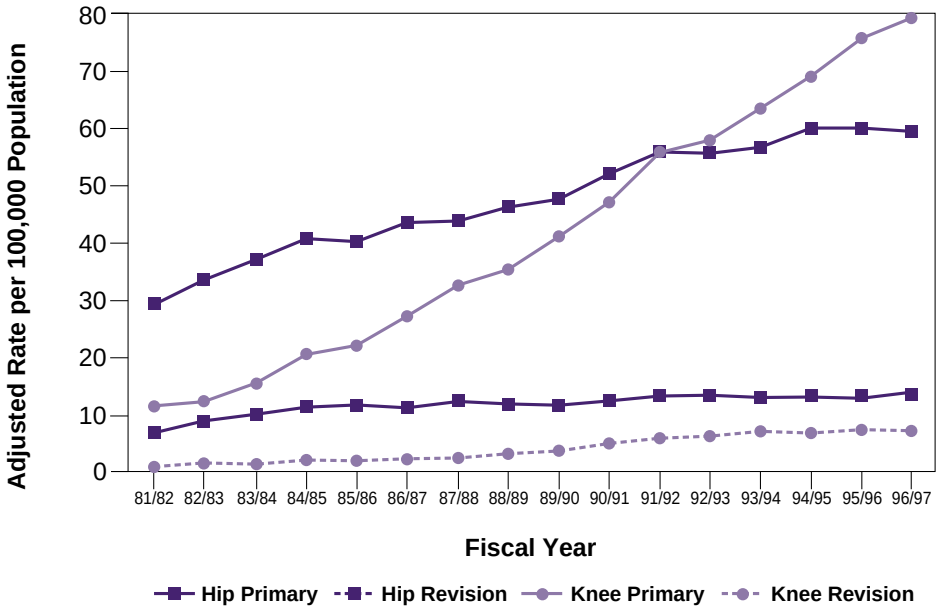
Knee Replacement Rates per 100,000

122.27 to 153.43	(7)+
99.07 to 122.26	(7)
87.75 to 99.06	(9)
81.68 to 87.74	(5)
61.57 to 81.67	(5)

+Value in brackets is the number of DHCs in each category

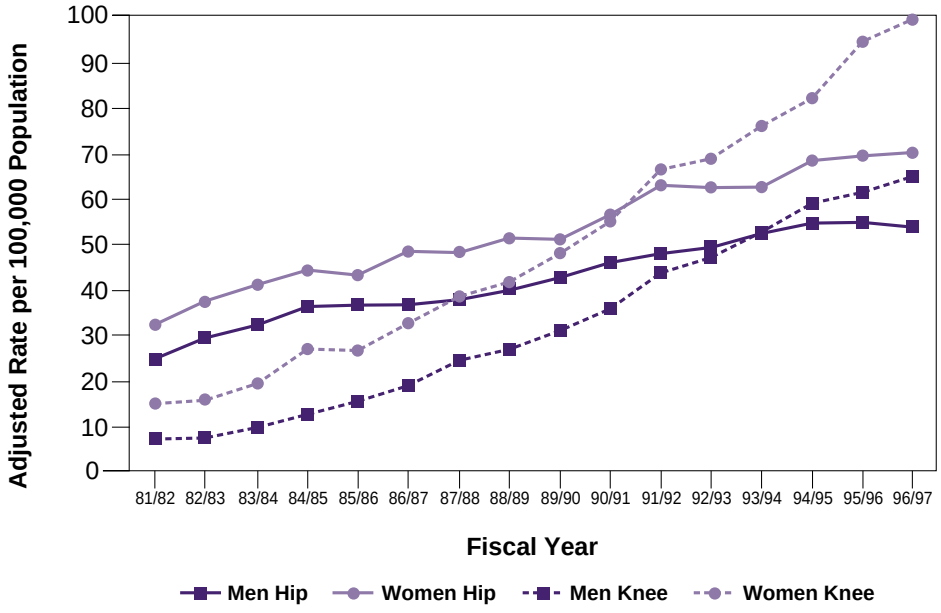
Data Source: Canadian Institute for Health Information

Exhibit 7.6: ***Age/Sex-adjusted Rates of Hip and Knee Replacements (Primary and Revision) Per 100,000 Population 20 Years and Over in Ontario, 1981/82 – 1996/97***



Data Source: Canadian Institute for Health Information

Exhibit 7.7: ***Age-adjusted Rates of Primary Hip and Knee Replacements Per 100,000 Population 20 Years and Over in Ontario, 1981/82 – 1996/97***



Data Source: Canadian Institute for Health Information

knees for men and women are displayed in Exhibit 7.7. The rates were higher for women at all ages.

The rates for revisions of hip and knee arthroplasty have increased gradually since 1981/82, but they have not kept pace with the increased rates for primary procedures. There are three possible reasons for this. As 90% of prostheses survive at least ten years, the lag time between changes in primary rates and revision rates should be 10 to 15 years. Second, since most individuals who have lower joints replaced are 70 years of age or over, the life expectancies of the patients approximated the survival times of their prostheses. Long-term cohort studies indicate that 80% of prostheses are still functioning as long as 20 years following surgery, with the wear and tear being greater in younger and more active patients than in older

and more sedentary ones.[7-15] Since the lifetime of the prosthesis increases with the age of the recipient, not all individuals who have a primary joint replacement can be expected to live long enough to have the arthroplasty revised. In 1996/97, there were 5,172 primary hip replacements and 1,203 hip revisions, compared to 6,894 primary knee replacements and 646 knee revisions. One can anticipate that over the next ten years the number of revisions, if not the rates, will increase, given the cumulative numbers of primary hip and knee replacements that have been performed since 1981/82.

Section 2. Trends in Hospital Volumes and Lengths of Stay for Total Hip and Total Knee Replacements

Over the 15-year period studied, the number of hospitals providing total hip and knee replacements ranged from 75 to 85. While this number varied from year to year, there was no long-term increase; thus, the rise in rates of the procedures are not explained by an increase in the number of facilities performing them. Accordingly, we examined the trends in the hospital volumes and the average lengths of stay in hospital associated with these procedures.

Exhibit 7.8 shows box plots of the hospital volumes of primary hip replacements from 1981/82 through 1996/97. In 1981/82, the median hospital volume was 14 primary hip procedures; 15 years later, this figure was 55. Similarly, in 1981/82, hospitals at the 25th percentile performed 7 procedures; 15 years later, the value at the 25th percentile was over 25.

Over this same time period, the average lengths of stay for primary total hip replacement dropped from about 25 days to 10 days, and the variability in hospital stays decreased as well (Exhibit 7.9). The increase in the numbers of procedures was accomplished by hospitals increasing the numbers of procedures and shortening lengths of stay, not by an increase in the number of facilities performing them.

The trends in increasing hospital volumes and declining average lengths of stay were even more dramatic for total knee replacements, shown in Exhibits 7.10 and 7.11. The median hospital volume of procedures increased over tenfold, from about 7 in 1981/82 to 81 in 1996/97, and the median average length of stay dropped from 24 days to 8. In 1996/97, the average hospital replaced more knees than hips, and the average length of stay was lower for knees than for hips.

Generally speaking, hospitals that provided primary total hip and knee replacements provided revisions of these procedures as well. In 1981/82, the median number of hip revisions was about 4; over the 15 years, this doubled to 9. For knee revisions, the median number increased from 1 to 5. The average lengths of stay declined even more dramatically than it did for patients having primary total joint replacements, dropping from 29 days to 13 days for hip revisions and from 24 days to 10 days for knee revisions.

Discussion

The trends in total joint surgery have been dramatic. There has been a marked increase in the rates of procedures since 1981, with the increase being more dramatic for total knee replacements than for total hip replacements. While the age/sex-adjusted rate of total hip replacements has stabilized at about 83 per 100,000 individuals over the age of 20, the rate for total knee replacements was 92 in fiscal year 1996/97 and is still increasing.

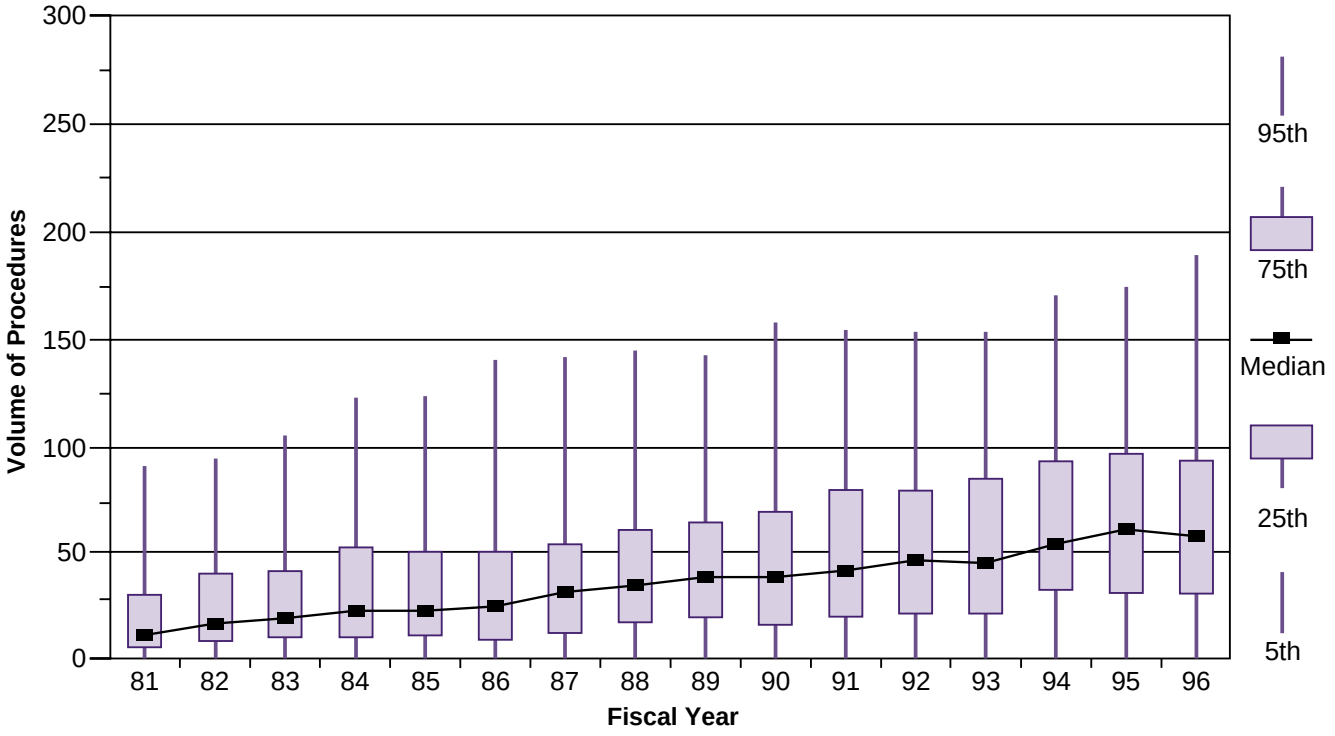
The Organization of Economic Cooperation and Development[16] compared variations in the crude rates (that is, without age adjustments) of total hip replacements per 100,000 population for a number of member states. In 1993, these rates ranged from 160 for Sweden to 37 in Australia, with rates of 73 for New Zealand, 84 for Finland, 86 for Iceland, and 130 for Norway. By way of comparison, the crude rate for both total hip and total knee replacements in Ontario was 55 per 100,000 population.

Crude rates of total hip and total knee replacements were also available for Denmark, the United Kingdom and the United States in 1993. For Denmark, this rate was 84 per 100,000 for hips and 48 per 100,000 for knees. In the U.S., the rate for knees, 71 per 100,000, was much higher than that for hips, 47 per 100,000. In the U.K., the rate for hips, 65 per 100,000, was slightly higher than that for knees, 60 per 100,000. It is not clear why the U.S. should have had the highest rate for total knee replacements and the lowest for total hip replacements. The data do suggest that Ontario has been following the trends, as the rates for total knee replacements continue to increase while those for total hip replacements have leveled off.

Variations in the rates have been reported within the U.S. and U.K. as well as for Canada. In Ontario, the variations across DHCs were low for total hip replacements and low to moderate for total knee replacements. The variation in rates does not correspond to the variations in the prevalence rates of arthritis reported in the Ontario Health Survey.[17,18]

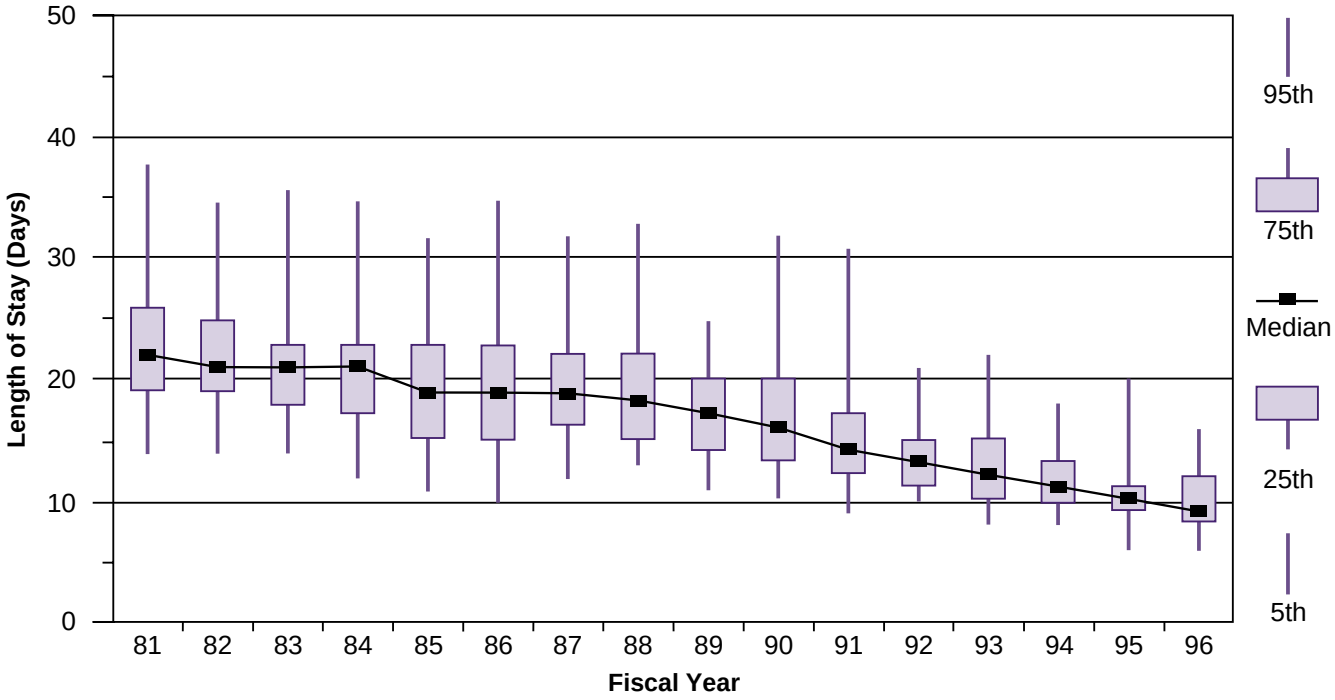
To investigate the possibility that the variation in rates is related to the appropriateness of the patients accepted for surgery, Van Walraven et al[19] abstracted hospital charts and medical records of 362 patients from hospitals providing most of the surgeries in areas with high or low rates of total joint replacement. In a structured review of the abstracts, physicians rated the patients for appropriateness for surgery. Regardless of whether the hospitals were serving the high- or low-rate areas, 94% of the patients were rated as appropriate for surgery. Thus, the variation in rates could not be explained by the

Exhibit 7.8: ***Hospital Volumes for Primary Hip Replacements, in Ontario, 1981/82 – 1996/97***



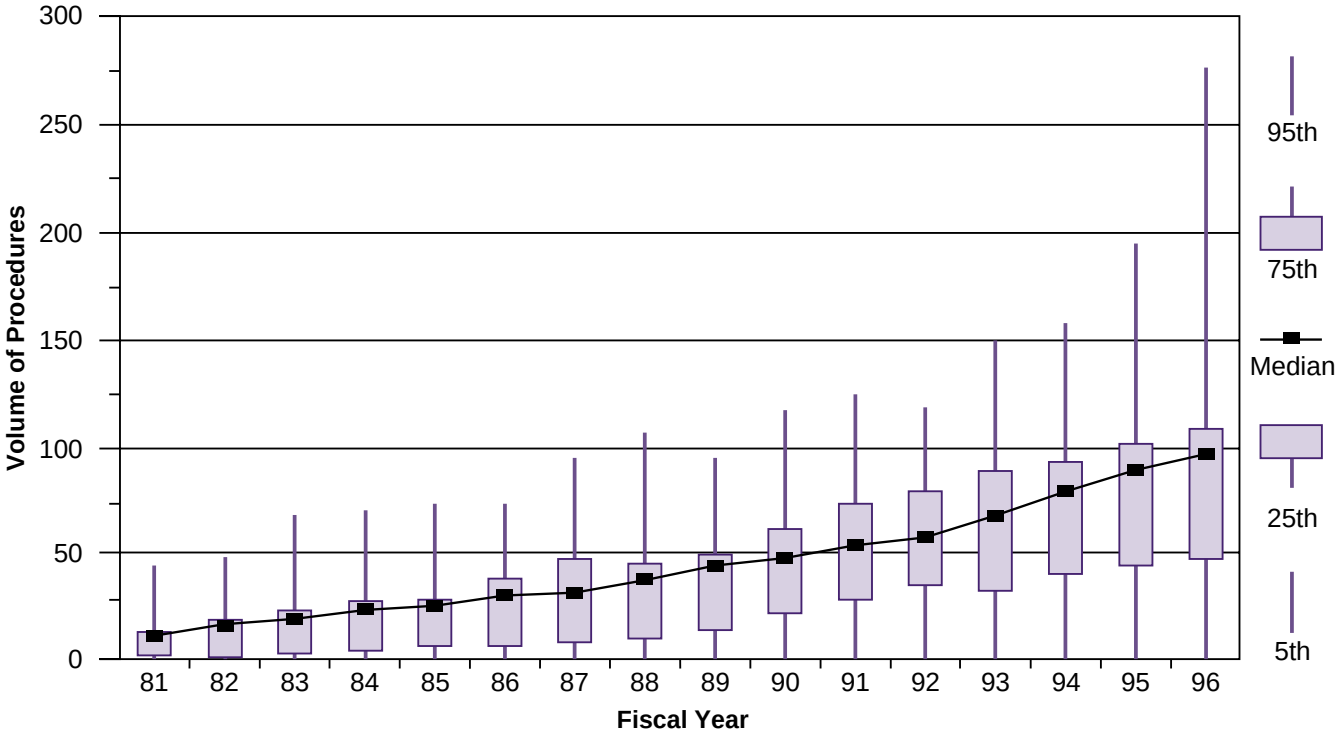
Data Source: Canadian Institute for Health Information

Exhibit 7.9: ***Hospital Lengths of Stay for Primary Hip Replacements, in Ontario, 1981/82 – 1996/97***



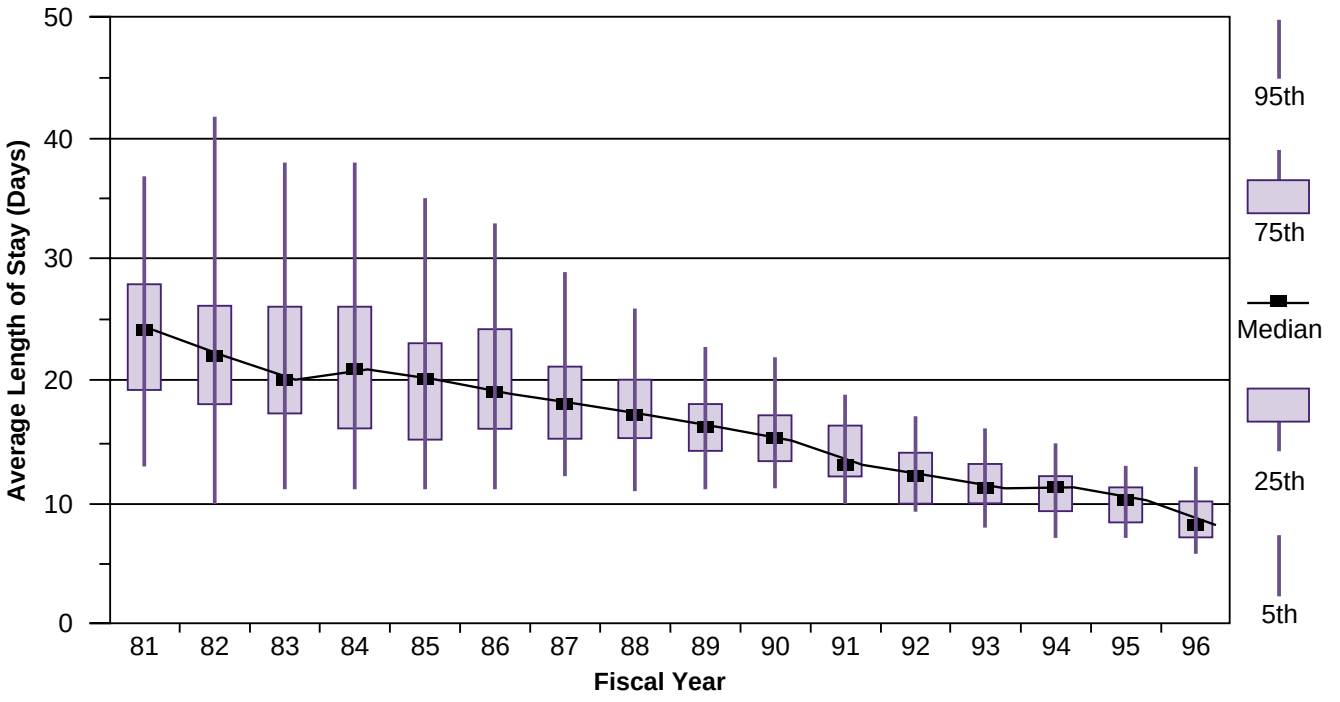
Data Source: Canadian Institute for Health Information

Exhibit 7.10: ***Hospital Volumes for Primary Knee Replacements, in Ontario, 1981/82– 1996/97***



Data Source: Canadian Institute for Health Information

Exhibit 7.11: ***Length of Stay for Primary Knee Replacements, in Ontario, 1981/82– 1996/97***



Data Source: Canadian Institute for Health Information

selection of inappropriate cases from the areas with high rates.

The increases in the numbers of total hip and total knee replacements have been made possible in part by the dramatic decline in the average lengths of stay for the procedures. Similar declines have been observed over the past 15 years in the U.S., England and Finland. In Ontario, the variations in the lengths of stay have dropped as well, as hospitals have worked to bring their averages more in line with the declining provincial averages.

The United States Health Care Financing Administration, which pays for services provided to Medicare beneficiaries, reported that in 1995 the average length of stay was 6.3 days for total hip replacements and 5.7 for total knee replacements, which were three to four days below the provincial averages[20]. Hospitals in Ontario are continuing to reduce the lengths of stays for these procedures, and are focusing attention on determining the point at which patients can be safely discharged to home care or rehabilitation services (St. Joseph's Hospital, personal communication, 1998.)

In Chapter 9, we report on the patterns of post-acute care for joint replacement patients from acute care facilities. During the study period there appeared to be no consistent relationships across the Home Care Programs between acute length of stay, discharge to a rehabilitation facility, discharge to home care, or return to the community without further services. Hospitals, Community Care Access Centres, and rehabilitation facilities are addressing the issues involved in post-acute care.

Section 3. Costs of Prostheses in Total Hip and Total Knee Replacements

Overview

In Ontario, hospitals receive global operating budgets each year to cover their operating costs. Most hospitals do not have financial information systems for deriving the costs of managing total hip and total knee replacements. There are a limited number of costing studies available. Laupacis and his colleagues,[21] as part of a randomized trial, estimated the costs of elective total hip arthroplasty within the first year following surgery. They estimated the inhospital costs (in 1988 dollars) to be $9,853 for cemented hips and $10,119 for uncemented hips. This included fees of about $1,100 for surgeons, assistants, and anesthetists; the cost of an average length of stay of 11.4 days (for both groups of patients); and an average price of $863 for a cemented implant and $714 for an uncemented one. In 1996, St. Joseph's Hospital in Hamilton, in planning an early discharge program, studied their costs of total hip and total knee replacements. The cost of the average hip replacement was $8,542 for a 10-day stay, and the cost for a knee replacement was $7,868 for a 9.35-day stay. For prostheses, the average costs were $1,384 for hip and $1,352 for knee. In one hospital in the United States, the average cost was $13,826 for primary total hip replacement and $12,561 for primary total knee replacement,[22] and the average costs of the prostheses were $4,769 (US$) for the hip implant and $3,691 (US$) for the knee implant. The variable costs of the prostheses for total hip and total knee replacements are a major component of variations in hospital costs.

There has been a proliferation of implantable hip and knee devices in the last two decades.[23] Anecdotal reports of the prices indicate that Ontario hospitals paid from under $1,000 to over $3,000 for these devices. Some hospitals negotiated contracts with specific suppliers, while others participated in block purchase agreements with other hospitals. Variations in prices paid by hospitals should indicate the potential for reducing the prices and saving costs. In this study, we surveyed hospitals providing total hip and total knee replacements to determine the makes, models and prices of the implants they used, and the procedures and policies they followed in selecting makes and models and negotiating prices.[24]

Data Source and Methods

Through a review of the Canadian Institute for Health Information (CIHI) discharge database, we identified 79 Ontario hospitals that provided a minimum of 10 total hip and 10 total knee replacements in the fiscal year 1993/94. A questionnaire was developed that contained questions on models, makes, numbers, and prices paid for hip and knee implants; which individuals or committees were responsible for determining the numbers of procedures to be provided; which individuals or committees were responsible for purchasing the implants; and any additional information the hospitals wished to provide. We pilot-tested the instrument with 15 of these hospitals, and sent copies of the revised form to the Chief Executive Officer and the Chief of Surgery at each of the remaining 64 hospitals. Members of the study team followed up with telephone calls to encourage participation and answer questions. The data from the completed questionnaires were entered into a Microsoft Access database program for analysis.

Findings

Seventy-six hospitals participated in the study, for a response rate of 96%. (Two merged facilities submitted a joint response.) At about half the hospitals (n=39), selection of the implant was made by individual surgeons; at six hospitals it was made by committees of surgeons; and at the remaining hospitals it was made by committees that included surgeons, administrative staff and other personnel. Almost all of the hospitals purchased the prostheses directly from the vendors, while 10 hospitals participated in bulk purchase plans. Four hospitals had the surgeons negotiate the purchase

price, 39 included surgeons in the negotiations, and 33 had the purchasing departments do the negotiating.

On the question that asked about the makes and models of implants used and the prices paid, complete information was provided by only 62 hospitals about hip implants and by only 57 hospitals about knee implants. There were a number of reasons why the information was incomplete: some hospitals did not have the information systems to list prices by models and makes; others combined components from different models when implanting the prostheses; and a few were bound by confidentiality clauses in their contracts from divulging the prices paid for specific makes and models.

Exhibit 7.12 displays the prices paid for hip implants. Prices are displayed for specific makes and models for which the volume of sales was 100 or more units during the study year. The prices for unspecified and hybrid models are displayed as well. For the lowest priced implant, Protek, the prices paid ranged from $650 to $1,287, with an average price of $1,172. For the most expensive implant, Harris Galante Multilock, the prices ranged from $2,497 to $3,343, with an average price of $2,870. The differences between the lowest and highest prices were small for some implants (Contemporary $108 and St. Michael's $91) and quite large for others (Harris $1,175 and PCA E series $1,207).

Exhibit 7.13 shows the same information for knee implants, which are generally more expensive than hip implants. The average prices ranged from $2,000 to $2,714. The lowest prices, for unspecified models, hybrids and Kinemax, were around $1,500. The lowest prices for the most expensive implants, Miller Galante and Duracon, were about $2,300. The smallest spread between the lowest and highest prices was $195 (Interax), and the largest spread was about $1,800 (Genesis).

For both hip and knee prostheses, we examined the relationships between the purchasing policies and procedures of hospitals, and the average prices and the range of prices they paid. Regardless of who selected the implants, who purchased them, or whether the hospital had a bulk purchasing arrangement, the average prices and price ranges were essentially the same.

Discussion

This section shows significant variation in the prices paid by Ontario hospitals for hip and knee prostheses. The argument may be made that new or more expensive designs are better, but by definition new implants have not been in use for sufficient lengths of time to be fully evaluated. Murray et al[23] polled manufacturers of hip prostheses in the U.K. about the designs that were available, the corresponding list prices, and references for any published results on clinical evaluations. The more recently a design was introduced, the more expensive it was. However, there was little or no scientific evidence that the newer and more expensive implants were better than the established designs. A similar study on primary knee prostheses yielded essentially the same results: i.e. scanty evidence in the literature regarding efficacy, and increasing prices with newer models.[25] The variation in prices for the same design, as well as among designs, indicate that there may be substantial potential for savings in the selection and purchase of these devices.

Morris[26] and Rorabeck et al[27] have suggested that different devices be compared and evaluated through randomized clinical trials. Randomized trials would mean that thousands of patients would have to be followed for years in order to test for predefined clinically significant differences between implants.[28] An alternative approach is a registry whereby patients receiving various devices are followed and assessed for outcomes.[29] Finland,[30] Norway,[11,31] and Sweden[7,14] have registries of total hip and total knee replacements initiated by orthopedic associations in each country. Malchau et al[14] reported on the outcomes of 92,675 primary total hip replacements performed in Sweden between 1967 and 1977. The estimated prosthetic survival rates did not differ significantly by the types of implant or whether or not the implants were cemented. Havelin et al[31] reported on 24,408 primary total hip replacements recorded by the Norwegian Arthroplasty Register from 1987 to 1993. They also found no clinically important differences among eight different designs, but they did find that two cemented femoral components had higher rates for loosening, while four others did not. Population-based registries of patients having total joint replacements provide a pragmatic and practical approach to assessing the quality of implants and procedures.

The hospitals were generally unaware of what prices other hospitals were paying for the same products. Our study may allow for a better understanding of the market place and the prices paid to suppliers. Part of the problem stems from the fact that some hospitals have entered into agreements with suppliers requiring that the prices paid remain confidential. Given that Ontario hospitals are publicly funded institutions, such agreements may not be in the public interest.

It should be noted that the results are based on data that are now four years old. There is anecdotal evidence that the market place has become more competitive, and that hospitals are now more successful in negotiating contracts with lower prices. With reported drops in prices, it has been suggested that smaller companies may be forced out of the market place. It must be emphasized that it may be neither desirable nor possible to always use the least expensive model; there should be room for a range of makes and models of prostheses. There are now over 12,000 primary total hip and primary total knee replacements being done in Ontario every year. The cost of total joint replacements in Ontario could

Exhibit 7.12: *Common (>100/year) Models of Hip Implants Used in Ontario, 1993/94*

Model Name	Number of Institutions Using Model	Number of Implants Reported	Lowest Price Paid & Percent From Average Price	Highest Price Paid & Percent From Average Price	Average Price (Weighted)
AML	10	451	$1,895 (–28%)	$2,995 (13%)	$2,647
Contemporary	5	112	$995 (–2%)	$1,103 (8%)	$1,018
Harris	2	180	$975 (–5%)	$2,150 (109%)	$1,027
Harris Galante Multilock	9	121	$2,497 (–13%)	$3,343 (16%)	$2,870
Mallory Head	8	303	$2,200 (–2%)	$2,850 (27%)	$2,246
Omnifit	5	176	$1,741 (–22%)	$2,555 (15%)	$2,229
PCA*	13	325	$1,695 (–31%)	$2,828 (15%)	$2,455
PCA E Series	5	138	$1,548 (–16%)	$2,755 (50%)	$1,837
Precision	9	187	$1,598 (–18%)	$2,599 (33%)	$1,960
Protek	7	112	$650 (–45%)	$1,287 (10%)	$1,172
St Michael's	2	120	$2,121 (0%)	$2,212 (4%)	$2,122
Total Hip System	4	231	$2,340 (–10%)	$2,955 (14%)	$2,587
Models Not Specified		759	$995	$3,010	$1,980**
Hybrids of Specific Models	14	590	$950	$3,559	$2,172**

Total number of primary hip implants included in the above table: 3,805
* Both cemented and uncemented versions are included
** Average is not weighted

Data Source: ICES Survey of Ontario Hospitals

Exhibit 7.13: *Common (>100/year) Models of Knee Implants Used in Ontario, 1993/94*

Model Name	Number of Institutions Using Model	Number of Implants Reported	Lowest Price Paid & Percent From Average Price	Highest Price Paid & Percent From Average Price	Average Price (Weighted)
AMK*	17	287	$1,980 (–23%)	$3,262 (27%)	$2,565
Duracon	5	199	$2,300 (–7%)	$2,730 (10%)	$2,472
Genesis*	13	450	$1,981 (–13%)	$3,777 (67%)	$2,264
Insall Burstein I or II	7	179	$1,850 (–8%)	$2,449 (21%)	$2,017
Interax	3	132	$2,200 (–7%)	$2,395 (2%)	$2,358
Kinemax*	7	224	$1,500 (–25%)	$2,500 (25%)	$2,000
Kinemax Plus*	3	151	$2,090 (–14%)	$2,450 (1%)	$2,431
Miller Galante	4	115	$2,250 (–4%)	$3,048 (31%)	$2,333
Miller Galante 2	24	521	$1,995 (–22%)	$3,151 (23%)	$2,555
PCA*	7	217	$2,129 (–22%)	$2,997 (10%)	$2,714
PFC*	6	190	$1,178 (–45%)	$2,671 (25%)	$2,139
Pressfit	4	188	$2,261 (–13%)	$2,800 (8%)	$2,596
Models Not Specified		1,360	$1,385	$3,137	$2,255**
Hybrids of Specific Models		287	$1,548	$3,233	$2,368**

Total number of primary knee implants included in the above table: 4,500
* Both cemented and uncemented versions are included
** Average is not weighted

Data Source: ICES Survey of Ontario Hospitals

drop $1.2 million for every $100 saved on the average price of prostheses. The Joint Policy and Planning Committee has repeated the survey of hospitals on costs of protheses. The report, which is near completion, will provide up-to-date information.

Section 4. Volumes and Outcomes

Overview

The relationship between volumes of surgery performed in hospitals and outcomes is under debate.[32,33] Starting with a seminal study by Luft, Bunker, and Enthoven,[34] there have been eight studies showing that mortality rates from total joint replacement declined with hospital volume[34-40] and seven showing that this relationship did not hold.[41-42] In five studies that assessed the relationship between surgical volumes and outcomes, three found no relationship[40,42,46] and two found that surgeons with very low volumes of total joint replacements had higher mortality rates.[45,47] Other outcomes of interest in volume and outcomes studies have included complications, revisions, and length of stay.

There are two explanations as to why hospitals and surgeons with high volumes for procedures should have better outcomes: the hypothesis that 'practice makes perfect' and the hypothesis that hospitals and surgeons with high volumes who provide high-quality care attract patients, through self-selection and referral, who are likely to have good outcomes.[36,39] If the 'practice makes perfect' hypothesis holds, total hip and total knee replacements should be concentrated in regional centres of excellence. However, if hospitals and surgeons with lower volumes can produce good results, the goal would be to ensure that the services are available in communities throughout the province.

In Ontario, there have been two volume/outcome studies related to total joint replacements. Coyte and his colleagues, through matching physician claims to OHIP with the discharge abstract data, identified 18,530 patients who had total knee replacements between 1984 and 1990 (personal communication, 1997). Of these, 1,301 procedures were for revisions, for a crude rate of 7%. About 20% of the patients had two primary joint replacements during the study period; as the laterality of the knee is not coded in either the hospital or the physician claims data, it was not possible to accurately identify which knee had been revised in those patients. In order to estimate survival times for the prostheses, Coyte et al marked the date of the first total knee replacement as the primary procedure and the date of replacement of the second knee as the revision. The longest time to revision was the difference between the first time and the date of revision. The shortest time to revision was the difference between time of the second time of the knee replacement and the date of revision.

The estimate for the longest time to revision produced the lower revision rate of 4.3%, while the estimate for the shortest time to revision was higher at 8.0%. After controlling for severity and comorbidity, Coyte found that revision rates were higher for teaching hospitals than for community hospitals (relative risk 1.60, p=0.018), higher for residents of urban communities than for residents of rural communities (relative risk 1.14, p=0.001), and higher for bilateral procedures than for unilateral procedures (relative risk 2.96, p<0.001).

Kreder and his colleagues[46] looked at data on patients undergoing elective total hip replacements in Ontario in 1992 to see if there was any relationship between surgeon and hospital volumes on the one hand, and complication rates and length of stay on the other. The study included 3,645 patients, 329 surgeons, and 90 hospitals. Surgeons who did more than 27 procedures a year discharged their patients earlier than surgeons who did fewer than 9 procedures a year. The mean difference in length of stay was 2.4 days and was statistically significant (p<0.05). Complication rates requiring hospital admission and mortality rates did not differ by surgeon or hospital volume.

Data Source and Methods

In this section, we extended research on the relationship between surgeon or hospital volumes and outcomes. Following the methods outlined in Appendix A7.1, we identified individuals admitted to Ontario hospitals for primary total hip and primary total knee replacements from fiscal year 1993/94 to fiscal year 1995/96. The CIHI records were matched with OHIP billing claims, and records were excluded if the CIHI procedure codes did not match the Ontario Health Insurance Plan (OHIP) procedure codes. The records were also matched with death records from the Office of the Registrar General of Ontario to verify deaths of patients occurring within a year of the procedure. The codes and algorithms for managing the data are presented in Appendix A7.1.

To establish volumes of procedures for hospitals and surgeons, we counted all total joint replacements, elective and non-elective, that were performed during the study period. The average annual rates were calculated for hospitals that did hip procedures and hospitals that did knee procedures. The physician billing numbers on the OHIP claims enabled us to identify the surgeons and the average number of procedures they performed annually. Originally, we categorized the hospitals and surgeons into quintiles of average annual volumes, but because of the small number of patients in the lower quintile groups, we later combined the bottom and middle two groups. Exhibits 7.14 and 7.18 show surgeons and hospitals grouped into three categories: low (below the 40th percentile), medium (40th to 80th percentiles), and high (above the 80th percentile).

The outcomes were assessed for elective primary total hip and total knee replacements. In this stage of the

Exhibit 7.14: *Characteristics of Surgeon and Hospital Volume Groups for Hip Replacement Surgery in Ontario, 1993/94 - 1996/97*

Variable	Surgeon Volume Groups*			Hospital Volume Groups*		
	Low	Medium	High	Low	Medium	High
Number of Providers	102	109	52	39	39	19
Patients/year	<21	21-44	>44	<41	41-111	>111
Total Patients	1,520	4,928	6,504	1,390	5,242	6,320
Hospital Volume (average)	92.5	97.7	145.4	15.9	68.5	188.7
Surgeon Volume (average)	11.6	31.7	75.3	23.7	38.0	75.7

* Low volume is less than the 40th percentile, medium volume is the 40th to 80th percentile and high volume is greater than the 80th percentile.

Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

Exhibit 7.15: *Unadjusted Patient Characteristics and Outcomes by Provider Volume Groups for Hip Replacements in Ontario, 1993/94 - 1996/97*

Variable	Surgeon Volume Groups*			Hospital Volume Groups*		
	Low	Medium	High	Low	Medium	High
Average Age	68.7	67.8	65.8	68.5	68.0	65.7
Comorbidity >0(%)	17.9	18.4	17.5	21.4	18.6	16.6
Comorbidity >1(%)	3.0	2.7	2.7	2.9	3.0	2.5
Men (%)	40.1	43.7	43.1	42.6	43.2	42.9
Diagnosis Not Osteoarthritis (%)	7.1	8.2	10.0	6.8	8.2	10.1
Discharged to Rehabilitation (%)	23.5	26.3	28.7	28.0	22.1	31.3
Average Length of Stay (days)	11.3	10.8	9.6	10.5	10.6	9.9
Died Within 3 Months (%)	0.6	0.7	0.6	0.8	0.7	0.5
Died Within 1 Year (%)	1.2	1.5	1.3	1.6	1.4	1.2
Infection Within 1 Year (%)	1.0	0.6	0.8	0.9	0.8	0.8
Revision Within 1 Year (%)	1.2	0.8	0.7	1.4	0.7	0.7
Complications at Index (%)	10.0	11.1	11.2	9.0	10.1	12.2

* Low volume is less than the 40th percentile, medium volume is the 40th to 80th percentile and high volume is greater than the 80th percentile.

Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

project, patients were excluded if their hips or knees were replaced because of fractures or cancers. We also excluded those who had bilateral procedures, so that we could identify the outcomes for specific elective primary replacements. The major outcomes were: deaths within three months and one year of the procedure; readmissions with infection within one year; revisions within one year; complications during index admission; and average lengths of stay. The logistic regression analyses of the outcomes on volumes were adjusted for gender, age, diagnosis of osteoarthritis; and the presence of comorbid conditions as measured by the Deyo[49] modification of the Charlson Index[48] for use with administrative databases. As surgeons generally work within one hospital, we built interaction terms into the models to determine if the effects of surgeon and hospital volumes were statistically independent.

Findings

Total Hip Replacements

Exhibit 7.14 shows the volumes of total hip replacements for surgeons and hospitals. During the four-year study period, 263 surgeons replaced the hips of 12,952 patients. Surgeons below the 40th percentile in volume (fewer than 21 procedures a year) accounted for about 10% of the procedures, while those above the 80th percentile (more than 44 procedures a year) accounted for 50%. The procedures were performed in 97 hospitals, with 39 hospitals in the low-volume group (fewer than 41 patients a year) accounting for 11% of the total hip replacements. While there is some relationship between hospital volume and surgeon volume, they are not tightly related to each other: low-

volume surgeons operated in high-volume hospitals, and high-volume surgeons operated in medium- and high-volume hospitals.

Exhibit 7.15 breaks down the patient characteristics and outcomes by surgeon and hospital volumes for primary hip replacements. The mortality rate was less than 0.7% after three months and less than 1.5% after a year. The readmission rate due to infections was 0.8% within one year, and about 10% of the patients had a complication during the index admission. The revision rate was 0.8% within one year and 1.8% within three years for those patients for whom we had data. The average length of stay was 10.8 days.

Exhibit 7.16 shows the adjusted odds ratios for the five major outcomes. As expected, the odds of mortality within three months and one year and complications during admission increased with age and comorbidity of the patients. Patients with osteoarthritis had better outcomes than persons with other diagnoses, and women had better outcomes than men. Patients of low-volume surgeons were more likely to have revisions within one year as compared to patients of high-volume surgeons, but the odds ratio of 1.5 did not reach statistical significance. With respect to hospital volumes, there were no differences except that patients in low- and medium-volume hospitals were slightly less likely to have complications during the index admission.

Exhibit 7.17 shows the multiple regression results for predicting average length of stay during the index admission. Average length of stay increased with patient age and comorbidity, and was higher for a diagnosis other than osteoarthritis and for males. It declined with each year, as one would expect from the general trends in length of stay. On average, patients of high-volume surgeons stayed in hospital a day less than patients of low- and medium-volume surgeons, after controlling for their characteristics. Hospital volume was not related to length of stay.

Total Knee Replacements

Exhibit 7.18 shows the volumes of total knee replacements for surgeons and hospitals. During the study period, 267 surgeons working in 88 hospitals replaced the knees of 14,352 patients. High-volume surgeons (those who did more than 42 procedures a year) accounted for 50% of the procedures. Medium-volume hospitals accounted for 43% of the replacements.

The patient characteristics by surgeon and hospital volumes are displayed in Exhibit 7.19. Knee patients were about two years older on average than hip patients. The outcomes for mortality, readmission due to infection, complications and revision were about the same for total knee replacements as they were for total hip replacements. The average length of stay was 10.3 days.

The adjusted odds of outcomes are displayed in Exhibit 7.20. As before, older patients, patients with comorbid conditions and men had more adverse outcomes. Diagnosis was relatively unimportant as a predictor of outcomes. With respect to volumes, hospitals with low volumes were marginally more likely to have patients die within three months. The odds of patients of low-volume hospitals having revisions in the first year were 2.2 times those of patients of high-volume hopsitals. Patients from low-volume hospitals were more likely to be readmitted for infection within one year than were patients from high-volume hospitals.

Exhibit 7.21 shows the multiple regression results for average length of stay of total knee patients. Again, age, gender and comorbidity were predictors of length of stay, and average length of stay declined over the study years. Patients of low-volume surgeons stayed in hospital on average, 1.4 days longer during the index admission than did patients of high-volume surgeons.

Discussion

Luft[34,35] has advocated regionalizing surgical procedures so as to reduce mortality and improve outcomes. There are six reasons for reconsidering his points on surgical volume and mortality. First, he began his work by examining data from 1974 and 1975 supplied by the Commission on Professional and Hospital Activities in the United States. The overall inhospital mortality rate was 3.2%, while the rate for low-volume hospitals was over 5%. In our study, the overall mortality at three months was about 0.5%, which is consistent with rates in studies published since 1990. The mortality rates have dropped as the numbers of procedures has increased, particularly for persons over 70 years of age. The reduction in mortality should reduce the relationship between volume and outcome.

Second, Luft's study included all total hip replacements, including urgent procedures for fractures and cancers. The mortality rates are higher for urgent procedures than for elective procedures. Surgeons with low volumes of procedures provide total joint replacements for fractures and cancer, and relatively few elective procedures; it therefore follows that they would have a different case-mix and worse case-mortality rates than high-volume surgeons, who provide most elective procedures and few urgent procedures.

Third, Luft's study also noted that mortality in total hip replacements was high in very low-volume hospitals and flattened out quickly as volume reached 10 procedures a year. The annual hospital volumes in Ontario are substantially higher. Hospitals providing 25 or fewer procedures accounted for fewer than 10% of total hip and total knee replacements.

Fourth, in other studies, Luft and his colleagues reported substantial variations in mortality rates by region of the country and type of hospital.[34-37,39] Part of the variation

Exhibit 7.16: *Adjusted Odds Ratios for Outcomes by Patient and Provider Characteristics for Hip Replacements in Ontario 1993/94 - 1996/97*

		Readmission for Hip Infection (Odds Ratios)	Readmission for Hip Revision (Odds Ratios)	Patient Death (Odds Ratios)		Complications during Admission (Odds Ratios)
		≤ 1 Year	≤ 1 Year	≤ 3 Months	≤ 1 Year	
Surgeon Volume	<21 vs >44	1.12	1.48	0.83	0.82	0.96
	21-44 vs >44	0.73	1.05	0.97	1.03	1.08
Hospital Volume	<41 vs >111	1.34	1.86	1.32	1.06	0.66
	41-111 vs >111	1.14	0.94	1.31	0.93	0.75
Patient Age	Per 10 Years	**1.04**	0.98	**2.88**	**2.47**	**1.29**
Patient Comorbidity	1 vs 0	1.45	0.69	**4.89**	**3.00**	**1.21**
	>1 vs 0	1.67	0.58	**18.27**	**8.10**	**1.76**
Patient Diagnosis	OA* vs non-OA	**0.38**	**0.51**	0.76	0.63	**0.43**
Patient Sex	Women vs Men	0.98	0.71	**0.59**	**0.46**	**0.79**

Odd ratios in bold are statistically significant (p<0.05).

* OA=Osteoarthritis

Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

Exhibit 7.17: *Adjusted Comparison of Length of Stay by Patient and Provider Characteristics for Hip Replacements in Ontario, 1993/94 - 1996/97*

		Multiple Regression Coefficients Differences in Length of Stay (days)
Surgeon Volume	<21 vs >44	**1.55**
	21-44 vs >44	**1.18**
Hospital Volume	<41 vs >111	-0.50
	41-111 vs >111	-0.11
Patient Age	Per 10 Years	**0.75**
Patient Comorbidity	1 vs 0	**1.54**
	>1 vs 0	**4.74**
Patient Diagnosis	Osteoarthritis vs Non-osteoarthritis	**-1.26**
Patient Sex	Women vs Men	**0.63**
Fiscal Year of Admission	94/95 vs 93/94	**-0.56**
	95/96 vs 93/94	**-1.53**
	96/97 vs 93/94	**-2.39**
Discharge Destination	Rehabilitation vs Home (+/- care)	-0.50
	Transfer vs Home (+/- care)	1.31

Regression coefficients in bold are statistically significant (p<0.05).

Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

was due to selection and referral, with hospitals with better outcomes getting good referrals. Sloan and his colleagues[41] reviewed discharge abstracts of 521 hospitals reporting to the U.S. Commission on Professional Health Activities in 1972 and 1981. They found huge variations in mortality rates for total hip replacement, ranging from 0.0% to 29.1% in 1972 and 0.0% to 20.9% in 1982. The mortality rate varied by year across the hospitals as well. The variations in hospital mortality rates within the low-, medium- and high-volume categories ruled out any volume/outcome relationship. As the number of procedures has increased and the outcomes have improved over time, the hospital volume-mortality relationship has declined if not disappeared.

Fifth, Luft focused primarily on deaths during the index admission.

Exhibit 7.18: *Characteristics of Surgeon and Hospital Volume Groups for Knee Replacement Surgery in Ontario, 1993/94 - 1996/97*

Variable	Surgeon Volume Groups*			Hospital Volume Groups*		
	Low	Medium	High	Low	Medium	High
Number of Providers	108	108	51	35	36	17
Patients per Year	<14	14-42	>42	<48	48-113	>113
Total Patients	1,463	5,745	7,144	1,914	6,127	6,311
Hospital Volume (average)	87.0	100.2	181.5	23.7	78.6	193.5
Surgeon Volume (average)	6.1	25.2	66.9	23.4	37.6	61.2

* Low volume is less than the 40th percentile, medium volume is the 40th to 80th percentile and high volume is greater than the 80th percentile.

Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

Exhibit 7.19: *Unadjusted Patient Characteristics and Outcomes by Provider Volume Groups for Knee Replacements in Ontario, 1993/94 - 1996/97*

Variable	Surgeon Volume Groups*			Hospital Volume Groups*		
	Low	Medium	High	Low	Medium	High
Average Age	70.1	70.0	69.2	70.1	70.0	69.1
Comorbidity >0(%)	20.4	20.3	21.4	18.1	20.8	21.7
Comorbidity >1(%)	3.2	3.0	3.4	3.3	3.2	3.3
Men (%)	41.6	37.2	37.9	40.7	37.6	37.6
Diagnosis Not Osteoarthritis (%)	8.3	8.0	9.7	5.6	9.3	9.5
Discharged to Rehabilitation (%)	29.2	25.8	28.2	19.2	24.9	32.2
Average Length of Stay (days)	11.5	10.5	10.0	10.8	10.5	10.0
Died Within 3 Months (%)	0.8	0.6	0.4	0.7	0.6	0.4
Died Within 1 Year (%)	1.8	1.3	1.0	1.5	1.3	1.1
Infection Within 1 Year (%)	1.4	1.4	1.5	1.9	1.4	1.4
Revision Within 1 Year (%)	0.6	0.9	0.8	1.1	0.9	0.6
Complications at Index (%)	9.0	9.8	11.0	6.6	10.0	11.8

* Low volume is less than the 40th percentile, medium volume is the 40th to 80th percentile and high volume is greater than the 80th percentile.

Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

Kreder and his colleagues[45,46] were the first to match patient records with vital statistics and to relate volumes and outcomes to mortality occurring within three months and the first year following primary total hip replacement. In so doing, they were able to follow patients regardless of whether they were discharged to home, rehabilitation hospitals, or long-term care facilities. Lastly, adjustment for case-mix is required for comparing outcomes across hospitals and surgeons; and this was not done in the earlier studies. Kreder et al adjusted for comorbidity with the Deyo index. Problems in case-mix adjustment pose major limitations for making comparisons across hospitals and surgeons.

It can be noted that in a study of volumes and outcomes for total hip replacement in the state of Washington, Kreder et al[45] found that low-volume surgeons had significantly worse outcomes for deaths, infections and revisions than high-volume surgeons. However, the low-volume surgeons (40th percentile) performed one or two procedures a year and high-volume surgeons above the 80th percentile perform 11 or more total hip replacements annually. In Ontario, 9% of the surgeons performed an average of one or two total hip replacements a year, while 69% of the surgeons did 10 or more. Compared to the United States, Ontario has very few, low-volume surgeons.

The results from these studies suggest that surgeons should perform some minimum number of total hip and total knee replacements to maintain their skills and competencies. Patients of medium- and high-volume surgeons tend to have better outcomes and shorter lengths of stay than do

Exhibit 7.20: *Adjusted Odds Ratios for Outcomes by Patient and Provider Characteristics for Knee Replacements in Ontario, 1993/94 - 1996/97*

		Re-admission for Knee Infection (Odds Ratios)	Re-admission for Knee Revision (Odds Ratios)	Patient Death (Odds Ratios)		Complications during Admission (Odds Ratios)
		≤ 1 Year	≤ 1 Year	≤ 3 Months	≤ 1 Year	
Surgeon Volume	<14 vs >42	0.80	0.57	1.76	1.60	0.98
	14-42 vs >42	0.84	0.91	1.61	1.22	0.99
Hospital Volume	<48 vs >113	1.57	**2.24**	1.39	1.22	**0.53**
	48-113 vs >113	1.11	1.57	1.30	1.08	0.83
Patient Age	Per 10 Years	**0.90**	**0.77**	**2.44**	**2.50**	**1.19**
Patient Comorbidity	1 vs 0	0.67	1.15	**5.36**	**3.13**	**1.19**
	>1 vs 0	1.69	0.80	**23.70**	**9.58**	**2.05**
Patient Diagnosis	OA* vs non-OA	**0.55**	1.10	1.28	0.94	0.96
Patient Sex	Women vs Men	0.79	0.91	0.66	**0.58**	**0.71**

Odd ratios in bold are statistically significant (p<0.05).

* OA=Osteoarthritis

Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

Exhibit 7.21: *Adjusted Comparison of Length of Stay by Patient and Provider Characteristics for Knee Replacements in Ontario, 1993/94 - 1996/97*

		Multiple Regression Coefficients Differences in Length of Stay (days)
Surgeon Volume	<14 vs >42	**1.42**
	14-42 vs >42	0.47
Hospital Volume	<48 vs >113	0.21
	48-113 vs >113	0.18
Patient Age	Per 10 Years	**0.68**
Patient Comorbidity	1 vs 0	**0.86**
	>1 vs 0	**2.76**
Patient Diagnosis	Osteoarthritis vs Non-osteoarthritis	-0.21
Patient Sex	Women vs Men	**0.41**
Fiscal Year of Admission	94/95 vs 93/94	**-0.66**
	95/96 vs 93/94	**-1.71**
	96/97 vs 93/94	**-2.11**
Discharge Destination	Rehabilitation vs Home (+/- care)	-0.39
	Transfer vs Home (+/- care)	-0.43

Regression coefficients in bold are statistically significant (p<0.05).

Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

those of surgeons with low average volumes. Hospitals maintain their volume by offering programs of total hip and total knee replacements and by having adequate medical, nursing and rehabilitation staff to provide services effectively. The results of our study indicate that low-volume hospitals providing fewer than 25 total joint replacements annually are less likely to achieve optimal results with their programs. These are issues that orthopedic surgeons and their hospitals need to address jointly.

Section 5. Times in the Surgeon's Queue for Elective Primary Total Hip and Total Knee Replacements

Overview

The issue of waiting times for surgery is a familiar one for users of the Canadian health care system. As was the case with cardiac care some years ago, queues are now an issue for orthopedic surgery, particularly total hip and total knee replacements, and problems are periodically encountered with waiting times.

The surgeon's queue has three stages. The first stage is when family physicians refer patients to orthopedic surgeons for consultation. In a survey of specialists across Canada in 1996, the Fraser Institute reported that the median time from referral to consultation was 8 weeks.[50] During the second stage the surgeons assess the patient and consider the appropriate management strategies. The third stage begins with the decision to proceed with surgery and ends with the provision of surgery. The Fraser Institute reported that in Ontario the median waiting time between date of consultation and date the surgery is performed is 11.9 weeks, the second-longest time in Canada.

The time in the surgical queue is the time between consultation and the actual date of surgery. Scheduled surgery may be cancelled by the hospital or surgeon, or the patient may postpone it for personal reasons. If operating times become available unexpectedly, the surgeon can ask patients if they would prefer to go in ahead of schedule. The Ontario Expert Panel on Hip and Knee Arthroplasty recommended criteria for surgical priority.[51] Working on the assumption that appropriateness of surgery would be based on radiologic findings and detailed examinations, the panel based their criteria on the definitions of functional capacity defined by the American College of Rheumatology,[52] levels of pain on rest and activity, problems in working or in providing care, for someone at home and expected improvement in functional capacity. Naylor and his colleagues[51] created scenarios based on these criteria. They modified the RAND Delphi method[53,54] to obtain ratings of urgency by the experts.

The panel recommended the following waiting times: For patients appropriate for surgery with near-normal functional status in spite of some impairment in mobility (ARA functional class II), mild pain on activity, and no rest pain, the experts judged that a waiting time of six to 12 months was appropriate. For patients who had diseased joints that were interfering with work or caregiving (ARA functional class III), and had severe pain on activity, and some pain at rest, the panel recommended waiting times of three to six months. A waiting time of one to three months was recommended for patients who were largely incapacitated (ARA functional class IV), had severe pain on activity, and rest pain that was absent or mild. A waiting time of under one month was recommended for patients largely incapacitated by pain in the joint, experiencing moderate to severe pain at rest, and with a good prospect for improvement of functioning and/or reduction in pain. There was a consensus that clinically appropriate patients should not have to wait longer than a year, regardless of the levels of disability and pain. Ideally, the criteria for urgency would be from the time of referral to a specialist by the family physician to the actual date of surgery, but in reality it would be difficult to apply these criteria until the orthopedic surgeon has completed the consultation, the date patients are entered into the queue.

Data Source and Methods

We used OHIP claims to identify all patients in Ontario who had primary total hip and total knee replacements in 1996/97, and reviewed these to identify the date of consultation with the ortho-pedic surgeon. Time in the queue was defined as the number of days between this consultation and the actual date of surgery. The times in the queue were divided into four categories: one to three months, three to six months, six months to one year, and over one year. As some waits were very long, we used the median rather than the mean as the measure of central tendency.

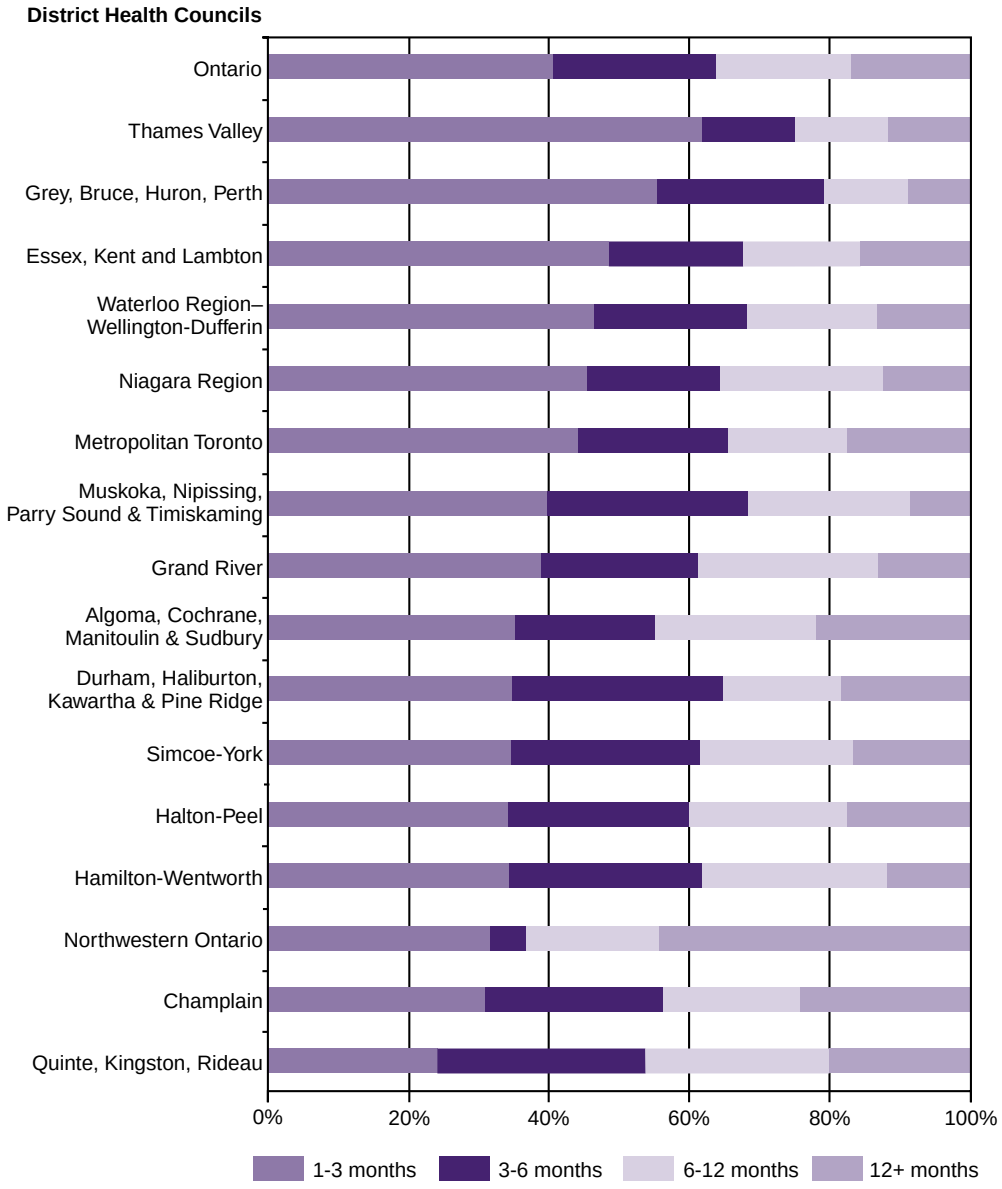
The frequency distributions and median waiting times are presented by District Health Council (DHC). In Section 1 of this chapter, we presented the rates of total primary hip and total primary knee replacements by DHC. The median waiting times were correlated with these rates across the DHCs to examine whether DHCs with high rates for total joint replacements had shorter median waiting times.

Findings

In 1996/97, there were 4,624 total primary hip replacements and 6,208 total primary knee replacements. OHIP claims for the consultation prior to surgery for about 96% of the procedures were: 4,448 for total hip replacements and 5,989 for knee replacements. The median time in the queue for hip replacement surgery was 17 weeks, and 22 weeks for knee replacement surgery.

As shown in Exhibit 7.22, 40.6% of hip replacement patients had their surgeries within the recommended window of

Exhibit 7.22: ***Waiting Times for Primary Hip Replacements by District Health Council in Ontario, 1995/96***



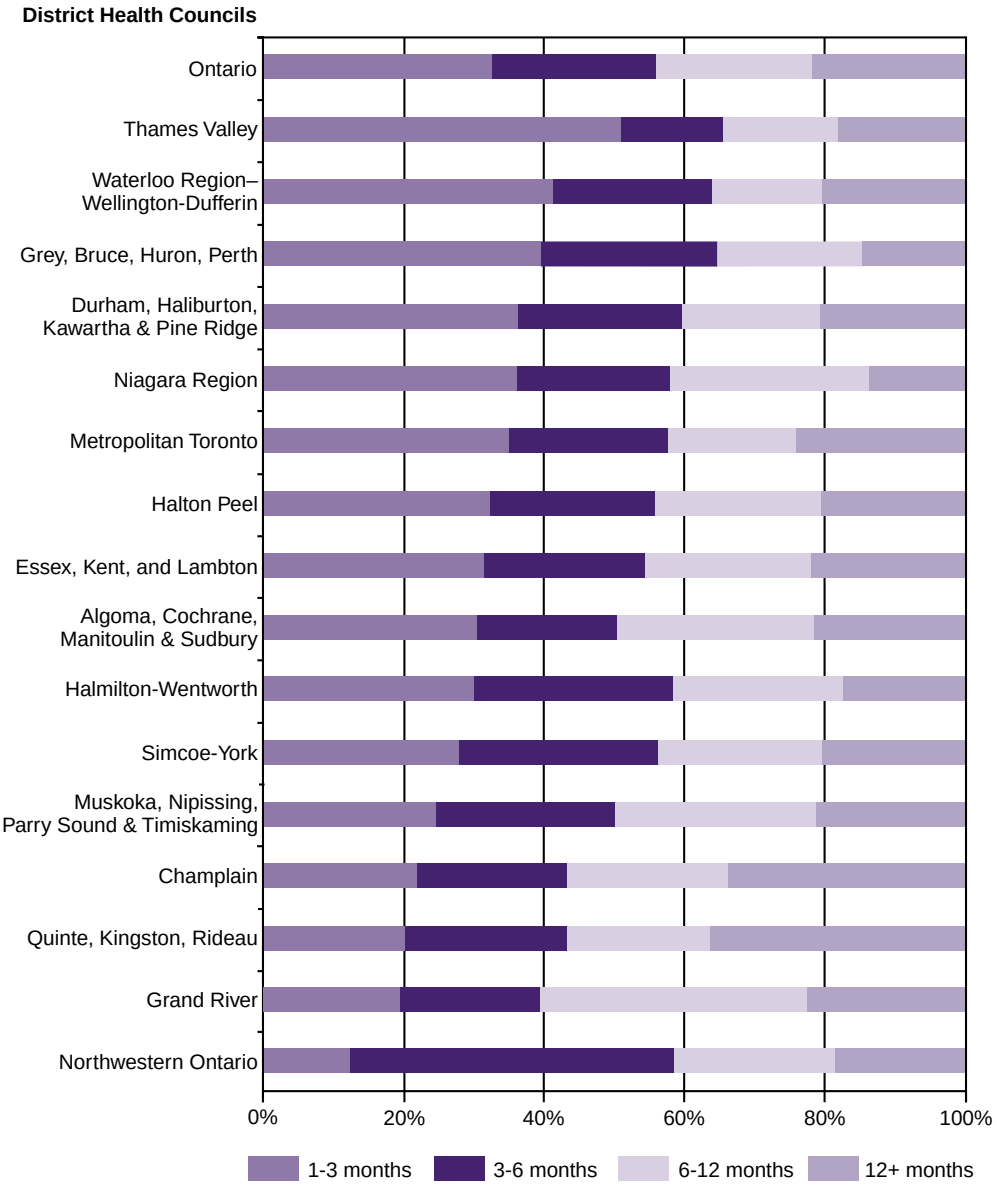
Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

three months; 19.3% waited three to six months; and 16.9% waited longer than a year. In 16 DHCs, at least 40% of patients had their surgeries within three months of the last consultation and fewer than 20% waited longer than a year. These DHCs were in South West Ontario, the Niagara region, and Metropolitan Toronto. The longest waits were for residents of Northwestern Ontario, where 44.2% of patients waited a year or more for the procedure.

For elective knee replacement, about one-third (32.7%) of patients had their surgeries performed within three months; another 23.2% patients were in the queue from three to six months; and 22% waited more than a year, as indicated in Exhibit 7.23. In only three DHCs did 40% of patients or more receive their procedures within three months of the last consultation. There were two DHCs (Champlain and Quinte-Kingston-Rideau) where more than one-third of the residents having total knee replacements waited more than a year for the procedures.

The median queuing times for total primary hip replacement ranged from 8 weeks in Thames Valley to 43 weeks in Northwestern Ontario, a fivefold variation. Similarly, the median times for knee replacements ranged from 12 weeks in Thames Valley to 36 weeks in Quinte, Kingston, Rideau, a threefold variation. The rank ordering of the median waiting times for

Exhibit 7.23: ***Waiting Times for Primary Knee Replacements by District Health Council in Ontario, 1995/96***



Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

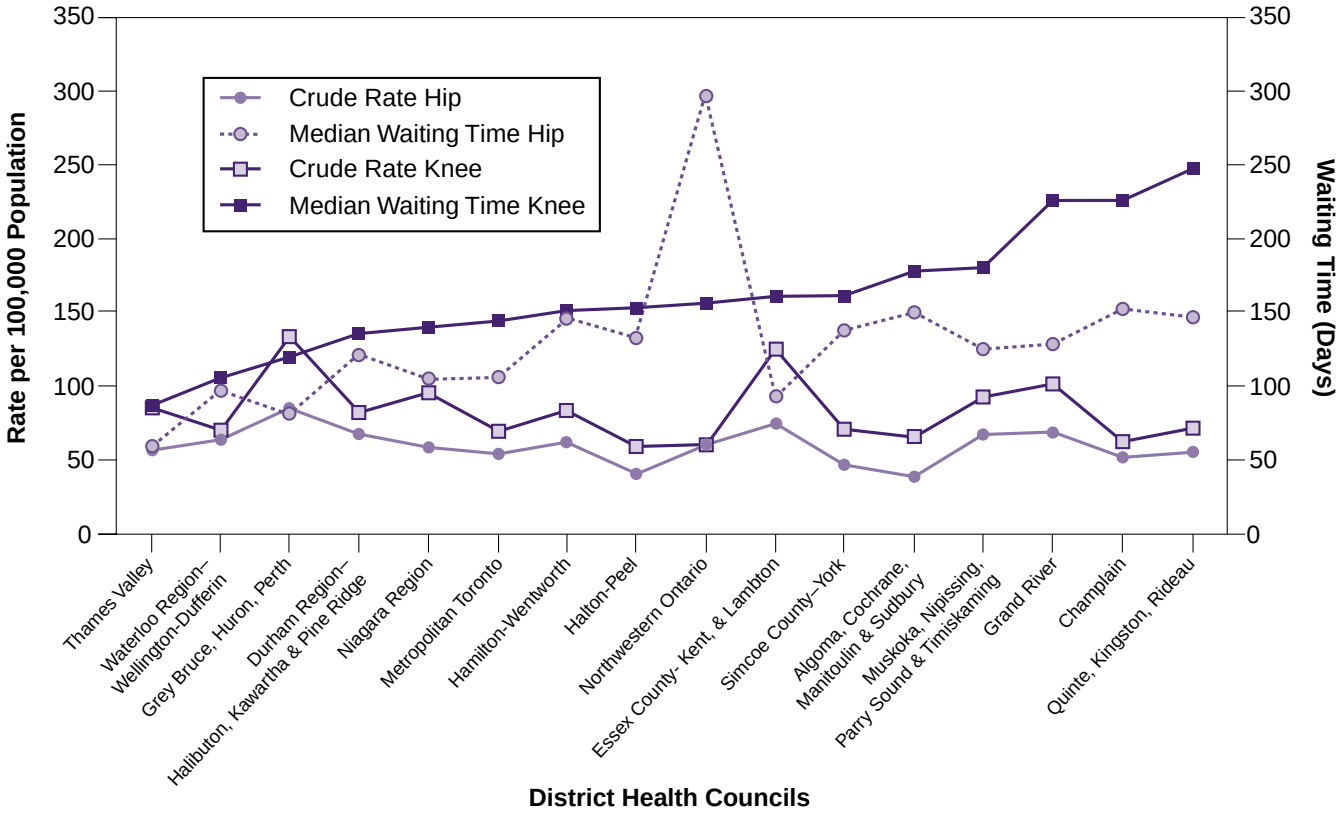
total hip and total knee replacements for DHCs are highly correlated (r=0.69). However, there are exceptions to the orderings: whereas Northwestern Ontario had the longest median queuing time for total hip replacements, (44 weeks) the median time for total knee replacements was half as long (22 weeks).

The age- and sex-adjusted rates per 100,000 population for the OHIP primary hip replacement cohort ranged from 41 for Algoma, Cochrane, Manitoulin and Sudbury to 85 for Grey, Bruce, Huron and Perth. The adjusted rates for the knee replacements cohort were higher across the province, ranging from 60 in Champlain to 132 in Grey, Bruce, Huron and Perth. The rank order correlations between rates and median waiting times were moderate for primary total hip replacements (rho= -0.482) and low for primary total knee replacement (rho= -0.14). Exhibit 7.24 indicates a trend between DHCs, with the lowest rates having the longest waiting times. However, the rank order correlation, although negative, is not significant at the 0.05 level for either hip or knee replacements.

Discussion

The strengths and weakness of this study are those based on the analysis of administrative data. The power of the methods is that the data are not

Exhibit 7.24: ***Relating Hip and Knee Rates and Waiting time (Days) by District Health Council Per 100,000 Population 20 Years and Over in Ontario 1995/96***



Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

just based on a sample, but include the entire population of eligible elective primary hip and knee replacement surgeries in Ontario. We have taken the date of surgical consultation to indicate the date on which the decision was made to offer joint replacement surgery. Orthopedic surgeons can bill for a surgical consultation only once a year; thus, for surgeons with waiting lists longer than a year, it is possible that the decision to proceed with surgery was made at a visit previous to the last consultation. Therefore, this limitation may lead to either an underestimate or an overestimate the true waiting time.

Waiting time is defined by the Fraser Institute as the period between making the decision to operate and receiving the operation.[50] The data from the Fraser Institute came from orthopedic surgeons who report the typical time it would take to book the next appointment for surgery. In our study, the median times for hip and knee replacements in Ontario were 17 and 22 weeks, respectively, and considerably longer than the wait of 12 weeks reported by the Fraser Institute.[50]

In an earlier study, Coyte et al[55] surveyed 1,486 Medicare recipients from the United States and 516 individuals from Ontario who received knee replacements between 1985 and 1989. Once a patient decided to have surgery following a consultation, the median waiting times were 4.5 weeks in the U.S. and 13.5 weeks in Ontario. Ninety-five percent of the respondents in the U.S. found their waiting times acceptable, compared to 85% of the patients in Ontario.

Williams et al[56] surveyed 209 primary total hip and total knee patients of 19 surgeons from across Ontario before and after they had surgery. Only 16% of the patients had surgery within three months; 19% waited for four to six months, 31% waited seven to 12 months, and the remaining 34.1% waited a year or longer. The waiting times were unrelated to the severity of pain or disability reported in the initial interview. The surgeons reported that they book the patients on a first-come, first-serve basis. In the final interview the patients were asked if they would have switched surgeons with shorter queues had it been possible, and 90% of them indicated they would have stayed with their surgeons.

Even when the queue is triaged, Roy and Hunter's review of an orthopedic waiting list in the U.K. found few differences between patients classified as urgent and non-urgent.[57] Interestingly, they also found that about 10%

of patients had deteriorated and needed to be taken off the list. In two cases, Roy and Hunter even changed the joint to be replaced due to ensuing deterioration. It is the deterioration and subsequent needs of the patients while in the queue that raises concern in health service providers.

Rationing is defined by the National Health System in the U.K. as withholding, without consent, potentially beneficial treatment, which implies exclusion or denial of service. Cost is the unavoidable underlining constraint, which leads to rationing. Even if the overall health care budget were to be expanded through increasing or redistributing taxes, the budget would still be finite and priorities for procedures would still have to be set.

Comparisons between the United States and Canada have consistently shown that waiting times in the U.S. are shorter for a variety of procedures. In the U.S., the higher costs of care are deemed preferable to the rationing of queues for services. Bell et al[58] conducted telephone interviews of 18 Canadian and 48 American hospitals in cities with populations of 500,000 or more. The hospitals were asked for the costs and waiting times for seven procedures, including total knee replacement, for patients who were willing to pay for the expenses out-of-pocket. The median waiting time was 3.6 weeks for hospitals in the U.S. as compared to 23.6 weeks in Canada. In U.S. dollars, the median charges for total knee replacement were $26,805 in the United States and $10,651 in Canada. Bell et al[58] concluded that American hospitals provide faster care at higher prices than Canadian hospitals.

In a commentary on the study, Rice[59] noted that faster care and higher prices applied to Americans who had sufficient health insurance and could pay for part of the costs for the procedures. Those who lack health insurance or cannot pay the out-of-pocket expenses may receive the procedures, but they have to wait for them. She noted that in Canada, residents are covered with universal public health insurance and are willing to wait for the services. Rice cautioned that faster care and shorter waiting times in the United States system, without universal health insurance coverage, cannot be equated with the universal public health insurance, longer waiting times and lower costs in Canada.

Summary

Total hip and total knee replacements are priority surgical services in Ontario. The province has provided special funds for the purchase of prostheses to increase the numbers of procedures to meet demand and reduce the waiting times for surgery. The Health Services Restructuring Commission has recommended that the number of total joint replacements be increased by one-third over the next five years to ensure that the rates for all areas reach 1995/96 provincial averages and to allow for the aging of the population. They have called for an annual total of 19,300 total hip and total knee replacements by the year 2003.

There are issues related to the recommendation that can be addressed. First, there is the intent to respond to unmet need for the procedures, but the level of unmet needs is not known. Hawker et al[60] are currently undertaking population-based studies in an area with a high rate for total joint replacement and an area with a low rate to estimate the levels of need, to determine if the levels of unmet need are higher in the area with a low rate, and whether those with clinical evidence of need wish or plan to have the arthroplasty. The results of this study are being anticipated with interest.

There is interest in the creation of a registry for total joint replacement, such as those in operation in the Scandinavian countries. The Canadian Orthopedic Association has called for the formation of registries in Canada, and is negotiating with the Canadian Institute for Health Information for the creation of a registry across Canada. The Ontario Ministry of Health has funded a demonstration project to enable orthopedic surgeons and hospitals in Southwestern Ontario to create a population-based registry that would include information on specific surgical services, implants, and characteristics of patients, in addition to the discharge abstract data. The goal is to replicate the registries maintained by the Orthopedic Associations in Norway, Sweden and Finland. Such registries offer the prospects of longer term monitoring the outcomes of total joint replacements related to surgical procedures and prostheses, regional planning, and managing access to procedures.

The Health Services Restructuring Commission has called for a formal system for queuing patients that would include standard methods for assessing appropriateness and urgency of surgery. Assessments of appropriateness, using criteria such as those recommended by the Ontario Expert Panel,[51] would serve to improve equity in access, and urgency ratings would be used to schedule patients in the queue and ensure that waiting times are related to need.

The referral process begins when the patients present with pain and problems related to their hips and knees. As noted in Chapter 5, primary care physicians reported barriers to specialist services, and rheumatologists and orthopedic surgeons are not equally accessible across Ontario. Generally, family physicians may not be aware of the time it takes to arrange consultations with orthopedic surgeons in the area, or of the lengths of their queues once the patients are accepted and entered into the queues. Since total hip and total knee replacements are elective, patients learn about and seek out specific surgeons for consultation. Once they have consulted a surgeon, they may be reluctant to switch surgeons, even if there is the prospect for a reduced waiting time

for surgery. While patients are willing to wait weeks and months for the procedure, there is little evidence as to how long they can wait before they deteriorate with respect to disability and pain. There is evidence to suggest that outcomes are not related to the length of time patients spend in the queue.[56]

The waiting list is the most difficult issue to address. At this point, with regard to elective procedures such as total joint replacements, hospitals control the beds, operating times and resources they make available. It is argued that Ministry funding for the purchase of prostheses may have to be extended to include the costs of operating rooms and beds in order to increase the numbers of total joint replacements and reduce the waiting lists and queuing times.

As operating times for total joint replacements are made available to surgeons, they decide which patients to book for the procedures. Surgeons control the queues, and there are few attempts to standardize the reporting of waiting times, or to rationalize or coordinate the queues across surgeons or within hospitals. Consequently, governments and funding agencies find it difficult to determine if increased funding for procedures would reduce waiting times in the queues. Typically, a surgical event is registered only after it has occurred. Consideration could be given to registering patients at the time of the surgical consultation when the decision is made to proceed with surgery. If this information were filed along with information about the booking dates, cancellations and final date of surgery, it may be possible for the registry information to systematically address the issues of times in the queue.

There are opportunities for reducing costs of total joint replacements. As indicated in the study by Cheung et al,[24] there is substantial room for savings in the purchase of implants for total hip and total knee surgery. There should be equity in the prices paid for the same makes and models of prostheses. This could be achieved if hospitals exchanged information on the contracts they have with suppliers. As noted in the last ICES Practice Atlas, substantial savings can be achieved by group purchasing and standardized criteria for prosthesis selection. It may be possible for surgeons and hospitals in Southwestern Ontario to coordinate their purchases of prostheses as they develop the registry for total replacements.

A major determinant of costs is the average length of stay in acute care services. As noted, the average lengths of stay continue to decline in European countries and the United States as well as in Ontario. The length of stay in acute care beds is in part contingent on the rehabilitation services available following discharge. In Chapter 9, we show the variability in post-acute rehabilitation services.

One approach worthy of evaluation is that taken by St. Joseph's Hospital in Hamilton in the planning of services for total joint replacements (St. Joseph's Hospital, personal communication, 1998). A management team developed care guidemaps for total hip and total knee patients, and reduced their length of stay to seven days, at which time they are discharged to home without further services. The team estimated that the total direct costs for the seven days of care, exclusive of physician fees, are $6,943 for hip patients. They have developed alternative care plans, based on the characteristics of the patient and circumstances in the home. By keeping patients in acute care for just three days and then transferring them to rehabilitation services for four days, the direct costs can be reduced by $1,500. For patients who can be discharged to home after four days and arranging and paying for SEN professional visits in the home for three days, the direct costs for the seven days of care would be $5,640 for hip replacements. The St. Joseph's team has been following the patients who experienced these alternative plans, and the preliminary reports suggest that all three plans result in good outcomes. They have commenced a formal evaluation of these services and may have to revise their plan to take into consideration the recommendations of the Health Services Restructuring Commission for Hamilton (St. Joseph's Hospital, personal communication, 1998).

The Health Services Restructuring Commission has set targets and benchmarks for the provision of total hip and total knee replacements in Ontario, and the Ministry has given priority funding for the procedures. It is up to hospitals and surgeons to orchestrate and provide the procedures in the most cost-effective manner possible.

References

1. Tepper S, Hoch O. Factors associated with hip osteoarthritis: Data from the first National Health and Nutrition Examination Survey (NHANES-1). *Am J Epidemiol* 1993; 137: 1081-1088.

2. Kelsey JL, Whittemore AS, Evans AS et al, editors. *Methods in Observational Epidemiology.* 2nd ed. New York: Oxford University Press; 1996.

3. Miles TP, Flegal K, Harris T. Musculoskeletal disorders: Time trends, comorbid conditions, self-assessed health status, and associated activity limitations. *Vital & Health Statistics – Series 3, Analytical & Epidemiological Studies* 1993; (27): 275-288.

4. Bunker JP, Frazier HS, Mosteller F. Improving health: Measuring effects of medical care. *Milbank Q* 1994; 72(2): 225-258.

5. Naylor CD, Anderson GM, Goel V, editors. Patterns of Health Care in Ontario. The ICES Practice Atlas, 1st ed. Ottawa: National Printers Inc.; 1994.

6. Goel V, Williams JI, Anderson GM, et al, editors. Patterns of Health Care in Ontario. The ICES Practice Atlas, 2nd ed. Ottawa: Canadian Medical Association; 1996.

7. Ahnfelt L, Herberts P, Malchau H et al. Prognosis of total hip replacement: A Swedish multi-center study of 4,664 revisions. *ACTA Orthop Scand* 1990; 61(suppl. 238): 1-26.

8. Birtwistle SJ, Porter ML, Wilson K. Long-term survival analysis of total hip replacement. *Ann R Coll Surg Engl* 1996; 78: 180-183.

9 Callahan CM, Drake BG, Heck DA, Dittus RS. Patient outcomes following tricompartmental total knee replacement, A Meta-analysis. *JAMA* 1994; 271(17): 1349-1357.

10. Christel P, Djian P. Recent advances in adult hip joint surgery. *Current Opinion in Rheumatology* 1994; 6(2): 161-171.

11. Furnes A, Lie SA, Havelin LI et al. The economic impact of failures in total hip replacement surgery: 28,997 cases from the Norwegian Arthroplasty Register, 1987-1993 [comment]. *ACTA Orthop Scand* 1996; 67(2): 115-121.

12. Havelin LI, Espehaug B, Vollset SE, Engesaeter LB. Early aseptic loosening of uncemented femoral components in primary total hip replacement. *J Bone Joint Surg* 1995; 77B(1): 11-17.

13. Hoffman CW, Lynskey TG, Hadlow V. Twenty years of total hip arthroplasty in Taranaki: A survival analysis. *Aust NZ J Surg* 1994; 64: 538-541.

14. Malchau H, Herberts P, Ahnfelt L. Prognosis of total hip replacement in Sweden. *ACTA Orthop Scand* 1993; 64(5): 497-506.

15. Murray DW, Carr AJ, Bulstrode C. Survival analysis of joint replacements. *J Bone Joint Surg* 1993; 75-B(5): 697-704.

16. Organization of Economic Cooperation and Development. OECD Health Data '96. Paris: OECD; 1996.

17. Ontario Ministry of Health. *Ontario Health Survey,* 1990 [user's guide]. Volume 1: Documentation. Ottawa: Ministry of Supply and Services; 1992.

18. Ontario Ministry of Health. *Ontario Health Survey,* 1990 [user's guide]. Volume 2: Microdata Manual. Ottawa: Ontario Ministry of Supply and Services; 1992.

19. Van Walraven C, Paterson JM, Kapral M et al. Appropriateness of primary total hip and knee replacements in regions of Ontario with high and low utilization rates. *Can Med Assoc J* 1996; 155(6): 697-706.

20. Health Care Financing Review. *Medicare and Medicaid Statistical Supplement;* 1997.

21. Laupacis A, Bourne R, Rorabeck C, Feeny D, Wong C, Tugwell P. Costs of elective hip arthroplasty during the first year: Cemented versus noncemented. *J Arthr* 1994; 9(5): 481-487.

22. Meyers SJ, Reuben JD, Cox DD et al. Inpatient cost of primary total joint arthroplasty. *J Arthr* 1996; 11(3): 281-285.

23. Murray D, Carr A, Bulstrode C. Which primary total hip replacement? *J Bone Joint Surg* 1995; 77-B(4): 520-527.

24. Cheung CM, Paterson JM, Gort EH et al. A survey of Ontario hospitals' purchasing practices for hip and knee prostheses. *Cdn J Surg* (in press) 1998.

25. Liow RYL, Murray DW. Which primary total knee replacement? A review of currently available TKR in the United Kingdom. *Ann R Coll Surg Engl* 1997; 79: 335-340.

26. Morris RW. Evidence-based choice of hip prostheses. *J Bone Joint Surg* 1996; 78-B: 691-693.

27. Rorabeck CH, Bourne R, Laupacis A et al. A double-blind study of 250 cases comparing cemented with cementless total hip arthroplasty. *Clinical Orthopaedics and Related Research* 1994; 298: 156-164.

28. Gillespie WJ, Pekarsky B, O'Connell DL. Evaluation of new technologies for total hip replacement. Economic modelling and clinical trials. *J Bone Joint Surg* 1995; 77(4): 528-533.

29. Zuckerman JD, Kummer FJ, Frankel VH. The effectiveness of a hospital-based strategy to reduce the cost of total joint implants [comment]. *J Bone Joint Surg* 1994; 76(6): 807-811.

30. Rissanen P, Aro S, Paavolainen P. Hospital- and patient-related characteristics determining length of hospital stay for hip and knee replacements. *Int J Tech Assess Health Care* 1996; 12(2): 325-335.

31. Havelin LI, Espehaug B, Vollset SE et al. The Norwegian arthroplasty register: A survey of 17,444 hip replacements 1987-1990. *ACTA Orthop Scand* 1993; 64(3): 245-251.

32. Black N, Johnston A. Volume and outcome in hospital care: Evidence, explanations and implications. *Health Services Management Research* 1990; 3(2): 108-114.

33. Houghton A. Variation in outcome of surgical procedures. *Br J Surg* 1994; 81: 653-660.

34. Luft HS, Bunker JP, Enthoven AC. Should operations be regionalized? The empirical relation between surgical volume and mortality. *N Engl J Med* 1979; 301: 1364-1369.

35. Luft HS. The relation between surgical volume and mortality: An exploration of causal factors and alternative models. *Med Care* 1980; XVIII(9): 940-959.

36. Luft HS, Hunt SS, Maerki SC. The volume-outcome relationship: Practice-makes-perfect or selective-referral patterns? *Health Services Research* 1987; 22(2): 157-182.

37. Maerki SC, Luft HS, Hunt SS. Selecting categories of patients for regionalization: Implications of the relationship between volume and outcome. *Med Care* 1986; 24(2): 148-158.

38. Riley G, Lubitz J. Outcomes of surgery in the Medicare population: Mortality after surgery. *Health Care Financing Review* 1985; 6: 103.

39. Luft HS, Garnick DW, Mark DH et al. Does quality influence choice of hospital? *JAMA* 1990; 263(21): 2899-2906.

40. Hughes RG, Hunt SS, Luft HS. Effects of surgeon volume and hospital volume on quality of care in hospitals. *Med Care* 1987; 25(6): 489-503.

41. Sloan FA, Perrin JM, Valvona J. In-hospital mortality of surgical patients: Is there an empiric basis for standard setting? *Surg* 1985; 99(4): 446-453.

42. Burns LR, Wholey DR. The effects of patient, hospital, and physician characteristics on length of stay and mortality. *Med Care* 1991; 29(3): 251-271.

43. Farley DE, Ozminkowsky RJ. Volume-outcome relationships and inhospital mortality: The effect of changes in volume over time. *Med Care* 1992; 30(1): 77-93.

44. Flood AB, Scott WR, Ewy W. Does practice make perfect? *Med Care* 1984; 22(2): 98-125.

45. Kreder HJ, Deyo RA, Koepsell T et al. Relationship between the volume of total hip replacements performed by providers and the rates of postoperative complications in the State of Washington. *J Bone Joint Surg* 1997; 79A(No. 4): 485-494.

46. Kreder HJ, Williams JI, Jaglal S et al. The relationship between surgeon and hospital volume and complication rates in Ontario following elective primary total hip arthroplasty: A preliminary investigation. *Cdn J Surg* (in press)1998.

47. Lavernia CJ, Guzman JF. Relationship of surgical volume to short-term mortality, morbidity, and hospital charges in arthroplasty. *J Arthr* 1995; 10(2): 133-140.

48. Charlson ME, Pompei P, Ales KL et al. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *J Chron Dis* 1987; 40(5): 373-383.

49. Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbodity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol* 1992; 45(6): 613-619.

50. Ramsay C, Walker M. *Waiting Your Turn: Hospital Waiting Lists in Canada.* 7th ed. Fraser Forum 1997; July (suppl): 1-66.

51. Naylor CD, Williams JI, The Ontario Panel on Hip and Knee Arthroplasty. Primary hip and knee replacement surgery – the Ontario criteria for case selection and surgical priority. *Quality in Health Care* 1996; 5: 20-30.

52. Steinbrocker O, Traeger CH, Batterman RC. Therapeutic measurement in rheumatoid arthritis. *JAMA* 1949; 140: 659-662.

53. Brook RH, Chassin MR, Fink A et al. A method for the detailed assessment of the appropriateness of medical technologies. *Int J Tech Assess Health Care* 1986; 2: 53-64.

54. Park RE, Fink A, Brook RH et al. Physician ratings of appropriate indications for six medical and surgical procedures. *Am J Public Health* 1986; 76(7): 766-772.

55. Coyte PC, Wright JG, Hawker GA et al. Waiting times for knee-replacement surgery in the United States and Ontario. *N Engl J Med* 1994; 331: 1068-1071.

56. Williams JI, Llewellyn-Thomas H, Arshinoff R et al. The burden of waiting for hip and knee replacements in Ontario. Ontario hip and knee replacement project team. *J Eval Clin Pract* 1997; 3(1): 59-68.

57. Roy CW, Hunter J. What happens to patients awaiting arthritis surgery? *Disabil Rehabil* 1996; 18(2): 101-105.

58. Bell CM, Crystal M, Detsky AS et al. Shopping around for hospital services. *JAMA* 1998; 279(13): 1015-1017.

59. Rice DP. The cost of instant access to health care [letter to the editor]. *JAMA* 1998; 279(13): 1030.

60. Hawker GA, Badley EM, Coyte PC et al. Identifying the need for hip and knee arthroplasty: A community survey, MRC Grant. 1997.

Appendix A7.1

Surgical Services for Total Joint Replacements

The data for this chapter came from the Discharge Abstract Data from inpatient hospital separations, provided by the Canadian Institute of Health Information (CIHI), for the fiscal years 1981/82 through 1996/97. The first step was to select all CIHI records for total hip and total knee replacements. CIHI records were considered as being for hip replacement if any of the valid procedure fields had a Canadian Classification of Therapeutic, Diagnostic and Surgical Procedure (CCP) code of 9351 or 9359. The records were considered as being for total knee replacement if the CCP of 9341 was found in any of the procedure fields.

Total joint replacements for fractures and cancer were considered to be urgent and nonelective. Records were excluded if they had (ICD-9) codes for fractures (800x through 899x), non-medical causes of injury (E800-E869, E880-E928, and E950-E999), malignant neoplasms (140x through 208x) or neoplasms of uncertain behavior (235x through 239x).

Procedures were considered to be revisions of total joint arthroplasty if any one of the ten fields for diagnoses had codes for osteomyelitis of hip (7300 through 7303, 7308, and 7309), mechanical complications of orthopedic device (9964), infection due to internal joint prosthesis (9966), other complications of internal prosthetic device (9967) or postoperative infections (9985 and 9986). All of the remaining records were considered to be primary replacements of the total hip and total knee.

For the study of the relationships between hospital volumes, surgeon volumes and outcomes, we matched claims from the Ontario Health Insurance Plan (OHIP) with the CIHI records. We started with records from the CIHI Discharge Abstract Data with CCP codes for total hip replacement (9351 or 9359) and total knee replacements (9341) for the fiscal years 1993/94 through 1996/97. For the same fiscal years, we abstracted the OHIP claims with the suffix of 'A' and the fee codes for total primary hip replacement (R440 or R553), revision of total hip replacement (R241), total primary knee replacement (R441 or R248), and revision of total knee replacement (R244).

The CIHI records were matched on the unique identifying number with the OHIP claims. Matching recordings had to have the same unique identifying number with the OHIP service date falling within the admission and discharge date of the CIHI record. About two percent of the CIHI records did not have the unique identifying number. For the CIHI records with unique identifying numbers, 89% were matched successfully with OHIP claims.

There were three sets of reasons for the mismatches. For about 25% of the unmatched CIHI records, there were no OHIP claims. Over half of these records were from hospitals in Kingston where members of the South East Academic Medical Organization, full-time medical faculty at Queens University, stopped billing for their services once they received a global contract for their services from the Ministry. Without claims for physician services we could not relate the total joint replacements to specific surgeons.

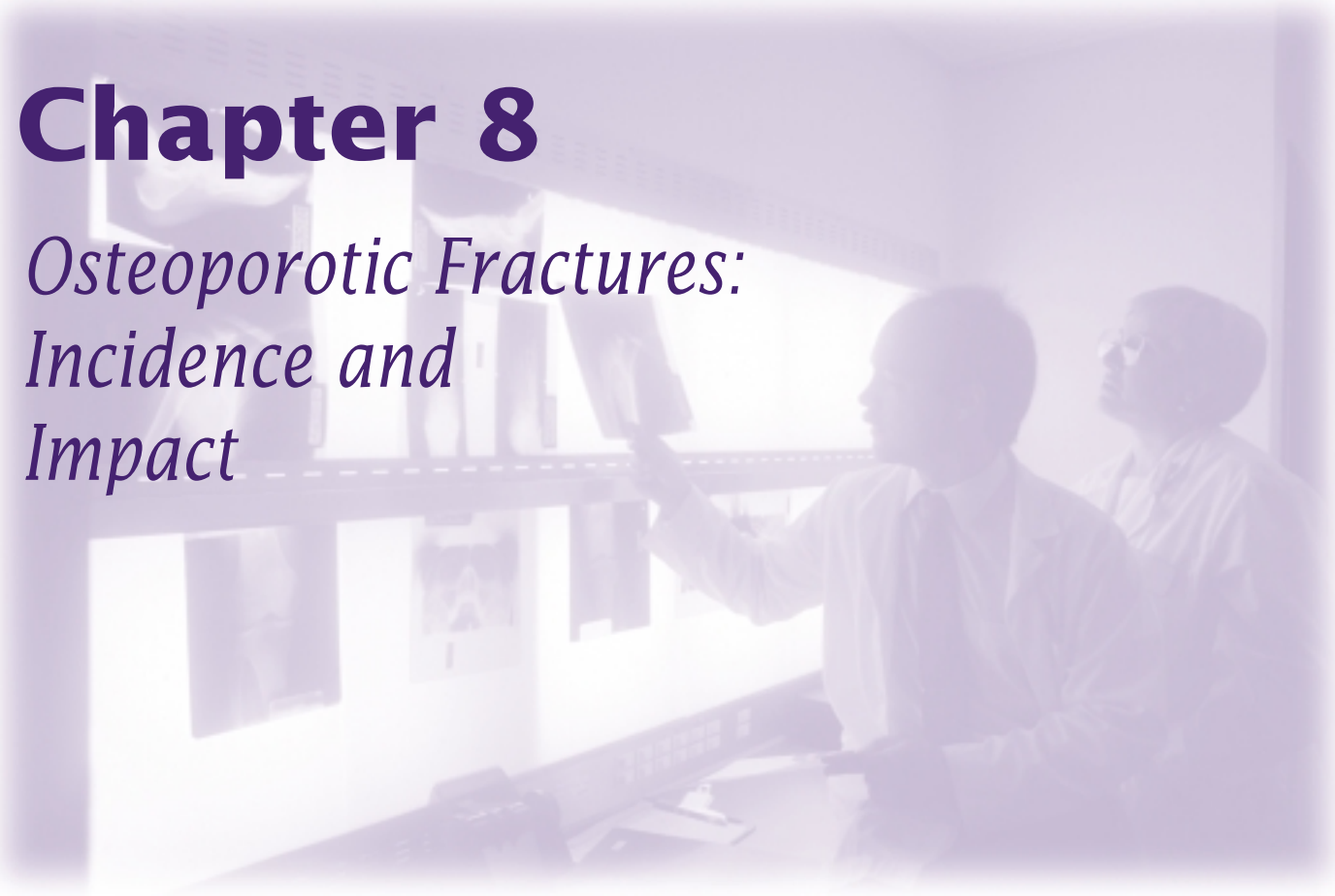
For half of the mismatching CIHI records and OHIP claims, the OHIP claims were for orthopedic procedures other than the total joint replacements specified on the CIHI record. In the remaining one-quarter of the mismatches, the OHIP claims related to the CIHI records were for non-orthopedic procedures.

The average annual volumes of total hip and total knee replacements for surgeons and hospitals were based on CIHI records, regardless of whether the procedures were elective or non-elective. The outcomes were for elective primary total joint replacements based on matched records excluding fractures and cancer. For both total hip and total knee replacements, the outcomes were specified for only those patients who had one joint replaced. If patients had both hips or both knees replaced during the study period, they were excluded from consideration as one could not relate the adverse events to the specific joint replaced.

The outcomes were complications during admission, readmission for infection of the joint replaced, readmission for revision of the primary total joint replacement and death. They were assessed within three months and again within the first year following the date the procedures were performed. Complications and readmission for infection were determined from the CIHI records, and revisions were identified from the matched CIHI records and OHIP claims. Through special research agreements with the Ministry of Health and the Office of the Registrar General, we obtained the identifiers of the patients in the study. The patients were linked to the statements of death through the Ontario Cancer Registry which uses Automatch® for probabilistic matching. Once the vital status of the patients was determined, the identifiers were removed from the data files. All deaths were included in the analysis, regardless of the underlying cause of death listed on the statements of death.

Chapter 8

Osteoporotic Fractures: Incidence and Impact



Overview

Osteoporosis is a skeletal disease characterized by low bone mass and deterioration of bone tissue, leading to enhanced bone fragility and consequently an increase in susceptibility to fracture.[1] People with osteoporosis are predisposed to fractures of the hip, vertebrae, wrist, humerus, pelvis and rib, as well as to other, less common types of fractures. Given sufficient force, bone fractures can occur in anyone, but they are considered to be osteoporotic when they result from minimal trauma such as a fall from standing height, which would not normally result in a fracture in young, healthy adults. For example, about 90% of hip and wrist fractures among the elderly are the result of mere slipping or tripping.[2,3]

As with many other chronic diseases, the incidence and prevalence of osteoporosis increase with age. For example, hip fracture rates are known to increase exponentially from age 50 years.[4,5] In white women, it is estimated that the lifetime risk of a hip fracture, a clinically diagnosed vertebral fracture or a wrist fracture are 17.5%, 15.6% and 16.0%, respectively. About 40% of women will experience one or more of these three fracture types during their lifetime. For white men, the respective lifetime risks are 6%, 5% and 2.5%.[6] It has been estimated that in 1993 the cost of treating fragility fractures in Canada was $1.3 billion.[7]

The rationale for studying osteoporotic fractures is that they result in considerable long-term residual disability. In a study of functional limitations experienced by 1,010 postmenopausal white women in a retirement community in California, those who had previously experienced various types of nonviolent fractures were compared to those who had not.[8] Women who had osteoporotic fractures were two to six times more likely to report difficulty with almost all activities surveyed, including stair climbing, reaching, bending, lifting, walking, getting in and out of a car, cooking, shopping, putting on shoes and doing heavy housework. The two most difficult tasks were cooking and shopping. Compared with all osteoporotic fractures, hip fractures were most strongly associated with difficulty in walking and descending stairs, and vertebral fractures were most strongly associated with difficulty in bending, lifting and climbing or descending stairs.

The purpose of this chapter is to assess the magnitude of and the burden on the health care system of the three most common osteoporotic fractures: wrist, vertebral and hip. Most of the analyses will focus on hip fractures because they account for the greatest morbidity, mortality and costs. Almost all patients with hip fractures require hospitalization, unlike those with wrist and vertebral fractures where the majority are treated on an outpatient basis. For wrist and vertebral fractures, we report on rates; and

for hip fractures, we report on time trends, in-hospital mortality, length of hospital stay and discharge destination. Last, we explore issues around the impact of hip fractures in terms of use of rehabilitation services.

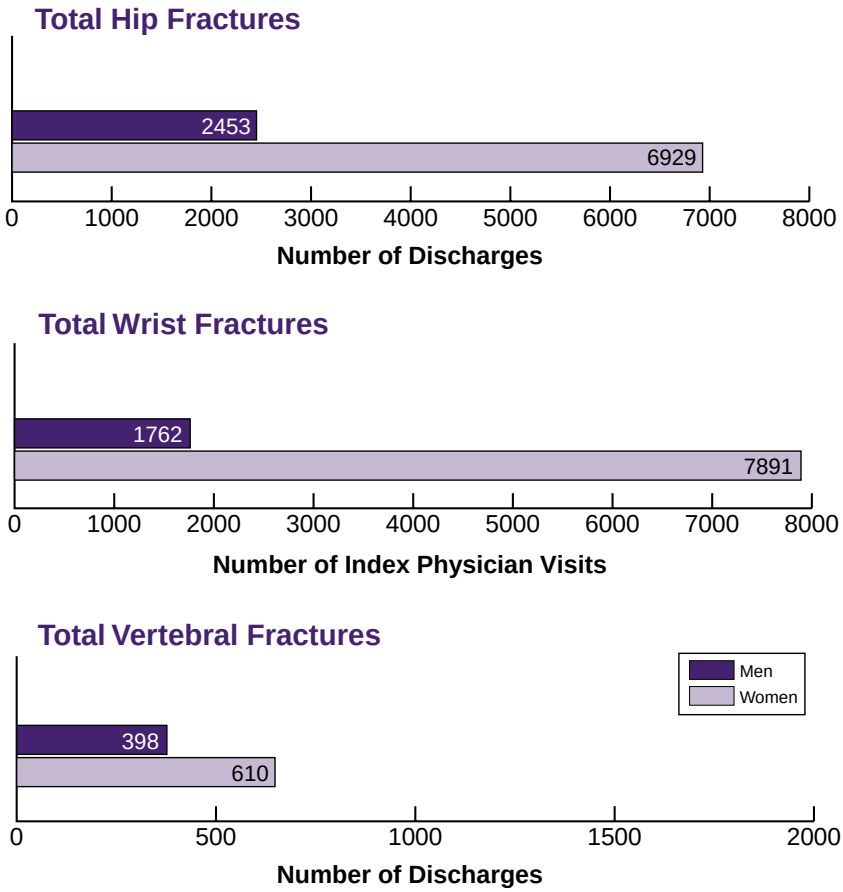
Data Source and Methods

Three sources of data were used for this study: discharge abstract data from the Canadian Institute for Health Information (CIHI) for the fiscal years 1985/86 through 1996/97; Ontario Health Insurance Plan (OHIP) claims data; and services data from the Ontario Home Care Administration System for the fiscal years 1993/94 and 1994/95, the last two years they were available. The study was limited to persons 50 years of age and over who had been managed for wrist fractures, vertebral fractures and hip fractures. Population estimates used in computing rates per 1,000 persons were supplied by Statistics Canada. Estimates were obtained for each calendar year from 1985 to 1996. Data were stratified by sex and 10-year age groups, beginning with 50 years and ending at 90+ years. Age standardization was performed by the direct method using the 1986 Ontario population as the standard to remove any distortion in rates introduced by the aging of the population over the time period (Appendix A8.1).

For wrist fractures, rates are based on type of treatment recorded in the OHIP claims data. (Previous estimates in the literature of wrist fractures have been limited by use of data from hospitalizations only.) For vertebral fractures, our analyses are limited to the hospitalized fractures because, unlike treatment for wrist fractures which have site-specific billing codes in the OHIP data, no specific treatment billing codes exist for vertebral fractures.

The study of the use of rehabilitation and other services following discharge from an acute care hospital is limited to patients discharged either to a rehabilitation hospital or to home care.

Exhibit 8.1: ***Sex-specific Hospital Discharges for Hip, and Vertebral Fractures and Index Physician Visits for Wrist Fractures for Persons Aged 50 Years and Over in Ontario, 1996/97***



Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

For patients discharged with home care, we examined the type of services they received up to 90 days after the acute care or rehabilitation hospital discharge. The services include nursing, physiotherapy, occupational therapy, homemaking and other services. Homemaking services were measured in hours, the remainder in visits. For patients discharged to rehabilitation hospitals, we calculated the length of the stay.

Small area rate variation (SARV) analyses were conducted to examine geographic variations in discharge destination. The geographic unit was the Home Care Program (HCP); there were 38 HCPs in Ontario. The SARV statistics include the extremal quotient (EQ) and the weighted coefficient of variation (CV). The EQ is the ratio of the highest to the lowest observed proportion of patients receiving home care and rehabilitation and measures the relative difference between extremes. The CV is the ratio of the standard deviation of the proportions to the mean proportion among areas weighted by the population in each area. The EQ and CV are descriptive statistics and are not able to test hypotheses like, for example, whether or not the proportions are statistically significantly different between areas. Therefore, we conducted the likelihood ratio chi-square test, which allows us to test the hypothesis that the proportion of patients discharged home with home care does not vary between areas. The comparison of the uses of rehabilitation services was adjusted for age, sex and comorbidity.

Findings

Wrist Fractures

The numbers of osteoporotic fractures by sex are displayed in Exhibit 8.1. Wrist fractures are the most common fractures occurring in women under 80 years of age. In terms of total number of fractures for both sexes and all ages, there were slightly more wrist fractures (n=9,653) than hip fractures (n=9,382). Similar to hip fractures, most wrist fractures occur in women, and about one-half occur in women aged 65 years or over.

The age-specific rates for hospital discharges for all three types of osteoporotic fractures are shown in Exhibit 8.2. In fiscal year 1996/97, 11.5% of wrist fracture patients were hospitalized for treatment.

Vertebral Fractures

For this injury, the lowest treated prevalence for the age groups studied is in patients 50-59 years of age. Approximately 1,000 patients are hospitalized each year with a vertebral fracture in Ontario (Exhibit 8.1). Since the vast majority of vertebral fractures do not require hospitalization, the hospital discharge data capture only the most severe cases.

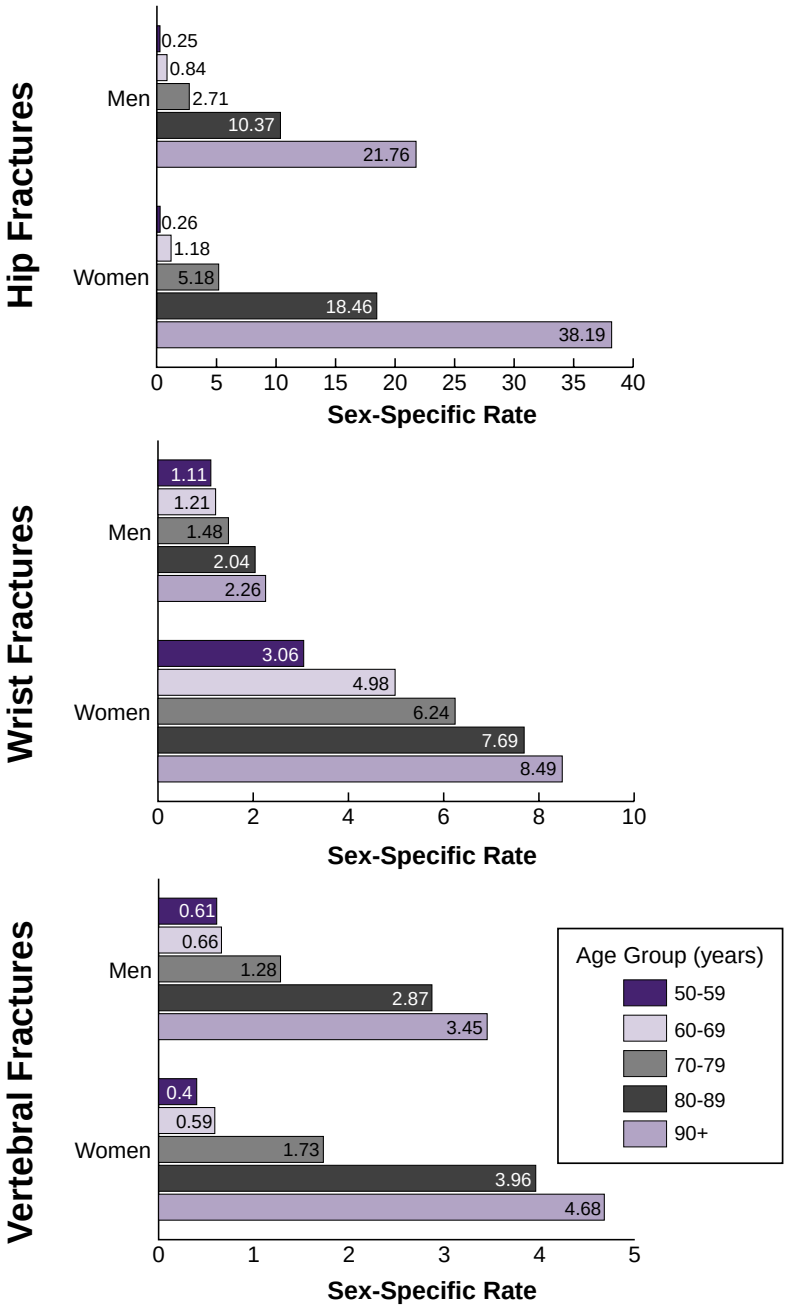
Hip Fractures

Trends in Hip Fractures

In 1985/86, the number of hip fractures among those aged 50 and over in Ontario was 7,415; in 1996/97, this increased to 9,382 (Exhibit 8.1). The overall hip fracture rate has remained fairly constant throughout the 12-year period: the steady rise in the number reflects the steady rise in the population aged 65 years and over. In fiscal year 1996/97, the rate was 1.8 per 1,000 men and 4.4 per 1,000 women (Exhibit 8.3). Three-quarters of all hip fractures occurred in women.

Hip fracture rates increased exponentially with age for both men and women through ages 50 to 89, nearly tripling for each 10 years of life (Exhibit 8.2). After age 90, the treated prevalence rate continued to increase but at a reduced rate. In the youngest age group (50-59), men and women had equal rates of hospitalization for hip fracture. After age 59, the rate was higher in women than in men; and from ages 69 through 89, the rate in women was twice that of men, falling to a ratio of 1.7 to 1 for those aged 90 and over. The treated prevalence rate among women in Ontario increases from 0.3 per 1,000 in those aged 50-59 to 38.2 per 1,000 in those aged 90 and over. More than half of postmenopausal women will live beyond age 80, and many will live beyond age 90. As a result, 63% of all hip fractures occur in women over the age of 80.

Exhibit 8.2: ***Age/Sex-specific Hospital Discharge Rates for Hip, Wrist and Vertebral Fractures per 1,000 persons Aged 50 Years and Over in Ontario, 1996/97***



Data Source: Canadian Institute for Health Information, Ontario Health Insurance Plan

Exhibit 8.3: ***Age-adjusted Hip Fracture Rates per 1,000 Population 50 Years and Over by Sex in Ontario, 1985/86 - 1996/97***

Fiscal Year	All Hip Fractures		Transcervical		Pertrochanteric		Unspecified	
	Women n(rate)	Men n(rate)	Women n(rate)	Men n(rate)	Women n(rate)	Men n(rate)	Women n(rate)	Men n(rate)
1985/86	5,658 (4.53)	1,757 (1.67)	2,410 (1.93)	646 (0.61)	2,721 (2.18)	948 (0.90)	527 (0.42)	163 (0.15)
1986/87	5,699 (4.41)	1,737 (1.59)	2,433 (1.88)	629 (0.59)	2,728 (2.11)	902 (0.83)	538 (0.42)	206 (0.19)
1987/88	5,942 (4.50)	1,739 (1.56)	2,526 (1.91)	631 (0.57)	2,870 (2.17)	935 (0.84)	546 (0.41)	173 (0.16)
1988/89	6,160 (4.59)	1,881 (1.66)	2,581 (1.92)	653 (0.58)	2,987 (2.22)	1,038 (0.91)	592 (0.44)	190 (0.17)
1989/90	6,194 (4.52)	1,968 (1.70)	2,593 (1.89)	745 (0.64)	3,058 (2.23)	1,058 (0.91)	543 (0.40)	165 (0.14)
1990/91	6,254 (4.49)	1,943 (1.64)	2,619 (1.88)	782 (0.66)	3,156 (2.27)	991 (0.84)	479 (0.34)	170 (0.14)
1991/92	6,588 (4.64)	2,095 (1.73)	2,895 (2.04)	857 (0.71)	3,248 (2.29)	1,075 (0.89)	445 (0.31)	163 (0.14)
1992/93	6,685 (4.61)	2,116 (1.71)	2,885 (1.99)	861 (0.70)	3,395 (2.34)	1,119 (0.90)	405 (0.28)	136 (0.11)
1993/94	6,720 (4.52)	2,163 (1.70)	2,961 (1.99)	897 (0.71)	3,412 (2.30)	1,124 (0.89)	347 (0.23)	142 (0.11)
1994/95	6,855 (4.51)	2,175 (1.67)	3,117 (2.05)	930 (0.71)	3,439 (2.26)	1,127 (0.87)	299 (0.20)	118 (0.09)
1995/96	6,778 (4.36)	2,322 (1.74)	3,057 (1.97)	983 (0.74)	3,410 (2.19)	1,227 (0.92)	311 (0.20)	112 (0.08)
1996/97	6,929 (4.35)	2,453 (1.79)	3,110 (1.95)	1,080 (0.79)	3,509 (2.20)	1,256 (0.92)	310 (0.19)	117 (0.09)

Data Source: Canadian Institute for Health Information

In-hospital Mortality for Hip Fracture Patients

Exhibit 8.4 shows the distribution of in-hospital mortality by age and sex. The overall mortality rate among patients 50 years and over who had hip fracture as the diagnosis most responsible for the hospital stay was 6.9%, and was twice as high among men than women. When analyzed by whether the patient had lived in the community or was institutionalized prior to hip fracture, the in-hospital mortality was higher among institutionalized (8.3%) than community-dwelling elderly (6.6%).

Hospital Stay

When length of hospital stay (LOS) is examined by type of fracture, hip fractures account for 90.5% of the total LOS for the three fractures combined, or 164,144 bed days for fiscal year 1996/97 (Exhibit 8.5). There has been a downward trend in average LOS for hip fracture patients over the 12-year period, resulting in approximately a 10-day difference between 1985 and 1996 (Exhibit 8.6). The age-adjusted average length of stay in 1985 was 29.2 days, compared to 19.1 days in 1996. On average, length of stay for patients previously in an institution is 5 days shorter than for those who had been living in the community prior to their hip fracture.

Trends in Discharge Destination Following Hip Fracture

The ability to return home after suffering a hip fracture is an increasingly important outcome measure because of its effects on social function and the high cost of long-term institutional care. Among patients who were in institutions prior to their hip fracture, 97% returned to institutional care following hospital discharge. Exhibit 8.7 shows the discharge destination by year for all surviving patients who had been living in the community prior to their hip fracture. Overall, a lower percentage of patients returned directly home in 1996 (43.9%) compared to 1985 (60.8%). There have also been increases in the proportion being transferred to nursing homes, other acute care hospitals and rehabilitation facilities over this time period. Perhaps a more telling statistic is that among those who had been community-dwelling, one in six was discharged to a long-term care institution immediately following hip fracture in 1996/97.

Utilization of Rehabilitation Services for Hip Fracture Patients

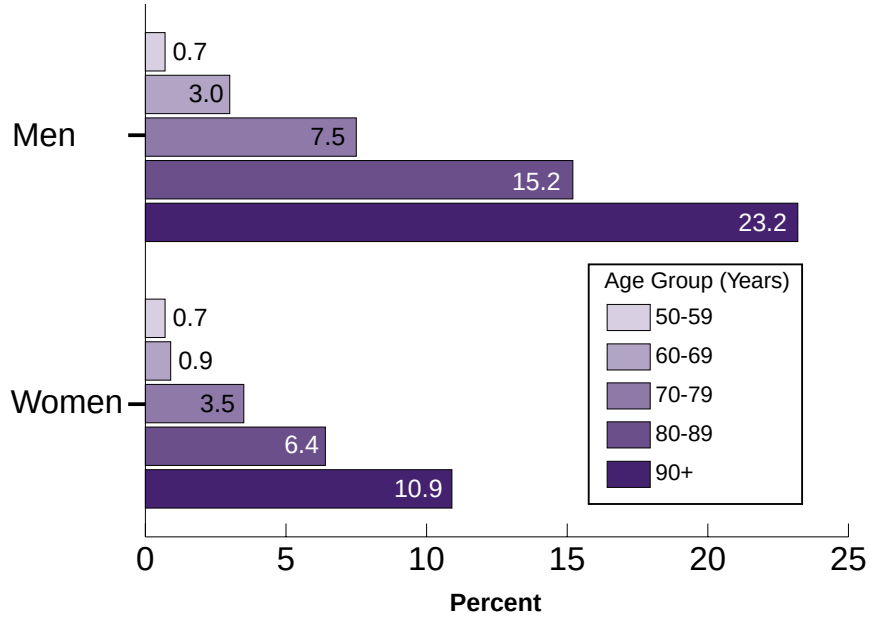
Hip fracture patients who have a prospect for returning to the community can be discharged either to a rehabilitation hospital or to home care. When patients are ready to leave the rehabilitation hospital, they can be transferred home either with or without home care. Exhibit 8.8 indicates that of those receiving rehabilitation services, the majority receive home care. The three groups (rehabilitation hospital only, home care only or both) did not differ significantly in terms of age or comorbidity.

Exhibit 8.9 indicates that patients discharged either home with home care or to a rehabilitation hospital had similar lengths of stay in acute care hospitals. Exhibit 8.10 shows that patients discharged from rehabilitation hospitals who then require home care services have, on average, more nursing visits (8.2 vs. 5.9) and homemaking hours (23.4 vs. 18.4), but slightly fewer physiotherapy visits (5.8 vs. 6.5) than patients discharged from acute care hospitals with home care only. The discharge data from rehabilitation hospitals do not specify the amount or types of services provided to hip fracture patients during their stay.

Small Area Rate Variation Analysis

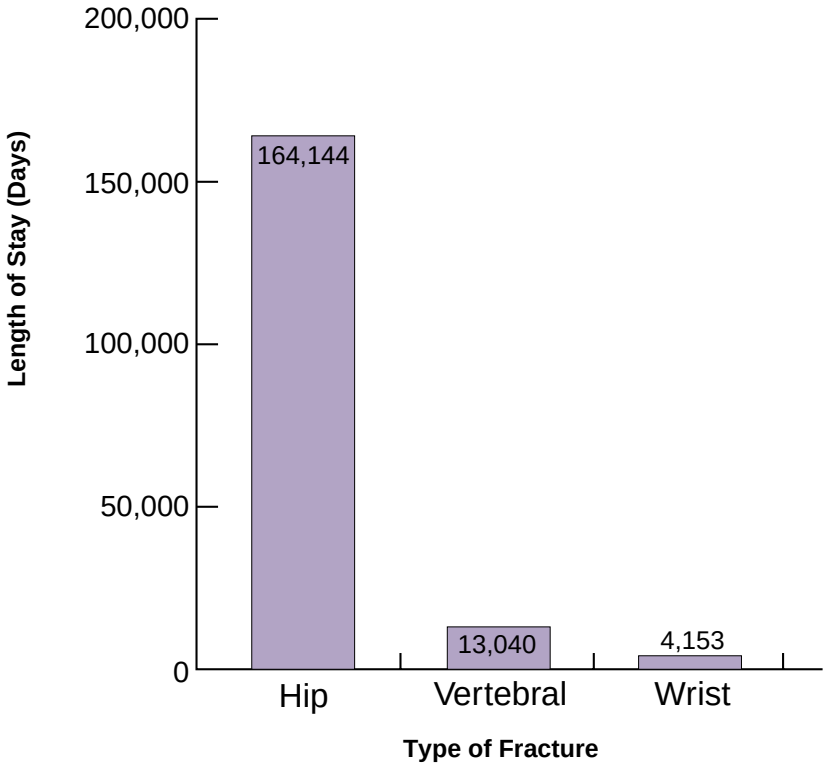
The overall province-wide adjusted proportion of patients discharged to

Exhibit 8.4: ***Age/Sex-specific In-Hospital Mortality Rates Among Hip Fracture Patients 50 years and Over in Ontario, 1996/97***



Data Source: Canadian Institute for Health Information

Exhibit 8.5: ***Total Length of Hospital Stay (LOS) for Hip, Wrist and Vertebral Fractures in Persons 50 years and Over in Ontario, 1996/97***



Data Source: Canadian Institute for Health Information

the community with home care only was 70.6% among those receiving rehabilitation services. The extremal quotient (EQ) was 2.6, indicating a moderate variation between Home Care Programs (Exhibit 8.11). Of the 38 Ontario HCPs, only two (Metro Toronto and Perth) had fewer than 40% of community-dwelling hip fracture patients discharged to home care only, while 21, or 55%, of HCPs had more than 90% discharged with home care only (Exhibit 8.12). The likelihood ratio chi-square test was statistically significant (p=0.0001), indicating that there were significant variations among the Home Care Programs in Ontario in the proportions of patients discharged home with home care.

To shed light on some potential reasons for this variation, we compared the areas with a high rate of discharge to home care only (>90%) to areas with a low rate. Exhibit 8.13 indicates that patients discharged from the high and low-rate areas have similar acute care LOS and comorbidity scores. These data suggest that the choice of rehabilitation setting is not accounted for by differences in patient characteristics.

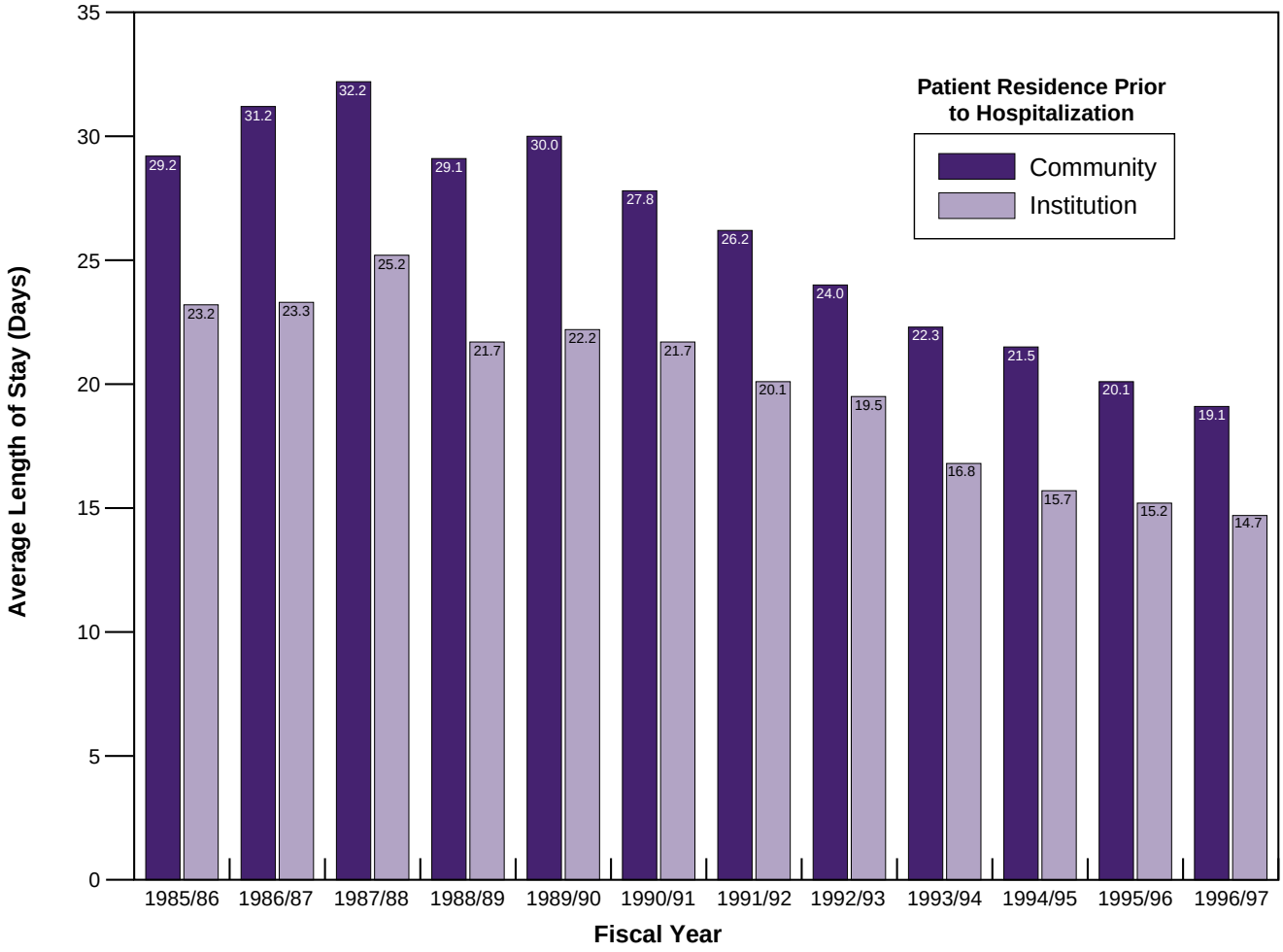
Discussion

These analyses indicate that osteoporotic fractures in Ontario are increasing and are more common in women than men. The sex difference in age-specific fracture rates is explained partly by the fact that women have less-dense bones by the rapid loss of bone tissue associated with menopause[6] and partly by the fact that more women than men survive to the age of vulnerability for osteoporotic fracture.

Wrist Fractures

In Canada, wrist fractures are the most common fracture until age 80, when their frequency is surpassed by hip fractures. Similar findings have been reported in the United States and northern Europe.[9,10] Wrist fractures are rarely fatal and cause much less disability than hip fractures. Comparable to other studies, we found that approximately 10% of wrist fractures result in

Exhibit 8.6: ***Age-adjusted Average Length of Hospital Stay for Hip Fracture Patients 50 Years and Over by Domicile in Ontario, 1985/86 – 1996/97***



Data Source: Canadian Institute for Health Information

Exhibit 8.7: ***Percentage of Prior Community Dwelling Hip Fracture Patients 50 Years and Over by Discharge Destination in Ontario, 1985/86 - 1996/97***

Fiscal Year	Acute Care	Rehabilitation	Chronic Care	Nursing Home	Home	Other
1985/86	3.7	18.8	10.5	4.8	60.8	1.5
1986/87	3.7	17.4	11.4	4.8	61.3	1.4
1987/88	3.6	19.6	9.9	5.4	60.1	1.4
1988/89	5.0	17.2	9.7	4.8	62.0	1.4
1989/90	4.7	19.3	10.7	5.6	57.9	1.7
1990/91	5.7	21.1	10.4	6.3	55.0	1.5
1991/92	6.1	22.9	9.3	6.6	53.4	1.7
1992/93	6.0	24.6	10.4	6.3	50.9	1.7
1993/94	6.4	25.0	10.6	7.4	48.9	1.8
1994/95	8.1	23.8	10.6	7.9	47.7	1.8
1995/96	9.1	24.7	9.2	8.2	46.7	2.0
1996/97	10.1	26.7	9.4	8.1	43.9	1.7

Data Source: Canadian Institute for Health Information

Exhibit 8.8: ***Type of Rehabilitation Service Received by Hip Fracture Cohort in Ontario, 1993/94 - 1994/95***

Rehabilitation Group	Percent	Number	Comorbidity		Mean Age (Years)
			Charlson Mean	Mean Number of Comorbidities	
Home Care Only	70.6	7,172	0.5	4.7	79.2 ± 9.2
Rehabilitation Hospital Only	12.7	1,295	0.4	4.7	78.6 ± 9.6
Rehabilitation Hospital + Home Care	16.7	1,695	0.4	4.8	79.4 ± 8.9

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

Exhibit 8.9: ***Acute Care and Rehabilitation Hospital Length of Stay and Mean Number of Comorbidities by Type of Rehabilitation Service Received by Hip Fracture Cohort in Ontario, 1993/94 - 1994/95***

Rehabilitation Group	Acute Care Length of Stay		Rehabilitation Hospital Length of Stay		Percent Rural
	Mean (SD)	Median	Mean (SD)	Median	
Home Care Only	18.7 ± 20.5	13	NA	NA	20%
Rehabilitation Hospital Only	17.1 ± 11.2	14	35.7 ± 28.0	28	4%
Rehabilitation Hospital + Home Care	17.0 ± 12.1	14	34.1 ± 23.2	29	10%

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

Exhibit 8.10: ***Average Number of Nursing and Physiotherapy Visits and Hours of Home-making for Patients Receiving Home Care in Ontario, 1993/94 - 1994/95***

Rehabilitation Group	Mean Nursing Visits (SD)	Mean Physiotherapy Visits (SD)	Mean Home-making Hours (SD)
Home Care Only	5.9 ± 11.8	6.5 ± 5.2	18.4 ± 32.8
Rehabilitation Hospital + Home Care	8.2 ± 14.9	5.8 ± 5.2	23.4 ± 32.2

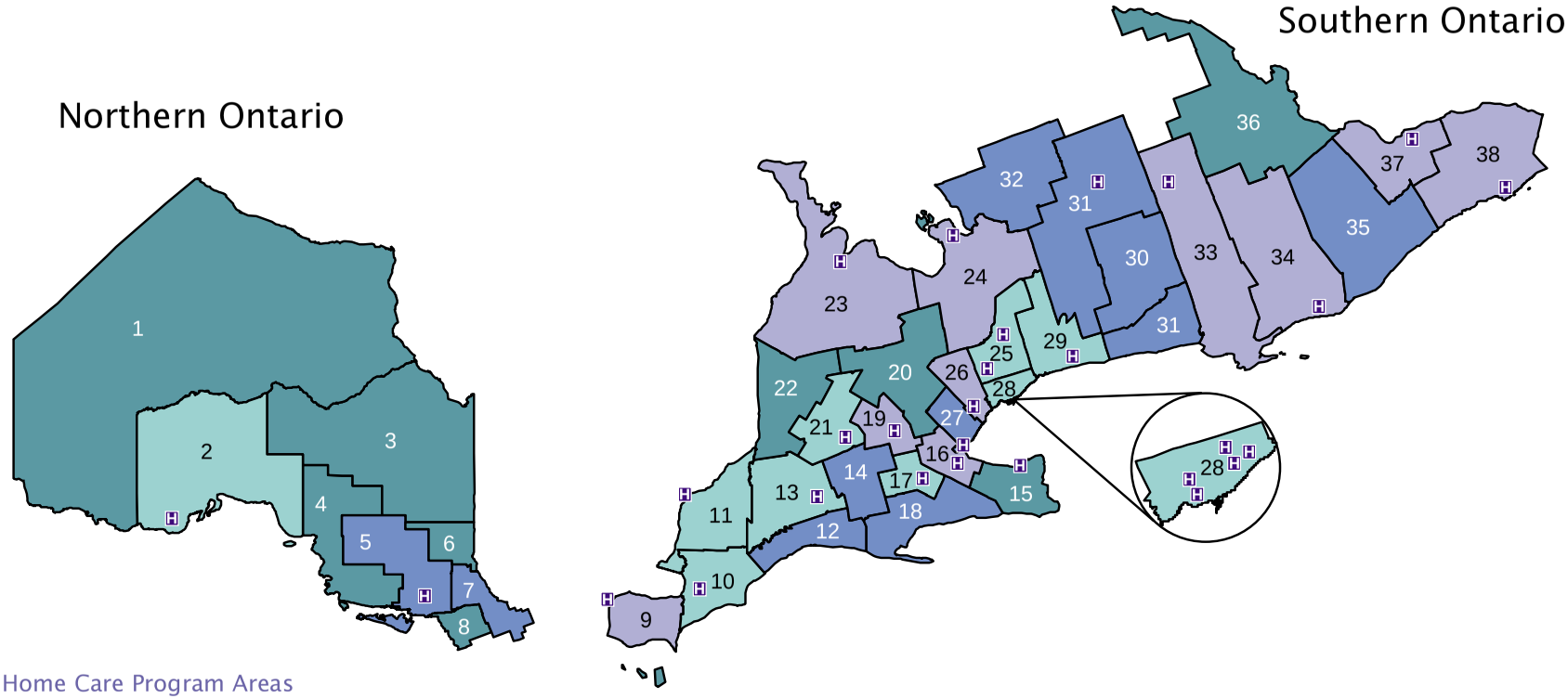
Data Source: Ontario Home Care Administration System

Exhibit 8.11: ***Summary Statistics From Small-area Rate Variation Analysis for Age-standardized Home Care Program Area for Individuals With Hip Fracture Receiving Home Care Only in Ontario, 1993/94 - 1994/95***

Summary Statistic	Value
Extremal Quotient	2.6
Coefficient of Variation	35.0
Age-adjusted Likelihood Ratio Chi Square	3,301.5 p=0.0001

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

Age/Sex-adjusted Proportion of Hip Fracture Patients 50 Years and Over Discharged with Home Care Services only by Home-Care Program Area in Ontario, 1993/94 - 1994/95



Home Care Program Areas

1. North-Western
2. Thunder Bay
3. Porcupine
4. Algoma
5. Sudbury
6. Timiskaming
7. North Bay
8. Parry Sound
9. Windsor-Essex
10. Kent-Chatham
11. Sarnia-Lambton
12. Elgin-St. Thomas
13. Middlesex-London
14. Oxford
15. Niagara Region
16. Hamilton-Wentworth
17. Brant
18. Haldimand-Norfolk
19. Waterloo
20. Wellington-Dufferin, Guelph
21. Perth
22. Huron
23. Grey-Bruce
24. Simcoe County
25. York Region
26. Peel
27. Halton
28. Metropolitan Toronto
29. Durham
30. Peterborough
31. Haliburton, Kawartha
32. Muskoka
33. Hastings-Prince Edward
34. Kingston, Frontenac and Lennox & Addington
35. Leeds, Grenville, Lanark
36. Renfrew
37. Ottawa-Carleton
38. Eastern Ontario

Age/Sex-adjusted Rates per 100,000 Population

98.2 to 100	(9)+
93.0 to 97.8	(10)
67.8 to 90.7	(10)
33.4 to 59.8	(9)
H Rehab Hospital Location	(30)

+Value in brackets is the number of Home Care Programs in each category

Data Source: Ontario Home Care Administration System, Canadian Institute for Health Information

Exhibit 8.12

hospitalization and that most patients require no rehabilitation services.[11,12] However, it is important to study wrist fractures because they serve as an important marker for future fractures. Women who experience wrist fractures have double the expected risk of vertebral and hip fractures.[13] Before age 70, wrist fractures are associated with a high risk of vertebral fracture, and after age 70, they are associated with a high risk of hip fracture.

Vertebral Fractures

Vertebral fractures usually occur spontaneously or as a result of very minimal trauma, such as a cough. Patients with vertebral fracture are usually treated outside hospital settings: thus, accurate records of the incidence, prevalence and costs of this type of fracture are not readily available. Differences in population sampling and the absence of a universally accepted definition of vertebral fracture have led to differences in reported prevalence and incidence rates. Vertebral fractures usually present with back pain (which is often severe), but in many patients the lesions are asymptomatic and may be discovered only incidentally on chest or spine X-ray films.[14]

The risks of pain and loss of physical function increase progressively with the number and severity of vertebral fractures. Pain and reduced physical activity lead to accelerated bone loss and increased risk of subsequent fractures, thereby sending the individual on a downward spiral in physical performance.[15] It is estimated that one-third of vertebral fractures come to medical attention and 2% to 10% necessitate admission to a hospital.[12,16]

Incidence data are now becoming available from large epidemiologic studies such as the European Vertebral Osteoporosis Study (EVOS). In the EVOS, a cross-sectional population-based study, the prevalence of radiographically defined vertebral deformities was about 13% in women 65 to 69 years and 12% in men for the same age group.[17] For younger age groups, vertebral deformities were relatively more common in men than in women, which may be attributed to men's higher rate of traumatic vertebral fractures. At about 65 years of age, this pattern reversed, with a steep increase in prevalence noted in elderly women. Although the true incidence of vertebral fractures is unknown, there is evidence that the rate increases exponentially with age, similar to the rate of incidence for hip fractures. The age-adjusted treated prevalence of clinically ascertained vertebral fractures has been estimated to be between 5.3 and 6.2 per 1,000 persons among white women aged 50 years and over.[14] There is currently a large epidemiological study being conducted in Canada, the Canadian Multi-Centre Osteoporosis Study (CAMOS), which will determine the prevalence and incidence of vertebral fractures in the Canadian population.

Exhibit 8.13: *Comparison of Rehabilitation Services in High and Low Rate Areas in Ontario, 1993/94 - 1994/95*

	Metro Toronto	>90% Home-Care Only
Acute Care Length of Stay		
Mean ± SD	19.0 ± 19.5	18.4 ± 18.7
Median	14	13
Rehabilitation Length of Stay		
Mean ± SD	36.2 ± 24.6	
Median	30	
Charlson Index		
Mean ± SD	0.4 ± 0.8	0.5 ± 0.8

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

Hip Fractures

Unlike the majority of wrist and vertebral fractures, hip fractures invariably require hospitalization and are costly to the health care system because of the need for surgical intervention, lengthy hospital stays and high rates of subsequent institutionalization. Today, early and better operative treatment with early mobilization has reduced the frequency of complications and improved survival. Still, an estimated 18% to 28% of older hip fracture patients die within one year of fracture, and 25% to 75% of those ambulating independently before their fracture can neither walk independently nor achieve their previous level of independent living one year later.[18-22]

The number of hip fractures in Ontario is expected to double by the year 2010, due to an increasing and aging population with longer life expectancy.[23] In 1996, there were 9,382 patients hospitalized for hip fracture in Ontario. Consistent with the findings from other populations in Canada, the United States, Britain and Scandinavia, we found that hip fracture rates in Ontario increase with age and are higher among women.[4,24-28] Each year in Ontario, an increasingly large number of elderly patients present with these injuries.

The exponential increase in hip fractures with aging is due in part to the age-related increase in the risk of falling and the age-related reduction in bone strength.[29] Among post-menopausal women, the likelihood of experiencing one fall per year increases from about 1 in 5 for women aged 60 to 64 years to 1 in 3 for those aged 80 to 84 years. However, only about 1% of all falls lead to hip fracture. Hip fractures are also very common in nursing home residents: one-half of all hip fractures in Ontario occurred in

patients residing in long-term care facilities. This is because medical conditions that increase the risk of falling, such as dementia, stroke and Parkinsonism, are also more common among nursing home residents.

Approximately 6% of patients with hip fractures die in hospital. This low in-hospital mortality rate probably reflects improvements in surgical techniques and in the post-surgical care following hip fracture when compared to earlier periods.

In the United States, hospitalization accounts for 44% of direct health care costs for hip fracture patients.[30] In Sweden, it was estimated that 50% of all health care costs for hip fracture were incurred during the first 18 days, when the patient was on the orthopedic ward. The average cost of care during initial hospitalization for hip fracture is about $7,000 (U.S.) per patient estimated across a number of studies from Europe, the United States, Australia and New Zealand.[31] In the first four months of care, reported costs (including initial costs) are about $12,000 (U.S.).

One obvious way to cut costs may be to reduce the duration of hospitalization. The average duration of hospitalization in the United States is 4.8 days less than in Canada.[32] The health consequences of a shortened hospital stay may be either positive (e.g. encourage early ambulation) or negative, depending on the adequacy of rehabilitation services after discharge. There have been significant changes in discharge destination, with more patients being transferred to rehabilitation hospitals. These changes coincide with a reduction in average length of stay. This may reflect the need for increased fiscal restraint by hospitals, the availability and uptake of home care services and the increase in beds for specialist rehabilitation hospitals. Whether these changes have resulted in improvements in the management of hip fracture patients and decreased cost to the health care system requires investigation. The one consistent finding is that one in six community-dwelling hip fracture patients will be discharged to a nursing home or chronic care facility following hospitalization, resulting in considerable cost to the health care system. In 1998, the cost to the patient for nursing-home care, defined as requiring 1.5 to 3 hours of professional nursing services per day, is $1,252 per month for basic coverage (four patients per room) with dollar-matching by the government, for a minimum yearly cost of $30,048. The costs are higher for semiprivate and private accommodation.

The pressure to reduce acute-care costs means that consideration must be given to alternative strategies of care. One option for hip fracture patients is earlier discharge to rehabilitation hospitals. The small area rate variation analyses indicate that there is considerable regional variation in discharge patterns. Much of this is due to Metro Toronto, where the majority of patients are discharged to rehabilitation hospitals. However, the LOS in acute-care hospitals in Metro Toronto is not different from that of areas of the province that discharge more than 90% of their patients directly home with home care. This is cause for some concern.

The hip fracture patients with the best chance of returning home are those who live with someone, have social contacts and did their own shopping before the fracture.[22,33] Guccione and colleagues[34] demonstrated that independence in bed-to-chair, chair-to-bed and chair-to-standing transfers and independent ambulation with a walker are essential if an elderly person is expected to live at home without 24-hour care. In Ontario, we found that on average the LOS in acute-care hospitals discharging to rehabilitation hospitals was only slightly lower than in those discharging directly home. Hospitals that do not have the opportunity to discharge patients to a rehabilitation setting may perhaps have more aggressive in-hospital rehabilitation programs in order to keep LOS at a minimum; whereas hospitals that do discharge to a rehabilitation hospital do not try so hard to get patients to achieve these functional milestones because they know the patients still have 24-hour care available to them after discharge. These data suggest that the acute-care hospitals that discharge to rehabilitation hospitals need to offer more aggressive management during the acute phase. A more perplexing finding is that more than one-half of the patients who experienced a lengthy rehabilitation hospital stay (34 days or more) required nursing and homemaking services that on average exceed those received by patients discharged directly home. It should be noted that these patients do not have more comorbidities than the home care only group, yet their recovery appears to be slower. This begs the question as to whether the rehabilitation hospital is the most appropriate setting for hip fracture patients, or whether our measurement of comorbidity is not sensitive enough to detect differences between the groups.

Our findings imply that discharge destination after hip fracture surgery, whether it be rehabilitation hospital or home care, was driven by the availability and accessibility to rehabilitation hospitals in certain areas of the province. When the data were examined by hospital, there was also variation between the hospitals within Metro Toronto. This suggests that hospital practice was an important determinant in the use of rehabilitation hospitals. In addition, the paucity of information about the effectiveness of rehabilitation settings may cause variation in access and utilization across acute-care hospitals that have access to rehabilitation hospitals.

A comparison of the different types of utilization indicates that acute care hospital costs account for the largest portion of medical care costs for patients with hip fractures. For example, the average length of hospital stay was 19 days for patients receiving subsequent rehabilitation,

$994 for the cost of home care only (based on service costs from the Metropolitan Toronto Home Care Program: $60 for physiotherapy, $40 for nursing, $20 for homemaking x average number of services in Exhibit 8.10) or 36 days in a rehabilitation hospital. For those receiving both a rehabilitation hospital stay and home care, it was an average 34-day stay plus $1,144 in home care services.

A report from the Health Services Restructuring Commission[35] states that, "it is apparent that some rehabilitation programs (i.e. musculoskeletal) are 'over-subscribed' in certain regions." It also states that, "the provision of rehabilitation services in Ontario has been plagued by problems including service fragmentation, lack of cost control and inequitable access to these services." Our data concur with the above statements. We demonstrated that institutional practice rather than clinical appropriateness most likely determines whether patients are discharged with home care services or to a rehabilitation hospital following hip fracture. A closer examination of patients receiving rehabilitation services is needed, given the cost implications of the rehabilitation options. The following are some questions that need to be addressed: How do patients discharged to home care only, to a rehabilitation hospital only or to both differ with respect to medical status and physical function? What criteria are used for discharging patients from acute care? Why do acute-care hospitals that have the option of discharging patients to a rehabilitation hospital not have a shorter length of stay? Why do more than half of the patients discharged from a rehabilitation hospital require more home care services than those discharged directly home? Is there an underutilization of services by those discharged to home care, or an overutilization of services by those discharged to a rehabilitation hospital? Despite such possible profound impacts, the effectiveness of different rehabilitation options for restoring function and preventing long-term nursing home placement is not known. Is there a difference in outcome (recovery of physical function) among the three patient groups, and how is this balanced against the increased cost of care in a rehabilitation hospital? What constitutes an appropriate discharge to Home Care or to a rehabilitation hospital?

The cardinal principle of geriatric orthopedics is to return the patient's physical functioning capabilities, since in the elderly loss of function means loss of independence.[36] Assessments of alternative delivery systems are an important part of the efforts to improve access to health services and to control costs. This has been recently emphasized by the National Forum on Health, which stated that "home care should be considered an integral part of publicly-funded health services and incentives should be geared to ensuring that people are treated in the most appropriate, cost-effective setting, taking into account total public and private costs."[37] However, before system redesign can be developed and implemented, studies that evaluate patient outcomes and alternative or integrated delivery methods are necessary.

Traditionally, rehabilitation occurred within the setting of the orthopedic ward to which the patient was originally admitted. One approach to this problem has been the proposed development of an orthopedic/geriatric rehabilitation ward. A multidisciplinary team would be organized, but a separate orthogeriatric unit would not be developed. Conventional care for those patients likely to return home usually involved a transfer to a rehabilitation ward. Another approach to this problem has been the development of early discharge programs with rehabilitation care provided in the home.[38-40] The patient's own home could be an ideal place for rehabilitation; better than the hospital environment, which might discourage independent thought or action in any patient, especially the elderly.[39] Rehabilitation would include a rapid return to the home, together with flexible support services ranging from hospital-level nursing initially to an intensive home-help service. This support could then adapt to the individual patient's return to normal function.

In England, in an attempt to reduce both hospital and long-term care, a "hospital at home" (HAH) program has been developed that provides nursing, rehabilitation and social services in the patient's home. Between 1986 and 1989, 284 patients with hip fractures were eligible for the program, while 126 who lived outside the catchment area formed the comparison group.[41] In terms of physical function and independence, 47% of patients in the early scheme returned to their original level of functioning, compared to 28% in the usual care group. Of the 284 eligible patients, 171 were discharged using the HAH scheme, and the average length of stay was 8.2 days.[41] There were considerable cost savings (43%) for those enrolled under the scheme over the 3-year period compared to those who had usual care. A more recent cost analysis of patients enrolled until December 1991 (n=1,104) reported that the total direct cost to the health system was significantly less for those with access to early discharge than for those in usual care ($4,884 vs. $5,606).[42]

Currently, a randomized trial is being conducted to answer whether a program of early discharge for home rehabilitation can: 1) increase the speed and success with which patients return to their prefracture functional status relative to current practice, and 2) reduce total cost to both the health system and to patients and their families in Toronto.

Finally, while more cost-effective treatment and rehabilitation offer modest hope of curtailing the rise in cost, any substantial reduction in the burden of hip fracture depends on prevention. Reducing the frequency and severity of falls, as well as reducing osteoporotic risk factors,

is an important component of any fracture prevention program.

Conclusion

The process of aging and the longer life expectancy of women compared to men have produced dramatic changes in the age and sex distribution of the Canadian population. Unprecedented growth in the number of persons over the age of 65 is projected to occur in the future.[43] In 1991, 12% of Canada's population was 65 years or over: this will increase to 15% in 2011 and to 25% by the year 2036. As the population ages, musculoskeletal injuries, especially those due to osteoporosis, will increase. Therefore, as the "baby boom" generation reaches 65 years and beyond, even more dramatic increases in the numbers of hip fractures can be expected. Patient age has a major impact on length of stay. Older patients tend to stay longer, most likely because with increased age comes increased morbidity. The doubling of the number of hip fractures coupled with longer hospital stays for patients over the age of 70 (the age group in which 75% of hip fractures occur) will more than double the costs of caring for these patients by the year 2010. Papadimitropoulos and colleagues recently estimated that the annual number of hip fractures in Canada will quadruple by the year 2041 to 88,124.[44]

Given these projections, a population-based strategy to reduce the burden of osteoporotic fractures is needed. Before this can be successfully undertaken, an accurate assessment of the risk of osteoporotic fractures and their impact on quality of life is essential if appropriate interventions are to be designed for different populations. For the general population, we need to develop and evaluate the most cost-effective strategies for primary prevention. Many potential risk factors for hip fracture have been identified, some of which are modifiable. Those that are modifiable can be grouped as factors that affect bone mineral density, risk of trauma and fall mechanics. The factors that are not modifiable may be useful for identifying patients at highest risk for fracture, those who might be good candidates for preventive strategies.[45] However, most of the data are derived from women; there have been few studies of hip fracture in men. A recent study by Grisso and colleagues[46] reported that factors thought to affect bone density as well as factors identified as risk factors for fall were important determinants of the risk of hip fracture in men. These include low body mass index, smoking, alcohol use, lack of physical activity, poor lower limb function (difficulty walking, getting out of a chair or climbing stairs), use of psychotropic drugs and history of stroke.[46,47] Finally, there needs to be more research on determining the outcomes and costs associated with interventions aimed at reducing these risk factors.

There is also a large number of people who are unaware that they have osteoporosis. For this high-risk group we need to conduct studies to increase case-finding to improve early detection and, hence, reduction of subsequent fractures. Emphasis should be placed on returning those who succumb to fracture to the community, retaining their independence and preventing institutionalization. In addition, finding caregivers for elderly relatives will become a more pressing problem because many of today's families are smaller and family members are dispersed geographically. Thus, additional institutional facilities as well as new approaches to care may be required in the future.

References

1. Consensus Development Conference: Diagnosis, prophylaxis and treatment of osteoporosis [editorial]. *Am J Med* 1993; 94: 646-650.
2. Owen RA, Melton LJ III, Johnson KA et al. Incidence of Colles' fracture in a North American community. *Am J Public Health* 1982; 72: 605-607.
3. Melton LJ III, Ilstrup DM, Riggs BL et al. Fifty-year trend in hip fracture incidence. *Clin Orthop* 1982; 162: 144-149.
4. Lewis AF. Fracture of the neck of the femur: Changing incidence. *Br Med J* 1981; 283: 1217-1220.
5. Farmer ME, White LR, Brody JA, Bailey KR. Race and sex differences in hip fracture incidence. *Am J Public Health* 1984; 74: 1374-1380.
6. Melton LJ III, Chrischilles EA, Cooper C et al. How many women have osteoporosis? *J Bone Min Res* 1992; 7: 1005-1010.
7. Goeree R, O'Brien B, Pettitt D et al. An assessment of the burden of illness due to osteoporosis in Canada. *J Soc Obstet Gynaecol Can* 1996; 18 (Suppl July): 15-24.
8. Greendale GA, Barrett-Connor E, Ingles S et al. Late physical activity and functional effects of osteoporotic fracture: The Rancho Bernardo Study. *J Am Geriatr Soc* 1995; 43: 955-961.
9. Slogaard S, Petersen VS. Epidemiology of distal radius fractures. *Acta Orthop Scand* 1985; 56: 391-393.
10. Melton LJ III, Cummings SR. Heterogeneity of age-related fractures: Implications for epidemiology. *Bone* 1987; 2: 321-331.
11. Garraway WM, Stauffer RN, Kurland LT et al. I. Limb fractures in a defined population; II. Orthopaedic treatment and utilisation of health care. *Mayo Clin Proc* 1979; 54: 708-713.

12. Chrischilles EA, Shireman T, Wallace R. Costs and health effects of osteoporotic fractures. *Bone* 1994; 15: 377-386.

13. Eastell R. Forearm fracture. *Bone* 1996; 18(3 Suppl) 203S-207S.

14. Cooper C, Atkinson EJ, O'Fallon WM et al. Incidence of clinically diagnosed vertebral fractures: A population-based study in Rochester, Minnesota, 1985-1989. *J Bone Min Res* 1992; 7: 221-227.

15. Ross PD, Davis JW, Epstein RS et al. Pain and disability associated with new vertebral fractures and other spinal conditions. *J Clin Epidemiol* 1994; 47: 231-239.

16. Cooper C, Melton LJ III. Vertebral fractures, how large is the silent epidemic? *Br Med J* 1992; 304: 793-794.

17. O'Neill TW, Felsenberg D, Varlow J et al. The prevalence of vertebral deformity in European men and women: The European Vertebral Osteoporosis Study. *J Bone Miner Res* 1996; 11: 1010-1018.

18. Koval KJ, Zuckerman JD. Functional recovery after fracture of the hip. *J Bone Jt Surg* 1994; 76-A: 751-758.

19. Marottoli RA, Berkman LF, Cooney LM. Decline in physical function following hip fracture. *J Am Geriatr Soc* 1992; 40: 861-866.

20. Mossey JM, Mutran E, Knott K et al. Determinants of recovery 12 months after hip fracture: The importance of psychosocial factors. *Am J Public Hlth* 1989; 72: 279-286.

21. Magaziner J, Simonsick E, Kashner TM et al. Survival experience of aged hip fracture patients. *Am J Public Health* 1989; 79: 274-278.

22. Borgquist L, Ceder L, Thorngren K. Function and social status 10 years after hip fracture. *Acta Orthop Scand* 1990; 61: 404-410.

23. Jaglal SB, Sherry PG, Schatzker J. The impact of hip fracture in Ontario and its consequences. *Can J Surg* 1996; 2: 105-111.

24. Ray WA, Griffin MR, West R et al. Incidence of hip fracture in Saskatchewan, Canada, 1976-1985. *Am J Epidemiol* 1990; 131: 502-509.

25. Kellie SE, Brody JA. Sex-specific and race-specific hip fracture rates. *Am J Public Health* 1990; 80: 326-328.

26. Rodriguez JG, Sattin RW, Waxweiler RJ. Incidence of hip fracture, United States, 1970-1983. *Am J Prev Med* 1989; 5: 175-181.

27. Boyce WJ, Vessey MP. Rising incidence of fracture of the proximal femur. *Lancet* 1985; 1(8421): 150-151.

28. Gullberg B, Duppe H, Nilsson B et al. Incidence of hip fractures in Malmö, Sweden (1950-1991). *Bone* 1993; 14: S23-S29.

29. Melton LJ III. Hip fractures: A worldwide problem today and tomorrow. *Bone* 1993; 14: S1-S8.

30. Barrett-Connor E. The economic and human costs of osteoporotic fracture. *Am J Med* 1995; 98 (Suppl 2A): 3S-8S.

31. Johnell O. The socioeconomic burden of fractures: Today and in the 21st century. *Am J Med* 1997; 103 (Suppl 2A): 20S-26S.

32. Inglehart JK. The American health-care system: Community hospitals. *N Engl J Med* 1993; 329: 372-376.

33. Ceder L, Thorngren KG, Wallden B. Prognostic indicators and early home rehabilitation in elderly patients with hip fracture. *Clin Orthop* 1980; 152: 173-184.

34. Guccione AA, Fagerson TL, Anderson JJ. Regaining functional independence in the acute care setting following hip fracture. *Physical Therapy* 1996; 76: 818-826.

35. Health Services Restructuring Commission. *Rebuilding Ontario's Health System: Home Care, Long Term Care, Mental Health, Rehabilitation, Sub-acute Care: A Discussion Paper.* July 1997: 58-67.

36. Devas MB, Irvine RE. The geriatric orthopaedic unit. *Brit J Geriatric Prac* 1969; 6: 19-25.

37. National Forum on Health. *Canada Health Action: Building on the Legacy.* Final report. 1997; 1: 21-22.

38. Ceder L, Stromqvist B, Hansson LI. Effects of strategy changes in the treatment of femoral neck fractures during a 17 year period. *Clin Orthop* 1987; 218: 53-57.

39. Pryor GA, Williams DR, Myles JW et al. Team management of the elderly patient with hip fracture. *Lancet* 1988; 1(8582): 401-403.

40. Sikorski JM, Davis NJ, Senior J. The rapid transit system for patients with fractures of the proximal femur. *BMJ* 1985; 1: 439-443.

41. Parker MJ, Pryor GA, Myles JW. Early discharge after hip fracture. *Orthop Scand* 1991; 62: 563-566.

42. Hollingworth W, Todd C, Parker M et al. Cost analysis of early discharge after hip fracture. *Brit Med J* 1993; 306: 903-906.

43. McKie C. Canadian social trends. In Statistics Canada. *Catalogue 11-008E.* Ottawa: Summer 1993.

44. Papadimitropoulos EA, Coyte PC, Josse RG et al. Current and projected rates of hip fracture in Canada. *Can Med Assoc J* 1997; 157: 1357-1363.

45. Slemenda C. Prevention of hip fractures: Risk factor modification. *Am J Med* 1997; 103 (Suppl 2A): 65S-73S.

46. Grisso J, Kelsey JL, O'Brien LA et al. Risk factors for hip fracture in men. *Am J Epidemiol* 1997; 145: 786-796.

47. Liu B, Anderson G, Mittmann N, To T, Axcell T, Shear N. Use of selective serotonin-reuptake inhibitors of tricyclic antidepressants and risk of hip fractures in elderly people. *Lancet* 1998; 351(9112): 1303-1307

48. Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol* 1992; 45(6): 613-619.

APPENDIX A8.1

Hospital discharge data and OHIP claims data were used for the analyses of osteoporotic fractures in Ontario. The hospital discharge data were collected by the Canadian Institute for Health Information (CIHI), which collates hospital discharge data in Ontario. These data include the admission date, most responsible diagnosis (defined as the diagnosis most responsible for admission), secondary diagnoses, procedures performed during inpatient stay, whether or not the patient had been transferred from another acute-care facility, age, sex, length of hospital stay, discharge destination and in-hospital mortality. Patient data were obtained for the fiscal years 1985/86 through 1996/97. The fiscal year is defined as the period extending from April 1 of the identified year to March 31 of the following year. Thus, the analyses extend to March 31, 1997.

Wrist Fractures

OHIP claims data for fiscal year 1996/97 were used to obtain estimates of both hospitalized and non-hospitalized patients treated for wrist fractures. Unlike vertebral fractures, there are specific billing codes that are used for treatment of wrist fractures. These include F028 (closed reduction of wrist), F027 (no reduction of wrist) and F030 (open reduction of wrist). We also examined CIHI data to determine the proportion of patients hospitalized for wrist fractures.

Vertebral Fractures

CIHI data were also used to estimate the incidence of vertebral fractures in persons aged 50 years and over. The ICD-9 diagnosis code for vertebral fractures is 805. The major limitation of using this data source is that the vast majority of vertebral fracture patients are not hospitalized and, therefore, the rates presented are an underestimate of the true incidence.

Hip Fractures

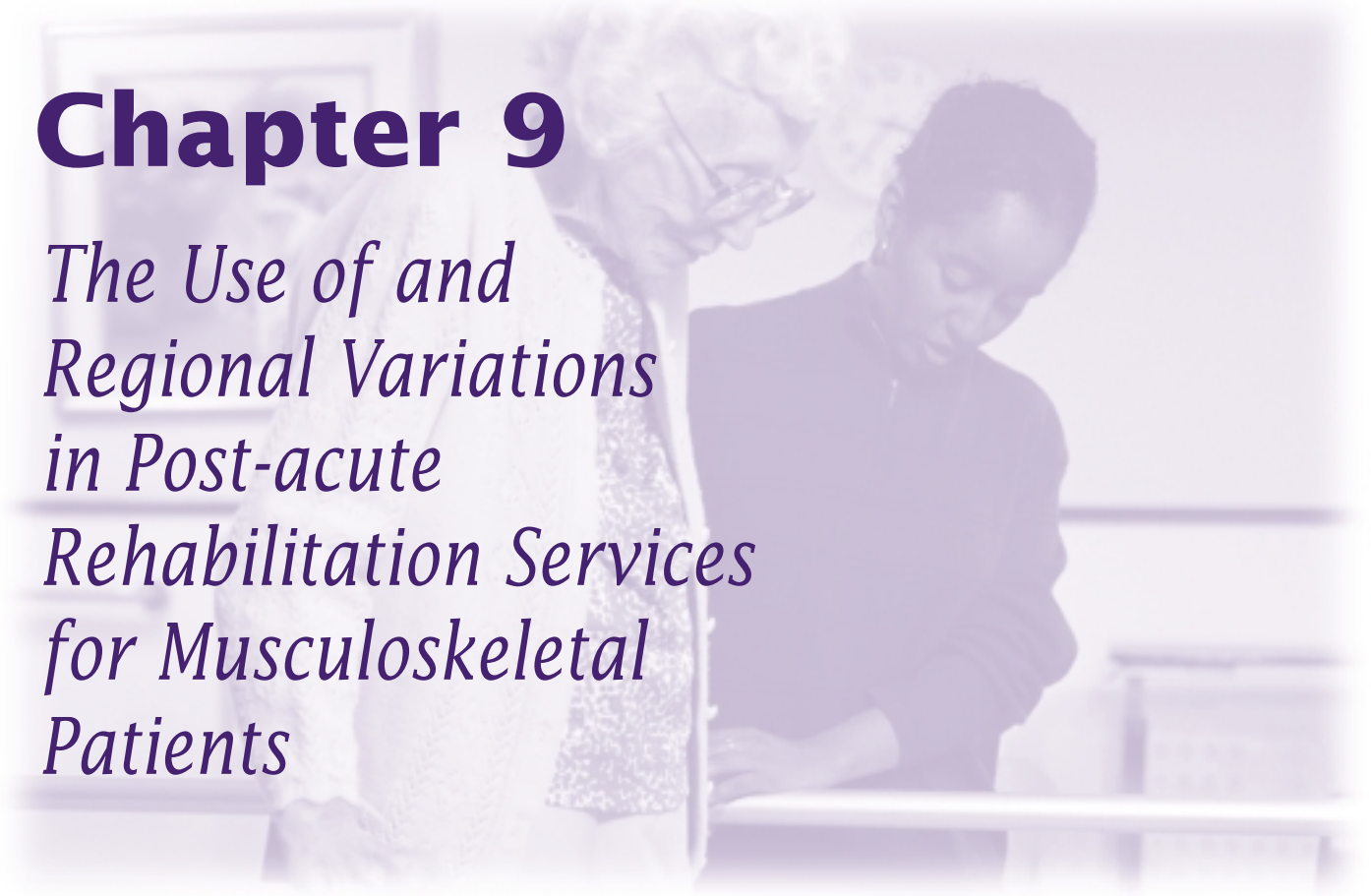
A case was defined as a person aged 50 years and over, hospitalized between the fiscal years 1985/86 and 1996/97, with a discharge diagnosis of fracture of the neck of the femur (hip fracture). Hip fracture was defined according to the International Classification of Diseases (ICD), 9th Revision, category 820 and includes transcervical fractures (820.0, 820.1), pertrochanteric fractures (820.2, 820.3) and fractures of an unspecified part of the neck of the femur (820.8, 820.9).

The following data sources were used to examine use of rehabilitation and other services following discharge from acute-care hospitals: CIHI for acute care and rehabilitation hospitalization information; and the Ontario Home Care Administration System (OHCAS) database for use of outpatient nursing, physiotherapy and homemaking services. All patients who had a discharge diagnosis of hip fracture in the fiscal years 1993/94 and 1994/95 were identified. Non-Ontario residents, people less than 50 years old, people who died in hospital, and people with missing sex codes, invalid health care numbers or neoplasm diagnosis (ICD-9 codes 140.0 to 239.9 in any diagnosis field) were deleted from the cohort. Records were also deleted for those not in the Major Clinical Category of Diseases and Disorders of the Musculoskeletal System and Connective Tissue System. The Major Clinical Category is a grouping variable added by CIHI based on an age, diagnosis and procedure algorithm. The hip fracture cohort was linked to the rehabilitation hospital database in the CIHI and the OHCAS database using a unique identifier. The acute care institutional transfers were kept together as one separation event providing the transfer occurred within one day of discharge. All patients not discharged to a rehabilitation hospital or not receiving services from the provincial Home Care Program (i.e. unlinked) were excluded from the analyses. The majority of those excluded are in long-term care institutions.

Hip fracture patients receiving rehabilitation services were divided into three groups based on the type of service received. Patients were discharged to: 1) home with home care only, 2) rehabilitation hospital only or 3) rehabilitation hospital followed by home care.

The secondary diagnoses listed were used to create a comorbidity index similar to the one proposed by Charlson.[48] The conditions and their associated weights (in parentheses) used to create this index were: peripheral vascular disease (1), dementia (1), chronic liver disease/cirrhosis (1), pre-existing peptic ulcer disease (1), diabetes mellitus without end organ damage (2), pre-existing renal failure (2), leukemia, lymphoma or solid cancer (2), liver disease with sequelae (3) and metastatic or multiple cancers (6). The index is a summation of these weights and can predict in-hospital mortality. We also summed the number of co-morbid conditions to provide another measure of comorbidity.

Total in CIHI	Exclusions					Total Events
	Not MCC 08	Acute Transfers	Deaths	Other Deletes	Unlinked	
18,687	184	732	1,052	961	5,596	10,162



Chapter 9

The Use of and Regional Variations in Post-acute Rehabilitation Services for Musculoskeletal Patients

Overview

Musculoskeletal conditions affect a significant proportion of the population,[1] and their prevalence increases with age.[2] These conditions are a leading cause of disability[3,4] and represent a significant economic burden to society.[5-9] The aging of the Canadian population[10] and restructuring of the health care system,[11] are likely to result in increasing demands for the funding, organization and delivery of services to Canadians with musculoskeletal conditions.

Health care systems in all jurisdictions are undergoing tremendous change, with a decreasing emphasis on institutional care that has taken the form of fewer inpatient admissions, shorter inpatient stays and the substitution of day surgery for inpatient care.[12] These changes to patterns of practice have contributed to altered discharge destinations, with more patients being discharged to rehabilitation hospitals or directly home, with or without home care services.[13] Along with the reductions to the institutional sector, there has been a dramatic increase in expenditures on community-based care, particularly home care services.[14-16] While there are many reasons for this increase, including technological change and the aging and increased longevity of the population, a key motivating factor has been the belief that significant cost savings in the public sector may be realized by redirecting care away from acute care institutions toward the community.[17-19]

In Ontario, the publicly-funded home care program has encompassed an array of agencies and professionals who provide a complex range of health and lifestyle-enhancement services to a variety of clients.[14,20] Prior to January 1996, there were 38 Home Care Programs responsible for ensuring the provision of these services, through a mix of for-profit and not-for-profit organizations. Since then, organizational reforms to Home Care Programs have resulted in the creation of 43 Community Care Access Centres responsible for negotiating, selecting, approving and evaluating contractual arrangements with home care providers.[21] The range of services is large and includes nursing, social work, physiotherapy, occupational therapy, speech language pathology, audiology and home making. While most clients receive these services to prevent or retard the deterioration of health and to assist them to maintain their independence in the community, some receive a more specialized variety of rehabilitation services following an acute-care hospitalization.

In restructuring the health system, managers, providers and policy-makers have been frustrated by the lack of important population-based information concerning post-acute rehabilitation services, such as the indications for referral, the methods used to assess eligibility, and the attitudes and beliefs concerning the management of patients. Efforts have been made to identify, measure and assess regional variations in the provision of specific musculoskeletal surgical events, such

as knee replacement surgery.[22-25] The purpose of the work reported in this chapter was to gather population-based information concerning the use of and regional variations in post-acute rehabilitation services for musculoskeletal patients. Here, we extend our analysis by examining the intensity of use and the propensity to use of several distinct categories of home care services available to specific types of musculoskeletal patients in Ontario.[16]

Data Source and Methods

We started with the Discharge Abstract Data for Ontario hospitals for the fiscal years 1993/94 and 1994/95, which we obtained from the Canadian Institute for Health Information (CIHI). In the CIHI database, the most responsible diagnosis for each separation is assigned to a Case Mix Group®, and the Case Mix Groups® are further classified into 25 Major Clinical Categories.[26,27] For purposes of this study, we regrouped the most responsible diagnoses in the Musculoskeletal group into five categories: Joint Replacement (total hip or total knee replacement), Fracture, Arthritis and Rheumatism, Other Surgical Procedure (musculoskeletal surgical procedures other than total joint replacements and repair of fractures), and Other Medical Condition (musculoskeletal conditions other than arthritis and rheumatism). Specific information about the selection and classification of cases can be found in Appendix A9.1. Patients were excluded if they did not live in Ontario, had invalid residence codes, were less than 20 years of age, had a diagnosis of cancer included in the discharge abstract, or were missing the unique identifying number. Since our interest was in post-acute rehabilitation services, we also excluded patients who had died in hospital, had been transferred to another acute-care facility, or had been discharged to a nursing home, home for the aged, chronic care institution, psychiatric hospital or other long-term care facility.

The discharge destinations for the patients were classified as follows: rehabilitation hospital followed by home without home care; rehabilitation hospital followed by home with home care; directly home with home care; and, directly home without home care (i.e. with only self-care or informal care). The data do not include rehabilitation services received outside the home care program through outpatient clinics or private services.

To identify which patients received home care services, we used a unique identifier to link all hospital separations to the Ontario Home Care Administration System database, and classified individuals who had received home care services within 30 days of their final discharge date as recipients. Some home care services were not captured in this database, the most notable omission for our purposes being those provided by The Arthritis Society's Consultation and Rehabilitation Service, which is funded by the Long Term Care Division of the Ontario Ministry of Health. The absence of these data results in an underestimate of home care utilization rates for musculoskeletal patients.

To assess the intensity and mix of home care services, we reviewed all encounters for each recipient and excluded any visits that occurred more than 90 days after the first encounter. Utilization initiated beyond 30 days from hospital discharge or extending beyond 90 days from the first service date is unlikely to be related to the musculoskeletal admissions,[18,28] although it may reflect a disease process that is a proximate cause for continued use of services.

Our assessment of the mix of services received by clients was restricted to the three largest home care service categories: nursing visits, physiotherapy and occupational therapy visits (hereafter referred to as rehabilitation therapy visits), and home-making hours; and to a miscellaneous category of "other professional visits" (i.e. social work, speech language and pathology). The variations in the use of post-acute rehabilitation services has four components: the number of individuals discharged from hospital; the rate for receiving any home care services; the propensity of home care participants to use specific services; and the intensity of the services provided. We defined post-acute home care utilization rates as the number of separations where home care services were received within 30 days of the final discharge date, divided by the total number of separations (irrespective of where these separations took place). We determined these rates for each of the five clinical categories and for all categories combined, as well as for all residents of a defined geographic area. In addition, we computed rates per 100 separations for the recipients of each of the 38 regional Home Care Programs. For each musculoskeletal clinical category, we analyzed the regional variations in these rates. Direct standardization was used to adjust post-acute home care (PAHC) rates to account for regional differences in the age and sex composition of patients discharged from hospital. We defined the propensity of use as the percentage of home care clients who received one or more services from each service category. Intensity is defined as the mean number of specific services received by home care clients.

Patients assigned to each of the four discharge destinations (rehabilitation hospital and subsequently home with or without home care, and directly home with or without home care) and to each of the five musculoskeletal clinical categories (Joint Replacement; Fracture; Arthritis and Rheumatism; Other Surgical Procedure and Other Medical Condition) were compared with respect to age, gender, hospital teaching status, acute and rehabilitation length of stay, urban/rural residence and comorbidity during hospitalization. To assess comorbidity, we adapted the Charlson index,[29] which is based on the ICD-9 diagnostic codes and CCP procedure codes in the hospital record.[30,31]

To describe the variations in post-acute rehabilitation care rates across the regions served by the home care programs, we used three standard statistics: the extremal quotient, the coefficient

of variation, and the systematic component of variation. The Chi-square test was used to determine the statistical significance of the regional variations. Adjustments were made to the tests for multiple comparisons. The statistics are discussed in the Appendix A9.1.

Findings

Of the 207,419 musculoskeletal hospitalizations that occurred over the study period (1993/94-1994/95), the application of various case eligibility criteria resulted in the exclusion of 40,619 cases, and the application of criteria based on discharge destination and inpatient death further narrowed the analysis set to 153,432.

Discharge Strategies

Exhibit 9.1 reports the distribution of Musculoskeletal hospitalizations by clinical category and by discharge destination over the study period. The most frequent clinical category was Fracture (27.1%), followed by: Other Surgical Procedure (24.5%), Arthritis and Rheumatism (19.2%), Joint Replacement (15.7%) and Other Medical Condition (13.5%). While there was a 1% decline in the total number of Musculoskeletal hospitalizations between 1993/94 (77,064) and 1994/95 (76,368), there was an 8.8% increase in the number of Joint Replacement hospitalizations. However, this increase did not alter the relative ranking of the five clinical categories.

Exhibit 9.1 demonstrates that there were substantial differences in post-acute rehabilitation between patients in each of the five clinical categories: Forty-one percent of Joint Replacement patients were discharged directly home

Exhibit 9.1: *Musculoskeletal Hospitalizations by Clinical Category and by Discharge Destination in Ontario, 1993/94 - 1994/95*

Clinical Category of Hospitalization	Discharge Destination				
	Rehabilitation Hospital		Home		All
	Without Home Care	With Home Care	Without Home Care	With Home Care	
Joint Replacement	5,053	1,939	7,190	9,899	24,081
Fracture	2,070	1,998	25,692	11,793	41,553
Arthritis and Rheumatism	376	244	23,926	5,001	29,547
Other Surgical	307	282	32,833	4,146	37,568
Other Medical	129	91	16,882	3,581	20,683
Total	**7,935**	**4,554**	**106,523**	**39,420**	**153,432**

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

Exhibit 9.2: *Characteristics of Musculoskeletal Patients by Clinical Category in Ontario, 1993/94 - 1994/95*

Patient Characteristic	Clinical Category of Hospitalization						
	Joint Replacement	Fracture	Arthritis and Rheumatism	Other Surgical	Other Medical	All	Chi-Square
Female (%)	59.1	58.7	54.1	49.0	53.6	54.8	P<0.001
Mean Age (Years)	68.1	59.1	53.0	47.9	54.9	56.0	P<0.001
Some Comorbidity (%)	19.2	17.3	30.4	8.0	16.7	17.8	P<0.001
Teaching Hospital (%)	36.1	26.7	33.3	38.0	15.6	30.7	P<0.001
Mean Acute Length of Stay (Days)	11.3	11.5	6.3	4.8	6.6	8.2	P<0.001
Mean Rehabilitation Length of Stay (Days)	21.4	38.1	34.1	40.1	31.6	28.5	P<0.001
Rural (%)	21.3	21.1	20.9	18.9	28.0	21.5	P<0.001

Data Source: Canadian Institute for Health Information

Exhibit 9.3: ***Characteristics of Musculoskeletal Patients by Discharge Destination in Ontario, 1993/94 - 1994/95***

Patient Characteristics	Discharge Destination					
	Rehabilitation Hospital		Home			
	Without Home Care	With Home Care	Without Home Care	With Home Care	All	Chi-Square
Female (%)	65.7	76.7	49.1	67.1	54.8	P<0.001
Mean Age	68.8	73.5	50.7	67.3	56.0	P<0.001
Some Comorbidity (%)	20.3	29.4	14.0	27.3	17.8	P<0.001
Teaching Hospital (%)	33.4	34.7	30.3	30.8	30.7	P<0.001
Mean Acute Length of Stay (Days)	13.0	15.7	6.0	12.7	8.2	P<0.001
Mean Rehabilitation Length of Stay (Days)	26.6	31.9	N/A	N/A	28.5	P<0.001
Rural (%)	8.9	13.7	21.8	24.5	21.5	P<0.001

NA - Not Applicable

Data Source: Canadian Institute for Health Information

Exhibit 9.4: ***Regional Variations in Age/Sex-Standardized Post-Acute Home Care Utilization Rates Per 100 Separations by Clinical Category in Ontario, 1993/94-1994/95****

Clinical Category of Hospitalization	Standardized Post-Acute Home Care Utilization Rate (%)	Extremal Quotient	Coefficient of Variation	Systematic Component of Variation
Joint Replacement	49.2	4.5	42.9	146.8
Fracture	33.1	2.1	20.5	32.1
Arthritis and Rheumatism	17.6	2.3	22.4	48.5
Other Surgical	11.8	4.0	33.6	140.5
Other Medical	17.9	3.1	19.3	35.4
All Musculoskeletal Patients	25.3	2.7	26.0	64.9

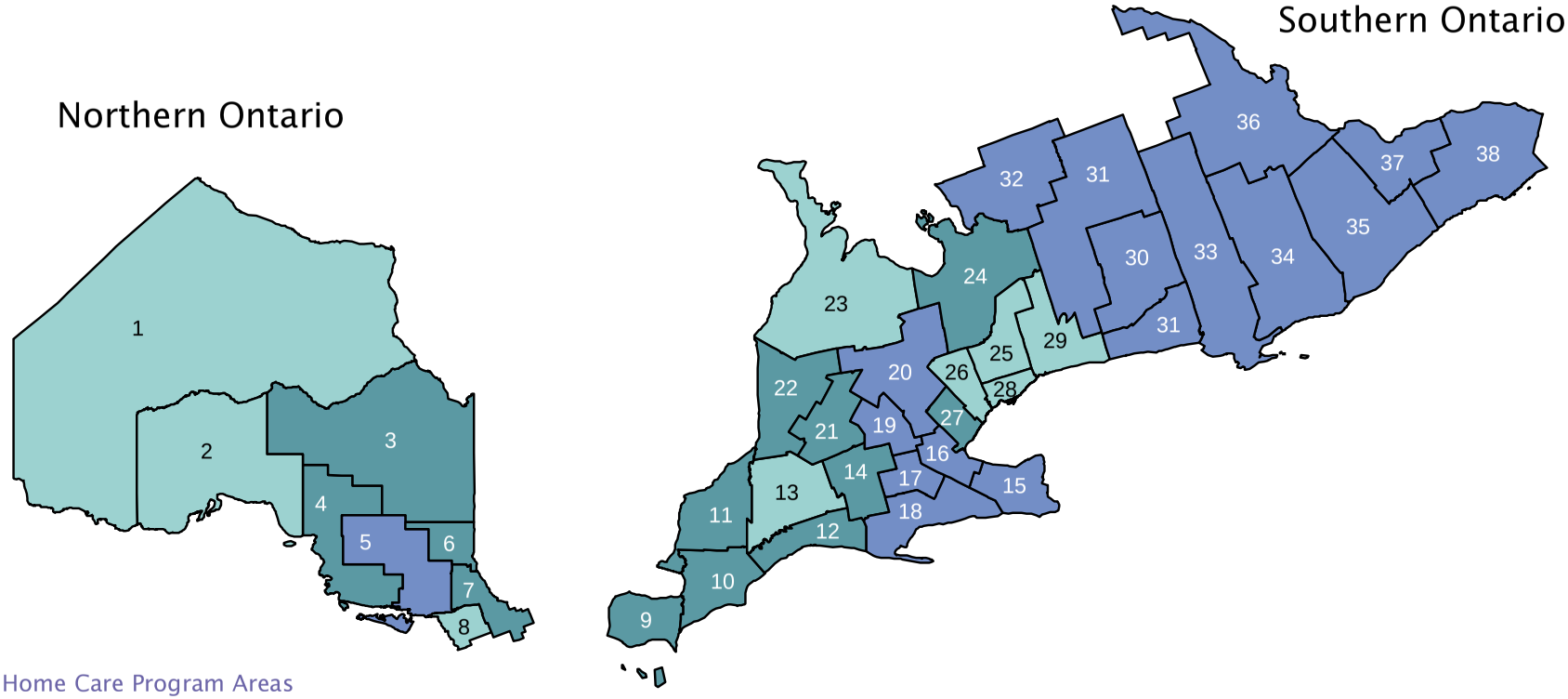
* Utilization and measures of regional variation were based on the 38 Home Care Programs (HCPs).

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

with home care, compared to only 28.4% of Fracture patients, 17.3% of Other Medical Condition patients, 16.9% of Arthritis and Rheumatism patients and 11.0% of Other Surgical Procedure patients. Moreover, 29% of Joint Replacement patients were discharged to a rehabilitation hospital, compared to only 9.8% of Fracture patients, 2.1% of Arthritis and Rheumatism patients, 1.6% of Other Surgical Procedure patients and 1.1% of Other Medical Condition patients. A clear distinction exists in the range of post-acute rehabilitation services available to Joint Replacement and Fracture patients compared to those for the other three groups. For example, only 29.9% of Joint Replacement patients and 61.8% of Fracture patients were discharged without either inpatient rehabilitation or home care services, compared to 83.9% of other Musculoskeletal patients.

For all clinical categories, including Joint Replacement patients, there was an increased probability to dis-

Age/Sex-adjusted Post-Acute Home Care Utilization Rates for All Musculoskeletal Conditions per 100,000 Population 20 Years and Over by Home Care Program Area in Ontario, 1993/94 - 1994/95



Home Care Program Areas

1. North-Western
2. Thunder Bay
3. Porcupine
4. Algoma
5. Sudbury
6. Timiskaming
7. North Bay
8. Parry Sound
9. Windsor-Essex
10. Kent-Chatham
11. Sarnia-Lambton
12. Elgin-St. Thomas
13. Middlesex-London
14. Oxford
15. Niagara Region
16. Hamilton-Wentworth
17. Brant
18. Haldimand-Norfolk
19. Waterloo
20. Wellington-Dufferin, Guelph
21. Perth
22. Huron
23. Grey-Bruce
24. Simcoe County
25. York Region
26. Peel
27. Halton
28. Metropolitan Toronto
29. Durham
30. Peterborough
31. Haliburton, Kawartha
32. Muskoka
33. Hastings-Prince Edward
34. Kingston, Frontenac and Lennox & Addington
35. Leeds, Grenville, Lanark
36. Renfrew
37. Ottawa-Carleton
38. Eastern Ontario

Home Care Utilization Rates per 100,000++

Significantly Lower	(9)+
No Significant Difference	(13)
Significantly Higher	(16)

+Value in brackets is the number of Home Care Programs in each category

++Statistically significant ($p<0.001$) regional variations in home care rates as compared to the overall provincial rate.

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

Exhibit 9.5

charge patients requiring post-acute rehabilitation either to a rehabilitation hospital (up from 7.7% in 1993/94 to 8.6% in 1994/95) or to home with home care services (up from 21.3% in 1993/94 to 23.5% in 1994/95).

Characteristics of Musculoskeletal Patients

Exhibit 9.2 reports significant differences in patient characteristics by clinical category. Patients in the Other Surgical Procedure category were significantly more likely to be young, urban males with a relatively low Charlson comorbidity index, discharged from a teaching hospital with short acute-care stays but with long inpatient rehabilitation stays. In contrast, Joint Replacement patients were more likely to be older females with a relatively high Charlson index exhibiting long acute-care stays and short rehabilitation hospital stays. As expected, one of the main distinguishing characteristics of arthritis and rheumatism patients was their tendency to present with other comorbid conditions: 30.4% of this group had a Charlson index of one or more, compared to only 8.0% of Other Surgical patients and 19.2% of Joint Replacement patients.

Exhibit 9.3 demonstrates that the assignment of home care services was systematically correlated with patient characteristics. Patients who received home care were significantly more likely to be female, older, exhibiting a relatively high Charlson comorbidity index, discharged from a teaching hospital, and to have had a long acute-care stay and a long stay in a rehabilitation hospital. Patients who were discharged directly home without home care were more likely to be men, younger, and with a lower comorbidity score.

Variations in the Propensity to Use Home Care Services

Exhibit 9.4 shows the age/sex-standardized post-acute home care utilization rates per 100 separations over the study period, by clinical and service categories. Overall, 25.3% of all Musculoskeletal patients received home care services following hospitalization, but there were large differences among the five clinical categories. Specifically, these services were received by 49.2% of Joint Replacement patients, compared to only 33.1% of Fracture patients and 15.2% of all other Musculoskeletal patients. Exhibit 9.4 also reports three summary measures of regional variations in these utilization rates: the extremal quotient,[32] the weighted coefficient of variation[32-37] and the systematic component of variation.[38] These measures were applied to the five clinical categories, over the study period and across the 38 Home Care Programs. Irrespective of the summary measure used, the results consistently demonstrate that moderate to substantial regional variation persists even after age/sex-standardization.

For each clinical category, post-acute home care utilization rates varied substantially across the province. In the case of Joint Replacement patients, the extremal quotient, which measures the ratio of the Home Care Program with the highest rate (Kingston/Frontenac/Lennox/Addington at 94.6 per 100 separations) to that with the lowest rate (Metropolitan Toronto at 21.4), was 4.5. This indicates a more than fourfold difference in post-acute home care utilization rates between extremal regions, even after adjusting for the age-sex composition of the population and after pooling two years of utilization data. Moreover, these extremal rates deviated significantly ($p<0.001$) from the provincial rate of 49.2. While regional variations in rates were not as high for Fracture and Arthritis and Rheumatism patients, the extremal quotients reported for these two groups still show a twofold difference between extremal regions.

Overall, there was wide regional variation in age-sex standardized post-acute home care utilization rates for all Musculoskeletal patients (ranging from 17.0% in Metropolitan Toronto to 46.3% in Kingston/Frontenac/Lennox/Addington). Chi-square tests were employed to assign each Home Care Program to one of three mutually exclusive categories for all Musculoskeletal disorders based on their standardized utilization rate over the study period relative to that for the province as a whole, as shown in Exhibit 9.5. Of the 38 Home Care Programs, 16 were significantly above the provincial average of 25.3% for the study period, and nine were significantly below. The remaining 13 Programs did not differ significantly from the provincial average.

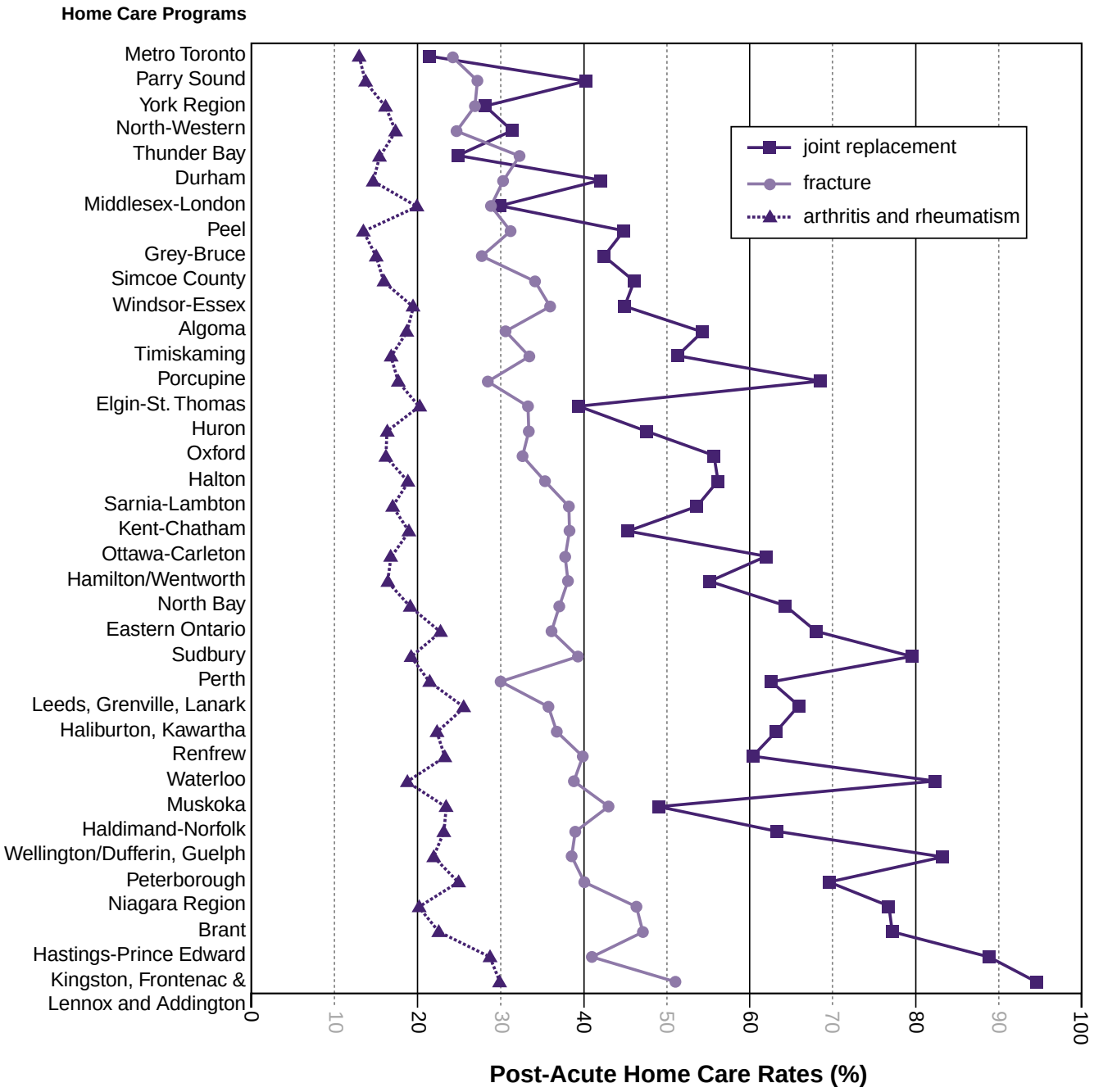
Exhibit 9.6 reports standardized post-acute home care utilization rates for Joint Replacement, Fracture, and Arthritis and Rheumatism patients in ascending order for the 38 Home Care Programs based on the overall ranking of these rates for all Musculoskeletal patients. The extremal regions for all three groups were identical, with Kingston/Frontenac/Lennox/Addington consistently reporting the highest rate and Metropolitan Toronto the lowest. Exhibit 9.6 demonstrates the congruence in the ranking of these rates for each clinical category as well as differences in both the level of and regional variation in these rates by clinical category.

Variations in the Propensity and Intensity of Use of Home Care Services

Exhibit 9.7 reports the propensity of home care clients to use specific services by clinical group. For all clinical categories, clients were most likely to use Nursing Visits (69.5%) and Rehabilitation Visits (67.4%). About half of the clients had Home Making services, but only 5.9% of them had Other Visits. Joint Replacement and Fracture clients were more likely to have had Rehabilitation Visits than Nursing Visits; for the other clinical categories the propensity of use of Nursing Visits was highest. About 42% of the Joint Replacement and Other Surgical Clients had Home-Making hours compared to over half of the clients in the Fracture, Arthritis and Rheumatism and Other Medical Condition clinical categories.

Exhibit 9.8 reports regional variations in age/sex-standardized post-acute home care utilization service intensity by clinical and service categories over the study period. Significant differences were found in the standardized mean

Exhibit 9.6: *Age/Sex-standardized Post-Acute Home Care Utilization Rates in Ontario, 1993/94 – 1994/95*



Data Source: Ontario Home Care Administration System

service intensity for Musculoskeletal home care clients. Joint Replacement patients in receipt of Nursing visits or Home-making hours received significantly fewer services than other patients (9.2 Nursing visits and 31.8 Home-making hours, versus 15.3 Nursing visits and 41.5 Home Making hours for all Musculoskeletal patients). While the service intensity of all Musculoskeletal patients in receipt of Rehabilitation Therapy visits was similar, varying from a low of 6.6 visits for Other Medical Condition patients to a high of 8.1 for Fracture patients these data mask significant differences by clinical category when all home care clients are considered. For example, mean Rehabilitation Therapy visits to Joint Replacement home care clients (6.5) were significantly greater than for all Musculoskeletal patients (5.2). Consequently, a full understanding of patterns of home care practice requires

Exhibit 9.7: ***Propensity of Home Care Clients to Use Categories of Service by Clinical Category in Ontario, 1993/94 - 1994/95***

Clinical Category	Home Service Category			
	Nursing Visits %	Rehabilitation Visits %	Home-Making Hours %	Other Visits %
Joint Replacement	61.9	85.8	41.8	7.2
Fracture	65.9	71.9	51.9	4.6
Arthritis and Rheumatism	79.2	50.0	55.4	6.8
Other Surgical	83.4	41.2	42.4	4.0
Other Medical	77.0	46.9	57.5	7.5
All Musculoskeletal Patients	69.5	67.4	48.7	5.9

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

Exhibit 9.8: ***Regional Variations in Age/Sex-Standardized Post-Acute Home Service Intensity for Home Care Clients by Clinical and Service Categories, 1993/94 - 1994/95****

Clinical Category of Hospitalization	Service Category	Standardized Mean Service Intensity
Joint Replacement	Nursing Visits	9.2
	Rehabilitation Visits	7.5
	Home-making Hours	31.8
	Other Professional Visits	3.4
Fracture	Nursing Visits	15.1
	Rehabilitation Visits	8.1
	Home-making Hours	45.0
	Other Professional Visits	4.1
Arthritis and Rheumatism	Nursing Visits	18.7
	Rehabilitation Visits	7.3
	Home-making Hours	45.9
	Other Professional Visits	3.0
Other Surgical	Nursing Visits	21.2
	Rehabilitation Visits	7.7
	Home-making Hours	38.0
	Other Professional Visits	2.1
Other Medical	Nursing Visits	19.7
	Rehabilitation Visits	6.6
	Home-making Hours	44.1
	Other Professional Visits	3.2
All Musculoskeletal Patients	Nursing Visits	15.3
	Rehabilitation Visits	7.7
	Home-making Hours	41.6
	Other Professional Visits	4.4

* Utilization and measures of regional variation were based on the 38 Home Care Programs (HCPs).

Data Source: Canadian Institute for Health Information, Ontario Home Care Administration System

knowledge of both the propensity and the intensity of service utilization. Knowledge of one without the other may lead to ill-informed health management and health policy decision-making.

Regional variation in home care service intensity is reported in Exhibit 9.8 for each clinical category and each service category. While there was a three-fold variation in standardized mean service intensity for Rehabilitation Therapy visits in extremal regions for Joint Replacement patients, there was more than an eightfold variation in such visits for both Other Surgical Procedure and Other Medical Condition patients. There was less variation in the intensity of Home Making hours. For all Musculoskeletal patients there was less than a twofold variation in the intensity of Home Making hours in extremal regions.

Discussion

We have recently witnessed the rapid pace of health system restructuring and the growing importance of post-acute rehabilitation services to both accommodate and facilitate acute-care discharge planning. However, throughout this process of change, a major frustration for health managers, providers and policy-makers has been the lack of information on costs and consequences. Little is known about the impact of restructuring on health outcomes and the extent to which the burden of care has shifted from institutions to patients, families and community agencies.

In this chapter, we detailed wide regional and clinical variations in the uses of post-acute rehabilitation services. There are four components that contribute to the variations in total utilization by service category: the number of individuals discharged from hospital to home, the rate of receiving home care services, the propensity of using a service category, and the intensity of services used in that category by those who receive them. As such, regional variations in per capita utilization is composed of three distinct components: the rates of post-acute home care, the propensity to use a category of services, and the intensity of the use of these services. Only by measuring and assessing the impact of each of these three components will health managers, providers and policy-makers be in an informed position to evaluate patterns of practice or to undertake policies to narrow regional variations in utilization.

A recent study commissioned by Ontario's Health Services Restructuring Commission (HSRC) measured regional variations in post-acute home care utilization, and used them as the basis for a home care reinvestment strategy.[16] At best, that strategy provided only a partial analysis, as it addressed only one (utilization rates) of the three components to variations in utilization. Until a comprehensive assessment is undertaken, the reinvestment estimates used by the HSRC will form a fragile basis on which to premise public sector investments.

While moderate regional variations were reported for all aspects of home care service provision, the service profiles appear to have been tailored to the underlying clinical condition of each group of clients. To some extent, the observation that the service profiles varied by clinical category was expected. For example, patients who must be immobilized after discharge require more nursing visits for basic care than Joint Replacement patients, who require functional training after surgery. Joint Replacement patients therefore require more Rehabilitation therapy visits and fewer Nursing visits than other Musculoskeletal patients.

However, the observation that regional variations in the propensity to use specific home care services (Nursing visits, Rehabilitation Therapy visits, and Home-making hours) were generally smaller than the propensity to use home care services in general, suggests that each Home Care Program acts as if it has a common service template for each clinical category once individuals are referred and deemed eligible for services. The occurrence of common service profiles may, in turn, have been due to limited variation in perceptions and beliefs held by case managers and service providers concerning service intervention and options for the clinical and lifestyle management of home care clients.

While we did not test any hypotheses concerning regional variations in the use of post-acute rehabilitation services, the extensive literature on area variations has advanced three main sets of hypotheses.[39-41] First, utilization may be attributable to variations in the prevalence and severity of musculoskeletal conditions.[2,22,42] Second, holding prevalence constant, there may be regional differences in patients' propensity to seek or be referred for post-acute rehabilitation service, or even variations in the application of eligibility criteria.[43] Third, variations in the availability of health professionals and facilities, and variations in perceptions concerning treatment effectiveness, alternative management options, and indications for intervention may influence referral and intervention rates.[23,44,45]

Our analysis of regional variations had four main limitations. First, the study was based on hospital discharge and home care service data obtained from the Ontario Ministry of Health. The main concern associated with the use of such data pertains to its validity and reliability.[46-49] Studies comparing administrative data to hospital chart data have overwhelmingly concluded that while major events, such as surgical procedures and mortality, patient demographics and primary diagnosis, are coded accurately,[50-55] complications and comorbid conditions are often miscoded.[54,55] While these results may allay some concerns with respect to the CIHI data, including issues surrounding the assignment of Musculoskeletal patients to the five main clinical categories, there has yet to be an equivalent comprehensive assessment of the home care database.

Second, in order to link musculoskeletal hospitalizations to the receipt of

home care services within a prescribed period following discharge, we used unique identifying numbers instead of discharge destination codes, as the latter only partially capture the use of home care. However, coding errors within the administrative database may have resulted in the failure to identify some recipients. Conversely, some recipients of home care services may have been registered with the program prior to hospitalization, and the service provision would thus have been unrelated to their hospitalization. The former effect would result in an underestimate of post-acute home care utilization rates, and the latter in an overestimate. As a result, the dominant effect cannot be determined.

Third, documented variations in post-acute home care utilization rates were based exclusively on variations in the use of those services captured in the Ontario Home Care Administration System database. Since care practices vary regionally, clients in one area may receive publicly funded home care services, while similar clients in another region may receive equivalent services from a public health agency (The Arthritis Society's Consultation and Rehabilitation Service, an outpatient department of a hospital, or one of an array of community support groups, such as Meals on Wheels). Consequently, the wide variations reported in this chapter for the five clinical groups and the four distinct service categories cannot reflect the extent to which appropriate care was available for residents of Ontario on equal terms and conditions.

Fourth, since the study was confined to patterns of practice for musculoskeletal patients in Ontario for the period 1993/94-1994/95, the results will not necessarily generalize to other jurisdictions, other categories of patients, or other time periods in Ontario. However, we believe Ontario is an ideal setting to describe patterns of practice in the provision of post-acute rehabilitation services, as all residents have access to publicly-funded hospital and home care services, and because all acute care separations and all subsequent home care utilization are captured in the administrative data.

In conclusion, the existence of wide variations in the propensity to use and the intensity of use of various post-acute rehabilitation services highlights opportunities to direct efforts towards the development of care and support pathways that might be consistently applied to specific musculoskeletal patients following hospitalization. In the light of the paucity of evidence detailing service cost-effectiveness, a program of health research directed towards the evaluation of the funding, organization and delivery of post-acute rehabilitation services to musculoskeletal patients would be timely.

References

1. Statistics Canada. *Health Status of Canadians.* Report of the 1991 General Social Survey. Catalogue No.: 11-612E, No. 8. Ottawa: Supply and Services Canada, 1994.
2. Badley EM, Arnold J, Webster G. *Arthritis in Ontario: A Study of Intra-Provincial Variation* [working paper 94-1]. Toronto: Arthritis Community Research and Evaluation Unit, 1994.
3. Verbrugge LM. Physical and social disability in adults. In Hibbard HH, Nutting PA, Grady ML, editors. *Functional and Health Status Measures for Primary Care.* 1st ed. Washington, DC: US Department of Health and Human Services, 1991.
4. McAlindon TE, Cooper C, Kirwan JR et al. Knee pain and disability in the community. *Br J Rheum* 1992; 31: 189-192.
5. Rice D. Cost of musculoskeletal conditions. In Praemer A, Furner S, Rice D, editors. *Musculoskeletal Conditions in the United States.* Chicago: American Academy of Orthopaedic Surgeons, 1992.
6. Yelin E, Callahan LF, National Arthritis Data Work Group. The economic cost and social and psychological impact of musculoskeletal conditions. *Arthritis Rheum* 1995; 38(10): 1351-1362.
7. Asche CV, Hawker G, Chan B et al. The economic cost and social and psychological impact of musculoskeletal conditions [comment]. *Arthritis Rheum* 1997; 39(11): 1931.
8. Coyte PC, Asche CV, Croxford R et al. The economic cost of arthritis and rheumatisms in Canada. In Badley EM, Williams JI, editors. *Patterns of Health Care in Ontario: Arthritis and Related Conditions,* Toronto: Institute for Clinical Evaluative Sciences, 1998.
9. Coyte PC, Asche CV, Croxford R et al. The economic cost of musculoskeletal disorders in Canada [forthcoming]. *Arthritis Care and Research*, 1999.
10. Statistics Canada. *Population Projections for Canada, Provinces and Territories,* 1993-2016. Catalogue No.: 91-520. Ottawa: Supply and Services Canada, December 1994.
11. Health Services Restructuring Commission. *Rebuilding Ontario's Health System: Interim Planning Guidelines and Implementation Strategies.* Toronto: Health Services Restructuring Commission, July 1997.
12. Axcell T, Young W. *Cost Savings Resulting from a Shift from Inpatient to Outpatient Service for Same Day Surgery.* Presented at the International Health Economics Association Conference, Vancouver, May 1996.
13. Coyte PC, Young W. *Costs, Outcomes and Potential Cost-savings Associated with Alternative Discharge Strategies for Patients Receiving Joint Replacement Surgery.* Presented at the International Health Economics Association Conference, Vancouver, May 1996.

14. Coyte PC, Young W. Applied home care research. *International Journal of Health Care Quality Assurance* 1997; 10(1): i-iv.

15. Coyte PC, Young W. *An Overview of Ontario's Home Care Program and Suggestions for a National Home Care Research Agenda* [unpublished]. Toronto: Institute for Clinical Evaluative Sciences, 1997.

16. Coyte PC, Young W. *Variations in the Use of and Reinvestments in Home Care Services Following an Acute Care Hospitalization.* Technical Report No.: 97-05-TR. Toronto: Institute for Clinical Evaluative Sciences, 1997.

17. Jackson RA. Home care: the cornerstone of health renewal in Nova Scotia. *Leadership in Health Services* 1994; 4: 5-14.

18. Hollander M. *The Costs and Cost-Effectiveness of Continuing Care Services in Canada.* Ottawa: Queen's-University of Ottawa Economic Projects, 1994; 1-113.

19. Jacobs P, Hall E, Henderson I et al. Episodic acute care costs: Linking inpatient and home care. *Can J Pub Health* 1995; 86: 200-205.

20. Stewart RL, Lund M. Home care: The Ontario experience. *Pride Institute Journal of Long Term Home Health Care* 1990; 9: 15-25.

21. Ontario Ministry of Health. *Government Unveils Plan for Speedy Long-term Care Reform* [news release]. Toronto: Ontario Ministry of Health, January 25, 1996.

22. Coyte PC, Wang PP, Hawker GA et al. The relationship between variations in knee replacement utilization rates and the reported prevalence of arthritis in Ontario, Canada. *J Rheumatol* 1997; 24(12): 2403-2412.

23. Coyte PC, Hawker GA, Wright JG. Variations in knee replacement utilization rates and the supply of health professionals in Ontario, Canada. *J Rheumatol* 1996; 23(7): 1214-1219.

24. Katz BA, Freund DA, Heck DA et al. Demographic variation in the rate of knee replacement: a multi-year analysis. *Health Serv Res* 1996; 31(2): 125-140.

25. Coyte PC, Wright JG, Freund DA et al. Regional variation in the utilization of knee replacement procedures and the supply of orthopaedic surgeons in Ontario, Canada. In Boan JA, editor. *Proceedings of the Fifth Canadian Conference on Health Economics.* Regina: Canadian Plains Research Center, University of Regina, 1994.

26. Canadian Institute for Health Information (CIHI). Length of Stay Database by CMG. Ottawa: Canadian Institute for Health Information, 1994.

27. Canadian Institute for Health Information (CIHI). *DPG Booklet.* Ottawa: Canadian Institute for Health Information, 1996.

28. Kenney GM. How access to long-term care affects home health transfers. *J Health Pol Policy Law* 1993; 83: 412-414.

29. Charlson ME, Pompei P, Ales KL et al. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *J Chronic Dis* 1987; 40(5): 373-383.

30. Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol* 1992; 45(6): 613-619.

31. Romano PS, Roos LL, Jollis JG. Adapting a clinical comorbidity index for use with ICD- 9-CM administrative data: Differing perspectives. *J Clin Epidemiol* 1993; 46(10): 1075-1079.

32. Kazandjian VA, Durance PW, Schork MA. The extremal quotient in small-area variation analysis. *Health Serv Res* 1989; 24: 665-684.

33. Diehr P. Small area statistics: large statistical problems. *Am J Public Health* 1984; 74: 313-314.

34. Diehr P, Cain KC, Connell F et al. What is too much variation? The null hypothesis in small-area analysis. *Health Serv Res* 1990; 24: 741-771.

35. Diehr P, Grembowski D. A small simulation approach to determining excess variation in dental procedure rates. *Am J Public Health* 1990; 80: 1343-1348.

36. Cain KC, Diehr P. Testing the null hypothesis in small area analysis. *Health Serv Res* 1992; 27: 267-294.

37. Diehr P, Cain KC, Kreuter W et al. Can small-area analysis detect variations in surgery rates? *Med Care* 1992; 30: 484-502.

38. McPherson K, Wennberg JE, Hovind OB et al. Small-area variations in the use of common surgical procedures: An international comparison of New England, England, and Norway. *N Engl J Med* 1982; 307: 1310-1314.

39. Wennberg JE, Gittelsohn A. Small area variations in health care delivery. *Science* 1973; 182: 1102-1108.

40. Wennberg JE, Gittelsohn A. Variations in medical care among small areas. *Sci Am* 1982; 246: 120-134.

41. Chassin MR, Brook RH, Park RE et al. Variations in the use of medical and surgical services by the medicare population. *N Engl J Med* 1986; 314: 285-290.

42. Hadler NM. Osteoarthritis as a public health problem. *Clin Rheum Dis* 1985; 11: 175-185.

43. Peterson MGE, Hollenberg JP, Szatrowski TP et al. Geographic variations in the rates of elective total hip and knee arthroplasties among medicare beneficiaries in the United States. *J Bone and J Surg* 1992; 74-A: 1530-1539.

44. Wright JG, Coyte PC, Hawker GA et al. Variations in orthopaedic surgeons' perceptions of the indications for and outcomes of knee replacement. *Can Med Assoc J* 1995; 152(5): 687-697.

45. Coyte PC, Hawker GA, Croxford R et al. Variations in rheumatologists' and family physicians' perceptions of the indications for and outcomes of knee replacement. *J Rheum* 1996; 23(4): 730-738.

46. Hsia DS, Krusnat M, Fagan AB et al. Accuracy of diagnostic coding for medicare patients under the prospective payment system. *N Engl J Med* 1988; 318: 352-355.

47. Iezzoni LI, Burnside S, Sickles L et al. Coding of acute myocardial infarction: Clinical and policy implications. *Ann Intern Med* 1988; 109: 745-751.

48. Fisher ES, Baron JA, Malenka DJ et al. Overcoming potential pitfalls in the use of medicare data for epidemiological research. *Am J Public Health* 1990; 80(12): 1487-1490.

49. Williams JI, Young W. A summary of studies on the quality of health care administrative databases in Canada. In Goel V, Williams JI, Anderson G et al., editors. Patterns of Health Care in Ontario. 2nd ed. Ottawa: Canadian Medical Association, 1996: 339-345.

50. Roos LL, Nicol JP, Cageorge SM. Using administrative data for longitudinal research: Comparison with primary data collection. *J Chron Dis* 1987; 40: 41-49.

51. Roos NP. Using administrative data from Manitoba, Canada, to study treatment outcomes: Developing control groups and adjusting for case severity. *Soc Sci Med* 1989; 28: 109-113.

52. Roos LL, Roos NP, Cageorge SM et al. How good are the data? Reliability of one health care data bank. *Med Care* 1982; 3: 266-276.

53. Ontario Ministry of Health. *Report of the Ontario Data Quality Reabstracting Study.* Toronto: Ontario Hospital Association, Hospital Medical Records Institute, Ontario Ministry of Health, April 1991.

54. Hawker GA. *The Reliability and Validity of Using Patient Survey and Hospital Discharge Files to Assess Peri-operative Health Status and Outcomes in Knee Replacement Surgery* [MSc thesis]. University of Toronto, 1993.

55. Hawker GA, Coyte PC, Paul JE et al. Accuracy of administrative claims data in assessing patient characteristics and course in hospital for knee replacement surgery. *J Clin Epi* 1997; 50(3): 265-273.

56. World Health Organization: International Classification of Diseases. Geneva: World Health Organization, 1977.

57. Rehabilitation Planning Committee. *Proposal for The Metropolitan Toronto Rehab Network.* Toronto: Rehabilitation Planning Committee, March 1995.

58. Statistics Canada. *Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures.* Second Printing. Ottawa: Minister of Industry, Science and Technology, 1993.

59. Pink GH, Bolley HB. Case mix groups and resource intensity weights: an overview for physicians. *Can Med Assoc J* 1994; 150(6): 889-894.

60. Anonymous: Government Unveils Plan for Speedy Long-Term Care Reform. [news release.] Toronto: Ministry of Health, January 25, 1996.

61. Romano PS, Roos LL, Jollis JG. Further evidence concerning the use of a clinical comorbidity index with ICD-9-CM administrative data. *J Clin Epi* 1993; 46(10): 1085-1090.

62. Melfi CA, Holleman E, Arthur D et al. Selecting a patient characteristic index for the prediction of medical outcomes using administrative data. *J Clin Epi* 1995; 48(7): 917-926.

63. SAS Institute Inc. *SAS Release 6.11 Edition.* Cary: SAS Institute Inc., 1996.

Appendix A9.1

Post-acute Rehabilitation Services

All inpatient separations from Ontario hospitals between fiscal years 1993/94 and 1994/95 were extracted from the Discharge Abstract Data from the Canadian Institute for Health Information (CIHI). Each separation was assigned to one of 25 Major Clinical Categories® based on a classification scheme for grouping most responsible diagnoses for similar clinical conditions.[26,27] To address the use of post-acute rehabilitation services for musculoskeletal conditions, we retained only those inpatient separations that correspond to the musculoskeletal Major Clinical Category, MCC08. Over the study period, there were 207,419 inpatient separations assigned to MCC08.

Various case eligibility criteria were applied sequentially to the hospitalizations to better define the study population. Hospitalizations were excluded if the patient was a non-resident of Ontario (114 musculoskeletal hospitalizations); had an invalid residence code (106 musculoskeletal hospitalizations); was less than 20 years of age (21,880 musculoskeletal hospitalizations); had a diagnosis of neoplasm (ICD-9 diagnosis codes[56] of 140.0-239.9) in any of the sixteen diagnosis fields in the CIHI data (10,901 musculoskeletal hospitalizations); had a missing gender code (one musculoskeletal hospitalization); or if the patient had a missing unique health care number (7,617 musculoskeletal hospitalizations). These exclusions amounted to 19.6% (or 40,619) of the original set of 207,419 musculoskeletal hospitalizations.

To improve the homogeneity of the data for analysis of regional variation in the use of post-acute rehabilitation services, three further exclusion criteria were applied. Hospitalizations were excluded: if there was an inpatient death (1,709 hospitalizations); if patients were discharged to another acute-care facility, which may signal medical instability at the time of discharge[57] (3,320 hospitalizations); or if patients were discharged to a nursing home, a home for the aged, a chronic care institution, a psychiatric hospital, or an unclassified institution (8,339 hospitalizations). Application of these criteria resulted in the exclusion of 13,368 hospitalizations or 6.4% of the original set of 207,419 musculoskeletal hospitalizations. The resulting analysis file comprised 153,432 hospitalizations where patients were discharged to one of four destinations: a rehabilitation hospital, and subsequently, discharged to home without home care; a rehabilitation hospital, and subsequently, discharged to home with home care; home with home care; and, home with self-care or informal care. Since data pertaining to the use of outpatient clinics were not available, each discharge category may include clients who received post-acute rehabilitation services apart from those provided by home care programs.

Since musculoskeletal patients present with an array of diagnoses and receive different procedures, a mutually exclusive and exhaustive clinical classification hierarchy was developed to assign the hospitalizations to one of five clinical categories. First, the hospitalizations were classified as joint replacement hospitalizations if there was a Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures (CCP)[58] code 93.41 (total knee replacement [geomedic] [polycentric]), 93.51 (total hip replacement with use of methyl methacrylate) or 93.59 (other total hip replacement) in any of the ten procedure fields in the CIHI data. Second, hospitalizations due to a fracture were identified if there was a primary ICD-9 diagnosis code[56] of 800.0-829.9 in the CIHI data. Third, hospitalizations due to arthritis and rheumatism were identified if there was a primary ICD-9 diagnosis code[56] of 098.5, 099.3, 274.0-274.9, 696.0, 710.0-720.9, 725.0-729.9, V13.4, or V43.6 in the CIHI data. These ICD-9 diagnosis codes[56] have been used by others to identify conditions associated with arthritis and rheumatism.[5-9] Fourth, other surgical hospitalizations were determined through the occurrence of surgical Case Mix Group® category codes[59] in the CIHI data. Fifth, all other hospitalizations were assigned to the other medical musculoskeletal hospitalizations category.

To identify inpatient separations for which home care services were received, all separations were deterministically linked, using a unique identifying number, to the Home Care Administration System database. Individuals who received home care services within 30 days of the discharge date were classified as home care recipients.

Some home care services were not captured in the Home Care Administration System database. For musculoskeletal patients, the most notable service exclusion were those provided by The Arthritis Society's Consultation and Rehabilitation Service, which was funded in 1997/98 by a $3.7 million grant from the Long Term Care Division of the Ontario Ministry of Health. The absence of these data results in an underestimate of home care utilization rates.

To assess the intensity and mix of home care servicing, all home care service encounters between the first home care service date and the home care discharge date, censored at 90 days from the acute-care discharge date, were assessed for home care recipients. Services provided beyond 30 days or extending beyond 90 days from the first service date were unlikely to be related to the index hospitalization,[18,28] and so were excluded from consideration.

In Ontario, agencies and professionals provide a complex range of health professional and lifestyle enhancement services, under the home care service designation, to a variety of clients.[14,20] The large range of service categories includes nursing, social work, physiotherapy, occupational therapy, speech language pathology, audiology and home-making. While most clients

receive these services to prevent or retard the deterioration of health and to assist them to maintain independence in the community, other clients receive a more specialized variety of rehabilitation services following an acute care hospitalization. Our assessment of the mix of services received by home care clients following acute-care discharge included three largest service categories: nursing visits, rehabilitation therapy visits provided by physiotherapists and occupational therapists, and home-making hours. We also included a fourth category of other, miscellaneous professional visits. For each service category, we describe regional variations in both the propensity and the intensity of service provision for each musculoskeletal clinical category.

Post-acute home care utilization rates were defined for each of the five clinical categories and for all categories combined. The rates were defined for all residents of a defined geographic area as the number of separations where home care services were received within 30 days of the final discharge date divided by the total number of separations (irrespective of where these separations took place). Post-acute home care utilization rates per 100 separations were computed for the residents of each of the 38 Home Care Programs that are responsible for ensuring the provision of publicly funded home care services through an array of for-profit and not-for-profit organizations. (Since January, 1996 organizational reforms to Home Care Programs have resulted in the creation of 43 Community Care Access Centres responsible for negotiating, selecting, approving, and evaluating contractual arrangements with home care providers).[60]

For each clinical category and for all categories combined, age/sex-specific post-acute home care utilization rates were computed for each geographic region over the study period, with four defined age groups: individuals less than 45 years; individuals aged between 45 and 64 years; individuals aged between 65 and 74 years; and individuals aged more than 74 years. Direct standardization was used to adjust post-acute home care utilization rates to account for regional differences in age and sex.

For robustness and comparability, we used three measures of regional variations in standardized post-acute home care utilization rates: the extremal quotient;[32] the weighted coefficient of variation;[32-37] and the systematic component of variation.[38] The extremal quotient is the ratio of the post-acute home care utilization rate in the region with the highest post-acute home care utilization rate relative to the region with the lowest rate. The weighted coefficient of variation measures the ratio of the standard deviation of post-acute home care utilization rates across the various geographic regions, weighted by the number of separations in each region, to the mean utilization rate for the province. The systematic component of variation measures variations in regional post-acute home care utilization rates after adjusting for random variations.

The extremal quotient is perhaps the most widely reported measure of area variations, and the easiest to understand. A drawback is that it conveys no information on the rates in regions other than in the two extremal regions. The weighted coefficient of variation, which also has a straightforward interpretation and is based on rates in all of the regions, may overestimate regional variations when rates are low and/or when the area population is small.[38] The systematic component of variation, developed to address these concerns, removes the component of variation attributed to population size, and provides a measure of variation which is stable across a range of rates and of population sizes.[38]

Chi-square tests were used to test for regional variation in post-acute home care utilization rates.[32-37] Individual region-specific tests of deviation in utilization rates from the mean rate for the province as a whole were adjusted to allow for multiple comparisons across the 38 Home Care Programs.[33,36] These tests were conducted by pooling data for the two study years, yielding a sufficient number of expected home care recipients in order to apply the Chi-square test.[34]

Patients assigned to each of the four discharge destinations (rehabilitation hospital and subsequently home without home care; rehabilitation hospital and subsequently home with home care; home with home care; and home with self care or informal care), and to each of the five musculoskeletal clinical categories (joint replacement; fracture; arthritis and rheumatism; other surgical musculoskeletal hospitalization; and other medical hospitalization) were compared with respect to their age, gender, hospital teaching status, acute and rehabilitation length of stay, urban/rural residence and comorbidity during the index event. Before such comparisons were made, however, operational definitions for comorbidity and teaching status were formed.

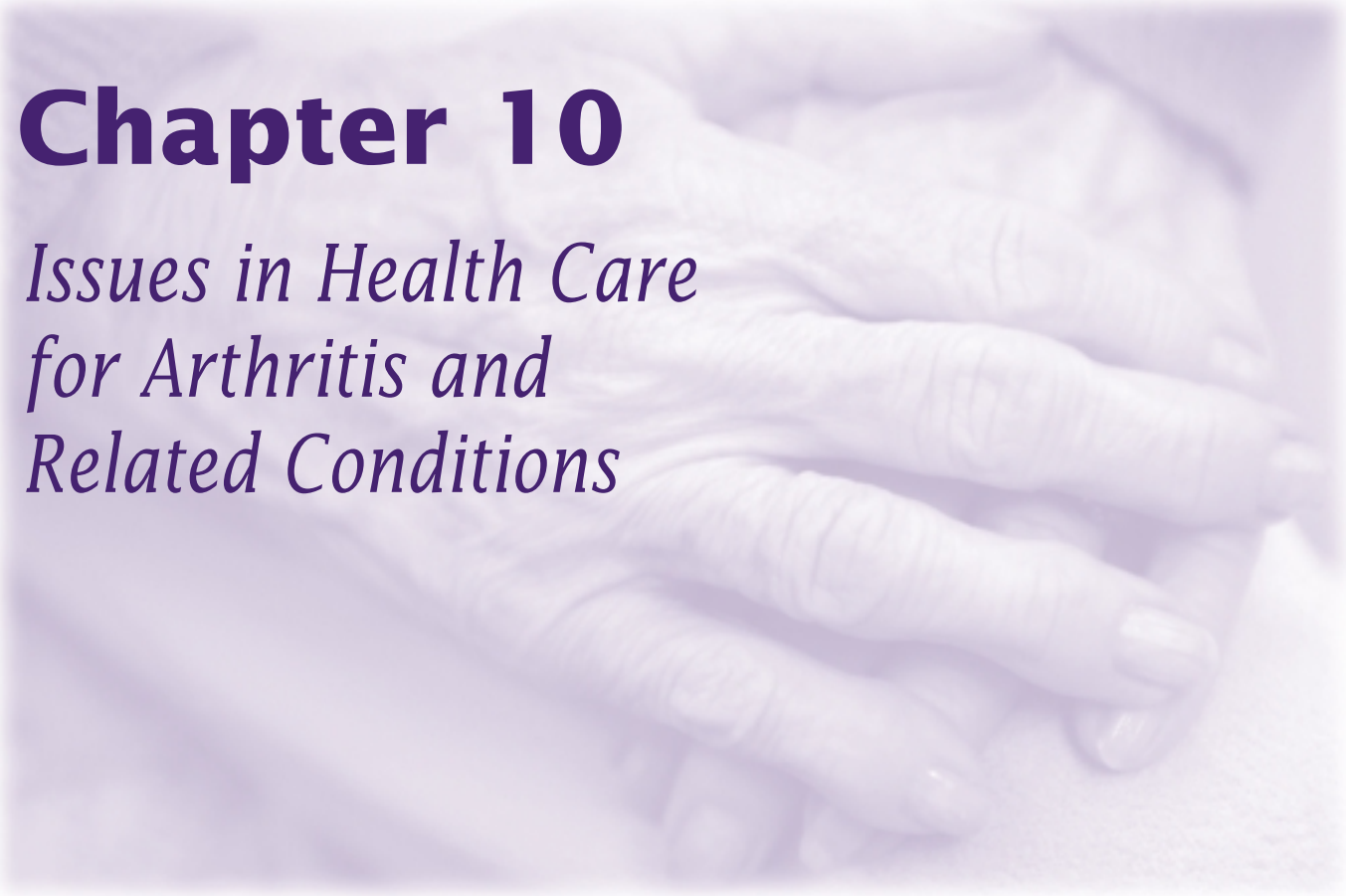
To assess the comorbidity of musculoskeletal patients during their index hospitalization, a medical record-based comorbidity index, the Charlson index,[29] was adapted for use with ICD-9 diagnostic codes and CCP procedure codes.[30,31] While this index was originally designed to be applied to medical record data to predict the relative risk of one-year mortality, it has been used to predict other outcomes in claims data.[30,31,61,62]

Hospitals were classified as: teaching, that is, were members of the Ontario Council of Teaching Hospitals (OCOTH); or non-teaching hospitals.

Univariate analyses, testing for significant differences between musculoskeletal patients assigned to each of the four discharge destinations and each of the five clinical categories, were conducted. Tests of significant difference for continuous data were based on T-tests. Chi-square tests were used for binary and nominal variables. All P-values were two-tailed. A P-value of 0.05 was considered statistically significant. Statistical analyses were performed on a Sun Sparc Server 1000 using SAS 6.11.[63]

Chapter 10

Issues in Health Care for Arthritis and Related Conditions



In this chapter we present major issues of health care for arthritis and related conditions and outline a comprehensive strategy for addressing them. Working from the evidence presented in this ICES Practice Atlas, we present the implications of what we know of the current situation in health care for these conditions and identify areas where there is room for improvement.

Comprehensive Strategy for the Control of Arthritis and Related Conditions

As can be seen in Exhibit 10.1, there are six key components for a comprehensive health strategy for managing the impact of arthritis and related conditions: primary care services, specialist and hospital services, rehabilitation and community support services, health education and health promotion, and health policy and planning. The ultimate goal of care is to improve the situation of people with arthritis and their families. To do this, one must understand the impact of arthritis in the population.

The Ontario Health Survey and the National Population Health Survey provide estimates of the major impacts of arthritis; including severe pain, disability, poor health and reduced quality of life. In the Ontario Health Survey, the majority of people with arthritis (85%) reported pain, and 55% said that the pain limited their activities.[1] Approximately one in seven people reporting arthritis in the Ontario Health Survey reported long-term disability. The impact of having arthritis disability meant that almost all (over 90%) of these individuals had at least some trouble with mobility—most frequently walking, standing and climbing stairs. A quarter could not leave their homes by themselves or only did so with the aid of an attendant. Three-quarters had at least some dependence on the help of others because of disability.[2]

As a large proportion of people with arthritis are in the working age population, there is an impact on labour force participation. As shown in Chapter 2, only 56% of persons in the Ontario Health Survey between the ages of 45 to 64 years who had arthritis, were currently in the labour force, compared to 72% of those without arthritis.[3] Further analysis showed that it was pain and arthritis disability rather than just chronic arthritis was associated with not being in the labour force.

As noted in Chapter 2, although women are more likely to have arthritis than men, the experience of arthritis is similar for both men and women.[4] The proportion of people with arthritis increases with age, but the impact in terms of pain, disability, poor health and health care utilization is fairly uniform across ages. This means that the experience of younger people with arthritis is similar to that of older people. Not only are the majority of people with arthritis

in the middle years of life, the majority of people in the population who experience serious impact on their lives are also relatively young. In relative terms the burden and costs of arthritis are greatest in young and middle-aged adults, and are about equal for men and women. This means that any initiatives and policies to address arthritis and related conditions need to be targeted to the whole population. These conditions cannot be dismissed as being predominantly conditions of older women.

Arthritis and related conditions are chronic disorders. The symptoms may wax and wane, but generally they progress until the end of life. Individuals with arthritis require access to care throughout their lives, but the type of care they require changes as their condition evolves.

Primary Care

Arthritis and related conditions are among the most frequent reasons for consultation with primary care physicians, who are the major prescribers of arthritis drugs and the gatekeepers to other services. Most osteoarthritis, nonarticular rheumatism, and low back pain should be managed by primary care physicians.[5] Primary care physicians also have roles in the long-term monitoring of rheumatoid arthritis (RA) and other chronic rheumatic disorders. These roles are of particular importance in rural and remote parts of Ontario which are without ready access to specialist care. It is important that these professionals have the training and experience to carry out appropriate investigations, including examination of the joints, provision of advice about self-management, making correct diagnoses, prescribing appropriate treatment, and making appropriate referrals to specialists or rehabilitation professionals.

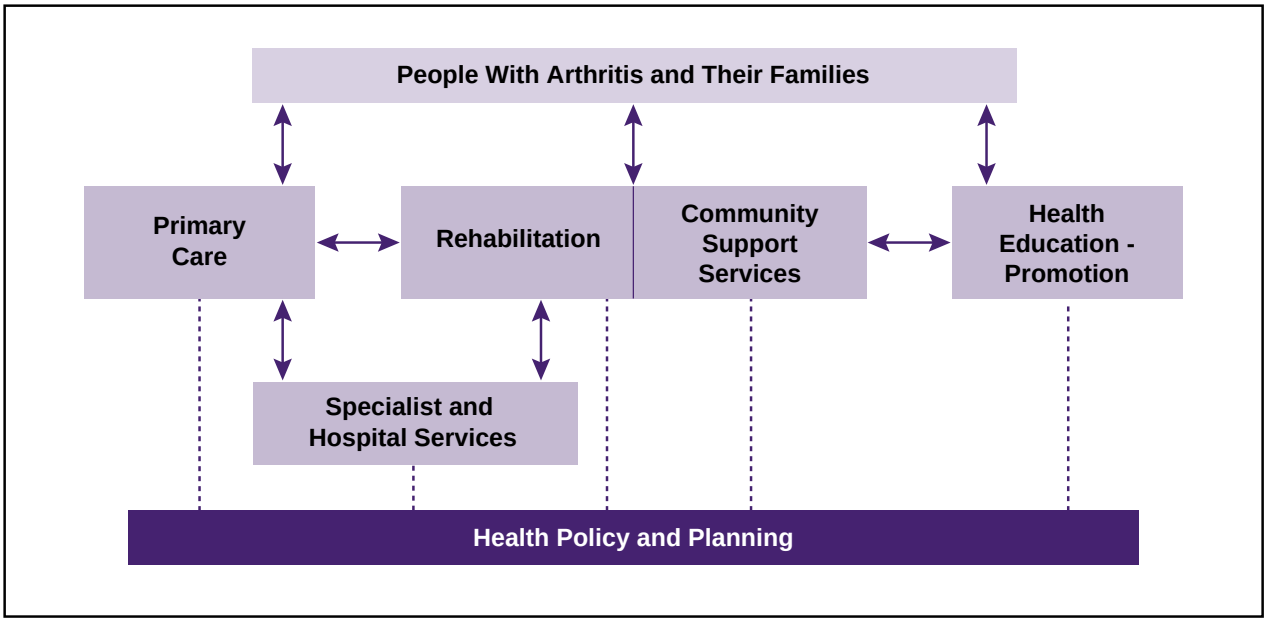
Examination of the joints is the cornerstone in the diagnosis of arthritis and this skill involves hands-on learning. Residents in family medicine training programs may gain some experience in diagnosis and treatment of arthritis and related conditions, but mandatory and systematic training in the management of the conditions is not required.

There are perceived deficiencies in the primary care management of arthritis and areas of concern include: timely referral to specialists, advising patients about exercise and other non-pharmacological interventions and the examination of joints. Evidence indicates that early and aggressive treatment of RA by a specialist can reduce future disability[6-8] and supports the role of exercise and patient education in reducing pain and disability.[9-12] The research presented in Chapter 5 indicates that family physicians may be underutilizing specialists, exercise and other treatment modalities. In a study of indications for knee replacement surgery, family physicians in Ontario were uncertain about which patients should be referred for surgery.[13]

The postgraduate training of family physicians was one the factors associated with use of appropriate investigations, management strategies and confidence in managing arthritis. There is a need for systematic teaching about the management of arthritis and related conditions in undergraduate, postgraduate and continuing education medical curricula.

Currently, the amount of curriculum in undergraduate medical education devoted to arthritis and related conditions is disproportionately low compared to the amount of illness and disability they cause.

Exhibit 10.1: ***A Comprehensive Strategy for the Control of Arthritis and Related Conditions***



Medications are an important part of the treatment of arthritis. The most frequently prescribed types of medication for arthritis and related conditions are non-steroidal anti-inflammatory drugs (NSAIDs). NSAIDs may be prescribed for a number of different conditions, but the most common use is for arthritis and related conditions. Numerous clinical trials have shown they are effective in reducing arthritis symptoms. However, these drugs are not without dangers, particularly for the elderly population. They have considerable side effects, the most significant being potentially life-threatening gastric haemorrhage. It has been suggested that NSAIDs are as dangerous, if not more so, than the drugs used for rheumatoid arthritis.[14,15] Fortunately there are alternatives in the treatment of osteoarthritis: randomized control trials suggest that acetaminophen is the preferred analgesic,[16-18] and that exercise and educational modalities can result in reduced pain and disability.[9,19,20]

As indicated in Chapter 6, two-fifths of all seniors had at least one prescription for an NSAID (almost four prescriptions per person), excluding those who may have bought these types of medications over-the-counter. Two-fifths of seniors also reported arthritis and rheumatism in the 1990 Ontario Health Survey.[21] This raises questions about the appropriateness of the extent of prescribing NSAIDs. There was a drop in prescription rate to community-dwelling Ontario residents which accompanied the introduction of copayments with the Ontario Drug Benefits program. The rate of prescribing to residents of long-term facilities is lower and appears to be declining over time. The prescribing of these types of drugs requires further investigation.

The rate of prescribing of gastrointestinal (GI) protective drugs was just over half that of NSAIDs in 1995/96, but the costs were more than twice as much: GI protective agents represent 10% of total drug costs to seniors in Ontario, whereas the cost of NSAIDs is 4% of total costs. Use of GI protective drugs appears to be increasing over time, particularly for residents of long-term facilities. The fact that the proportion of NSAID users with a hospital admission for GI bleeding was higher than for non-users suggest that they are being prescribed appropriately for high risk patients. However, the high cost of these medications raises issues of their cost-benefit ratio.[22-24] The trends toward increased prescription and cost lend urgency to the need for research on appropriate prescribing, the identification of high risk patients, and the development of cost-effective prescribing guidelines. Attention also needs to be paid to ways in which NSAID use might be reduced by substitution of acetaminophen where appropriate and by increased use of non-pharmacological modalities. Implementation of any changes will be difficult in the face of corporate advertising for NSAIDs and GI protective drugs. It needs to be accompanied by education of family physicians and other doctors and by education targeted toward people with arthritis.

The rate of prescribing and cost of bone protective drugs is increasing dramatically, although they were only prescribed to a minority of seniors; 22% of community-dwelling women and 2% of men. If these drugs are effective, there should ultimately be a decrease in the rates of osteoporotic fracture.[25] This is an area where more population-based research is needed to quantify the costs and benefits associated with this type of medication.

This Atlas presented information on medications for arthritis and related conditions only for the population covered by the Ontario Drug Benefit program, those over the age of 65. We know very little about prescribing of arthritis medications to the population aged under 65, although as was noted in the Introduction, the majority of people with arthritis and related conditions are in this age group.

Specialist and Hospital Services

Specialist and hospital services are a vital part of the treatment for many people with arthritis and related conditions, and such services need to be available and accessible. We have some information on the amount and location of specialist clinics (Chapter 4), but most of our information relates to inpatient admissions, and particularly to inpatient admissions for joint replacement surgery. Hospital services are the tip of the iceberg. Most patients with arthritis and related conditions are seen in ambulatory care settings and a relatively small proportion are admitted to hospital.

Rheumatology

The medical specialty most concerned with the treatment of arthritis is rheumatology. Some forms of arthritis need management by a rheumatologist with access to full hospital services, including inpatient beds and a full range of diagnostic and supporting services, including referral to rehabilitation and community services. There are some data to suggest that patients treated by rheumatologists have better outcomes than those treated by other physicians.[6] Evidence is emerging that patients with rheumatoid arthritis receiving early and aggressive treatment with disease-modifying anti-rheumatic drugs (DMARDs) have better outcomes in terms of less disability and deformity and increased function than those treated later in the course of the disease.[6,8] This a marked change from previous thinking where these types of drugs were reserved for patients failing other types of treatment. DMARDs need close monitoring, particularly for adverse effects, and rheumatologists are the specialist of choice for this function. The implication is that people with rheumatoid arthritis need prompt referral for this treatment.

Some forms of arthritis such as severe rheumatoid arthritis with multi-system involvement and connective tissue disorders can be life-threatening. These patients need urgent admission to hospital. It is important therefore that there are rheumatology services with access to hospital beds for these patients. Also, some of the rarer types of arthritis, such as the spondyloarthropathies and connective tissue disorders (see Chapter 1), need to be treated by specialists who have experience with these types of conditions.

Rheumatology has become a predominantly outpatient speciality, so that currently, most of the care delivered by these specialists is in outpatient or clinic settings.[26] This has been reflected in marked reductions in the number of admissions to hospital for arthritis patients for medical reasons. The overall impact of this change has not been evaluated, despite the fact that there are studies which demonstrate the benefit of inpatient admission in the treatment of rheumatoid arthritis.[27-28]

There has been a gradual expansion in the number of rheumatologists since 1992, but the coverage of rheumatology services across the province is far from complete. Chapter 4 documents the provincial variations in mean waiting times for new patients to see a rheumatologist. Surprisingly, the waiting times were not correlated with the availability of rheumatology clinics. The waiting times for new patients may be affected by the number of patients returning for appointments. We do not know about the case-mix of patients across services, particularly with respect to the proportion of patients with rheumatoid arthritis or other serious conditions that require close monitoring. Nor do we have data on the way rheumatologists work in multidisciplinary teams to provide comprehensive care for people with arthritis and related conditions.

Orthopedic Surgery

Orthopedic surgery is an essential part of care for corrective and pain-relieving surgery for joints damaged by disease and injury. Joint replacement surgery is a highly cost-effective surgical procedure[29,30] for the treatment of advanced osteoarthritis (the most common form of arthritis in the population) and joints destroyed by rheumatoid arthritis. Orthopedic services are also vital for the treatment of osteoporotic fractures of the wrist, vertebrae and hips.

Orthopedic surgeons may be the primary consultant for medical management of arthritis and related conditions. The study of services relevant to people with arthritis and related conditions shows that there are two-thirds more orthopedic clinics than rheumatology clinics. Some of these are for the assessment of patients for surgery and for other musculoskeletal conditions such as low back pain and for the outpatient treatment of fractures. However, a proportion of patients with arthritis receive their treatment for arthritis from this source up to the time when they become candidates for surgery. The role of orthopedic surgeons in the clinical management of arthritis, especially osteoarthritis, requires further exploration.

Joint Replacement Surgery

Joint replacement surgery is one of the success stories of arthritis treatment; the procedures are a very effective means of improving quality of life. There have been marked increases over time in the rate of hip and knee replacement operations in Ontario. Although the increase in hip replacement rates has stabilized, the increase of rates in knee replacement continues. The increases have been made possible, in part, by dramatic declines in the average length of stay for procedures. It should be noted that the average length of stays in Ontario are still higher than in the U.S. Attention is now being focussed on identifying the point at which patients can be safely discharged to home or to rehabilitation services for post-acute care.

Variations in the availability of hip and knee replacement surgery in Ontario persist even though there have been reductions in variations over time. The reasons for these variations are not clear. They are not attributable to availability of specialists:[31] some of the lowest rates were found in Toronto, where availability is highest. The results of an ongoing study looking at need for hip and knee replacement in two counties with respectively high and low rates of joint replacement are awaited with interest.

The Health Services Restructuring Commission[32] and the Ministry of Health have resolved to improve access to total joint replacement in the province and to reduce variability in the rates across District Health Councils. The Ministry is being encouraged to offer supplemental funding to hospitals for operating rooms and beds in addition to the funding provided for the purchase of prostheses.

Waiting times for total joint replacement remains an unresolved issue. The waiting times between consultation visits and dates of surgery reported in Chapter 7, were longer than the typical times reported by orthopedic surgeons. Family physicians reported waiting times to see orthopedic surgeons as a barrier to referral. Once the consultation is complete, the time to surgery is determined by the scheduling of operating time, the availability of beds, and the timing preferences of the patients. However, we lack standardized procedures for reporting times between the first visit with the family physician for problems with hips and knees and the date the surgery is performed. It has yet to be determined whether the demonstration project of a registry for total joint replacements in Southwestern Ontario will be able to establish a system for documenting waiting times.

Joint replacement rates are also governed by the availability of funds to pay for the prostheses. There seems to be the potential for increased efficiencies in cost by streamlining purchase policies. As suggested in Chapter 7, population-based registries of patients

having total joint replacement provide a pragmatic and practical approach to assess quality of implants and procedures. Recent government initiatives to make more money available for the purchase of prostheses will make an important contribution.

The relationship between the volume of joint replacement surgery by orthopedic surgeons and outcome was one of the issues studied in-depth. Results suggest that surgeons should perform some minimum number of total joint replacements to maintain skills and competencies, and that low volume hospitals providing less than 25 procedures are less likely to achieve optimal results. Centralizing procedures in hospitals providing a set minimum of procedures could serve to reduce access to remote and rural areas. A solution may be for orthopedic surgeons to hold office hours in the underserved communities, with surgery taking place in designated centres. This is already the practice of some surgeons. As well, there are issues of access to orthopedic services and for other services, including ambulatory services such as arthroscopic procedures and management of osteoporotic fractures. Strategies to improve access to speciality care and reduce waiting times needs to be evaluated. We need to understand more about the factors that relate to the availability and uptake of joint replacement and the relationship to the availability of resources, whether it be related to availability of finance, surgeons or hospital resources.

Rehabilitation and Community Support Services

The disability associated with arthritis and related conditions and osteoporotic fractures leads to reduced independence and community mobility, less participation in employment, social and leisure activities, as well as loss of income and incurring extra expenditures.[2] Rehabilitation therapy and community support services need to be in place to help individuals deal with the disabilities arising from arthritis. These services represent a vast but largely uncharted territory. There are few data about them and in the case of community services, there is very little documentation about what services are available.

Rehabilitation serves to prevent loss of physical function in ongoing arthritis, as well as to restore function after surgery, severe episodes of inflammatory arthritis or fractures.[33,34] The range of professional services includes physical and occupational therapy, which play important and complementary roles in the maintenance of function and control of disability. People with arthritis may also need orthotics and special shoes. Exercise and information about assistive devices (including use of canes) are also an integral part of the rehabilitation.

Rehabilitation services are delivered in a variety of settings, including rehabilitation hospitals, outpatient clinics, private practice clinics and in the home. Community and in-home rehabilitation services may be offered by profit and not-for-profit organizations through the Community Care Access Centres or other arrangements. The Arthritis Society's Consultation and Rehabilitation Service is funded by the Ontario Ministry of Health and delivers rehabilitation and social work services to people with arthritis in community, workplace and home settings.

There is little information about the full spectrum of rehabilitation programs for people with arthritis and related conditions. The databases for rehabilitation hospitals and home care have limited information about the underlying medical conditions of the people receiving services. However, linkage of data for acute care with home care and rehabilitation hospital services allows for the analysis of post-acute care services, as we have seen in Chapter 9. These present a limited view of the rehabilitation services received by people with arthritis and related conditions. We lack systematic data on ambulatory rehabilitation care in the community and in the home unless they are directly linked to acute care discharges. Most rehabilitation services for arthritis and related conditions take place in ambulatory care or community settings, with individuals accessing these services directly from the community.

Population surveys give some indication of the use of rehabilitation professional services in Ontario. The Ontario Health Survey showed that approximately 2.3% of people with arthritis consulted physiotherapists and 3% consulted chiropractors during the previous year.[35] The estimated number of consultations per individual per year was 14 for physiotherapists and 7 for chiropractors. People with musculoskeletal conditions made up the bulk of the practice of physiotherapists accounting for 90% of all conditions seen.[36] Only a very small proportion of people with arthritis and related conditions used home care services.[37]

There are large provincial variations in the supply of physiotherapists, occupational therapists and chiropractors. Physiotherapists and occupational therapists tend to be located near rheumatologists and orthopedic surgeons, whereas chiropractors tend to be located independently of other types of practitioners. The extent to which chiropractic care provides complementary services in the areas with low provision from other relevant professionals needs further investigation.

Chapters 8 and 9 show the patterns of post-acute care for patients discharged from hospital with hip fracture and musculoskeletal conditions, respectively. Both chapters demonstrate the large variations in the use of rehabilitation and home care services across the province and the lack of any real relationships between length of stay in acute-care hospitals, discharge destination and subsequent use of home care services. Research is required on the effectiveness and optimum use of post-acute rehabilitation services.

There is relatively little information or research on rehabilitation services in the community. An exception is the Consultation and Rehabilitation Service in Ontario where evaluations of services have shown positive results. Controlled trials of home physiotherapy for rheumatoid arthritis[38,39] and for ankylosing spondylititis[40,41] and a controlled trial of home occupational therapy for rheumatoid arthritis[42] showed benefits in terms of reduced pain and maintainance of function over the long-term with a relatively low intensity of professional service input.

Restructuring of the Health Care System and the Move to Care in the Community

The organization and provision of services in the community sector are undergoing major changes, and this is taking place concurrently with a major shift of health care from institutions to the community. These changes are taking place in situations where there is very little information. The Health Services Restructuring Commission initially focussed on the hospital sector. It is making recommendations on hospital restructuring based on community and regional requirements for acute-care beds, rehabilitation beds, home care and long-term care facilities. Ultimately, the Commission will identify areas for reinvestment in health that will lead to the development of comprehensive, integrated services for communities, districts and regions.

Community Care Access Centres are being implemented across the province to reorganize and provide a range of services that include nursing, rehabilitation services and community support services such as home-making. These services are being purchased from various provider organizations. The Community Care Access Centres are intended to be responsive to local priorities, which will inevitably result in variation in services provided across the province.

Changes in the health care system mean that rehabilitation professionals are increasingly working in community settings. The 1993 survey of family physicians in Ontario indicated few barriers to outpatient physiotherapy. In contrast, a large proportion of family physicians reported both access and waiting time barriers to home physiotherapy, occupational therapy and social work services. Documentation of access to, and adequacy of, rehabilitation professional services is urgently needed, particularly in light of the changes in patterns of care delivery.

Community health care is not covered by the Canada Health Act and charges for services may be made. In principle, services should be more accessible because they are locally based, however, charges may represent barriers to access. Research is needed to better define the factors associated with access to rehabilitation services in community settings.

The current changes in rehabilitation and community support services have so far mainly been at the organizational level. Less attention has been paid to the nature of the services that should be provided. There is a need for innovative studies which explore of models of care for people with chronic disabling conditions. Here, issues relate to the ongoing management of the conditions and the maintenance of function and prevention of disability. Issues include the potential monitoring role of rehabilitation professionals to identify and respond to emerging impairment and disability before it makes an impact on daily life, to reinforce maintenance of exercise and other disease management strategies and to promote timely use of assistive devices and adaptations in the work and home environment.

The implications of all these changes to health care delivery for people with arthritis and related conditions are not yet clear. In particular, the fate of The Arthritis Society's Consultation and Rehabilitation Service is uncertain. Given the potential of rehabilitation to contribute to the reduction of disability and pain associated with arthritis and related conditions, a major investment must be made in the development of rehabilitation services. This is particularly true for community-based services, for people with arthritis and related conditions which are appropriate for the chronic course of these conditions.

Health Education and Health Promotion

Health education and health promotion is needed to provide information about the prevention of arthritis and osteoporosis and what can be done to reduce their impact. The number of people with arthritis and related conditions is so large that the health care system would be overwhelmed if all who had symptoms consulted physicians. Many types of arthritis and related conditions are minor and self-limiting and do not require medical intervention. Education about what to do about these disorders is needed, including use of medication such as acetaminophen or aspirin, appropriate use of simple physical remedies (such as ice, heat or mechanical support) and when to seek medical care.

There is growing awareness of the importance of strategies to prevent osteoarthritis.[43,44] Osteo-arthritis of the knee is increased in obese people and previous joint injury is a risk factor. Arthritis needs to be added to the list of conditions caused by obesity.

For people with arthritis, the evidence shows that the use of so-called 'self-management' strategies can lead to significant decreases in pain, disability and medical consultation as well as increases in self-efficacy.[45] Self-management includes teaching about techniques for controlling pain and other symptoms, exercise, use of assistive devices and adaptations, and appropriate consultation with health professionals. Research shows

that patient education interventions provide benefits that are 20-30% as effective as treatment by medication in reducing pain and 40% as effective in improving disability, leading to fewer physician consultations.[12] Exercise programs for people with arthritis have resulted in significant improvements in pain and disability as well as decreased need for medication.[20,46-48]

Services to facilitate self-management range from community-based programs to support groups. An important component of community services is the availability of appropriate classes, facilities and professional advice to meet the needs of people with arthritis and related conditions. All of these components are integral to the maintenance of function and control of disability for people with these conditions.

A report on the range of programs for people with arthritis and osteoporosis available in Ontario highlighted the limited availability of services and indicated a number of potential problems that people might have in accessing such programs.[49] Programs were offered in a variety of settings ranging from hospitals to community centres. Exercise was the main component of programs, with many also including an educational component. Few programs offered components directed toward the use of assistive devices, medical therapy or social support. There were difficulties in finding out about programs as most were poorly advertised and relied on word of mouth or doctor's referral. Few programs were available in rural communities or in languages other than English, and funding and leadership for many programs was precarious. Most programs were delivered in one location only, with only a quarter being more widely available. These findings raise issues about how to increase the availability of programs. There is potential to build on existing programs including the programs of the Osteoporosis Society of Canada and the community programs of The Arthritis Society, Ontario Division most notably the Arthritis-Self Management Program, their exercise programs and disease specific organizations, such as Blue Bird Clubs.

Health promotion for osteoporosis includes education about the available strategies to maintain bone density (and to prevent bone loss) and strategies to prevent fracture.[50-52] Strategies to maintain bone density include medication (see Chapter 1), adequate dietary intake of calcium and vitamin D and weight-bearing exercise. Programs for people with established osteoporosis are needed to educate them about strategies to maintain bone density and avoid falling and hence fracture. Load-bearing exercise has been demonstrated to help maintain bone density. Exercise that includes components directed to improving balance has been shown to reduce falls. Strategies to prevent fractures centre around the prevention of falls. This includes strategies to improve balance and awareness of factors that might affect balance (such as use of sedatives and alcohol), increasing physical activity and awareness of environmental factors. The latter would include elimination of trip hazards, adequate lighting and so on.

In summary, health education and health promotion relating to arthritis and related conditions has the potential to reduce future health and community care costs.[53] More research as well as increased investment in such services is needed.

Health Policy and Planning

There are three basic approaches to estimating the impact of arthritis and other conditions on our society: demands on the health care system, disability-adjusted life years, and societal costs. It is instructive to look at the findings for each of these approaches.

Arthritis is a leading cause of morbidity, disability and the utilization of health services.[54] Arthritis and related conditions are the most frequent cause of long-term disability in Ontario. These disorders are one of the most common type of chronic and recurring conditions, second only to allergies. Arthritis and related conditions are the third leading cause of days with reduced activities. With respect to visits to primary care physicians, diseases of the respiratory system are the most common diagnosis recorded on OHIP claims followed by diseases of the musculoskeletal system. Arthritis and related conditions are the third leading reason for consulting health professionals and the second ranking reason for taking prescription and over-the-counter drugs. The additive effect of the differences can be seen in the results of the NPHS; 15% of the respondents had arthritis and they accounted for 33% of the costs for health care. The findings from Ontario are consistent with those elsewhere. Arthritis ranks consistently high as a cause of morbidity, disability and health care utilization, particularly in the middle-aged and older population.[55,56]

Although it is generally true that the overall mortality from arthritis and related conditions is low, some of the inflammatory disorders such as rheumatoid arthritis are associated with increased mortality and shortened life span.[57-61] Indeed, in 1995, as many people in Canada died of arthritis and related conditions as died of melanoma.[62] This does not include deaths due to the adverse effects of arthritis drugs, such as gastric hemorrhage related to taking of anti-inflammatory medication, nor deaths related to hip fracture.

Calculation of disability-adjusted life years (DALYs) is a technique for combining the impact of mortality and disability on the loss of potential years of healthy life. The World Bank used this technique for estimating the global burden of disease and the cost-effectiveness of interventions. The six conditions with the highest DALYs in the developed

countries were heart disease, stroke, depression, road traffic accidents, alcohol use, and osteoarthritis, in that order.[63] Kaplan[64] and Reynolds[65] estimate that the average person in a country such as ours loses three to four years of healthy life to arthritis over the course of a lifetime. There are studies that suggest the control of non-fatal conditions[66-68] would lead to greater gains in life expectancy than control of fatal conditions, with the greatest gains for any one condition coming from the control of arthritis.

As we have seen in Chapter 3, the estimated costs of arthritis to Canadian society are considerable. The societal costs were calculated to be $5.8 billion, with the estimates ranging from $4.3 to $7.3 billion. The majority of the costs associated with arthritis and related conditions are indirect costs associated with disability, mainly the loss of productivity from persons with arthritis who are unable to work. Only one-third of the total cost is associated with the direct cost of health care.

The fact that a preponderance of those affected by arthritis and related conditions are women and many are over the age of retirement or are not in the labour force makes attribution of costs difficult. In addition wages for women in the work force have traditionally been about 70% of those for men. Taken together, these factors may mean that the true indirect costs of arthritis are underestimated.[69] Also, as indicated in Chapter 3, the costing study does not account for the intangible costs of pain and suffering, and the benefits of good health.

Perhaps the most important indicator of the importance of arthritis and related conditions are projections of what is to come with demographic changes and the aging of the population.[70,71] Projections based on the 1994 National Population Health Survey and the 1991 General Social Survey suggest that the number of people in Canada with arthritis will increase by approximately one million per decade for the next 40 years, and in the first half of this time period, the increase will be split between the older half of the working age population (those aged 45-64) and those aged 65 years and older.[71] One can anticipate that the number of hip fractures will double by the year 2010 due to the aging of the population.[72] Much of the increase in the number of people with arthritis is due to the aging of the baby boom generation. This increase in numbers will have implications for the need for health care.

It should be noted that the increases in the number of people with arthritis and related conditions will take place at a time when the size of the population aged under 45 years will remain constant. It is this section of the population which has traditionally provided most of the health care services, as well as providing a major contribution to the tax base which funds health and welfare services. Given these pending increases it is important that we take steps to reduce the impact of arthritis in the population.

Conclusion

Arthritis is a major cause of morbidity, disability and health care utilization in Ontario. Although there is at present no known cure for any type of arthritis, appropriate treatment helps to prevent disability, maintain function and reduce pain. One still hears accounts of people with arthritis being told that this condition is just a part of growing old and nothing can be done: this is far from the truth. Proven modalities include medication, specialist care, rehabilitation, exercise and education (self-management). For severe arthritis, joint replacement, particularly of the hip and knee, has been shown to be a very efficacious and cost effective procedure which relieves pain and improves function.

This atlas reviews what we know of the situation relating to arthritis and related conditions in Ontario, and suggest that there are six key components for a comprehensive strategy for reducing their impact on individuals and in the population as a whole (Exhibit 10.1). These are primary care services, rehabilitation and community support services, health education and health promotion, specialist and hospital services, and health policy and planning.

The components of the strategy for arthritis can be viewed as sub-components of the existing health care system. Most of these components are in place, although the nature of provision may not be the optimum, as this Atlas illustrates. The issues are ones of the adequacy, availability and accessibility of these services for people with arthritis and related conditions. A major element, and one which needs particular attention as the health care system is restructured, is how these components of the health care system work together to give integrated care. Coordination of care has a number of aspects including how patients are triaged and referred, the comprehensiveness and continuity of services, and the appropriateness of care to the stage of disease.

The information included in this Atlas is largely governed by the availability of data. We know most about services in the acute care sector. There is a danger that our appreciation of services for people with arthritis and related conditions will be unduly coloured by this. The major area of services used for arthritis and related conditions are ambulatory and primary care, rehabilitation services and community care. These are areas where we lack adequate information systems.

Arthritis and related conditions are the most frequent chronic conditions. A health care system which is oriented to acute and short term needs, it is arguably not the best to deal with long-term and evolving conditions. A health care system that is responsive to the changing needs and challenges of people with arthritis and related conditions is likely to be better able to respond to other chronic disabling disorders.

Arthritis and related conditions are associated with a large burden of morbidity and disability in the population and high societal costs. This burden will increase with the aging of the population. A comprehensive health strategy to reduce the impact of these conditions is urgently needed.

References

1. Badley EM, Webster GK, Rasooly I. The impact of musculoskeletal disorders in the population. Are they just aches and pains? Findings from the 1990 Ontario Health Survey. *J Rheumatol* 1995; 22: 733-739.

2. Badley EM. The impact of disabling arthritis. *Arthritis Care Res* 1995; 8: 221-228.

3. The Arthritis Society. *Meeting the needs of people with arthritis: A strategic approach.* Submission of The Arthritis Society Ontario Division to the Ontario Health Services Restructuring Commission. December 1996.

4. Verbrugge LM. Women, men and osteoarthritis. *Arthritis Care Res* 1995; 8: 212-20.

5. Glazier R. The future of rheumatology: Paradigm shift or turf war? [editorial] *J Rheumatol* 1996; 23: 1494-1496.

6. Ward MM, Leigh JP, Fries JM. Progression of functional disability in patients with rheumatoid arthritis: Associations with rheumatology subspecialty care. *Arch Intern Med* 1993; 153: 2229-2237.

7. Wilke WS, Sweeney TJ, Calabrese LH. Early, aggressive therapy for rheumatoid arthritis: Concerns, descriptions, and estimate of outcome. *Arthritis Rheum* 1993; 23: 26-41.

8. Fries JF, Williams CA, Morfeld D, et al. Reduction in long-term disability in patients with rheumatoid arthritis by disease-modifying antirheumatic drug-based treatment strategies. *Arthritis Rheum* 1996; 39: 616-622.

9. Elsbett-Koeppen RH, Badley EM. Nonpharmacologic treatment modalities in the treatment of arthritis: Patient education, exercise and social support. Toronto: Arthritis Community Research & Evaluation Unit; 1998 (June). *ACREU Working Paper* 98-4.

10. Minor MA, Lane NE. Recreational exercise in arthritis. *Rheum Dis Clin North Am* 1996; 22: 563-577.

11. Goeppinger J, Lorig K. Interventions to reduce the impact of chronic disease: Community-based arthritis patient education. *Annu Rev Nurs Res* 1997; 15: 101-122.

12. Superio-Cabuslay E, Ward MM, Lorig K. Patient education interventions in osteoarthritis and rheumatoid arthritis: A meta-analytic comparison with nonsteroidal antiinflammatory drug treatment. *Arthritis Care Res* 1996; 9: 292-301.

13. Coyte PC, Hawker G, Croxford R, et al. Variation in rheumatologists' and family physicians' perceptions of the indications for and outcomes of knee replacement surgery. *J Rheumatol* 1996; 23: 730-738.

14. Symmons D. Excess mortality in rheumatoid arthritis: Is it the disease or the drugs? [editorial] *J Rheumatol* 1995; 22: 2200-2202.

15. Fries JF, Williams CA, Ramey DR, Bloch DA. The relative toxicity of alternative therapies for rheumatoid arthritis: Implications for therapeutic progression. *Semin Arthritis Rheum* 1993; 23 (2 Suppl 1): 68-73.

16. Hochberg MC, Altman RD, Brandt KD, et al. Guidelines for the medical management of osteoarthritis. Part I. Osteoarthritis of the hip. *Arthritis Rheum* 1995; 38: 1535-1540.

17. Hochberg MC, Altman RD, Brandt KD, et al. Guidelines for the medical management of osteoarthritis. Part II. Osteoarthritis of the knee. *Arthritis Rheum* 1995; 38: 1541-1546.

18. Brandt K. Should nonsteroidal anti-inflammatory drugs be used to treat osteoarthritis? *Rheum Dis Clin North Am* 1993; 19: 29-44.

19. Daltroy LH. Arthritis patient education. *Bull Rheum Dis* 1992; 41: 2-4.

20. Minor MA, Hewett JE, Webel RR, Anderson SK, Kay DR. Efficacy of physical conditioning exercise in patients with rheumatoid arthritis and osteoarthritis. *Arthritis Rheum* 1989; 32: 1396-1405.

21. Badley EM, Yoshida K, Webster G, Stephens M. Disablement and chronic health problems in Ontario. Toronto: Ministry of Health; 1993. *Ontario Health Survey 1990 Working Paper* No. 5.

22. Gabriel SE, Jaakkimainen RL, Bombardier C. The cost-effectiveness of misoprostol for nonsteroidal antiinflammatory drug-associated adverse gastrointestinal events. *Arthritis Rheum* 1993; 36: 447-459.

23. Gabriel SE, Campion ME, O'Fallon WM. A cost-utility analysis of misoprostol prophylaxis for rheumatoid arthritis patients receiving nonsteroidal antiinflammatory drugs. *Arthritis Rheum* 1994; 37: 333-341.

24. Maetzel A, Ferraz MB, Bombardier C. The cost effectiveness of misoprostol in preventing serious gastrointestinal events associated with the use of non-steroidal antiinflammatory drugs. *Arthritis Rheum* 1998; 41: 1-10.

25. Golden BD. The prevention and treatment of osteoporosis. *Arthritis Care Res* 1998; 11: 124-134.

26. Badley EM. The provision of rheumatologic services. In: Klippel JH, Dieppe PA, editors. *Rheumatology.* 2nd ed. Vol. 1. London: Mosby; 1998; 2.1-2.8.

27. Vliet Vlieland TPM, Breedveld FC, Hazes, JMW. The two-year follow-up of a randomized comparison of in-patient multidisciplinary team care and routine out-patient care for active rheumatoid arthritis. *Br J Rheum* 1997; 36: 82-85.

28. Helewa A, Bombardier C, Goldsmith CH, Menchions B, Smythe HA. Cost-effectiveness of inpatient and intensive outpatient treatment of rheumatoid arthritis. A randomized controlled trial. *Arthritis Rheum* 1989; 32: 1505-1514.

29. Chang RW, Pellissier JM, Hazen, GB. A cost-effectiveness analysis of total hip arthroplasty for osteoarthritis of the hip. *JAMA* 1996; 275: 858-865.

30. Laupacis A, Bourne R, Rorabeck C, et al. Costs of elective total hip arthroplasty during the first year. *J Arthroplasty* 1994; 481-487.

31. Coyte PC, Hawker G, Wright JG. Variations in knee replacement utilization rates and the supply of health professionals in Ontario Canada. *J Rheumatol* 1996; 23: 1214-1220.

32. Health Services Restructuring Commission. *Change and transition. Planning guidelines and implementation strategies for home care, long term care, mental health, rehabilitation, and sub-acute care.* 1998 April.

33. Guccione AA. Physical therapy for musculoskeletal syndromes. *Rheum Dis Clin North Am* 1996; 22: 551-562.

34. Helewa A. Physical therapy management of patients with rheumatoid arthritis and other inflammatory conditions. In: Walker JM, Helewa A, editors. *Physical therapy in arthritis.* Philadelphia: Saunders; 1996. 245-263.

35. Badley EM, Wang P. Determinants of consulation with health professions for musculoskeletal disorders in a population with universal health insurance. *Arthritis Rheum* 1996;39(9 Suppl);S263.

36. Badley EM. The economic burden of musculoskeletal disorders in Canada is similar to that for cancer, and may be higher. *J Rheumatol* 1995; 22: 204-206.

37. Badley EM, Cott CA, Gignac MAM, Parthimos M. *Determinants of good health for persons with chronic diseases and disability. A report on the 1994 National Population Health Survey.* Toronto: Arthritis Community Research and Evaluation Unit. 1997 May.

38. Bell MJ, Lineker SC, Wilkins AL et al. A randomized controlled trial to evaluate the efficacy of community based physical therapy in the treatment of people with rheumatoid arthritis. *J Rheumatol* 1998; 25: 231-237.

39. Lineker SC, Bell MJ, Wilkins AL et al. Improvements following short term community-based physical therapy are maintained at one year in people with moderate to severe RA. [abstract] *Arthritis Rheum* 1997; 40(9 Suppl): S336.

40. Kraag G, Stokes B, Groh J, Helewa A, Goldsmith C. The effects of comprehensive home physiotherapy and supervision on patients with ankylosing spondylitis—A randomized controlled trial. *J Rheumatol* 1990; 17: 228-233.

41. Kraag G, Stokes B, Groh et al. The effects of comprehensive home physiotherapy and supervision on patients with ankylosing spondylitis—An 8-month followup. *J Rheumatol* 1994; 21: 261-263.

42. Helewa A, Goldsmith CH, Lee P et al. Effects of occupational therapy home service on patients with rheumatoid arthritis. *Lancet* 1991; 337: 1453-1456.

43. Dieppe P. Strategies for the prevention of osteoarthritis. [Review]. *Int J Tissue React* 1993; 15: 93-97.

44. Hochberg MC. Epidemiologic considerations in the primary prevention of osteoarthritis. [editorial] *J Rheumatol* 1991; 18: 1438-1440.

45. Lorig K, Holman H. Arthritis self-management studies: A twelve-year review. *Health Educ Q* 1993; 20: 17-28.

46. McKeag DB. The relationship of osteoarthritis and exercise. *Clin Sports Med* 1991; 11: 471- 487.

47. Minor MA. Physical activity and management of arthritis. *Ann Behav Med* 1991; 13: 117- 124.

48. U.S. Department of Health and Human Services. *Physical activity and health. A report of the Surgeon General.* Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, and National Center for Chronic Disease Prevention and Health Promotion; 1996.

49. Elliot-Gibson V, Cott CA, Gignac MAM, Badley EM. *A key informant survey of programs and services for Canadians with osteoarthritis and osteoporosis.* Toronto: Arthritis Community Research and Evaluation Unit; 1998 June. Working paper 98-93.

50. Osteoporosis Society of Canada, Scientific Advisory Board. Clinical practice guidelines for the diagnosis and management of osteoporosis. *Can Med Assoc J* 1996; 155: 1113-1133.

51. Wark JD. Osteoporotic fractures: Background and prevention strategies. *Maturitas* 1996; 23: 193-207.

52. Bellantoni MF. Osteoporosis prevention and treatment. A*m Fam Physician* 1996; 54: 986-992.

53. Fries JF, Koop CE, Sokolov J et al. Beyond health promotion: Reducing need and demand for medical care. *Health Affairs* 1998; 17: 70-84.

54. Badley EM, Rasooly I, Webster GK. Relative importance of musculoskeletal disorders as a cause of chronic health problems, disability, and health care utilization: Findings from the 1990 Ontario Health Survey. *Rheumatol* 1994; 21: 505-514.

55. Verbrugge LM, Patrick DL. Seven chronic conditions: Their impact on US adults' activity levels and use of medical services. *Am J Public Health* 1995; 85: 173-182.

56. Pope GC. Medical conditions, health status, and health services utilization. *Health Serv Res* 1988; 22: 857-877.

57. Wolfe F, Mitchell DM, Sibley JT et al. The mortality of rheumatoid arthritis. *Arthritis Rheum* 1994; 37: 481-494.

58. Cosh JA. Survival and death in rheumatoid arthritis. [editorial] *J Rheumatol* 1984; 11: 117-119.

59. Symmons DPM, Jones MA, Scott DL, Prior P. Long-term mortality outcome in patients with rheumatoid arthritis: Early presenters continue to do well. *J Rheumatol* 1998; 25: 1072-1077.

60. Pincus T, Callahan LF. Taking mortality in rheumatoid arthritis seriously–predictive markers, socioeconomic status and comorbidity. [editorial] *J Rheumatol* 1986; 13: 841-5.

61. Pincus T. Long-term outcomes in rheumatoid arthritis. *Br J Rheumatol* 1995; 34(Suppl 2): 59-73.

62. Statistics Canada. *Causes of death, 1995.* Ottawa: Statistics Canada; 1997.

63. Murray CJ, Lopez AD, editors. The global burden of disease. *A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020.* Boston: Harvard School of Public Health on behalf of the World Health Organization and the World Bank; 1996.

64. Kaplan RM, Alcaraz JE, Anderson JP, Weisman M. Quality-adjusted life years lost to arthritis: Effects of gender, race, and social class. *Arthritis Care Res* 1996; 9: 473-482.

65. Reynolds DL, Torrance GW, Badley EM, et al. Modelling the population health impact of musculoskeletal diseases: Arthritis. *J Rheumatol* 1993; 20: 1037-1047.

66. Boult C, Altmann M, Gilbertson D, et al. Decreasing disability in the 21st century: The future effects of controlling six fatal and nonfatal conditions. *Am J Public Health* 1996; 86:1388-1393.

67. Boult C, Kane RL, Louis TA et al. Chronic conditions that lead to functional limitations in the elderly. *J Gerontol* 1994; 49: M28-M36.

68. Nusselder WJ, van der Velden K, van Sonsbeek JL et al. The elimination of selected chronic diseases in a population: The compression and expansion of morbidity. *Am J Public Health* 1996; 86: 187-194.

69. Yelin E. The importance of arthritis to the economy: Impact on work productivity. Presentation to the XII Pan American Congress of Rheumatology. Montreal, Quebec, 1998 21-25 June.

70. Helmick CG, Lawrence RC, Pollard RA, et al. National Arthritis Data Workgroup. Arthritis and other rheumatic conditions: Who is affected now, who will be affected later? *Arthritis Care Res* 1995; 8: 203-211.

71. Badley EM, Wang PP. Arthritis and the aging population: Projections of arthritis prevalence in Canada 1991 to 2031. *J Rheumatol* 1998; 25: 138-144.

72. Jaglal SB, Sherry PG, Schatzker J. The impact and consequences of hip fracture in Ontario. *Can J Surg* 1996: 39: 105-111.

Technical Appendix

Technical Appendix

Health Planning Regions and District Health Councils in Ontario

For planning purposes, the Ontario Ministry of Health divided the province into six health planning regions and 33 District Health Councils (DHCs). Effective April 1, 1998, the Ministry reduced the number of District Health Councils to 16 by merging many DHCs.

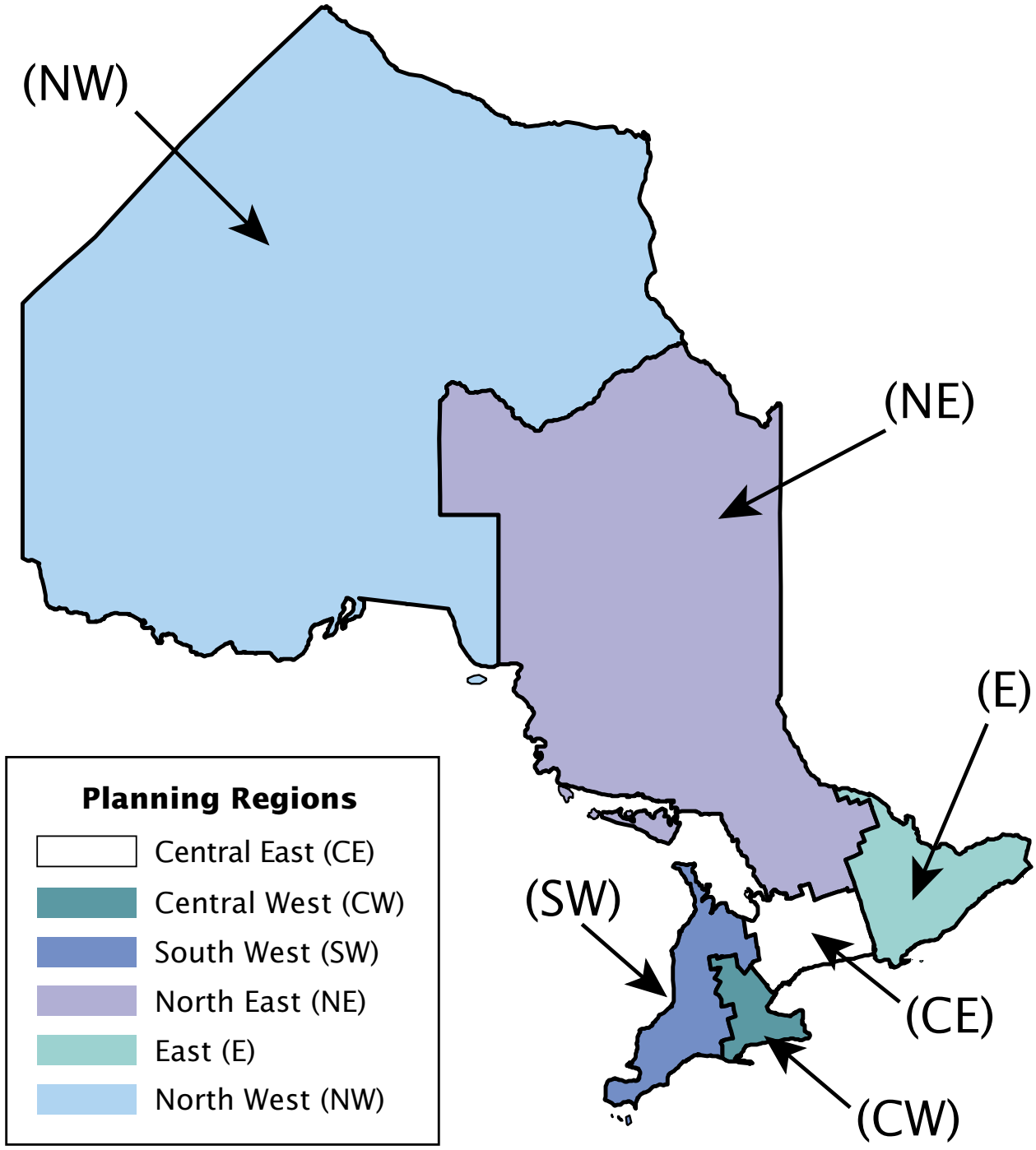
To facilitate comparison between this Atlas and earlier ICES Practice Atlases, we have shown variations in services using both the old and new District Health Councils.

TA.1 illustrates the six Health Planning Regions. According to Statistics Canada's population estimates for 1996, the number of residents vary across health planning regions from 258,540 residents in the North West to more than five million people in the Central East region.

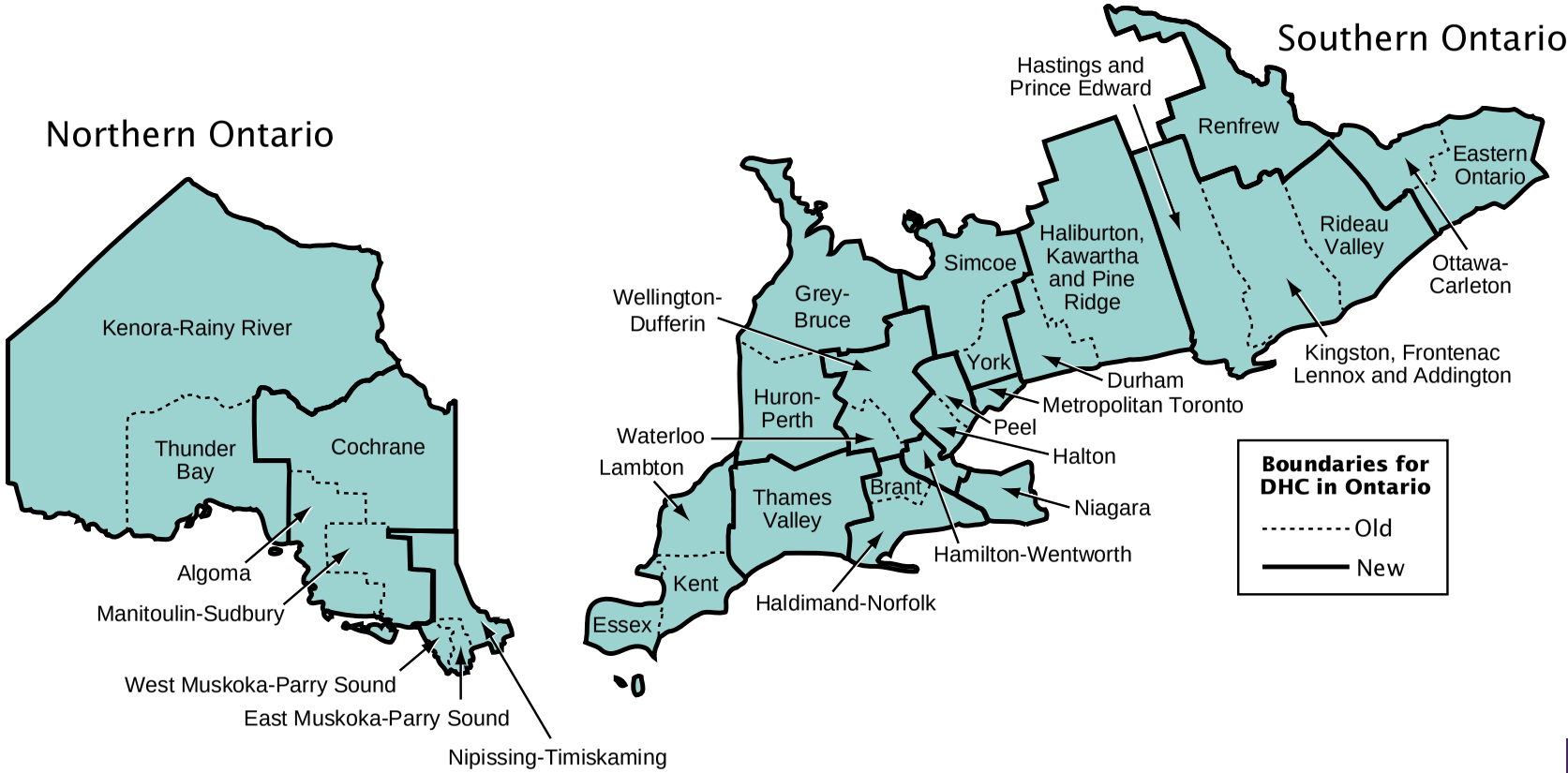
Exhibit TA.2 delineates the boundaries for the old and new District Health Councils. Four District Health Council boundaries remain unchanged: Metropolitan Toronto (now referred to as Toronto), Hamilton-Wentworth, Niagara Region and Thames Valley.

TA.3 uses the 1996 census to illustrate the distribution of the population of Ontario broken down by the District Health Council and Health Planning Region. According to the new DHC boundaries, four District Health Councils have less than 300,000 residents: Grand River; Muskoka, Nippissing, Parry Sound and Timiskaming; Northwestern Ontario; and Grey, Bruce, Huron and Perth; and four have populations of approximately 1 million or more: Halton-Peel; Toronto; Simcoe-York; and Champlain. The remaining District Health Councils have populations that range from 400,000 to 800,000.

Ontario Health Planning Regions



Ontario District Health Councils



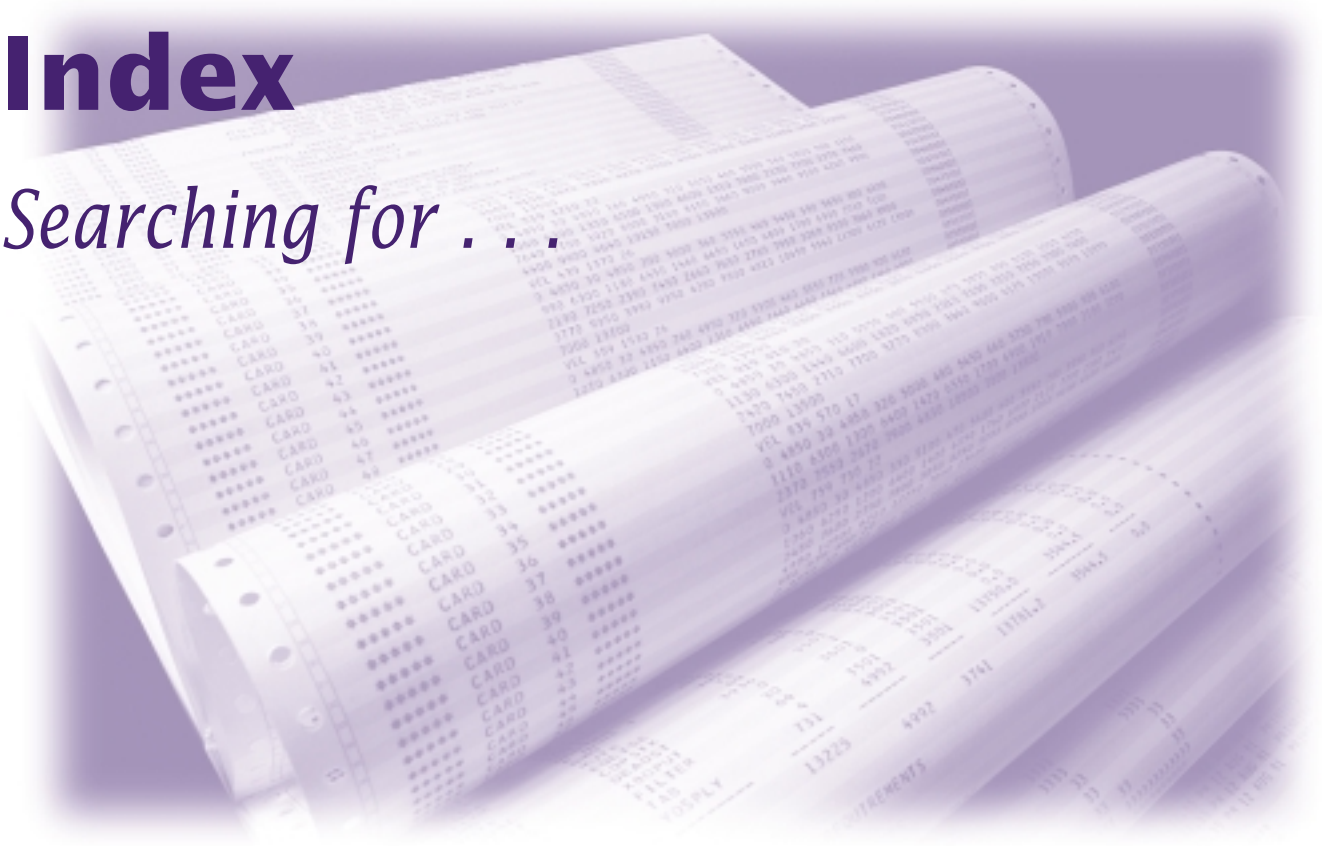
Technical Appendix TA.3: *Populations of Ontario Health Planning Regions and District Health Councils, 1996*

Old District Health Councils	1996 Old District Health Councils Population	New District Health Councils	1996 New District Health Councils Population
Central East		**Central**	
• Durham Region	480,334	• Durham Haliburton, Kawartha & Pine Ridge	780,342
• Haliburton, Kawartha & Pine Ridge	300,008	• Halton-Peel	1,257,641
• Metropolitan Toronto	2,446,121	• Toronto	2,446,121
• Peel	901,384	• Simcoe-York	967,540
• Simcoe County	344,766		
• York Region	622,774		
Total	**5,095,387**	**Total**	**5,451,644**
Central West		**Central West**	
• Brant	125,195	• Grand River	234,103
• Haldimand-Norfolk	108,908	• Hamilton-Wentworth	489,943
• Halton	356,257	• Niagara Region	422,622
• Hamilton-Wentworth	489,943	• Waterloo Region-Wellington-Dufferin	655,782
• Niagara	422,622		
• Waterloo Region	428,426		
• Wellington-Dufferin	227,356		
Total	**2,158,707**	**Total**	**1,802,450**
East		**East**	
• Eastern Ontario	194,530	• Champlain	1,061,448
• Hastings and Prince Edward Counties	154,359	• Quinte, Kingston, Rideau	498,127
• Kingston, Frontenac, Lennox and Addington	180,704		
• Ottawa-Carleton Regional	762,974		
• Renfrew County	103,944		
• Rideau Valley	163,064		
Total	**1,559,575**	**Total**	**1,559,575**
North East		**North East**	
• Algoma	133,640	• Algoma, Cochrane, Manitoulin & Sudbury	440,587
• Cochrane	96,763	• Muskoka, Nipissing, Parry Sound & Timiskaming	223,659
• East Muskoka-Parry Sound	73,053		
• Manitoulin-Sudbury	210,184		
• Nipissing/Timiskaming	129,211		
• West Muskoka/Parry Sound	21,395		
Total	**664,246**	**Total**	**664,246**
North West		**North West**	
• Kenora-Rainy River	92,530	• Northwestern Ontario	258,450
• Thunder Bay	165,920		
Total	**258,450**	**Total**	**258,450**
South West		**South West**	
• Essex County	367,329	• Essex, Kent and Lambton	620,154
• Grey-Bruce	160,740	• Grey, Bruce, Huron, Perth	299,029
• Huron/Perth	138,289	• Thames Valley	596,878
• Kent County	115,955		
• Lambton	136,870		
• Thames Valley	596,878		
Total	**1,516,061**	**Total**	**1,516,061**
Ontario Total	**11,252,426**	**Ontario Total**	**11,252,426**

Data Source: Statistics Canada

Index

Searching for . . .



A–D

E-J

K-O

P-W

GLOSSARY OF ACRONYMS	
ACREU	Arthritis Community Research and Evaluation Unit
ACR	American College of Rheumatology
BMI	Body mass index
CIHI	Canadian Institute for Health Information
CMG	Case Mix Group
CRA	Canadian Rheumatology Association
DEXA	Dual X-ray absorptiometry
DHC	District Health Council
DMARD	Disease-modifying Anti-Rheumatic Drug
HUI	Health Utility Index
ICES	Institute for Clinical Evaluative Sciences
ICD	International Classification of Diseases
MRIW	Mean Resource Intensity Weight
NHANES I	National Health and Nutrition Examination Survey
NPHS	National Population Health Survey
NSAID	Non-steroidal anti-inflammatory Drug
ODB	Ontario Drug Benefit program
OHCAS	Ontario Home Care Administration System
OHIP	Ontario Health Insurance Plan
OHS	Ontario Health Survey
RA	Radiographic assessment