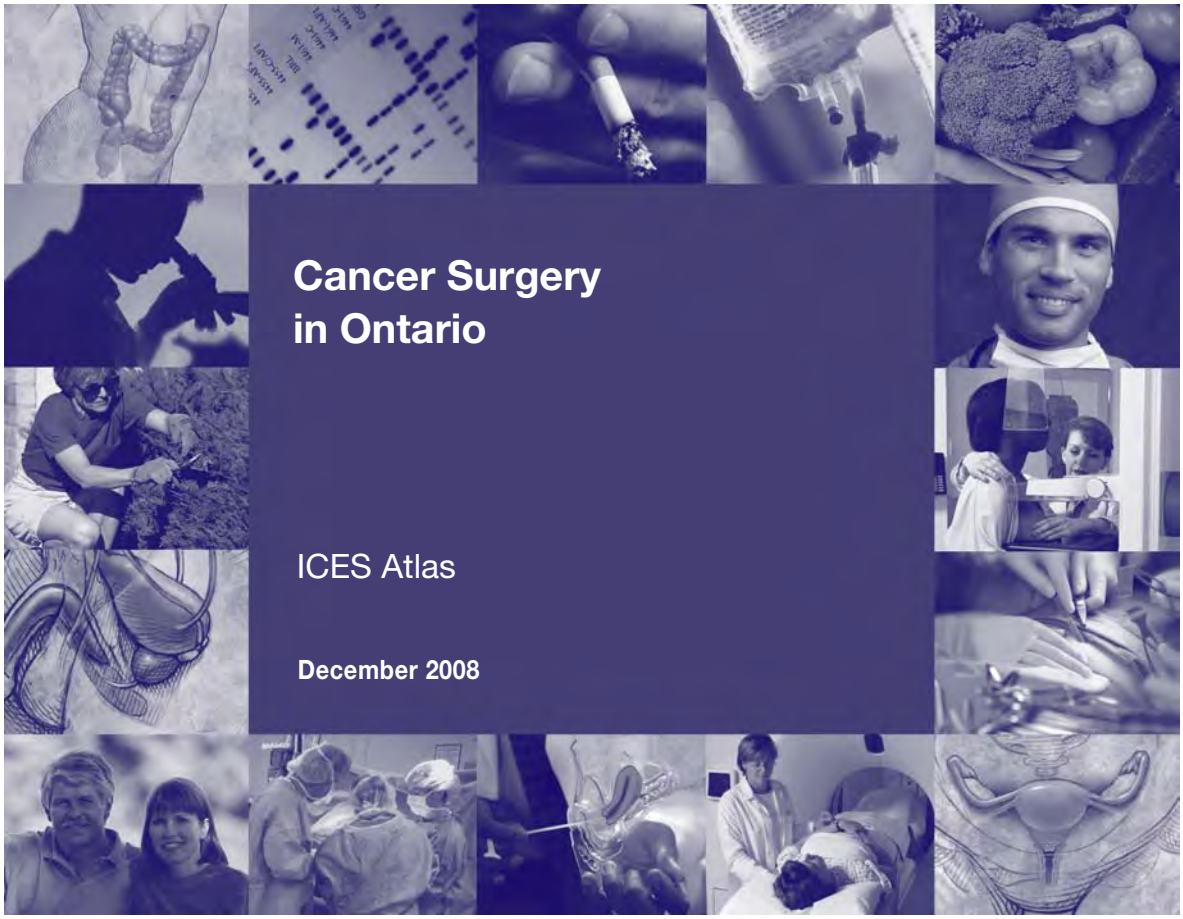
ICES Institute for Clinical Evaluative Sciences

Cancer Surgery in Ontario

ICES Atlas

December 2008

cancer care ontario | action cancer ontario



Cancer Surgery in Ontario

ICES Atlas

December 2008

Editors

David R. Urbach, MD, MSc, FRCSC, FACS

Marko Simunovic, MD, MPH, FRCSC

Susan E. Schultz, MA, MSc

Publication Information

Published by the Institute for Clinical Evaluative Sciences (ICES) © 2008

Canadian cataloguing in publication data

Cancer Surgery in Ontario: ICES Atlas

Includes bibliographical references.

ISBN: 978-0-9738553-6-4

i. Urbach, David R. 1968-
ii. Simunovic, Marko 1962-
iii. Schultz, Susan E. 1957-

How to cite this publication

The production of *Cancer Surgery in Ontario: ICES Atlas* was a collaborative venture. Accordingly, to give credit to individual authors, please cite individual chapters and title, in addition to editors and book title.

For example:

Quan ML, Hodgson N, Przybysz R, Gunraj N, Schultz SE, Baxter N, Urbach DR, Simunovic M. Surgery for Breast Cancer. In: Urbach DR, Simunovic M, Schultz SE, editors. *Cancer Surgery in Ontario: ICES Atlas.* Toronto: Institute for Clinical Evaluative Sciences, 2008.

Institute for Clinical Evaluative Sciences (ICES)
G1 06, 2075 Bayview Avenue
Toronto, ON M4N 3M5
Telephone: 416-480-4055
www.ices.on.ca

Contents

Authors' Affiliations

Lisa Barbera, MD, MPA, FRCPC
Assistant Professor
Department of Radiation Oncology,
University of Toronto

Scientist
Clinical Epidemiology,
Sunnybrook Research Institute

Adjunct Scientist
Institute for Clinical Evaluative Sciences

Staff Radiation Oncologist
Odette Cancer Centre,
Sunnybrook Health Sciences Centre

Nancy Baxter, MD, PhD, FRCSC
Associate Professor
Departments of Surgery and Health Policy,
Management and Evaluation (HPME),
University of Toronto

Adjunct Scientist
Institute for Clinical Evaluative Sciences

Scientist
The Keenan Research Centre in the Li Ka Shing
Knowledge Institute of St. Michael's Hospital

Gail Darling, MD, FRCSC
Associate Professor
Department of Surgery,
University of Toronto

Researcher
Ontario Cancer Institute

Thoracic Surgeon
Division of Thoracic Surgery,
Toronto General Hospital,
University Health Network

Laurie Elit, MD, MSc, FRCSC
Associate Professor
Department of Obstetrics and Gynecology,
McMaster University

Gynecologic Oncologist
Juravinski Cancer Centre,
Hamilton Health Sciences Centre

Antonio Finelli, MD, MSc, FRCSC
Assistant Professor
Department of Surgery,
University of Toronto

Surgical Oncologist/Staff Surgeon
Division of Urology,
Princess Margaret Hospital,
University Health Network

Nadia Gunraj, MPH
Analyst
Institute for Clinical Evaluative Sciences

Nicole Hodgson, MD, MSc, FRCSC
Assistant Professor
Department of Surgery,
McMaster University

Surgical Oncologist
Juravinski Cancer Centre,
Hamilton Health Sciences Centre

Janice S. Kwon, MD, MPH, FRCSC
Assistant Professor
Department of Gynecologic Oncology,
MD Anderson Cancer Center, Houston, Texas

Assistant Professor
Division of Gynecologic Oncology, University of
British Columbia and B.C. Cancer Agency

Erin Kennedy, MD, PhD, FRCSC
Gastrointestinal Surgical Oncologist
Division of General Surgery, Toronto General
Hospital, University Health Network

Assistant Professor
Departments of Surgery and Health Policy,
Management and Evaluation (HPME),
University of Toronto

Rahima Nenshi-Patel, MD
Research Fellow
Department of Surgery,
University of Toronto

Kenneth T. Pace, MD, MSc, FRCSC
Assistant Professor
Department of Surgery, Department of Health
Policy, Management and Evaluation (HPME),
University of Toronto

Urologist
Department of Surgery, St. Michael's Hospital

Raymond Przybysz, MSc
Epidemiologist
Institute for Clinical Evaluative Sciences

May Lynn Quan, MD, MSc, FRCSC
Assistant Professor
Departments of Surgery and Health Policy,
Management and Evaluation (HPME),
University of Toronto

Surgical Oncologist
Sunnybrook Health Sciences Centre

Susan E. Schultz, MA, MSc
Epidemiologist
Institute for Clinical Evaluative Sciences

Sharon Sharir, MD, MPH, FRCSC
Assistant Professor
Department of Surgery,
University of Toronto

Urologist
Humber River Regional Hospital

Marko Simunovic, MD, MPH, FRCSC
Associate Professor
Department of Surgery,
McMaster University

Associate Member
Clinical Epidemiology and Biostatistics,
McMaster University

Surgical Oncologist
Juravinski Cancer Centre,
Hamilton Health Sciences Centre

David Urbach, MD, MSc, FRCSC, FACS
Associate Professor
Departments of Surgery and Health Policy,
Management and Evaluation (HPME),
University of Toronto

Scientist
Cancer Care Ontario

Scientist
Division of Clinical Decision-Making and Health Care,
Toronto General Hospital Research Institute

Adjunct Scientist
Institute for Clinical Evaluative Sciences

Andrew S. Wilton, MSc
Analyst
Institute for Clinical Evaluative Sciences

Acknowledgments

The authors wish to thank the following individuals and organizations for their contributions to the success of this project and to apologize in advance for any inadvertent omissions:

Editing

Evelyne Michaels
Editor
Institute for Clinical Evaluative Sciences

Layout

Laura Benben
Senior Web and Graphic Designer

Randy Samaroo
Graphic Designer
Institute for Clinical Evaluative Sciences

Printing

Continental Press

Internal Coordination

Gary Spencer
Director, Reporting and Knowledge Transfer

Nancy MacCallum
Coordinator

Paulina Carrión
Coordinator
Institute for Clinical Evaluative Sciences

Administrative and Logistical Support

Julie Harnish
Research Coordinator

Stacey Stegienko
Research Analyst

Joy Zoleta
Administrative Assistant
Toronto General Hospital

Marilu Joffe
Research Administrative Assistant
Institute for Clinical Evaluative Sciences

Jennifer Mah
Executive Secretary
Cancer Care Ontario

Content Support/Stakeholder

Katya Duvalko
Amber Hunter
John Irish
Robin MacLeod
Elizabeth McCarthy
Joan Murphy
Jillian Ross
Hartley Stern
Terrence Sullivan
Graham Woodward
Frances Wright

Funding Support

This Atlas was funded by Cancer Care Ontario through a *Patterns of Care Research Network* grant.

About Our Sponsoring Organizations

Institute for Clinical Evaluative Sciences (ICES)

Ontario's resource for informed health care decision-making

The Institute for Clinical Evaluative Sciences (ICES) is an independent, non-profit organization that produces knowledge to enhance the effectiveness of health care for Ontarians. Internationally recognized for its innovative use of population-based health information, ICES' evidence supports health policy development and guides changes to the organization and delivery of health care services.

Key to our work is our ability to link population-based health information, at the patient-level, in a way that ensures the privacy and confidentiality of personal health information. Linked databases reflecting 12 million of 30 million Canadians allow us to follow patient populations through diagnosis and treatment, and to evaluate outcomes.

ICES brings together the best and the brightest talent under one roof. Many of our scientists are not only internationally recognized leaders in their fields, but are also practicing clinicians who understand the grassroots of health care delivery, making the knowledge produced at ICES clinically-focused and useful in changing practice. Other team members have statistical training, epidemiological backgrounds, project management or communications expertise. The variety of skill sets and educational backgrounds ensures a multi-disciplinary approach to issues and creates a real-world mosaic of perspectives that is vital to shaping Ontario's future health care system.

ICES receives core funding from the Ontario Ministry of Health and Long-Term Care. In addition, our faculty and staff compete for peer-reviewed grants from federal funding agencies, such as the Canadian Institutes of Health Research, and project-specific funds are received from provincial and national organizations. These combined sources enable ICES to have a large number of projects underway, covering a broad range of topics. The knowledge that arises from these efforts is always produced independent of our funding bodies, which is critical to our success as Ontario's objective, credible source of *Evidence Guiding Health Care.*

Cancer Care Ontario

Better cancer services every step of the way

Cancer Care Ontario is the provincial agency responsible for continually improving cancer services. As the government's cancer advisor, Cancer Care Ontario:

- directs and oversees more than 600 million public health care dollars to hospitals and other cancer care providers to deliver high quality, timely cancer services
- implements provincial cancer prevention and screening programs designed to reduce cancer risks and raise screening participation rates
- works with cancer care professionals and organizations to develop and implement quality improvements and standards
- uses electronic information and technology to support health professionals and patient self-care to continually improve the safety, quality, efficiency, accessibility and accountability of cancer services
- plans cancer services to meet current and future patient needs, and works with health care providers in every Local Health Integration Network to continually improve cancer care for the people they serve
- rapidly transfers new research into improvements and innovations in clinical practice and cancer service delivery

Foreword

by Terrence Sullivan, PhD

Surgical services central to improving quality of care for Ontarians with cancer

Here in Ontario, it is our ambition to improve cancer services every step of the way. This most recent large study of cancer surgery and related services in Ontario is an extremely important contribution to this mission.

In the last five years, cancer surgery in Ontario has changed considerably. In previous years, it was a discipline that was somewhat external to the formal sweep of organized cancer services. Today cancer surgery exists at the centre of orchestrated activities designed to improve the quality of care for cancer patients, the majority of whom will require surgical procedures.

Cancer Care Ontario is proud to be an active supporter of these initiatives. Through the Health Services Research Network and our support of individual health services researchers in the field, we are strengthening Ontario's place in international efforts focused on cancer care. A joint career awards program between Cancer Care Ontario and the Ontario Cancer Institute for Cancer Research will enhance these relationships even further.

Health services research in cancer care has the capacity to shine a light on the quality, organization and management of cancer services and health systems.

This **ICES Atlas**—***Cancer Surgery in Ontario***—builds upon previous efforts by Neill Iscoe and his colleagues more than a decade ago. By focusing on a large swath of major surgeries comprising about 60 percent of all cancer surgery in Ontario, the authors and editors provide a rich platform for further work. More specifically, they have noted variations in a range of cancer surgeries, related diagnostic procedures, and studies on the multidisciplinary treatment of cancer which warrant further discussion and inquiry.

Ontario's cancer surgery program has become a platform for improving multidisciplinary case conferences throughout the province. Indeed, work is currently underway to reduce variations and improve access in the diagnostic phase of cancer care, where surgeons often play important roles in initiating and coordinating multidisciplinary assessment.

The careful mapping of variations in the utilization of services and resources contained in the latest Atlas allows the authors to point out important and sometimes perplexing variations in the use of procedures among Ontario's 14 Local Health Integration Networks (LHINs).

With the current alignment of administrative and clinical leadership from regional cancer programs across Ontario, we have a structured opportunity for detailed exploration of the reasons behind these variations. It is hoped that this will enable further local efforts to improve performance and quality in all regions. As the Atlas editors point out, it is essential that such work engage specialty surgeons as well as general surgeons region by region across Ontario.

A number of initiatives have already been launched and are underway to improve cancer surgery outcomes in Ontario. Some are already capturing international attention. These include initiatives to consolidate thoracic surgery in a smaller number of high-quality centres. This consolidation means a number of trained thoracic surgeons are now involved in higher volumes of surgical activity than has been the case historically in Ontario. A similar initiative is underway with respect to hepatobiliary-pancreatic surgery.

These kinds of large quality initiatives require the good will and collaboration of hospitals, their chief executive officers and chiefs of staffs, surgeons, the 14 Ontario LHINs and Cancer Care Ontario. Our efforts are succeeding because they focus on what is right for patients: ensuring quality services as close to home as quality permits.

We believe it is possible to develop a consensus standard—made in Ontario and built upon international evidence—to consolidate the organization of services in a fashion that provides higher quality outcomes for patients. This important initiative has been led by surgeons with the active involvement of hospital leadership as well as health professionals across Ontario. As the provincial surgical oncology program evolves, we anticipate further quality improvement work in a range of disease areas, including prostate cancer, breast cancer and other less common cancers.

Continued on page x

Foreword

The consolidation of services into areas of excellence in cancer services is also underway in the United Kingdom, in France, and in selected areas of the United States. Armed with the most current available data from this new ICES Atlas, we can now begin to understand and evaluate areas for improvement. This includes focusing on parts of the province where there is lower-than-optimal utilization of cancer surgery, where wide variations exist in the use of diagnostics for cancer surgery, and where there may be significant variation in particular surgical and multidisciplinary approaches to treatment. It is our hope that an overall approach to disease management across the spectrum of cancer care will yield a series of focused areas for improvements in access and quality.

In short, this ICES Atlas represents a quality improvement platform for Ontario's surgical oncology program in a number of areas. This research also provides an important resource for efforts to improve and to target more comprehensive capture of cancer stage data.

I anticipate fruitful analysis and application of this work for several years to come, and I congratulate the editors and authors on achieving this important benchmark.

Terrence Sullivan, PhD
President and Chief Executive Officer

Cancer Care Ontario

Executive Summary

Issue

Cancer is a leading cause of death in western countries. While surgery is commonly used in the treatment of cancer, we lack important information about the use of surgery in the treatment of cancer in Ontario.

Study

This Atlas presents information on surgery and related health services provided to persons in Ontario who were newly-diagnosed with one of the following cancers in 2003/04: cancers of the breast, prostate, lung and large bowel (colon and rectum) or cancers of the female genital tract (uterus, ovary, cervix and vulva). We analyzed data from the Ontario Cancer Registry (OCR) and from several of Ontario's administrative health databases to produce information intended to guide regional, population-based planning of cancer surgery services.

Key Findings

- Many Ontarians in our study cohorts who were newly diagnosed with cancer underwent some kind of surgery in the 12 months prior to and following their diagnoses. This included 95 percent of women with uterine cancer; 92 percent of women with breast cancer; 87 percent of people with colon cancer; 78 percent of people with rectal cancer; 73 percent of women with ovarian cancer; and 57 percent of women with cervical cancer. Comparatively fewer patients had surgery for prostate cancer (47 percent) and lung cancer (40 percent).
- We noted variations in the proportion of people with many types of cancer who had surgery according to the Local Health Integration Networks (LHINs) where patients resided at the time they were diagnosed. We found similar variations in the types of surgical procedures provided.
- Most patients who had surgery for the cancers we studied received their surgery in hospitals located in the LHIN where they were living when their cancer was diagnosed.
- Based on our findings, it is possible that some patients with cancer in Ontario are not receiving the highest-quality surgical procedures. For example, although lymph node sampling is an important part of establishing tumour stage in breast cancer, 24 percent of the breast cancer patients we studied did not undergo any kind of axillary (underarm) lymph node sampling. Similarly, 46 percent of women who underwent major surgery for vulvar cancer did not receive groin lymph node dissection.
- A large proportion of the cancer surgery provided to patients in our study cohorts was delivered by surgeons who did not specialize solely in cancer surgery (i.e., they did not identify themselves as surgical oncologists). However, we also noted that the amount of surgery provided by surgical oncologists was disproportionate to their numbers. For example, gynecologic oncologists made up only four percent of surgeons performing uterine cancer surgery in Ontario at the time. Yet these specialists performed 21 percent of all surgeries on women with uterine cancer in our study cohort.
- Most cancer surgery delivered to patients in our study cohorts was provided in the community hospital setting.
- We found that surgeons provided a substantial amount of care to people newly diagnosed with cancer, regardless of whether these patients underwent surgical procedures for their disease.
- Patients in some of our study cohorts did not receive surgical procedures that might have cured their disease. For example, we found that only 19 percent of patients with lung cancer had a surgical procedure to remove their tumours. Because of data limitations, we were unable to determine why some patients did not undergo specific procedures. However, the most common reason that people with cancer are not offered potentially curative surgery is that their cancers have already progressed to a point where removal of the tumour is no longer beneficial.
- Many cancer patients in our study cohorts utilized a variety of health services other than surgery. These included diagnostic imaging, needle biopsies, specialist consultations, radiation therapy and chemotherapy.

Continued on page xii

Implications

- Surgery is a critical part of cancer care in Ontario. For many patients, surgeons serve as the gatekeepers to the cancer care system.
- Programs intended to improve the quality of cancer surgery in Ontario must engage all surgeons, not just surgical oncologists. Such programs must target surgeons who work in community hospitals, since these surgeons are major providers of cancer care in Ontario.
- Further research should be done to determine why certain variations exist in the delivery of cancer-related surgical services in Ontario and whether such variations are cause for concern and intervention.
- Further research is also needed to understand why some Ontarians with cancer may not be undergoing surgical procedures which offer the potential for cure.
- Expansion of the Ontario Cancer Registry to include detailed cancer-related information, such as information on cancer stage and initial treatment, would greatly improve our ability to conduct cancer-related health services research in Ontario.
- A program of cancer-related health services research in Ontario would facilitate planning of these services and help in developing quality improvement programs. A key objective of research on the quality of cancer surgery would be to understand which structures and processes of care lead to better outcomes for Ontarians with cancer.

Glossary of Terms

Ablation
Removal of a body part or the destruction of its function. Ablation may be done using surgery, or by exposure to an energy source or a noxious substance.

Adenocarcinoma
A malignant tumour originating in the epithelial cells of glandular tissue and forming glandular structures.

Adjuvant
Use of drugs, radiation therapy or other means of supplemental treatment **after** cancer surgery *(see Neoadjuvant).*

Age-standardized
Results which are statistically adjusted for differences in age between comparison groups, to discount the effect of age on the comparison. Age-standardized differences that are observed between comparison groups cannot be explained by differences in the ages of the subjects in the groups.

Ascites
Fluid accumulation in the abdominal cavity.

Axilla
Armpit.

Basal cell cancer
A slow-growing form of cancer, usually affecting the skin.

Benign
Not life-threatening or severe and likely to respond to treatment. A tumour that is not malignant.

Benign prostatic enlargement (BPE)
Non-malignant enlargement of the prostate gland commonly occurring in older men and sometimes leading to compression of the urethra and obstruction of the flow of urine. Also *benign prostatic hypertrophy (BPH).*

Bilateral
Occurring on, performed on or affecting both sides of the body.

Biopsy
Removal and examination of a sample of tissue from a living body for diagnostic purposes. Also refers to the resulting tissue sample.

Bladder
A stretchable, sac-like structure in the body that holds fluids. The word "bladder" is used in this Atlas to refer to the urinary bladder (the reservoir that holds urine).

Bone scan
A nuclear scanning test that identifies bone growth or breakdown. It can be done to detect whether cancer has spread to the bones.

Brachytherapy
Radiation therapy in which the source of irradiation is placed close to the surface of the body or within a body cavity.

Breast
Either of two milk-secreting, glandular organs on the chest of a woman.

Breast-conserving surgery (BCS)
Surgical removal of a portion of the breast that leaves the remainder of the breast intact.

Bronchoscopy
Inspection of the airways using a flexible telescope, performed for diagnosis of problems involving the airways. Biopsy of abnormal tissue can be done using bronchoscopy.

CA 125
CA (cancer antigen) 125 is a substance measured using a blood test. The presence of CA125 may indicate the presence of some types of cancer, such as ovarian cancer.

Canadian Institute for Health Information (CIHI)
An independent, not-for-profit organization, primarily funded by the provincial and federal governments of Canada. CIHI collects and maintains a number of datasets from across Canada that are relevant to Canada's health care system such as hospital discharge records and ambulatory care records.

Canadian Medical Directory (CMD)
A document containing a list of physicians in Canada, as well as their contact information and areas of specialization.

Cancer
A disease characterized by any of various malignant neoplasms composed of abnormal cells that tend to proliferate rapidly and invade surrounding tissue.

Carcinoma *in situ*
A cluster of malignant cells that has not yet invaded the deeper epithelial tissue or spread to other parts of the body.

Cervicectomy
Surgical removal of the cervix of the uterus, usually done for treatment of cervical cancer *(see Trachelectomy).*

Cervix
A neck-shaped anatomical structure, especially the narrowed lower end of the uterus that extends into the vagina.

Chemotherapy
The treatment of disease, especially cancer, using drugs that are destructive to malignant cells and tissues.

Cohort
A group of individuals having a factor in common, such as a type of cancer.

Colon
The part of the large intestine extending from the cecum to the rectum where water and electrolytes are absorbed, solidified and prepared for elimination as feces.

Colonoscopy
Inspection of the interior surface of the colon with a flexible endoscope that is inserted through the rectum and is equipped to obtain tissue samples.

Colostomy
An artificial opening from the colon through the abdominal wall. Patients with cancer may have a colostomy to bypass a blockage of the lower bowel, or as part of their definitive cancer surgery. A colostomy may be temporary or permanent.

Community hospital
A hospital that is not a teaching hospital.

Comorbidity
A concomitant but unrelated disease process or medical condition.

Computed tomography (CT)
A method of examining body organs by scanning them with X-rays and then using a computer to construct a series of cross-sectional images along a single axis.

Cone biopsy
An extensive form of a cervical biopsy. It is called a cone biopsy because a cone-shaped wedge of tissue is removed from the cervix and examined under a microscope. A cone biopsy removes abnormal tissue located high in the cervical canal. A small amount of normal tissue around the cone-shaped wedge of abnormal tissue is also removed so that a margin free of abnormal cells is left in the cervix.

Consultation
An assessment of a patient done by one health care provider at the request of another health care provider.

Cryotherapy
The local or general use of low temperatures in medical therapy.

Cystoscopy
A diagnostic procedure in which the doctor inserts a lighted instrument called a cystoscope into the urethra to check for abnormalities. Cystoscopy is used to diagnose problems in the urethra and urinary bladder.

Cytology
Analysis of the microscopic appearance of cells, especially for the diagnosis of abnormalities and malignancies.

Cytotoxic
Producing a toxic effect on cells, causing cell injury or death.

Debulking
Surgical removal of all or most of a tumour.

Definitive surgical procedure
The most extensive surgical procedure performed for a patient who has had more than one procedure.

Ductal carcinoma *in situ* (DCIS)
Precancerous growth (or early carcinoma) of the milk-secreting ducts in the breast that have the potential of becoming invasive and spreading to other tissues.

Empyema
The presence of infection-related pus in a body cavity, especially the chest cavity.

Endometrium
The internal lining of the uterus.

Erectile dysfunction
The inability to achieve penile erection or to maintain an erection until ejaculation; also called "impotence."

Excision
Surgical removal of a tumour (or a portion of a structure or organ) by cutting.

Exenteration
Removal of pelvic organs such as the bladder and rectum.

External beam radiation therapy
Use of high-energy rays (or particles) to destroy cancer cells or slow their rate of growth. In external beam radiation therapy, a focused beam of radiation is delivered by a machine outside the body.

Fecal occult blood test (FOBT)
A test for invisible blood in the stool. The test is done by placing a small sample of stool on a chemically treated medium. Fecal occult blood testing is used as a screening test for colorectal cancer.

Fee-for-service
Charging a fee for each specific service rendered in health care, as distinguished from participating in a prepaid medical practice.

Grade
A measure of how abnormal the cells of a neoplasm appear microscopically and what might be the outcome in terms of its growth rate, invasiveness and dissemination.

High-intensity focused ultrasound (HIFU)
A type of cancer treatment that targets high-frequency sound waves to a specific part of a cancer. Some cells die when this high-intensity ultrasound beam is focused directly onto them.

Histology
The scientific study of the microscopic structure of tissues.

Hormonal therapy
Manipulation of the endocrine system using specific hormones, particularly steroid hormones, or drugs which inhibit the production or activity of such hormones (hormone antagonists). Because steroid hormones are powerful drivers of gene expression in certain cancer cells, changing the levels or activity of certain hormones can cause certain cancers to cease growing, or even to undergo cell death. Surgical removal of endocrine organs, such as the testicles or ovaries, can also be employed as a form of hormonal therapy.

Human papilloma virus (HPV)
A family of viruses that infect the skin and mucous membranes and which can cause genital warts or cancer. Human papilloma virus infection is a strong risk factor for cervical cancer.

Hysterectomy
Surgical removal of all or part of the uterus.

Ileostomy
A surgically-constructed, artificial excretory opening through the abdominal wall into the ileum (the last portion of the small intestine). An ileostomy, which can be temporary or permanent, is usually done to bypass a blockage in the intestine; it may also be done as a temporary measure to divert the flow of feces from an area downstream where two ends of bowel have been connected to allow healing.

Incidence
The extent or rate of occurrence, especially in the number of new cases of a disease in a population over a period of time.

Incontinence
The inability to control excretory functions, such as urination and defecation.

Inpatient
Treatment in a hospital in clinic that requires at least one overnight stay.

Intraperitoneal
Refers to structures within the abdominal cavity. For example, intraperitoneal chemotherapy is delivered directly into this cavity through the abdominal wall.

Intravenous (IV)
Administered by vein.

Invasive
Marked by the tendency to spread, especially into healthy tissue (as does a tumour).

Laparoscopic
Performed using instruments passed through small incisions in the abdominal wall, usually with video guidance.

Lobe
An anatomical division of an organ of the body. The lungs are characterized by lobes that are held in place by connective tissue.

Lobectomy
Surgical removal of one lobe of a lung

Local Health Integration Network (LHIN)
One of 14 health regions in Ontario with a mandate for planning, integrating and funding health care services at a local level.

Loop electrosurgical excision procedure (LEEP)
Use of a thin, low-voltage electrified wire loop to cut out abnormal tissue. This method is commonly utilized to remove tissue from the cervix.

Lung
Either of two spongy organs in the chest that serve as the organs of gas exchange.

Lymph node
A bean-shaped mass of tissue found at intervals along the vessels of the lymphatic system that filters foreign substances from the blood. Many cancers spread first to the lymph nodes before spreading elsewhere in the body.

Lymphadenectomy
Surgical removal of one or more lymph nodes. Lymphadenectomy is usually done to determine whether a tumour has already spread to the lymph nodes, or to remove lymph nodes that are known to contain cancerous cells.

Lymphedema
Swelling of the soft tissues related to lymphatic fluid.

Lymphocele
An accumulation of lymphatic fluid.

Macroscopic cancer
Refers to cancers that can be seen without the use of a magnifying instrument.

Magnetic resonance imaging (MRI)
The use of a nuclear magnetic resonance spectrometer to produce electronic images of specific atoms and molecular structures in solids, especially human cells, tissues and organs.

Malignant
Relating to cancer cells that are invasive and tend to metastasize.

Mammogram
An X-ray image of the human breast used to detect tumours or other abnormalities.

Mastectomy
Surgical removal of all or a part of the breast.

Mediastinoscopy
Inspection of the tissues around the windpipe using a rigid lighted tube attached to a viewing device that is inserted through a surgical incision above the breastbone. Mediastinoscopy is usually done to obtain lymph node samples to determine whether lung cancer has spread to the nodes.

Mediastinotomy
Surgical removal of lymph nodes near the central airways, performed to determine whether lung cancer has spread to these nodes.

Metastasis
Movement of cancerous cells from an original site to one or more sites elsewhere in the body, usually by way of the blood vessels or lymphatic vessels.

Microinvasive cancer
Refers to cancers at the earliest stage of invasion into surrounding tissues.

Microscopic cancer
Refers to cancers that can only be seen using a magnifying instrument.

Multidisciplinary
Collaborative treatment by two or more health care providers in different areas of practice.

Needle core biopsy
The removal of suspicious-looking tissue with a wide needle for examination under a microscope. This is often done to diagnose breast cancer.

Neoadjuvant
Refers to treatment (chemotherapy and/or radiotherapy) given to people with cancer ***before*** surgery. The goal of neoadjuvant therapy is usually to reduce the size of the cancer, making surgery easier and more likely to be successful *(see Adjuvant).*

Neoplasm
An abnormal new growth of tissue caused by abnormally rapid cellular proliferation. It continues to grow after the stimuli that initiated the new growth cease. It also shows partial or complete lack of structural organization and functional coordination with the normal tissue, and usually forms a distinct mass of tissue which may be either benign or malignant.

Omentectomy
Surgical removal of the greater omentum, often done as a staging and debulking procedure in patients with ovarian cancer.

Omentum
Fatty folds of the peritoneum that connect the stomach with other abdominal organs and then drape over the transverse colon to cover the anterior surface of the abdominal cavity.

Oncologist
A physician who specializes in the treatment of patients with cancer.

Oncology
The branch of medicine that deals with tumours, including study of their development, diagnosis, treatment and prevention.

Ontario Cancer Registry (OCR)
A list of Ontario residents who have been newly diagnosed with cancer or who have died of cancer (excluding non-melanoma skin cancer).

Ontario Health Insurance Plan (OHIP)
The health plan that pays physicians for medical services provided to all Canadian citizens or permanent residents living in the province of Ontario.

Oophorectomy
Surgical removal of an ovary.

Orchidectomy
Surgical removal of a testicle.

Outpatient
Treatment in a hospital or clinic that does not require an overnight stay.

Ovary
One of the paired female reproductive organs that produce ova (egg cells) and certain sex hormones, including estrogen.

Palliative
Relieving or soothing the symptoms of a disease such as cancer without effecting a cure.

Pap (Papanicolaou) smear
A screening test, especially for cervical cancer, in which a smear of cells scraped from the cervix or vagina is treated with a chemical stain and examined under a microscope for pathological changes.

Para-aortic
Adjacent to the aorta.

Paracentesis
Surgical puncture or tapping of a fluid-filled body cavity, especially the abdomen, with a hollow needle or catheter to withdraw fluid.

Parametrium
The tissue surrounding the uterus.

Pathology
The medical science concerned with all aspects of disease with an emphasis on the essential nature, causes and development of abnormal conditions, as well as with the structural and functional changes that result from disease processes. The term is also used to refer to the anatomical or functional manifestations of a disease.

Percutaneous lung biopsy (also called needle lung biopsy)
This procedure involves inserting a needle into the lung through the chest wall to obtain tissue samples using a computed tomography (CT) scan or X-ray for guidance. Most often, the abnormality is not believed to be accessible by other diagnostic techniques such as bronchoscopy.

Perineum
The area between the anus and the scrotum in the male and between the anus and the vulva (the labial opening to the vagina) in the female.

Perioperative
The time period surrounding a patient's surgical procedure; this commonly includes ward admission, anesthesia, surgery and recovery. Also one of the three phases of surgery: preoperative, perioperative and postoperative.

Peritoneal cavity
The space within the abdomen that contains the intestines, the stomach and the liver. It is bound by thin membranes.

Peritoneum
The tissue that lines the abdominal wall and covers most of the organs in the abdomen.

Pleura
The thin serous membrane that envelops each lung and folds back to make a lining for the chest cavity.

Pleural effusion
An accumulation of fluid in the chest cavity surrounding a lung.

Pleurodesis
The intentional creation of fibrous adhesions between the layers of the pleura to obliterate the pleural (chest) cavity.

Pneumonectomy
The surgical removal of an entire lung.

Positron emission tomography (PET)
A method of medical imaging capable of displaying the metabolic activity of organs in the body that is useful in diagnosing cancer.

Prevalence
The total number of cases of a disease in a given population at a specific time.

Prostate
A firm, partly muscular, chestnut-sized gland in males which is located at the neck of the urethra. The gland produces a secretion which forms the fluid portion of semen.

Prostatectomy
The surgical removal of the prostate. Prostatectomy may be performed for cancer of the prostate as well as for benign conditions.

Prostate-specific antigen (PSA)
An enzyme secreted by the epithelial cells of the prostate gland. Since blood levels of prostate-specific antigen are elevated in patients with prostate enlargement and prostate cancer, it is used as a target in screening tests for prostate cancer.

Radiation therapy planning
Positioning the patient's body, making marks on the skin, and taking imaging scans to determine how best to deliver the radiation dose to a patient.

Radiation therapy
Treatment of cancer by controlled exposure to a radioactive substance.

Radical hysterectomy
Complete surgical removal of the uterus, upper vagina and parametrium (tissue surrounding the uterus).

Rectum
The last section of the digestive tract, extending from the colon to the anus, in which feces are stored before being eliminated.

Resection
Surgical removal of all or part of an organ, tissue or other body structure.

Salpingo-oophorectomy (SO)
Surgical removal of an ovary and its associated fallopian tube. Removal of both ovaries and tubes is called a bilateral salpingo-oophorectomy (BSO); removal of a single ovary and tube is called a unilateral salpingo-oophorectomy (USO).

Sarcoma
A tumour arising from connective tissue, such as bone, fat or muscle.

Screening
The examination of a group of usually asymptomatic individuals to detect those with a high probability of having or developing a given disease.

Sentinel lymph node
The hypothetical first lymph node or group of nodes reached by metastasizing cancer cells from a tumour.

Sigmoidoscopy
Visual examination (with a sigmoidoscope) of the lower third of the colon to search for polyps or other abnormalities.

Socioeconomic status (SES)
The position of individuals or groups within a hierarchical social structure. Socioeconomic status depends on a combination of variables, including occupation, education, income, wealth and place of residence.

Squamous cell cancer
Refers to cancers arising in the flat, thin cells found in the outer layer of the skin.

Stage
A measure, usually numbered I to IV, used to indicate how far a cancer has spread. Stage typically takes into account the size of a tumour, how deeply it has penetrated, whether it has invaded adjacent organs, whether it has invaded adjacent lymph nodes, how many nodes are affected, and whether cancer has spread to distant organs.

Stoma
A surgically constructed opening, especially one made in the abdominal wall, to permit the passage of waste.

Stricture
Abnormal narrowing of a bodily passage, usually due to inflammation, cancer or the formation of scar tissue.

Sublobar resection
Surgical removal of a portion of one lobe of the lung.

Sub-specialty
A narrow field of study or work within a specialty, such as urologic oncology or breast surgery.

Teaching hospital
A hospital that provides training to medical students and residents (physicians who have completed medical school and are enrolled in specialty training).

Thoracentesis
Insertion of a hollow needle or similar instrument into the pleural cavity of the chest in order to drain an abnormal accumulation of fluid.

Thoracoscopy
Surgical inspection of the chest cavity using a specialized telescope. Thoracoscopy may be performed for diagnosis and also to treat some conditions such as an abnormal accumulation of fluid in the chest cavity.

Thoracostomy
The surgical formation of an opening into the chest cavity, usually for placement of a tube to drain air or fluid.

Thoracotomy
A surgical procedure to open the chest cavity. A thoracotomy is usually performed to permit surgery within the chest cavity (such as removal of a lobe of the lung).

Total abdominal hysterectomy (TAH)
Surgical removal of the uterus and cervix by means of an incision made in the lower abdomen.

Trachelectomy
Excision of the cervix (the neck of the uterus). Usually done for the treatment of cancer of the cervix *(see Cervicectomy).*

Transurethral resection of the prostate (TURP)
Removal of the section of the prostate that is blocking urine flow using an instrument that is inserted through the urethra.

Tumour
A mass of new tissue growth that serves no function in the body. A tumour may be either benign or malignant.

Ultrasound
The use of ultrasonic waves for diagnostic or therapeutic purposes, specifically to visualize an internal body structure.

Unilateral
Refers to something occurring on, performed on or affecting one side of the body or one of its parts.

Urethra
The membranous tube that extends from the urinary bladder to the exterior; in males, the urethra conveys semen as well as urine.

Urologist
A surgeon who specializes in the diagnosis and treatment of diseases of the urinary tract and urogenital system.

Uterus
The organ of a female mammal in which the young are developed previous to birth (the womb).

Utilization
A measure of the amount of health services consumed by individuals or populations during a given time period. These services include physician visits, hospitalizations and the number of days spent in hospital.

Video-assisted thoracic surgery (VATS)
A surgical procedure done with the assistance of an endoscope introduced into the pleural space. This method may be used to biopsy abnormalities in the lungs, to remove portions of lung tissue, or to treat diseases affecting the chest cavity such as a collapsed lung.

Visual internal urethrotomy (VIU)
A procedure that involves passing an instrument through the penis up the urethra and making a small incision to widen a stricture (narrowing) that is causing urinary symptoms

Vulva
The external genital organs of the female, including the labia majora, labia minora, clitoris and vestibule of the vagina.

Vulvectomy
The surgical removal of the vulva.

INSIDE

Chapter 1

Introduction

David R. Urbach, MD, MSc, FRCSC, FACS, Marko Simunovic, MD, MPH, FRCSC, and Susan E. Schultz, MA, MSc

Why do we need a Cancer Surgery Atlas for Ontario?

Many kinds of cancer are diagnosed and treated surgically. The overall objective of *Cancer Surgery in Ontario* was to give Ontarians with cancer—and their health service providers—the latest information on the availability of and access to specific procedures, with a special focus on cancer-related surgery.

This information can also be used to support population-based, regional planning of Ontario's cancer surgery services in the future, and to provide the background information necessary to develop a program of health services research related to cancer surgery in Ontario. Finally, this Atlas outlines an agenda for cancer surgery-related health services research.

Cancer Surgery in Ontario focuses on the four most common types of cancer affecting Canadians—breast, prostate, colorectal and lung cancer—as well as on cancers of the female genital tract (uterine, ovarian, cervical and vulvar cancer).

It has been more than ten years since the Institute for Clinical Evaluative Sciences (ICES) published its first practice Atlas of cancer surgery.[1] This earlier publication focused on how surgery was being used for different types of cancer, including cancers of the head and neck, the gastrointestinal tract, the lung, bones and connective tissue, the breast, the female genital tract, the kidney, the bladder, the prostate gland and the endocrine glands. Based on analyses of the collected data, the authors of the 1997 ICES Atlas identified what they viewed as priorities for change in Ontario's existing system for cancer surgery.*

We thought it was time to update some of this information and take a fresh look at the current system. For example:

- The previous ICES Atlas analyzed data from the years 1992 to 1995, and much has changed in the interim.
- In the earlier report, regional analyses were done at the level of Ontario's District Health Councils, which no longer exist. The province's health service regions have since been re-organized into 14 Local Health Integration Networks (LHINs).
- Today many cancer services, such as radiation therapy and a large proportion of systemic chemotherapy, are delivered in a relatively small number of regional cancer centres.** By contrast, cancer surgery is provided in more than 100 hospitals throughout Ontario.

The role of surgery and surgeons in cancer diagnosis and treatment

While other treatment methods for cancer such as radiation therapy and systemic chemotherapy are undoubtedly important, no modality is as central to the overall treatment of most cancers as surgery. There are many reasons why a patient with cancer may see a surgeon or undergo a surgical procedure:

- Surgery is often used to obtain tissue samples (biopsies) for diagnosis.
- Surgery is also performed to remove tumours and other cancerous growths with the expectation of curing the patient.
- When cure is not possible, palliative surgical procedures may be used to manage pain and/or other symptoms.

* Priorities identified in the 1997 ICES practice Atlas entitled *Cancer Surgery in Ontario* included: (1) the need for a coordinated system; (2) the possible relationships between volume and outcomes; and (3) patients' right to know about their health service provider's surgical volume.[1] A large body of literature published after the 1997 Atlas suggests that, in many cases, relationships exist between volume and outcome for a variety of cancer surgeries.[2] Important policy initiatives emerged from this earlier report, especially with respect to focusing on regionalized models of surgical cancer care, and understanding variations in use of certain procedures, such as breast-conserving surgery for breast cancer. Variations in the use of surgery for prevalent cancers suggested that, at least in the early 1990s, consensus—even for very common surgical procedures—was lacking in Ontario.

** Currently there are 12 regional cancer centres in Ontario that provide both radiation therapy and systemic therapy, and two that provide only systemic therapy. There are plans to expand the number of regional cancer centres in Ontario to 16.

The role of cancer surgeons

Because surgeons frequently assess patients who are referred by their primary care physicians with a possible diagnosis of cancer, in effect, surgeons serve as gatekeepers to the cancer care system.[3] Surgeons are often the heath care providers responsible for establishing a diagnosis of cancer, for coordinating diagnostic imaging and other tests to determine how far the cancer has progressed (staging), and for organizing the follow-up of patients after their treatment. They often coordinate consultations with other cancer specialists, such as radiation and medical oncologists. They also follow their patients to detect any recurrence of cancer so it can be treated as quickly as possible (a process known as "surveillance"). This is all in addition to the surgical procedures mentioned previously.

Today in Ontario, all radiation and most systemic therapy for cancer are provided in a relatively small number of regional cancer centres. By contrast, the delivery of cancer surgery is far more decentralized. Surgical procedures are carried out by a wide variety of surgeons in different clinical settings. In fact, more than 100 hospitals in Ontario currently provide some type of cancer surgery.

For example, the majority of breast and colorectal cancer surgery (70 percent) is performed in community hospitals.[4] In such settings, coordination between surgeons and other cancer care providers—such as medical oncologists, radiation oncologists, pathologists and palliative care physicians—may not be as natural as it is in regional cancer centres. Only a small proportion of cancer operations are performed at hospitals associated with regional cancer centres, although such hospitals do tend to perform the more complex and high-risk operations.[5]

What we already know about patterns of care

Previous studies have noted variations in many aspects of cancer surgery in Ontario. For example, there is evidence that different types of surgery are provided to patients who live in different parts of the province.[6] The reasons for this are not completely understood. However, such findings are likely due to variations in surgeons' practice styles, to differences in patient preferences, and to the availability of alternative treatments such as radiation therapy.

Many studies show that the outcomes of cancer surgery are strongly influenced by how many similar surgical procedures the surgeon has done and/or by how often that type of surgery is done in a particular hospital. For many cancers, patients treated by "higher-volume" providers (i.e., surgeons who do such operations frequently) usually have better outcomes than those treated by "lower-volume" providers who do the procedures less often.[7-9]

Studies also show that the specialization of both surgeon and hospital may affect the outcome of cancer surgery.[10,11] Access to cancer surgery, frequently measured as the length of time patients wait for surgery, also varies between different regions.[12,13]

But while we have some understanding about variations in patterns of surgery, outcomes and access, there is much still we do not know about the delivery of cancer surgery. Who should perform cancer surgery and in what settings? Should patients travel to specialty centres for surgical care? Which surgical procedures should be done? What resources will be necessary to provide care to patients who develop cancer in the future? How will advances in health technology influence cancer care in the future?

Health planners are already responding to concerns about quality, access, cost and equity in the delivery of cancer surgery to Ontario patients. One of our goals in producing this new ICES Atlas—*Cancer Surgery in Ontario*—is to equip them with data which will support them in their decision-making.

How we did the research

Key questions about cancer surgery in Ontario

In developing this Atlas, we set out to answer a number of relevant and important questions about cancer surgery in Ontario:

- How many Ontarians who are newly-diagnosed with cancer have a surgical procedure as a result of their diagnosis?
- Among patients who undergo surgery for cancer, what kinds of surgical procedures are done?
- Where do patients with cancer have their surgery? In which types of hospitals are these procedures performed?
- What types of surgeons provide surgery to patients with cancer?
- What other kinds of health resources are consumed by patients who have surgery for cancer? Do they differ from health services provided to patients with cancer who do not have surgery?

Wherever possible, information is presented according to patient characteristics such as age, sex and socioeconomic status. Data are also grouped by certain geographic characteristics such as community size and Local Health Integration Network (LHIN) of patient residence—that is, where patients lived at the time they were diagnosed with cancer.

Data sources and methods

Cancer Surgery in Ontario focuses on the four most common types of cancer affecting Canadians—breast, prostate, colorectal and lung cancer—as well as on cancers of the female genital tract (uterine, ovarian, cervical and vulvar cancer).

We present information on 31,457 patients in Ontario who were newly-diagnosed with one of these cancers between April 1, 2003 and March 31, 2004. This represents 57 percent of all 55,041 patients in Ontario who were newly-diagnosed with all types of cancer during this period of time. This particular time frame was chosen because it was the most recent period for which complete information on treatment was available.

Data were obtained from the Ontario Cancer Registry (OCR) which contains information on virtually all new cases of invasive cancer in Ontario (except for non-melanoma skin cancer) reported since 1964.[14-16]

The OCR identifies new cancer cases through a variety of sources. These include: hospital discharge and day surgery summaries; pathology reports; patient records from regional cancer centres; and death certificates. Currently, the OCR does not collect or disseminate comprehensive information on cancer stage. (Cancer stage refers to the extent of cancer within the body. It is most-often based on the size or depth of penetration of the tumour, the presence of cancer in nearby lymph nodes, and whether it has spread from its original site to other parts of the body.)

Once we identified patients newly-diagnosed with cancer in the OCR, we linked them to administrative data from the Canadian Institute for Health Information (CIHI), the Ontario Health Insurance Plan (OHIP), and the Registered Persons Database (RPDB)—a population-based registry maintained by Ontario's Ministry of Health and Long-Term Care (MOHLTC) to manage publicly funded health care services covered under OHIP. The RPDB contains demographic information about virtually the entire provincial population. This allowed us to identify the health services provided to patients in our various study cohorts during a specific two-year period—from 12 months before the date their cancers were diagnosed to 12 months after.

While many health services are provided to patients with cancer, our objective was to focus on those services that were principally related to the treatment of the cancer. Our analyses did not include health services utilized by these same patients for coexisting health conditions (e.g., hypertension, diabetes or cataracts), nor did it include primary care services.

Our approach to identifying cancer-related surgeries and procedures in Ontario was somewhat different than the methods used in previous studies.[1] Instead of defining a list of specific procedures at the outset, we began by first collecting data about all the health services provided to patients with each type of cancer. We then narrowed this list of services down so it contained only those services which had been provided to more than one percent of all patients with that particular cancer. Finally, clinical experts on our research team reviewed the listed services one by one to determine which could be specifically related to cancer. This method ensured that we captured not only curative procedures, but also palliative or diagnostic procedures which might otherwise have been excluded from our analyses.

Study populations

For each of the eight cancer sites chosen for our study, we identified study cohorts. These included all individuals 20 years of age or older who were identified as having that particular cancer in the Ontario Cancer Registry (OCR) and whose diagnosis date fell between April 1, 2003 and March 31, 2004. These are referred to as the **Overall Cancer Cohorts**.

The **Overall Cancer Cohorts** were then subdivided into two smaller groups. The **Cancer Surgery Cohort** included anyone who had surgery related to their cancer during the period from 12 months prior to 12 months after their diagnosis. The **Cancer/No Surgery Cohort** included everyone in the **Overall Cohort** who did not have surgery during the designated time period.

Content and format of the chapter exhibits

Each main chapter in this Atlas contains tables and maps—called exhibits—which are used to present our research findings. While these exhibits contain specific information related to the type of cancer being discussed, they are essentially similar in what they present.

Understanding the exhibits

Each exhibit has a two- or three-part alphanumeric designation. The first number identifies the chapter within the Atlas that contains the exhibit; the second number identifies the number of the exhibit within the chapter. Thus, Exhibit 2.1 is the first exhibit in Chapter 2.

In Chapters 2 through 8 of this Atlas, all exhibits of the same number within their respective chapters present similar information in a similar format. Thus, Exhibits 2.1, 3.1, 4.1, 5.1, et cetera are similar in format and content.

Some exhibits also contain a letter as the third character. These letters (a, b and c) are used to indicate exhibits that are part of a series or related in some way. The content of these exhibits is outlined below.

Chapter 9, which focuses on cancer of the vulva, is an exception to this format. Because this cancer is quite rare, the number of newly-diagnosed cases in 2003/04 was small. As a result, certain analyses could not be performed, out of concern for either confidentiality issues or because any resulting statistics would be unreliable. Therefore, Chapter 9 has the fewest exhibits, and these are abbreviated.

The following overview outlines the content and format of each exhibit in Chapters 2 through 8, with the letter **"X"** used as a stand-in for the chapter numbers.

Exhibit X.1 presents data on the incidence† of each cancer in Ontario during 2003/04. It also gives the number and percentage of incident cases who did or did not have surgery. Both incidence and the percentage of patients who had surgery are examined by age, sex (where relevant), socioeconomic status (SES), community size and the Local Health Integration Network (LHIN) where patients were living at the time of their diagnosis (referred to throughout as the LHIN "of patient residence").

The SES measure used here is neighbourhood income quintile: patients' neighbourhoods of residence are ranked according to how the average income in their neighbourhood compares to all other neighbourhoods in their city or metropolitan area. A ranking of 1 indicates the lowest income group; a ranking of 5 indicates the wealthiest neighbourhoods.

In Chapters 4 and 5, Exhibit X.1a shows information about both sexes combined; Exhibit X.1b shows information about men only; and Exhibit X.1c shows information about women only.

Exhibit X.2 is a map showing variations in age- or age-sex standardized cancer incidence across Ontario LHINs in 2003/04. Incidence rates for each LHIN are shown in relation to the overall Ontario rate. The LHIN rates are also grouped according to whether the incidence rate was within 10 percent of the Ontario rate; between 10 and 20 percent higher or lower than the Ontario rate; or more than 20 percent higher or lower than the Ontario rate. All incidence rates were standardized to the 1991 Canadian population.

Exhibit X.3 presents data about the cancer-related "hospital encounters" of patients in each Cancer Surgery Cohort. For example, it shows how many times those patients were admitted to hospital, whether their surgical procedures were done on an inpatient basis (i.e., they stayed at least one night in hospital) or on an ambulatory basis (i.e., they went home the same day). Data are also presented on the average number of visits with the surgeon (or surgeons) who performed patients' cancer procedures during a specific one-year period (starting six months before and ending six months after their first cancer-related procedure). Information is presented by patient age, sex (where appropriate), SES, community size and LHIN of patient residence.

Exhibit X.4 presents data on all the hospital admissions (both inpatient and outpatient) for cancer surgery performed on patients in each Cancer Surgery Cohort. Our intent was to determine how many patients received cancer surgery in the LHIN where they lived at the time they were diagnosed. We also wanted to show how often patients with various cancers had to travel to different parts of Ontario for their surgery. The exhibit shows the LHINs where surgical procedures took place in relation to the LHINs where patients lived. This exhibit also illustrates which regions served as "referral regions" (i.e., they provided cancer surgery to large numbers of patients who resided in other parts of the province during the study period).

Exhibit X.5a describes "patterns of care" as they relate to patients in each Cancer Surgery Cohort. Patients were grouped according to their "definitive" surgical procedure. If a patient only had one procedure, then that was considered their definitive procedure. For patients who had more than one type of surgery for their cancer, their definitive procedure was the most extensive procedure they underwent. Information is presented according to patient age, sex (where applicable), SES, community size and LHIN of patient residence.

Exhibit X.5b is a map showing geographic variations in the percentage of patients in each Cancer Surgery Cohort who had a selected type of surgery. (This map does not appear in every chapter of the Atlas because, in some cases, the number of patients in certain LHINs was too small to be displayed.)

† "Incidence" is defined as the number of new occurrences of a disease in a population during a particular period of time. It is usually expressed as a rate per population. In this Atlas we report incidence per 100,000 individuals per year for each cancer site. (Incidence differs from prevalence in that prevalence includes both existing and new cases of disease.)

Exhibit X.6a presents information about the surgeons who operated on patients in each Cancer Surgery Cohort. It also examines the types of definitive surgery performed by physicians in different specialties. Data about surgeons' specialties[¶] were obtained from both the Ontario Health Insurance Plan (OHIP) Corporate Provider Database (CPDB) and from self-reported information submitted by physicians to the Canadian Medical Directory (CMD). [Note: The numbers of patients and procedures listed in this exhibit and also in Exhibit X.6b vary from the numbers in other exhibits because they were obtained from OHIP physician billings rather than from the Canadian Institute for Health Information (CIHI) Discharge Abstract Database (DAD). The variation is due to differences in how surgical procedures are classified in OHIP data compared with the CIHI-DAD. Also, procedures performed by physicians who are salaried and do not submit OHIP claims are missing from the OHIP data.]

Exhibit X.6b presents information on the types of hospital where patients in each Cancer Surgery Cohort underwent surgery for their cancers and the type of definitive surgery patients received in each type of hospital. Hospitals were classified as either academic (teaching) or community hospitals (as defined by the Joint Policy and Planning Committee of the Ontario Hospital Association and the Ontario Ministry of Health and Long-Term Care).

Exhibit X.7 These three exhibits **(X.7a, X.7b and X.7c)** present information on health services provided to the patients in each of the Cancer Surgery Cohorts. These included cancer-related diagnostic services (such as surgical biopsies to check for malignancy); diagnostic imaging tests; physician consultations; the use of radiotherapy and systemic chemotherapy; and other selected interventions. Complete data on which patients in our cancer cohorts actually underwent radiation therapy were not available. However, because all patients who receive radiation first undergo radiation therapy planning, we have used it throughout the Atlas as a surrogate measure for radiation therapy treatment. The specific services included in these exhibits vary across different cancer sites. The tables only list health services that were provided to patients in the Cancer Surgery Cohorts during a 24-month period (from 12 months before to 12 months after their definitive surgery). All information is presented by LHINs of patient residence.

Exhibit X.8 The final three exhibits **(X.8a, X.8b and X.8c)** present information on health services provided to the patients in the Cancer/No Surgery Cohorts during a 24-month period (from 12 months before to 12 months after their date of diagnosis). All information is presented by LHINs of patient residence.

Chapter 9 exhibits

Exhibit 9.1 is the same as exhibit X.1, except it does not include any analysis by LHIN of patient residence.

Exhibit 9.2 is the same as Exhibit X.2.

Exhibit 9.3 is the same as Exhibit X.4 in all the other chapters, except that it does not include any analysis by LHIN of patient residence.

Exhibits 9.4a and 9.4b are the same as Exhibits X.5a and X.5b in the other chapters.

Exhibit 9.6 combines all of Exhibits X.7a, X.7b and X.7c plus Exhibits X.8a, X.8b and X.8c. However, it only includes the summary values for all of Ontario.

[¶] Relatively few surgical sub-specialties have formal certification programs. Thoracic surgery is an example of a surgical sub-specialty with certification. Other sub-specialties, such as surgical oncology, breast surgery and urologic oncology, are not easily identifiable. For this reason we used the Canadian Medical Directory to classify surgeons into their self-identified sub-specialties.

References

1. Iscoe NA, To T, Gort EH, Tran M. *Cancer Surgery in Ontario.* Toronto: Institute for Clinical Evaluative Sciences; 1997.
2. Urbach DR, Stukel TA, Croxford R, MacCallum NL. Analysis of Current Research Related to the Impact of Low-Volume Procedures/Surgery and Care on Outcomes of Care. Report submitted to the Canadian Institute for Health Information. 2005.
3. Bahn CH. The surgeon as gatekeeper. *Am J Surg* 1993; 165(5):550–3.
4. Simunovic M, Rempel E, Thériault ME, Coates A, Whelan T, Holowaty E, et al. Influence of hospital characteristics on operative death and survival of patients after major cancer surgery in Ontario. *Can J Surg* 2006; 49(4):251–8.
5. Cancer Quality Council of Ontario. *Strengthening the Quality of Cancer Services in Ontario.* Toronto: Cancer Care Ontario; 2003.
6. Iscoe NA, Goel V, Wu K, Fehringer G, Holowaty EJ, Naylor CD. Variation in breast cancer surgery in Ontario. *CMAJ* 1994; 150(3):345–52.
7. Birkmeyer JD, Sun Y, Goldfaden A, Birkmeyer NJ, Stukel TA. Volume and process of care in high-risk cancer surgery. *Cancer* 2006; 106(11):2476–81.
8. Hodgson DC, Zhang W, Zaslavsky AM, Fuchs CS, Wright WE, Ayanian JZ. Relation of hospital volume to colostomy rates and survival for patients with rectal cancer. *J Natl Cancer Inst* 2003; 95(10):708–16.
9. Urbach DR, Bell CM, Austin PC. Differences in operative mortality between high- and low-volume hospitals in Ontario for 5 major surgical procedures: estimating the number of lives potentially saved through regionalization. *CMAJ* 2003; 168(11):1409–14.
10. Porter GA, Soskolne CL, Yakimets WW, Newman SC. Surgeon-related factors and outcome in rectal cancer. *Ann Surg* 1998; 227(2):157–67.
11. Chaudhry R, Goel V, Sawka C. Breast cancer survival by teaching status of the initial treating hospital. *CMAJ* 2001; 164(2):183–8.
12. Simunovic M, Thériault ME, Paszat L, Coates A, Whelan T, Holowaty E, et al. Using administrative databases to measure waiting times for patients undergoing major cancer surgery in Ontario, 1993–2000. *Can J Surg* 2005; 48(2):137–42.
13. Hodgson DC, Przybysz R, Bhamani A, Urbach DR. Cancer surgery. In: Tu JV, Pinfold SP, McColgan P, Laupacis A, editors. *Access to Health Services in Ontario: ICES Atlas.* 2nd edition. Toronto: Institute for Clinical Evaluative Sciences; 2006. Accessed September 21, 2008 at http://www.ices.on.ca/file/Chp2_v5new.pdf.
14. McLaughlin JR, Kreiger N, Marrett LD, Holowaty EJ. Cancer incidence registration and trends in Ontario. *Eur J Cancer* 1991; 27(11):1520–4.
15. Holowaty EJ, Moravan V, Lee G, Chong N, Dale D. A Reabstraction Study to Estimate the Completeness and Accuracy of Data Elements in the Ontario Cancer Registry. Report submitted to Health Canada. 1996.
16. Robles SC, Marrett LD, Clarke EA, Risch HA. An application of capture methods to the estimation of completeness of cancer registration. *J Clin Epidemiol* 1988; 41(5):495–501.

INSIDE

2

Chapter

Surgery for Breast Cancer

May Lynn Quan, MD, MSc, FRCSC,* Nicole Hodgson, MD, MSc, FRCSC,* Susan E. Schultz, MA, MSc, Raymond Przybysz, MSc, Nadia Gunraj, BSc, MPH, Nancy Baxter, MD, PhD, FRCSC, David R. Urbach, MD, MSc, FRCSC, FACS, and Marko Simunovic, MD, MPH, FRCSC

*May Lynn Quan and Nicole Hodgson contributed equally to this chapter.

Executive Summary

Issue

Breast cancer is the most common cancer affecting Canadian women. It is also the second leading cause of cancer deaths within this group.

Study

This chapter provides a snapshot of treatment patterns for women diagnosed with invasive breast cancer in Ontario between April 1, 2003 and March 31, 2004. We focus on the delivery of surgical care and related health services and include data regarding patient factors (i.e., age, socioeconomic status, place of residence) and provider factors (i.e., surgical specialty and type of hospital delivering services). The study cohort did not include women diagnosed with ductal carcinoma in situ (DCIS), a non-invasive type of cancer, or the many women with non-cancerous breast lesions.

Key Findings

- The great majority of Ontario women (92 percent) diagnosed with invasive breast cancer in 2003/04 underwent a definitive surgical procedure within a year of diagnosis.
- Nearly two-thirds (61 percent) received some form of breast-conserving surgery; about one-quarter (24 percent) did not undergo a lymph node excision within three months of breast cancer surgery.
- Rates of individual surgical procedures for breast cancer varied moderately according to where women lived at the time of diagnosis. Most breast cancer surgery-related hospital admissions (84 percent) occurred within the Local Health Integration Network (LHIN) where the patient resided.
- The percentage of breast cancer surgery performed in academic (teaching) and community hospitals was 27 percent and 73 percent, respectively.

Implications

Further research is needed to understand the variations in surgical practice in different geographic regions related to a diagnosis of invasive breast cancer. We found that during the study period, most breast cancer surgery in Ontario was provided by surgeons in community hospitals. Therefore, any efforts to improve quality of care for women with invasive breast cancer—if required—must involve surgeons in both academic and community practice settings.

Introduction

Breast cancer is the most common cancer affecting Canadian women and the second leading cause of cancer deaths within this group. The most recently published data estimated that in 2007, 22,300 women across the country would be diagnosed with breast cancer, and 5,300 would die from the disease.[1]

This chapter provides a detailed snapshot of treatment (surgical procedures and related health care services) delivered to Ontario women with invasive breast cancer whose diagnosis date in the Ontario Cancer Registry (OCR) fell between April 1, 2003 and March 31, 2004. (Additional information about the OCR and about how invasive breast cancer was defined can be found in the Technical Appendix at the end of this Atlas.)

Women with breast cancer are usually diagnosed after an abnormality is detected by the woman herself, found during a clinical breast examination by a physician or other health professional, or detected through breast screening mammography. Women in whom a suspicious lesion is found may undergo further diagnostic tests such as a mammogram (if not previously done), an ultrasound, a needle biopsy (to remove cells for examination) or a surgical biopsy (to remove a larger sample of tissue). If cancer is confirmed, the majority of women undergo surgery as the first treatment intervention.

The type of surgical procedure(s) recommended to a patient with breast cancer is determined by various factors. Patient factors include the woman's age, current health, previous illnesses and breast size. Tumour factors include tumour size and cancer stage. Ideally, only one kind of definitive surgery is needed to deal with breast cancer. However, additional procedures may be recommended later on—for example, if tests show the presence of cancer cells at the cut edge (margin) of tissue removed during breast-conserving surgery.

Surgical procedures used to treat invasive breast cancer

A number of surgical options are currently used to treat invasive breast cancer.[2]

Breast-conserving surgery

This involves removing the tumour and an adequate margin of normal breast tissue (also known as lumpectomy, segmental or wedge resection, partial mastectomy or quadrantectomy).

Mastectomy

This involves removing the entire breast (also known as a simple or total mastectomy); the underlying chest wall muscles are not removed as they often were in the past. A modified radical mastectomy removes both the breast and axillary lymph nodes in a single procedure.

Lymph node excision

This involves removing the lymph nodes in the axilla (armpit) next to the affected breast. Research shows this is the first place that malignant cells will spread. Removal and analysis of these nodes is needed to "stage" the patient's cancer—that is, to see if and how far the cancer has spread. This in turn will influence treatment recommendations. Removing malignant nodes may also provide a therapeutic benefit (i.e., preventing further growth of cancer cells in these lymph nodes).

In the past, surgeons typically removed most nodes from the axilla. More recently, they have started using a newer, less invasive technique called a "sentinel lymph node biopsy."[3] In this procedure, only the first draining node or nodes (usually between one and four in total) are removed and studied for signs of cancer. An axillary dissection (removal of the remaining nodes) is only done if the sentinel node tests positive for cancer cells.

Reconstructive breast surgery

Such procedures include reconstructing the breast after mastectomy. This is done using a saline or silicone implant or by transplanting muscle and other tissues from the woman's body to build a new breast. Reconstructive breast surgery may be done immediately after definitive surgery to remove the breast or after a delay of weeks, months or even years. Rates of reconstructive breast surgery were not examined in this Atlas.

Additional treatment options

Although surgery is the main treatment for breast cancer, other therapies such as radiation therapy, chemotherapy and hormone therapy are often used as well. Again, numerous patient and tumour factors, along with the type of surgery provided, influence recommendations for these treatment modalities. For example, radiation therapy is usually recommended following breast-conserving surgery[4,5] and occasionally recommended following mastectomy.

Ideally, all treatment decisions (such as the choice of breast-conserving surgery vs. mastectomy) should be made by the individual patient, in concert with information and support from the treating medical team.[6] This emphasizes the need for a multidisciplinary approach when treating patients with breast cancer.

In Ontario, breast cancer surgery is typically done by general surgeons. Some of these surgeons have a focus on breast surgery; these doctors are self-identified in this chapter as "breast surgeons." Other doctors, referred to here as "surgical oncologists," focus on the surgical treatment of many cancers, including breast cancer.

How the study cohorts were defined

This chapter provides detailed information about surgical services delivered to Ontario women diagnosed with invasive breast cancer in 2003/04. It is important to emphasize that our study cohorts did not include the approximately 4,000 women treated annually in Ontario after being diagnosed with a non-invasive cancer known as "ductal carcinoma in situ" (DCIS). Nor did the cohorts include many women with benign (non-cancerous) lesions of the breast. Patients with DCIS or benign breast lesions often require assessment and treatment by a surgeon. Finally, it should be explained that our data do not differentiate what types of lymph node excision were performed (i.e., axillary node dissection vs. sentinel lymph node biopsy).

The study population for this chapter included all Ontario women 20 years of age or older identified with breast cancer in the Ontario Cancer Registry (OCR) whose diagnosis date fell between April 1, 2003 and March 31, 2004. This is referred to as the **Overall Breast Cancer Cohort.**

The Overall Breast Cancer Cohort was then subdivided into two smaller groups.

- The **Breast Cancer Surgery Cohort** included all Ontario women 20 years of age or older identified with breast cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had breast cancer surgery within 12 months before or after their diagnosis date.

- The **Breast Cancer/No Surgery Cohort** included all Ontario women 20 years of age or older identified with breast cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have breast cancer surgery within 12 months before or after their diagnosis date.

Notes:

- If a patient had more than one type of procedure, the most extensive procedure is identified in this Atlas as the "definitive" surgery.

- All patients who receive radiation therapy as part of cancer treatment first undergo radiation therapy planning. This involves positioning the person's body, marking the skin and taking imaging scans to determine the best way to deliver the radiation dose. Because complete data on which patients in our study cohorts actually received radiation therapy were not available, we have used radiation therapy planning as a surrogate measure for radiation therapy treatment.

Chapter 2—List of Exhibits

Exhibits and Findings

Exhibit 2.1 Incidence of breast cancer in Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Breast Cancer Cohort, by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Breast Cancer Cohort: Total number of cases (% Ontario)	Had surgery: number	Had surgery: age-standardized[1] % total	Did not have surgery: number	Did not have surgery: age-standardized[1] % total
Ontario	**145.7**	**7,121 (100.0)**	**6,548**	**92.0**	**573**	**8.0**
Age group (years)[2]						
20–39	23.0	402 (5.6)	379	94.3	23	5.7
40–49	136.1	1,293 (18.2)	1,218	94.2	75	5.8
50–59	243.8	1,710 (24.0)	1,629	95.3	81	4.7
60–69	335.0	1,593 (22.4)	1,495	93.8	98	6.2
70+	342.2	2,123 (29.8)	1,827	86.1	296	13.9
Neighbourhood income quintile						
Q1 (Lowest)	132.7	1,236 (17.9)	1,129	92.0	107	8.0
Q2	141.5	1,365 (19.7)	1,233	90.6	132	9.4
Q3	150.7	1,403 (20.3)	1,295	92.3	108	7.7
Q4	158.4	1,424 (20.6)	1,337	93.5	87	6.5
Q5 (Highest)	156.8	1,495 (21.6)	1,376	91.7	119	8.3
Community size (population)						
≥ 1,250,000	145.2	2,721 (38.2)	2,497	91.3	224	8.7
100,000–1,249,999	152.2	2,720 (38.2)	2,496	91.9	224	8.1
< 100,000	142.8	1,676 (23.5)	1,554	93.1	122	6.9
LHIN						
1. Erie St. Clair	144.7	387 (5.4)	364	94.0	23	6.0
2. South West	149.1	585 (8.2)	537	91.9	48	8.1
3. Waterloo Wellington	140.1	355 (5.0)	328	92.1	27	7.9
4. Hamilton Niagara Haldimand Brant	148.8	872 (12.3)	788	90.7	84	9.3
5. Central West	131.0	294 (4.1)	269	90.6	25	9.4
6. Mississauga Halton	153.8	529 (7.4)	486	91.1	43	8.9
7. Toronto Central	143.4	694 (9.8)	615	88.3	79	11.7
8. Central	149.4	811 (11.4)	753	92.7	58	7.3
9. Central East	131.0	762 (10.7)	728	95.5	34	4.5
10. South East	145.3	317 (4.5)	286	90.5	31	9.5
11. Champlain	159.5	744 (10.5)	673	90.7	71	9.3
12. North Simcoe Muskoka	162.7	278 (3.9)	264	95.2	14	4.8
13. North East	134.3	352 (4.9)	330	93.9	22	6.1
14. North West	134.8	134 (1.9)	124	93.3	10	6.7

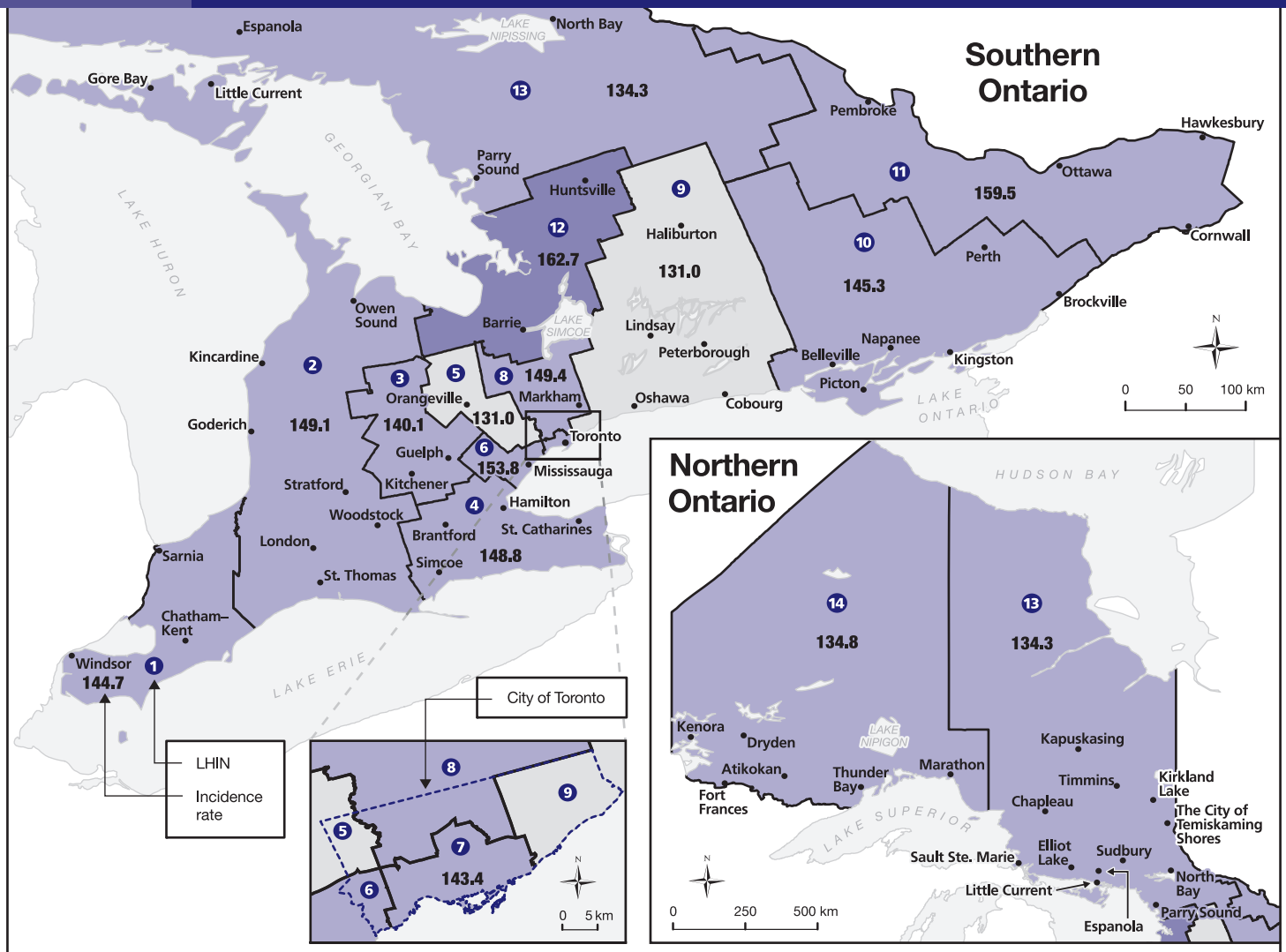
1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Breast Cancer Cohort.

2 Age-specific rates have not been standardized.

Findings

- Most of the 7,121 women in the Overall Breast Cancer Cohort underwent some type of breast cancer surgery within the 12 months before or after their diagnosis (92 percent or 6,548 women).
- Just over half of incident cases (52 percent) of breast cancer occurred in women over 60 years of age.
- There was little variation in surgery rates by annual neighbourhood income and community size.
- Older women were less likely to undergo breast cancer surgery. Eighty-six percent of those aged 70 years or older underwent a surgical procedure for their disease.

Exhibit 2.2 Age-standardized breast cancer incidence per 100,000 women 20 years of age or older, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age-standardized breast cancer incidence per 100,000 women in the Overall Breast Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 145.7 per 100,000 women

LHIN rate per 100,000 women	LHIN rate compared to OR	Number of LHINs in each category
> 174.8	More than 20% above OR	0
160.3–174.8	10% to 20% above OR	1
131.2–160.2	Within 10% of OR	11
116.6–131.1	10% to 20% below OR	2
< 116.6	More than 20% below OR	0

Findings

- In 2003/04, the breast cancer incidence rate for Ontario was 146 cases per 100,000 women 20 years of age or older.
- The lowest incidence rates (131 cases per 100,000) were found among women who lived in the Central West and Central East Local Health Integration Networks (LHINs) at the time of diagnosis.
- The North Simcoe Muskoka LHIN had the highest incidence of breast cancer in Ontario in 2003/04, with 163 cases per 100,000 women.

Exhibit 2.3 Health care utilization among women in the Breast Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

	Breast Cancer Surgery Cohort			Hospital admissions[1]			
	Total number of patients	Average # visits with treating surgeon[2]	% with more than one hospital admission	Total number of admissions		Same-day surgery	Inpatient admissions
Characteristic	*number*	*visits/patient*	*% patients*	*number (average per patient)*		*age-standardized % total admissions[3]*	
Ontario	**6,548**	**3.6**	**27.5**	**8,557**	**(1.3)**	**52.1**	**47.9**
Age group (years)[3]							
20–39	379	3.7	33.8	518	(1.4)	56.8	43.2
40–49	1,218	3.6	32.7	1,665	(1.4)	57.3	42.7
50–59	1,629	3.6	34.1	2,250	(1.4)	56.8	43.2
60–69	1,495	3.7	27.9	1,946	(1.3)	54.7	45.3
70+	1,827	3.6	17.6	2,178	(1.2)	42.3	57.7
Neighbourhood income quintile							
Q1 (Lowest)	1,129	3.7	25.7	1,443	(1.3)	50.1	49.9
Q2	1,233	3.6	26.6	1,593	(1.3)	51.8	48.2
Q3	1,295	3.7	29.1	1,715	(1.3)	53.4	46.6
Q4	1,337	3.6	28.2	1,770	(1.3)	52.6	47.4
Q5 (Highest)	1,376	3.6	27.0	1,802	(1.3)	51.8	48.2
Community size (population)							
≥ 1,250,000	2,497	3.6	26.5	3,276	(1.3)	56.9	43.1
100,000–1,249,999	2,496	3.6	25.4	3,185	(1.3)	49.9	50.1
< 100,000	1,554	3.8	31.9	2,095	(1.3)	47.4	52.6
LHIN							
1. Erie St. Clair	364	4.3	30.8	486	(1.3)	44.8	55.2
2. South West	537	3.7	24.6	672	(1.3)	45.8	54.2
3. Waterloo Wellington	328	3.9	44.4	488	(1.5)	45.8	54.2
4. Hamilton Niagara Haldimand Brant	788	3.2	25.5	1,003	(1.3)	48.7	51.3
5. Central West	269	3.7	28.6	369	(1.4)	65.7	34.3
6. Mississauga Halton	486	3.8	32.3	670	(1.4)	72.5	27.5
7. Toronto Central	615	3.3	18.7	751	(1.2)	44.8	55.2
8. Central	753	3.6	24.1	964	(1.3)	53.6	46.4
9. Central East	728	3.9	30.8	980	(1.3)	56.2	43.8
10. South East	286	4.0	31.0	387	(1.4)	68.8	31.2
11. Champlain	673	3.4	15.6	784	(1.2)	36.3	63.7
12. North Simcoe Muskoka	264	3.3	21.8	327	(1.2)	41.1	58.9
13. North East	330	3.8	44.9	498	(1.5)	57.4	42.6
14. North West	124	4.5	40.1	175	(1.4)	57.1	42.9

1 Time frame for hospital admissions is from 12 months prior to 12 months after diagnosis.

2 Time frame for surgeon visits is from 6 months prior to 6 months after the first surgery.

3 Standardized to the Overall Breast Cancer Cohort; age-specific rates have not been standardized.

Findings

- Just over half (52 percent) of surgical procedures for women in the Breast Cancer Surgery Cohort were done as outpatient same-day surgery. This percentage varied by patients' Local Health Integration Network (LHIN) of residence, ranging from 36 percent to 73 percent.
- More than one in four women (27 percent) had more than one admission for the purpose of surgical treatment. This percentage varied by patients' LHIN of residence, ranging from 16 percent to 45 percent.
- Women in this study cohort visited their surgeons an average of 3.6 times during the 12-month study period (starting six months before and ending six months after their first breast cancer surgery).

Exhibit 2.4 Hospital admissions for surgical procedures among women in the Breast Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN of patient residence	LHIN where care was received					
	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton
	number (col%, row %)[1]					
1. Erie St. Clair	**445 (99.6, 91.9)**	33 (4.8, 6.8)		**		
2. South West		**627 (91.4, 93.7)**	12 (2.7, 1.8)	9 (0.9, 1.3)		**
3. Waterloo Wellington		17 (2.5, 3.5)	**435 (96.2, 89.3)**	13 (1.3, 2.7)	6 (1.9, 1.2)	7 (1.1, 1.4)
4. Hamilton Niagara Haldimand Brant		**	**	**927 (95.2, 92.8)**	**	48 (7.3, 4.8)
5. Central West		**	**		**246 (76.6, 66.8)**	35 (5.3, 9.5)
6. Mississauga Halton		**	**	15 (1.5, 2.2)	29 (9.0, 4.3)	**526 (79.7, 78.9)**
7. Toronto Central				**	10 (3.1, 1.3)	27 (4.1, 3.6)
8. Central					25 (7.8, 2.6)	**
9. Central East		**			**	**
10. South East						
11. Champlain				**		**
12. North Simcoe Muskoka				**	**	6 (0.9, 1.9)
13. North East		**		**		
14. North West						
Ontario	**447 (100, 5.2)**	**686 (100, 8.1)**	**452 (100, 5.3)**	**974 (100, 11.4)**	**321 (100, 3.8)**	**660 (100, 7.7)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having breast cancer surgery in a given LHIN were residents of that LHIN at the time of diagnosis, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all breast cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings

- The great majority (84 percent) of admissions to hospital for breast cancer surgery among women in the Breast Cancer Surgery Cohort took place in the Local Health Integration Networks (LHINs) where the women resided. For example, there were 669 admissions for breast cancer surgery among women who lived in the South West LHIN; 627 of these admissions (94 percent) were to hospitals located in the South West LHIN.

Exhibit 2.4 (cont'd) Hospital admissions for surgical procedures among women in the Breast Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN where care was received								
7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West	Ontario
number (col%, row %)[1]								
**	**							484 (5.7, 100)
6 (0.5, 0.9)	**		**		**	**		669 (7.9, 100)
9 (0.7, 1.8)								487 (5.7, 100)
14 (1.1, 1.4)		**		**				999 (11.7, 100)
41 (3.4, 11.1)	39 (5.2, 10.6)	**						368 (4.3, 100)
78 (6.4, 11.7)	9 (1.2, 1.3)	**	**	**				667 (7.8, 100)
606 (49.7, 81.0)	80 (10.7, 10.7)	20 (2.2, 2.7)		**	**			748 (8.8, 100)
297 (24.3, 30.9)	**538 (71.7, 56.0)**	98 (10.9, 10.3)		**				961 (11.3, 100)
123 (10.1, 12.6)	69 (9.2, 7.1)	**768 (84.6, 78.6)**	6 (1.6, 0.6)	**	**			977 (11.5, 100)
9 (0.7, 2.3)	**	6 (0.7, 1.6)	**360 (95.0, 93.3)**	9 (1.2, 2.3)				386 (4.5, 100)
**	**		11 (2.9, 1.4)	**761 (98.1, 97.4)**		**		781 (9.2, 100)
26 (2.1, 8.0)	8 (1.1, 2.5)	6 (0.7, 1.9)			**273 (96.1, 84.5)**			323 (3.8, 100)
**					**	**485 (99.4, 97.6)**		497 (5.8, 100)
							173 (98.9, 100.0)	173 (2.0, 100)
1,220 (100, 14.3)	**750 (100, 8.8)**	**908 (100, 10.7)**	**379 (100, 4.4)**	**776 (100, 9.1)**	**284 (100, 3.3)**	**488 (100, 5.7)**	**175 (100, 2.1)**	**8,520 (100, 100)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having breast cancer surgery in a given LHIN were residents of that LHIN at the time of diagnosis, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all breast cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings (cont'd)

- LHINs in and around the city of Toronto showed the highest rates of "inter-LHIN" movement by patients undergoing breast cancer surgery. For example, 748 patients residing in the Toronto LHIN were admitted to hospital for surgery, but of these, only 606 admissions (81 percent) were to hospitals located in the Toronto LHIN. At the same time, an additional 614 patients residing in non-Toronto LHINs were treated in Toronto LHIN hospitals (for a total of 1,220 patients treated in these hospitals).

Exhibit 2.5a

Type of definitive surgical procedure among women in the Breast Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Breast Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]				
		Breast-conserving surgery only	Breast-conserving surgery and lymph node excision	Mastectomy	Mastectomy and lymph node excision	Other[2]
Ontario	6,548	849 (13.2)	3,175 (48.1)	702 (10.8)	1,777 (27.2)	45 (0.7)
Age group (years)[3]						
20–39	**	** (6.6)	** (47.5)	** (13.2)	** (31.7)	**
40–49	1,218	98 (8.0)	656 (53.9)	139 (11.4)	317 (26.0)	8 (0.7)
50–59	1,629	150 (9.2)	919 (56.4)	146 (9.0)	396 (24.3)	18 (1.1)
60–69	1,495	150 (10.0)	801 (53.6)	140 (9.4)	394 (26.4)	10 (0.7)
70+	**	** (23.3)	** (33.9)	** (12.4)	** (30.1)	**
Neighbourhood income quintile						
Q1 (Lowest)	1,129	161 (13.6)	489 (44.0)	124 (10.7)	347 (30.9)	8 (0.7)
Q2	1,233	168 (13.6)	581 (47.0)	129 (10.6)	347 (28.1)	8 (0.6)
Q3	1,295	153 (12.0)	629 (48.4)	133 (10.3)	373 (28.8)	7 (0.5)
Q4	1,337	176 (14.1)	691 (50.5)	141 (10.6)	319 (24.1)	10 (0.7)
Q5 (Highest)	1,376	168 (13.2)	694 (49.2)	154 (11.3)	349 (25.6)	11 (0.7)
Community size (population)						
≥ 1,250,000	2,497	366 (15.6)	1,346 (53.1)	276 (10.9)	485 (19.4)	24 (0.9)
100,000–1,249,999	2,496	306 (12.2)	1,120 (44.8)	240 (9.7)	819 (32.9)	11 (0.4)
< 100,000	1,554	177 (10.9)	708 (46.1)	186 (11.9)	473 (30.5)	10 (0.6)
LHIN						
1. Erie St. Clair	**	** (6.9)	** (39.4)	** (10.5)	** (41.9)	**
2. South West	**	** (9.4)	** (41.8)	** (14.2)	** (34.4)	**
3. Waterloo Wellington	**	** (10.5)	** (44.9)	** (13.2)	** (30.7)	**
4. Hamilton Niagara Haldiamnd Brant	**	** (18.8)	** (48.2)	** (9.1)	** (23.2)	**
5. Central West	**	** (16.2)	** (53.7)	** (11.1)	** (18.1)	**
6. Mississauga Halton	**	** (12.2)	** (62.7)	** (9.4)	** (15.0)	**
7. Toronto Central	615	95 (16.7)	305 (48.5)	82 (13.2)	127 (20.7)	6 (1.0)
8. Central	753	122 (16.7)	387 (51.4)	86 (11.4)	149 (19.4)	9 (1.1)
9. Central East	**	** (14.1)	** (49.6)	** (8.4)	** (27.3)	**
10. South East	**	** (11.7)	** (55.0)	** (9.0)	** (23.5)	**
11. Champlain	**	** (8.2)	** (44.6)	** (5.8)	** (41.1)	**
12. North Simcoe Muskoka	**	** (11.4)	** (48.5)	** (15.4)	** (24.0)	**
13. North East	**	** (10.4)	** (40.7)	** (14.2)	** (34.4)	**
14. North West	124	13 (10.0)	52 (42.1)	14 (11.1)	45 (36.8)	0 (0.0)

** Cell value suppressed for reasons of privacy and confidentiality.

1 Percent of subgroup undergoing each type of definitive procedure, age-standardized to the Overall Breast Cancer Cohort.

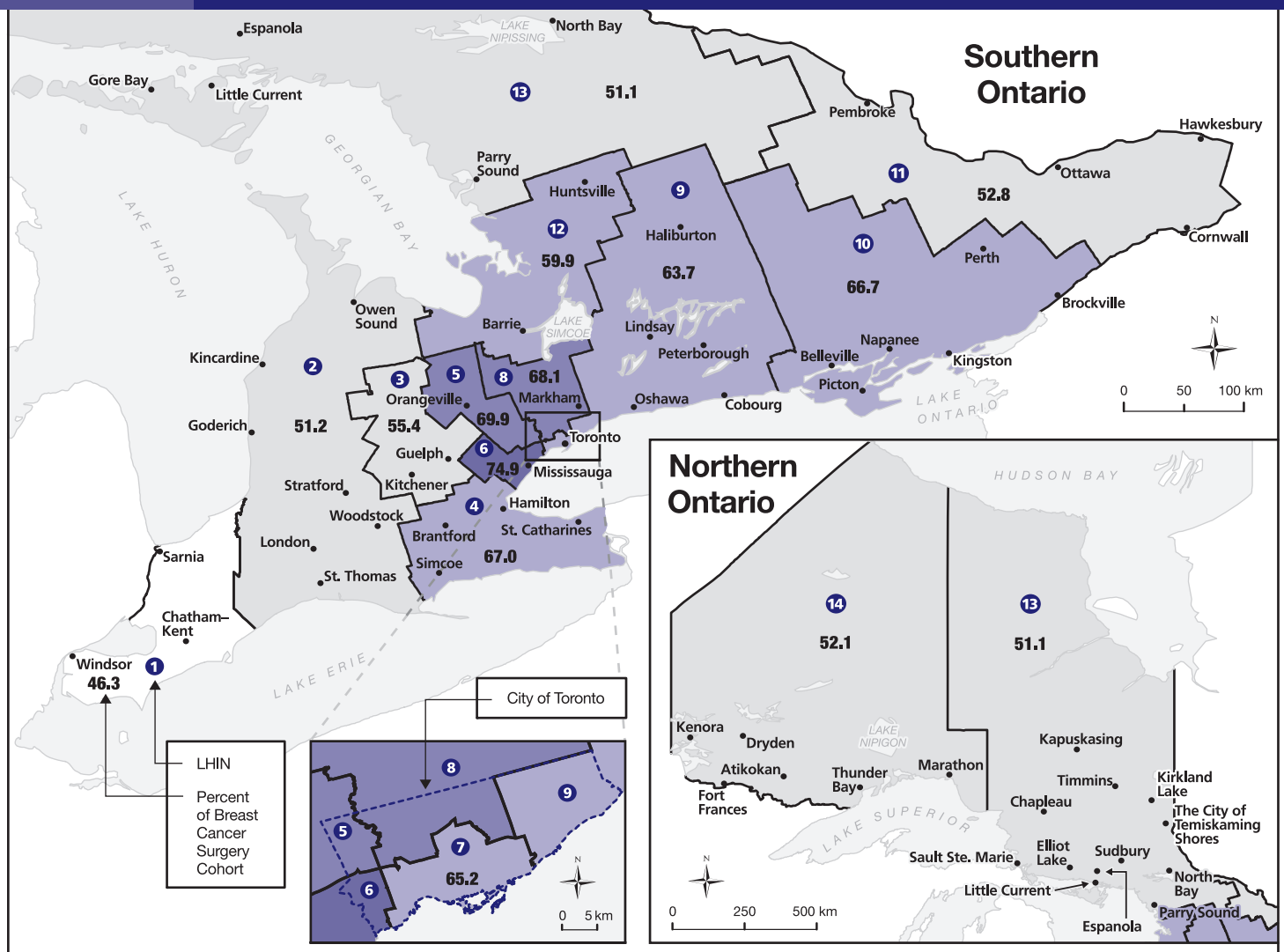
2 Please see the Technical Appendix at the end of this Atlas for a definition of "other."

3 Age-specific rates have not been standardized.

Findings

- The majority of women (61 percent) in the Breast Cancer Surgery Cohort had breast-conserving surgery, with or without lymph node excision.
- There was moderate variation in rates of surgical procedure by patient age group and Local Health Integration Network (LHIN) of patient residence. For example, the rate of mastectomy with lymph node excision ranged from 15 percent in women living in the Mississauga Halton LHIN to 42 percent among those living in the Erie St. Clair LHIN.
- Overall, 24 percent of women who had any type of breast cancer surgery within 12 months of diagnosis had no lymph node excision procedure. That is, they had either breast-conserving surgery or mastectomy without any lymph node excision. This proportion increased with age, reaching 36 percent in women aged 70 and older. The percentage of women who did not have lymph node excision ranged from a low of 14 percent among women living in the Champlain LHIN to a high of 30 percent of women living in the Toronto Central LHIN.

Exhibit 2.5b Proportion of women in the Breast Cancer Surgery Cohort [2003/04] whose definitive surgery was breast-conserving surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Percent of women in the Breast Cancer Surgery Cohort whose definitive surgery was breast conserving surgery, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 61.3 percent

Percent of Breast Cancer Surgery Cohort	LHIN rate compared to OR	Number of LHINs in each category
> 73.5	More than 20% above OR	1
67.6–73.5	10% to 20% above OR	2
55.5–67.5	Within 10% of OR	5
49.4–55.4	10% to 20% below OR	5
< 49.3	More than 20% below OR	1

Findings

- There was considerable variation across Local Health Integration Networks (LHINs) in the proportion of women in the Breast Cancer Surgery Cohort who underwent breast-conserving surgery as their definitive procedure.
- Approximately 75 percent of women who resided in the Mississauga Halton LHIN at the time of diagnosis had breast-conserving surgery—a rate more than 20 percent higher than the provincial average at the time.
- For women residing in the Erie St. Clair LHIN, the rate of breast-conserving procedures was only 46 percent—more than 20 percent below the provincial average.

Exhibit 2.6a Overall pattern of surgical care provided to women in the Breast Cancer Surgery Cohort [2003/04], by physician specialty, in Ontario

Physician specialty	Physicians performing breast cancer surgery *number (% physicians)*	All breast cancer surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*					
				Breast-conserving surgery only	Breast-conserving surgery and lymph node excision	Mastectomy	Mastectomy and lymph node excision	Other	Total
General surgeons, with self-identified breast sub-specialty	25 (5.4)	1,368 (16.6)	1,080 (17.2)	179 (16.6)	496 (45.9)	161 (14.9)	235 (21.8)	9 (0.8)	1,080
General surgeons, with self-identified surgical oncology sub-specialty	14 (3.0)	420 (5.1)	356 (5.7)	37 (10.3)	182 (50.8)	34 (9.5)	103 (28.8)	**	356
General surgeons, no self-identified sub-specialty	307 (65.7)	5,683 (68.8)	4,360 (69.3)	526 (12.1)	2,120 (48.6)	448 (10.3)	1,237 (28.3)	30 (0.7)	4,360
Other	121 (25.9)	791 (9.5)	488 (7.8)	66 (13.5)	244 (49.8)	36 (7.3)	142 (29.0)	**	488
Ontario	**467**	**8,262**	**6,284**	**808 (12.8)**	**3,042 (48.4)**	**679 (10.8)**	**1,717 (27.3)**	**39 (0.7)**	**6,284**

** Cell value suppressed and removed from totals for reasons of privacy and confidentiality.

1 Based on one definitive procedure per patient.

Findings

- General surgeons with no self-identified sub-specialty performed the majority (69 percent) of surgical procedures for breast cancer among women in the Breast Cancer Surgery Cohort.
- In terms of the types of procedures being performed (e.g., breast-conserving vs. mastectomy), these varied little across the different surgeon groups. For example, general surgeons with a surgical oncology sub-specialty were no more likely than any other general surgeons to do either mastectomies or breast-conserving surgery.

Exhibit 2.6b Overall pattern of surgical care provided to women in the Breast Cancer Surgery Cohort [2003/04], by hospital type, in Ontario

Hospital type	Hospitals performing breast cancer surgery *number (% hospitals)*	All breast cancer surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*					
				Breast-conserving surgery only	Breast-conserving surgery and lymph node excision	Mastectomy	Mastectomy and lymph node excision	Other	Total
Academic	14 (10.9)	2,300 (27.0)	1,938 (29.6)	273 (14.1)	938 (48.4)	218 (11.3)	500 (25.8)	9 (0.5)	1,938
Community/Small	114 (89.1)	6,229 (73.0)	4,608 (70.4)	574 (12.5)	2,237 (48.5)	484 (10.5)	1,277 (27.7)	36 (0.8)	4,608
Ontario	**128**	**8,529**	**6,546**	**847 (12.9)**	**3,175 (48.5)**	**702 (10.7)**	**1,777 (27.2)**	**45 (0.7)**	**6,546**

1 Based on one definitive procedure per patient.

Findings

- Community hospitals performed the majority (73 percent) of breast cancer-related surgical procedures for women in the Breast Cancer Surgery Cohort.
- The rates of definitive surgical procedures done for breast cancer were similar in both academic (teaching) and community hospitals.

Exhibit 2.7a **Diagnostic services received by women in the Breast Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after[1] their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario**

LHIN of patient residence	Breast Cancer Surgery Cohort *Number*	Total number of services provided *(average[2] # services per patient)*							
		Mammography					Biopsy		
		12 months before surgery	12 months after surgery	Additional magnification views	Breast/ axilla ultrasound	Breast MRI scan	Performed by radiologist	Performed by non-radiologist	Wire localization procedures
1. Erie St. Clair	364	445 (1.2)	236 (0.6)	201 (0.6)	622 (1.7)	**	292 (0.8)	135 (0.4)	121 (0.3)
2. South West	537	652 (1.2)	343 (0.6)	423 (0.8)	826 (1.5)	31 (0.1)	535 (0.1)	158 (0.3)	218 (0.4)
3. Waterloo Wellington	328	374 (1.1)	206 (0.6)	265 (0.8)	511 (1.6)	12 (0.0)	132 (0.4)	143 (0.4)	99 (0.3)
4. Hamilton Niagara Haldimand Brant	788	937 (1.2)	529 (0.7)	549 (0.7)	1,115 (1.4)	39 (0.0)	600 (0.8)	183 (0.2)	269 (0.3)
5. Central West	269	365 (1.4)	213 (0.8)	190 (0.7)	526 (2.0)	31 (0.1)	276 (1.0)	72 (0.3)	101 (0.4)
6. Mississauga Halton	486	657 (1.4)	353 (0.7)	404 (0.8)	875 (1.8)	55 (0.1)	355 (0.7)	123 (0.3)	184 (0.4)
7. Toronto Central	615	946 (1.5)	460 (0.7)	499 (0.8)	1,265 (2.1)	241 (0.4)	674 (1.1)	195 (0.3)	291 (0.5)
8. Central	753	1,133 (1.5)	587 (0.8)	576 (0.8)	1,440 (1.9)	154 (0.2)	773 (1.0)	176 (0.2)	320 (0.4)
9. Central East	728	1,079 (1.5)	536 (0.7)	543 (0.7)	1,161 (1.6)	84 (0.1)	669 (0.9)	242 (0.3)	295 (0.4)
10. South East	286	334 (1.2)	232 (0.8)	216 (0.8)	324 (1.1)	15 (0.1)	225 (0.8)	73 (0.3)	65 (0.2)
11. Champlain	673	869 (1.3)	411 (0.6)	570 (0.8)	1,090 (1.6)	92 (0.1)	634 (0.9)	264 (0.4)	309 (0.5)
12. North Simcoe Muskoka	264	259 (1.0)	186 (0.7)	162 (0.6)	476 (1.8)	14 (0.1)	276 (1.0)	82 (0.3)	71 (0.3)
13. North East	330	369 (1.1)	241 (0.7)	269 (0.8)	309 (0.9)	**	119 (0.4)	218 (0.7)	99 (0.3)
14. North West	124	130 (1.0)	81 (0.7)	111 (0.9)	161 (1.3)	**	28 (0.2)	65 (0.5)	48 (0.4)
Ontario	**6,548**	**8,554 (1.3)**	**4,615 (0.7)**	**4,978 (0.8)**	**10,708 (1.6)**	**774 (0.1)**	**5,591 (0.9)**	**2,129 (0.3)**	**2,490 (0.4)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Unless otherwise specified.

2 Denominator includes all patients in the Breast Cancer Surgery Cohort.

Findings

- Women in the Breast Cancer Surgery Cohort underwent an average of 2.0 mammograms and 1.6 ultrasounds (per patient) in the 24 months surrounding their definitive surgery. Eighty percent of these patients required additional mammography magnification views beyond the standard two-view film.
- Only 774 patients (12 percent) underwent magnetic resonance imaging (MRI) of the breast, with the greatest number of these (31 percent) among women who resided in the Toronto Central Local Health Integration Network (LHIN) at the time of their diagnosis.
- Nearly three-quarters of all breast biopsies carried out during the study period were performed by radiologists.

Exhibit 2.7b Radiologic services received by women in the Breast Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Breast Cancer Surgery Cohort *Number*	Total number of services provided *(average[1] # services per patient)*					
		Chest		Abdomen			
		X-ray	CT scan	Ultrasound	CT scan	Bone scan	Pelvis CT scan
1. Erie St. Clair	364	761 (2.1)	53 (0.1)	348 (1.0)	122 (0.3)	369 (1.0)	57 (0.2)
2. South West	537	1,090 (2.0)	65 (0.1)	415 (0.8)	106 (0.2)	399 (0.7)	81 (0.2)
3. Waterloo Wellington	328	542 (1.7)	64 (0.2)	293 (0.9)	66 (0.2)	270 (0.8)	50 (0.2)
4. Hamilton Niagara Haldimand Brant	788	1,305 (1.7)	104 (0.1)	526 (0.7)	134 (0.2)	436 (0.6)	103 (0.1)
5. Central West	269	425 (1.6)	47 (0.2)	261 (1.0)	65 (0.2)	209 (0.8)	44 (0.2)
6. Mississauga Halton	486	885 (1.8)	117 (0.2)	415 (0.9)	125 (0.3)	397 (0.8)	91 (0.2)
7. Toronto Central	615	1,032 (1.7)	160 (0.3)	627 (1.0)	177 (0.3)	529 (0.9)	140 (0.2)
8. Central	753	1,319 (1.8)	147 (0.2)	820 (1.1)	223 (0.3)	660 (0.9)	179 (0.2)
9. Central East	728	1,265 (1.7)	138 (0.2)	636 (0.9)	176 (0.2)	574 (0.8)	136 (0.2)
10. South East	286	524 (1.8)	70 (0.2)	240 (0.8)	60 (0.2)	215 (0.8)	38 (0.1)
11. Champlain	673	1,398 (2.1)	184 (0.3)	698 (1.0)	177 (0.3)	624 (0.9)	86 (0.1)
12. North Simcoe Muskoka	264	539 (2.0)	76 (0.3)	275 (1.0)	124 (0.5)	300 (1.1)	122 (0.5)
13. North East	330	657 (2.0)	103 (0.3)	343 (1.0)	138 (0.4)	317 (1.0)	88 (0.3)
14. North West	124	261 (2.1)	26 (0.2)	135 (1.1)	35 (0.3)	93 (0.8)	32 (0.3)
Ontario	**6,548**	**12,003 (1.8)**	**1,354 (0.2)**	**6,032 (0.9)**	**1,728 (0.3)**	**5,392 (0.8)**	**1,247 (0.2)**

[1] Denominator includes all patients in the Breast Cancer Surgery Cohort.

Findings

- Almost all women in the Breast Cancer Surgery Cohort received a chest X-ray, ultrasound of the abdomen and/or bone scan during the period from 12 months prior to 12 months after their definitive surgery for breast cancer.
- Computed tomography (CT) scanning was used in a minority of patients.

Exhibit 2.7c Consultations and services received by women in the Breast Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Breast Cancer Surgery Cohort *number*	Radiation oncology		Radiation therapy planning[1]		Medical oncology	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	364	71.2	1.0	54.7	1.0	65.9	1.0
2. South West	537	68.9	1.0	58.1	1.1	32.8	1.1
3. Waterloo Wellington	328	77.4	1.1	62.5	1.1	62.5	1.2
4. Hamilton Niagara Haldimand Brant	788	72.6	1.1	66.4	1.0	45.6	1.1
5. Central West	269	80.7	1.1	74.3	1.1	74.0	1.1
6. Mississauga Halton	486	79.0	1.1	72.2	1.2	40.5	1.1
7. Toronto Central	615	78.4	1.1	67.8	1.2	55.4	1.0
8. Central	753	76.6	1.0	68.8	1.1	44.0	1.1
9. Central East	728	74.2	1.0	63.7	1.1	44.1	1.1
10. South East	286	81.1	1.2	69.6	1.1	54.9	1.2
11. Champlain	673	85.3	1.2	64.9	1.1	50.7	1.1
12. North Simcoe Muskoka	264	67.8	1.1	59.1	1.1	60.2	1.1
13. North East	330	73.6	1.0	59.4	1.1	41.8	1.0
14. North West	124	85.5	1.1	65.3	1.1	40.3	1.0
Ontario	**6,548**	**76.2**	**1.1**	**65.0**	**1.1**	**49.1**	**1.1**

LHIN of patient residence	Breast Cancer Surgery Cohort *number*	Chemotherapy		General surgery	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit[3]	Average[2] # visits per patient
1. Erie St. Clair	364	39.0	7.2	100.0	5.5
2. South West	537	37.2	8.4	99.8	4.8
3. Waterloo Wellington	328	43.0	7.9	99.7	5.1
4. Hamilton Niagara Haldimand Brant	788	38.6	7.8	99.5	4.7
5. Central West	269	55.8	6.5	100.0	5.2
6. Mississauga Halton	486	46.1	6.2	100.0	5.5
7. Toronto Central	615	44.2	7.7	99.3	5.1
8. Central	753	48.2	7.6	98.9	5.4
9. Central East	728	41.9	6.9	96.6	5.4
10. South East	286	41.3	6.8	65.7	5.3
11. Champlain	673	45.3	5.8	99.1	4.7
12. North Simcoe Muskoka	264	47.0	6.5	100.0	4.6
13. North East	330	44.2	5.8	93.0	5.2
14. North West	124	54.8	10.8	83.1	5.7
Ontario	**6,548**	**43.7**	**7.1**	**97.1**	**5.1**

1 Please refer to the Introduction at the beginning of this chapter for an explanation of radiation therapy planning.

2 Denominator includes all patients in the Breast Cancer Surgery Cohort.

3 Visits include assessments, consultations and counselling.

Findings

- Three-quarters of women in the Breast Cancer Surgery Cohort saw a radiation oncologist; 65 percent received radiation therapy planning.
- Nearly half of all patients in this study cohort were seen by a medical oncologist.
- On average, patients visited their breast cancer surgeons five times in the period from 12 months prior to 12 months after their definitive surgery.

Exhibit 2.8a

Diagnostic services received by women in the Breast Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months[1] after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Breast Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[2] # services per patient)*							
		Mammography			Breast/ axilla ultrasound	Breast MRI scan	Biopsy		Wire localization procedures
		12 months before diagnosis	12 months after diagnosis	Additional magnification views			Performed by radiologist	Performed by non-radiologist	
1. Erie St. Clair	23	13 (0.6)	6 (0.3)	6 (0.3)	23 (1.0)	0 (0.0)	13 (0.6)	7 (0.3)	0 (0.0)
2. South West	48	23 (0.5)	7 (0.1)	12 (0.3)	32 (0.7)	**	33 (0.7)	23 (0.5)	0 (0.0)
3. Waterloo Wellington	27	12 (0.4)	9 (0.3)	12 (0.4)	32 (1.2)	0 (0.0)	9 (0.3)	16 (0.6)	**
4. Hamilton Niagara Haldimand Brant	84	36 (0.4)	16 (0.2)	27 (0.3)	50 (0.6)	6 (0.1)	31 (0.4)	49 (0.6)	**
5. Central West	25	15 (0.6)	7 (0.3)	9 (0.4)	32 (1.3)	**	19 (0.8)	20 (0.8)	**
6. Mississauga Halton	43	16 (0.4)	6 (0.1)	6 (0.1)	41 (1.0)	**	17 (0.4)	30 (0.7)	0 (0.0)
7. Toronto Central	79	34 (0.4)	28 (0.4)	22 (0.3)	60 (0.8)	**	45 (0.6)	31 (0.4)	**
8. Central	58	38 (0.7)	25 (0.4)	16 (0.3)	61 (1.1)	**	45 (0.8)	30 (0.5)	8 (0.1)
9. Central East	34	20 (0.6)	9 (0.3)	12 (0.4)	29 (0.9)	**	23 (0.7)	24 (0.7)	**
10. South East	31	15 (0.5)	8 (0.3)	6 (0.2)	18 (0.6)	0 (0.0)	20 (0.6)	13 (0.4)	**
11. Champlain	71	42 (0.6)	15 (0.2)	14 (0.2)	65 (0.9)	13 (0.2)	50 (0.7)	15 (0.2)	8 (0.1)
12. North Simcoe Muskoka	14	11 (0.8)	**	**	10 (0.7)	0 (0.0)	**	**	**
13. North East	22	**	7 (0.3)	**	**	0 (0.0)	6 (0.3)	19 (0.9)	**
14. North West	10	**	**	**	9 (0.9)	0 (0.0)	**	6 (0.6)	**
Ontario	**569**	**284 (0.5)**	**148 (0.3)**	**153 (0.3)**	**467 (0.8)**	**38 (0.1)**	**317 (0.6)**	**288 (0.5)**	**34 (0.1)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Unless otherwise specified.

2 Denominator includes all patients in the Breast Cancer Surgery Cohort.

Findings

- Utilization of diagnostic services among women in the Breast Cancer/No Surgery Cohort was much lower than among those in the Breast Cancer Surgery Cohort. For example, women who did not receive breast cancer surgery had, on average, 0.5 mammograms per patient in the 12 months before their diagnosis, compared with 1.3 mammograms per patient in the 12 months before surgery, among women who did have such surgery.

Exhibit 2.8b Radiologic services received by women in the Breast Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Breast Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*					
		Chest		Abdomen			
		X-ray	CT scan	Ultrasound	CT scan	Bone scan	Pelvis CT scan
1. Erie St. Clair	23	64 (2.8)	19 (0.8)	21 (0.9)	18 (0.8)	16 (0.7)	**
2. South West	48	103 (2.1)	23 (0.5)	23 (0.5)	31 (0.6)	34 (0.7)	28 (0.6)
3. Waterloo Wellington	27	47 (1.7)	11 (0.4)	20 (0.7)	**	17 (0.6)	**
4. Hamilton Niagara Haldimand Brant	84	165 (2.0)	32 (0.4)	51 (0.6)	26 (0.3)	48 (0.6)	18 (0.2)
5. Central West	25	34 (1.4)	8 (0.3)	22 (0.9)	10 (0.4)	18 (0.7)	9 (0.4)
6. Mississauga Halton	43	113 (2.6)	49 (1.1)	39 (0.9)	42 (1.0)	29 (0.7)	37 (0.9)
7. Toronto Central	79	129 (1.6)	52 (0.7)	45 (0.6)	59 (0.7)	38 (0.5)	52 (0.7)
8. Central	58	129 (2.2)	47 (0.8)	46 (0.8)	46 (0.8)	45 (0.8)	45 (0.8)
9. Central East	34	69 (2.0)	22 (0.6)	22 (0.6)	25 (0.7)	13 (0.4)	19 (0.6)
10. South East	31	52 (1.7)	15 (0.5)	23 (0.7)	12 (0.4)	19 (0.6)	10 (0.3)
11. Champlain	71	172 (2.4)	45 (0.6)	46 (0.6)	53 (0.7)	46 (0.6)	35 (0.5)
12. North Simcoe Muskoka	14	35 (2.5)	10 (0.7)	**	12 (0.9)	**	11 (0.8)
13. North East	22	53 (2.4)	12 (0.5)	11 (0.5)	14 (0.6)	18 (0.8)	7 (0.3)
14. North West	10	19 (1.9)	7 (0.7)	**	**	**	**
Ontario	**569**	**1,184 (2.1)**	**352 (0.6)**	**378 (0.7)**	**354 (0.6)**	**358 (0.6)**	**279 (0.5)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Breast Cancer/No Surgery Cohort.

Findings

- The most commonly used diagnostic imaging tests for women in the Breast Cancer/No Surgery Cohort were chest X-rays (2.1 per patient on average), abdominal ultrasounds (0.7 per patient) and chest and abdominal computed tomography (CT) scans (0.6 per patient).

Exhibit 2.8c

Consultations and services received by women in the Breast Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Patients without surgery *number*	Radiation oncology		Radiation therapy planning[1]		Medical oncology	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	23	34.8	1.1	21.7	1.0	52.2	1.2
2. South West	48	33.3	1.4	31.3	1.9	29.2	1.1
3. Waterloo Wellington	27	48.1	1.2	44.4	1.3	51.9	1.1
4. Hamilton Niagara Haldimand Brant	84	33.3	1.1	25.0	1.5	39.3	1.2
5. Central West	25	48.0	1.1	52.0	1.2	60.0	1.5
6. Mississauga Halton	43	23.3	1.3	18.6	1.3	34.9	1.6
7. Toronto Central	79	19.0	1.3	15.2	1.3	32.9	1.2
8. Central	58	41.4	1.0	32.8	1.1	39.7	1.2
9. Central East	34	29.4	1.2	20.6	1.7	20.6	1.0
10. South East	31	61.3	1.2	41.9	1.1	38.7	1.0
11. Champlain	71	49.3	1.3	33.8	1.3	38.0	1.1
12. North Simcoe Muskoka	14	**	**	**	**	50.0	1.1
13. North East	22	40.9	1.0	27.3	1.2	45.5	1.0
14. North West	10	**	**	**	**	**	**
Ontario	**569**	**36.6**	**1.2**	**28.6**	**1.3**	**38.0**	**1.2**

LHIN of patient residence	Patients without surgery *number*	Chemotherapy		General surgery	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit[3]	Average[2] # visits per patient
1. Erie St. Clair	23	39.1	7.2	73.9	2.8
2. South West	48	18.8	8.3	64.6	3.4
3. Waterloo Wellington	27	**	6.8	77.8	3.1
4. Hamilton Niagara Haldimand Brant	84	27.4	7.9	82.1	2.4
5. Central West	25	40.0	7.4	88.0	3.1
6. Mississauga Halton	43	41.9	6.3	76.7	2.8
7. Toronto Central	79	20.3	9.1	68.4	2.2
8. Central	58	32.8	8.3	74.1	2.7
9. Central East	34	20.6	5.7	73.5	2.8
10. South East	31	29.0	6.0	64.5	2.8
11. Champlain	71	19.7	8.1	64.8	2.8
12. North Simcoe Muskoka	14	**	14.3	78.6	1.7
13. North East	22	22.7	12.2	63.6	2.7
14. North West	10	**	**	80.0	1.9
Ontario	**569**	**26.0**	**7.8**	**73.1**	**2.6**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Please refer to the Introduction at the beginning of this chapter for an explanation of radiation therapy planning.

2 Denominator includes all patients in the Breast Cancer Surgery Cohort.

3 Visits include assessments, consultations and counselling.

Findings

- The proportion of women receiving various non-surgical services and consults (radiation oncology, radiation therapy planning, medical oncology and chemotherapy) was much lower among those in the Breast Cancer/No Surgery Cohort compared to those in the Breast Cancer Surgery Cohort. For example, 76 percent of women with breast cancer who had surgery also saw a radiation oncologist, compared with only 37 percent of women who did not have surgery.
- However, a considerable number of women who did not have surgery still went for radiation consults, radiation therapy planning, medical oncology consults, medical treatment and surgeon visits.

Discussion and Conclusions

This study presents important new information about the surgical care of women in Ontario aged 20 and older who were newly-diagnosed with breast cancer in 2003/04.

We found that the great majority of these women (92 percent) underwent a definitive surgical procedure within a year of diagnosis. Just over half of these procedures were provided in an outpatient setting. A relatively high proportion of women in this cohort (28 percent) underwent more than one breast cancer procedure. Most surgical admissions (84 percent) occurred in hospitals that were located in the Local Health Integration Networks (LHINs) where the patients lived at the time of their diagnosis. Most definitive surgeries (69 percent) were provided by general surgeons with no self-identified sub-specialty, and most took place in community hospitals (70 percent).

Breast-conserving surgery was the most common type of definitive surgery for breast cancer, received by 61 percent of women who had surgery. At the LHIN level, we noted moderate variation in rates of individual procedures. Nearly one in four women (24 percent) did not undergo a lymph node excision; omission of this surgical procedure was more likely to occur among older women.

Among women newly-diagnosed with breast cancer in 2003/04, both local and distant diagnostic testing (i.e., breast imaging and staging of other parts of the body where cancer might have spread) were utilized in almost all cases.

Although the majority of these women did have definitive surgery for their disease, those who did not have surgery still utilized considerable surgical and other health care resources across a variety of disciplines.

These findings suggest that the care of women with breast cancer is resource-intense; it also involves multiple disciplines such as radiology, medical oncology, radiation oncology, surgery and pathology.

Implications for clinical practice

Our findings have implications for the clinical care of women with breast cancer. We saw variation in practice at the LHIN level for numerous aspects of breast cancer surgery. These included what type of definitive procedure was done (e.g., breast-conserving surgery only vs. mastectomy and lymph node excision), use of outpatient surgery and use of multiple procedures. This variation could not be explained by surgeon or hospital descriptors; however, it could be partially explained by women's age at the time of their diagnosis (i.e., those over age 70 were more likely than younger women to undergo either breast-conserving surgery or mastectomy without any lymph node excision).

Variations in the choice of definitive surgery for breast cancer might be explained by differences in the stage of disease, physician preference, patient preference and/or varying resources available at the LHIN level.

For example, ready access to non-surgical methods of diagnosis such as core needle biopsy can allow for more appropriate planning; this increases the likelihood that the definitive surgery can be performed in one procedure. Indeed, studies suggest that use of core needle biopsy as opposed to open surgical biopsy decreases the need for multiple surgeries later on.

We found evidence of potential gaps in the quality of care that patients received. For example, 24 percent of women diagnosed with breast cancer who underwent surgery did not undergo a lymph node excision. While this occurred more frequently in women aged 70 years or older (36 percent), 19 percent of younger women (those aged 20–39 years) also did not have a lymph node excision.

Although staging guidelines for women with breast cancer recommend the evaluation of distant sites of disease only in high-risk patients,[2] a large number of women in this study (up to 80 percent) received a bone scan. This far exceeds the number of women expected to be at high risk for cancer recurrence or metastasis. The decision to omit lymph node excision may limit the accuracy of cancer staging and may affect further treatment decisions. At the same time, overuse of tests designed to detect distant spread of cancer (such as bone scans) will likely result in little gain for most patients.

Most surgical procedures reviewed and analyzed for this chapter of the Atlas took place in community hospitals and were carried out by general surgeons with no self-identified sub-specialty. Thus, any efforts to introduce new surgical technologies or techniques in breast cancer treatment or to improve any aspect of care at a population level, must ensure uptake by both general surgeons and sub-specialists practising in both community and academic hospitals.

With respect to new diagnostic technologies, magnetic resonance imaging (MRI) was not widely utilized in our patient cohorts, which reflects its evolving role in breast evaluation and its limited availability across the province.

With respect to recent advances in sentinel lymph node biopsy, the data sources used for this study did not distinguish whether a procedure was a sentinel node biopsy or an axillary node dissection. Therefore, we are unable to comment on the use of sentinel lymph node biopsy in this study cohort.

Breast cancer requires multidisciplinary services and care, including the involvement of radiation oncologists and medical oncologists. We found that more than three-quarters (76 percent) of all women newly-diagnosed with breast cancer in 2003/04 had been assessed at least once by a radiation oncologist. This suggests that access to radiotherapy services was good during the study period, since 61 percent of women received breast-conserving surgery and would therefore require post-operative radiotherapy treatment according to practice guidelines. Sixty-five percent of all women who had any type of surgery received radiation therapy planning.

In contrast, we found that less than half of all women in the study cohort were seen in consultation by a medical oncologist—fewer than might be expected. We suggest some possible explanations for this finding. For example, it is possible that surgeons did not refer patients with early breast cancers to medical oncologists because adjuvant therapy (e.g., chemotherapy) was not considered appropriate for these women. Or it might be that these patients were treated by the surgeons themselves or discharged to other physicians, such as general practitioners, for treatment with oral hormonal agents used to treat some kinds of breast cancer.

Implications for policy and planning

We observed some variations in practice patterns for breast cancer surgery at the level of Ontario's Local Health Integration Networks (LHINs). For example, the proportion of women with breast cancer who had surgery but did not have a lymph node excision ranged from a low of 14 percent among women who resided in the Champlain LHIN at the time of their diagnosis to a high of 29 percent among those who lived in the Toronto Central LHIN. Similar variations have been previously noted in Ontario and also in other jurisdictions.[7]

We could find no obvious explanations for this variation among LHINs; it will be up to those working at the LHIN level to investigate further and to devise local solutions where required. It is also important to recognize that the majority of care for breast cancer in Ontario is provided in community hospitals, so any improvement efforts must engage health teams connected to both academic and community hospitals.

Future research

More research is needed to understand variations in practice and quality gaps as they affect Ontario women newly-diagnosed with breast cancer. For example, a better understanding of care-delivery structures (e.g., available diagnostic resources) and processes (e.g., decision-making by surgeons and patients) which might play a role in these variations and gaps could lead to the identification of modifiable factors. These factors might then be optimized to improve the care of women diagnosed with breast cancer in Ontario. Finally, drawing conclusions about quality of care will continue to be difficult, as long as important clinical information—such as cancer stage—is missing from data in the Ontario Cancer Registry.

References

1. Canadian Cancer Society/National Cancer Institute of Canada. *Canadian Cancer Statistics 2007*. Toronto: CCS/NCIC; 2007.
2. McCready D, Holloway C, Shelley W, Down N, Robinson P, Sinclair S, et al. Surgical management of early stage invasive breast cancer: a practice guideline. *Can J Surg* 2005; 48(3):185–94.
3. Fleissig A, Fallowfield LJ, Langridge CI, Johnson L, Newcombe RG, Dixon JM, et al. Post-operative arm morbidity and quality of life. Results of the ALMANAC randomised trial comparing sentinel node biopsy with standard axillary treatment in the management of patients with early breast cancer. *Breast Cancer Res Treat* 2006; 95(3):279–93.
4. Fisher B, Anderson S, Bryant J, Margolese RG, Deutsch M, Fisher ER, et al. Twenty–year follow-up of randomized trial comparing total mastectomy, lumpectomy and lumpectomy plus irradiation for the treatment of invasive breast cancer. *N Engl J Med* 2002; 347(16):1233–41.
5. Clarke M, Collins R, Darby S, Davies C, Elphinstone P, Evans E, et al. Effects of radiotherapy and of differences in the extent of surgery for early breast cancer on local recurrence and 15-year survival: an overview of the randomised trials. *Lancet* 2005; 366 (9503):2087–106.
6. Henteleff H, McCready D, Giuliano A, Evidence Based Reviews in Surgery Group. Evidence-based surgery. Canadian Association of General Surgeons and American College of Surgeons Evidence Based Reviews in Surgery. 19. The effect of a decision aid on knowledge and treatment decision making for breast cancer. *Can J Surg* 2006; 49(6):431–3.
7. Gaudette LA, Gao RN, Spence A, Shi F, Johansen H, Olivotto IA. Declining use of mastectomy for invasive breast cancer in Canada, 1981–2000. *Can J Public Health* 2004; 95(5):336–40.

INSIDE

3

Chapter

Surgery for Prostate Cancer

Antonio Finelli, MD, MSc, FRCSC,* Kenneth T. Pace, MD, MSc, FRCSC,* Sharon Sharir, MD, MPH, FRCSC,* Susan E. Schultz, MA, MSc, Nadia Gunraj, BSc, MPH, Andrew S. Wilton, MSc, Raymond Przybysz, MSc, Marko Simunovic, MD, MPH, FRCSC, and David R. Urbach, MD, MSc, FRCSC, FACS

*Antonio Finelli, Kenneth T. Pace and Sharon Sharir contributed equally to this chapter.

Executive Summary

Issue

Prostate cancer is the most common cancer affecting Canadian men and the third most common cause of cancer deaths in this group.

Study

This chapter describes health services provided to men in Ontario who were newly-diagnosed with prostate cancer in 2003/04.

Key Findings

- Nearly half (47 percent) of men with prostate cancer had surgery within a year of diagnosis.
- Most surgery for prostate cancer was provided in an inpatient setting.
- More than three-quarters (79 percent) of surgical procedures for prostate cancer occurred in the Local Health Integration Networks (LHINs) where patients lived at the time they were diagnosed.
- Among patients who had surgery, 59 percent had a potentially curative radical prostatectomy. Forty-one percent had other operations such as transurethral resection of the prostate (TURP).
- Radical prostatectomies for newly-diagnosed prostate cancer were very uncommon among patients aged 75 years or older.
- A total of 178 urologists treated patients newly-diagnosed with prostate cancer in Ontario in 2003/04; 32 of them were urologic oncologists.
- Urologic oncologists performed 30 percent of all prostate cancer operations; they were more likely than general urologists to perform radical prostatectomies.
- The majority (73 percent) of prostate cancer operations were done in community hospitals.

Implications

- **The aging population and the growing use of prostate cancer screening are expected to create an increasing demand for prostate cancer treatment in Ontario.**
- **Urologists provide a substantial proportion of health services to men with prostate cancer whether or not surgery is performed. These specialists are the core providers of care to men with this disease.**

Introduction

Prostate cancer is the most commonly diagnosed malignancy among Canadian men. The most recently published estimates predicted that 22,300 new cases would be diagnosed in Canada in 2007, nearly all of them among men over age 50.[1]

The incidence of prostate cancer has gradually increased over the past three decades. Earlier detection—the result of prostate-specific antigen (PSA) testing, which became widely available in 1988—may explain this trend.[2]

The most recent estimates suggested that prostate cancer, which is the third leading cause of mortality among Canadian men, would be responsible for approximately 4,300 deaths in Canada in 2007. However, since the mid-1990s, the mortality rate for prostate cancer has been declining. This may be due to a combination of earlier detection and better treatment. It is also possible that some very slow-growing prostate cancers, which are now detected by screening (and therefore counted as prostate cancer cases), never become clinically apparent or end up not being listed as a cause of death.

Men diagnosed with prostate cancer often survive for many years due to early diagnosis, relatively non-aggressive tumour progression and the availability of effective treatments. The five-year survival rate for this type of cancer is 92 percent. Therefore, we can state that today, prostate cancer is a highly prevalent disease that has the potential to require a considerable expenditure of health care resources.

The diagnosis of prostate cancer

A primary care physician may refer a patient to a urologist for many reasons, including a desire to rule out prostate cancer. Warning signs include an elevated level of PSA in the blood; an abnormality detected during physical examination of the prostate gland; and problems with urination.

A diagnosis of prostate cancer is usually made via a transrectal ultrasound (TRUS) and an ultrasound-guided biopsy of the gland. However, in some cases, cancer is discovered unexpectedly when the patient undergoes surgery to relieve another condition such as benign prostatic enlargement (also known as benign prostatic hypertrophy or BPH).

Once a diagnosis has been made, patients may undergo staging investigations such as a chest X-ray, bone scan or computed tomographic (CT) scan, particularly if they are believed to have higher-risk disease and thus a poorer prognosis (e.g., tissue analyses suggest a high-grade cancer).

Decisions about prostate cancer treatment

Decisions about prostate cancer treatment are based on many factors, including the patient's age, his overall health, cancer stage (the size and location of the cancer, and if it has spread beyond the prostate), tumour grade (how abnormal the cancer cells look under a microscope and how quickly the tumour is likely to grow and spread), current PSA levels and, finally, the patient's own preferences. Patient preferences regarding the potential side effects of different treatments, such as erectile dysfunction and urinary incontinence, are also considered when selecting treatment options.

Men with localized prostate cancer are generally offered surgery only if they are younger than 72 years and in good health. Other considerations include tumour grade and tumour stage. For example, brachytherapy—radiotherapy involving an irradiation source placed close to the surface of the body or within a body cavity—is more typically used in patients with lower-grade cancers. Men with higher-stage localized cancers are most typically treated with simple radiation. Those with metastatic disease (i.e., their cancers have spread beyond the prostate gland) are not usually offered either curative surgery or radiation.

Urologists may refer patients to a radiation oncologist to discuss the pros and cons of radiation therapy. Since hormonal manipulation therapy is usually managed by urologists, referrals to medical oncologists usually occur when chemotherapy is deemed to be necessary, typically late in a patient's disease course, when hormonal treatment stops working.

Treatments for localized prostate cancer

The usual treatment for localized prostate cancer is radical prostatectomy (surgery to remove the entire prostate gland and surrounding tissue) or radiation therapy, either by external beam radiation or brachytherapy.

Hormonal manipulation may also be used in combination with radiation therapy for patients with localized cancer who are deemed to be at higher risk for cancer progression. Chemotherapy is not usually recommended for men with localized prostate cancer. Some prostate cancer treatments may cause a urethral stricture—a narrowing of the channel carrying urine from the bladder (urethra)—which may require the use of another procedure called visual internal urethrotomy (VIU) to relieve the blockage.

Since some prostate cancers are indolent (i.e., slow to develop) and do not require treatment, another common approach is "watchful waiting" or "active surveillance." In these cases, doctors monitor the cancer and only recommend treatment if the tumour shows signs of growth or if symptoms develop.

Treatments for metastatic prostate cancer

Prostate cancer that has already spread (metastasized) to distant sites is not curable. Treatment of metastatic prostate cancer usually involves suppression of testosterone, a hormone that stimulates the growth of prostate cancer. Manipulation of testosterone secretion may involve the use of oral or injected drugs. In some cases, bilateral orchidectomy (removal of both testicles) is recommended.

Hormonal manipulation may also be used in combination with radiation therapy for patients who are deemed to be at higher risk for cancer progression. Chemotherapy is usually reserved for men with metastatic disease in whom hormonal manipulation no longer works.

Non-curative prostate surgeries may be performed when prostate cancer is causing urinary blockage. In these cases, a surgical procedure known as transurethral resection of the prostate (TURP) can relieve urinary symptoms.

Newer surgical treatment options for prostate cancer, which generally involve a more minimally invasive approach, are emerging. These include laparoscopic radical prostatectomy and various methods to destroy prostate tissue without surgical removal of the prostate, such as freezing prostate tissue (cryotherapy), or heating it via a process called High Intensity Focused Ultrasound (HIFU).

Notes:

- If a patient had more than one type of procedure, the most extensive procedure is identified in this Atlas as the "definitive" surgery.
- All patients who receive radiation therapy as part of cancer treatment first undergo radiation therapy planning. This involves positioning the person's body, marking the skin and taking imaging scans to determine the best way to deliver the radiation dose. Because complete data on which patients in our study cohorts actually received radiation therapy were not available, we have used radiation therapy planning as a surrogate measure for radiation therapy treatment.

How the study cohorts were defined

This chapter provides detailed information about patterns of health services provided to Ontario men newly-diagnosed with prostate cancer in 2003/04. This includes information regarding men who underwent surgery and those who did not.

The study population for this chapter included all Ontario men 20 years of age or older identified with prostate cancer in the Ontario Cancer Registry (OCR) whose diagnosis date fell between April 1, 2003 and March 31, 2004. This is referred to as the **Overall Prostate Cancer Cohort.**

The Overall Prostate Cancer Cohort was then subdivided into two smaller groups.

- The **Prostate Cancer Surgery Cohort** included all Ontario men 20 years of age or older identified with prostate cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had prostate cancer surgery within 12 months before or after their diagnosis date.
- The **Prostate Cancer/No Surgery Cohort** included all Ontario men 20 years of age or older identified with prostate cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have prostate cancer surgery within 12 months before or after their diagnosis date.

Chapter 3—List of Exhibits

Exhibits and Findings

Exhibit 3.1 Incidence of prostate cancer among Ontario men 20 years of age or older in 2003/04, and use of surgery in the Overall Prostate Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Prostate Cancer Cohort: Total number of cases (% Ontario)	Had surgery: number	Had surgery: age-standardized[1] % total	Had prostate biopsy only: number	Had prostate biopsy only: age-standardized[1] % total	Did not have surgery or prostate biopsy: number	Did not have surgery or prostate biopsy: age-standardized[1] % total
Ontario	**163.1**	**7,635 (100.0)**	**3,610**	**47.3**	**3,774**	**49.4**	**251**	**3.3**
Age group (years)[2]								
20–54	9.5	**	**	76.8	**	22.7	**	**
55–64	187.3	**	1,324	65.1	699	34.3	12	0.6
65–69	349.8	**	811	53.3	701	46.0	11	0.7
70–74	377.5	**	447	30.2	1,008	68.1	26	1.7
75+	303.2	**	**	28.7	**	61.4	**	9.9
Neighbourhood income quintile								
Q1 (Lowest)	141.0	1,166 (15.7)	523	46.9	589	49.3	54	3.8
Q2	159.0	1,444 (19.5)	654	46.2	737	50.2	53	3.6
Q3	169.6	1,507 (20.3)	720	47.2	748	50.0	39	2.8
Q4	176.5	1,536 (20.7)	746	47.9	744	48.8	46	3.3
Q5 (Highest)	185.0	1,766 (23.8)	874	47.9	843	49.2	49	2.9
Community size (population)								
≥ 1,250,000	166.1	2,795 (36.6)	1,314	46.5	1,415	50.8	66	2.7
100,000–1,249,999	169.7	2,834 (37.1)	1,387	48.7	1,357	48.2	90	3.1
< 100,000	163.5	2,003 (26.2)	909	46.5	1,000	49.3	94	4.2
LHIN								
1. Erie St. Clair	195.3	510 (6.7)	262	52.6	236	44.9	12	2.5
2. South West	181.3	700 (9.2)	358	50.3	315	46.2	27	3.5
3. Waterloo Wellington	157.6	370 (4.9)	208	57.3	148	40.6	14	2.1
4. Hamilton Niagara Haldimand Brant	144.9	848 (11.1)	380	45.6	438	51.2	30	3.2
5. Central West	196.6	396 (5.2)	224	53.1	164	43.8	8	3.1
6. Mississauga Halton	176.5	539 (7.1)	249	45.2	275	51.5	15	3.3
7. Toronto Central	132.2	588 (7.7)	235	39.7	330	57.0	23	3.3
8. Central	166.5	829 (10.9)	402	48.0	413	50.3	14	1.7
9. Central East	163.0	900 (11.8)	487	53.9	393	43.6	20	2.5
10. South East	140.5	314 (4.1)	135	41.8	164	52.3	15	5.9
11. Champlain	173.1	750 (9.8)	253	32.2	470	63.3	27	4.5
12. North Simcoe Muskoka	160.0	280 (3.7)	136	51.5	130	43.6	14	4.9
13. North East	163.5	441 (5.8)	197	45.6	223	50.2	21	4.2
14. North West	159.8	163 (2.1)	83	55.8	70	38.8	10	5.4

** Cell value suppressed for reasons of privacy and confidentiality.

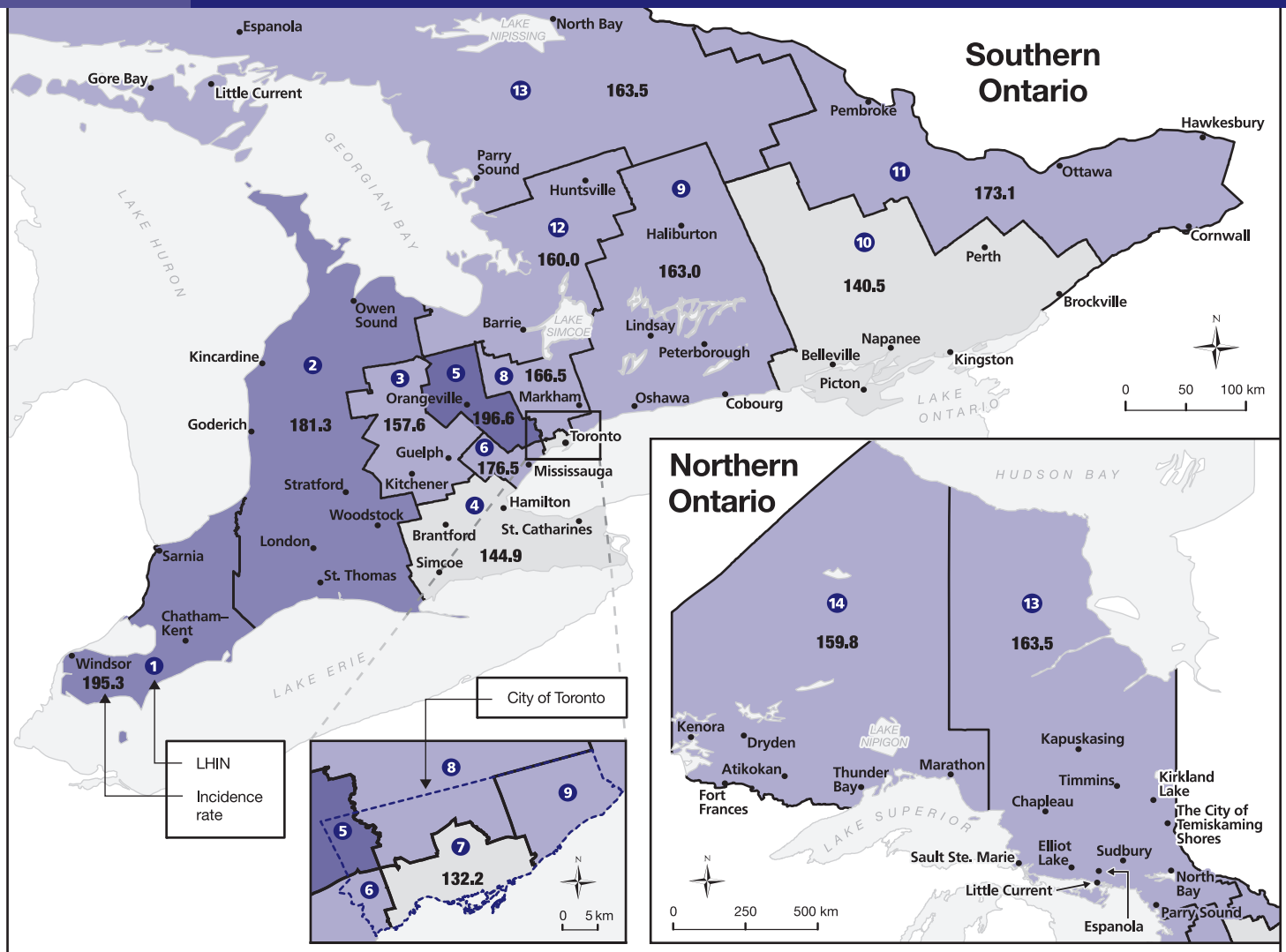
1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Prostate Cancer Cohort.

2 Age-specific rates have not been standardized.

Findings

- The incidence of prostate cancer in Ontario increased with age in 2003/04—from 9.5 cases per 100,000 men under age 55 years to 303.2 cases per 100,000 men age 75 years or older.
- We noted evidence of a socioeconomic status (SES) gradient in the incidence of prostate cancer during the study period. The incidence was 141 cases per 100,000 men from the poorest neighbourhoods in Ontario, rising to 185 cases per 100,000 men from the wealthiest neighbourhoods.
- The rate of surgery for prostate cancer among men in this study cohort declined with increasing age—from a high of 77 percent among those under age 55 years to a low of 29 percent among those aged 75 years or older.

Exhibit 3.2 Age-standardized prostate cancer incidence per 100,000 men 20 years of age or older, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age-standardized prostate cancer incidence rate per 100,000 men in the Overall Prostate Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 163.1 per 100,000 men

LHIN rate per 100,000 men	LHIN rate compared to OR	Number of LHINs in each category
> 195.7	More than 20% above OR	1
178.6–195.7	10% to 20% above OR	2
147.7–178.5	Within 10% of OR	8
130.5–147.6	10% to 20% below OR	3
< 130.5	More than 20% below OR	0

Findings

- In 2003/04, the prostate cancer incidence rate for Ontario was 163 cases per 100,000 men 20 years of age or older.
- There was considerable variation in incidence according to the Local Health Integration Network (LHIN) of patient residence—ranging from a low of 132 cases per 100,000 among men living in the Toronto Central LHIN at the time of their diagnosis to a high of 197 cases per 100,000 among those residing in the Central West LHIN.

Exhibit 3.3 Health care utilization among men in the Prostate Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Prostate Cancer Surgery Cohort: Total number of patients	Prostate Cancer Surgery Cohort: Average # visits with treating surgeon[2]	Prostate Cancer Surgery Cohort: % with more than one hospital admission	Hospital admissions[1]: Total number of admissions	Hospital admissions[1]: Same-day surgery	Hospital admissions[1]: Inpatient admissions
	number	*visits/patient*	*% patients*	*number (average per patient)*	*age-standardized % total admissions[3]*	
Ontario	**3,610**	**5.5**	**3.1**	**3,680 (1.0)**	**5.1**	**94.9**
Age group (years)[3]						
20–54	453	5.5	1.3	459 (1.0)	2.0	98.0
55–64	1,324	5.8	1.4	1,335 (1.0)	2.1	97.9
65–69	811	5.6	2.3	821 (1.0)	1.8	98.2
70–74	447	5.7	3.6	459 (1.0)	5.4	94.6
75+	575	4.5	5.6	606 (1.1)	11.2	88.8
Neighbourhood income quintile						
Q1 (Lowest)	523	5.4	2.9	535 (1.0)	4.9	95.1
Q2	654	5.6	2.9	667 (1.0)	5.9	94.1
Q3	720	5.5	3.9	741 (1.0)	4.9	95.1
Q4	746	5.7	3.5	759 (1.0)	5.7	94.3
Q5 (Highest)	874	5.3	1.8	881 (1.0)	4.8	95.2
Community size (population)						
≥ 1,250,000	1,314	5.8	2.1	1,329 (1.0)	2.3	97.7
100,000–1,249,999	1,387	5.1	3.6	1,419 (1.0)	8.4	91.6
< 100,000	909	5.5	3.7	932 (1.0)	3.9	96.1
LHIN						
1. Erie St. Clair	262	5.2	5.7	279 (1.1)	12.6	87.4
2. South West	358	5.3	1.5	362 (1.0)	1.6	98.4
3. Waterloo Wellington	208	5.2	5.2	215 (1.0)	18.8	81.2
4. Hamilton Niagara Haldimand Brant	380	5.8	2.4	387 (1.0)	5.7	94.3
5. Central West	224	5.8	3.4	227 (1.0)	1.3	98.7
6. Mississauga Halton	249	4.8	**	253 (1.0)	4.6	95.4
7. Toronto Central	235	5.5	**	235 (1.0)	0.7	99.3
8. Central	402	6.2	2.1	406 (1.0)	1.8	98.2
9. Central East	487	5.9	2.7	495 (1.0)	3.6	96.4
10. South East	135	5.0	**	135 (1.0)	0.5	99.5
11. Champlain	253	5.0	1.6	253 (1.0)	2.7	97.3
12. North Simcoe Muskoka	136	4.7	**	139 (1.0)	2.3	97.7
13. North East	197	4.6	7.7	209 (1.1)	4.3	95.7
14. North West	83	7.0	**	84 (1.0)	8.1	91.9

** Cell value suppressed for reasons of privacy and confidentiality.

1 Time frame for hospital admissions is from 12 months prior to 12 months after diagnosis.

2 Time frame for surgeon visits is from 6 months prior to 6 months after the first surgery.

3 Standardized to the Overall Prostate Cancer Cohort; age-specific rates have not been standardized.

Findings

- Men in the Prostate Cancer Surgery Cohort aged 70 years or older tended to have more same-day procedures than men under age 70. This suggests that younger men with prostate cancer were more likely to have more radical surgery.
- The number of times men in this study cohort visited a urologist in the year surrounding their surgery was quite similar across age groups, neighbourhood income quintiles and community size.
- Across Local Health Integration Networks (LHINs), the average number of visits patients had with their treating surgeons ranged from a low of 4.6 visits among men living the North East LHIN at the time of their diagnosis to a high of 7.0 visits among men living in the North West LHIN.

Exhibit 3.4 Hospital admissions for surgical procedures among men in the Prostate Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN of patient residence	LHIN where care was received					
	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton
	number (col%, row %)[1]					
1. Erie St. Clair	**209 (99.5, 74.9)**	65 (14.1, 23.3)	**			
2. South West		**347 (75.4, 95.9)**	8 (3.8, 2.2)	**	**	
3. Waterloo Wellington		11 (2.4, 5.1)	**188 (90.4, 87.9)**	**	**	**
4. Hamilton Niagara Haldimand Brant		9 (2.0, 2.3)	**	**352 (96.4, 91.0)**	**	7 (3.6, 1.8)
5. Central West			**		**160 (66.4, 70.5)**	9 (4.7, 4.0)
6. Mississauga Halton		**	**	**	21 (8.7, 8.3)	**161 (83.4, 63.6)**
7. Toronto Central				**	8 (3.3, 3.4)	**
8. Central		**			19 (7.9, 4.7)	**
9. Central East			**	**	**	**
10. South East					**	
11. Champlain					**	**
12. North Simcoe Muskoka		7 (1.5, 5.0)	**	**	13 (5.4, 9.4)	**
13. North East		19 (4.1, 9.1)			6 (2.5, 2.9)	
14. North West					**	
Ontario	**210 (100, 5.7)**	**460 (100, 12.5)**	**208 (100, 5.7)**	**365 (100, 9.9)**	**241 (100, 6.6)**	**193 (100, 5.2)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having prostate cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all prostate cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings

- More than three-quarters (79 percent) of hospital admissions for prostate cancer-related surgery undergone by patients in the Prostate Cancer Surgery Cohort occurred at a hospital in the Local Health Integration Network (LHIN) where the patient resided at the time of their diagnosis.

Exhibit 3.4 (cont'd) Hospital admissions for surgical procedures among men in the Prostate Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN where care was received								
7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West	Ontario
number (col%, row %)[1]								
**			**					279 (7.6, 100)
**								362 (9.8, 100)
6 (1.3, 2.8)								214 (5.8, 100)
10 (2.1, 2.6)	**					**		387 (10.5, 100)
27 (5.7, 11.9)	25 (7.4, 11.0)	**			**			227 (6.2, 100)
46 (9.8, 18.2)	16 (4.7, 6.3)	**		**				253 (6.9, 100)
179 (38.0, 76.2)	23 (6.8, 9.8)	18 (4.0, 7.7)			**			235 (6.4, 100)
110 (23.4, 27.1)	**230 (67.8, 56.7)**	33 (7.3, 8.1)			11 (9.0, 2.7)			406 (11.0, 100)
54 (11.5, 10.9)	36 (10.6, 7.3)	**392 (86.5, 79.2)**	**		**			495 (13.5, 100)
**	**	6 (1.3, 4.4)	**106 (93.0, 78.5)**	15 (5.9, 11.1)		**		135 (3.7, 100)
**		**	6 (5.3, 2.4)	**238 (93.3, 94.1)**		**		253 (6.9, 100)
8 (1.7, 5.8)	**	**			**101 (82.8, 72.7)**	**		139 (3.8, 100)
12 (2.5, 5.7)	**			**	**	**163 (97.0, 78.0)**		209 (5.7, 100)
**							**78 (98.7, 92.9)**	84 (2.3, 100)
471 (100, 12.8)	**339 (100, 9.2)**	**453 (100, 12.3)**	**114 (100, 3.1)**	**255 (100, 6.9)**	**122 (100, 3.3)**	**168 (100, 4.6)**	**79 (100, 2.1)**	**3,678 (100, 100)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having prostate cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all prostate cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings (cont'd)

- Hospitals located in certain LHINs were more likely others (i.e., those located in other LHINs) to treat prostate cancer patients who resided outside their geographic boundaries. For example, 62 percent of men who had surgery for prostate cancer in the Toronto Central LHIN were living outside the boundaries of that LHIN when they were diagnosed with their disease.

Exhibit 3.5a

Type of definitive surgical procedure among men in the Prostate Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Prostate Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]	
		Radical prostatectomy	Non-curative prostate surgery[2]
Ontario	**3,610**	**2,550 (58.8)**	**1,060 (41.2)**
Age group (years)[3]			
20–54	453	425 (93.8)	28 (6.2)
55–64	1,324	1,188 (89.7)	136 (10.3)
65–69	811	693 (85.5)	118 (14.5)
70–74	447	224 (50.1)	223 (49.9)
75+	575	20 (3.5)	555 (96.5)
Neighbourhood income quintile			
Q1 (Lowest)	523	326 (55.6)	197 (44.4)
Q2	654	446 (57.1)	208 (42.9)
Q3	720	497 (56.6)	223 (43.4)
Q4	746	548 (60.0)	198 (40.0)
Q5 (Highest)	874	668 (61.9)	206 (38.1)
Community size (population)			
≥ 1,250,000	1,314	989 (61.8)	325 (38.2)
100,000–1,249,999	1,387	935 (55.9)	452 (44.1)
< 100,000	909	626 (58.8)	283 (41.2)
LHIN			
1. Erie St. Clair	262	129 (47.5)	133 (52.5)
2. South West	358	283 (64.0)	75 (36.0)
3. Waterloo Wellington	208	139 (59.9)	69 (40.1)
4. Hamilton Niagara Haldimand Brant	380	235 (52.3)	145 (47.7)
5. Central West	224	181 (63.9)	43 (36.1)
6. Mississauga Halton	249	191 (61.9)	58 (38.1)
7. Toronto Central	235	173 (62.1)	62 (37.9)
8. Central	402	317 (64.9)	85 (35.1)
9. Central East	487	327 (58.2)	160 (41.8)
10. South East	135	90 (51.8)	45 (48.2)
11. Champlain	253	200 (58.3)	53 (41.7)
12. North Simcoe Muskoka	136	101 (61.6)	35 (38.4)
13. North East	197	133 (52.8)	64 (47.2)
14. North West	83	50 (53.6)	33 (46.4)

1 Percent of subgroup that had each type of definitive procedure, age-standardized to the Overall Prostate Cancer Cohort.

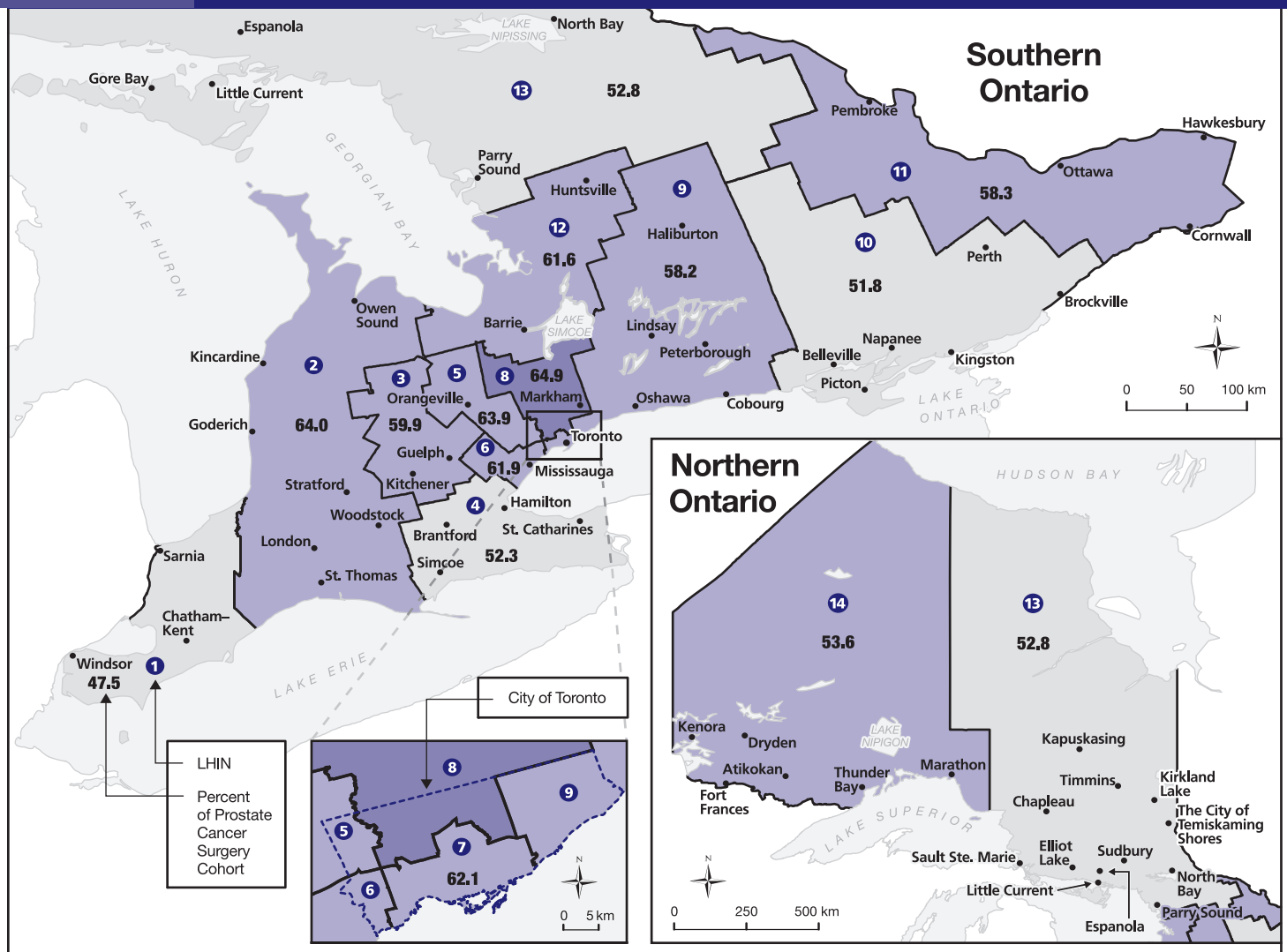
2 See the Technical Appendix at the end of this Atlas for definition of "non-curative prostate surgery."

3 Age-specific rates have not been standardized.

Findings

- The rate of radical prostatectomy decreased with age among men in the Prostate Cancer Surgery Cohort. The lowest rate of this surgical procedure was among men age 75 years or older.
- The rate of non-curative prostate surgery—for example, simple prostatectomy, transurethral resection of the prostate (TURP), and ablation—increased with the patients' age.
- Rates of both radical prostatectomy and non-curative surgery were similar across neighbourhood income quintiles and community size. However, we noted a shallow socioeconomic status (SES) gradient: this means the likelihood that men would undergo a radical prostatectomy increased with increasing SES.

Exhibit 3.5b Proportion of men in the Prostate Cancer Surgery Cohort [2003/04] whose definitive surgery was radical prostatectomy, by Local Health Integration Network (LHIN) of patient residence, in Ontario



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Percent of men in the Prostate Cancer Surgery Cohort whose definitive surgery was a radical prostatectomy, by LHIN of patient residence, in Ontario

Ontario rate (OR) = 58.8 percent

Percent of Prostate Cancer Surgery Cohort	LHIN rate compared to OR	Number of LHINs in each category
> 70.8	More than 20% above OR	0
64.4–70.8	10% to 20% above OR	1
53.3–64.3	Within 10% of OR	9
47.4–53.2	10% to 20% below OR	4
< 47.3	More than 20% below OR	0

Findings

- Nearly 60 percent of all men in the Prostate Cancer Surgery Cohort underwent a radical prostatectomy.
- The proportion of men in this study cohort whose definitive surgery was radical prostatectomy varied across Local Health Integration Networks (LHINs) of patient residence—from a low of 47 percent among men living in the Erie St. Clair LHIN at the time of their diagnosis to a high of 65 percent among men residing in the Central LHIN.

Exhibit 3.6a Overall pattern of surgical care provided to men in the Prostate Cancer Surgery Cohort [2003/04], by physician specialty, in Ontario

Physician specialty	Physicians performing prostate cancer surgery *number (% physicians)*	All prostate cancer surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*		
				Radical prostatectomy	Non-curative prostate surgery	Total
Urology with urologic oncology sub-specialty	32 (18.0)	1,057 (30.2)	1,014 (30.3)	817 (80.6)	197 (19.4)	1,014
Urology without urologic oncology sub-specialty	146 (82.0)	2,429 (69.5)	2,326 (69.4)	1,621 (69.7)	705 (30.3)	2,326
Other surgical specialties	**	12 (0.3)	12 (0.4)	0 (0.0)	12 (100.0)	12
Ontario	**178**	**3,498**	**3,352**	**2,438 (72.7)**	**914 (27.3)**	**3,352**

** Cell value suppressed and removed from totals for reasons of privacy and confidentiality.

1 Based on one definitive procedure per patient.

Findings

- Eighteen percent of the surgeons who provided surgery for men in the Prostate Cancer Cohort identified themselves as having a urologic oncology sub-specialty.
- Urologic oncologists performed proportionately more of the surgeries for prostate cancer—about 30 percent of all surgeries—than general urologists.
- Patients treated by urologic oncologists were slightly more likely to have a radical prostatectomy (81 percent) compared with those treated by general urologists (70 percent).
- Seventy percent of the prostate surgeries performed on men in this study cohort were done by general urologists.

Exhibit 3.6b Overall pattern of surgical care provided to men in the Prostate Cancer Surgery Cohort [2003/04], by hospital type, in Ontario

Hospital type	Hospitals performing prostate cancer surgery *number (% hospitals)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*		
				Radical prostatectomy	Non-curative prostate surgery	Total
Academic	13 (16.3)	1,010 (27.3)	1,000 (27.8)	829 (82.9)	171 (17.1)	1,000
Community/Small	67 (83.7)	2,686 (72.7)	2,594 (72.2)	1,705 (65.8)	889 (34.2)	2,594
Ontario	**80**	**3,704**	**3,594**	**2,534 (70.5)**	**1,060 (29.5)**	**3,594**

1 Based on one definitive procedure per patient.

Findings

- Most (73 percent) of the prostate cancer surgeries undergone by men in the Prostate Cancer Surgery Cohort were performed in community hospitals in Ontario.
- Men who had their prostate cancer surgery in academic (teaching) hospitals were more likely to have a radical prostatectomy (83 percent) compared with those who were treated in community hospitals (66 percent).

Exhibit 3.7a Health care services received by men in the Prostate Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Prostate Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)* Biopsy	Cystoscopy	Visual internal urethrotomy	Number of patients who received hormone injection(s) (% Cohort)
1. Erie St. Clair	262	196 (0.7)	290 (1.1)	33 (0.1)	104 (39.7)
2. South West	358	321 (0.9)	195 (0.5)	**	57 (15.9)
3. Waterloo Wellington	208	161 (0.8)	219 (1.1)	**	43 (20.7)
4. Hamilton Niagara Haldimand Brant	380	260 (0.7)	351 (0.9)	57 (0.2)	77 (20.3)
5. Central West	224	214 (1.0)	245 (1.1)	20 (0.1)	57 (25.4)
6. Mississauga Halton	249	216 (0.9)	222 (0.9)	46 (0.2)	44 (17.7)
7. Toronto Central	235	207 (0.9)	146 (0.6)	21 (0.1)	45 (19.1)
8. Central	402	368 (0.9)	402 (1.0)	80 (0.2)	74 (18.4)
9. Central East	487	356 (0.7)	384 (0.8)	57 (0.1)	96 (19.7)
10. South East	135	112 (0.8)	59 (0.4)	8 (0.1)	14 (10.4)
11. Champlain	253	245 (1.0)	154 (0.6)	45 (0.2)	54 (21.3)
12. North Simcoe Muskoka	136	116 (0.9)	67 (0.5)	9 (0.1)	32 (23.5)
13. North East	197	132 (0.7)	161 (0.8)	21 (0.1)	43 (21.8)
14. North West	83	61 (0.7)	86 (1.0)	21 (0.3)	14 (16.9)
Ontario	**3,610**	**2,965 (0.8)**	**2,981 (0.8)**	**424 (0.1)**	**754 (20.9)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Prostate Cancer Surgery Cohort.

Findings

- On average, most men in the Prostate Cancer Surgery Cohort (approximately 80 percent) underwent a prostate biopsy within a year of their definitive surgery.
- A similar number of men in this study cohort underwent a cystoscopy (a procedure which involves inserting a lighted instrument called a cystoscope into the urethra to check for abnormalities).
- There was a nearly three-fold variation in cystoscopy rates among men who were living in different Local Health Integration Networks (LHINs) at the time they were diagnosed with prostate cancer. Rates of cystoscopy ranged from an average of 0.4 procedures per patient among men living in the South East LHIN to 1.1 procedures per patient among those living in the Erie St. Clair, Waterloo Wellington and Central West LHINs.
- Approximately 10 percent of men in this study cohort required a visual internal urethrotomy (VIU) within a year of their definitive surgery for prostate cancer. This procedure is normally done to relieve symptoms that can develop after prostate surgery.
- Twenty-one percent of patients in this study cohort received hormonal therapy (given to suppress the production of testosterone) within a year of their definitive surgery for prostate cancer. The proportion of patients receiving hormone injections ranged from 10 percent of men living in the South East LHIN at the time of their diagnosis to 40 percent of those residing in Erie St. Clair LHIN. (This variation should be interpreted with caution as it may reflect differences in physician billing practices rather than a true difference in utilization of services.)

Exhibit 3.7b Radiologic services received by men in the Prostate Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Prostate Cancer Surgery Cohort *Number*	Total number of services provided *(average[1] # services per patient)*					
		Ultrasound-abdomen/pelvis/transrectal	Abdomen-pelvis			Chest	
			CT scan	MRI scan	Bone scan	X-ray	CT scan
1. Erie St. Clair	262	586 (2.2)	101 (0.4)	**	122 (0.5)	367 (1.4)	24 (0.1)
2. South West	358	531 (1.5)	131 (0.4)	**	177 (0.5)	395 (1.1)	22 (0.1)
3. Waterloo Wellington	208	352 (1.7)	61 (0.3)	**	111 (0.5)	159 (0.8)	9 (0.0)
4. Hamilton Niagara Haldimand Brant	380	639 (1.7)	160 (0.4)	**	162 (0.4)	396 (1.0)	23 (0.1)
5. Central West	224	412 (1.8)	124 (0.6)	**	124 (0.6)	257 (1.1)	22 (0.1)
6. Mississauga Halton	249	386 (1.6)	75 (0.3)	**	109 (0.4)	356 (1.4)	23 (0.1)
7. Toronto Central	235	428 (1.8)	91 (0.4)	7 (0.0)	91 (0.4)	305 (1.3)	23 (0.1)
8. Central	402	837 (2.1)	169 (0.4)	8 (0.0)	223 (0.6)	525 (1.3)	33 (0.1)
9. Central East	487	696 (1.4)	158 (0.3)	**	197 (0.4)	536 (1.1)	58 (0.1)
10. South East	135	178 (1.3)	60 (0.4)	**	50 (0.4)	204 (1.5)	21 (0.2)
11. Champlain	253	164 (0.6)	109 (0.4)	9 (0.0)	122 (0.5)	357 (1.4)	15 (0.1)
12. North Simcoe Muskoka	136	217 (1.6)	89 (0.7)	**	95 (0.7)	211 (1.6)	27 (0.2)
13. North East	197	315 (1.6)	68 (0.3)	**	95 (0.5)	219 (1.1)	11 (0.1)
14. North West	83	158 (1.9)	34 (0.4)	0 (0.0)	35 (0.4)	117 (1.4)	17 (0.2)
Ontario	**3,610**	**5,899 (1.6)**	**1,430 (0.4)**	**44 (0.0)**	**1,713 (0.5)**	**4,404 (1.2)**	**328 (0.1)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Prostate Cancer Surgery Cohort.

Findings

- On average, men in the Prostate Cancer Surgery Cohort underwent 1.6 ultrasounds per patient within a year before or after their definitive surgery. There was significant variation in ultrasound rates among men living in different Local Health Integration Networks (LHINs) at the time of their diagnosis. These ranged from 0.6 ultrasounds per patient among men living in the Champlain LHIN to 2.2 ultrasounds per patient among men residing in the Erie St. Clair LHIN.
- On average, four out of 10 patients in this study cohort underwent computed tomography (CT) scans in the two-year period surrounding their definitive surgery. Far fewer underwent magnetic resonance imaging (MRI) scans.
- On average, half of the patients had a bone scan within a year of their definitive surgery for prostate cancer. Bone scan rates varied little across the LHINs of patient residence.

Exhibit 3.7c Consultations and services received by men in the Prostate Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Prostate Cancer Surgery Cohort *Number*	Radiation oncology: % cohort who had a consult	Radiation oncology: Average[2] # consults per patient	Radiation therapy planning[1]: % cohort who received service	Radiation therapy planning[1]: Average[2] # sessions per patient	Brachytherapy: % cohort who received service	Brachytherapy: Average[2] # sessions per patient
1. Erie St. Clair	262	26.7	1.1	11.5	1.1	**	**
2. South West	358	29.6	1.1	9.2	1.2	**	**
3. Waterloo Wellington	208	23.1	1.2	4.8	1.2	0.0	0.0
4. Hamilton Niagara Haldimand Brant	380	23.7	1.1	4.7	1.2	0.0	0.0
5. Central West	224	21.4	1.1	10.3	1.1	0.0	0.0
6. Mississauga Halton	249	28.1	1.2	6.4	1.1	**	**
7. Toronto Central	235	25.1	1.1	6.4	1.2	0.0	0.0
8. Central	402	27.4	1.1	8.2	1.2	**	**
9. Central East	487	18.7	1.1	8.4	1.1	**	**
10. South East	135	44.4	1.2	**	2.6	0.0	0.0
11. Champlain	253	42.3	1.1	7.5	1.2	0.0	0.0
12. North Simcoe Muskoka	136	19.9	1.1	13.2	1.0	0.0	0.0
13. North East	197	26.4	1.1	7.1	1.9	0.0	0.0
14. North West	83	59.0	1.1	15.7	1.0	0.0	0.0
Ontario	**3,610**	**27.4**	**1.1**	**8.0**	**1.2**	**0.3**	**1.4**

LHIN of patient residence	Prostate Cancer Surgery Cohort *Number*	Medical oncology: % cohort who had a consult	Medical oncology: Average[2] # consults per patient	Chemotherapy: % cohort who received service	Chemotherapy: Average[2] # sessions per patient	Urology: % cohort who had a visit[3]	Urology: Average[2] # visits per patient
1. Erie St. Clair	262	**	**	**	**	99.2	7.6
2. South West	358	**	**	**	**	99.2	7.6
3. Waterloo Wellington	208	**	**	**	**	100.0	7.8
4. Hamilton Niagara Haldimand Brant	380	1.8	1.0	1.6	4.7	100.0	10.0
5. Central West	224	8.0	1.3	**	**	100.0	9.6
6. Mississauga Halton	249	4.0	1.2	**	**	100.0	8.8
7. Toronto Central	235	3.0	1.1	**	**	99.6	8.5
8. Central	402	2.2	1.0	**	**	100.0	9.5
9. Central East	487	2.9	1.1	1.2	6.7	99.8	8.7
10. South East	135	**	**	0.0	0.0	74.1	7.4
11. Champlain	253	**	**	**	**	100.0	9.1
12. North Simcoe Muskoka	136	8.8	1.3	**	**	100.0	8.2
13. North East	197	**	**	**	**	94.9	7.9
14. North West	83	**	**	**	**	98.8	9.4
Ontario	**3,610**	**2.8**	**1.2**	**1.1**	**6.7**	**98.6**	**8.8**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Please refer to the Introduction at the beginning of this chapter for a definition of radiation therapy planning.

2 Denominator includes only patients in the Prostate Cancer Surgery Cohort who had at least one consultation, session or visit.

3 Visits include assessments, consultations and counselling.

Findings

- About 27 percent of men in the Prostate Cancer Surgery cohort saw a radiation oncologist during the study period, although fewer than one-third of these went on to have radiation therapy planning. Variations were found in rates of radiation oncology consultation and radiation therapy planning across Local Health Integration Networks (LHINs).
- Medical oncology consultations and use of chemotherapy were quite rare in this study cohort—only about three percent of men saw a medical oncologist; one percent received chemotherapy.

Exhibit 3.8a Health care services received by men in the Prostate Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Prostate Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*			Number of patients who received hormone injection(s) (% Cohort)
		Biopsy	Cystoscopy	Visual internal urethrotomy	
1. Erie St. Clair	248	239 (1.0)	165 (0.7)	**	133 (53.8)
2. South West	342	334 (1.0)	122 (0.4)	0 (0.0)	168 (49.1)
3. Waterloo Wellington	162	136 (0.8)	92 (0.6)	**	59 (36.4)
4. Hamilton Niagara Haldimand Brant	468	399 (0.9)	230 (0.5)	6 (0.0)	244 (52.1)
5. Central West	172	207 (1.2)	78 (0.5)	**	60 (34.9)
6. Mississauga Halton	290	330 (1.1)	94 (0.3)	8 (0.0)	117 (40.3)
7. Toronto Central	353	439 (1.2)	121 (0.3)	9 (0.0)	100 (28.3)
8. Central	427	457 (1.1)	157 (0.4)	7 (0.0)	165 (38.6)
9. Central East	413	336 (0.8)	156 (0.4)	7 (0.0)	156 (37.8)
10. South East	179	168 (0.9)	58 (0.3)	**	56 (31.3)
11. Champlain	497	730 (1.5)	161 (0.3)	**	220 (44.3)
12. North Simcoe Muskoka	144	128 (0.9)	40 (0.3)	**	65 (45.1)
13. North East	244	165 (0.7)	80 (0.3)	7 (0.0)	119 (48.8)
14. North West	80	46 (0.6)	35 (0.4)	0 (0.0)	33 (41.3)
Ontario	**4,025**	**4,114 (1.0)**	**1,589 (0.4)**	**58 (0.0)**	**1,695 (42.1)**

** Cell value suppressed for reasons of privacy and confidentiality.

[1] Denominator includes all patients in the Prostate Cancer/No Surgery Cohort.

Findings

- Most men in the Prostate Cancer/No Surgery Cohort underwent a prostate biopsy within a year of their diagnosis.
- Fewer than half of the men in this study cohort underwent a cystoscopy within a year of their diagnosis.
- Forty-two percent of men with prostate cancer who did not have surgery received hormonal therapy within a year of their diagnosis. The use of hormonal therapy varied across the Local Health Integration Networks (LHINs) of patient residence, ranging from 28 percent of men living in the Toronto Central LHIN at the time of their diagnosis to 54 percent of men living in Erie St. Clair LHIN. (This variation should be interpreted with caution as it may be due to differences in physician billing practices rather than a true difference in utilization of services.)

Exhibit 3.8b Radiologic services received by men in the Prostate Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Prostate Cancer/No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*					
		Ultrasound-abdomen/pelvis/transrectal	Abdomen-pelvis			Chest	
			CT Scan	MRI Scan	Bone Scan	X-ray	CT scan
1. Erie St. Clair	248	606 (2.4)	243 (1.0)	**	217 (0.9)	410 (1.7)	27 (0.1)
2. South West	342	479 (1.4)	263 (0.8)	6 (0.0)	251 (0.7)	366 (1.1)	25 (0.1)
3. Waterloo Wellington	162	244 (1.5)	77 (0.5)	0 (0.0)	114 (0.7)	140 (0.9)	**
4. Hamilton Niagara Haldimand Brant	468	625 (1.3)	202 (0.4)	7 (0.0)	255 (0.5)	480 (1.0)	42 (0.1)
5. Central West	172	333 (1.9)	129 (0.8)	**	114 (0.7)	192 (1.1)	23 (0.1)
6. Mississauga Halton	290	477 (1.6)	150 (0.5)	**	190 (0.7)	376 (1.3)	32 (0.1)
7. Toronto Central	353	794 (2.2)	169 (0.5)	14 (0.0)	198 (0.6)	467 (1.3)	49 (0.1)
8. Central	427	779 (1.8)	237 (0.6)	12 (0.0)	272 (0.6)	525 (1.2)	56 (0.1)
9. Central East	413	648 (1.6)	174 (0.4)	10 (0.0)	238 (0.6)	440 (1.1)	38 (0.1)
10. South East	179	242 (1.4)	69 (0.4)	**	86 (0.5)	165 (0.9)	17 (0.1)
11. Champlain	497	465 (0.9)	213 (0.4)	11 (0.0)	304 (0.6)	585 (1.2)	51 (0.1)
12. North Simcoe Muskoka	144	223 (1.5)	78 (0.5)	**	95 (0.7)	190 (1.3)	26 (0.2)
13. North East	244	354 (1.5)	139 (0.6)	**	171 (0.7)	259 (1.1)	34 (0.1)
14. North West	80	124 (1.6)	45 (0.6)	**	42 (0.5)	84 (1.1)	**
Ontario	**4,025**	**6,393 (1.6)**	**2,188 (0.5)**	**76 (0.0)**	**2,547 (0.6)**	**4,679 (1.2)**	**436 (0.1)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Prostate Cancer Surgery Cohort.

Findings

- Abdominal/pelvic ultrasound was the most common type of radiologic service delivered to men in the Prostate Cancer/No Surgery Cohort during the period from 12 months prior to 12 months after their diagnosis.
- There was significant variation in ultrasound rates among Local Health Integration Networks (LHINs) of patient residence—from less than one ultrasound per patient among men living in the Champlain LHIN at the time of their diagnosis to more than two ultrasounds per patient among men residing in the Erie St. Clair LHIN.
- Other radiologic services delivered to men in this study cohort during that time period included: chest X-rays (1.2 per patient), bone scans (0.6 per patient) and abdominal/pelvic computed tomography (CT) scans (0.5 per patient).

Exhibit 3.8c

Consultations and services received by men in the Prostate Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Prostate Cancer/ No Surgery Cohort *number*	Radiation oncology		Radiation therapy planning[1]		Brachytherapy	
		% cohort who had a consult	Average[2] # consult per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who received service	Average[2] # sessions per patient
1. Erie St. Clair	248	70.6	1.1	35.1	1.0	23.4	1.0
2. South West	342	65.5	1.1	30.4	1.1	4.7	1.1
3. Waterloo Wellington	162	61.1	1.1	5.6	1.1	3.7	1.2
4. Hamilton Niagara Haldimand Brant	468	63.0	1.0	3.4	1.1	5.6	1.1
5. Central West	172	62.8	1.1	15.1	1.2	12.2	1.1
6. Mississauga Halton	290	59.3	1.1	9.3	1.4	13.8	1.0
7. Toronto Central	353	59.8	1.1	8.5	1.2	15.0	1.1
8. Central	427	60.9	1.1	17.1	1.1	9.4	1.2
9. Central East	413	49.9	1.0	17.2	1.1	10.2	1.2
10. South East	179	66.5	1.0	8.4	1.1	5.6	1.1
11. Champlain	497	74.6	1.1	4.6	2.0	10.3	1.0
12. North Simcoe Muskoka	144	41.7	1.0	11.8	1.1	8.3	1.3
13. North East	244	63.1	1.1	9.8	1.3	4.9	1.1
14. North West	80	80.0	1.2	53.8	1.1	2.5	1.0
Ontario	**4,025**	**62.6**	**1.1**	**14.0**	**1.2**	**9.7**	**1.1**

LHIN of patient residence	Prostate Cancer/ No Surgery Cohort *number*	Medical oncology		Chemotherapy		Urology	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit[3]	Average[2] # visits per patient
1. Erie St. Clair	248	3.6	1.1	1.6	20.0	98.0	6.4
2. South West	342	3.5	1.0	2.0	5.9	95.0	4.8
3. Waterloo Wellington	162	4.9	1.0	1.2	5.0	95.7	5.2
4. Hamilton Niagara Haldimand Brant	468	2.4	1.1	1.9	7.9	97.6	5.7
5. Central West	172	8.1	1.6	5.2	8.1	94.8	6.1
6. Mississauga Halton	290	5.9	1.3	2.8	3.5	96.6	5.2
7. Toronto Central	353	4.2	1.3	1.4	1.8	94.9	5.1
8. Central	427	4.7	1.1	1.9	6.5	96.5	5.6
9. Central East	413	4.4	1.3	0.7	11.0	97.6	5.6
10. South East	179	2.2	1.0	6.1	2.9	66.5	6.1
11. Champlain	497	2.8	1.0	1.8	4.9	94.8	4.5
12. North Simcoe Muskoka	144	6.3	1.6	4.2	4.7	96.5	5.3
13. North East	244	2.9	1.1	1.2	5.3	89.3	5.0
14. North West	80	6.3	1.0	7.5	7.3	76.3	6.0
Ontario	**4,025**	**4.0**	**1.2**	**2.2**	**6.2**	**94.0**	**5.4**

1 Please refer to the Introduction at the beginning of this chapter for a definition of radiation therapy planning.

2 Denominator includes only patients in the Prostate Cancer/No Surgery Cohort who had at least one consultation, session or visit.

3 Visits include assessments, consultations and counselling.

Findings

- Rates of consultation for radiation oncology were much higher among men in the "no surgery" cohort (63 percent) compared to those in the surgery cohort (27 percent). This proportion varied across Local Health Integration Networks (LHINs)—from 42 percent among men living in the North Simcoe Muskoka LHIN to 80 percent of men in the North West LHIN.
- Nearly 10 percent of men in this study cohort received brachytherapy. Rates of brachytherapy varied widely, from 2.5 percent of men residing in the North West LHIN to approximately 23 percent living in the Erie St. Clair LHIN.

Discussion and Conclusions

Prostate cancer is the most common cancer affecting Canadian men. In 2003/04, a total of 7,635 men living in Ontario were diagnosed with this disease. Just under half of those men (47.3 percent) underwent surgery for prostate cancer within a year of diagnosis. Those who did not have surgery were still heavy users of health care resources.

Our findings suggest a relationship between socioeconomic status (SES), as measured by neighbourhood income quintile, and prostate cancer incidence. There was also a link between men's SES and their likelihood of having a radical prostatectomy. Men in the Overall Prostate Cancer Cohort who lived in the poorest neighbourhoods in Ontario were the least likely to be diagnosed with prostate cancer; they were also the least likely to undergo curative surgery (radical prostatectomy) once they were diagnosed.

One possible explanation for this association is that patients living in Ontario are required to pay for prostate specific antigen (PSA) testing done outside hospitals. Therefore, it is likely that men living in wealthier neighbourhoods (i.e., those who could best afford to pay for testing) were more likely to be screened. This might have led to more diagnoses of prostate cancer. However, it is impossible to provide a definitive explanation of the apparent link between radical prostatectomy and SES without more information, especially regarding the stage of men's cancers at the time of diagnosis.

Virtually all men with prostate cancer in Ontario are treated by urologists. Patients in our study who were treated by urologic oncologists were slightly more likely to have a radical prostatectomy compared to those who were treated by general urologists.

We believe this differential use of radical prostatectomy is largely related to variations in referral patterns (i.e., which patients tend to be treated by general urologists vs. those who are usually seen by urologic oncologists). For example, in some patients (including those in our study cohorts) prostate cancer is discovered incidentally after a transurethral resection of the prostate (TURP) done to relieve symptoms caused by benign prostate enlargement. TURPs are usually done by a general urologist rather than by a urologic oncologist.

Many patients in whom an "incidental" prostate cancer is discovered during a TURP do not go on to have a radical prostatectomy. Because some patients with an established diagnosis of prostate cancer are specifically referred to urologic oncologists, our finding that patients treated by urologic oncologists were more likely to have had a radical prostatectomy than those treated by general urologists should not be surprising. Although our data are not definitive, we do not believe that urologic oncologists and general oncologists would differ in their use of potentially curative surgery in patients with an established diagnosis of prostate cancer.

We also noted that 21 percent of patients in the Prostate Cancer Surgery Cohort received hormonal therapy within a year of their definitive surgery. This number may be an underestimate; some hormonal injections might not have been included in our data sources because of variations in physician billing practices. Nor could we determine how many men received hormonal therapy orally rather than by injection.

Implications for clinical practice

Very few patients in the Overall Prostate Cancer Cohort received chemotherapy within a year of being diagnosed with prostate cancer. This is likely because the majority of newly-diagnosed men had localized disease and thus did not require systemic therapy. Even men with metastatic disease at diagnosis usually receive hormonal therapy first; they would receive chemotherapy only if hormonal therapy was ineffective.

More interestingly, only 27 percent of men in our study cohort who underwent prostate surgery saw a radiation oncologist in the two-year period surrounding their definitive surgery. More than double that number of men—63 percent—who did not undergo surgery saw a radiation oncologist during that time period.

While surgery may be the optimal therapy for many men with prostate cancer, external beam radiotherapy and brachytherapy are viable treatment options.[3,4] More research is needed to investigate the reasons for the low rate of referral to radiation oncologists we observed, and also for the wide variation in consultations with radiation oncologists among men living in different Local Health Integration Networks (LHINs) across Ontario. Could this be explained by local practice patterns or by differences in access to radiation oncology? Or might some other factors have been involved?

Although many men in the Overall Prostate Cancer Cohort had surgery for their disease, more than half did not. This could be attributable to the use of primary radiotherapy (external beam radiotherapy and brachytherapy) for localized disease, and also to the non-operative management of patients who present with metastatic prostate cancer. Also, given the indolent (slow-growing) nature of prostate cancers, a "watchful waiting" approach is currently used for many men with prostate cancer.

A newer, more intensive monitoring strategy known as "active surveillance" is growing in popularity.[5] Active surveillance is also resource-intensive, requiring frequent visits to doctors, quarterly PSA testing and repeat prostate biopsies.

The indications for staging investigations such as computed tomography (CT) scans and bone scanning among men diagnosed with prostate cancer vary, although in general men with low-risk cancers do not require them.[6] While some men in our cohorts underwent such investigations, many did not. These tests are also resource-intensive, and further research might allow us to better define the subgroups of men most likely to benefit most from these tests.

Implications for policy and planning

While we noted some regional variability, prostate cancer diagnosis and access to prostate cancer surgery was fairly consistent across the province during the study period.

The vast majority of patients in our study cohorts received their prostate cancer treatment within their "home" Local Health Integration Network (LHIN)—that is, where they were living at the time of diagnosis. Urologists appeared to serve as the gatekeepers for the management of prostate cancer patients, even for patients who did not undergo surgery. Those in the non-surgery cohort saw a urologist an average of 5 times in the two years surrounding their diagnosis. This finding is not surprising; prostate cancer and its treatment can have many unwanted effects on voiding (urination) and sexual function that urologists are well-positioned to manage.

This analysis provides a snapshot of prostate cancer care in Ontario during a single year. Thus, we were unable to track changes in cancer diagnosis and treatment which are continually evolving over time. Rates of PSA screening continue to rise, and as they do, more men will be diagnosed with prostate cancer.[7]

The treatment of prostate cancer will almost certainly require additional health care resources, including a sufficient supply of urologic surgeons, since urologists are the principal providers of prostate cancer treatment. Although brachytherapy was used to treat a minority of patients with prostate cancer in our cohorts (approximately 10 percent), its use may increase over time. Sufficient radiotherapy resources for brachytherapy programs will be necessary if this modality becomes a more common therapeutic option.

If the use of active surveillance becomes more common, this will place additional pressure on services provided by Ontario's urologists. Alternative delivery models, such as training clinical nurse specialists to provide active surveillance services, may help reduce the demand on urologists to monitor patients with prostate cancer who do not have early surgery.

With respect to the surgical management of prostate cancer, the increasing role of laparoscopic and robotic-assisted laparoscopic radical prostatectomy has not been assessed. In 2007, robotic-assisted laparoscopic radical prostatectomy was the most commonly performed surgical procedure for localized prostate cancer in the United States. The 2008 National Comprehensive Cancer Network clinical practice guideline for prostate cancer care includes both laparoscopic radical prostatectomy and robotic-assisted laparoscopic radical prostatectomy as options for the treatment of localized prostate cancer.[6]

Emerging technologies, such as high-intensity focused ultrasound (HIFU) and cryotherapy for the management of localized prostate cancer, were not included in this study. The introduction of such novel diagnostic and surgical procedures impacts on health care resources. They are associated with greater cost and a professional learning curve that will likely result in increased wait times for patients,[8] as well as some degree of increased surgical risk.

Finally, we must point out that our research was limited by the lack of detailed information on cancer stage and on the medical status of individual patients in our cohorts. Patients' comorbid medical conditions have a large effect on treatment decisions in prostate cancer, since prostate cancer is often slowly progressive in its course. Patterns of care are best appraised with this information.

Future research

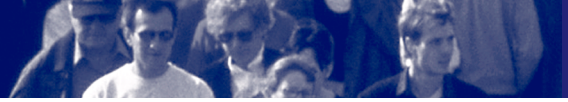
Additional research and other actions are needed to improve the completeness and quality of data on cancer patients contained in the Ontario Cancer Registry (OCR). Cancer stage and comorbidity information would allow for more thorough analysis and more productive inference regarding the quality of care and homogeneity of services across Ontario's Local Health Integration Networks.

More research is also needed to examine the burden that prostate cancer will place on the health care system, given both the growth in Ontario's population and the aging of its citizens. As more and more men enter their 60s, 70s and beyond, both the incidence and prevalence of prostate cancer is expected to increase. This, in turn, will increase the need for surgical, radiation and medical oncology services.

Finally, as high-intensity focused ultrasound and cryotherapy emerge as possible treatments for localized prostate cancer, more research will be needed to determine the optimal role for these modalities in disease management.

References

1. Canadian Cancer Society/National Cancer Institute of Canada. *Canadian Cancer Statistics 2007.* Toronto: CCS/NCIC; 2007.
2. McDavid K, Lee J, Fulton JP, Tonita J, Thompson TD. Prostate cancer incidence and mortality rates and trends in the United States and Canada. *Public Health Rep* 2004; 119(2):174–186.
3. Bolla M, Collette L, Blank L, Warde P, Dubois JB, Mirimanoff RO, et al. Long-term results with immediate androgen suppression and external irradiation in patients with locally advanced prostate cancer (an EORTC study): a phase III randomised trial. *Lancet* 2002; 360(9327):103–6.
4. Grimm PD, Blasko JC, Sylvester JE, Meier RM, Cavanagh W. 10-year biochemical (prostate-specific antigen) control of prostate cancer with 125I brachytherapy. *Int J Radiat Oncol Biol Phys* 2001; 51(1):31–40.
5. Dall'Era MA, Cooperberg MR, Chan JM, Davies BJ, Albertsen PC, Klotz LH, et al. Active surveillance for early-stage prostate cancer: review of the current literature. *Cancer* 2008; 112(12):2664–70.
6. National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology™, v. 1.2008. Prostate cancer. Accessed on November 13, 2007 at http://www.nccn.org/.
7. Farwell WR, Linder JA, Jha AK. Trends in prostate-specific antigen testing from 1995 through 2004. *Arch Intern Med* 2007; 167(22):2497–502.
8. Hamilton RJ, Finelli A. The impact of introducing laparoscopic radical prostatectomy on surgical wait times for prostate cancer. *Can J Urol* 2006; 13(Suppl 3):25–9.



INSIDE

4

Chapter

Surgery for Colorectal Cancer

Rahima Nenshi, MD, Nancy Baxter, MD, PhD, FRCSC, Erin Kennedy, MD, PhD, FRCSC, Susan E. Schultz, MA, MSc, Nadia Gunraj, BSc, MPH, Andrew S. Wilton, MSc, David R. Urbach, MD, MSc, FRCSC, FACS and Marko Simunovic, MD, MPH, FRCSC

Executive Summary

Issue

Colorectal cancer is the second leading cause of death due to cancer in Canada among men and women combined.

Study

In this chapter we will present patterns of surgical care and related health services provided to Ontario men and women newly-diagnosed with colorectal cancers in 2003/04. Where possible, we assess the influence of patient and provider factors on the services delivered.

Key Findings

- The majority (87 percent) of Ontario men (n=2,353) and women (n=2,250) newly-diagnosed with colon cancer in 2003/04 underwent surgery for their disease within a year of diagnosis.
- A slightly smaller majority (78 percent) of Ontario men (n=766) and women (n=511) newly-diagnosed with rectal cancer in the same period of time underwent surgery within a year of diagnosis.
- We observed important differences in the types of surgery provided and in the use of radiation therapy for patients with rectal cancer according to the Local Health Integration Network (LHIN) of patient residence (i.e., where they lived at the time of diagnosis).
- More than 80 percent of admissions to hospital for colon or rectal cancer surgery occurred in hospitals located in the LHIN of patient residence. The majority of these surgeries (70 percent) were performed in community hospitals.
- Approximately 70 percent of all colon and rectal cancer surgery was performed by general surgeons with no self-identified sub-specialty.

Implications

- **Further research is needed to understand variations in surgical care for colorectal cancers in Ontario.**
- **Quality improvement efforts must engage all surgeons who provide colorectal cancer surgery in both academic (teaching) and community hospital settings.**

Introduction

Colorectal cancer is the term used to describe cancers which develop in the colon or rectum. These cancers are the second leading cause of cancer deaths in Canada.[1] The most recently published estimates predicted that in 2007, just over 20,800 Canadians would be newly-diagnosed with colorectal cancer, and 8,700 Canadians (4,700 men and 4,000 women) would die of the disease.

Anatomically, the colon and rectum form the large bowel. The colon is defined as the first three-quarters of the large bowel; the remaining quarter is referred to as the rectum.

Patients with colorectal cancer may present with a variety of symptoms, such as a change in bowel habits, evidence of bright red blood with the passage of stool or unexplained abdominal discomfort.[2] More general symptoms include unexplained weight loss, fatigue and/or loss of appetite. Patients with or without symptoms may be diagnosed following a routine blood test which shows evidence of blood loss. Similarly, a screening test for colorectal cancer called fecal occult blood testing (FOBT) may show evidence of bleeding related to a tumour in the colon or rectum.

A definitive diagnosis of colorectal cancer usually involves lower gastrointestinal (GI) endoscopy—inspection of the intestinal tract using a flexible telescope which is passed into the bowel through the anus. This allows for the visualization and, if necessary, for the biopsy (sampling or removal) of a suspicious lesion. The two main types of endoscopy used to diagnose or rule out suspected colorectal cancer are flexible sigmoidoscopy and colonoscopy.

Once patients are diagnosed, they should undergo appropriate tests to assess the extent—either local or distant—of their disease (a process called "staging"). Surgery is the primary treatment for colorectal cancer; currently, it is the only modality which has the potential for curing colorectal cancer. If a cure is not possible, palliative surgery may be required to ease symptoms such as pain, bleeding, bowel blockage and bowel perforation.

Other modalities of care such as radiation or chemotherapy are often used to complement the surgical treatment of patients with colorectal cancer. (The variety of diagnostic tests and treatments utilized by people with colorectal cancer highlights the considerable resources and expertise—both surgical and non-surgical—which are required to optimize chances for cure or palliation.)

The goal of surgical therapy with curative intent is to achieve complete removal of the primary cancer with tumour-free margins; to remove all lymph nodes in the anatomic drainage basin of the involved bowel segment; and, if necessary, to remove adjacent organs affected by the primary tumour.

Diagnostic tests, surgical procedures, and the use of adjuvant therapies for tumours of the colon often differ from those used for rectal tumours.[3] For example, resection of a rectal cancer often results in a permanent stoma and the use of radiation therapy delivered before (pre-operative) or after (post-operative) surgery.

Tumours in the colon rarely require a permanent stoma or radiation therapy. For this reason, we present our findings based on the site of origin—colon or rectum—separately.

For the purposes of this chapter, surgical procedures for colorectal cancer have been divided into four categories:

Resection with permanent stoma

This involves removing at least the rectum and anus and providing the patient with a permanent colon or small bowel stoma (i.e., a portion of bowel is brought out to the skin surface to allow the passage of stool into a disposable stoma bag). A permanent stoma of the large bowel is also called a "permanent colostomy."

Resection with potentially reversible stoma

This involves removing a segment of colon or rectum and providing the patient with a colon or small bowel stoma. Some of the downstream bowel (including the anus) is left in place. This allows for the possibility to surgically reattach the severed ends of bowel at a later date. This type of stoma is also called a "temporary colostomy" or "temporary ileostomy."

Notes:

- If a patient had more than one type of procedure, the most extensive procedure is identified in this Atlas as the "definitive" surgery.
- All patients who receive radiation therapy as part of cancer treatment first undergo radiation therapy planning. This involves positioning the person's body, marking the skin and taking imaging scans to determine the best way to deliver the radiation dose. Because complete data on which patients in our study cohorts actually received radiation therapy were not available, we have used radiation therapy planning as a surrogate measure for radiation therapy treatment.

Resection without stoma

This involves removing a segment of the large bowel and immediately reattaching the severed ends of the bowel.

Bypass, stoma, local excision or other abdominal procedure

Such procedures are provided to palliate symptoms when it is deemed that the main tumour cannot be safely removed. A bypass is a procedure to connect two segments of bowel internally to avoid a downstream blockage. A stoma may also be used for the same purpose. These procedures may also be indicated when the risks of surgery to remove the tumour outweigh the benefits—for example, if the cancer has spread widely or if the patient has other significant health problems (comorbidities). Some patients may choose to undergo a limited local excision (removal) of a rectal cancer instead of a major resection. This choice allows the patient to avoid a permanent stoma, although it means a greater risk of tumour recurrence.

How the study cohorts were defined

This chapter provides detailed information about surgical services and related health services delivered to men and women newly-diagnosed with colorectal cancer in Ontario in 2003/04.

The study population for this chapter included all Ontario men and women 20 years of age or older identified with colon or rectal cancer in the Ontario Cancer Registry (OCR) whose diagnosis date fell between April 1, 2003 and March 31, 2004. These are referred to as the **Overall Colon Cancer Cohort** or the **Overall Rectal Cancer Cohort,** respectively.

The Overall Colon Cancer Cohort and the Overall Rectal Cancer Cohort were each then subdivided into two smaller groups.

- The **Colon Cancer Surgery Cohort** included all Ontario men and women 20 years of age or older identified with colon cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had colon cancer surgery within 12 months before or after their diagnosis date. The **Rectal Cancer Surgery Cohort** included all Ontario men and women age 20 years or older identified with rectal cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had rectal cancer surgery within 12 months before or after their diagnosis date.
- The **Colon Cancer/No Surgery Cohort** included all Ontario men and women 20 years of age or older identified with colon cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have colon cancer surgery within 12 months before or after their diagnosis date. The **Rectal Cancer/No Surgery Cohort** included all Ontario men and women age 20 years or older identified with rectal cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have rectal cancer surgery within 12 months before or after their diagnosis date.

Chapter 4—List of Exhibits

Exhibit 4.1a-colon Incidence of colon cancer among Ontario men and women 20 years of age or older in 2003/04, and use of surgery in the Overall Colon Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Exhibit 4.1a-rectal Incidence of rectal cancer among Ontario men and women 20 years of age or older in 2003/04, and use of surgery in the Overall Rectal Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Exhibit 4.1b-colon Incidence of colon cancer among Ontario men 20 years of age or older in 2003/04, and use of surgery in the Overall Colon Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Exhibit 4.1b-rectal Incidence of rectal cancer among Ontario men 20 years of age or older in 2003/04, and use of surgery in the Overall Rectal Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Exhibit 4.1c-colon Incidence of colon cancer among Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Colon Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Exhibit 4.1c-rectal Incidence of rectal cancer among Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Rectal Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Exhibit 4.2-colon Age- and sex-standardized colon cancer incidence per 100,000 population, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04

Exhibit 4.2-rectal Age- and sex-standardized rectal cancer incidence per 100,000 population, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04

Exhibit 4.3-colon Health care utilization among men and women in the Colon Cancer Surgery Cohort [2003/04], by sex, age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.3-rectal Health care utilization among men and women in the Rectal Cancer Surgery Cohort [2003/04], by sex, age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.4-colon Hospital admissions for colon cancer surgery among men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

Exhibit 4.4-rectal Hospital admissions for rectal cancer surgery among men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

Exhibit 4.5a-colon Type of definitive surgical procedure among men and women in the Colon Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.5a-rectal Type of definitive surgical procedure among men and women in the Rectal Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.5b-colon Proportion of men and women in the Colon Cancer Surgery Cohort whose definitive surgery was a resection without stoma, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.5b-rectal Proportion of men and women in the Rectal Cancer Surgery Cohort whose definitive surgery was a resection without stoma, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.6a-colon and rectal Overall pattern of surgical care provided to men and women in the Colon and Rectal Cancer Surgery Cohorts [2003/04], by physician specialty, in Ontario

Exhibit 4.6b-colon and rectal Overall pattern of surgical care provided to men and women in the Colon and Rectal Cancer Surgery Cohorts [2003/04], by hospital type, in Ontario

Exhibit 4.7a-colon Diagnostic services received by men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.7a-rectal Diagnostic services received by men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.7b-colon Health services received by men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.7b-rectal Health services received by men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.7c-colon Consultations and services received by men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.7c-rectal Consultations and services received by men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.8a-colon Diagnostic services received by men and women in the Colon Cancer/No Surgery Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.8a-rectal Diagnostic services received by men and women in the Rectal Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.8b-colon Health services received by men and women in the Colon Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.8b-rectal Health services received by men and women in the Rectal Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.8c-colon Consultations and services received by men and women in the Colon Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibit 4.8c-rectal Consultations and services received by men and women in the Rectal Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Exhibits and Findings

Exhibit 4.1a
Colon cancer

Incidence of colon cancer among Ontario men and women 20 years of age or older in 2003/04, and use of surgery in the Overall Colon Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Colon Cancer Cohort					
		Total		Had surgery		Did not have surgery	
		number of cases (% Ontario)		*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**54.6**	**5,265**	**(100.0)**	**4,603**	**87.4**	**662**	**12.6**
Sex[2]							
Men	56.4	**2,680**	(50.9)	2,353	**87.3**	327	**12.7**
Women	52.9	**2,585**	(49.1)	2,250	**87.4**	335	**12.6**
Age group (years)[2]							
20–54	10.0	**623**	(11.8)	550	**88.3**	73	**11.7**
55–64	89.7	**975**	(18.5)	880	**90.1**	95	**9.9**
65–69	167.5	**727**	(13.8)	661	**91.0**	66	**9.0**
70–74	231.1	**896**	(17.0)	800	**89.3**	96	**10.7**
75+	315.6	**2,044**	(38.8)	1,712	**83.7**	332	**16.3**
Neighbourhood income quintile							
Q1 (Lowest)	53.5	**981**	(19.3)	867	**88.5**	114	**11.5**
Q2	55.3	**1,068**	(21.0)	928	**87.0**	140	**13.0**
Q3	58.2	**1,054**	(20.7)	924	**87.8**	130	**12.2**
Q4	56.6	**969**	(19.1)	838	**86.3**	131	**13.7**
Q5 (Highest)	55.4	**1,008**	(19.8)	892	**88.4**	116	**11.6**
Community size (population)							
≥ 1,250,000	53.5	**1,865**	(35.4)	1,639	**87.8**	226	**12.2**
100,000–1,249,999	54.4	**1,918**	(36.4)	1,676	**87.4**	242	**12.6**
< 100,000	60.5	**1,480**	(28.1)	1,288	**87.1**	192	**12.9**
LHIN							
1. Erie St. Clair	60.2	**326**	(6.2)	284	**87.2**	42	**12.8**
2. South West	54.1	**445**	(8.5)	382	**86.3**	63	**13.7**
3. Waterloo Wellington	49.0	**241**	(4.6)	208	**86.3**	33	**13.7**
4. Hamilton Niagara Haldimand Brant	53.1	**643**	(12.2)	571	**88.8**	72	**11.2**
5. Central West	48.1	**194**	(3.7)	179	**90.9**	15	**9.1**
6. Mississauga Halton	59.7	**361**	(6.9)	319	**88.1**	42	**11.9**
7. Toronto Central	47.6	**455**	(8.6)	385	**84.9**	70	**15.1**
8. Central	59.0	**601**	(11.4)	528	**87.9**	73	**12.1**
9. Central East	52.8	**602**	(11.4)	536	**89.1**	66	**10.9**
10. South East	56.3	**260**	(4.9)	221	**85.4**	39	**14.6**
11. Champlain	52.7	**476**	(9.0)	412	**86.5**	64	**13.5**
12. North Simcoe Muskoka	54.5	**191**	(3.6)	164	**86.7**	27	**13.3**
13. North East	66.1	**353**	(6.7)	318	**90.0**	35	**10.0**
14. North West	55.7	**114**	(2.2)	96	**85.9**	18	**14.1**

1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Colon Cancer Cohort.

2 Sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Exhibit 4.1a (cont'd)

Colon cancer

Incidence of colon cancer among Ontario men and women 20 years of age or older in 2003/04, and use of surgery in the Overall Colon Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Findings

- The age-standardized incidence of colon cancer among Ontario men and women aged 20 years or older in 2003/04 was very similar: 56 cases per 100,000 for men and 53 cases per 100,000 for women.
- Colon cancer incidence was strongly related to age. More than half of patients newly-diagnosed with colon cancer were 70 years old or older. Incidence rose steeply with increasing age, from 90 cases per 100,000 in those aged 55 to 64 years to more than 300 cases per 100,000 in those aged 75 or older.
- There was no association between colon cancer incidence and neighbourhood income, but incidence did tend to increase with decreasing community size (i.e., incidence was highest in communities with populations of less than 100,000).
- The majority of men and women with colon cancer (87 percent) had surgery for their disease within 12 months before or after their date of diagnosis.
- Individuals 75 years of age or older at the time of diagnosis were less likely to undergo surgery for colon cancer compared to younger patients with the disease.
- The proportion of patients in the Overall Colon Cancer Cohort who underwent surgery varied little according to neighbourhood income, community size or the Local Health Integration Network (LHIN) of patient residence.

Exhibit 4.1a
Rectal cancer

Incidence of rectal cancer among Ontario men and women 20 years of age or older in 2003/04, and use of surgery in the Overall Rectal Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Rectal Cancer Cohort					
		Total		Had surgery		Did not have surgery	
		number of cases (% Ontario)		*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**17.0**	**1,642**	**(100.0)**	**1,277**	**77.8**	**365**	**22.2**
Sex[2]							
Men	20.5	970	(59.1)	766	78.5	204	21.5
Women	13.7	672	(40.9)	511	76.6	161	23.4
Age group (years)[2]							
20–54	4.8	301	(18.3)	234	77.9	67	22.1
55–64	34.8	379	(23.1)	309	81.5	70	18.5
65–69	53.2	230	(14.0)	193	84.2	37	15.8
70–74	61.2	235	(14.3)	185	78.3	50	21.7
75+	79.6	497	(30.3)	356	71.4	141	28.6
Neighbourhood income quintile							
Q1 (Lowest)	17.6	316	(20.0)	252	79.9	64	20.1
Q2	18.8	355	(22.4)	266	75.1	89	24.9
Q3	16.7	303	(19.2)	243	80.2	60	19.8
Q4	18.1	318	(20.1)	244	76.9	74	23.1
Q5 (Highest)	15.4	290	(18.3)	229	78.8	61	21.2
Community size (population)							
≥ 1,250,000	14.8	526	(32.0)	394	74.7	132	25.3
100,000–1,249,999	17.5	615	(37.5)	488	79.5	127	20.5
< 100,000	20.8	501	(30.5)	395	78.6	106	21.4
LHIN							
1. Erie St. Clair	15.9	85	(5.2)	67	78.1	18	21.9
2. South West	22.0	175	(10.7)	146	83.7	29	16.3
3. Waterloo Wellington	20.1	98	(6.0)	80	81.9	18	18.1
4. Hamilton Niagara Haldimand Brant	17.9	216	(13.2)	171	80.1	45	19.9
5. Central West	11.6	48	(2.9)	41	84.2	7	15.8
6. Mississauga Halton	14.9	97	(5.9)	75	79.2	22	20.8
7. Toronto Central	13.8	131	(8.0)	83	65.1	48	34.9
8. Central	16.7	175	(10.7)	131	71.6	44	28.4
9. Central East	15.6	178	(10.8)	147	80.1	31	19.9
10. South East	20.8	93	(5.7)	68	74.6	25	25.4
11. Champlain	15.8	145	(8.8)	116	80.6	29	19.4
12. North Simcoe Muskoka	16.9	58	(3.5)	42	69.0	16	31.0
13. North East	19.0	101	(6.2)	81	79.7	20	20.3
14. North West	20.1	41	(2.5)	29	73.5	12	26.5

[1] Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Rectal Cancer Cohort.

[2] Sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Exhibit 4.1a (cont'd)

Rectal cancer

Incidence of rectal cancer among Ontario men and women 20 years of age or older in 2003/04, and use of surgery in the Overall Rectal Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Findings

- In 2003/04, the rectal cancer incidence rate for men (20 cases per 100,000) was about 50 percent higher than for women (14 cases per 100,000).
- Rectal cancer incidence increased with increasing age, although the gradient was much shallower than it was for colon cancer. The rate for those aged 55 to 64 years was 35 cases per 100,000; in those age 75 years or older, it rose to 80 cases per 100,000.
- Rectal cancer incidence was also 40 percent higher among Ontarians living in the smallest communities (< 100,000 population) at the time of diagnosis compared with those who resided in large urban centres. The incidence of rectal cancer was 21 cases per 100,000 in smaller communities vs. 15 cases per 100,000 in larger centres.
- Seventy-eight percent of patients with rectal cancer had surgery for their disease within 12 months before or after their date of diagnosis; 22 percent did not have surgery. Individuals 75 years of age or older with rectal cancer were less likely than those in all other age groups to have surgery for their disease.
- There was no clear association between the likelihood of having surgery and either neighbourhood income quintile or community size among patients in the Overall Rectal Cancer Cohort.

Exhibit 4.1b
Colon cancer

Incidence of colon cancer among Ontario men 20 years of age or older in 2003/04, and use of surgery in the Overall Colon Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Colon Cancer Cohort - Men					
		Total		Had surgery		Did not have surgery	
		number of cases (% Ontario)		*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**56.4**	**2,680**	**(100.0)**	**2,353**	**87.8**	**327**	**12.2**
Age group (years)[2]							
20–54	10.0	**310**	(11.6)	275	**88.7**	35	**11.3**
55–64	106.5	**569**	(21.2)	520	**91.4**	49	**8.6**
65–69	196.4	**411**	(15.3)	371	**90.3**	40	**9.7**
70–74	284.6	**517**	(19.3)	461	**89.2**	56	**10.8**
75+	346.6	**873**	(32.6)	726	**83.2**	147	**16.8**
Neighbourhood income quintile							
Q1 (Lowest)	56.1	**469**	(18.3)	422	**90.0**	47	**10.0**
Q2	57.0	**529**	(20.6)	458	**86.8**	71	**13.2**
Q3	58.4	**527**	(20.5)	460	**87.6**	67	**12.4**
Q4	59.0	**516**	(20.1)	441	**85.2**	75	**14.8**
Q5 (Highest)	55.7	**526**	(20.5)	473	**89.8**	53	**10.2**
Community size (population)							
≥ 1,250,000	55.4	**946**	(35.3)	840	**88.7**	106	**11.3**
100,000–1,249,999	57.8	**985**	(36.8)	866	**87.9**	119	**12.1**
< 100,000	61.4	**748**	(27.9)	647	**86.6**	101	**13.4**
LHIN							
1. Erie St. Clair	63.9	**170**	(6.3)	144	**84.8**	26	**15.2**
2. South West	55.1	**218**	(8.1)	186	**85.6**	32	**14.4**
3. Waterloo Wellington	46.6	**111**	(4.1)	104	**93.9**	7	**6.1**
4. Hamilton Niagara Haldimand Brant	58.7	**349**	(13.0)	312	**89.7**	37	**10.3**
5. Central West	49.2	**102**	(3.8)	95	**90.1**	7	**9.9**
6. Mississauga Halton	64.3	**194**	(7.2)	174	**89.6**	20	**10.4**
7. Toronto Central`	45.8	**213**	(8.0)	186	**87.5**	27	**12.5**
8. Central	61.9	**313**	(11.7)	274	**87.5**	39	**12.5**
9. Central East	51.2	**287**	(10.7)	260	**90.7**	27	**9.3**
10. South East	52.2	**120**	(4.5)	102	**84.8**	18	**15.2**
11. Champlain	56.1	**246**	(9.2)	213	**86.4**	33	**13.6**
12. North Simcoe Muskoka	56.8	**99**	(3.7)	80	**82.2**	19	**17.8**
13. North East	72.2	**196**	(7.3)	172	**87.1**	24	**12.9**
14. North West	58.7	**60**	(2.2)	51	**87.1**	9	**12.9**

[1] Incidence rates have been standardized to the Canadian population on July 1, 1991.
Subgroup proportions (% Total) have been standardized to the Overall Colon Cancer Cohort.

[2] Age-specific rates have have not been standardized.

Findings

- Colon cancer incidence among men showed a similar pattern to the incidence in overall population. The incidence increased sharply with advancing age and decreased somewhat with increasing community size.
- About 90 percent of men under age 75 years and 83 percent of those aged 75 or older who were diagnosed with colon cancer in 2003/04 were treated surgically.
- Men residing in large urban centres (population ≥ 1.25 million) were the least likely to be diagnosed with colon cancer and the most likely to have surgery once they were diagnosed with the disease.
- Across Local Health Integration Networks (LHINs), the highest incidence of colon cancer in Ontario men (72 cases per 100,000) was found among those who lived in the North East LHIN.

Exhibit 4.1b
Rectal cancer

Incidence of rectal cancer among Ontario men 20 years of age or older in 2003/04, and use of surgery in the Overall Rectal Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Rectal Cancer Cohort - Men				
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**20.5**	**970 (100.0)**	**766**	**79.0**	**204**	**21.0**
Age group (years)[2]						
20–54	5.5	171 (17.6)	139	81.3	32	18.7
55–64	42.5	227 (23.4)	188	82.8	39	17.2
65–69	76.5	160 (16.5)	133	83.1	27	16.9
70–74	87.0	158 (16.3)	127	80.4	31	19.6
75+	100.9	254 (26.2)	179	70.5	75	29.5
Neighbourhood income quintile						
Q1 (Lowest)	21.3	177 (19.1)	140	78.8	37	21.2
Q2	22.4	206 (22.3)	162	79.3	44	20.7
Q3	21.9	196 (21.2)	157	79.8	39	20.2
Q4	21.0	185 (20.0)	147	79.4	38	20.6
Q5 (Highest)	16.7	161 (17.4)	128	79.7	33	20.3
Community size (population)						
≥ 1,250,000	18.5	320 (33.0)	240	74.8	80	25.2
100,000–1,249,999	21.6	365 (37.6)	299	82.0	66	18.0
< 100,000	23.7	285 (29.4)	227	79.7	58	20.3
LHIN						
1. Erie St. Clair	19.0	49 (5.1)	38	74.0	11	26.0
2. South West	27.4	106 (10.9)	89	84.1	17	15.9
3. Waterloo Wellington	24.5	59 (6.1)	49	82.9	10	17.1
4. Hamilton Niagara Haldimand Brant	22.6	132 (13.6)	105	79.4	27	20.6
5. Central West	16.1	**	**	82.1	**	**
6. Mississauga Halton	18.3	58 (6.0)	49	83.3	9	16.7
7. Toronto Central	16.9	78 (8.0)	46	60.7	32	39.3
8. Central	20.5	106 (10.9)	76	72.1	30	27.9
9. Central East	18.4	102 (10.5)	90	88.9	12	11.1
10. South East	20.6	46 (4.7)	36	79.3	10	20.7
11. Champlain	18.2	80 (8.3)	67	84.4	13	15.6
12. North Simcoe Muskoka	20.8	36 (3.7)	24	65.1	12	34.9
13. North East	22.9	62 (6.4)	49	79.7	13	20.3
14. North West	20.5	**	**	90.4	**	**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Rectal Cancer Cohort.

2 Age-specific rates have have not been standardized.

Findings

- Rectal cancer incidence among men increased with advancing age and also with decreasing community size. There was no clear association between rectal cancer incidence and neighbourhood income quintile.
- Seventy-nine percent of all men diagnosed with rectal cancer in 2003/04 were treated with surgery. However, only 71 percent of those aged 75 years or older had surgery for their cancer.
- The proportion of men in the Overall Rectal Cancer Cohort treated surgically was similar across neighbourhood income quintiles, and also among all age groups under age 75.
- Across Local Health Integration Networks (LHINs), the highest incidence of rectal cancer among Ontario men (27 cases per 100,000) was found among those who lived in the South West LHIN.

Exhibit 4.1c
Colon cancer

Incidence of colon cancer among Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Colon Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Colon Cancer Cohort - Women					
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**52.9**	**2,585 (100.0)**	**2,250**	**87.0**	**335**	**13.0**
Age group (years)[2]						
20–54	10.1	313 (12.1)	275	87.9	38	12.1
55–64	73.6	406 (15.7)	360	88.7	46	11.3
65–69	139.7	316 (12.2)	290	91.8	26	8.2
70–74	179.9	379 (14.7)	339	89.4	40	10.6
75+	285.8	1,171 (45.3)	986	84.2	185	15.8
Neighbourhood income quintile						
Q1 (Lowest)	51.0	512 (20.4)	445	86.9	67	13.1
Q2	53.6	539 (21.4)	470	87.2	69	12.8
Q3	58.1	527 (21.0)	464	88.0	63	12.0
Q4	54.4	453 (18.0)	397	87.3	56	12.7
Q5 (Highest)	55.1	482 (19.2)	419	86.9	63	13.1
Community size (population)						
≥ 1,250,000	51.7	919 (35.6)	799	86.8	120	13.2
100,000–1,249,999	51.1	933 (36.1)	810	86.9	123	13.1
< 100,000	59.5	732 (28.3)	641	87.6	91	12.4
LHIN						
1. Erie St. Clair	56.7	156 (6.0)	140	89.8	16	10.2
2. South West	53.2	227 (8.8)	196	87.0	31	13.0
3. Waterloo Wellington	51.4	130 (5.0)	104	78.5	26	21.5
4. Hamilton Niagara Haldimand Brant	47.6	294 (11.4)	259	87.9	35	12.1
5. Central West	46.9	92 (3.6)	84	91.6	8	8.4
6. Mississauga Halton	55.2	167 (6.5)	145	86.6	22	13.4
7. Toronto Central	49.2	242 (9.4)	199	82.2	43	17.8
8. Central	56.3	288 (11.1)	254	88.3	34	11.7
9. Central East	54.3	315 (12.2)	276	87.5	39	12.5
10. South East	60.3	140 (5.4)	119	85.9	21	14.1
11. Champlain	49.3	230 (8.9)	199	86.6	31	13.4
12. North Simcoe Muskoka	52.4	92 (3.6)	84	91.4	8	8.6
13. North East	60.2	157 (6.1)	146	92.9	11	7.1
14. North West	52.9	54 (2.1)	45	84.8	9	15.2

[1] Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Colon Cancer Cohort.

[2] Age-specific rates have have not been standardized.

Findings

- Colon cancer incidence among women increased with age, from 74 cases per 100,000 in those aged 55–64 years, to 286 cases per 100,000 among those aged 75 years or older.
- About 90 percent of women under age 75 years were treated surgically vs. 84 percent of those aged 75 years or older.
- The incidence of colon cancer among women residing in smaller communities (<100,000 population) was 60 cases per 100,000. This rate was about 18 percent higher than the average incidence of colon cancer among women living in all other communities —about 51 cases per 100,000.
- Across Local Health Integration Networks (LHINs), the highest incidence of colon cancer among Ontario women (60 cases per 100,000) was found in those who lived in the South East and North East LHINs.

Exhibit 4.1c Rectal cancer

Incidence of rectal cancer among Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Rectal Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Rectal Cancer Cohort - Women				
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**13.7**	**672 (100.0)**	**511**	**76.0**	**161**	**24.0**
Age group (years)[2]						
20–54	4.2	130 (19.3)	95	73.1	35	26.9
55–64	27.5	152 (22.6)	121	79.6	31	20.4
65–69	30.9	70 (10.4)	60	85.7	10	14.3
70–74	36.6	77 (11.5)	58	75.3	19	24.7
75+	59.3	243 (36.2)	177	72.8	66	27.2
Neighbourhood income quintile						
Q1 (Lowest)	14.2	139 (21.2)	112	81.6	27	18.4
Q2	15.2	149 (22.7)	104	69.0	45	31.0
Q3	11.7	107 (16.3)	86	80.7	21	19.3
Q4	15.2	133 (20.2)	97	73.2	36	26.8
Q5 (Highest)	14.0	129 (19.6)	101	77.5	28	22.5
Community size (population)						
≥ 1,250,000	11.3	206 (30.7)	154	74.7	52	25.3
100,000–1,249,999	13.6	250 (37.2)	189	75.9	61	24.1
< 100,000	18.0	216 (32.1)	168	76.9	48	23.1
LHIN						
1. Erie St. Clair	13.0	36 (5.4)	29	84.2	7	15.8
2. South West	16.9	69 (10.3)	57	83.1	12	16.9
3. Waterloo Wellington	15.9	39 (5.8)	31	80.5	8	19.5
4. Hamilton Niagara Haldimand Brant	13.4	84 (12.5)	66	81.0	18	19.0
5. Central West	7.2	**	**	87.1	**	**
6. Mississauga Halton	11.7	39 (5.8)	26	73.3	13	26.7
7. Toronto Central	10.9	53 (7.9)	37	71.4	16	28.6
8. Central	13.0	69 (10.3)	55	71.0	14	29.0
9. Central East	13.0	76 (11.3)	57	67.3	19	32.7
10. South East	21.0	47 (7.0)	32	67.8	15	32.2
11. Champlain	13.6	65 (9.7)	49	75.1	16	24.9
12. North Simcoe Muskoka	13.2	**	**	74.6	**	**
13. North East	15.2	39 (5.8)	32	79.8	7	20.2
14. North West	19.7	20 (3.0)	10	49.2	10	50.8

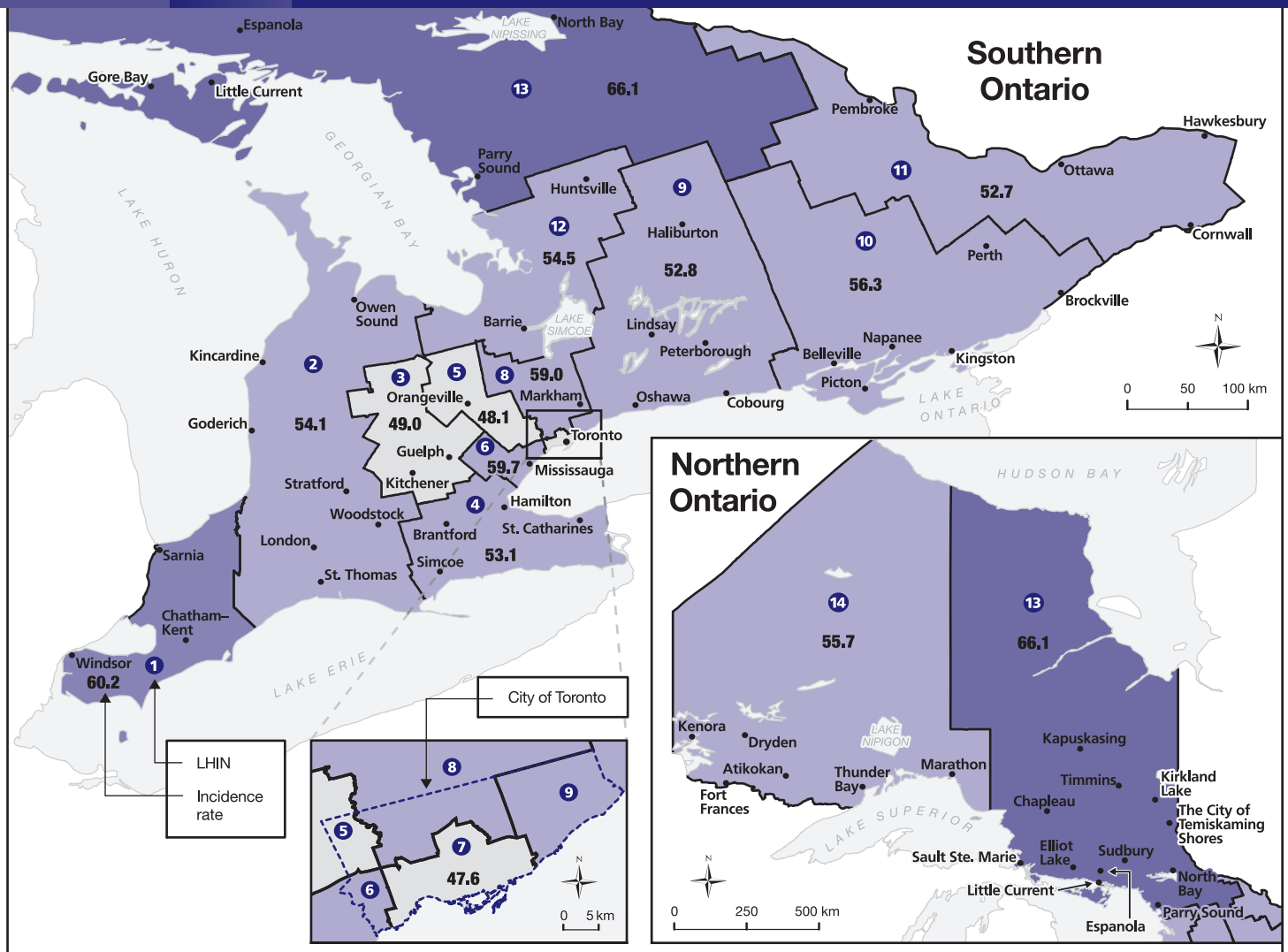
1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Rectal Cancer Cohort.

2 Age-specific rates have have not been standardized.

Findings

- The incidence of rectal cancer among women increased with increasing age. Among women aged 70–74 years, it was 37 cases per 100,000. Among those aged 75 years or older, it was 59 cases per 100,000.
- The incidence of rectal cancer also increased with decreasing community size. In 2003/04 there were 18 cases per 100,000 among women who lived in small communities. (<100,000 population) compared with only 11 cases per 100,000 among women residing in communities of 1.25 million or more.
- Rectal cancer incidence in 2003/04 was highest among women who resided in the South East Local Health Integration Network (LHIN) (21 cases per 100,000 population). It was lowest among those living in the Central West LHIN (7.2 cases per 100,000).
- Women in the youngest age group (20–54 years) were less likely to have surgery for rectal cancer compared with men in the same age group (73 percent of women in this age group vs. 81 percent of similarly aged men).

Exhibit 4.2 **Colon cancer** **Age- and sex-standardized colon cancer incidence per 100,000 population, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04**



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age- and sex-standardized colon cancer incidence rate per 100,000 persons in the Overall Colon Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

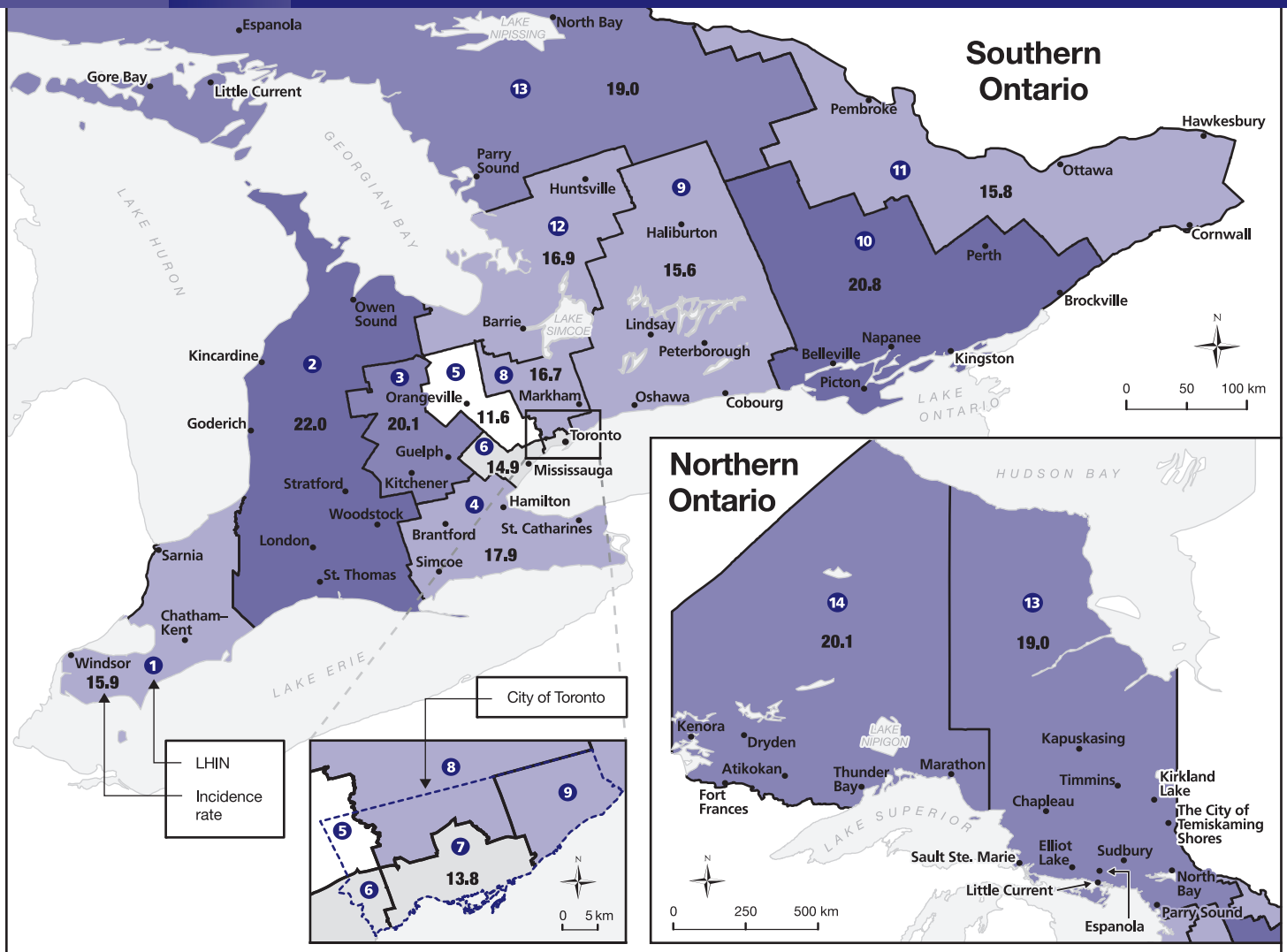
Ontario rate (OR) = 54.6 per 100,000 persons

LHIN rate per 100,000 persons	LHIN rate compared to OR	Number of LHINs in each category
> 65.5	More than 20% above OR	1
59.8–65.5	10% to 20% above OR	1
49.5–59.7	Within 10% of OR	9
43.7–49.4	10% to 20% below OR	3
< 43.7	More than 20% below OR	0

Findings

- In 2003/04, the age- and sex-adjusted incidence of colon cancer among Ontarians aged 20 years or older was 55 cases per 100,000 population.
- Rates of colon cancer ranged from a low of 48 cases per 100,000 among those living in the Toronto Central Local Health Integration Network (LHIN) at the time of diagnosis, to a high of 66 cases per 100,000 among those who resided in the North East LHIN.

Exhibit 4.2 **Rectal cancer** **Age- and sex-standardized rectal cancer incidence per 100,000 population, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04**



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age- and sex-adjusted rectal cancer incidence rate per 100,000 persons in the Overall Rectal Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 17.0 per 100,000 persons

LHIN rate per 100,000 persons	LHIN rate compared to OR	Number of LHINs in each category
> 20.4	More than 20% above OR	2
18.7–20.4	10% to 20% above OR	3
15.4–18.6	Within 10% of OR	6
13.6–15.3	10% to 20% below OR	2
< 13.6	More than 20% below OR	1

Findings

- In 2003/04, the age- and sex-adjusted incidence of rectal cancer among Ontarians age 20 years or older was 17 cases per 100,000 population.
- Rates of rectal cancer ranged from a low of 12 cases per 100,000 among those living in the Central West Local Health Integration Network (LHIN), to a high of 22 cases per 100,000 among those who resided in the South West LHIN.

Exhibit 4.3 Colon cancer

Health care utilization among men and women in the Colon Cancer Surgery Cohort [2003/04], by sex, age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Colon Cancer Surgery Cohort: Total number of patients	Colon Cancer Surgery Cohort: Average # visits with treating surgeon[2]	Colon Cancer Surgery Cohort: % with more than one hospital admission	Hospital admissions[1]: Total number of admissions	Hospital admissions[1]: Same-day surgery	Hospital admissions[1]: Inpatient admissions
	number	*visits/patient*	*% patients*	*number (average per patient)*	*standardized % total admissions[3]*	
Ontario	**4,603**	**2.9**	**8.5**	**5,041 (1.1)**	**1.4**	**98.6**
Sex[3]						
Men	2,353	2.8	9.3	2,595 (1.1)	1.4	98.6
Women	2,250	3.0	7.9	2,446 (1.1)	1.4	98.6
Age group (years)[3]						
20–54	550	3.1	13.3	628 (1.1)	1.8	98.2
55–64	880	3.1	9.8	979 (1.1)	1.5	98.5
65–69	661	3.3	8.6	724 (1.1)	1.4	98.6
70–74	800	3.1	8.4	882 (1.1)	1.7	98.3
75+	1,712	2.6	6.6	1,828 (1.1)	1.1	98.9
Neighbourhood income quintile						
Q1 (Lowest)	867	2.9	9.3	956 (1.1)	1.8	98.2
Q2	928	3.0	7.7	1,004 (1.1)	0.8	99.2
Q3	924	2.9	8.7	1,016 (1.1)	1.9	98.1
Q4	838	3.0	9.5	930 (1.1)	1.2	98.8
Q5 (Highest)	892	2.8	6.9	962 (1.1)	0.9	99.1
Community size (population)						
≥ 1,250,000	1,639	2.9	8.6	1,801 (1.1)	1.9	98.1
100,000–1,249,999	1,676	2.8	7.3	1,810 (1.1)	0.8	99.2
< 100,000	1,288	3.0	9.8	1,430 (1.1)	1.4	98.6
LHIN						
1. Erie St. Clair	284	3.1	6.5	302 (1.1)	1.0	99.0
2. South West	382	3.0	8.3	413 (1.1)	0.7	99.3
3. Waterloo Wellington	208	2.8	7.2	226 (1.1)	1.9	98.1
4. Hamilton Niagara Haldimand Brant	571	2.8	9.9	635 (1.1)	0.6	99.4
5. Central West	179	3.0	9.1	200 (1.1)	4.0	96.0
6. Mississauga Halton	319	3.1	11.9	360 (1.1)	0.4	99.6
7. Toronto Central	385	2.8	10.1	431 (1.1)	3.2	96.8
8. Central	528	2.9	6.8	568 (1.1)	1.3	98.7
9. Central East	536	3.1	7.1	580 (1.1)	1.0	99.0
10. South East	221	3.0	6.5	237 (1.1)	0.4	99.6
11. Champlain	412	2.3	8.1	448 (1.1)	1.9	98.1
12. North Simcoe Muskoka	164	3.2	6.2	175 (1.1)	1.2	98.8
13. North East	318	3.3	10.3	357 (1.1)	0.9	99.1
14. North West	96	3.5	11.0	109 (1.1)	2.3	97.7

1 Time frame for hospital admissions is from 12 months before to 12 months after diagnosis.

2 Time frame for surgeon visits is from 6 months before to 6 months after the first surgery.

3 Subgroup proportions (% Total) standardized to the Overall Colon Cancer Cohort; sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Findings

- Nearly all colon cancer-related surgery among patients in the Colon Cancer Surgery Cohort took place in an inpatient hospital setting. Nine percent of patients in this group had more than one hospital admission for cancer surgery during the two-year period from 12 months before to 12 months after diagnosis.
- The proportion of patients in the study cohort who had multiple hospital admissions related to their colon cancer decreased with age—from 13 percent of patients aged 20–54 years, to seven percent of those aged 75 years or older.
- On average, patients in the study cohort had about three visits with their treating surgeons in the 12 months surrounding their first surgery.

Exhibit 4.3 **Rectal cancer**

Health care utilization among men and women in the Rectal Cancer Surgery Cohort [2003/04], by sex, age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Rectal Cancer Surgery Cohort: Total number of patients	Rectal Cancer Surgery Cohort: Average # visits with treating surgeon[2]	Rectal Cancer Surgery Cohort: % with more than one hospital admission	Hospital admissions[1]: Total number of admissions	Hospital admissions[1]: Same-day surgery	Hospital admissions[1]: Inpatient admissions
	number	*visits/patient*	*% patients*	*number (average per patient)*	*standardized % total admissions*[3]	
Ontario	**1,277**	**4.2**	**18.0**	**1,531 (1.2)**	**4.4**	**95.6**
Sex[3]						
Men	766	4.1	20.5	937 (1.2)	3.8	96.2
Women	511	4.3	14.9	594 (1.2)	5.2	94.8
Age group (years)[3]						
20–54	234	4.3	21.3	289 (1.2)	6.3	93.7
55–64	309	4.5	22.3	389 (1.3)	5.0	95.0
65–69	193	4.3	16.6	228 (1.2)	3.6	96.4
70–74	185	4.4	16.3	216 (1.2)	4.2	95.8
75+	356	3.7	14.8	409 (1.1)	3.3	96.7
Neighbourhood income quintile						
Q1 (Lowest)	252	4.2	14.8	293 (1.2)	5.0	95.0
Q2	266	4.2	16.6	313 (1.2)	3.7	96.3
Q3	243	4.5	19.5	301 (1.2)	5.5	94.5
Q4	244	4.0	20.8	298 (1.2)	4.6	95.4
Q5 (Highest)	229	4.4	19.0	274 (1.2)	4.6	95.4
Community size (population)						
≥ 1,250,000	394	4.4	15.6	463 (1.2)	3.3	96.7
100,000–1,249,999	488	4.2	17.7	580 (1.2)	4.8	95.2
< 100,000	395	4.0	20.7	488 (1.2)	4.6	95.4
LHIN						
1. Erie St. Clair	67	4.3	13.0	77 (1.1)	1.1	98.9
2. South West	146	4.2	20.7	180 (1.2)	5.4	94.6
3. Waterloo Wellington	80	4.2	17.0	94 (1.2)	4.0	96.0
4. Hamilton Niagara Haldimand Brant	171	4.3	22.7	212 (1.2)	4.0	96.0
5. Central West	41	4.6	13.5	50 (1.2)	6.0	94.0
6. Mississauga Halton	75	5.3	18.9	90 (1.2)	2.9	97.1
7. Toronto Central	83	4.3	17.1	96 (1.2)	2.0	98.0
8. Central	131	4.2	17.3	159 (1.2)	3.6	92.1
9. Central East	147	4.2	13.8	168 (1.1)	2.7	92.6
10. South East	68	4.0	20.8	87 (1.3)	3.2	96.8
11. Champlain	116	3.4	20.6	144 (1.2)	6.0	94.0
12. North Simcoe Muskoka	42	4.2	20.3	49 (1.2)	10.4	84.9
13. North East	81	4.1	15.1	92 (1.1)	3.2	96.8
14. North West	29	4.0	**	33 (1.1)	8.0	92.0

** Cell value suppressed for reasons of privacy and confidentiality.

1 Time frame for hospital admissions is from 12 months before to 12 months after diagnosis.

2 Time frame for surgeon visits is from 6 months before to 6 months after the first surgery.

3 Subgroup proportions (% Total) standardized to the Overall Rectal Cancer Cohort; sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Findings

- Nearly all rectal cancer-related surgery undergone by patients in the Rectal Cancer Surgery Cohort took place in an inpatient hospital setting. Eighteen percent of patients in this group had more than one hospital admission for cancer surgery during the two-year period from 12 months before to 12 months after diagnosis.
- The proportion of patients in the study cohort who had multiple hospital admissions for rectal cancer surgery decreased with age—from 21 percent of patients under age 65 years, to 15 percent of those aged 75 years or older.
- On average, patients in this study cohort had about four visits with their treating surgeons in the 12 months surrounding their first surgery.

Exhibit 4.4 **Colon cancer**

Hospital admissions for colon cancer surgery among men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN of patient residence	LHIN where care was received					
	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton
	number (col%, row %)[1]					
1. Erie St. Clair	**275 (99.6, 91.1)**	23 (5.5, 7.6)		**		**
2. South West		**384 (91.0, 93.0)**	11 (5.0, 2.7)	7 (1.1, 1.7)		
3. Waterloo Wellington		6 (1.4, 2.7)	**200 (91.7, 88.5)**	**	7 (4.0, 3.1)	**
4. Hamilton Niagara Haldimand Brant		**	**	**609 (95.8, 95.9)**		9 (2.6, 1.4)
5. Central West			**	**	**142 (80.2, 71.0)**	12 (3.5, 6.0)
6. Mississauga Halton			**	7 (1.1, 1.9)	7 (4.0, 1.9)	**305 (87.9, 84.7)**
7. Toronto Central		**			**	11 (3.2, 2.6)
8. Central				**	13 (7.3, 2.3)	**
9. Central East						
10. South East				**		
11. Champlain						**
12. North Simcoe Muskoka		**		**	**	
13. North East		**		**		
14. North West						
Ontario	**276 (100, 5.5)**	**422 (100, 8.4)**	**218 (100, 4.3)**	**636 (100, 12.6)**	**177 (100, 3.5)**	**347 (100, 6.9)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression

1 **"col %"** is used to show what proportion of all patients having colon cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all colon surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings

- Eighty-six percent of hospital admissions for colon cancer surgery among men and women in the Colon Cancer Surgery Cohort took place in the Local Health Integration Networks (LHINs) where patients resided at the time of diagnosis.

Exhibit 4.4 (cont'd)

Colon cancer

Hospital admissions for colon cancer surgery among men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN where care was received								
7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West	Ontario
number (col%, row %)[1]								
**								302 (6.0, 100)
**			**	**	**			413 (8.2, 100)
**	**							226 (4.5, 100)
8 (1.3, 1.3)		**				**		635 (12.6, 100)
24 (3.8, 12.0)	16 (3.7, 8.0)	**			**			200 (4.0, 100)
31 (4.9, 8.6)	7 (1.6, 1.9)			**				360 (7.1, 100)
359 (56.3, 83.3)	38 (8.7, 8.8)	18 (3.2, 4.2)						431 (8.6, 100)
135 (21.2, 23.9)	**340 (78.2, 60.1)**	64 (11.4, 11.3)			9 (4.9, 1.6)	**		566 (11.2, 100)
60 (9.4, 10.4)	32 (7.4, 5.5)	**472 (84.0, 81.5)**	7 (2.9, 1.2)		7 (3.8, 1.2)			579 (11.5, 100)
**		**	**220 (92.1, 92.8)**	12 (2.6, 5.1)				237 (4.7, 100)
**			11 (4.6, 2.5)	**434 (95.8, 97.1)**				447 (8.9, 100)
6 (0.9, 3.4)	**	**		**	**158 (85.4, 90.8)**			174 (3.5, 100)
**		**		**	6 (3.2, 1.7)	**337 (99.4, 94.7)**		356 (7.1, 100)
							107 (99.1, 98.2)	109 (2.2, 100)
638 (100, 12.7)	**435 (100, 8.6)**	**562 (100, 11.2)**	**239 (100, 4.7)**	**453 (100, 9.0)**	**185 (100, 3.7)**	**339 (100, 6.7)**	**108 (100, 2.1)**	**5,035 (100, 100)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression

1 **"col %"** is used to show what proportion of all patients having colon cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all colon surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings (cont'd)

- There was considerable migration of patients across LHIN boundaries in the Greater Toronto Area. For example, about 44 percent of admissions for colon cancer surgery in hospitals located in the Toronto Central LHIN were for patients who resided outside that LHIN. Most of these out-of-LHIN patients came from the Central, Central East, Mississauga Halton and Central West LHINs.

Exhibit 4.4 **Rectal cancer**

Hospital admissions for rectal cancer surgery among men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN of patient residence	LHIN where care was received					
	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton
	number (col%, row %)[1]					
1. Erie St. Clair	**64 (98.5, 83.1)**	12 (6.3, 15.6)				
2. South West		**172 (90.1, 95.6)**	**	**		**
3. Waterloo Wellington		**	**78 (96.3, 83.0)**	**		**
4. Hamilton Niagara Haldimand Brant		**		**197 (92.5, 92.9)**	**	7 (7.4, 3.3)
5. Central West					**37 (72.5, 74.0)**	**
6. Mississauga Halton			**	**	**	**68 (72.3, 75.6)**
7. Toronto Central					**	**
8. Central					8 (15.7, 5.0)	**
9. Central East				**		**
10. South East						
11. Champlain						
12. North Simcoe Muskoka						
13. North East		**		**		**
14. North West						
Ontario	**65 (100, 4.3)**	**191 (100, 12.5)**	**81 (100, 5.3)**	**213 (100, 13.9)**	**51 (100, 3.3)**	**94 (100, 6.1)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having rectal cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all rectal cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings

- Eighty-three percent of hospital admissions for rectal cancer surgery among men and women in the Rectal Cancer Surgery Cohort took place in the Local Health Integration Networks (LHINs) where patients resided at the time of diagnosis.

Exhibit 4.4 (cont'd)

Rectal cancer

Hospital admissions for rectal cancer surgery among men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN where care was received								
7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West	Ontario
number (col%, row %)[1]								
								77 (5.0, 100)
**					**			180 (11.8, 100)
**								94 (6.1, 100)
**				**				212 (13.9, 100)
7 (3.7, 14.0)	**	**	**					50 (3.3, 100)
13 (6.8, 14.4)	**							90 (5.9, 100)
80 (41.9, 83.3)	7 (7.6, 7.3)	**						96 (6.3, 100)
50 (26.2, 31.4)	**73 (79.3, 45.9)**	21 13.4, 13.2)			**			159 (10.4, 100)
18 (9.4, 10.7)	7 (7.6, 4.2)	**129 (82.2, 76.8)**	7 (7.2, 4.2)		**			168 (11, 100)
**	**		**82 (84.5, 94.3)**	2 (1.4, 2.3)				87 (5.7, 100)
			7 (7.2, 4.9)	**136 (97.8, 95.1)**				143 (9.4, 100)
9 (4.7, 18.4)					**37 (84.1, 75.5)**			49 (3.2, 100)
**					**	**82 (100, 90.1)**		91 (6.0, 100)
							32 (100, 97.0)	33 (2.2, 100)
191 (100, 12.5)	**92 (100, 6.0)**	**157 (100, 10.3)**	**97 (100, 6.3)**	**139 (100, 9.1)**	**44 (100, 2.9)**	**82 (100, 5.4)**	**32 (100, 2.1)**	**1,529 (100, 100)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having rectal cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all rectal cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings (cont'd)

- There was considerable migration of patients across LHIN boundaries in the Greater Toronto Area. For example, about 58 percent of admissions for rectal cancer surgery in hospitals located in the Toronto Central LHIN were for patients who resided outside the LHIN. Most of these out-of-LHIN patients came from the Central, Central East and Mississauga Halton LHINs.

Exhibit 4.5a
Colon cancer

Type of definitive surgical procedure among men and women in the Colon Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Colon Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]			
		Resection with permanent stoma	Resection with potentially reversible stoma	Resection without stoma	Bypass, stoma, local excision or other abdominal procedure
Ontario	4,603	54 (1.2)	554 (12.1)	3,329 (72.3)	666 (14.5)
Sex[2]					
Men	2,353	35 (1.5)	302 (13.0)	1,683 (71.2)	333 (14.3)
Women	2,250	19 (0.8)	252 (11.0)	1,646 (73.2)	333 (14.9)
Age group (years)[2]					
20–54	550	9 (1.7)	77 (14.0)	385 (70.0)	79 (14.3)
55–64	880	9 (0.9)	90 (10.0)	656 (74.6)	125 (14.4)
65–69	661	7 (1.1)	70 (10.5)	467 (70.7)	117 (17.7)
70–74	800	10 (1.2)	91 (11.3)	593 (74.0)	106 (13.5)
75+	1,712	19 (1.1)	226 (13.3)	1,228 (71.4)	239 (14.2)
Neighbourhood income quintile					
Q1 (Lowest)	**	15 (1.8)	107 (12.4)	629 (72.5)	116 (13.4)
Q2	**	14 (1.5)	102 (11.0)	682 (73.5)	130 (14.0)
Q3	**	10 (1.1)	104 (11.2)	675 (73.1)	135 (14.7)
Q4	**	** (1.1)	** (13.6)	** (70.9)	** (14.4)
Q5 (Highest)	**	**	** (12.0)	** (71.8)	** (15.6)
Community size (population)					
≥ 1,250,000	**	** (1.4)	** (10.9)	** (70.9)	** (16.8)
100,000–1,249,999	**	** (1.5)	** (11.8)	** (73.0)	** (13.7)
< 100,000	**	**	** (13.9)	** (73.2)	** (12.6)
LHIN					
1. Erie St. Clair	**	**	** (11.5)	** (67.2)	** (20.9)
2. South West	**	**	** (13.7)	** (72.5)	** (13.5)
3. Waterloo Wellington	**	**	** (13.3)	** (76.4)	** (9.9)
4. Hamilton Niagara Haldiamnd Brant	571	9 (1.5)	70 (12.0)	438 (77.2)	54 (9.3)
5. Central West	**	**	** (7.9)	** (68.9)	** (22.9)
6. Mississauga Halton	319	7 (2.3)	55 (18.0)	205 (63.4)	52 (16.3)
7. Toronto Central	385	6 (1.6)	37 (10.2)	266 (69.0)	76 (19.2)
8. Central	528	6 (1.1)	50 (9.6)	400 (76.0)	72 (13.3)
9. Central East	536	10 (1.8)	58 (10.6)	404 (75.4)	64 (12.1)
10. South East	221	0 (0.0)	29 (13.3)	157 (70.8)	35 (15.9)
11. Champlain	412	10 (2.4)	49 (11.9)	268 (64.9)	85 (20.9)
12. North Simcoe Muskoka	164	0 (0.0)	15 (8.9)	128 (79.1)	21 (12.0)
13. North East	**	**	** (14.5)	** (78.1)	** (6.8)
14. North West	96	0 (0.0)	12 (13.4)	71 (73.2)	13 (13.4)

** Cell value suppressed for reasons of privacy and confidentiality.

1 Percent of subgroup that had each type of surgery as their definitive procedure, standardized to the Overall Colon Cancer Cohort.

2 Sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Findings

- Resection without a stoma was the most common definitive surgery for patients in the Colon Cancer Surgery Cohort (72 percent).
- Approximately 15 percent of patients received a bypass, stoma, local excision or other abdominal procedure (i.e., non-major resection).
- The rate of resection with a permanent stoma was quite rare—about one percent of patients in this study cohort.
- There was little variation in the type of definitive surgery undergone by patients in the study cohort by either sociodemographic or geographic characteristics.

Exhibit 4.5a **Rectal cancer**

Type of definitive surgical procedure among men and women in the Rectal Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Rectal Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]			
		Resection with permanent stoma	Resection with potentially reversible stoma	Resection without stoma	Bypass, stoma, local excision or other abdominal procedure
Ontario	**1,277**	**334 (26.0)**	**367 (28.8)**	**366 (28.6)**	**210 (16.6)**
Sex[2]					
Men	766	214 (27.8)	238 (31.6)	208 (26.4)	106 (14.2)
Women	511	120 (23.8)	129 (24.8)	158 (31.0)	104 (20.4)
Age group (years)[2]					
20–54	234	65 (27.8)	71 (30.3)	57 (24.4)	41 (17.6)
55–64	309	78 (25.2)	90 (29.1)	97 (31.4)	44 (14.2)
65–69	193	61 (31.4)	46 (23.0)	55 (28.0)	31 (17.6)
70–74	185	47 (25.2)	48 (25.0)	66 (36.0)	24 (13.8)
75+	356	83 (23.9)	112 (32.0)	91 (24.8)	70 (19.2)
Neighbourhood income quintile					
Q1 (Lowest)	252	58 (23.8)	66 (25.9)	77 (30.1)	51 (20.2)
Q2	266	75 (28.4)	82 (31.3)	62 (23.1)	47 (17.2)
Q3	243	69 (29.0)	62 (25.1)	66 (25.9)	46 (19.9)
Q4	244	60 (24.5)	76 (31.3)	74 (30.2)	34 (14.0)
Q5 (Highest)	229	62 (26.4)	67 (30.2)	75 (32.6)	25 (10.7)
Community size (population)					
≥ 1,250,000	394	80 (19.4)	134 (34.6)	112 (28.7)	68 (17.4)
100,000–1,249,999	488	146 (29.8)	125 (25.7)	128 (26.2)	89 (18.3)
< 100,000	395	108 (2.1)	108 (27.5)	126 (31.7)	53 (13.8)
LHIN					
1. Erie St. Clair	67	18 (27.7)	15 (24.8)	19 (27.8)	15 (19.7)
2. South West	146	34 (23.3)	41 (27.8)	47 (31.7)	24 (17.2)
3. Waterloo Wellington	80	35 (43.0)	16 (20.1)	19 (21.8)	10 (15.1)
4. Hamilton Niagara Haldiamnd Brant	171	55 (32.8)	54 (30.8)	40 (23.9)	22 (12.4)
5. Central West	41	11 (26.7)	12 (24.5)	6 (13.4)	12 (35.5)
6. Mississauga Halton	**	** (23.1)	** (33.5)	** (30.4)	**
7. Toronto Central	83	14 (16.2)	28 (34.9)	25 (30.7)	16 (18.3)
8. Central	131	27 (21.3)	46 (33.8)	36 (24.9)	22 (15.6)
9. Central East	147	27 (17.7)	49 (32.4)	43 (27.5)	28 (17.7)
10. South East	68	16 (21.6)	17 (24.3)	23 (35.9)	12 (18.2)
11. Champlain	116	27 (22.4)	29 (26.0)	41 (34.0)	19 (17.6)
12. North Simcoe Muskoka	42	12 (27.6)	8 (20.5)	13 (26.2)	9 (21.0)
13. North East	81	32 (36.9)	18 (25.1)	20 (25.2)	11 (12.8)
14. North West	**	** (22.0)	** (28.1)	** (39.5)	**

** Cell value suppressed for reasons of privacy and confidentiality.

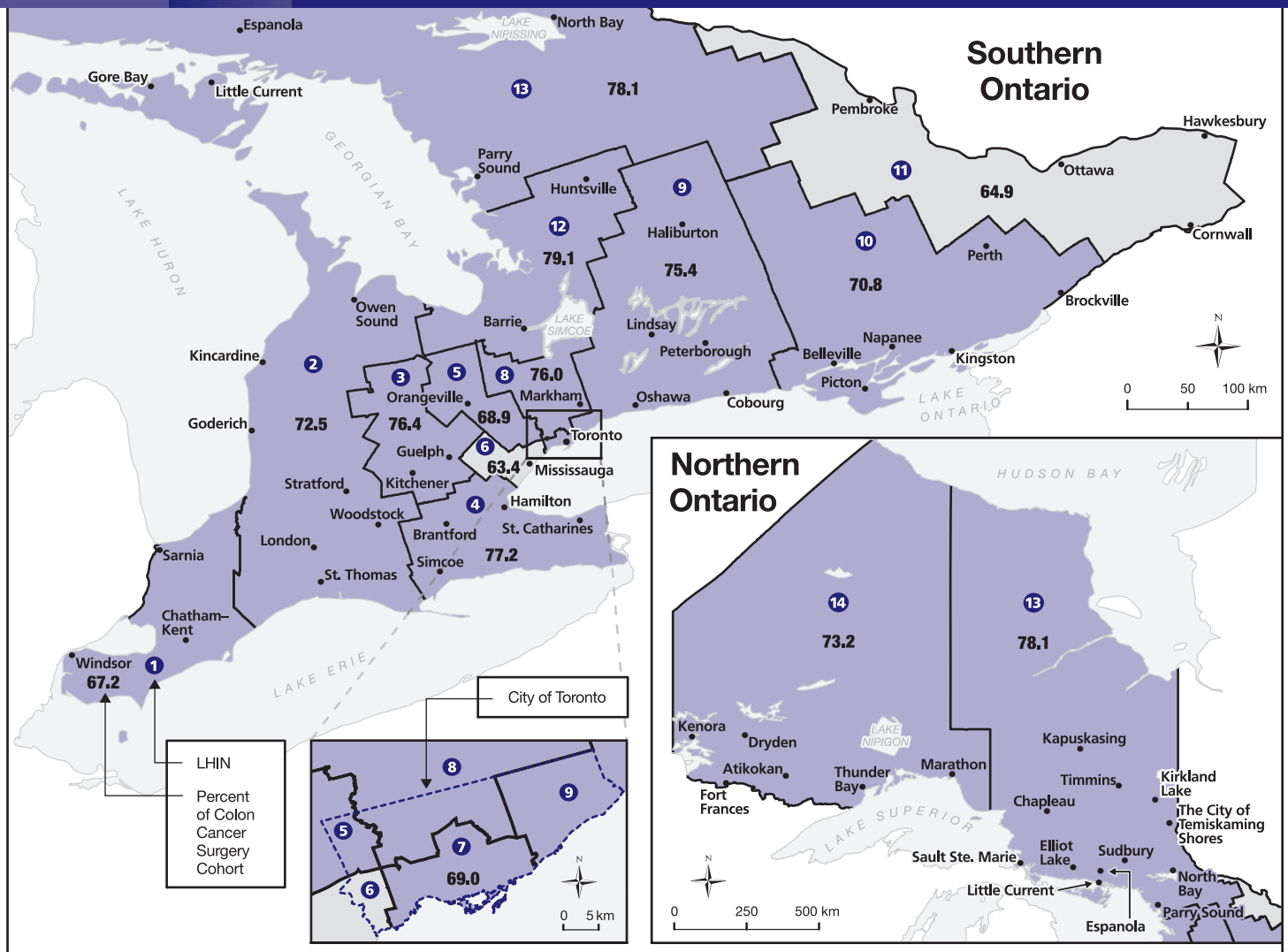
1 Percent of subgroup that had each type of surgery as their definitive procedure, standardized to the Overall Rectal Cancer Cohort.

2 Sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Findings

- Various types of definitive surgery were used among patients in the Rectal Cancer Surgery Cohort. The proportions were nearly equal for several procedures: 29 percent had a resection without stoma; 29 percent had a resection with a potentially reversible stoma; and 26 percent underwent resection with a permanent stoma.
- There was moderate variation in the type of definitive surgery received according to the patients' Local Health Integration Networks (LHINs) of residence. For example, the rate of resection with permanent stoma varied from 16 percent among those who lived in the Toronto Central LHIN when they were diagnosed, to 43 percent of those residing in the Waterloo Wellington LHIN.

Exhibit 4.5b **Colon cancer** **Proportion of men and women in the Colon Cancer Surgery Cohort whose definitive surgery was a resection without stoma, by Local Health Integration Network (LHIN) of patient residence, in Ontario**



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Proportion of men and women in the Colon Cancer Surgery Cohort whose definitive surgery was a resection without stoma, by LHIN of patient residence, in Ontario

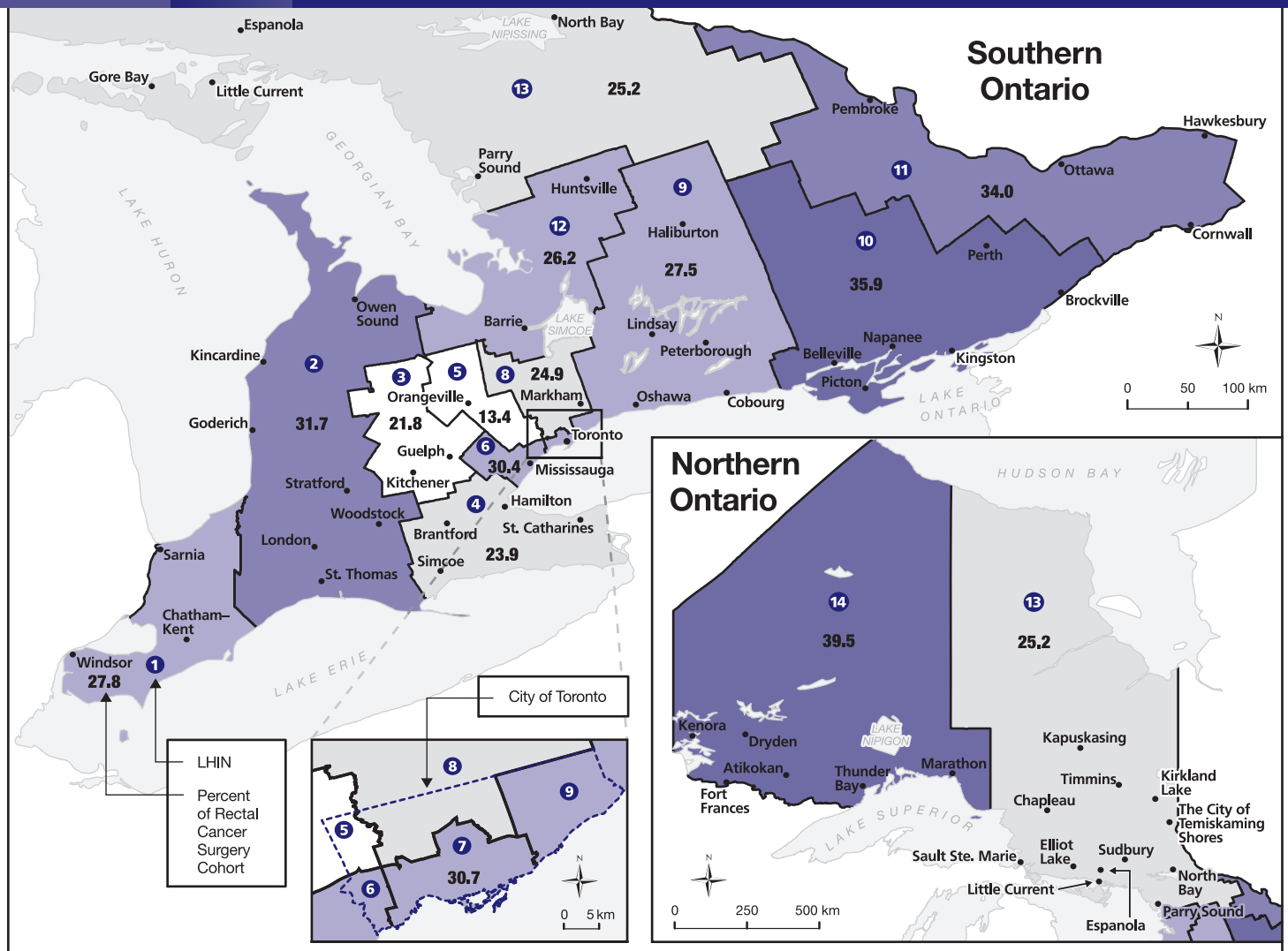
Ontario rate (OR) = 72.3 percent

Percent of Colon Cancer Surgery Cohort	LHIN rate compared to OR	Number of LHINs in each category
> 87.1	More than 20% above OR	0
79.2–87.1	10% to 20% above OR	0
65.5–79.1	Within 10% of OR	12
57.5–65.4	10% to 20% below OR	2
< 57.5	More than 20% below OR	0

Findings

- In 12 of the 14 Local Health Integration Networks (LHINs), the proportion of patients in the Colon Cancer Surgery Cohort whose definitive surgery was a resection without a stoma was within 10 percent of the overall Ontario rate at the time (72 percent).
- Patients residing in both the Mississauga Halton and Champlain LHINs had rates of resection without a stoma that were more than 10 percent below the Ontario rate at the time (72 percent).

Exhibit 4.5b **Rectal cancer** **Proportion of men and women in the Rectal Cancer Surgery Cohort whose definitive surgery was a resection without stoma, by Local Health Integration Network (LHIN) of patient residence, in Ontario**



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Proportion of men and women in the Rectal Cancer Surgery Cohort whose definitive surgery was a resection without stoma, by LHIN of patient residence, in Ontario

Ontario rate (OR) = 28.6 percent

Percent of Rectal Cancer Surgery Cohort	LHIN rate compared to OR	Number of LHINs in each category
> 34.4	More than 20% above OR	2
31.4–34.4	10% to 20% above OR	2
25.9–31.3	Within 10% of OR	5
22.8–25.8	10% to 20% below OR	3
< 22.8	More than 20% below OR	2

Findings

- There was considerable variation in the proportion of patients in the Rectal Cancer Surgery Cohort whose definitive surgery was a resection without a stoma. Those who resided in either the Central West Local Health Integration Network (LHIN) or the Waterloo Wellington LHIN at the time of diagnosis had rates of resection without a stoma that were more than 20 percent lower compared to the overall Ontario rate at the time (29 percent).
- Patients residing in both the South East and North West LHINs had rates of resection without a stoma that were more than 20 percent above the Ontario rate.

Exhibit 4.6a — Overall pattern of surgical care provided to men and women in the Colon and Rectal Cancer Surgery Cohorts [2003/04], by physician specialty, in Ontario

Colon Cancer

Physician specialty	Physicians performing colon cancer surgery *number (% physicians)*	All colon cancer surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				Resection with permanent stoma	Resection with potentially reversible stoma	Resection without stoma	Bypass, stoma, local excision or other abdominal procedure	Total
General surgery with self-reported surgical oncology sub-specialty	21 (6.4)	219 (4.9)	195 (5.0)	**	24 (12.6)	132 (69.5)	34 (17.9)	190
General surgery with self-reported colorectal surgery sub-specialty	29 (4.7)	461 (10.4)	406 (10.3)	13 (3.2)	49 (12.1)	300 (73.9)	44 (10.8)	406
General surgery with self-reported laparoscopy sub-specialty	15 (3.3)	185 (4.2)	163 (4.2)	**	12 (7.4)	127 (78.4)	23 (14.2)	162
General surgery with other or no self-reported sub-specialty	336 (74.5)	3,303 (74.4)	2,915 (74.3)	32 (1.1)	344 (11.8)	2,162 (74.2)	377 (12.9)	2,915
Other specialty	50 (11.1)	270 (6.1)	244 (6.2)	**	30 (12.4)	166 (68.3)	47 (19.3)	243
Ontario	**451**	**4,438**	**3,923**	**45 (1.3)**	**459 (11.7)**	**2,887 (73.6)**	**525 (13.4)**	**3,916**

Rectal Cancer

Physician specialty	Physicians performing rectal cancer surgery *number (% physicians)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				Resection with permanent stoma	Resection with potentially reversible stoma	Resection without stoma	Bypass, stoma, local excision or other abdominal procedure	Total
General surgery with self-reported surgical oncology sub-specialty	16 (5.0)	89 (6.7)	77 (7.2)	16 (20.8)	29 (37.7)	21 (27.3)	11 (14.3)	77
General surgery with self-reported colorectal surgery sub-specialty	27 (8.4)	200 (15.1)	153 (14.2)	44 (28.8)	53 (34.6)	40 (26.1)	16 (10.5)	153
General surgery with self-reported laparoscopy sub-specialty	13 (4.0)	48 (3.6)	40 (3.7)	**	13 (37.1)	14 (40.0)	8 (22.9)	35
General surgery with other or no self-reported sub-specialty	240 (74.3)	909 (68.4)	729 (67.9)	206 (28.3)	214 (29.4)	228 (31.3)	81 (11.1)	729
Other specialty	27 (8.4)	82 (6.2)	75 (7.0)	24 (32.0)	16 (21.3)	24 (32.0)	11 (14.7)	75
Ontario	**323**	**1,328**	**1,074**	**290 (27.1)**	**325 (30.4)**	**327 (30.6)**	**127 (11.9)**	**1,069**

** Cell value suppressed and removed from totals for reasons of privacy and confidentiality.

1 Based on one definitive procedure per patient.

Findings

- Nearly three-quarters (74 percent) of patients in the Colon Cancer Surgery Cohort were treated by general surgeons with no self-reported sub-specialty.
- More than two-thirds (68 percent) of patients in the Rectal Cancer Surgery Cohort were treated by general surgeons with no self-reported sub-specialty.
- The definitive surgical procedures provided to patients in both study cohorts were largely unrelated to the surgeons' sub-specialties.

Exhibit 4.6b Overall pattern of surgical care provided to men and women in the Colon and Rectal Cancer Surgery Cohorts [2003/04], by hospital type, in Ontario

Colon Cancer

Hospital type	Hospitals performing colon cancer surgery *number (% hospitals)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				Resection with permanent stoma	Resection with potentially reversible stoma	Resection without stoma	Bypass, stoma, local excision or other abdominal procedure	Total
Academic	14 (8.6)	1,289 (25.7)	1,148 (25.0)	20 (1.7)	134 (11.7)	810 (70.6)	184 (16.0)	1,148
Community/Small	106 (91.4)	3,734 (74.3)	3,381 (75.0)	34 (1.0)	412 (12.0)	2,519 (73.1)	481 (13.9)	3,381
Ontario	**120**	**5,023**	**4,594**	**54 (1.2)**	**546 (11.9)**	**3,329 (72.5)**	**665 (14.5)**	**4,594**

Exhibit 4.6b

Rectal Cancer

Hospital type	Hospitals performing rectal cancer surgery *number (% hospitals)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				Resection with permanent stoma	Resection with potentially reversible stoma	Resection without stoma	Bypass, stoma, local excision or other abdominal procedure	Total
Academic	13 (12.6)	450 (30.9)	403 (31.6)	108 (26.8)	121 (30.0)	101 (25.1)	73 (18.1)	403
Community/Small	90 (87.4)	1,008 (69.1)	872 (68.4)	226 (25.9)	245 (28.1)	265 (30.4)	136 (15.6)	872
Ontario	**103**	**1,458**	**1,275**	**334 (26.2)**	**366 (28.7)**	**366 (28.7)**	**209 (16.4)**	**1,275**

[1] Based on one definitive procedure per patient.

Findings

- The majority of patients in the Colon Cancer Surgery Cohort (75 percent) and in the Rectal Cancer Surgery Cohort (68 percent) underwent surgery for their disease in community hospitals.
- The proportion of patients with colorectal cancer who underwent each type of definitive surgery was similar in both academic (teaching) and community hospitals.

Exhibit 4.7a **Colon cancer**

Diagnostic services received by men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Colon Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*							
		Abdomen				Chest			
		Ultrasound	CT scan	MRI scan	Transrectal ultrasound	X-ray	CT scan	Lower GI endoscopy	Barium enema
1. Erie St. Clair	284	232 (0.8)	431 (1.5)	0 (0.0)	9 (0.0)	565 (2.0)	74 (0.3)	437 (1.5)	**
2. South West	382	310 (0.8)	544 (1.4)	**	19 (0.0)	742 (1.9)	91 (0.2)	473 (1.2)	13 (0.0)
3. Waterloo Wellington	208	220 (1.1)	323 (1.6)	**	18 (0.1)	374 (1.8)	102 (0.5)	260 (1.3)	8 (0.0)
4. Hamilton Niagara Haldimand Brant	571	519 (0.9)	795 (1.4)	9 (0.0)	31 (0.1)	1,217 (2.1)	200 (0.4)	824 (1.4)	26 (0.0)
5. Central West	179	167 (0.9)	332 (1.9)	**	23 (0.1)	302 (1.7)	101 (0.6)	310 (1.7)	**
6. Mississauga Halton	319	302 (0.9)	553 (1.7)	25 (0.1)	34 (0.1)	588 (1.8)	164 (0.5)	499 (1.6)	19 (0.1)
7. Toronto Central	385	458 (1.2)	886 (2.3)	29 (0.1)	60 (0.2)	736 (1.9)	224 (0.6)	652 (1.7)	9 (0.0)
8. Central	528	702 (1.3)	1,050 (2.0)	24 (0.0)	84 (0.2)	1,000 (1.9)	325 (0.6)	847 (1.6)	12 (0.0)
9. Central East	536	568 (1.1)	1,020 (1.9)	16 (0.0)	52 (0.1)	998 (1.9)	401 (0.7)	819 (1.5)	14 (0.0)
10. South East	221	219 (1.0)	352 (1.6)	**	7 (0.0)	395 (1.8)	101 (0.5)	211 (1.0)	**
11. Champlain	412	442 (1.1)	818 (2.0)	18 (0.0)	41 (0.1)	971 (2.4)	146 (0.4)	591 (1.4)	17 (0.0)
12. North Simcoe Muskoka	164	158 (1.0)	265 (1.6)	**	6 (0.0)	291 (1.8)	76 (0.5)	227 (1.4)	**
13. North East	317	409 (1.3)	429 (1.4)	12 (0.0)	16 (0.1)	559 (1.8)	163 (0.5)	475 (1.5)	6 (0.0)
14. North West	96	118 (1.2)	110 (1.1)	**	14 (0.1)	185 (1.9)	35 (0.4)	139 (1.4)	10 (0.1)
Ontario	**4,602**	**4,824 (1.0)**	**7,908 (1.7)**	**150 (0.0)**	**414 (0.1)**	**8,923 (1.9)**	**2,203 (0.5)**	**6,764 (1.5)**	**147 (0.0)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Colon Cancer Surgery Cohort.

Findings

- In the 24 months surrounding their definitive surgery, the diagnostic services received most frequently by patients in the Colon Cancer Surgery Cohort were: chest X-ray, abdominal computed tomography (CT) scan and endoscopy of the lower gastrointestinal (GI) tract. On average, patients received between one and two of each of these diagnostic services during the study period.
- Of the three most commonly used diagnostic procedures, use of abdominal CT varied the most across Local Health Integration Networks (LHINs). The average rate of abdominal CT ranged from 1.1 per patient among those residing in the North West LHIN at the time of diagnosis to 2.3 per patient among those who lived in the Toronto Central LHIN.
- There was little evidence that patients who underwent surgery for colon cancer also underwent magnetic resonance imaging (MRI), transrectal ultrasound or barium enema for diagnostic purposes during the 24 months surrounding their definitive surgeries.

Exhibit 4.7a **Rectal cancer**

Diagnostic services received by men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Rectal Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*							
		Abdomen				Chest			
		Ultrasound	CT scan	MRI scan	Transrectal ultrasound	X-ray	CT scan	Lower GI endoscopy	Barium enema
1. Erie St. Clair	67	47 (0.7)	167 (2.5)	**	23 (0.3)	164 (2.4)	21 (0.3)	102 (1.5)	**
2. South West	146	141 (1.0)	250 (1.7)	11 (0.1)	31 (0.2)	374 (2.6)	57 (0.4)	282 (1.9)	27 (0.2)
3. Waterloo Wellington	80	76 (1.0)	146 (1.8)	8 (0.1)	15 (0.2)	153 (1.9)	35 (0.4)	142 (1.8)	7 (0.1)
4. Hamilton Niagara Haldimand Brant	171	139 (0.8)	284 (1.7)	7 (0.0)	**	373 (2.2)	60 (0.4)	332 (1.9)	18 (0.1)
5. Central West	41	37 (0.9)	98 (2.4)	8 (0.2)	10 (0.2)	72 (1.8)	27 (0.7)	87 (2.1)	**
6. Mississauga Halton	75	63 (0.8)	198 (2.6)	9 (0.1)	16 (0.2)	177 (2.4)	54 (0.7)	169 (2.3)	**
7. Toronto Central	83	95 (1.1)	226 (2.7)	28 (0.3)	35 (0.4)	160 (1.9)	98 (1.2)	187 (2.3)	**
8. Central	131	149 (1.1)	315 (2.4)	25 (0.2)	43 (0.3)	284 (2.2)	108 (0.8)	296 (2.3)	9 (0.1)
9. Central East	147	124 (0.8)	383 (2.6)	11 (0.1)	31 (0.2)	282 (1.9)	140 (1.0)	350 (2.4)	13 (0.1)
10. South East	68	44 (0.6)	132 (1.9)	**	**	116 (1.7)	42 (0.6)	94 (1.4)	13 (0.2)
11. Champlain	116	112 (1.0)	261 (2.3)	26 (0.2)	9 (0.1)	292 (2.5)	54 (0.5)	267 (2.3)	15 (0.1)
12. North Simcoe Muskoka	42	32 (0.8)	84 (2.0)	10 (0.2)	8 (0.2)	66 (1.6)	34 (0.8)	84 (2.0)	**
13. North East	81	83 (1.0)	151 (1.9)	8 (0.1)	14 (0.2)	171 (2.1)	62 (0.8)	145 (1.8)	**
14. North West	29	28 (1.0)	37 (1.3)	0 (0.0)	0 (0.0)	69 (2.4)	11 (0.4)	59 (2.0)	0 (0.0)
Ontario	**1,277**	**1,170 (0.9)**	**2,732 (2.1)**	**156 (0.1)**	**244 (0.2)**	**2,753 (2.2)**	**803 (0.6)**	**2,596 (2.0)**	**119 (0.1)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Rectal Cancer Surgery Cohort.

Findings

- In the 24 months surrounding their definitive surgery, the diagnostic services received most frequently by patients in the Rectal Cancer Surgery Cohort were: chest X-ray, abdominal computed tomography (CT) scan and endoscopy of the lower gastrointestinal (GI) tract. On average, patients received at least two of each of these diagnostic services.
- Use of the above-mentioned procedures was not uniform across Local Health Integration Networks (LHINs). For example, there were 1.3 abdominal CT scans per person among patients residing in the North West LHIN at the time of diagnosis, and 2.7 per person among those living in the Toronto Central LHIN.
- There was little evidence that patients who underwent surgery for rectal cancer also underwent magnetic resonance imaging (MRI), transrectal ultrasound or barium enema for diagnostic purposes during the 24 months surrounding their definitive surgeries.

Exhibit 4.7b
Colon cancer

Health services received by men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Colon Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*				
		Stoma reversal	Percutaneous abscess drainage	ICU days	Emergency department visits	Home care visits
1. Erie St. Clair	284	**	**	403 (1.4)	453 (1.6)	8,404 (29.6)
2. South West	382	8 (0.0)	10 (0.0)	390 (1.0)	627 (1.6)	8,322 (21.8)
3. Waterloo Wellington	208	**	**	223 (1.1)	265 (1.3)	4,302 (20.7)
4. Hamilton Niagara Haldimand Brant	571	14 (0.0)	27 (0.0)	949 (1.7)	1,031 (1.8)	12,162 (21.3)
5. Central West	179	**	**	229 (1.3)	243 (1.4)	3,712 (20.7)
6. Mississauga Halton	319	9 (0.0)	6 (0.0)	521 (1.6)	385 (1.2)	7,208 (22.6)
7. Toronto Central	385	7 (0.0)	16 (0.0)	495 (1.3)	657 (1.7)	10,295 (26.7)
8. Central	528	15 (0.0)	21 (0.0)	892 (1.7)	742 (1.4)	11,394 (21.6)
9. Central East	536	7 (0.0)	19 (0.0)	458 (0.9)	833 (1.6)	14,355 (26.8)
10. South East	221	**	8 (0.0)	75 (0.3)	338 (1.5)	4,815 (21.8)
11. Champlain	412	**	8 (0.0)	406 (1.0)	792 (1.9)	9,513 (23.1)
12. North Simcoe Muskoka	164	**	**	216 (1.3)	378 (2.3)	2,725 (16.6)
13. North East	317	**	**	467 (1.5)	923 (2.9)	6,383 (20.1)
14. North West	96	**	0 (0.0)	48 (0.5)	260 (2.7)	1,822 (19.0)
Ontario	**4,602**	**81 (0.0)**	**132 (0.0)**	**5,772 (1.3)**	**7,927 (1.7)**	**105,412 (22.9)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Colon Cancer Surgery Cohort.

Findings

- On average, patients in the Colon Cancer Surgery Cohort required 1.3 intensive care unit (ICU) days, 1.7 emergency department (ED) visits, and 22.9 home care visits in the 24 months surrounding their definitive surgery.
- The average number of ICU days among patients in the study cohort varied across Local Health Integration Networks (LHINs). These ranged from a low of 0.3 ICU days per patient among those residing in the South East LHIN to a high of 1.7 ICU days per patient among those living in the Hamilton Niagara Haldimand Brant and Central LHINs at the time of their diagnosis.

Exhibit 4.7b **Rectal cancer**

Health services received by men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Rectal Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*				
		Stoma reversal	Percutaneous abscess drainage	ICU days	Emergency department visits	Home care visits
1. Erie St. Clair	67	**	0 (0.0)	65 (1.0)	89 (1.3)	2,219 (33.1)
2. South West	146	15 (0.1)	**	130 (0.9)	219 (1.5)	4,070 (27.9)
3. Waterloo Wellington	80	6 (0.1)	**	94 (1.2)	108 (1.4)	2,704 (33.8)
4. Hamilton Niagara Haldimand Brant	171	24 (0.1)	**	373 (2.2)	288 (1.7)	6,231 (36.4)
5. Central West	41	6 (0.1)	**	10 (0.2)	34 (0.8)	1,492 (36.4)
6. Mississauga Halton	75	9 (0.1)	**	127 (1.7)	77 (1.0)	1,871 (24.9)
7. Toronto Central	83	10 (0.1)	**	131 (1.6)	102 (1.2)	3,122 (37.6)
8. Central	131	17 (0.1)	**	163 (1.2)	152 (1.2)	3,883 (29.6)
9. Central East	147	11 (0.1)	**	205 (1.4)	240 (1.6)	6,093 (41.4)
10. South East	68	10 (0.1)	6 (0.1)	29 (0.4)	96 (1.4)	2,197 (32.3)
11. Champlain	116	**	**	64 (0.6)	224 (1.9)	3,820 (32.9)
12. North Simcoe Muskoka	42	**	**	56 (1.3)	57 (1.4)	1,506 (35.9)
13. North East	81	6 (0.1)	**	102 (1.3)	292 (3.6)	2,388 (29.5)
14. North West	29	**	0 (0.0)	25 (0.9)	92 (3.2)	1,136 (39.2)
Ontario	**1,277**	**126 (0.1)**	**37 (0.0)**	**1,574 (1.2)**	**2,070 (1.6)**	**42,732 (33.5)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Rectal Cancer Surgery Cohort.

Findings

- On average, patients in the Rectal Cancer Surgery Cohort required 1.2 intensive care unit (ICU) days, 1.6 emergency department (ED) visits, and 33.5 home care visits in the 24 months surrounding their definitive surgery. While utilization rates for ICU days and ED visits were similar to those observed among patients with colon cancer, the use of home care was much higher among patients with rectal cancer.
- The average number of ED visits among patients in the study cohort varied substantially by patients' Local Health Integration Network (LHIN) of residence. In the 24 months surrounding their definitive surgery, those living in the Central West LHIN at the time of diagnosis averaged just under one ED visit per person; those residing in the North East had 3.6 ED visits, on average.

Exhibit 4.7c **Colon cancer**

Consultations and services received by men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Colon Cancer Surgery Cohort *number*	Radiation oncology		Radiation therapy planning[1]		Medical oncology	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	284	11.3	1.1	5.6	1.0	63.0	1.0
2. South West	382	8.6	1.0	5.5	1.0	45.0	1.1
3. Waterloo Wellington	208	11.5	1.2	5.8	1.0	44.7	1.2
4. Hamilton Niagara Haldimand Brant	571	13.3	1.0	8.1	1.0	38.7	1.1
5. Central West	179	8.9	1.1	6.7	1.2	59.2	1.2
6. Mississauga Halton	319	10.0	1.1	7.2	1.0	48.9	1.2
7. Toronto Central	385	12.5	1.1	7.5	1.2	47.0	1.1
8. Central	528	11.9	1.1	7.0	1.1	43.2	1.2
9. Central East	536	9.9	1.2	6.5	1.1	40.3	1.2
10. South East	221	9.5	1.2	5.9	1.2	39.8	1.2
11. Champlain	412	22.8	1.2	10.7	1.2	58.7	1.1
12. North Simcoe Muskoka	164	5.5	1.0	**	**	58.5	1.3
13. North East	318	8.8	1.0	5.7	1.1	49.4	1.1
14. North West	96	13.5	1.0	7.3	1.0	36.5	1.1
Ontario	**4,603**	**11.8**	**1.1**	**6.9**	**1.1**	**47.1**	**1.1**

LHIN of patient residence	Colon Cancer Surgery Cohort *number*	Chemotherapy		General surgery	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit[3]	Average[2] # visits per patient
1. Erie St. Clair	284	35.9	17.5	94.0	7.2
2. South West	382	34.6	16.9	92.1	6.4
3. Waterloo Wellington	208	38.0	19.7	88.0	5.6
4. Hamilton Niagara Haldimand Brant	571	31.9	18.4	97.9	6.6
5. Central West	179	45.3	22.9	90.5	6.3
6. Mississauga Halton	319	38.2	21.8	98.1	6.9
7. Toronto Central	385	35.1	18.5	95.6	7.3
8. Central	528	38.6	21.5	98.3	7.1
9. Central East	536	41.2	18.1	96.3	6.4
10. South East	221	31.2	17.6	71.5	4.7
11. Champlain	412	34.5	17.0	97.1	5.8
12. North Simcoe Muskoka	164	32.9	14.6	98.2	5.8
13. North East	318	31.1	14.5	87.4	6.7
14. North West	96	34.4	22.6	91.7	6.2
Ontario	**4,603**	**36.0**	**18.7**	**93.9**	**6.5**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Please refer to the Introduction at the beginning of this chapter for an explanation of radiation therapy planning.

2 Denominator includes only patients in the Colon Cancer Surgery Cohort who had at least one consultation, session or visit.

3 Visits include assessments, consultations and counselling.

Exhibit 4.7c (cont'd)
Colon cancer

Consultations and services received by men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Findings

- Patients in the Colon Cancer Surgery Cohort visited a general surgeon more than six times, on average, in the 24 months surrounding their definitive surgery.
- Approximately 47 percent of patients in the study cohort visited a medical oncologist, and 36 percent underwent chemotherapy in the 24 months surrounding their definitive surgery.
- Radiation therapy was used less often than chemotherapy among patients in the study cohort.
- The proportion of colon cancer surgery patients who received a consultation with a radiation oncologist varied from under six percent of those living in the North Simcoe Muskoka Local Health Integration Network (LHIN) at the time of diagnosis to 23 percent of those residing in the Champlain LHIN.

Exhibit 4.7c **Rectal cancer**

Consultations and services received by men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Rectal Cancer Surgery Cohort *number*	Radiation oncology		Radiation therapy planning[1] before surgery		Radiation therapy planning[1] after surgery	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who received service	Average[2] # sessions per patient
1. Erie St. Clair	67	82.1	1.1	25.4	1.1	50.7	1.1
2. South West	146	65.1	1.1	9.6	1.0	37.0	1.1
3. Waterloo Wellington	80	61.3	1.1	10.0	1.0	36.3	1.1
4. Hamilton Niagara Haldimand Brant	171	56.7	1.0	14.0	1.1	27.5	1.0
5. Central West	41	58.5	1.0	31.7	1.2	26.8	1.1
6. Mississauga Halton	75	65.3	1.1	32.0	1.1	25.3	1.1
7. Toronto Central	83	63.9	1.1	24.1	1.2	24.1	1.2
8. Central	131	59.5	1.1	34.4	1.0	19.1	1.1
9. Central East	147	60.5	1.1	23.1	1.0	25.2	1.1
10. South East	68	66.2	1.0	11.8	1.0	25.0	1.1
11. Champlain	116	79.3	1.1	39.7	1.0	22.4	1.1
12. North Simcoe Muskoka	42	73.8	1.0	19.0	1.1	26.2	1.4
13. North East	81	72.8	1.1	11.1	1.1	40.7	1.0
14. North West	29	51.7	1.1	20.7	1.0	44.8	1.0
Ontario	**1,277**	**65.1**	**1.1**	**21.6**	**1.1**	**29.4**	**1.1**

LHIN of patient residence	Rectal Cancer Surgery Cohort *number*	Medical oncology		Chemotherapy		General surgery	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit[3]	Average[2] # visits per patient
1. Erie St. Clair	67	85.1	1.1	74.6	16.1	98.5	8.8
2. South West	146	46.6	1.3	47.3	15.2	91.8	7.8
3. Waterloo Wellington	80	55.0	1.1	53.8	18.2	80.0	6.8
4. Hamilton Niagara Haldimand Brant	171	44.4	1.1	36.3	15.0	98.8	9.2
5. Central West	41	61.0	1.3	68.3	21.7	87.8	8.1
6. Mississauga Halton	75	73.3	1.2	60.0	24.6	94.7	9.0
7. Toronto Central	83	47.0	1.1	50.6	23.1	94.0	9.8
8. Central	131	47.3	1.3	58.8	26.9	99.2	8.1
9. Central East	147	47.6	1.2	53.7	22.5	95.2	9.3
10. South East	68	58.8	1.1	55.9	16.4	79.4	5.0
11. Champlain	116	62.1	1.1	55.2	13.4	99.1	7.4
12. North Simcoe Muskoka	42	73.8	1.4	59.5	21.1	100.0	7.8
13. North East	81	64.2	1.2	56.8	13.7	84.0	8.3
14. North West	29	34.5	1.0	55.2	28.8	89.7	8.5
Ontario	**1,277**	**54.9**	**1.2**	**53.6**	**19.3**	**93.4**	**8.3**

1 Please refer to the Introduction at the beginning of this chapter for an explanation of radiation therapy planning.

2 Denominator includes only patients in the Rectal Cancer Surgery Cohort who had at least one consultation, session or visit.

3 Visits include assessments, consultations and counselling.

Exhibit 4.7c (cont'd)
Rectal cancer

Consultations and services received by men and women in the Rectal Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Findings

- On average, patients in the Rectal Cancer Surgery Cohort visited a general surgeon eight times in the 24 months surrounding their definitive surgery.
- Approximately 65 percent of patients who had surgery for their rectal cancer also had a radiation oncology consultation during this time period. Just over half (55 percent) had a consultation with a medical oncologist.
- The percentage of rectal cancer patients who underwent planning for pre-operative radiation therapy varied from 10 percent among those living in the South West and Waterloo Wellington Local Health Integration Networks (LHINs) to 40 percent of those residing in the Champlain LHIN.

Exhibit 4.8a
Colon cancer

Diagnostic services received by men and women in the Colon Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Colon Cancer/No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*							
		Abdomen				Chest			
		Ultrasound	CT Scan	MRI	Transrectal ultrasound	X-ray	CT scan	Lower GI endoscopy	Barium enema
1. Erie St. Clair	42	32 (0.8)	48 (1.1)	0 (0.0)	**	68 (1.6)	13 (0.3)	45 (1.1)	**
2. South West	62	37 (0.6)	69 (1.1)	**	**	75 (1.2)	20 (0.3)	53 (0.9)	**
3. Waterloo Wellington	33	23 (0.7)	38 (1.2)	0 (0.0)	**	64 (1.9)	19 (0.6)	35 (1.1)	**
4. Hamilton Niagara Haldimand Brant	71	51 (0.7)	62 (0.9)	**	**	109 (1.5)	14 (0.2)	81 (1.1)	**
5. Central West	14	15 (1.1)	25 (1.8)	0 (0.0)	**	32 (2.3)	9 (0.6)	14 (1.0)	0 (0.0)
6. Mississauga Halton	42	38 (0.9)	71 (1.7)	**	**	70 (1.7)	30 (0.7)	41 (1.0)	**
7. Toronto Central	70	74 (1.1)	94 (1.3)	6 (0.1)	13 (0.2)	90 (1.3)	43 (0.6)	89 (1.3)	0 (0.0)
8. Central	72	84 (1.2)	124 (1.7)	0 (0.0)	12 (0.2)	148 (2.1)	60 (0.8)	67 (0.9)	0 (0.0)
9. Central East	65	49 (0.8)	74 (1.1)	14 (0.2)	**	92 (1.4)	33 (0.5)	70 (1.1)	0 (0.0)
10. South East	39	21 (0.5)	42 (1.1)	0 (0.0)	**	61 (1.6)	15 (0.4)	20 (0.5)	0 (0.0)
11. Champlain	63	56 (0.9)	79 (1.3)	0 (0.0)	**	150 (2.4)	31 (0.5)	59 (0.9)	**
12. North Simcoe Muskoka	27	20 (0.7)	29 (1.1)	0 (0.0)	0 (0.0)	32 (1.2)	4 (0.1)	14 (0.5)	0 (0.0)
13. North East	34	25 (0.7)	29 (0.9)	**	0 (0.0)	39 (1.1)	19 (0.6)	39 (1.1)	**
14. North West	18	8 (0.4)	9 (0.5)	0 (0.0)	**	13 (0.7)	5 (0.3)	10 (0.6)	0 (0.0)
Ontario	**652**	**533 (0.8)**	**793 (1.2)**	**30 (0.0)**	**53 (0.1)**	**1,043 (1.6)**	**315 (0.5)**	**637 (1.0)**	**9 (0.0)**

** Cell value suppressed for reasons of privacy and confidentiality.

[1] Denominator includes all patients in the Colon Cancer/No Surgery Cohort.

Findings

- Chest X-rays, abdominal computed tomography (CT) scans and endoscopy of the lower gastrointestinal (GI) tract were the most frequently used diagnostic tests among patients in the Colon Cancer/No Surgery Cohort.
- On average, patients in this study cohort had approximately one abdominal CT scan, two chest X-rays and one endoscopic scan of the lower GI tract during the 24 months surrounding their diagnosis.
- There was little evidence that patients with colon cancer who did not have surgery underwent magnetic resonance imaging (MRI), transrectal ultrasound or barium enema during the 24 months surrounding their diagnosis.

Exhibit 4.8a **Rectal cancer**

Diagnostic services received by men and women in the Rectal Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after their diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Rectal Cancer/No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*							
		Abdomen				Chest			
		Ultrasound	CT Scan	MRI	Transrectal ultrasound	X-ray	CT scan	Lower GI endoscopy	Barium enema
1. Erie St. Clair	18	10 (0.6)	20 (1.1)	0 (0.0)	**	38 (2.1)	12 (0.7)	22 (1.2)	0 (0.0)
2. South West	29	20 (0.7)	31 (1.1)	0 (0.0)	**	52 (1.8)	11 (0.4)	61 (2.1)	**
3. Waterloo Wellington	18	**	20 (1.1)	**	**	19 (1.1)	**	31 (1.7)	0 (0.0)
4. Hamilton Niagara Haldimand Brant	45	30 (0.7)	58 (1.3)	0 (0.0)	**	81 (1.8)	10 (0.2)	70 (1.6)	0 (0.0)
5. Central West	7	**	8 (1.1)	**	**	6 (0.9)	**	17 (2.4)	0 (0.0)
6. Mississauga Halton	22	9 (0.4)	26 (1.2)	**	**	22 (1.0)	9 (0.4)	32 (1.5)	**
7. Toronto Central	48	35 (0.7)	70 (1.5)	7 (0.1)	20 (0.4)	75 (1.6)	32 (0.7)	80 (1.7)	0 (0.0)
8. Central	42	30 (0.7)	52 (1.2)	6 (0.1)	**	61 (1.5)	19 (0.5)	51 (1.2)	**
9. Central East	31	19 (0.6)	53 (1.7)	9 (0.3)	11 (0.4)	39 (1.3)	20 (0.6)	66 (2.1)	0 (0.0)
10. South East	25	14 (0.6)	26 (1.0)	**	**	32 (1.3)	7 (0.3)	30 (1.2)	0 (0.0)
11. Champlain	29	13 (0.4)	31 (1.1)	**	**	64 (2.2)	11 (0.4)	50 (1.7)	0 (0.0)
12. North Simcoe Muskoka	16	12 (0.8)	17 (1.1)	**	**	15 (0.9)	**	19 (1.2)	**
13. North East	20	15 (0.8)	26 (1.3)	**	**	23 (1.2)	14 (0.7)	33 (1.7)	0 (0.0)
14. North West	12	12 (1.0)	13 (1.1)	**	**	26 (2.2)	**	22 (1.8)	**
Ontario	**362**	**227 (0.6)**	**451 (1.2)**	**36 (0.1)**	**66 (0.2)**	**553 (1.5)**	**162 (0.4)**	**584 (1.6)**	**6 (0.0)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Rectal Cancer/No Surgery Cohort.

Findings

- The most frequently used diagnostic tests among patients in the Rectal Cancer/No Surgery Cohort were: endoscopy of the lower gastrointestinal tract (flexible sigmoidoscopy or colonoscopy); chest X-rays and computed tomography (CT).
- On average, each patient in this study cohort had approximately one abdominal CT scan, two chest X-rays and two lower GI tract endoscopies during the 24 months surrounding their diagnosis.
- There was little evidence that patients who did not undergo surgery for rectal cancer underwent magnetic resonance imaging (MRI), transrectal ultrasound or barium enema for diagnostic purposes during the 24 months surrounding their diagnosis.

Exhibit 4.8b **Colon cancer**

Health services received by men and women in the Colon Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after their diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Colon Cancer/No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*				
		Stoma reversal	Percutaneous abscess drainage	ICU days	Emergency department visits	Home care visits
1. Erie St. Clair	42	0 (0.0)	0 (0.0)	14 (0.3)	71 (1.7)	516 (12.3)
2. South West	62	0 (0.0)	0 (0.0)	16 (0.3)	95 (1.5)	625 (10.1)
3. Waterloo Wellington	33	**	0 (0.0)	**	45 (1.4)	497 (15.1)
4. Hamilton Niagara Haldimand Brant	71	0 (0.0)	0 (0.0)	59 (0.8)	172 (2.4)	870 (12.3)
5. Central West	14	0 (0.0)	**	25 (1.8)	16 (1.1)	191 (13.6)
6. Mississauga Halton	42	0 (0.0)	0 (0.0)	19 (0.5)	49 (1.2)	624 (14.9)
7. Toronto Central	70	**	**	27 (0.4)	116 (1.7)	1,156 (16.5)
8. Central	72	0 (0.0)	**	102 (1.4)	136 (1.9)	843 (11.7)
9. Central East	65	0 (0.0)	0 (0.0)	26 (0.4)	122 (1.9)	692 (10.6)
10. South East	39	0 (0.0)	0 (0.0)	6 (0.2)	66 (1.7)	930 (23.8)
11. Champlain	63	0 (0.0)	**	27 (0.4)	155 (2.5)	1,293 (20.5)
12. North Simcoe Muskoka	27	0 (0.0)	0 (0.0)	**	75 (2.8)	144 (5.3)
13. North East	34	0 (0.0)	0 (0.0)	85 (2.5)	112 (3.3)	378 (11.1)
14. North West	18	0 (0.0)	0 (0.0)	12 (0.7)	25 (1.4)	97 (5.4)
Ontario	**652**	**	**6 (0.0)**	**425 (0.7)**	**1,255 (1.9)**	**8,856 (13.6)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Colon Cancer/No Surgery Cohort.

Findings

- Although they did not have surgery for their colon cancer, patients in the Colon Cancer/No Surgery Cohort still made substantial use of health services in the 24 months surrounding their diagnosis. These included: 0.7 intensive care unit (ICU) days per patient, on average; 1.9 emergency department (ED) visits; and 13.6 home care visits. ED utilization was slightly higher in this group than in the Colon Cancer Surgery Cohort.
- There was some variation in the use of these health services among patients who resided in different Local Health Integration Networks (LHINs) at the time of their diagnosis. For example, home care use for patients in the Colon Cancer/No Surgery Cohort varied from just over five visits per person among patients living in the North West and North Simcoe Muskoka LHINs to more than 20 visits per person among those who resided in the South East and Champlain LHINs.

Exhibit 4.8b **Rectal cancer**

Health services received by men and women in the Rectal Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after their diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Rectal Cancer/No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*				
		Stoma reversal	Percutaneous abscess drainage	ICU days	Emergency department visits	Home care visits
1. Erie St. Clair	18	0 (0.0)	0 (0.0)	11 (0.6)	23 (1.3)	97 (5.4)
2. South West	29	0 (0.0)	0 (0.0)	**	39 (1.3)	331 (11.4)
3. Waterloo Wellington	18	0 (0.0)	0 (0.0)	8 (0.4)	22 (1.2)	275 (15.3)
4. Hamilton Niagara Haldimand Brant	45	0 (0.0)	**	**	89 (2.0)	1,560 (34.7)
5. Central West	7	0 (0.0)	0 (0.0)	0 (0.0)	**	12 (1.7)
6. Mississauga Halton	22	0 (0.0)	0 (0.0)	6 (0.3)	26 (1.2)	160 (7.3)
7. Toronto Central	48	0 (0.0)	0 (0.0)	107 (2.2)	62 (1.3)	737 (15.4)
8. Central	42	0 (0.0)	0 (0.0)	90 (2.1)	44 (1.0)	1,037 (24.7)
9. Central East	31	0 (0.0)	0 (0.0)	0 (0.0)	46 (1.5)	592 (19.1)
10. South East	25	0 (0.0)	0 (0.0)	0 (0.0)	27 (1.1)	423 (16.9)
11. Champlain	29	0 (0.0)	0 (0.0)	6 (0.2)	66 (2.3)	1,177 (40.6)
12. North Simcoe Muskoka	16	0 (0.0)	0 (0.0)	0 (0.0)	**	212 (13.3)
13. North East	20	0 (0.0)	0 (0.0)	11 (0.6)	66 (3.3)	514 (25.7)
14. North West	12	0 (0.0)	0 (0.0)	**	21 (1.8)	416 (34.7)
Ontario	**362**	**0 (0.0)**	**	**250 (0.7)**	**552 (1.5)**	**7,543 (20.8)**

** Cell value suppressed for reasons of privacy and confidentiality.

[1] Denominator includes all patients in the Rectal Cancer/No Surgery Cohort.

Findings

- Patients in the Rectal Cancer/No Surgery Cohort made substantial use of health services in the 24 months surrounding their diagnosis. These included: 0.7 intensive care unit (ICU) days per patient, on average; 1.5 emergency department (ED) visits; and 20.8 home care visits.
- Use of home care among patients in this study cohort varied widely according to the Local Health Integration Networks (LHINs) of patient residence. Those who lived in the Central West LHIN at the time of diagnosis had only 1.7 home care visits per person in the 24 months surrounding their diagnosis; those who resided in the Champlain LHIN averaged over 40 visits per patient.

Exhibit 4.8c **Colon cancer**

Consultations and services received by men and women in the Colon Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after their diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Colon Cancer/No Surgery Cohort *number*	Radiation oncology		Radiation therapy planning[1]		Medical oncology	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	42	**	**	**	**	35.7	1.0
2. South West	63	**	**	**	**	11.1	1.4
3. Waterloo Wellington	33	**	**	**	**	33.3	1.3
4. Hamilton Niagara Haldimand Brant	72	**	**	**	**	15.3	1.0
5. Central West	15	**	**	**	**	40.0	1.0
6. Mississauga Halton	42	**	**	**	**	38.1	1.6
7. Toronto Central	70	10.0	1.0	**	**	30.0	1.2
8. Central	73	8.2	1.0	**	**	39.7	1.4
9. Central East	66	**	**	**	**	18.2	1.3
10. South East	39	**	**	**	**	28.2	1.3
11. Champlain	64	12.5	1.4	**	**	20.3	1.2
12. North Simcoe Muskoka	27	**	**	**	**	29.6	1.4
13. North East	35	**	**	**	**	20.0	1.0
14. North West	18	**	**	**	**	**	**
Ontario	**662**	**7.3**	**1.3**	**4.4**	**1.4**	**25.8**	**1.3**

LHIN of patient residence	Colon Cancer/No Surgery Cohort *number*	Chemotherapy		General surgery	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit[3]	Average[2] # visits per patient
1. Erie St. Clair	42	14.3	18.8	59.5	4.5
2. South West	63	**	**	54.0	4.1
3. Waterloo Wellington	33	**	**	60.6	3.6
4. Hamilton Niagara Haldimand Brant	72	12.5	16.0	62.5	3.7
5. Central West	15	**	**	33.3	6.2
6. Mississauga Halton	42	26.2	20.5	52.4	4.3
7. Toronto Central	70	21.4	8.4	61.4	3.8
8. Central	73	27.4	10.4	60.3	6.1
9. Central East	66	12.1	24.5	69.7	4.5
10. South East	39	17.9	16.9	23.1	1.8
11. Champlain	64	10.9	9.0	62.5	4.6
12. North Simcoe Muskoka	27	**	**	66.7	2.6
13. North East	35	**	**	62.9	4.0
14. North West	18	**	**	66.7	2.4
Ontario	**662**	**15.3**	**14.9**	**58.2**	**4.2**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Please refer to the Introduction at the beginning of this chapter for an explanation of radiation therapy planning.

2 Denominator includes only patients in the Colon Cancer/No Surgery Cohort who had at least one consultation, session or visit.

3 Visits include assessments, consultations and counselling.

Exhibit 4.8c (cont'd)
Colon cancer

Consultations and services received by men and women in the Colon Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

Findings

- On average, patients in the Colon Cancer/No Surgery Cohort visited a general surgeon four times during the 24 months surrounding their diagnosis date.
- Among patients in this cohort, 26 percent saw a medical oncologist during this time period, and 15 percent received chemotherapy as part of their treatment.
- Use of radiation therapy among patients who did not undergo surgery for their colon cancer was rare. Only seven percent of patients in the study cohort visited a radiation oncologist in the 24 months surrounding their diagnosis date, and just four percent underwent radiation therapy planning.

Exhibit 4.8c **Rectal cancer**

Consultations and services received by men and women in the Rectal Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after their diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Rectal Cancer/No Surgery Cohort *number*	Radiation oncology		Radiation therapy planning[1]		Medical oncology	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	18	38.9	1.1	38.9	1.1	50.0	1.0
2. South West	29	44.8	1.1	31.0	1.1	31.0	1.1
3. Waterloo Wellington	18	**	**	**	**	33.3	1.0
4. Hamilton Niagara Haldimand Brant	45	51.1	1.1	42.2	1.0	44.4	1.0
5. Central West	7	**	**	**	**	**	**
6. Mississauga Halton	22	27.3	1.2	0.0	0.0	0.0	0.0
7. Toronto Central	48	56.3	1.1	45.8	1.5	33.3	1.1
8. Central	44	40.9	1.0	31.8	1.5	13.6	1.0
9. Central East	31	58.1	1.2	51.6	1.4	32.3	1.1
10. South East	25	48.0	1.3	32.0	1.4	44.0	1.1
11. Champlain	29	55.2	1.3	44.8	1.2	34.5	1.1
12. North Simcoe Muskoka	16	**	**	**	**	**	**
13. North East	20	50.0	1.0	**	**	60.0	1.0
14. North West	12	**	**	**	**	**	**
Ontario	**365**	**45.2**	**1.2**	**35.9**	**1.4**	**33.4**	**1.1**

LHIN of patient residence	Rectal Cancer/No Surgery Cohort *number*	Chemotherapy		General surgery	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit[3]	Average[2] # visits per patient
1. Erie St. Clair	18	38.9	3.7	77.8	4.3
2. South West	29	**	**	86.2	3.6
3. Waterloo Wellington	18	38.9	7.1	66.7	2.8
4. Hamilton Niagara Haldimand Brant	45	35.6	12.3	88.9	4.1
5. Central West	7	**	**	**	**
6. Mississauga Halton	22	27.3	8.3	77.3	3.9
7. Toronto Central	48	27.1	15.5	75.0	4.6
8. Central	44	25.0	12.8	79.5	3.7
9. Central East	31	32.3	12.0	83.9	5.2
10. South East	25	28.0	5.0	64.0	3.4
11. Champlain	29	31.0	5.8	72.4	3.3
12. North Simcoe Muskoka	16	**	**	93.8	4.1
13. North East	20	**	**	70.0	5.5
14. North West	12	**	**	91.7	3.7
Ontario	**365**	**29.0**	**10.4**	**78.4**	**4.0**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Please refer to the Introduction at the beginning of this chapter for an explanation of radiation therapy planning.

2 Denominator includes only patients in the Rectal Cancer/No Surgery Cohort who had at least one consultation, session or visit.

3 Visits include assessments, consultations and counselling.

Findings

- The use of radiation therapy was much higher among patients in the Rectal Cancer/No Surgery Cohort compared with those in the Colon Cancer/No Surgery Cohort. Approximately 45 percent of patients with rectal cancer saw a radiation oncologist in the 24 months surrounding their diagnosis date; 36 percent underwent radiation therapy planning.
- On average, patients with rectal cancer who did not have surgery still visited a general surgeon four times during the 24 months surrounding their diagnosis date; 33 percent saw a medical oncologist; and 29 percent received chemotherapy as part of their treatment.

Discussion and Conclusions

Summary of findings and implications for clinical practice

The great majority of Ontario men and women newly-diagnosed with colorectal cancer in 2003/04 underwent surgery related to their disease within a year of diagnosis (87 percent of those with colon cancer and 78 percent of those with rectal cancer). Approximately 15 percent of these procedures did not involve an actual resection of bowel and thus were unlikely to be curative.

For both colon and rectal cancer, age-standardized incidence rates in Ontario were higher for men than for women. This difference was particularly striking for rectal cancer, where the incidence among men (20.5 cases per 100,000 population) was much higher than it was among women (13.7 cases per 100,000 population). We observed dramatic increases in colon cancer incidence after age 64 years in both men and women.

The age-standardized proportions of men and women treated with surgery for colorectal cancer were similar. As well, the age-standardized proportion of patients treated with surgery varied little by age group, neighbourhood income, community size and the Local Health Integration Network (LHIN) of patient residence at the time of diagnosis. These results suggest that equitable access to surgical services existed across the province during the study period. However, limitations in the available data meant we were unable to comment on the timeliness of surgery.

The measures of care assessed in this chapter were relatively consistent by patient sex, age group, neighbourhood income and community size. We noted little variation at the LHIN level in the types of surgical procedures and related health services provided to patients newly-diagnosed with colon cancer. However, this was not the case for patients with rectal cancer.[4]

For example, at the LHIN level, the percentage of patients with rectal cancer who underwent resection with permanent stoma ranged from 16 percent to 43 percent; the proportion of surgical patients who saw a radiation oncologist ranged from 52 percent to 82 percent; and the proportion of surgical patients who underwent planning for pre-operative radiation ranged from 10 percent to 40 percent. Such LHIN-level variations likely reflect differences in treatment approaches to rectal cancer that existed at the time (and may still exist).

We found that general surgeons with no self-reported sub-specialty treated 74 percent of patients with colon cancer and 68 percent of patients with rectal cancer. Surgical oncologists treated only a small percentage of cases in both our study cohorts. The majority of procedures for colon cancer (74 percent) and for rectal cancer (69 percent) took place in community hospital settings.

There were no major differences in the types of surgery provided by different types of surgeons or within different types of hospitals (community vs. academic). Indeed, such observations have been noted previously.[5,6]

Most surgical admissions for colon cancer (86 percent) occurred in the LHINs where patients were living at the time of their diagnosis; similarly, most surgical admissions for rectal cancer (83 percent) occurred in the LHINs of patient residence.

We found that the care of patients with colorectal cancer was resource-intensive, involving numerous diagnostic tests, procedures and care delivered by a variety of physician groups. Among patients with rectal cancer, there was little use of pelvic magnetic resonance imaging (MRI) or transrectal ultrasound. This was the case even though such tests are helpful in identifying patients with Stage II and Stage III tumours who are candidates for pre-operative radiation therapy,[7] and even though pre-operative imaging of the pelvis has recently become the standard of care for rectal cancer.

We found that patients with colorectal cancer who did not undergo major surgery still used considerable surgical and other health care resources.

Implications for policy and planning

The majority of care for Ontario patients newly-diagnosed with colorectal cancer in 2003/04 was provided in community hospitals and by general surgeons with no self-identified sub-specialty. We believe that quality improvement programs should be designed so that they reach all key providers of colorectal cancer surgery; provincial initiatives should engage surgeons working not only in academic but also in community hospitals; and finally, such programs should include surgeons practicing in all Local Health Integration Networks (LHINs) throughout the province.

We noted few variations in how patients with colorectal cancer were treated based on their age, neighbourhood income, community size and their LHIN of residence at the time they were diagnosed. The variations we did observe related largely to the care of patients with rectal cancer: for example, we observed considerable disparity from LHIN to LHIN in the type of definitive surgery that these patients received. We also noted variations between LHINs in whether or not patients with rectal cancer were seen by a radiation oncologist, and in whether or not they underwent pre-operative radiation planning.

There may be an opportunity for LHIN-based quality improvement efforts that focus on standardizing the surgical approach to patients with rectal cancer.

One health technology innovation in the area of colorectal cancer surgery deserves comment. Increasingly, minimally invasive abdominal surgery (laparoscopic surgery) is being used to treat patients with colorectal cancer.[8] The appropriateness of this approach for each individual patient is dependent on numerous factors. These include the qualifications and expertise of the treating surgeon, the availability of resources such as specialized surgical instruments, and the stage and location of the patient's tumour. We believe it would be useful to assess the uptake of laparoscopic surgery for colorectal cancer in the province.

Future research

Additional research and other actions are needed to improve the completeness and quality of data on cancer patients contained in the Ontario Cancer Registry (OCR). Cancer stage and comorbidity information would allow for more thorough analysis and more useful inference regarding the quality of care and homogeneity of services across Ontario's Local Health Integration Networks (LHINs).

More research is also needed to examine the burden that colorectal cancer will place on the health care system, given both the growth in Ontario's population and the aging of its citizens.

References

1. Canadian Cancer Society/National Cancer Institute of Canada. *Canadian Cancer Statistics 2007*. Toronto: CCS/NCIC; 2007.
2. Nelson H, Petrelli N, Carlin A, Couture J, Fleshman J, Guillem J, et al. Guidelines 2000 for colon and rectal cancer surgery. *J Natl Cancer Inst* 2001; 93(8):583–96.
3. Simunovic M, Stewart L, Zwaal C, Johnston M, Diagnostic Imaging Guidelines Panel. *Cross-Sectional Imaging in Colorectal Cancer: Recommendations Report.* Toronto: Cancer Care Ontario; 2006. Accessed March 31, 2008 at http://www.cancercare.on.ca/pdf/pebcdicrc.pdf.
4. Paszat LF, Brundage MD, Groome PA, Schulze K, Mackillop WJ. A population-based study of rectal cancer: permanent colostomy as an outcome. *Int J Radiat Oncol Biol Phys* 1999; 45(5):1185–91.
5. Simunovic M, To T, Baxter N, Balshem A, Ross E, Cohen Z, et al. Hospital procedure volume and teaching status do not influence treatment and outcome measures of rectal cancer surgery in a large general population. *J Gastrointest Surg* 2000; 4(3):324–30.
6. Simunovic M, Rempel E, Theriault ME, Coates A, Whelan T, Holowaty E, et al. Influence of hospital characteristics on operative death and survival of patients after major cancer surgery in Ontario. *Can J Surg* 2006; 49(4):251–8.
7. Figueredo A, Zuraw L, Wong RK, Agboola O, Rumble RB, Tandan V, et al. The use of preoperative radiotherapy in the management of patients with clinically resectable rectal cancer: a practice guideline. *BMC Med* 2003; 1:1.
8. Clinical Outcomes of Surgical Therapy Study Group. A comparison of laparoscopically assisted and open colectomy for colon cancer. *N Engl J Med* 2004; 350(20):2050–9.

INSIDE

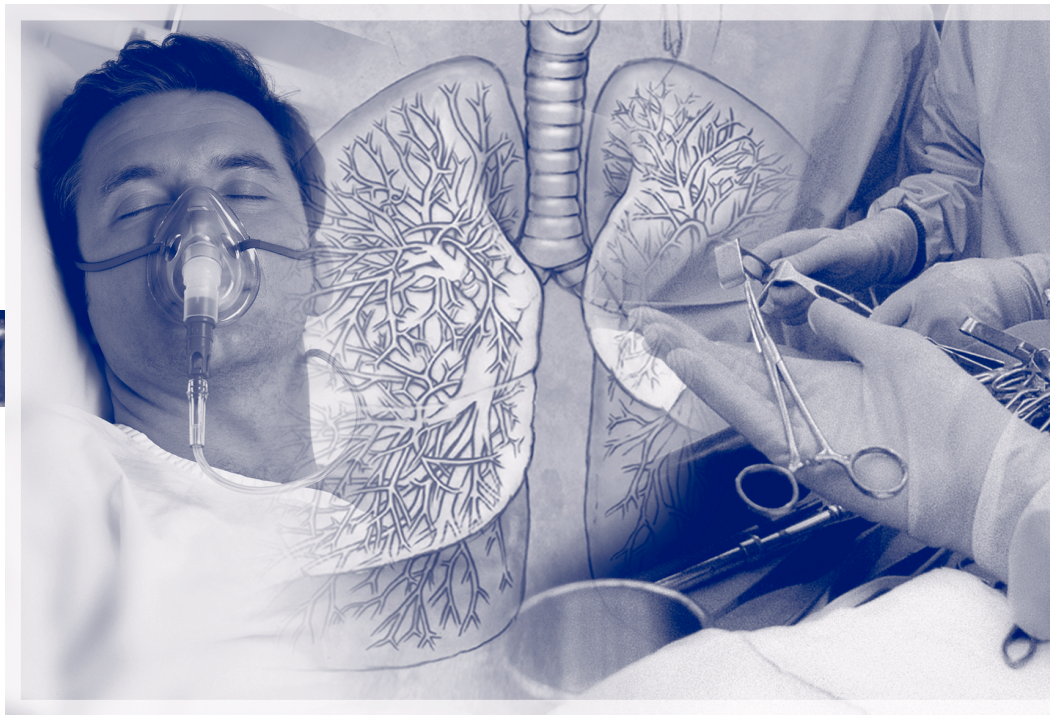
5

Chapter

Surgery for Lung Cancer

Gail Darling, MD, FRCSC,* Rahima Nenshi, MD,*
Susan E. Schultz, MA, MSc, Nadia Gunraj, BSc, MPH,
Andrew S. Wilton, MSc, Marko Simunovic, MD, MPH, FRCSC,
and David R. Urbach, MD, MSc, FRCSC, FACS

*Gail Darling and Rahima Nenshi contributed equally to this chapter.



Executive Summary

Issue

Lung cancer is the leading cause of death due to cancer in Canada.

Study

This chapter provides a snapshot of treatment patterns for men and women newly-diagnosed with lung cancer in Ontario between April 1, 2003 and March 31, 2004. We focus on the delivery of surgical care and related health services and, where possible, include data regarding patient factors (i.e., age, socioeconomic status, place of residence) and provider factors (i.e., surgical specialty and type of hospital delivering services). We also assess the influence of patient and provider factors on the services provided.

Key Findings

- Sixty percent of Ontario men and women newly-diagnosed with lung cancer in 2003/04 did not undergo surgery for their disease within a year of diagnosis. The remaining 40 percent did have a surgical procedure (diagnostic, curative and/or palliative) related to their lung cancers.
- Older people newly-diagnosed with lung cancer (those age 75 years or older) were less likely to have surgery than younger people with this disease.
- A majority (81 percent) of operations for lung cancer were done in the Local Health Integration Network (LHIN) where the patients resided at the time they were diagnosed. The Toronto Central LHIN appeared to serve as a referral region for lung cancer surgery in Ontario.
- Among the 40 percent of patients in our study cohort who underwent at least one surgical procedure for lung cancer, nearly half (47 percent) had their tumours surgically resected (removed) via lobectomy, pneumonectomy or sublobar resection.
- Just over half (54 percent) of the patients who underwent a resection for lung cancer had a lobectomy; 12 percent had a pneumonectomy; and 34 percent had a sublobar resection.
- Forty-four percent of the lung cancer surgeries in our study were performed by thoracic surgeons; 16 percent by general surgeons; and 10 percent by surgical oncologists. Other physicians (i.e., not surgeons) provided many palliative procedures to patients with lung cancer.
- The majority (61 percent) of lung cancer surgeries done in Ontario during 2003/04 were performed in community hospitals.
- There was variation across LHINs of patient residence in the use of surgery, radiation therapy and chemotherapy to treat Ontarians newly-diagnosed with lung cancer.

Implications

- **We noted variations in the use of surgical procedures and referral to specialists among lung cancer patients residing in different LHINs. More research is necessary to understand this observation.**
- **The incidence of lung cancer increases with age. As the Ontario population ages, there will be an increasing demand for health services related to the diagnosis and treatment of lung cancer. An appropriate supply of lung cancer surgeons will be required to manage these patients.**

Introduction

In Canada, lung cancer is the most common type of cancer affecting men and women; it is also the leading cause of death due to cancer in both men and women. More people die from lung cancer each year than die from breast, prostate and colorectal cancer combined. The most recently published data estimated that 23,300 Canadians (12,400 men and 10,900 women) would be diagnosed with lung cancer in 2007, and another 19,900 Canadians (11,000 men and 8,900 women) would die of this disease.[1]

While some lung cancers are diagnosed at an early stage after abnormalities show up on an imaging test, between two-thirds and three-quarters of patients with lung cancer have advanced disease at the time of diagnosis. In general, surgical resection is not performed for these late-stage lung cancers. This limits the chance for curative treatment; it also contributes to a poor prognosis for many lung cancer patients.

Since most patients who develop lung cancer are smokers, they typically have other comorbid conditions such as smoking-related heart disease and chronic lung disease. The presence of these chronic health problems limits the use of potentially curative therapy for lung cancer, including surgery.[2]

Lung cancer is divided into two major groups according to the histology (tissue type) of the tumour. These are *non-small cell lung cancer (NSCLC)* and *small cell lung cancer*. The majority of lung cancers (80 percent) are NSCLC.

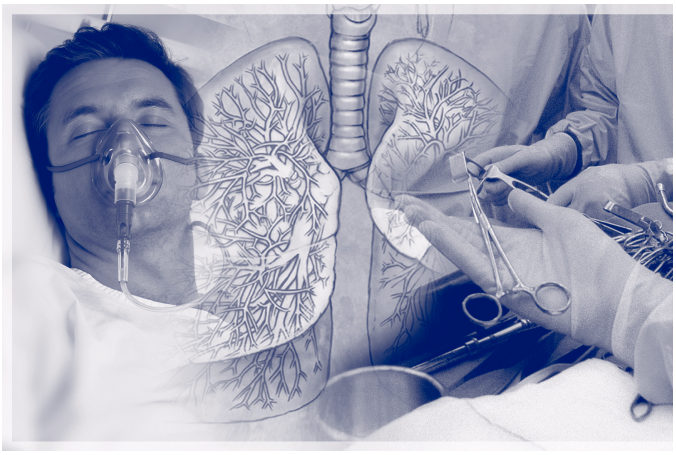
Treatment for non-small cell lung cancer (NSCLC)

All types of NSCLC (squamous cell, adenocarcinoma, large cell carcinoma, bronchoalveolar carcinoma and mixed types) are treated similarly. Only only a small minority of patients with NSCLC are diagnosed early enough for surgery to be potentially curative.[3] The choice of treatment for NSCLC depends on the stage of the disease—that is, how far the cancer has progressed at the time of diagnosis.

At one end of the spectrum are Stage I NSCLC lung cancers; these have not spread to lymph nodes or other parts of the body. At the other end of the spectrum are Stage IV NSCLC lung cancers which have already spread to distant sites in the body. Surgery is the preferred treatment for Stages I and II NSCLC, unless the patient is medically unfit to undergo a major operation. Surgery is rarely used to treat Stage III NSCLC. Stage IV patients are usually treated with palliative intent (i.e., to relieve symptoms).

Treatment for small cell lung cancer

Surgery is not generally done for small cell lung cancer; instead, most patients are treated with systemic chemotherapy, regardless of stage.



The role of surgery in the diagnosis and staging of lung cancer

Although surgery cannot cure many patients with lung cancer, surgeons play a major role in the diagnosis of lung cancer. They are also involved in providing palliative care for patients with advanced lung cancer who require surgical procedures to help manage their symptoms.

When it comes to diagnosing lung cancer, a *biopsy* (obtaining a tissue sample) is almost always the first step. This is often done via a procedure called *percutaneous biopsy* (sometimes called a *needle lung biopsy*). The procedure involves inserting a needle into the lung through the chest wall to obtain tissue samples using a computed tomography (CT) scan or X-ray for guidance. In some cases, lung cancer is diagnosed by *bronchoscopy* (inspection of the airways using a specialized type of flexible telescope).

Once lung cancer has been diagnosed, other procedures or tests are performed to determine the stage of disease. The procedures used for diagnosis and staging include: *bronchoscopy; thoracoscopy* (inspection of the chest cavity); *mediastinoscopy* (inspection of the tissues around the windpipe and surgical removal of lymph nodes via inserting a specialized rigid telescope (endoscope) through an incision in the neck); and occasionally *mediastinotomy* (surgical removal of lymph nodes near the central airways).

Surgical procedures may also be required to obtain samples of tissue and/or fluid from other parts of the patient's body—for example, enlarged lymph nodes or fluid accumulations around the lungs or heart.

Surgical procedures for removing lung cancer fall into several main categories. A *thoracotomy* involves opening the chest cavity. At that point, surgeons may perform a *lobectomy* (removing one lobe* of the affected lung); a *pneumonectomy* (removal of an entire lung); or a *sublobar resection* (removing a portion of one lobe).[1]

* There are three lobes in the right lung; the left lung has two lobes.

In some cases, both mediastinoscopy (removal of lymph nodes) and resection of the cancer by a thoracotomy are done at the same time (i.e., while the patient is under a general anesthetic). This requires immediate pathologic evaluation of the lymph nodes, since resection is only done if the tumour has not already spread. In other circumstances, the mediastinoscopy is done as a separate procedure.

Patients with advanced lung cancers may suffer from symptoms caused by accumulation of fluid around the lung (pleural effusion), or from bleeding or obstruction of their airway by a tumour. Surgical procedures such as insertion of a chest tube (thoracostomy), are used to treat pleural effusions. In some cases patients require a procedure called *pleurodesis*—the intentional creation of fibrous adhesions between the layers of the pleura to obliterate the pleural cavity. (The pleura are the thin membranes that envelop each lung and fold back to make a lining for the chest cavity.)

Symptoms caused by obstruction or bleeding in the patient's airway may be relieved by the partial removal of a tumour using instruments or a laser (via bronchoscopy).

Video-assisted thoracic surgery (VATS)

In recent years, video-assisted thoracic surgery (VATS) has become popular. A tiny camera on a tube (called a thoracoscope) is inserted through a small incision in the chest, allowing the surgeon to see portions of the lung and other structures on a video screen. By making additional small incisions, surgeons can insert other instruments and perform curative resections of small lung cancers. This method can also be used for diagnostic purposes—for example, to examine the pleural surfaces; to biopsy accessible mediastinal lymph nodes; and to treat the complications of lung cancer such as pleural effusions and empyema (infection of the chest cavity).

VATS has been advocated as a way to reduce postoperative impairment of lung function, pain, length of hospital stay and recovery time. VATS procedures were included among the surgical procedures for lung cancer studied for this Atlas *(see below).*

Surgical procedures for lung cancer included in this study

Treatment procedures

- pneumonectomy, lobar resection and sublobar resection

Palliative procedures

- thoracostomy, thoracotomy without lung resection, thoracoscopy, pleurodesis and bronchoscopy with tumour removal

Cancer staging procedures

- bronchoscopy with or without biopsy, thoracoscopy, mediastinoscopy and mediastinotomy

How the study cohorts were defined

This chapter provides detailed information about surgical services delivered to men and women in Ontario who were diagnosed with lung cancer in 2003/04.

The study population for this chapter included all Ontario men and women 20 years of age or older identified with lung cancer in the Ontario Cancer Registry (OCR) whose diagnosis date fell between April 1, 2003 and March 31, 2004. This is referred to as the **Overall Lung Cancer Cohort.**

The Overall Lung Cancer Cohort was subdivided into two pairs of smaller groups. For Exhibits 5.1 to 5.6, the Overall Lung Cancer Cohort was subdivided as follows:

- The **Lung Cancer Surgery Cohort** included all Ontario men and women 20 years of age or older identified with lung cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had lung cancer surgery within 12 months before or after their diagnosis date.
- The **Lung Cancer/No Surgery Cohort** included all Ontario men and women 20 years of age or older identified with lung cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have lung cancer surgery within 12 months before or after their diagnosis date.

For Exhibits 5.7a, b and c and also for Exhibits 5.8a, b and c, the Overall Lung Cancer Cohort was subdivided as follows:

- The **Lung Cancer Resection Cohort** included all Ontario men and women 20 years of age or older identified with lung cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had resection (pneumonectomy, lobar or sublobar resection) within 12 months before or after their diagnosis date.
- The **Lung Cancer/No Resection Cohort** included all Ontario men and women 20 years of age or older identified with lung cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have a resection (pneumonectomy, lobar or sublobar resection) within 12 months before or after their diagnosis date. This group includes all individuals who did not have surgery and those whose definitive surgery was limited to surgical staging or palliative procedures.

Notes:

- If a patient had more than one type of procedure, the most extensive procedure is identified in this Atlas as the "definitive" surgery.
- All patients who receive radiation therapy as part of cancer treatment first undergo radiation therapy planning. This involves positioning the person's body, marking the skin and taking imaging scans to determine the best way to deliver the radiation dose. Because complete data on which patients in our study cohorts actually received radiation therapy were not available, we have used radiation therapy planning as a surrogate measure for radiation therapy treatment.

Chapter 5—List of Exhibits

Exhibits and Findings

Exhibit 5.1a Incidence of lung cancer in Ontario men and women 20 years of age or older in 2003/04, and use of surgery in the Overall Lung Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Standardized[1] incidence rate per 100,000	Overall Lung Cancer Cohort				
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*standardized[1] % total*	*number*	*standardized[1] % total*
Ontario	**70.5**	**6,734 (100.0)**	**2,684**	**39.9**	**4,050**	**60.1**
Sex[2]						
Men	78.7	3,739 (55.5)	1,439	38.5	2,300	61.5
Women	62.7	2,995 (44.5)	1,245	41.6	1,750	58.4
Age group (years)[2]						
20–54	12.0	747 (11.1)	354	46.7	393	53.3
55–64	135.9	1,477 (21.9)	674	45.7	803	54.3
65–69	244.1	1,060 (15.7)	461	43.5	599	56.5
70–74	330.1	1,276 (18.9)	531	41.8	745	58.2
75+	354.0	2,174 (32.3)	664	30.5	1,510	69.5
Neighbourhood income quintile						
Q1 (Lowest)	90.2	1,590 (24.5)	570	35.7	1,020	64.3
Q2	73.6	1,402 (21.6)	555	39.9	847	60.1
Q3	72.2	1,312 (20.2)	551	41.8	761	58.2
Q4	68.4	1,172 (18.0)	478	40.7	694	59.3
Q5 (Highest)	55.6	1,023 (15.7)	444	43.7	579	56.3
Community size (population)						
≥ 1,250,000	56.3	1,958 (29.1)	850	43.8	1,108	56.2
100,000–1,249,999	76.6	2,669 (39.7)	1,040	39.0	1,629	61.0
< 100,000	87.1	2,104 (31.3)	794	37.4	1,310	62.6
LHIN						
1. Erie St. Clair	88.6	472 (7.0)	176	37.6	296	62.4
2. South West	70.1	551 (8.2)	195	34.6	356	65.4
3. Waterloo Wellington	66.7	314 (4.7)	115	35.3	199	64.7
4. Hamilton Niagara Haldimand Brant	73.8	890 (13.2)	331	37.4	559	62.6
5. Central West	50.3	196 (2.9)	90	44.5	106	55.5
6. Mississauga Halton	60.0	366 (5.4)	132	36.3	234	63.7
7. Toronto Central	55.0	516 (7.7)	228	44.5	288	55.5
8. Central	57.7	586 (8.7)	261	45.2	325	54.8
9. Central East	66.4	756 (11.2)	375	49.9	381	50.1
10. South East	85.5	390 (5.8)	111	28.0	279	72.0
11. Champlain	80.8	718 (10.7)	257	35.8	461	64.2
12. North Simcoe Muskoka	87.2	299 (4.4)	109	36.1	190	63.9
13. North East	96.2	512 (7.6)	245	46.9	267	53.1
14. North West	81.8	164 (2.4)	59	37.9	105	62.1

[1] Incidence rates have been standardized to the Canadian population aged 20 years or older on July 1,1991. Subgroup proportions (% Total) have been standardized to the Overall Lung Cancer Cohort.

[2] Sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Exhibit 5.1a (cont'd) **Incidence of lung cancer in Ontario men and women 20 years of age or older in 2003/04, and use of surgery in the Overall Lung Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence**

Findings

- Men constituted 56 percent of all lung cancer patients in Ontario in 2003/04. Rates of lung cancer in the Overall Lung Cancer Cohort were higher among men (78.7 cases per 100,000) compared to women (62.7 cases per 100,000).
- The incidence of lung cancer increased with age. Nearly one-third of newly-diagnosed lung cancers occurred in people over 75 years of age, while only 11 percent occurred in those under age 55 years.
- Lung cancer incidence declined with both increasing community size and increasing neighbourhood income. Conversely, the proportion of Ontarians with lung cancer who underwent surgery for their disease increased with both income and community size. For example, lung cancer incidence was 56 cases per 100,000 among those living in the richest neighbourhoods at the time they were diagnosed; 44 percent of this group underwent surgery. Among those who resided in the poorest neighbourhoods, incidence was 90 cases per 100,000; 36 percent of this group had surgery.
- The probability of undergoing surgery was slightly higher for women than men—just under 40 percent of men and just over 40 percent of women diagnosed with lung cancer in 2003/04 underwent some type of surgery for their disease.
- The proportion of patients with newly-diagnosed lung cancer who underwent surgery decreased with age—from about 47 percent among those aged 20–54 years to about 30 percent among those 75 years of age or older.
- There were variations in rates of surgery for lung cancer across Local Health Integration Networks (LHINs) of patient residence. The proportion of patients in the study cohort who had surgery for their disease ranged from a low of 28 percent among those living in the South East LHIN at the time of diagnosis, to a high of 50 percent among those who resided in the Central East LHIN.

Exhibit 5.1b

Incidence of lung cancer in Ontario men 20 years of age or older in 2003/04, and use of surgery among men in the Overall Lung Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Lung Cancer Cohort - Men					
		Total		Had surgery		Did not have surgery	
		number of cases (% Ontario)		*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**78.7**	**3,739**	(100.0)	**1,439**	**38.5**	**2,300**	**61.5**
Age group (years)[2]							
20–54	**11.6**	**360**	(9.6)	154	**42.8**	206	**57.2**
55–64	**154.4**	**825**	(22.1)	354	**42.9**	471	**57.1**
65–69	**282.9**	**592**	(15.8)	255	**43.1**	337	**56.9**
70–74	**423.4**	**769**	(20.6)	310	**40.3**	459	**59.7**
75+	**473.7**	**1,193**	(31.9)	366	**30.7**	827	**69.3**
Neighbourhood income quintile							
Q1 (Lowest)	**102.2**	**841**	(23.4)	281	**33.0**	560	**67.0**
Q2	**83.0**	**770**	(21.4)	297	**38.7**	473	**61.3**
Q3	**81.4**	**734**	(20.4)	302	**41.1**	432	**58.9**
Q4	**75.2**	**652**	(18.1)	262	**40.5**	390	**59.5**
Q5 (Highest)	**63.4**	**601**	(16.7)	252	**42.4**	349	**57.6**
Community size (population)							
≥ 1,250,000	**64.6**	**1,103**	(29.5)	462	**42.0**	641	**58.0**
100,000–1,249,999	**84.6**	**1,441**	(38.6)	535	**37.1**	906	**62.9**
< 100,000	**97.3**	**1,194**	(31.9)	442	**36.8**	752	**63.2**
LHIN							
1. Erie St. Clair	**101.9**	**268**	(7.2)	103	**38.4**	165	**61.6**
2. South West	**78.0**	**306**	(8.2)	103	**32.3**	203	**67.7**
3. Waterloo Wellington	**74.7**	**176**	(4.7)	55	**30.0**	121	**70.0**
4. Hamilton Niagara Haldimand Brant	**80.8**	**484**	(12.9)	171	**35.6**	313	**64.4**
5. Central West	**64.2**	**126**	(3.4)	56	**42.6**	70	**57.4**
6. Mississauga Halton	**65.9**	**203**	(5.4)	73	**35.2**	130	**64.8**
7. Toronto Central	**66.1**	**301**	(8.1)	124	**41.1**	177	**58.9**
8. Central	**63.8**	**321**	(8.6)	141	**44.8**	180	**55.2**
9. Central East	**71.2**	**406**	(10.9)	190	**47.4**	216	**52.6**
10. South East	**91.6**	**208**	(5.6)	54	**25.9**	154	**74.1**
11. Champlain	**86.7**	**380**	(10.2)	131	**34.8**	249	**65.2**
12. North Simcoe Muskoka	**93.3**	**164**	(4.4)	63	**38.5**	101	**61.5**
13. North East	**110.1**	**297**	(7.9)	138	**45.5**	159	**54.5**
14. North West	**97.5**	**98**	(2.6)	37	**38.3**	61	**61.7**

1 Incidence rates have been standardized to the Canadian population on July 1,1991. Subgroup proportions (% Total) have been standardized to the Overall Lung Cancer Cohort.

2 Age-specific rates have not been standardized.

Findings

- The findings shown in this Exhibit are similar to those in Exhibit 5.1a —that is, both the incidence of lung cancer and the proportion of men who had surgery was related to age, average neighbourhood income and community size.
- Men living in the North East Local Health Integration Network (LHIN) when they were diagnosed had the highest incidence of lung cancer among men (110 cases per 100,000 population). This was followed by men who resided in the Erie St. Clair LHIN (102 cases per 100,000).
- Men diagnosed with lung cancer who lived in large urban centres at the time of their diagnosis were more likely to have surgery than men living in smaller communities.
- Men living in the Central East LHIN at the time of diagnosis were the most likely to have lung cancer surgery (47 percent); those living in the South East LHIN were the least likely (26 percent).

Exhibit 5.1c Incidence of lung cancer among Ontario women 20 years of age or older in 2003/04, and use of surgery among women in the Overall Lung Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Lung Cancer Cohort - Women				
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**62.7**	**2,995**	**1,245**	**41.6**	**1,750**	**58.4**
Age group (years)[2]						
20–54	12.5	387 (12.9)	200	51.7	187	48.3
55–64	118.1	652 (21.8)	320	49.1	332	50.9
65–69	206.9	468 (15.6)	206	44.0	262	56.0
70–74	240.7	507 (16.9)	221	43.6	286	56.4
75+	239.4	981 (32.8)	298	30.4	683	69.6
Neighbourhood income quintile						
Q1 (Lowest)	78.8	749 (25.8)	289	39.1	460	60.9
Q2	64.6	632 (21.8)	258	41.5	374	58.5
Q3	63.5	578 (19.9)	249	42.6	329	57.4
Q4	62.0	520 (17.9)	216	41.0	304	59.0
Q5 (Highest)	48.2	422 (14.5)	192	45.3	230	54.7
Community size (population)						
≥ 1,250,000	48.3	855 (28.6)	388	45.9	467	54.1
100,000–1,249,999	69.0	1,228 (41.0)	505	41.4	723	58.6
< 100,000	77.3	910 (30.4)	352	38.2	558	61.8
LHIN						
1. Erie St. Clair	75.7	204 (6.8)	73	36.5	131	63.5
2. South West	62.6	245 (8.2)	92	37.5	153	62.5
3. Waterloo Wellington	59.1	138 (4.6)	60	41.9	78	58.1
4. Hamilton Niagara Haldimand Brant	67.2	406 (13.6)	160	39.8	246	60.2
5. Central West	36.9	70 (2.3)	34	46.8	36	53.2
6. Mississauga Halton	54.4	163 (5.4)	59	37.7	104	62.3
7. Toronto Central	44.4	215 (7.2)	104	48.6	111	51.4
8. Central	51.9	265 (8.9)	120	45.7	145	54.3
9. Central East	61.8	350 (11.7)	185	53.1	165	46.9
10. South East	79.7	182 (6.1)	57	30.7	125	69.3
11. Champlain	75.3	338 (11.3)	126	37.1	212	62.9
12. North Simcoe Muskoka	81.3	135 (4.5)	46	33.1	89	66.9
13. North East	83.0	215 (7.2)	107	48.8	108	51.2
14. North West	66.7	66 (2.2)	22	37.4	44	62.6

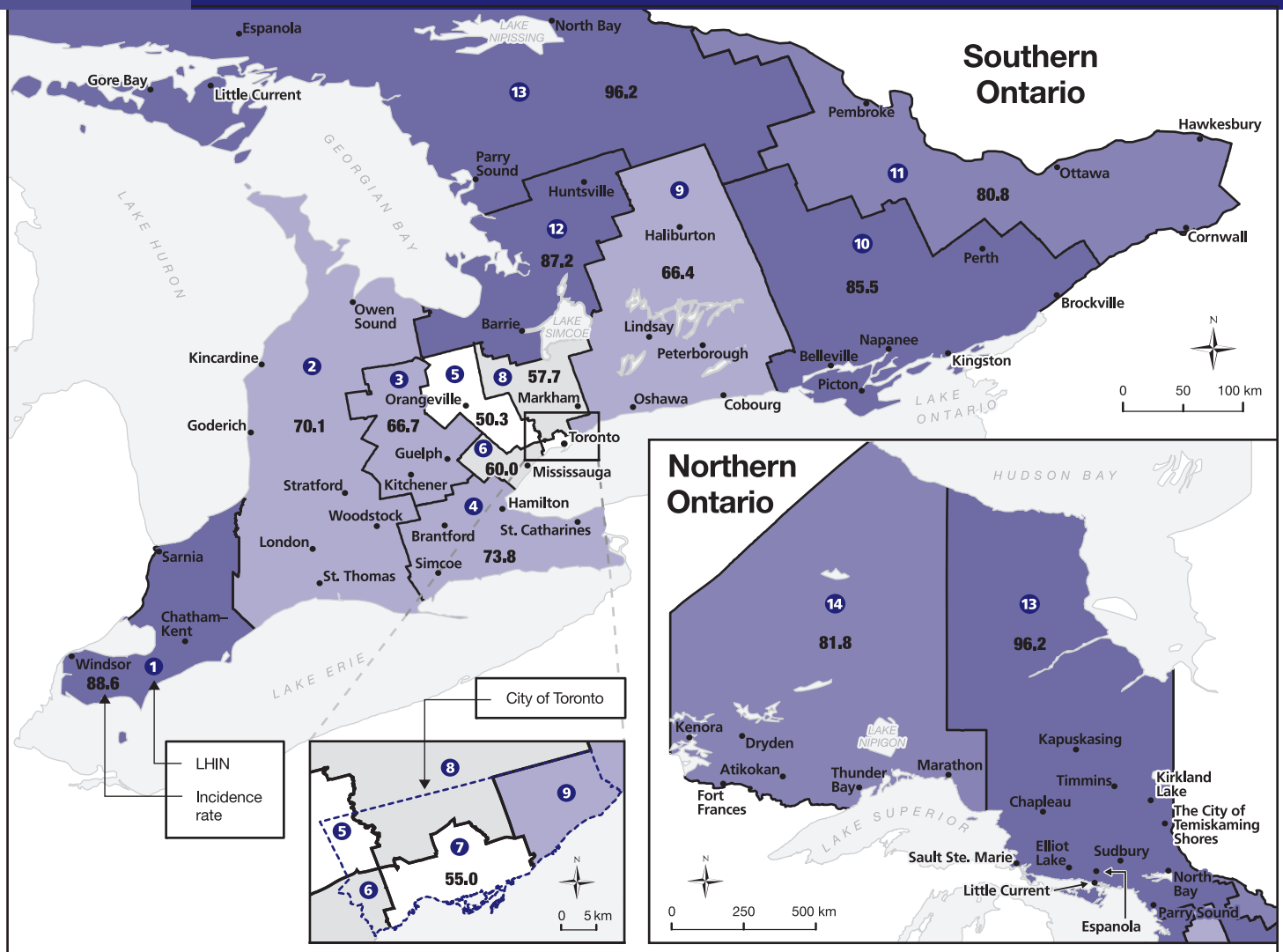
1 Incidence rates have been standardized to the Canadian population on July 1,1991. Subgroup proportions (% Total) have been standardized to the Overall Lung Cancer Cohort.

2 Age-specific rates have not been standardized.

Findings

- Lung cancer incidence among Ontario women in 2003/04 increased markedly with decreasing neighbourhood income and community size. The rate was highest among women living in the lowest-income neighbourhoods (79 cases per 100,000) and in communities with fewer than 100,000 people (77 cases per 100,000).
- Across the Local Health Integration Networks (LHINs) of patient residence, the highest incidence of lung cancer (83 cases per 100,000 population) was among women living in the North East LHIN at the time of diagnosis. The lowest incidence was among those who resided in the Central West LHIN (37 cases per 100,000 population).
- Women in the Overall Lung Cancer Cohort who were under age 65 years at the time of diagnosis were more likely to undergo surgery related to their cancer than similarly aged men in the same study cohort.
- The age-standardized proportion of women in this study cohort who underwent surgery related to their lung cancers in the 12 months before and after diagnosis was highest among those living in the Central East LHIN (53 percent) and lowest among those living in the South East LHIN (31 percent).

Exhibit 5.2 Age- and sex-standardized lung cancer incidence per 100,000 persons 20 years of age or older, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age- and sex-standardized lung cancer incidence rate per 100,000 persons in the Overall Lung Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 70.5 per 100,000 persons

LHIN rate per 100,000 persons	LHIN rate compared to OR	Number of LHINs in each category
> 84.6	More than 20% above OR	4
77.2–84.6	10% to 20% above OR	2
63.9–77.1	Within 10% of OR	4
56.4–63.8	10% to 20% below OR	2
< 56.4	More than 20% below OR	2

Findings

- The incidence of lung cancer in Ontario in 2003/04 was highest (96 cases per 100,000) among men and women living in the North East Local Health Integration Network (LHIN) at the time of diagnosis. This was followed by those residing in the Erie St. Clair LHIN (89 cases per 100,000) and in the North Simcoe Muskoka LHIN (87 cases per 100,000).
- Lung cancer incidence was lowest among men and women living in the Central West LHIN at the time of diagnosis (50 cases per 100,000). This was followed by those residing in the Toronto Central LHIN (55 cases per 100,000) and the Central LHIN (58 cases per 100,000).

Exhibit 5.3 Health care utilization among men and women in the Lung Cancer Surgery Cohort [2003/04], by age, sex, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Lung Cancer Surgery Cohort			Hospital admissions[1]		
	Total number of patients	Average # visits with treating surgeon[2]	% with more than one hospital admission	Total number of admissions	Same-day surgery	Inpatient admissions
	number	*visits/patient*	*% patients*	*number (average per patient)*	*standardized % total admissions[3]*	
Ontario	**2,684**	**3.5**	**27.2**	**3,655 (1.4)**	**27.8**	**72.2**
Sex[3]						
Men	1,439	3.6	28.2	1,987 (1.4)	28.3	71.7
Women	1,245	3.5	25.9	1,668 (1.3)	27.3	72.7
Age group (years)[3]						
20–54	354	3.3	28.5	487 (1.4)	25.2	74.8
55–64	674	3.5	29.5	961 (1.4)	31.7	68.3
65–69	461	3.5	29.5	626 (1.4)	30.3	69.7
70–74	531	3.6	28.2	719 (1.4)	27.0	73.0
75+	664	3.6	23.5	862 (1.3)	25.4	74.6
Neighbourhood income quintile						
Q1 (Lowest)	570	3.6	25.0	778 (1.4)	29.4	70.6
Q2	555	3.5	25.7	729 (1.3)	28.6	71.4
Q3	551	3.4	27.4	758 (1.4)	27.4	72.6
Q4	478	3.6	25.8	640 (1.3)	27.2	72.8
Q5 (Highest)	444	3.6	33.0	629 (1.4)	26.1	73.9
Community size (population)						
≥ 1,250,000	850	3.4	31.8	1,184 (1.4)	26.4	73.6
100,000–1,249,999	1,040	3.7	25.1	1,360 (1.3)	28.1	71.9
< 100,000	794	3.4	25.0	1,111 (1.4)	28.3	71.7
LHIN						
1. Erie St. Clair	176	3.8	18.8	224 (1.3)	21.3	78.7
2. South West	195	3.0	15.4	248 (1.3)	23.2	76.8
3. Waterloo Wellington	115	3.2	23.9	148 (1.3)	24.0	76.0
4. Hamilton Niagara Haldimand Brant	331	3.6	27.9	442 (1.3)	33.7	66.3
5. Central West	90	3.8	30.1	125 (1.4)	20.8	79.2
6. Mississauga Halton	132	3.1	32.0	184 (1.4)	21.2	78.8
7. Toronto Central	228	3.6	32.2	326 (1.4)	30.2	69.8
8. Central	261	3.4	30.9	367 (1.4)	28.0	72.0
9. Central East	375	4.0	33.7	559 (1.5)	39.5	60.5
10. South East	111	4.0	21.4	145 (1.3)	19.6	80.4
11. Champlain	257	3.9	22.7	331 (1.3)	14.4	85.6
12. North Simcoe Muskoka	109	3.7	34.1	154 (1.4)	27.0	73.0
13. North East	245	2.9	18.7	307 (1.3)	22.6	77.4
14. North West	59	3.2	44.0	95 (1.6)	31.8	68.2

1 Time frame for hospital admissions was from 12 months before to 12 months after diagnosis.

2 Time frame for surgeon visits was from 6 months before to 6 months after the first surgery.

3 Standardized to the Overall Lung Cancer Cohort; sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Findings

- Approximately 72 percent of hospital admissions for surgery among patients in the Lung Cancer Surgery Cohort were for inpatient hospital care. The remaining 28 percent were for ambulatory (same-day) procedures related to patients' lung cancers.
- Twenty-seven percent of patients in this study cohort had more than one hospital admission for diagnosis and/or treatment of lung cancer.
- Patients residing in the Champlain Local Health Integration Network (LHIN) at the time of diagnosis had the lowest rates of same-day surgery related to their lung cancers (14 percent).
- Patients in this study cohort had 3.5 visits, on average, with their treating surgeon in the 12 months surrounding their diagnosis.

Exhibit 5.4 Hospital admissions for surgical procedures among men and women in the Lung Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN of patient residence	LHIN where care was received					
	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton
	number (col%, row %)[1]					
1. Erie St. Clair	**173 (99.4, 77.2)**	50 (17.1, 22.3)				
2. South West		**226 77.1, 96.2)**	**	**		
3. Waterloo Wellington		6 (2.0, 4.1)	**111 (94.9, 75.0)**	20 (4.4, 13.5)	**	**
4. Hamilton Niagara Haldimand Brant		7 (2.4, 1.6)		**416 (91.0, 94.3)**	**	13 (9.1, 2.9)
5. Central West				**	**75 (78.1, 60.5)**	**
6. Mississauga Halton			**	13 (2.8, 7.1)	**	**116 (81.1, 63.0)**
7. Toronto Central			**	**	**	**
8. Central						
9. Central East				**	**	**
10. South East						
11. Champlain			**	**		
12. North Simcoe Muskoka		**			**	**
13. North East		**		**		
14. North West		**				
Ontario	**174 (100, 4.8)**	**293 (100, 8.1)**	**117 (100, 3.2)**	**457 (100, 12.6)**	**96 (100, 2.6)**	**143 (100, 3.9)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having lung cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all lung cancer patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings

- Approximately eight out of 10 operations for lung cancer (81 percent) were done in the Local Health Integration Networks (LHINs) where patients resided at the time they were diagnosed.
- Approximately 45 percent of lung cancer operations done in hospitals located in the Toronto Central LHIN were performed on patients who lived in this LHIN when their cancers were diagnosed. The majority of the lung cancer operations in Toronto Central LHIN hospitals were performed in patients who lived in other LHINs such as the Central LHIN (24 percent) and Central East LHIN (12 percent).

Exhibit 5.4 (cont'd) Hospital admissions for surgical procedures among men and women in the Lung Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN where care was received								
7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West	Ontario
number (col%, row %)[1]								
								224 (6.2, 100)
**								235 (6.5, 100)
**								148 (4.1, 100)
**	**							441 (12.1, 100)
30 (4.7, 24.2)	12 (4.0, 9.7)	**			**			124 (3.4, 100)
40 (6.3, 21.7))	8 (2.7, 4.3)				**			184 (5.1, 100)
290 (45.3, 89.5)	17 (5.7, 5.2)	8 (1.6, 2.5)		**				324 (8.9, 100)
151 (23.6, 41.3)	**193 (64.8, 52.7)**	18 (3.7, 4.9)						366 (10.1, 100)
74 (11.6, 13.3)	22 (7.4, 3.9)	**454 (93.2, 81.5)**	**					557 (15.3, 100)
		6 (1.2, 4.2)	**114 (96.6, 79.2)**	19 (5.5, 13.2)				144 (4.0, 100)
			**	**323 (94.2, 98.2)**		**		329 (9.1, 100)
33 (5.2, 21.4)	45 (15.1, 29.2)				**65 (90.3, 42.2)**	**		154 (4.2, 100)
**					**	**292 (98.0, 95.1)**		307 (8.5, 100)
							94 (97.9, 98.9)	95 (2.6, 100)
640 (100, 17.6)	**298 (100, 8.2)**	**487 (100, 13.4)**	**118 (100, 3.2)**	**343 (100, 9.4)**	**72 (100, 2.0)**	**298 (100, 8.2)**	**96 (100, 2.6)**	**3,632 (100, 100)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having lung cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all lung cancer patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings (cont'd)

- Across the province, more than 40 percent of surgical procedures undergone by patients in the study cohort were done in hospitals located in the Toronto Central, Central East and Hamilton Niagara Haldimand Brant LHINs.

Exhibit 5.5a Type of definitive surgical procedure among men and women in the Lung Cancer Surgery Cohort [2003/04], by age, sex, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Lung Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]				
		Pneumonectomy	Lobar resection	Sublobar resection	Palliative procedures	Surgical staging
Ontario	2,684	156 (5.5)	674 (24.6)	429 (15.6)	911 (35.4)	514 (18.8)
Sex[2]						
Men	1,439	96 (6.4)	342 (23.5)	208 (14.0)	505 (36.2)	288 (19.9)
Women	1,245	60 (4.5)	332 (26.1)	221 (17.5)	406 (34.4)	226 (17.6)
Age group (years)[2]						
20–54	354	25 (7.1)	90 (25.0)	52 (14.3)	102 (29.7)	85 (23.9)
55–64	674	54 (8.1)	189 (27.9)	111 (16.4)	195 (29.0)	125 (18.6)
65–69	461	28 (6.1)	110 (23.9)	81 (17.5)	144 (31.2)	98 (21.3)
70–74	531	30 (5.7)	145 (27.4)	104 (19.5)	154 (29.0)	98 (18.5)
75+	664	19 (2.9)	140 (21.1)	81 (12.2)	316 (47.6)	108 (16.3)
Neighbourhood income quintile						
Q1 (Lowest)	570	39 (6.5)	136 (23.9)	92 (15.6)	182 (33.5)	121 (20.6)
Q2	555	28 (4.8)	146 (25.8)	90 (15.4)	178 (33.7)	113 (20.3)
Q3	551	33 (5.7)	137 (24.7)	88 (16.0)	197 (36.3)	96 (17.4)
Q4	478	26 (5.2)	111 (21.7)	78 (16.1)	170 (37.8)	93 (19.2)
Q5 (Highest)	444	19 (4.1)	131 (29.3)	66 (14.9)	155 (35.6)	73 (16.2)
Community size (population)						
≥ 1,250,000	850	40 (4.4)	183 (21.1)	182 (21.2)	286 (34.9)	159 (18.5)
100,000–1,249,999	1,040	61 (5.7)	287 (26.9)	127 (11.9)	354 (35.7)	211 (19.8)
< 100,000	794	55 (6.7)	204 (25.6)	120 (14.2)	271 (35.9)	144 (17.6)
LHIN						
1. Erie St.Clair	**	**	** (19.7)	** (13.2)	** (47.1)	** (18.2)
2. South West	195	14 (7.0)	57 (27.7)	31 (14.6)	68 (38.4)	25 (12.3)
3. Waterloo Wellington	115	8 (7.3)	30 (24.9)	17 (11.1)	37 (36.8)	23 (19.9)
4. Hamilton Niagara Haldimand Brant	331	26 (7.7)	100 (30.7)	39 (11.8)	93 (28.8)	73 (20.9)
5. Central West	90	6 (5.4)	13 (10.7)	16 (16.6)	36 (49.2)	19 (18.1)
6. Mississauga Halton	132	8 (5.6)	35 (26.8)	27 (20.5)	40 (30.1)	22 (17.1)
7. Toronto Central	228	8 (3.9)	51 (22.2)	47 (20.0)	68 (31.7)	54 (22.2)
8. Central	261	15 (5.5)	58 (21.9)	55 (21.1)	98 (38.9)	35 (12.7)
9. Central East	375	15 (3.6)	102 (26.9)	59 (14.4)	97 (26.2)	102 (29.0)
10. South East	111	12 (11.9)	10 (8.1)	22 (17.0)	56 (54.5)	11 (8.5)
11. Champlain	**	** (6.8)	** (35.9)	**	** (45.3)	** (10.2)
12. North Simcoe Muskoka	109	8 (7.1)	18 (14.4)	23 (22.0)	37 (36.3)	23 (20.1)
13. North East	245	8 (2.5)	50 (21.1)	57 (24.2)	66 (28.6)	64 (23.6)
14. North West	59	7 (9.8)	15 (31.6)	7 (10.8)	23 (35.5)	7 (12.4)

** Cell value suppressed for reasons of privacy and confidentiality.

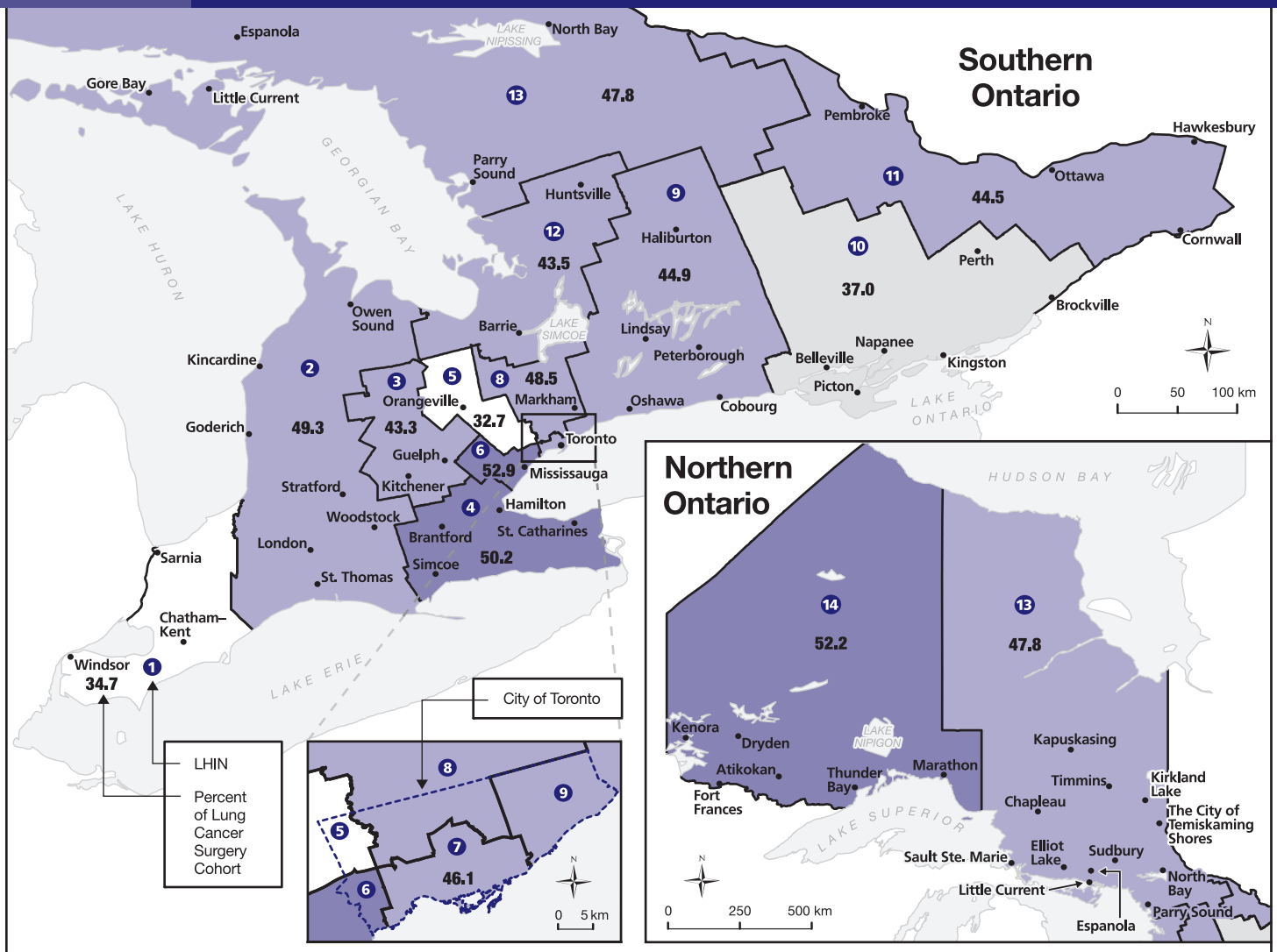
1 Percent of each subgroup that had each type of definitive procedure, standardized to the Overall Lung Cancer Cohort.

2 Sex-specific rates have been adjusted for age; age-specific rates have been adjusted for sex.

Findings

- Of the 2,684 patients in the Lung Cancer Surgery Cohort, only 1,259 (47 percent) had a surgical resection of their tumours (lobectomy, pneumonectomy or sublobar resection).
- Approximately half of the 1,259 patients who had a resection for lung cancer had a lobectomy (54 percent). A minority of patients who had a resection had a pneumonectomy (12 percent). About one-third (34 percent) of those who had a resection had a sublobar resection.
- The type of resection patients underwent for their lung cancers varied according to their Local Health Integration Networks (LHINs) of residence. The proportion of patients in the study cohort who had a lobectomy for their lung cancers varied—from eight percent among those living in the South East LHIN to 36 percent of those residing in the Champlain LHIN.
- Approximately 35 percent of patients who underwent surgery for their lung cancer had palliative procedures only.

Exhibit 5.5b Proportion of men and women in the Lung Cancer Surgery Cohort [2003/04] whose definitive surgery was a resection (pneumonectomy, lobar resection or sublobar resection), by Local Health Integration Network (LHIN) of patient residence, in Ontario



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Proportion of men and women in the Lung Cancer Surgery Cohort whose definitive surgery was a resection (pneumonectomy, lobar resection or sublobar resection), by LHIN of patient residence, in Ontario

Ontario rate (OR) = 45.7 percent

Percent of Lung Cancer Surgery Cohort	LHIN rate compared to OR	Number of LHINs in each category
> 55.0	More than 20% above OR	0
50.1–55.0	10% to 20% above OR	3
41.4–50.0	Within 10% of OR	8
36.3–41.3	10% to 20% below OR	1
< 36.3	More than 20% below OR	2

Findings

- The proportion of patients in the Lung Cancer Surgery Cohort whose surgery involved a resection (pneumonectomy, lobar resection or sublobar resection) varied according to the Local Health Integration Network (LHIN) of residence at the time of diagnosis. It ranged from a high of about 53 percent of patients living in the Mississauga Halton LHIN to a low of 33 percent of those who resided in the Central West LHIN.

Exhibit 5.6a Overall pattern of surgical care provided to men and women in the Lung Cancer Surgery Cohort [2003/04], by physician specialty, in Ontario

Physician specialty	Physicians performing lung cancer surgery *number (% physicians)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*					
				Pneumon-ectomy	Lobar resection	Sublobar resection	Palliative procedures	Surgical staging	Total
Surgical oncology	9 (1.8)	333 (10.0)	282 (12.3)	22 (7.8)	122 (43.3)	54 (19.2)	36 (12.8)	48 (2.1)	282
Thoracic surgery	27 (5.4)	1,477 (44.3)	1,065 (46.5)	79 (7.4)	333 (31.3)	227 (21.3)	128 (12.0)	298 (28.0)	1,065
General surgery	87 (17.4)	525 (15.8)	364 (15.9)	31 (8.5)	121 (33.2)	68 (18.7)	78 (21.4)	66 (18.1)	364
Other	377 (75.4)	998 (29.9)	580 (25.3)	13 (2.2)	73 (12.6)	49 (8.5)	411 (70.9)	34 (5.9)	580
Ontario	**500**	**3,333**	**2,291**	**145 (6.3)**	**649 (28.3)**	**398 (17.4)**	**653 (28.5)**	**446 (19.5)**	**2,291**

[1] Based on one definitive procedure per patient.

Findings

- Thoracic surgeons comprised just five percent of the total number of physicians who provided lung cancer surgery in Ontario during the study period. Yet they performed 44 percent of all surgical procedures on this group and 47 percent of all definitive procedures.
- A relatively small group of surgical oncologists performed 10 percent of all surgeries on patients in the study cohort. These nine surgical oncologists represented just two percent of the physicians treating lung cancer in Ontario at the time of the study.
- According to our data, 25 percent of patients in the study cohort were treated by "other physicians." These doctors provided largely palliative procedures, although some also performed lung resections in a small number of patients. "Other" physicians included surgical specialists such as cardiac surgeons, as well as non-surgeons who performed procedures such as the insertion of chest tubes for the treatment of pleural effusion (an accumulation of fluid between the chest wall and the lung).

Exhibit 5.6b Overall pattern of surgical care provided to men and women in the Lung Cancer Surgery Cohort [2003/04], by hospital type, in Ontario

Hospital type	Hospitals performing lung cancer surgery *number (% hospitals)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*					
				Pneumon-ectomy	Lobar resection	Sublobar resection	Palliative procedures	Surgical staging	Total
Academic	14 (12.0)	1,548 (38.7)	1,074 (40.3)	81 (7.5)	330 (30.7)	168 (15.6)	321 (29.9)	174 (16.2)	1,074
Community/Small	102 (88.0)	2,454 (61.3)	1,593 (59.7)	75 (4.7)	344 (21.6)	261 (16.4)	584 (36.7)	329 (20.7)	1,593
Ontario	**116**	**4,002**	**2,667**	**156 (5.8)**	**674 (25.3)**	**429 (16.1)**	**905 (33.9)**	**503 (18.9)**	**2,667**

[1] Based on one definitive procedure per patient.

Findings

- The majority (61 percent) of lung cancer surgeries performed on patients in the Lung Cancer Surgery Cohort took place in community hospitals.
- Patients undergoing surgery for lung cancer in academic (teaching) hospitals were more likely to have a pneumonectomy or lobar resection compared with those who received care in community hospitals.

Exhibit 5.7a

Diagnostic services received by men and women in the Lung Cancer Resection Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Lung Cancer Resection Cohort *number*	Total number of services provided *(average # services per patient[1])*			
		Percutaneous lung or pleural biopsy	Bronchoscopy	Mediastin-oscopy	Mediastin-otomy
1. Erie St. Clair	64	46 (0.7)	119 (1.9)	11 (0.2)	**
2. South West	102	43 (0.4)	158 (1.5)	**	**
3. Waterloo Wellington	55	**	98 (1.8)	**	**
4. Hamilton Niagara Haldimand Brant	165	40 (0.2)	373 (2.3)	61 (0.4)	7 (0.0)
5. Central West	35	18 (0.5)	60 (1.7)	22 (0.6)	0 (0.0)
6. Mississauga Halton	70	49 (0.7)	132 (1.9)	40 (0.6)	**
7. Toronto Central	106	67 (0.6)	196 (1.8)	79 (0.7)	6 (0.1)
8. Central	128	78 (0.6)	230 (1.8)	70 (0.5)	9 (0.1)
9. Central East	176	117 (0.7)	309 (1.8)	147 (0.8)	**
10. South East	43	37 (0.9)	27 (0.6)	12 (0.3)	**
11. Champlain	121	128 (1.1)	171 (1.4)	100 (0.8)	8 (0.1)
12. North Simcoe Muskoka	49	47 (1.0)	71 (1.4)	37 (0.8)	**
13. North East	115	36 (0.3)	175 (1.5)	19 (0.2)	**
14. North West	29	**	46 (1.6)	21 (0.7)	**
Ontario	**1,258**	**722 (0.6)**	**2,165 (1.7)**	**634 (0.5)**	**49 (0.0)**

LHIN of patient residence	Lung Cancer Resection Cohort *number*	Total number of services provided *(average # services per patient[1])*			
		Thoroscopy	Chest tube	Thoracentesis	Pleurodesis
1. Erie St. Clair	64	28 (0.4)	8 (0.1)	**	0 (0.0)
2. South West	102	**	11 (0.1)	**	**
3. Waterloo Wellington	55	9 (0.2)	**	**	0 (0.0)
4. Hamilton Niagara Haldimand Brant	165	9 (0.1)	12 (0.1)	**	6 (0.0)
5. Central West	35	**	**	**	0 (0.0)
6. Mississauga Halton	70	12 (0.2)	8 (0.1)	**	0 (0.0)
7. Toronto Central	106	8 (0.1)	17 (0.2)	8 (0.1)	**
8. Central	128	**	29 (0.2)	9 (0.1)	0 (0.0)
9. Central East	176	**	24 (0.1)	7 (0.0)	**
10. South East	43	0.0	8 (0.2)	0 (0.0)	0 (0.0)
11. Champlain	121	0.0	23 (0.2)	6 (0.0)	**
12. North Simcoe Muskoka	49	0.0	6 (0.1)	**	**
13. North East	115	**	57 (0.5)	**	**
14. North West	29	**	**	**	6 (0.2)
Ontario	**1,258**	**84 (0.1)**	**213 (0.2)**	**58 (0.0)**	**19 (0.0)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Lung Cancer Surgery Cohort.

Findings

- On average, patients in the Lung Cancer Resection Cohort received 1.7 bronchoscopies in the year before and after their definitive surgery. This suggests that many patients had more than a single bronchoscopy procedure over the 24-month period surrounding their surgery.
- Approximately half the patients in the study cohort underwent a diagnostic procedure called mediastinoscopy (surgical inspection of the tissues and organs of the middle chest using a rigid telescope). The rate varied considerably across Local Health Integration Networks (LHINs) of patient residence—ranging from five percent of lung cancer patients who lived in the South West LHIN at the time of their diagnosis to 80 percent of those who resided in the Central East and Champlain LHINs.
- Percutaneous lung biopsies or pleural biopsies (inserting a needle through the chest wall to obtain tissue samples) were conducted in approximately 60 percent of patients. There was considerable variability across LHINs in the use of these diagnostic procedures: use was very low among lung cancer patients living in the North West and Hamilton Niagara Haldimand Brant LHINs at the time of their diagnosis, and very high among those living in the North Simcoe and Champlain LHINs.

Exhibit 5.7b Radiologic services received by men and women in the Lung Cancer Resection Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Lung Cancer Resection Cohort *number*	Total number of services provided *(average # services per patient[1])*							
		Chest			Abdomen				
		X-ray	CT Scan	MRI Scan	Ultrasound	CT scan	MRI Scan	Head CT Scan	Bone scan
1. Erie St. Clair	64	558 (8.7)	200 (3.1)	**	60 (0.9)	110 (1.7)	**	42 (0.7)	66 (1.0)
2. South West	102	725 (7.1)	251 (2.5)	**	64 (0.6)	167 (1.6)	**	46 (0.5)	63 (0.6)
3. Waterloo Wellington	55	396 (7.2)	125 (2.3)	**	47 (0.9)	76 (1.4)	**	25 (0.5)	45 (0.8)
4. Hamilton Niagara Haldimand Brant	165	1,321 (8.0)	307 (1.9)	0 (0.0)	106 (0.6)	169 (1.0)	**	85 (0.5)	115 (0.7)
5. Central West	35	244 (7.0)	123 (3.5)	**	27 (0.8)	70 (2.0)	**	27 (0.8)	33 (0.9)
6. Mississauga Halton	70	546 (7.8)	203 (2.9)	**	63 (0.9)	135 (1.9)	**	35 (0.5)	54 (0.8)
7. Toronto Central	106	876 (8.3)	324 (3.1)	**	101 (1.0)	195 (1.8)	7 (0.1)	52 (0.5)	105 (1.0)
8. Central	128	1,133 (8.9)	365 (2.9)	**	108 (0.8)	224 (1.8)	8 (0.1)	78 (0.6)	106 (0.8)
9. Central East	176	1,485 (8.4)	504 (2.9)	**	120 (0.7)	327 (1.9)	8 (0.0)	141 (0.8)	136 (0.8)
10. South East	44	346 (7.9)	112 (2.5)	**	21 (0.5)	54 (1.2)	**	43 (1.0)	43 (1.0)
11. Champlain	121	1,066 (8.8)	367 (3.0)	**	103 (0.9)	215 (1.8)	**	180 (1.5)	126 (1.0)
12. North Simcoe Muskoka	49	359 (7.3)	122 (2.5)	0 (0.0)	42 (0.9)	76 (1.6)	**	25 (0.5)	50 (1.0)
13. North East	115	676 (5.9)	262 (2.3)	**	80 (0.7)	140 (1.2)	**	80 (0.7)	87 (0.8)
14. North West	29	176 (6.1)	69 (2.4)	0 (0.0)	30 (1.0)	16 (0.6)	0 (0.0)	14 (0.5)	22 (0.8)
Ontario	**1,259**	**9,907 (7.9)**	**3,334 (2.6)**	**22 (0.0)**	**972 (0.8)**	**1,974 (1.6)**	**50 (0.0)**	**873 (0.7)**	**1,051 (0.8)**

** Cell value suppressed for reasons of privacy and confidentiality.

[1] Denominator includes all patients in the Lung Cancer Resection Cohort.

Findings

- A large number of chest X-rays (eight per patient on average) and computed tomography (CT) scans of the chest (2.6 per patient) were done on patients in the Lung Cancer Resection Cohort within the two-year period surrounding patients' definitive surgeries for lung cancer.
- Other common imaging tests undergone by patients in this study cohort included abdominal CT scans (1.6 per patient on average), bone scans (0.8 per patient) and head CT scans (0.7 per patient).
- Magnetic resonance imaging (MRI) was rarely used to diagnose or stage lung cancer in this group of patients.

Exhibit 5.7c

Consultations and services received by men and women in the Lung Cancer Resection Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Lung Cancer Resection Cohort *number*	Radiation oncology		Radiation therapy planning[1]		Medical oncology	
		% cohort who had a consult	Average[2] # consult per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	64	48.4	1.2	23.4	1.3	42.2	1.0
2. South West	102	30.4	1.1	7.8	1.4	21.6	1.0
3. Waterloo Wellington	55	43.6	1.2	10.9	1.2	36.4	1.1
4. Hamilton Niagara Haldimand Brant	165	23.6	1.2	13.3	1.3	15.8	1.3
5. Central West	35	40.0	1.4	25.7	1.6	60.0	1.3
6. Mississauga Halton	70	22.9	1.2	15.7	1.5	42.9	1.2
7. Toronto Central	106	30.2	1.3	19.8	1.2	39.6	1.3
8. Central	128	32.0	1.2	18.8	1.3	46.1	1.4
9. Central East	176	22.2	1.1	15.3	1.4	29.0	1.2
10. South East	44	31.8	1.3	**	**	20.5	1.2
11. Champlain	121	47.1	1.1	11.6	1.6	49.6	1.1
12. North Simcoe Muskoka	49	30.6	1.1	**	**	61.2	1.5
13. North East	115	38.3	1.3	17.4	1.3	31.3	1.2
14. North West	29	79.3	1.3	**	**	65.5	1.0
Ontario	**1,259**	**33.4**	**1.2**	**14.8**	**1.3**	**35.9**	**1.2**

LHIN of patient residence	Lung Cancer Resection Cohort *number*	Chemotherapy		Surgery (general, thoracic and surgical oncology)	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit[3]	Average[2] # visits per patient
1. Erie St. Clair	64	21.9	11.8	100.0	7.9
2. South West	102	21.6	9.1	100.0	5.4
3. Waterloo Wellington	55	16.4	11.1	100.0	6.0
4. Hamilton Niagara Haldimand Brant	165	11.5	7.5	99.4	6.9
5. Central West	35	42.9	14.2	100.0	6.7
6. Mississauga Halton	70	24.3	8.1	100.0	6.1
7. Toronto Central	106	22.6	11.9	100.0	6.8
8. Central	128	28.1	12.4	100.0	6.3
9. Central East	176	21.0	10.0	98.0	6.8
10. South East	44	18.2	4.9	56.8	4.5
11. Champlain	121	28.9	6.6	100.0	6.7
12. North Simcoe Muskoka	49	24.5	8.8	100.0	7.2
13. North East	115	15.7	8.5	89.6	6.0
14. North West	29	31.0	6.2	100.0	5.0
Ontario	**1,259**	**21.8**	**9.6**	**97.3**	**6.5**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Please refer to the Introduction at the beginning of this chapter for a definition of radiation therapy planning.

2 Denominator includes only those patients in the Lung Cancer Resection Cohort who had at least one visit, consult or session.

3 Visits include assessments, consultations and counselling.

Exhibit 5.7c (cont'd) **Consultations and services received by men and women in the Lung Cancer Surgery/Resection Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario**

Findings

- Approximately 33 percent of all patients in the Lung Cancer Surgery/Resection Cohort saw a radiation oncologist during the 12 months before and after their definitive surgery. About 15 percent of this study cohort received radiation therapy as part of their treatment.
- Rates of referral to a radiation oncologist were highest (79 percent) among patients who lived in the North West Local Health Integration Network (LHIN) at the time of their diagnosis. The lowest referral rates were observed among those living in the Central East LHIN (22 percent) and in the Mississauga Halton LHIN (23 percent).
- Rates of radiation therapy planning (vs. referral to a radiation oncologist) varied from four percent to 26 percent across different LHINs of patient residence.
- More than one-third (36 percent) of patients in this study cohort were seen by a medical oncologist during the 24 months surrounding their definitive surgery. This rate ranged from a low of 16 percent among people residing in the Hamilton Niagara Haldimand Brant LHIN at the time of diagnosis to a high of 66 percent among those living in the North West LHIN.
- More than one in five patients in the study cohort (22 percent) received chemotherapy as part of their treatment for lung cancer. The highest rate (43 percent) was observed among those living in the Central West LHIN at the time of diagnosis; the lowest rate (12 percent) was among those residing in the Hamilton Niagara Haldimand Brant LHIN.
- On average, patients in the study cohort visited their surgeons 6.5 times during the period from 12 months before to 12 months after their definitive surgeries.

Exhibit 5.8a

Diagnostic services received by men and women in the Lung Cancer/No Resection Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Lung Cancer/ No Resection Cohort *number*	Total number of services provided *(average[1] # services per patient)*			
		Percutaneous lung or pleural biopsy	Bronchoscopy	Mediastin-oscopy	Mediastin-otomy
1. Erie St. Clair	408	148 (0.4)	200 (0.5)	28 (0.1)	8 (0.0)
2. South West	449	144 (0.3)	195 (0.4)	29 (0.1)	**
3. Waterloo Wellington	259	65 (0.3)	116 (0.4)	27 (0.1)	**
4. Hamilton Niagara Haldimand Brant	725	139 (0.2)	492 (0.7)	86 (0.1)	**
5. Central West	161	49 (0.3)	114 (0.7)	19 (0.1)	**
6. Mississauga Halton	296	77 (0.3)	156 (0.5)	26 (0.1)	**
7. Toronto Central	410	118 (0.3)	234 (0.6)	60 (0.1)	6 (0.0)
8. Central	458	163 (0.4)	324 (0.7)	47 (0.1)	8 (0.0)
9. Central East	580	132 (0.2)	358 (0.6)	106 (0.2)	11 (0.0)
10. South East	346	133 (0.4)	27 (0.1)	**	
11. Champlain	597	338 (0.6)	213 (0.4)	26 (0.0)	**
12. North Simcoe Muskoka	250	98 (0.4)	132 (0.5)	31 (0.1)	**
13. North East	397	111 (0.3)	207 (0.5)	79 (0.2)	15 (0.0)
14. North West	135	16 (0.1)	65 (0.5)	**	**
Ontario	**5,471**	**1,732 (0.3)**	**2,833 (0.5)**	**574 (0.1)**	**65 (0.0)**

LHIN of patient residence	Lung Cancer/ No Resection Cohort *number*	Total number of services provided *(average[1] # services per patient)*			
		Thoroscopy	Chest tube	Thoracentesis	Pleurodesis
1. Erie St. Clair	408	9 (0.0)	44 (0.1)	100 (0.2)	12 (0.0)
2. South West	449	**	41 (0.1)	69 (0.2)	12 (0.0)
3. Waterloo Wellington	259	**	23 (0.1)	35 (0.1)	**
4. Hamilton Niagara Haldimand Brant	725	6 (0.0)	42 (0.1)	105 (0.1)	13 (0.0)
5. Central West	161	**	24 (0.1)	44 (0.3)	8 (0.0)
6. Mississauga Halton	296	**	20 (0.1)	74 (0.3)	7 (0.0)
7. Toronto Central	410	14 (0.0)	63 (0.2)	79 (0.2)	20 (0.0)
8. Central	458	6 (0.0)	91 (0.2)	125 (0.3)	30 (0.1)
9. Central East	580	20 (0.0)	69 (0.1)	126 (0.2)	42 (0.1)
10. South East	346	0 (0.0)	26 (0.1)	49 (0.1)	6 (0.0)
11. Champlain	597	**	129 (0.2)	94 (0.2)	18 (0.0)
12. North Simcoe Muskoka	250	**	15 (0.1)	51 (0.2)	**
13. North East	397	12 (0.0)	43 (0.1)	36 (0.1)	42 (0.1)
14. North West	135	0 (0.0)	13 (0.1)	23 (0.2)	**
Ontario	**5,471**	**89 (0.0)**	**643 (0.1)**	**1,010 (0.2)**	**222 (0.0)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Lung Cancer/No Resection Cohort.

Findings

- Patients in the Lung Cancer/No Resection Cohort underwent a number of diagnostic procedures in the 24 months surrounding their diagnosis. These included bronchoscopy (2,833 procedures) and percutaneous lung biopsy (1,732 procedures).
- Mediastinoscopy was rarely performed on patients who did not have a resection. There were 574 of these procedures (about one for every 11 patients in this study cohort).
- The most common palliative procedures for patients with lung cancer who did not have a resection were thoracentesis (1,010 procedures or 0.2 per patient on average); the insertion of chest tubes (643 procedures), and pleurodesis (222 procedures). There was little variation in the use of these services across different LHINs of patient residence.

Exhibit 5.8b Radiologic services received by men and women in the Lung Cancer/No Resection Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Lung Cancer/No Resection Cohort *number*	Total number of services provided *(average[1] # services per patient)*							
		Chest			Abdomen				
		X-ray	CT scan	MRI scan	Ultrasound	CT scan	MRI scan	Head CT scan	Bone scan
1. Erie St. Clair	408	1,866 (4.6)	818 (2.0)	**	217 (0.5)	510 (1.3)	0.0	362 (0.9)	217 (0.5)
2. South West	449	2,451 (5.5)	816 (1.8)	**	220 (0.5)	609 (1.4)	**	364 (0.8)	273 (0.6)
3. Waterloo Wellington	259	1,038 (4.0)	502 (1.9)	**	134 (0.5)	311 (1.2)	0.0	271 (1.0)	181 (0.7)
4. Hamilton Niagara Haldimand Brant	725	3,124 (4.3)	1,068 (1.5)	**	409 (0.6)	664 (0.9)	7 (0.0)	407 (0.6)	409 (0.6)
5. Central West	161	646 (4.0)	373 (2.3)	**	81 (0.5)	187 (1.2)	**	157 (1.0)	107 (0.7)
6. Mississauga Halton	296	1,228 (4.1)	560 (1.9)	**	145 (0.5)	394 (1.3)	6 (0.0)	261 (0.9)	141 (0.5)
7. Toronto Central	410	1,808 (4.4)	864 (2.1)	**	252 (0.6)	585 (1.4)	7 (0.0)	364 (0.9)	239 (0.6)
8. Central	458	2,174 (4.7)	1,000 (2.2)	7 (0.0)	312 (0.7)	738 (1.6)	8 (0.0)	459 (1.0)	285 (0.6)
9. Central East	580	2,326 (4.0)	1,197 (2.1)	**	281 (0.5)	895 (1.5)	6 (0.0)	506 (0.9)	359 (0.6)
10. South East	346	1,529 (4.4)	645 (1.9)	8 (0.0)	171 (0.5)	343 (1.0)	7 (0.0)	352 (1.0)	223 (0.6)
11. Champlain	597	3,664 (6.1)	1,367 (2.3)	14 (0.0)	350 (0.6)	786 (1.3)	24 (0.0)	785 (1.3)	417 (0.7)
12. North Simcoe Muskoka	250	1,008 (4.0)	472 (1.9)	**	123 (0.5)	389 (1.6)	**	225 (0.9)	198 (0.8)
13. North East	397	1,598 (4.0)	763 (1.9)	**	216 (0.5)	506 (1.3)	6 (0.0)	475 (1.2)	266 (0.7)
14. North West	135	463 (3.4)	238 (1.8)	0.0	87 (0.6)	100 (0.7)	6 (0.0)	105 (0.8)	61 (0.5)
Ontario	**5,471**	**24,925 (4.6)**	**10,683 (2.0)**	**56 (0.0)**	**2,998 (0.5)**	**7,017 (1.3)**	**86 (0.0)**	**5,093 (0.9)**	**3,376 (0.6)**

** Cell value suppressed for reasons of privacy and confidentiality.

[1] Denominator includes all patients in the Lung Cancer/No Resection Cohort.

Findings

- Patients in the Lung Cancer/No Resection Cohort received a number of radiologic services in the 12 months before and after their diagnosis. These included: computed tomography (CT) scans of the chest (two per patient, on average), abdominal CT scans (1.3 per patient); abdominal ultrasounds (0.5 per patient); head CT scans (0.9 per patient); and bone scans (0.6 per patient).
- Patients who did not undergo resection received slightly fewer radiologic imaging services overall compared to those who did have resection surgery *(see Exhibit 5.7b).*
- There was little variation in the use of radiologic services provided to patients in this study cohort across different Local Health Integrations (LHINs) of patient residence.

Exhibit 5.8c Consultations and services received by men and women in the Lung Cancer/No Resection Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Lung Cancer/ No Resection Cohort *number*	Radiation oncology		Radiation therapy planning[1]		Medical oncology	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	408	52.5	1.2	41.2	1.3	43.6	1.1
2. South West	449	51.0	1.2	32.7	1.5	35.2	1.1
3. Waterloo Wellington	259	59.5	1.3	43.2	1.4	46.3	1.2
4. Hamilton Niagara Haldimand Brant	725	49.9	1.1	34.6	1.3	39.6	1.2
5. Central West	161	46.0	1.2	36.6	1.5	60.2	1.7
6. Mississauga Halton	296	43.9	1.2	35.1	1.4	51.0	1.4
7. Toronto Central	410	50.5	1.3	43.4	1.5	53.4	1.3
8. Central	458	54.1	1.2	43.9	1.3	49.3	1.4
9. Central East	580	49.8	1.2	38.6	1.4	39.3	1.3
10. South East	346	67.1	1.4	45.7	1.3	47.7	1.2
11. Champlain	597	69.3	1.2	45.2	1.4	54.3	1.1
12. North Simcoe Muskoka	250	52.8	1.2	35.2	1.3	67.6	1.6
13. North East	397	63.0	1.1	53.7	1.7	42.8	1.1
14. North West	135	43.0	1.4	27.4	1.5	30.4	1.1
Ontario	**5,471**	**54.7**	**1.2**	**40.4**	**1.4**	**46.3**	**1.3**

LHIN of patient residence	Lung Cancer/ No Resection Cohort *number*	Chemotherapy		Surgery (general, thoracic and surgical oncology)	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a visit	Average[2] # visits[3] per patient
1. Erie St. Clair	408	33.1	9.0	62.3	3.1
2. South West	449	41.2	9.0	54.8	2.9
3. Waterloo Wellington	259	37.1	10.9	53.3	2.8
4. Hamilton Niagara Haldimand Brant	725	29.8	8.9	56.0	2.8
5. Central West	161	49.7	10.1	60.2	3.0
6. Mississauga Halton	296	36.5	11.2	51.4	2.5
7. Toronto Central	410	31.7	9.3	52.4	2.5
8. Central	458	31.9	9.9	60.0	2.8
9. Central East	580	32.9	9.0	63.8	3.0
10. South East	346	28.3	9.4	28.9	2.3
11. Champlain	597	35.7	6.9	58.0	2.6
12. North Simcoe Muskoka	250	38.0	10.1	62.8	3.0
13. North East	397	35.0	9.2	76.6	2.8
14. North West	135	39.3	11.2	70.4	2.4
Ontario	**5,471**	**34.4**	**9.3**	**57.6**	**2.8**

1 Please refer to the Introduction at the beginning of this chapter for a definition of radiation therapy planning.

2 Denominator includes only those patients in the Lung Cancer/No Resection Cohort who had at least one visit, consult or session.

3 Visits include assessments, consultations and counselling.

Exhibit 5.8c (cont'd) **Consultations and services received by men and women in the Lung Cancer/No Resection Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario**

Findings

- The majority (55 percent) of patients in the Lung Cancer/No Resection Cohort saw a radiation oncologist in the period from 12 months before to 12 months after their diagnosis. A smaller proportion (40 percent) actually underwent radiation therapy planning.
- Approximately 46 percent of patients in the study cohort saw a medical oncologist in the 24 months surrounding their diagnosis. Rates were highest (68 percent) among patients living in the North Simcoe Muskoka LHIN at the time of diagnosis and lowest (30 percent) among those residing in the North West LHIN.
- More than one-third (34 percent) of patients in the study cohort received chemotherapy treatment. Rates of chemotherapy varied according to the LHIN of patient residence—from a high of 50 percent among those living in the Central West LHIN at the time of diagnosis to a low of 28 percent among those who resided in the South East LHIN.
- More than half (58 percent) of patients in this study cohort saw a surgeon in the 24 months surrounding their diagnosis. During this period, these patients were seen by a surgeon approximately 2.8 times per person on average.

Discussion and Conclusions

This study, which examined data on 6,734 patients newly-diagnosed with lung cancer in 2003/04, provides important new information about lung cancer care in Ontario.

Our analyses show that the disease was more common among men than women during the study period. Regardless of gender, the incidence of lung cancer increased with increasing age (i.e., older people were more likely to develop lung cancer than younger people). But while the incidence of lung cancer was higher among people age 75 years or older, their rates of surgery were lower compared to rates of surgery among younger patients.

We also found that lung cancer incidence was highest among people who resided in lower-income neighbourhoods in Ontario at the time of diagnosis and also among people living in smaller-sized communities. In contrast, the highest rates of surgery were observed among patients who lived in the highest-income neighbourhoods and in the largest-sized communities at the time of their lung cancer diagnosis.

The types of diagnostic and treatment-related procedures performed for lung cancer in Ontario during the study period varied according to the Local Health Integration Network (LHIN) of patient residence. While most patients who underwent surgery for lung cancer were treated in hospitals located in their own LHINs of residence, many of those who lived in the Central and North Simcoe Muskoka LHINs received care in hospitals located elsewhere (i.e., outside their home LHINs).

More than 60 percent of the 6,734 patients newly-diagnosed with lung cancer in Ontario during the study period did not undergo any type of surgical procedure related to their disease. Of those who had any related surgical procedure, 1,425 (53 percent) underwent only staging or palliative procedures.

Some type of surgical resection procedure (lobectomy, pneumonectomy or sublobar resection) was performed in only 1,259 patients—this translates to just 19 percent of the Overall Lung Cancer Cohort. Approximately half of those who had a surgical resection underwent a lobectomy.

Palliative surgery intended to relieve the symptoms of lung cancer was more common among people aged 75 years or older. Rates of palliative procedures were also higher among patients who resided in four Local Health Integration Networks (LHINs)—South East, Central West, Erie St. Clair and Champlain—at the time of their diagnosis.

A variety of physicians provided surgical care to patients with lung cancer in our study cohorts. Thoracic surgeons performed 44 percent of all procedures and 54 percent of all resections. General surgeons provided care to 18 percent of patients who had resections. Other physicians who provided treatment were: surgical oncologists; "other" physicians (including cardiovascular or cardiothoracic surgeons); and non-surgeons who provided palliative procedures.

Surgical care for patients with lung cancer was provided in both community and academic (teaching) hospitals during the study period. However, we observed that a slightly higher percentage of patients undergoing surgery in academic hospitals had resections compared to those who were treated in community hospitals.

With respect to diagnostic services, we noted little variation in the use of computed tomography (CT) scans or other imaging tests across LHINs of patient residence. However, the use of diagnostic lung or pleural biopsies did vary according to LHIN. All patients who had some kind of surgery for their lung cancer—and most patients who did not have surgery—underwent at least one bronchoscopy in the 12 months before and after their diagnosis.

The frequency of medical and radiation oncology consultations for patients with lung cancer varied across LHINs. Such variations were observed for those who had some kind of surgery for their disease and also among those who did not. Rates of treatment with radiation and chemotherapy also varied across LHINs, and (as expected) were higher among patients who did not undergo surgical resection of their lung cancers.

Implications for clinical practice

The high incidence of lung cancer in Ontario has important implications for providers of care. While a minority of patients with lung cancer in our study cohorts underwent some type of surgical procedure for their disease, the utilization of diagnostic imaging and surgical diagnostic procedures among the majority (i.e., those who did not have surgery) was high. Palliative and/or diagnostic procedures were performed in many patients who did not undergo surgical resection.

While consultations with medical and radiation oncologists were frequent, it was somewhat surprising to find low rates of radiation therapy planning (40 percent) and systemic chemotherapy (34 percent) among patients who did not undergo resection.

We noted variability in patterns of care across LHINs of patient residence, and also according to community size and annual household income. Such variations might have been due to differences in the stage of disease at diagnosis. For example, surgical resection is generally not performed on patients with Stage III or Stage IV lung cancers. Other explanations for observed variations in the rate of surgical resection likely include: differences in physician opinion, patients' individual preferences regarding treatment, patient comorbidities and the availability of resources within specific LHINs.

Our study found that just 19 percent of patients with a new diagnosis of lung cancer underwent a surgical resection. Although this number is lower than the commonly cited rate of resectable disease, our study included cases of small cell lung cancer, which are not normally treated by surgery. The rate of resection in our study is consistent with recent reports from other countries.[2] In particular, information on the stage of disease at diagnosis would help us better understand the extent to which differences in cancer stage influence the rate of resection.

While lobectomy (removal of a single lobe in an affected lung) is the standard type of surgical resection for potentially curable lung cancer, pneumonectomy (removal of the entire lung) is sometimes required (e.g., for more extensive tumours that cannot be completely removed by excising a single lobe).

Studies show that the use of pneumonectomy has been decreasing over time. Research into the patterns of lung cancer care in the U.S. found that pneumonectomy was done in 13.6 percent of patients who had a resection.[4] The rate of pneumonectomy among patients in our own study cohort—12 percent—was similar. However, both these rates are substantially higher than the generally accepted rate of pneumonectomy which is between five and six percent.

As expected, lobectomy was the most common type of resection performed on patients in our study cohort. Sublobar resections include a variety of procedures such as segmental resections and small wedge excisions of lung tissue. Wedge resections are most commonly used to obtain tissue for the diagnosis of a lung mass; they are generally not considered adequate for treatment purposes, except in patients with severe lung disease who are unable to tolerate removal of more lung tissue. Wedge resections are more likely to be performed in elderly patients.

The observed variability in the type of resections performed across LHINs of patient residence warrants further evaluation—particularly the relatively high number of sublobar resections performed in patients residing in certain LHINs at the time of their diagnoses.

Our study found that the use of diagnostic imaging among patients in our study cohorts was uniform across different LHINs of patient residence. While most experts agree about the value of diagnostic imaging procedures in patients with lung cancer, there is some controversy about the use of procedures for lung cancer staging. In particular, most experts believe that lymph node status should be determined by mediastinoscopy (or mediastinotomy) prior to resection, or by sampling lymph nodes at the time of lung cancer resection. However, some physicians/surgeons rely on diagnostic imaging alone. It is possible that increased use of positron emission tomographic (PET) scans in the future will lead to a reduction in the use of invasive staging maneuvers like mediastinoscopy.

The appropriateness of care provided to patients with lung cancer depends on many factors, including the stage of disease at diagnosis, comorbid medical conditions and patient preferences. Since we did not have information about these factors, it is not possible to make global judgments about the appropriateness of surgical care delivered to patients in this study.

However, we did identify trends in the rate of resection among different patient groups that warrant further investigation. For example, the lower rate of surgical resection among patients living in smaller communities, in certain LHINs, and in lower-income neighborhoods may not be completely explained by differences in cancer stage, comorbidities or patient preferences. Other potential explanations include variations in referrals to surgeons, physician practice patterns, undersupply of resources, lack of access to specialists and lack of access to local services.

We noted that the use of surgical resection was less frequent among patients aged 75 years or older compared to its use in younger patients. It is generally recommended that medically fit people with lung cancer who are over age 70 should be offered resection, since their outcomes after surgery are similar to those of younger patients.[5] Of course, it is possible that the older patients in our study had comorbid medical conditions, including chronic lung disease, which made the risks of surgical resection unacceptably high.

Lung cancer care requires the careful coordination of health services involving a variety of medical disciplines. These include: diagnostic services (provided by radiologists, surgeons and other physicians); therapeutic services (including surgical resection, radiation therapy and systemic chemotherapy); and palliative procedures.

Studies suggest that multidisciplinary care is beneficial even in early stage disease. Recent evidence from 2004 suggests that some patients with early non-small cell lung cancers (NSCLC)—Stage Ib tumours and almost all Stage II tumours—benefit from adjuvant chemotherapy.[6,7] Previously, patients with Stages I and II NSCLC were treated with surgery alone, or by radiation therapy if they were not good surgical candidates.

While patients with advanced lung cancer may benefit from palliative chemotherapy or radiation therapy, referral to these specialists and use of these services were lower than anticipated. This may reflect patient preferences, physicians' beliefs that palliative treatment is not useful, and/or comorbidities that often exist in patients with advanced disease. It was not clear from our study whether access to specialists and/or treatment facilities affected the use of radiation therapy and systemic chemotherapy.

Lung cancer surgery is provided by different types of surgeons. It is likely that fewer general surgeons will perform lung cancer surgery in the future, since fewer general surgeons are now trained in thoracic surgery.

Implications for policy and planning

Lung cancer care is likely to consume even more health resources for the foreseeable future, due largely to the aging Canadian population and the consequences of increased exposure to cigarette smoking among women over the last few decades.

In our study of 6,734 patients newly-diagnosed with lung cancer in Ontario in 2003/04, we observed variability in the use of surgical resection and referral to radiation and medical oncologists. To forecast what resources are needed to provide adequate cancer care in the future, it is important to understand whether the variability in the use of these health services observed in this study is related to lack of local health resources or to other factors—for example, the reluctance of patients to travel to larger centres for diagnosis and treatment.

As the current cohort of general surgeons practicing in Ontario ages and retires, more thoracic surgery will be done by thoracic surgeons rather than by general surgeons. Many smaller communities cannot support a full-time thoracic surgeon. Therefore, patients from smaller communities who require the services of thoracic surgeons will have to travel to other parts of Ontario for treatment and care. Since lung cancer care is complex and involves a variety of treatment modalities, it must be provided in multidisciplinary settings; these are likely to be located in larger urban centres. Even so, we found that most patients in our study cohorts received treatment at hospitals located within their LHIN of residence.

Important trends that will affect resources for lung cancer surgery in the future include: changes in population demographics; the changing prevalence of cigarette smoking; the increased use of radiologic screening to detect early-stage lung cancers in high-risk individuals; the use of positron emission tomography (PET) scans to evaluate patients (in addition to conventional imaging); and the use of new surgical technologies such as video assisted thoracic surgery (VATS).

Future research

A lack of detailed clinical information in currently available data limited our ability to examine a number of research questions raised by our analyses. For example, we did not have complete information on cancer stage at diagnosis, since these data are not currently included in the Ontario Cancer Registry (OCR).

Information about cancer stage at diagnosis is required to address the many questions raised by this study. For example, it is possible that people with lung cancer who live in lower-income neighbourhoods may present with more advanced disease. This could explain the lower rate of surgical resection we observed among patients residing in Ontario's lowest-income neighbourhoods at the time of their diagnosis. The absence of stage-specific data also limited our ability to measure quality of care—such as appropriate referral to specialists and concordance with practice guideline recommendations.

We feel it is vital that stage information be routinely collected for Ontarians with all types of cancer. This will allow researchers to better evaluate both the appropriateness and the quality of care. Even in the absence of such stage-specific data, further study is required. In particular, we need to understand the low rates of referral to and treatment by medical and radiation oncologists that we observed among patients who did not undergo surgical resection for their lung cancers.

Further research is also needed in the area of access to care for lung cancer. Whether the variability we observed was related to a lack of availability of specialists locally, or to patients' reluctance to travel to other centres, needs to be determined. Since we found little variability in frequency of diagnostic imaging tests given to people with lung cancer, it seems that these resources were widely available during the study period.

The projected aging of the Canadian population will increase the demand for resources to diagnose and treat lung cancer, which is more common in older people. Yet the number of surgeons capable of providing care to these patients is expected to decrease. As general surgeons who practice thoracic surgery retire, they are no longer being replaced by general surgeons trained to provide lung cancer care. Therefore, most surgical treatment for lung cancer will be provided by thoracic surgeons. The appropriate number of trained thoracic surgeons needed to serve Ontarians should be the subject of future research.

References

1. Canadian Cancer Society/National Cancer Institute of Canada. C*anadian Cancer Statistics 2007*. Toronto: CCS/NCIC; 2007.
2. Devbhandari MP, Yang SS, Quennell P, Krysiak P, Shah R, Jones MT. Lung cancer resection rate in south Manchester: is it comparable to international standards? Results of a prospective tracking study. *Interact Cardiovasc Thorac Surg* 2007; 6(6):712–4.
3. Park BJ, Altorki NK. Diagnosis and management of early lung cancer. *Surg Clin North Am* 2002; 82(3):457–76.
4. Little AG, Rusch VW, Bonner JA, Gaspar LE, Green MR, Webb WR, et al. Patterns of surgical care of lung cancer patients. *Ann Thorac Surg* 2005; 80(6):2051–6.
5. Brokx HA, Visser O, Postmus PE, Paul MA. Surgical treatment for octogenarians with lung cancer: results from a population-based series of 124 patients. *J Thorac Oncol* 2007; 2(11):1013–7.
6. Pisters KM, Evans WK, Azzoli CG, Kris MG, Smith CA, Desch CE, et al. Cancer Care Ontario and American Society of Clinical Oncology adjuvant chemotherapy and adjuvant radiation therapy for stages I–IIIA resectable non small-cell lung cancer guideline. *J Clin Oncol* 2007; 25(34):5506–18.
7. Kassam F, Shepherd FA, Johnston M, Visbal A, Feld R, Darling G, et. al. Referral patterns for adjuvant chemotherapy in patients with completely resected non-small cell lung cancer. *J Thorac Oncol* 2007; 2(1):39–43.

INSIDE

6

Chapter

Surgery for Uterine Cancer

Laurie Elit, MD, MSc, FRCSC, Janice S. Kwon, MD, MPH, FRCSC, Susan E. Schultz, MA, MSc, Raymond Przybysz, MSc, Andrew S. Wilton, MSc, Marko Simunovic, MD, MPH, FRCSC, and David R. Urbach, MD, MSc, FRCSC, FACS

Executive Summary

Issue

Uterine cancer is the most common cancer of the female genital tract. It is also the fourth most common type of cancer among Canadian women, the ninth leading cause of cancer-related deaths within this group, and the most common gynecologic cancer requiring surgical treatment in Ontario.

Study

This chapter focuses on women living in Ontario who were diagnosed with cancer of the uterus in 2003/04. We looked at patterns of treatment, including the use of surgery and related health services during a two-year period—from 12 months before to 12 months after the date of diagnosis. We also identified and analyzed certain demographic, geographic and health care system factors that might have affected how women with uterine cancer were treated, including whether or not they underwent surgery for their disease.

Key Findings

- Nearly 95 percent of Ontario women age 20 years or older newly-diagnosed with uterine cancer in 2003/04 underwent surgery as part of their cancer treatment.
- Many women (41 percent) underwent more than one surgical procedure as part of their treatment. The majority of these procedures (71 percent) were done in an inpatient hospital setting.
- Eight out of 10 surgical procedures for uterine cancer were provided in hospitals located within women's Local Health Integration Network (LHIN) of residence.
- The most common surgical procedure (72 percent) was total abdominal hysterectomy combined with bilateral salpingo-oophorectomy (BSO). The next most common was total abdominal hysterectomy with BSO and pelvic or para-aortic lymph node excision (19 percent). Four percent of women underwent total abdominal hysterectomy alone.
- Just four percent of the surgeons who operated on women with uterine cancer were gynecologic oncologists; however, these specialists carried out 21 percent of the procedures.
- During our study period, nearly two-thirds of the surgery on women with uterine cancer was done in community hospitals.

Implications

- **Further research is needed to better understand the role of lymph node excision in uterine cancer, as 19 percent of Ontario women had this procedure during the study period.**
- **The number of gynecologic oncologists practicing in Ontario is small, yet they provided care to large numbers of women with uterine cancer. Further evaluation of their role is indicated.**

Introduction

Uterine cancer is the most common cancer of the female genital tract and also the most common gynecologic cancer requiring surgical treatment in Ontario. It is the fourth most common cancer among Canadian women and the ninth leading cause of cancer-related deaths in this group.[1] The most recently published cancer statistics estimated that in 2007, 4,100 Canadian women would be diagnosed with uterine cancer (new onset), and 740 women would die from the disease.

Uterine cancer is usually identified after a complaint of abnormal vaginal bleeding; the diagnosis is typically confirmed by biopsy of the endometrium (the lining of the uterus). Endometrial biopsies are often done as outpatient procedures in a physician's office. In other cases, dilatation and curettage (D&C) may be necessary; this procedure is normally done in a hospital setting and requires general or regional anesthesia. Other tests, such as chest X-rays, ultrasound and computed tomograpy (CT) scans, are used to determine the distant tumour extent (i.e., the extent to which the tumour has spread beyond the uterus).

Treatment for uterine cancer usually involves removal of the uterus (a procedure known as total abdominal hysterectomy or TAH), along with removal of fallopian tubes and ovaries (unilateral/bilateral salpingo-oophorectomy or USO/BSO). Patients with more aggressive or advanced cancers typically also undergo removal of lymph nodes in the pelvis and around the aorta (pelvic and para-aortic lymphadenectomy). Some women may also require surgical removal of a fatty fold of tissue lining portions of the stomach and large intestine called the omentum (a procedure called an omentectomy). These latter two procedures are done to determine whether microscopic tumour cells have travelled to the lymph nodes or to the omentum. If so, additional treatment such as radiation or chemotherapy may be required.

Surgery for uterine cancer is normally performed by obstetrician/gynecologists, gynecologic oncologists or, less frequently, by general surgeons. Referral to a gynecologic oncologist is appropriate in cases of advanced cancers or where tissue analyses suggest a high-grade cancer (i.e., serous or clear cell tumours). Both medical oncologists and gynecologic oncologists provide chemotherapy to women with gynecologic cancer.

Adjuvant radiation therapy is also offered to women at high risk for spread—for example, those whose cancers involve the neck of the uterus (the cervix). Women who receive radiation treatment for uterine cancer must first undergo radiation therapy planning.

How the study cohorts were defined

In this chapter, we present information on the use of surgery and related health services by women newly-diagnosed with uterine cancer in Ontario in 2003/04. This includes information regarding women who underwent surgery and those who did not.

The study population for this chapter included all Ontario women 20 years of age or older identified with uterine cancer in the Ontario Cancer Registry (OCR) whose diagnosis date fell between April 1, 2003 and March 31, 2004. This is referred to as the **Overall Uterine Cancer Cohort.**

The Overall Uterine Cancer Cohort was then subdivided into two smaller groups:

- The **Uterine Cancer Surgery Cohort** included all Ontario women age 20 years or older identified with uterine cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had uterine cancer surgery during the period from 12 months before to 12 months after their diagnosis date.
- The **Uterine Cancer/No Surgery Cohort** included all Ontario women age 20 years or older identified with uterine cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have uterine cancer surgery during the period from 12 months before to 12 months after their diagnosis date.

Notes:

- If a patient had more than one type of procedure, the most extensive procedure is identified in this Atlas as the "definitive" surgery.
- All patients who receive radiation therapy as part of cancer treatment first undergo radiation therapy planning. This involves positioning the person's body, marking the skin and taking imaging scans to determine the best way to deliver the radiation dose. Because complete data on which patients in our study cohorts actually received radiation therapy were not available, we have used radiation therapy planning as a surrogate measure for radiation therapy treatment.

Chapter 6—List of Exhibits

Exhibits and Findings

Exhibit 6.1 Incidence of uterine cancer in Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Uterine Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Uterine Cancer Cohort				
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**29.8**	**1,436 (100.0)**	**1,360**	**94.7**	**76**	**5.3**
Age group (years)[2]						
20–39	1.5	**	**	92.3	**	**
40–49	12.8	**	**	93.4	**	6.6
50–69	69.8	**	**	96.5	**	3.5
70+	75.3	**	**	92.1	**	7.9
Neighbourhood income quintile						
Q1 (Lowest)	23.1	216 (15.5)	200	92.7	16	7.3
Q2	28.5	278 (19.9)	263	94.5	15	5.5
Q3	31.5	291 (20.9)	275	94.4	16	5.6
Q4	35.3	309 (22.2)	295	95.1	14	4.9
Q5 (Highest)	33.2	301 (21.6)	288	95.4	13	4.6
Community size (population)						
≥ 1,250,000	29.3	536 (37.4)	507	94.4	29	5.6
100,000–1,249,999	31.4	556 (38.7)	522	93.9	34	6.1
< 100,000	29.2	343 (23.9)	330	96.4	13	3.6
LHIN						
1. Erie St. Clair	29.3	**	**	97.8	**	**
2. South West	26.2	102 (7.1)	96	93.5	6	6.5
3. Waterloo Wellington	31.9	77 (5.4)	71	91.7	6	8.3
4. Hamilton Niagara Haldimand Brant	28.8	173 (12.1)	166	94.2	7	5.8
5. Central West	29.3	**	**	93.3	**	**
6. Mississauga Halton	28.9	98 (6.8)	91	89.5	7	10.5
7. Toronto Central	26.1	**	**	96.3	**	**
8. Central	29.9	**	**	97.4	**	**
9. Central East	31.9	180 (12.5)	165	91.6	15	8.4
10. South East	37.1	**	**	96.2	**	**
11. Champlain	28.6	132 (9.2)	123	93.7	9	6.3
12. North Simcoe Muskoka	32.8	**	**	94.6	**	**
13. North East	32.2	**	**	98.7	**	**
14. North West	28.7	**	**	81.1	**	**

** Cell value suppressed for reasons of privacy and confidentiality.

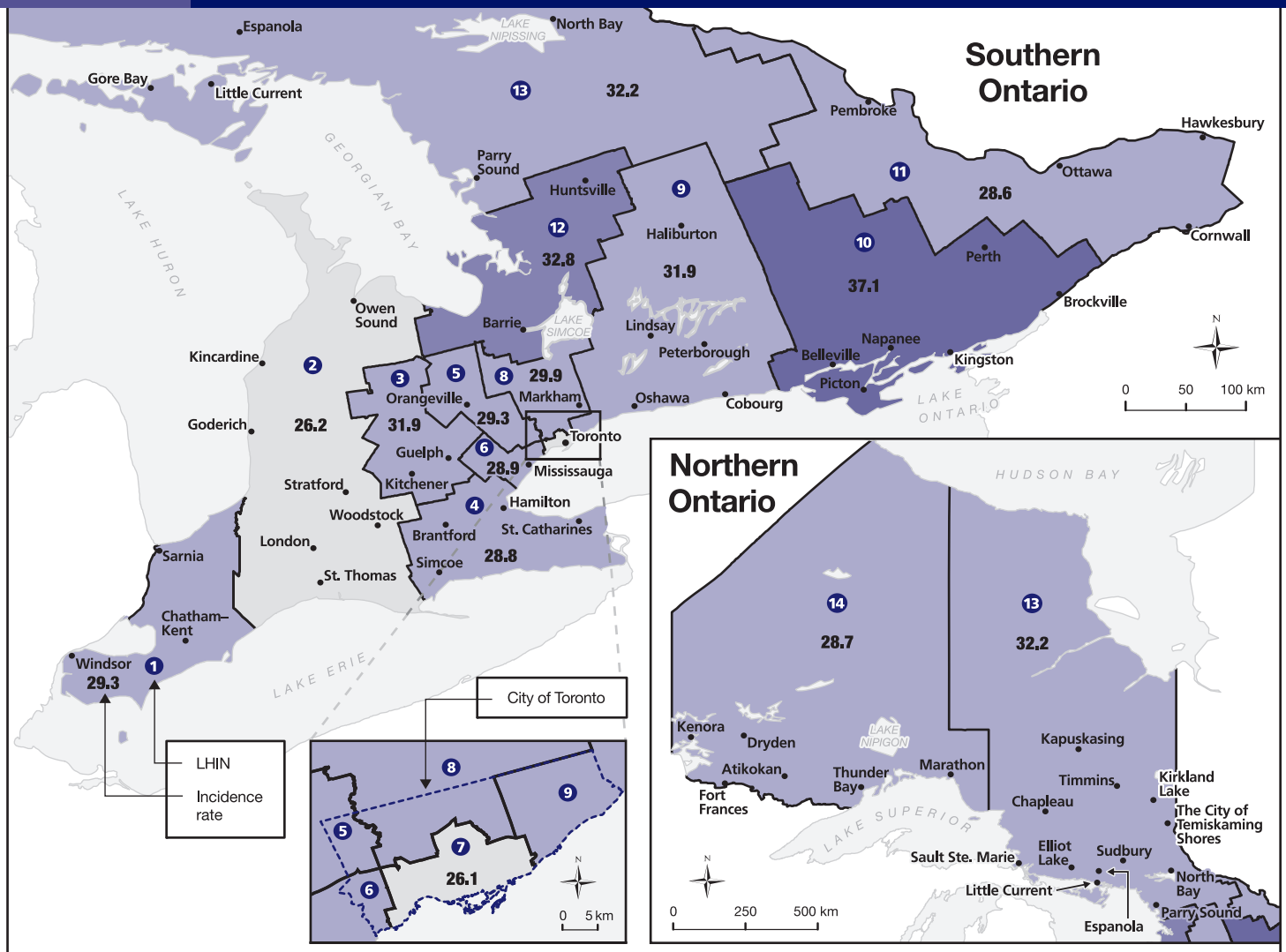
1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Uterine Cancer Cohort.

2 Age-specific rates have not been standardized.

Findings

- In 2003/04, the age-standardized incidence of uterine cancer in Ontario increased with age—from about 13 cases per 100,000 among women age 40–49 years to 75 cases per 100,000 women aged 70 years or older.
- The incidence of uterine cancer was noticeably higher among women living in higher-income neighbourhoods (33–35 cases per 100,000 women) at the time of diagnosis than it was among those living in the lowest-income neighbourhoods (23 cases per 100,000 women).
- The vast majority (95 percent) of Ontario women aged 20 years or older newly diagnosed with uterine cancer in 2003/04 received an operative procedure as part of their treatment. A small minority (five percent) did not undergo any type of surgery for their disease.
- Factors such as women's age or socioeconomic status did not play a role in whether or not women with uterine cancer were treated surgically.

Exhibit 6.2 Age-standardized uterine cancer incidence per 100,000 women 20 years of age or older, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age-standardized uterine cancer incidence rate per 100,000 women in the Overall Uterine Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 29.8 per 100,000 women

LHIN rate per 100,000 women	LHIN rate compared to OR	Number of LHINs in each category
> 35.8	More than 20% above OR	1
32.6–35.8	10% to 20% above OR	1
27.0–32.5	Within 10% of OR	10
23.8–26.9	10% to 20% below OR	2
< 23.8	More than 20% below OR	0

Findings

- In 2003/04, 10 of Ontario's 14 Local Health Integration Networks (LHINs) had uterine cancer incidence rates that were within 10 percent above or below the average provincial rate—29.8 cases per 100,000 women—at the time.
- The incidence of uterine cancer among women living in the Toronto Central and South West LHINs at the time they were diagnosed was more than 10 percent below the average provincial rate. It was more than 10 percent above the average rate for Ontario among women residing in either the North Simcoe Muskoka LHIN or the South East LHIN.
- The South East LHIN had the highest rate of uterine cancer in 2003/04, with an incidence of 37 cases per 100,000 women. This rate was more than 20 percent higher than the average rate for Ontario.

Exhibit 6.3 Health care utilization among women in the Uterine Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Uterine Cancer Surgery Cohort: Total number of patients	Uterine Cancer Surgery Cohort: Average # visits with treating surgeon[2]	Uterine Cancer Surgery Cohort: % with more than one hospital admission	Hospital admissions[1]: Total number of admissions	Hospital admissions[1]: Same-day surgery	Hospital admissions[1]: Inpatient admissions
	number	*visits/patient*	*% patients*	*number (average per patient)*	*age-standardized % total admissions[3]*	
Ontario	**1,360**	**3.1**	**40.9**	**1,938 (1.4)**	**29.1**	**70.9**
Age group (years)[3]						
20–39	24	3.4	70.8	42 (1.8)	40.5	59.5
40–49	114	3.4	40.4	164 (1.4)	28.0	72.0
50–69	792	3.1	39.0	1,113 (1.4)	28.4	71.6
70+	430	2.8	42.6	619 (1.4)	29.9	70.1
Neighbourhood income quintile						
Q1 (Lowest)	200	3.1	44.9	296 (1.5)	30.7	69.3
Q2	263	2.9	45.0	385 (1.5)	31.4	68.6
Q3	275	3.0	39.3	387 (1.4)	27.7	72.3
Q4	295	3.1	42.3	425 (1.4)	29.7	70.3
Q5 (Highest)	288	3.2	35.4	392 (1.4)	26.4	73.6
Community size (population)						
≥ 1,250,000	507	3.2	38.2	715 (1.4)	28.4	71.6
100,000–1,249,999	522	2.9	42.0	748 (1.4)	28.7	71.3
< 100,000	330	3.1	43.4	474 (1.4)	29.9	70.1
LHIN						
1. Erie St. Clair	77	3.5	35.8	107 (1.4)	27.9	72.1
2. South West	96	2.9	31.3	129 (1.3)	22.2	76.0
3. Waterloo Wellington	71	3.3	48.8	108 (1.5)	30.7	69.3
4. Hamilton Niagara Haldimand Brant	166	3.2	41.9	240 (1.4)	29.3	68.9
5. Central West	57	3.3	37.8	80 (1.4)	25.3	74.7
6. Mississauga Halton	91	2.9	39.9	127 (1.4)	28.8	71.2
7. Toronto Central	120	3.4	37.7	170 (1.4)	29.4	70.6
8. Central	156	3.3	37.9	223 (1.4)	28.4	71.6
9. Central East	165	3.3	44.4	237 (1.4)	31.0	69.0
10. South East	78	3.4	25.8	100 (1.3)	17.1	82.9
11. Champlain	123	1.9	46.6	180 (1.5)	32.5	67.5
12. North Simcoe Muskoka	53	3.0	40.4	76 (1.4)	29.1	69.1
13. North East	83	2.9	54.9	130 (1.6)	32.7	67.3
14. North West	23	3.2	29.5	30 (1.3)	27.8	70.3

1 Time frame for hospital admissions is from 12 months before to 12 months after diagnosis.

2 Time frame for surgeon visits is from 6 months before to 6 months after the first surgery.

3 Standardized to the Overall Uterine Cancer Cohort; age-specific rates have not been standardized.

Findings

- On average, women in the Uterine Cancer Surgery Cohort had 1.4 hospital encounters per person related to their cancer surgery during the two-year period surrounding their diagnosis date (i.e., from 12 months before to 12 months after diagnosis).
- Seventy-one percent of these hospital visits were for inpatient procedures (such as hysterectomy); the remaining 29 percent were for procedures such as dilatation and curettage (D&C) that are usually done on an outpatient, same-day surgery basis.
- On average, women who had surgery for uterine cancer visited their surgeons approximately three times during the one-year period surrounding their surgery (i.e., from six months before to six months after their surgery).

Exhibit 6.4 Hospital admissions for surgical procedures among women in the Uterine Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN of patient residence	LHIN where care was received					
	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton
	number (col%, row %)[1]					
1. Erie St. Clair	**88 (100, 82.2)**	18 (11.6, 16.8)				
2. South West		**119 (76.8, 93.7)**		6 (2.3, 4.7)		
3. Waterloo Wellington		16 (10.3, 15.1)	**78 (96.3, 73.6)**	6 (2.3, 5.7)		**
4. Hamilton Niagara Haldimand Brant		**		**235 (89.4, 98.3)**		**
5. Central West					**32 (74.4, 41.0)**	7 (7.6, 9.0)
6. Mississauga Halton				9 (3.4, 7.3)	**	**72 (78.3, 58.1)**
7. Toronto Central						6 (6.5, 3.8)
8. Central					8 (18.6, 3.7)	
9. Central East				**		
10. South East						
11. Champlain						
12. North Simcoe Muskoka					**	
13. North East		**		**		
14. North West						
Ontario	**88 (100, 4.7)**	**155 (100, 8.2)**	**81 (100, 4.3)**	**263 (100, 13.9)**	**43 (100, 2.3)**	**92 (100, 4.9)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having uterine cancer surgery in a given LHIN were residents of that LHIN at the time of diagnosis, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all uterine cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings

- Approximately 80 percent of women in the Uterine Cancer Surgery Cohort received treatment in the Local Health Integration Network (LHIN) where they lived at the time of their diagnosis.

Exhibit 6.4 (cont'd) Hospital admissions for surgical procedures among women in the Uterine Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN where care was received								
7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West	Ontario
number (col%, row %)[1]								
								107 (5.7, 100)
								127 (6.7, 100)
**								106 (5.6, 100)
								239 (12.6, 100)
23 (6.6, 29.5)	13 (7.3, 16.7)							78 (4.1, 100)
36 (10.3, 29.0)	**							124 (6.6, 100)
141 (40.5, 89.2)	11 (6.2, 7.0)							158 (8.4, 100)
72 (20.7, 33.2)	**121 (68.4, 55.8)**	14 (8.7, 6.5)						217 (11.5, 100.1)
54 (15.5, 23.5)	20 (11.3, 8.7)	**146 (90.7, 63.5)**	8 (8.2, 3.5)		**			230 (12.2, 100)
**	**		**88 (90.7, 89.8)**	6 (3.3, 6.1)				98 (5.2, 100)
				174 (96.7, 99.4)				175 (9.2, 100)
14 (4.0, 18.7)	**				**56 (93.3, 74.7)**			75 (4.0, 100)
**	**				**	**119 (100, 92.2)**		129 (6.8, 100)
							28 (100, 96.6)	29 (1.5, 100)
348 (100, 18.4)	**177 (100, 9.4)**	**161 (100, 8.5)**	**97 (100, 5.1)**	**180 (100, 9.5)**	**60 (100, 3.2)**	**119 (100, 6.3)**	**28 (100, 1.5)**	**1,892 (100, 100)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having uterine cancer surgery in a given LHIN were residents of that LHIN at the time of diagnosis, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all uterine cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings (cont'd)

- More than one-fifth of the women who underwent surgery for uterine cancer in one of the following LHINs—South West, Mississauga Halton, Toronto Central, Central and Central West—resided outside these LHINs. This suggests that these five LHINs acted as referral centres and that many cancer patients travelled to them from other parts of the province to receive surgical treatment and care.

Exhibit 6.5a

Type of definitive surgical procedure among women in the Uterine Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Uterine Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]			
		Total abdominal hysterectomy with USO/BSO and lymph node[2] excision	Total abdominal hysterectomy and USO/BSO	Total abdominal hysterectomy	Other[3]
Ontario	1,360	255 (18.7)	979 (71.9)	59 (4.4)	67 (5.0)
Age group (years)[4]					
20–39	**	**	** (45.8)	** (25.0)	** (25.0)
40–49	**	** (16.7)	** (71.1)	** (8.8)	**
50–69	792	152 (19.2)	591 (74.6)	21 (2.7)	28 (3.5)
70+	430	83 (19.3)	296 (68.8)	22 (5.1)	29 (6.7)
Neighbourhood income quintile					
Q1 (Lowest)	200	37 (18.5)	139 (70.2)	12 (5.5)	12 (5.8)
Q2	263	46 (17.3)	185 (71.2)	15 (5.3)	17 (6.2)
Q3	275	60 (22.0)	194 (70.1)	11 (4.2)	10 (3.7)
Q4	295	43 (14.2)	231 (78.6)	10 (3.3)	11 (4.0)
Q5 (Highest)	288	64 (22.0)	201 (69.9)	9 (3.2)	14 (4.9)
Community size (population)					
≥ 1,250,000	507	65 (12.7)	387 (77.0)	25 (4.7)	30 (5.7)
100,000–1,249,999	522	136 (25.8)	343 (66.0)	18 (3.5)	25 (4.7)
< 100,000	330	54 (16.1)	248 (74.3)	16 (6.1)	12 (3.5)
LHIN					
1. Erie St. Clair	77	9 (11.5)	57 (72.1)	**	**
2. South West	96	26 (25.9)	64 (66.7)	**	**
3. Waterloo Wellington	71	11 (15.2)	56 (80.0)	**	**
4. Hamilton Niagara Haldiamnd Brant	166	44 (25.7)	109 (65.1)	**	**
5. Central West	57	8 (13.9)	42 (75.0)	**	**
6. Mississauga Halton	91	13 (13.3)	70 (80.1)	**	**
7. Toronto Central	120	15 (12.3)	95 (79.2)	**	**
8. Central	156	21 (13.4)	117 (76.0)	**	**
9. Central East	165	16 (9.0)	130 (78.8)	**	**
10. South East	78	**	72 (92.7)	**	**
11. Champlain	123	70 (56.4)	41 (33.0)	**	**
12. North Simcoe Muskoka	53	**	43 (81.1)	**	**
13. North East	83	**	74 (89.2)	**	**
14. North West	23	11 (47.6)	8 (33.7)	**	**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Percent of subgroup that had each type of definitive procedure, age-standardized to the Overall Ovarian Cancer Cohort.

2 Includes pelvic nodes only or pelvic and para-aortic lymph nodes.

3 Please see Technical Appendix at the end of this Atlas for definition of "other."

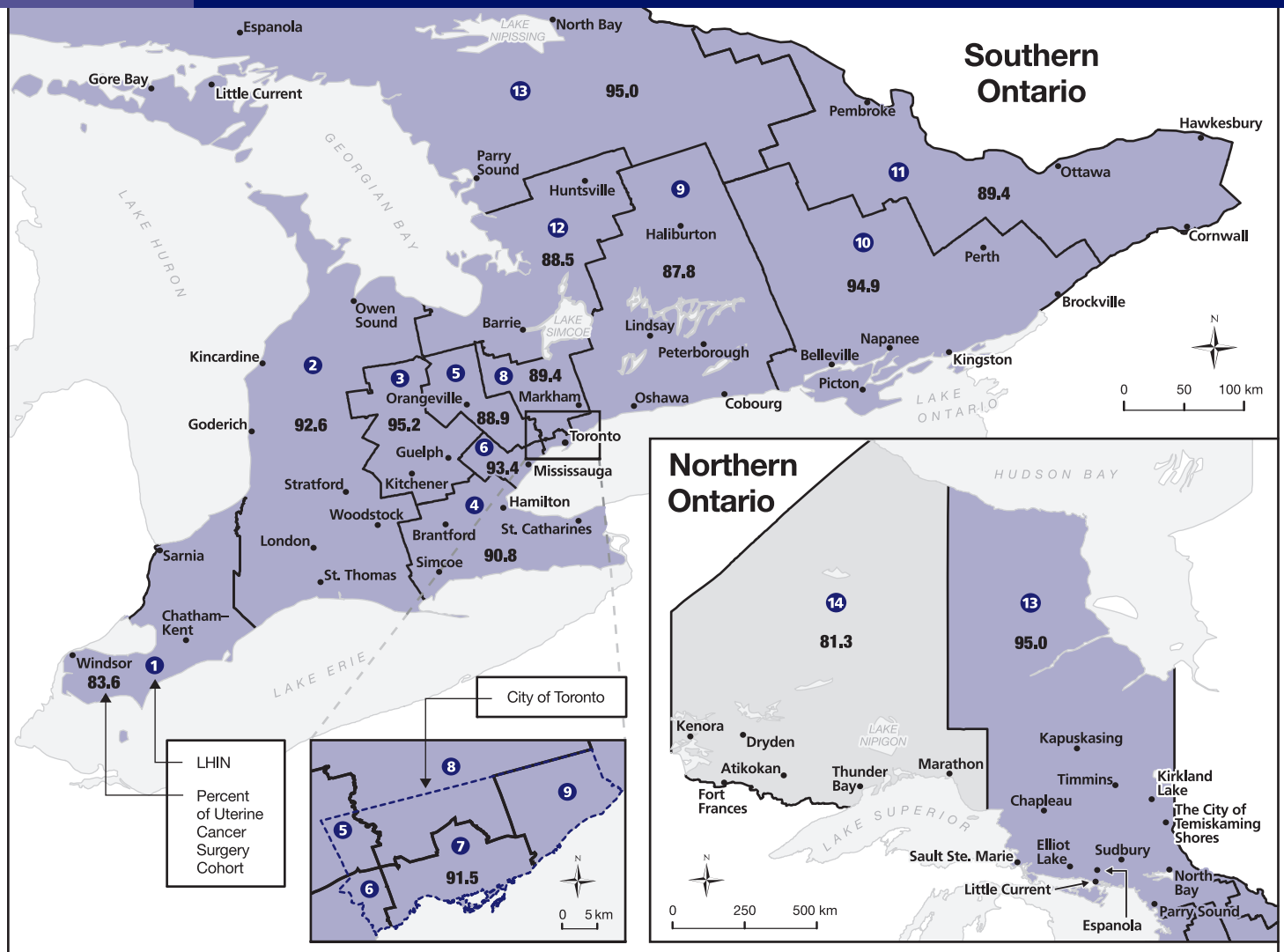
4 Age-specific rates have not been standardized.

Findings

- Younger women aged 20–39 years were more likely than older women to be treated by hysterectomy alone. Twenty-five percent of women in this younger age group underwent hysterectomy alone, compared with fewer than 10 percent of women in all other age groups.
- Pelvic and/or para-aortic lymphadenectomy was done in 20 percent of women who underwent a hysterectomy.

Exhibit 6.5b

Proportion of women in the Uterine Cancer Surgery Cohort [2003/04] whose definitive surgery was total abdominal hysterectomy (TAH) with unilateral or bilateral salpingo-oophorectomy (USO/BS0), by Local Health Integration Network (LHIN) of patient residence, in Ontario



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Percent of women in the Uterine Cancer Surgery Cohort whose definitive surgery was any total hysterectomy and USO/BSO, by LHIN of patient residence, in Ontario

Ontario rate (OR) = 90.6 percent

Percent of Uterine Cancer Surgery Cohort	LHIN rate compared to OR	Number of LHINs in each category
> 109.1	More than 20% above OR	0
99.3–109.1	10% to 20% above OR	0
82.0–99.2	Within 10% of OR	13
72.1–81.9	10% to 20% below OR	1
< 72.1	More than 20% below OR	0

Findings

- Across Ontario, approximately 91 percent of women diagnosed with uterine cancer in 2003/04 underwent any total abdominal hysterectomy with unilateral or bilateral salpingo-oophorectomy (USO/BSO) as the definitive surgical treatment for their disease.
- In 13 of 14 Local Health Integration Networks (LHINs) of patient residence, the proportion of women who underwent TAH with BSO was within 10 percent above or below the provincial rate. Among women living in the North West LHIN, this rate was more than 10 percent below the Ontario average. This finding could reflect the fact that some women living in the North West LHIN travelled to Manitoba for treatment; our data sources did not contain information on care received outside of Ontario.

Exhibit 6.6a Overall pattern of surgical care provided to women in the Uterine Cancer Surgery Cohort [2003/04], by physician specialty, in Ontario

Physician specialty	Physicians performing uterine cancer surgery *number (% physicians)*	All uterine cancer surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				Total abdominal hysterectomy with USO/BSO and lymph node excision	Total abdominal hysterectomy and USO/BSO	Total abdominal hysterectomy	Other	Total patients
Gynecologic oncology	16 (4.0)	380 (21.3)	373 (29.0)	182 (48.8)	166 (44.5)	12 (3.2)	13 (3.5)	373
Obstetrics and gynecology	363 (90.5)	1,357 (76.1)	878 (68.2)	83 (9.4)	710 (80.9)	41 (4.7)	44 (5.0)	878
General surgery/ other	22 (5.5)	46 (2.6)	30 (2.3)	**	24 (80.0)	6 (20.0)	**	30
Ontario	**401**	**1,783**	**1,281**	**265 (20.7)**	**900 (70.3)**	**59 (4.6)**	**57 (4.4)**	**1,281**

** Cell value suppressed and removed from totals for reasons of privacy and confidentiality.

1 Based on one definitive procedure per patient.

Findings

- Approximately three-quarters of all surgeries and 68 percent of definitive surgeries for uterine cancer undergone by women in the Uterine Cancer Surgery Cohort were performed by obstetrician/gynecologists.
- Although gynecologic oncologists comprised only four percent of physicians performing uterine cancer surgery during the study period, they provided 21 percent of all surgeries performed on women newly-diagnosed with uterine cancer.
- Nearly half of the patients in this study cohort whose surgery was performed by a gynecologic oncologist had a lymphadenectomy as part of their definitive surgery. Fewer than 10 percent of those whose surgery was performed by an obstetrician/gynecologist underwent this procedure.

Exhibit 6.6b Overall pattern of surgical care provided to women in the Uterine Cancer Surgery Cohort [2003/04], by hospital type, in Ontario

Hospital type	Hospitals performing uterine cancer surgery *number (% hospitals)*	All uterine cancer surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				Total abdominal hysterectomy with USO/BSO and lymph node excision	Total abdominal hysterectomy and USO/BSO	Total abdominal hysterectomy	Other	Total patients
Academic	12 (12.1)	702 (36.9)	599 (44.1)	207 (34.6)	347 (57.9)	21 (3.5)	24 (4.0)	599
Community/Small	87 (87.9)	1,183 (63.1)	759 (55.9)	48 (6.3)	632 (83.2)	38 (5.0)	41 (5.4)	759
Ontario	**99**	**1,900**	**1,358**	**255 (18.8)**	**979 (72.1)**	**59 (4.3)**	**65 (4.8)**	**1,358**

1 Based on one definitive procedure per patient.

Findings

- While both academic (teaching) and community hospitals provided surgical care to women in the Uterine Cancer Surgery Cohort, the majority of these operations—over 60 percent—took place in community hospitals.
- Women with uterine cancer who underwent surgery were more likely to have a lymphadenectomy if their surgery was carried out in an academic hospital setting.

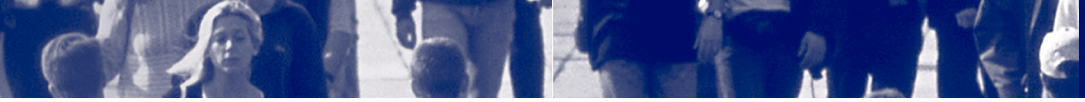


Exhibit 6.7a Diagnostic and screening services (local tumour extent[1]) received by women in the Uterine Cancer Surgery Cohort [2003/04], in the 12 months before their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Uterine Cancer Surgery Cohort *number*	Total number of services provided *(average[2] # services per patient)*			
		Pap smear	Endometrial biopsy (outpatient)	Dilatation and currettage (D&C)	Surgical biopsy
1. Erie St. Clair	77	22 (0.3)	48 (0.6)	15 (0.2)	9 (0.1)
2. South West	96	32 (0.3)	58 (0.6)	20 (0.2)	9 (0.1)
3. Waterloo Wellington	71	17 (0.2)	35 (0.5)	19 (0.3)	**
4. Hamilton Niagara Haldimand Brant	166	58 (0.3)	96 (0.6)	49 (0.3)	6 (0.0)
5. Central West	57	15 (0.3)	26 (0.5)	14 (0.2)	**
6. Mississauga Halton	91	35 (0.4)	57 (0.6)	28 (0.3)	**
7. Toronto Central	120	29 (0.2)	54 (0.5)	33 (0.3)	**
8. Central	156	70 (0.4)	94 (0.6)	43 (0.3)	**
9. Central East	165	55 (0.3)	81 (0.5)	62 (0.4)	11 (0.1)
10. South East	78	32 (0.4)	30 (0.4)	**	**
11. Champlain	123	37 (0.3)	69 (0.6)	34 (0.3)	**
12. North Simcoe Muskoka	53	20 (0.4)	30 (0.6)	20 (0.4)	**
13. North East	83	26 (0.3)	39 (0.5)	22 (0.3)	6 (0.1)
14. North West	23	11 (0.5)	19 (0.8)	**	0 (0.0)
Ontario	**1,360**	**459 (0.3)**	**737 (0.5)**	**370 (0.3)**	**70 (0.1)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Local tumour extent procedures are cytologic, histologic and radiologic services used for diagnosis and to assess the local extent of a tumour.

2 Denominator includes all patients in the Uterine Cancer Surgery Cohort.

Findings

- Endometrial biopsy was the most frequently used diagnostic procedure undergone by women in the Uterine Cancer Surgery Cohort within the 12 months before their definitive surgery.
- On average, only 30 percent of women in this study cohort had undergone a Pap smear test in the 12 months prior to their definitive surgery.

Exhibit 6.7b Diagnostic services (distant tumour extent[1]) received by women in the Uterine Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Uterine Cancer Surgery Cohort *number*	Total number of services provided *(average[2] # services per patient)*					
				Abdomen		Pelvis	
		Chest X-ray	Pelvic/intra-cavity/ transvaginal ultrasound	Ultrasound	CT scan	CT scan	MRI scan
1. Erie St. Clair	77	104 (1.4)	65 (0.8)	33 (0.4)	27 (0.4)	23 (0.3)	**
2. South West	96	167 (1.7)	78 (0.8)	51 (0.5)	53 (0.6)	50 (0.5)	**
3. Waterloo Wellington	71	92 (1.3)	60 (0.8)	23 (0.3)	37 (0.5)	37 (0.5)	**
4. Hamilton Niagara Haldimand Brant	166	299 (1.4)	161 (1.0)	58 (0.3)	109 (0.7)	107 (0.6)	**
5. Central West	57	79 (1.4)	75 (1.3)	34 (0.6)	43 (0.8)	42 (0.7)	6 (0.1)
6. Mississauga Halton	91	137 (1.5)	104 (1.1)	38 (0.4)	76 (0.8)	76 (0.8)	**
7. Toronto Central	120	156 (1.3)	169 (1.4)	75 (0.6)	112 (0.9)	110 (0.9)	10 (0.1)
8. Central	156	175 (1.1)	180 (1.2)	97 (0.6)	82 (0.5)	80 (0.5)	6 (0.0)
9. Central East	165	208 (1.3)	171 (1.0)	86 (0.5)	103 (0.6)	102 (0.6)	14 (0.1)
10. South East	78	127 (1.6)	69 (0.9)	37 (0.5)	31 (0.4)	27 (0.3)	0 (0.0)
11. Champlain	123	202 (1.6)	125 (1.0)	50 (0.4)	64 (0.5)	65 (0.5)	**
12. North Simcoe Muskoka	53	73 (1.4)	60 (1.1)	18 (0.3)	43 (0.8)	42 (0.8)	**
13. North East	83	57 (0.7)	68 (0.8)	40 (0.5)	31 (0.4)	30 (0.4)	**
14. North West	23	38 (1.7)	21 (0.9)	6 (0.3)	6 (0.3)	6 (0.3)	0 (0.0)
Ontario	**1,360**	**1,844 (1.4)**	**1,408 (1.0)**	**646 (0.5)**	**817 (0.6)**	**797 (0.6)**	**58 (0.0)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Distant tumour extent procedures are radiologic services used to assess whether the tumour has spread to other areas of the body (metastasis).

2 Denominator includes all patients in the Uterine Cancer Surgery Cohort.

Findings

- The diagnostic imaging tests most commonly received by women in the Uterine Cancer Surgery Cohort—either before or after their definitive surgery—were chest X-ray and pelvic/intracavitary/transvaginal ultrasound.
- Rates of ultrasound and CT scan were highest among women who lived in the Toronto Central LHIN at the time of their diagnosis.

Exhibit 6.7c Consultations and services received by women in the Uterine Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Uterine Cancer Surgery Cohort *number*	Gynecologic oncology		Obstetrics/Gynecology		Radiation oncology	
		% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	77	20.8	2.6	98.7	5.0	63.6	1.1
2. South West	96	31.3	2.7	96.9	4.3	55.2	1.1
3. Waterloo Wellington	71	23.9	2.7	98.6	4.6	71.8	1.1
4. Hamilton Niagara Haldimand Brant	166	34.3	3.5	90.4	4.5	71.7	1.0
5. Central West	57	52.6	4.0	96.5	4.6	64.9	1.0
6. Mississauga Halton	91	46.2	3.7	97.8	4.2	52.7	1.1
7. Toronto Central	120	46.7	3.7	94.2	4.4	53.3	1.1
8. Central	156	48.1	3.4	91.0	4.7	59.0	1.0
9. Central East	165	39.4	3.4	93.3	4.3	56.4	1.1
10. South East	78	9.0	2.4	55.1	4.3	33.3	1.2
11. Champlain	123	84.6	2.4	88.6	3.2	78.0	1.0
12. North Simcoe Muskoka	53	45.3	1.7	100.0	4.3	37.7	1.1
13. North East	83	12.0	1.6	89.2	4.4	75.9	1.0
14. North West	23	0.0	0.0	91.3	5.2	60.9	1.0
Ontario	**1,360**	**39.2**	**3.1**	**91.4**	**4.4**	**60.7**	**1.1**

LHIN of patient residence	Uterine Cancer Surgery Cohort *number*	Radiation therapy planning[3]		Medical oncology		Chemotherapy	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient
1. Erie St. Clair	77	29.9	1.0	**	**	9.1	3.0
2. South West	96	33.3	1.1	7.3	1.0	14.6	2.0
3. Waterloo Wellington	71	39.4	1.1	9.9	1.0	**	**
4. Hamilton Niagara Haldimand Brant	166	21.1	1.1	7.2	1.3	3.6	3.0
5. Central West	57	36.8	2.0	**	1.5	**	**
6. Mississauga Halton	91	30.8	1.4	11.0	1.1	9.9	2.0
7. Toronto Central	120	35.8	1.7	10.0	1.2	15.8	2.2
8. Central	156	23.1	1.9	4.5	1.0	8.3	2.1
9. Central East	165	31.5	1.6	**	**	6.7	4.0
10. South East	78	24.4	1.1	7.7	1.7	0.0	0.0
11. Champlain	123	25.2	1.1	**	**	8.1	3.0
12. North Simcoe Muskoka	53	24.5	2.3	15.1	1.5	**	**
13. North East	83	31.3	1.0	**	**	**	**
14. North West	23	26.1	1.2	0.0	0.0	0.0	0.0
Ontario	**1,360**	**28.9**	**1.4**	**6.3**	**1.2**	**7.6**	**2.7**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Visits include assessments, consultations and counselling.

2 Denominator includes only patients in the Uterine Cancer Surgery Cohort who had a visit, consult or session.

3 Please refer to chapter Introduction for a definition of radiation therapy planning.

Findings

- Nearly two-thirds of women in the Uterine Cancer Surgery Cohort (61 percent) saw a radiation oncologist within the period from 12 months before to 12 months after their definitive surgery. However, fewer than 30 percent of women underwent radiation therapy planning.
- Utilization of chemotherapy in this study cohort was very low. Just over six percent of women were seen by medical oncologists, and only eight percent received adjuvant chemotherapy.

Exhibit 6.8a

Diagnostic and screening services (local tumour extent[1]) received by women in the Uterine Cancer/No Surgery Cohort [2003/04], in the 12 months before their diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Uterine Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[2] # services per patient)*			
		Pap smear	Endometrial biopsy outpatient	Dilatation and currettage (D&C)	Surgical biopsy
1. Erie St. Clair	**	0 (0.0)	**	0 (0.0)	**
2. South West	**	**	**	0 (0.0)	0 (0.0)
3. Waterloo Wellington	6	**	**	0 (0.0)	**
4. Hamilton Niagara Haldimand Brant	7	**	**	0 (0.0)	0 (0.0)
5. Central West	**	**	**	0 (0.0)	**
6. Mississauga Halton	7	**	**	**	**
7. Toronto Central	**	0 (0.0)	**	0 (0.0)	0 (0.0)
8. Central	**	**	**	0 (0.0)	0 (0.0)
9. Central East	14	6 (0.4)	**	0 (0.0)	0 (0.0)
10. South East	**	**	**	0 (0.0)	0 (0.0)
11. Champlain	8	**	**	0 (0.0)	0 (0.0)
12. North Simcoe Muskoka	**	**	**	0 (0.0)	0 (0.0)
13. North East	**	0 (0.0)	**	0 (0.0)	0 (0.0)
14. North West	**	**	**	0 (0.0)	0 (0.0)
Ontario	**76**	**21 (0.3)**	**33 (0.4)**	**	**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Local tumour extent procedures are cytologic, histologic and radiologic services used for diagnosis and to assess the local extent of a tumour.

2 Denominator includes all patients in the Uterine Cancer/No Surgery Cohort.

Findings

- A total of 76 Ontario women—or 5.3 percent of all women diagnosed with uterine cancer in 2003/04—did not undergo any surgical procedure related to their disease within the 12 months before their diagnosis date.
- Outpatient endometrial biopsy was the most commonly used diagnostic procedure in the Uterine Cancer/No Surgery Cohort, with about four out of every 10 women undergoing this procedure.
- In the 12 months prior to diagnosis, the average per capita Pap smear rate among women who did not undergo surgery for uterine cancer was 0.3. This rate is similar to the average per capita Pap smear rate among women who did undergo surgery for their uterine cancer (see Exhibit 6.7a).

Exhibit 6.8b Diagnostic services (distant tumour extent[1]) received by women in the Uterine Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Uterine Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[2] # services per patient)*					
		Chest X-ray	Pelvic/intra-cavity/ transvaginal ultrasound	Abdomen		Pelvis	
				Ultrasound	CT scan	CT scan	MRI scan
1. Erie St. Clair	**	**	**	0 (0.0)	**	**	0 (0.0)
2. South West	**	6 (1.2)	**	**	**	**	0 (0.0)
3. Waterloo Wellington	6	10 (1.7)	**	**	12 (2.0)	12 (2.0)	0 (0.0)
4. Hamilton Niagara Haldimand Brant	7	7 (1.0)	**	**	**	**	0 (0.0)
5. Central West	**	9 (2.3)	**	**	8 (2.0)	8 (2.0)	**
6. Mississauga Halton	7	8 (1.1)	9 (1.3)	7 (1.0)	10 (1.4)	10 (1.4)	**
7. Toronto Central	**	6 (1.2)	**	**	7 (1.4)	7 (1.4)	0 (0.0)
8. Central	**	9 (2.3)	**	**	**	**	**
9. Central East	14	17 (1.2)	8 (0.6)	13 (0.9)	17 (1.2)	16 (1.1)	**
10. South East	**	10 (3.3)	**	**	6 (2.0)	6 (2.0)	0 (0.0)
11. Champlain	8	17 (2.1)	9 (1.1)	27 (3.4)	13 (1.6)	13 (1.6)	**
12. North Simcoe Muskoka	**	**	**	0 (0.0)	**	**	0 (0.0)
13. North East	**	**	**	0 (0.0)	0 (0.0)	0 (0.0)	
14. North West	**	**	**	**	**	**	0 (0.0)
Ontario	**76**	**108 (1.4)**	**51 (0.7)**	**65 (0.9)**	**84 (1.1)**	**85 (1.1)**	**13 (0.2)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Distant tumour extent procedures are radiologic services used to assess whether the tumour has spread to other areas of the body (metastasis).

2 Denominator includes all patients in the Uterine Cancer/No Surgery Cohort.

Findings

- Among women in the Uterine Cancer/No Surgery Cohort, the most common diagnostic imaging studies done during the period from 12 months before to 12 months after their diagnosis date were chest X-ray (1.4 tests per woman, on average) and computerized tomography (CT) scan of the abdomen and pelvis (one test per woman, on average).

Exhibit 6.8c

Consultations and services received by women in the Uterine Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Uterine Cancer/ No Surgery Cohort *number*	Gynecologic oncology		Obstetrics/Gynecology		Radiation oncology	
		% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	**	0.0	0.0	**	**	0.0	0.0
2. South West	**	**	**	**	**	**	**
3. Waterloo Wellington	6	**	**	**	**	**	**
4. Hamilton Niagara Haldimand Brant	7	**	**	**	**	**	**
5. Central West	**	**	**	**	**	**	**
6. Mississauga Halton	7	100.0	2.1	100.0	2.4	**	**
7. Toronto Central	**	**	**	**	**	**	**
8. Central	**	**	**	**	**	**	**
9. Central East	14	42.9	1.8	71.4	1.8	46.7	1.1
10. South East	**	0.0	0.0	**	**	**	**
11. Champlain	8	87.5	3.1	87.5	3.7	**	**
12. North Simcoe Muskoka	**	0.0	0.0	**	**	**	**
13. North East	**	0.0	0.0	**	**	0.0	0.0
14. North West	**	0.0	0.0	**	**	0.0	0.0
Ontario	**76**	**50.0**	**2.4**	**72.4**	**2.6**	**48.7**	**1.3**

LHIN of patient residence	Uterine Cancer/ No Surgery Cohort *number*	Radiation therapy planning[3]		Medical oncology		Chemotherapy	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient
1. Erie St. Clair	**	0.0	0.0	0.0	0.0	0.0	0.0
2. South West	**	**	**	**	**	0.0	0.0
3. Waterloo Wellington	6	**	**	**	**	**	**
4. Hamilton Niagara Haldimand Brant	7	**	**	0.0	0.0	**	**
5. Central West	**	0.0	0.0	**	**	0.0	0.0
6. Mississauga Halton	7	**	**	**	**	**	**
7. Toronto Central	**	0.0	0.0	**	**	**	**
8. Central	**	0.0	0.0	0.0	0.0	**	**
9. Central East	14	**	**	**	**	**	**
10. South East	**	**	**	**	**	0.0	0.0
11. Champlain	8	**	**	**	**	**	6.0
12. North Simcoe Muskoka	**	**	**	0.0	0.0	0.0	0.0
13. North East	**	0.0	0.0	0.0	0.0	0.0	0.0
14. North West	**	0.0	0.0	**	**	0.0	0.0
Ontario	**76**	**27.6**	**1.4**	**22.4**	**1.2**	**13.2**	**2.9**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Visits include assessments, consultations and counselling.

2 Denominator includes only patients in the Uterine Cancer/No Surgery Cohort who had a visit, consult or session.

3 Please refer to chapter Introduction for a definition of radiation therapy planning.

Findings

- Fifty percent of women in the Uterine Cancer/No Surgery Cohort saw a gynecologic oncologist during the 12 months before and the 12 months after their diagnosis date—compared to 39 percent of those in the Uterine Cancer Surgery Cohort *(see Exhibit 6.7c)*.
- Women who did not have surgery were less likely to see a radiation oncologist during the study period than those who had surgery for their uterine cancer. They were also much more likely to see a medical oncologist (22 percent vs. six percent) and to receive chemotherapy (13 percent vs. eight percent).

Discussion and Conclusions

Uterine cancer is the most common cancer of the female genital tract. It is also the fourth most common type of cancer among Canadian women and the ninth leading cause of cancer-related deaths in women. Uterine cancer is the most common gynecologic cancer requiring surgical treatment in Ontario.

In our analysis of data about Ontario women diagnosed with uterine cancer in 2003/04, we found that sociodemographic factors such as women's age and income were related to the incidence of uterine cancer. However, these factors did not seem to play a role in whether or not women underwent surgery for their disease. In general, we found no significant variations in whether or not women had surgery according to their Local Health Integration Network (LHIN) of residence. The one exception was the low rate of surgery among women residing in Ontario's North West LHIN which is geographically close to the province of Manitoba. It is possible that some women living in the northwest part of Ontario travelled to the city of Winnipeg for their cancer treatment and were therefore not captured in our data.

On average, 30 percent of women in the Overall Uterine Cancer Surgery Cohort underwent dilatation and curettage (D&C), presumably for the purpose of making a diagnosis. This procedure is done in a hospital setting and requires general or regional anesthesia.

One potential area of concern with respect to surgical procedures for cancer in Ontario are the distances some women must travel in order to receive proper diagnosis and treatment. However, we found that most women in the Uterine Cancer Surgery Cohort were able to access care where they lived at the time of their diagnosis (i.e., their LHIN of residence). This suggests that, during our study period, women had adequate access to obstetrician/gynecologists, since the data also show that these specialists provided more than three-quarters (76 percent) of all uterine cancer-related surgeries for women in our study cohort.

However, access to treatment by gynecologic oncologists—recommended for women with more advanced disease and/or those with high-grade tumours or poor prognosis histologies (i.e., serous or clear cell tumours)—may be an issue. In 2003/04, there were only 16 gynecologic oncologists in the entire province, and they worked primarily in academic (teaching) hospitals located in urban centres.

Unfortunately, the Ontario Cancer Registry (OCR), which was the primary source of data for this Atlas, contains incomplete information about patients' cancer stage. Thus, it is impossible to know whether or not some women with uterine cancer who might have needed more specialized care were able to access it.

Implications for clinical practice

While few clinical practice guidelines exist regarding the optimal treatment of uterine cancer, the current consensus is that treatment for all but the lowest-grade tumours should include hysterectomy and salpingo-oophorectomy (USO/BSO). According to our findings, about one in 10 Ontario women newly diagnosed with uterine cancer in 2003/04 did not undergo USO/BSO as part of their definitive surgery; indeed, half of these women did not even receive a hysterectomy.

The role of lymphadenectomy (surgical removal of lymph nodes) in uterine cancer treatment is the subject of ongoing debate. In their 2007 study, Kwon et al. found that that lymphadenectomy rates were much lower in Ontario compared with the United States. Indeed, in many parts of the US, this procedure is almost routine.[2]

Their population-based overview of practice patterns and outcomes in Ontario (utilizing data from 1996 to 2000) did not find an association between lymphadenectomy and survival in women with intermediate and high-risk endometrial cancer.[2] Thus, at the present time, there is no strong evidence that lymphadenectomy improves survival in women with uterine cancer. However, if positive nodes are identified as a result of the surgery, this finding can be used to guide decisions about adjuvant therapy.

In our study, 19 percent of Ontario women newly-diagnosed with uterine cancer in 2003/04 underwent lymphadenectomy. This is higher than the rate of 11 percent among women with intermediate and high-risk cancers cited by Kwon et al. in 2007. However, this study only looked at women with Stage I cancers, whereas our study examined women with uterine cancers regardless of stage.

According to our data, the use of lymphadenectomy varied by the type of health care provider. Gynecologic oncologists performed lymph node dissection in half of their cases, while just one in 10 obstetrician gynecologists did so. This may be due to the fact that gynecologic oncologists typically see patients with more severe disease.

Implications for policy and planning

It is important that Ontario women with uterine cancer who are at low risk for distant (metastatic) disease continue having access to surgery within their own communities. This means access both to specialist physicians who perform surgery (obstetrician/gynecologists and gynecologic oncologists) and to hospitals; it also means ensuring that cancer surgery happens in a timely manner.

In the absence of evidence that specific types of treatment improve survival in women with uterine cancer, practice guidelines and health policy recommendations for the surgical management of uterine cancer should focus on improving the delivery of care: this includes reducing costs[3] and facilitating timely access to care within communities.

References

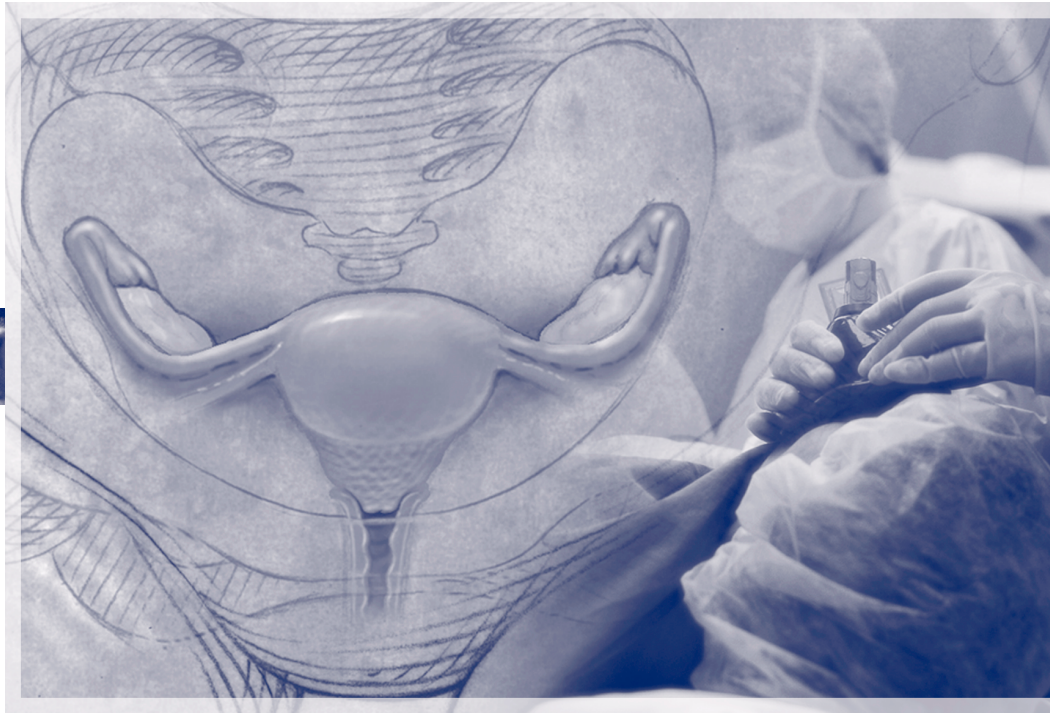
1. Canadian Cancer Society/National Cancer Institute of Canada. Canadian Cancer Statistics 2007. Toronto: CCS/NCIC; 2007.
2. Kwon JS, Carey MS, Cook EF, Qiu F, Paszat L. Patterns of practice and outcomes in intermediate- and high-risk stage I and II endometrial cancer: a population-based study. *Int J Gynecol Cancer* 2007; 17(2):433–40.
3. Kwon JS, Carey MS, Goldie SJ, Kim JJ. Cost-effectiveness analysis of treatment strategies for Stage I and II endometrial cancer. *J Obstet Gynaecol Can* 2007; 29(2):131–9.

INSIDE

Chapter 7

Surgery for Ovarian Cancer

Laurie Elit, MD, MSc, FRCSC, Susan E. Schultz, MA, MSc, Raymond Przybysz, MSc, Andrew S. Wilton, MSc, Nadia Gunraj, BSc, MPH, Marko Simunovic, MD, MPH, FRCSC, and David R. Urbach, MD, MSc, FRCSC, FACS



Executive Summary

Issue

Ovarian cancer is a common cancer of the female genital tract with a high case fatality rate.

Study

This chapter examines patterns of treatment provided to women in Ontario who were newly-diagnosed with ovarian cancer in 2003/04. The research focuses on the use of surgery and related health services. It also explores the role of certain demographic, geographic and health care system factors in the treatment of ovarian cancer among women who underwent surgery for their disease and also among those who did not.

Key Findings

- Nearly three quarters (73 percent) of women diagnosed with ovarian cancer in 2003/04 received surgery within a year of diagnosis.
- Almost all procedures (96 percent) were done in an inpatient hospital setting.
- Some Local Health Integration Networks (LHINs) appeared to serve as referral centres for women with ovarian cancer. For example, 223 surgical procedures for the disease were done in facilities located in the Toronto Central LHIN during the study period. However, only 56 of these (25 percent) were for patients who resided in the Toronto Central LHIN at the time they were diagnosed.
- The most common surgical procedure performed on women with ovarian cancer was unilateral or bilateral salpingo-oophorectomy (USO/BSO) with omentectomy; this was undergone by 58 percent of women in the study cohort. Other procedures included USO/BSO alone (27 percent) and USO/BSO with pelvic or para-aortic lymph node excision (8.1 percent).
- While gynecologic oncologists comprised just 6.5 percent of surgeons who performed surgery for ovarian cancer in Ontario during the study period, these sub-specialists did 49 percent of all procedures.
- Six out of 10 surgeries for ovarian cancer (60 percent) were done in academic (teaching) hospitals.

Implications

- **More research is needed to better understand why the use of cancer staging procedures—such as omentectomy and lymph node excision—varied among women in the study cohort who underwent surgery for ovarian cancer.**
- **Plans for expanding surgical services related to the treatment of ovarian cancer in Ontario should factor in the existing referral patterns among Local Health Integration Networks (LHINs).**
- **There are relatively few gynecologic oncologists in Ontario; these sub-specialists provide care to a large number of women with ovarian cancer. Further evaluation is required—both in terms of the role of gynecologic oncologists in treating women with ovarian cancer, and also whether the supply of these specialists will be sufficient to meet future demand.**

Introduction

Ovarian cancer is the seventh most common type of cancer among Canadian women and the fifth leading cause of cancer deaths in women.[1] The most recently published cancer statistics estimated that in 2007, 2,400 Canadian women would be newly-diagnosed with ovarian cancer, and 1,700 women would die from the disease.

Women with ovarian cancer usually present with vague symptoms such as abdominal bloating, pelvic discomfort, frequent urination and/or an unexplained change in bowel habits. The diagnosis of ovarian cancer is usually made by an abdominal-pelvic ultrasound and a CA 125 blood test. (CA 125 is a protein which is present in especially high concentrations in ovarian cancer cells and can be detected via a blood sample analysis.)

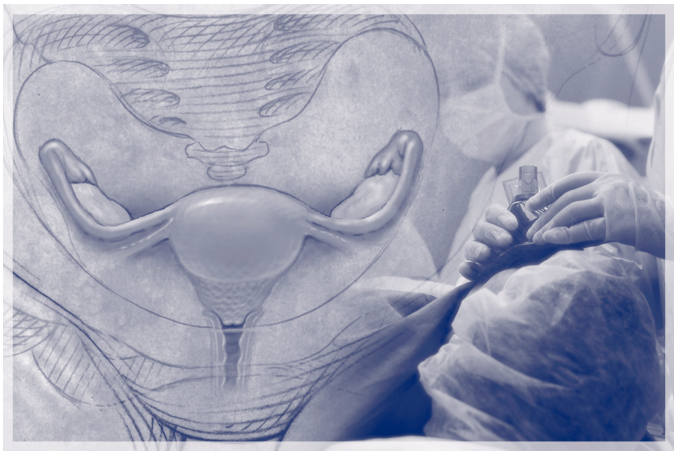
Treatments for ovarian cancer

Treatment for ovarian cancer depends on the stage of disease and on the general health status of the patient. Surgery for ovarian cancer can be performed for a number of reasons: to make a tissue diagnosis; to determine the extent of disease; to assess the intra-abdominal contents; and to remove as much of the cancer as possible with the goal of leaving only microscopic residual disease.

Bilateral salpingo-oophorectomy (BSO) involves removing both fallopian tubes and both ovaries; unilateral salpingo-oophorectomy (USO) involves removing just one tube and a single ovary. An omentectomy is the surgical removal of a fatty fold of tissue lining portions of the stomach and large intestine called the omentum. Lymphadenectomy involves removing the nodes that lie along the great vessels in the pelvis and abdomen.

These latter two procedures are done to determine whether microscopic tumour cells have travelled to the lymph nodes or to the omentum, in which case treatment in addition to surgery may be required.

In patients with ovarian cancer where there is evidence of metastases (spread) detected on diagnostic imaging tests—such as enlarged para-aortic lymph nodes or liver metastasis—treatment usually involves neoadjuvant chemotherapy using a combination of carboplatin and paclitaxel (Taxol), often called carbo/taxol. (Neoadjuvant chemotherapy refers to drug treatment given to people with cancer before surgery; the goal is to reduce the size of the cancer, making surgery easier and reducing its impact on the patient.) If there is a positive disease response to this chemotherapy (i.e., the cancer shrinks), then women are offered interval "debulking" surgery (removal of most of the tumour) followed by further chemotherapy.



How the study cohorts were defined

This chapter provides detailed information about the demographic characteristics of Ontario women newly-diagnosed with ovarian cancer in 2003/04, their perioperative assessment and characteristics of the hospital interaction. This includes information regarding women who underwent surgery and those who did not.

The study population for this chapter included all Ontario women 20 years of age or older identified with ovarian cancer in the Ontario Cancer Registry (OCR) whose diagnosis date fell between April 1, 2003 and March 31, 2004. This is referred to as the **Overall Ovarian Cancer Cohort.**

The Overall Ovarian Cancer Cohort was then subdivided into two smaller groups:

- The **Ovarian Cancer Surgery Cohort** included all Ontario women 20 years of age or older identified with ovarian cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had ovarian cancer surgery within 12 months before or after their diagnosis date.
- The **Ovarian Cancer/No Surgery Cohort** included all Ontario women 20 years of age or older identified with ovarian cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have ovarian cancer surgery within 12 months before or after their diagnosis date.

Notes:

- If a patient had more than one type of procedure, the most extensive procedure is identified in this Atlas as the "definitive" surgery.
- All patients who receive radiation therapy as part of cancer treatment first undergo radiation therapy planning. This involves positioning the person's body, marking the skin and taking imaging scans to determine the best way to deliver the radiation dose. Because complete data on which patients in our study cohorts actually received radiation therapy were not available, we have used radiation therapy planning as a surrogate measure for radiation therapy treatment.

Chapter 7—List of Exhibits

Exhibits and Findings

Exhibit 7.1 Incidence of ovarian cancer in Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Ovarian Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Ovarian Cancer Cohort				
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**19.8**	**963 (100.0)**	**700**	**72.7**	**263**	**27.3**
Age group (years)[2]						
20–39	3.6	** (6.5)	**	93.7	**	**
40–49	15.2	** (15.0)	**	92.4	**	7.6
50–69	33.9	** (41.4)	**	84.5	**	15.5
70+	57.5	** (37.1)	**	47.9	**	52.1
Neighbourhood income quintile						
Q1 (Lowest)	18.6	178 (19.0)	116	69.0	62	31.0
Q2	18.6	181 (19.3)	130	73.5	51	26.5
Q3	22.5	208 (22.2)	158	74.0	50	26.0
Q4	21.6	192 (20.5)	147	74.1	45	25.9
Q5 (Highest)	19.4	179 (19.1)	135	74.4	44	25.6
Community size (population)						
≥ 1,250,000	19.4	356 (37.0)	270	74.0	86	26.0
100,000–1,249,999	20.6	369 (38.3)	264	72.7	105	27.3
< 100,000	20.3	238 (24.7)	166	71.3	72	28.7
LHIN						
1. Erie St. Clair	19.7	53 (5.5)	47	87.8	6	12.2
2. South West	16.8	68 (7.1)	45	66.5	23	33.5
3. Waterloo Wellington	14.3	38 (3.9)	27	69.9	11	30.1
4. Hamilton Niagara Haldimand Brant	22.9	133 (13.8)	89	67.0	44	33.0
5. Central West	23.4	51 (5.3)	41	74.4	10	25.6
6. Mississauga Halton	17.2	55 (5.7)	36	62.4	19	37.6
7. Toronto Central	18.2	89 (9.2)	61	67.8	28	32.2
8. Central	22.4	118 (12.3)	93	78.1	25	21.9
9. Central East	18.0	105 (10.9)	81	76.4	24	23.6
10. South East	21.8	50 (5.2)	33	71.6	17	28.4
11. Champlain	21.4	100 (10.4)	79	78.9	21	21.1
12. North Simcoe Muskoka	22.5	39 (4.0)	26	72.6	13	27.4
13. North East	17.9	46 (4.8)	32	71.5	14	28.5
14. North West	19.4	18 (1.9)	10	58.1	8	41.9

** Cell value suppressed for reasons of privacy and confidentiality.

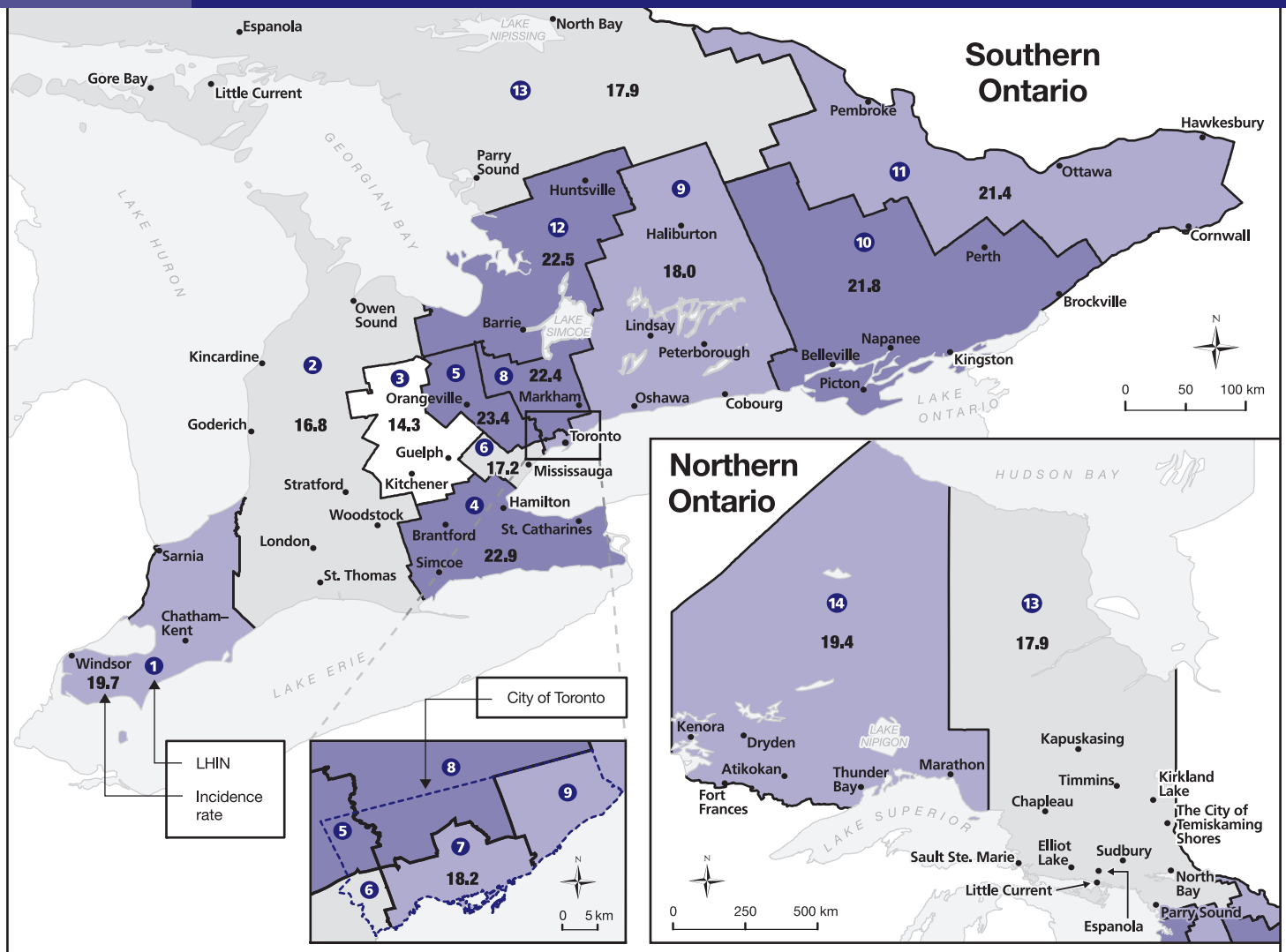
1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Ovarian Cancer Cohort.

2 Age-specific rates have not been standardized.

Findings

- While the incidence of ovarian cancer among Ontario women increased with age in 2003/04, the probability of surgical treatment decreased. About three-quarters (73 percent) of women in the Overall Ovarian Cancer Cohort underwent a surgical procedure related to the diagnosis and treatment of their disease.
- There was no clear relationship between women's socioeconomic status and whether they had surgery for ovarian cancer. However, those living in regions with the lowest neighbourhood income were less likely than all others to have ovarian cancer-related surgery.
- Rates of ovarian cancer-related surgery ranged across Local Health Integration Networks (LHINs) of patient residence—from a low of 58 percent among women living in the North West LHIN to a high of 88 percent among those residing in the Erie St. Clair LHIN.

Exhibit 7.2 Age-standardized ovarian cancer incidence per 100,000 women 20 years of age or older, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age-standardized ovarian cancer incidence per 100,000 women in the Overall Ovarian Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 19.8 per 100,000 women

LHIN rate per 100,000 women	LHIN rate compared to OR	Number of LHINs in each category
> 23.8	More than 20% above OR	0
21.7–23.8	10% to 20% above OR	5
18.0–21.6	Within 10% of OR	5
15.8–17.9	10% to 20% below OR	3
< 15.8	More than 20% below OR	1

Findings

- In 2003/04, the lowest incidence of ovarian cancer in Ontario was 14 cases per 100,000 among women who lived in the Waterloo Wellington Local Health Integration Network (LHIN) at the time of diagnosis. This rate was more than 20 percent below the overall Ontario rate of 20 cases per 100,000 women during the study period.
- The highest incidence of ovarian cancer was 23 cases per 100,000 women who lived in the Central West LHIN at the time they were diagnosed. This rate was about 18 percent above the overall Ontario rate.

Exhibit 7.3 Health care utilization among women in the Ovarian Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Ovarian Cancer Surgery Cohort: Total number of patients	Ovarian Cancer Surgery Cohort: Average # visits with treating surgeon[1]	Ovarian Cancer Surgery Cohort: % with more than one hospital admission	Hospital admissions[2]: Total number of admissions	Hospital admissions[2]: Same-day surgery	Hospital admissions[2]: Inpatient admissions
	number	*visits/patient*	*% patients*	*number (average per patient)*	*age-standardized % total admissions[3]*	
Ontario	**700**	**2.9**	**64 (7.9)**	**766 (1.1)**	**3.6**	**96.4**
Age group (years)[3]						
20–39	59	3.2	14 (23.7)	74 (1.3)	14.9	85.1
40–49	133	3.4	17 (12.8)	151 (1.1)	2.6	97.4
50–69	337	3.0	29 (8.6)	366 (1.1)	2.7	97.3
70+	171	2.2	**	175 (1.0)	2.9	97.1
Neighbourhood income quintile						
Q1 (Lowest)	116	2.6	11 (8.2)	127 (1.1)	4.2	95.8
Q2	130	2.8	13 (9.3)	144 (1.1)	3.6	96.4
Q3	158	2.8	11 (5.2)	170 (1.1)	2.4	97.6
Q4	147	2.9	18 (9.1)	165 (1.1)	5.8	94.2
Q5 (Highest)	135	3.2	10 (6.9)	145 (1.1)	1.1	98.9
Community size (population)						
≥ 1,250,000	270	3.2	28 (9.0)	300 (1.1)	3.9	96.1
100,000–1,249,999	264	2.8	21 (7.0)	285 (1.1)	3.6	96.4
< 100,000	166	2.4	15 (8.1)	181 (1.1)	2.7	97.3
LHIN						
1. Erie St. Clair	47	3.0	**	52 (1.1)	3.1	96.9
2. South West	45	2.8	**	47 (1.0)	0.0	93.5
3. Waterloo Wellington	27	2.9	**	30 (1.1)	6.4	93.6
4. Hamilton Niagara Haldimand Brant	89	3.8	6 (6.8)	95 (1.1)	2.6	97.4
5. Central West	41	2.8	**	45 (1.1)	0.0	100.0
6. Mississauga Halton	36	2.4	6 (19.3)	42 (1.2)	6.1	93.9
7. Toronto Central	61	3.5	**	65 (1.1)	0.8	99.2
8. Central	93	3.4	12 (10.8)	106 (1.1)	6.4	93.6
9. Central East	81	3.5	**	86 (1.1)	1.8	98.2
10. South East	33	2.0	**	34 (1.0)	2.2	97.8
11. Champlain	79	1.6	10 (11.8)	89 (1.1)	3.3	96.7
12. North Simcoe Muskoka	26	2.5	**	27 (1.0)	7.1	92.9
13. North East	32	1.9	**	37 (1.2)	1.3	98.7
14. North West	10	1.8	**	11 (1.1)	12.4	87.6

** Cell value suppressed for reasons of privacy and confidentiality.

1 Time frame for surgeon visits is from 6 months before to 6 months after the first surgery.

2 Time frame for hospital admissions is from 12 months before to 12 months after diagnosis.

3 Standardized to the Overall Ovarian Cancer Cohort; age-specific rates have not been standardized.

Findings

- Almost all operations for ovarian cancer (96 percent) performed on women in the Ovarian Cancer Surgery Cohort were done in an in-patient hospital setting.
- The average number of visits by women in this study cohort to their treating surgeon in the 12 months surrounding their surgery ranged across Local Health Integration Networks (LHINs). Women living in the Champlain LHIN at the time they were diagnosed had the lowest number (1.6 visits per person); those residing in the Hamilton Niagara Haldimand Brant LHIN had the highest (3.8 visits per person).

Exhibit 7.4 Hospital admissions for surgical procedures among women in the Ovarian Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN of patient residence	LHIN where care was received					
	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton
	number (col%, row %)[1]					
1. Erie St. Clair	**29 (100, 55.8)**	23 (28.4, 44.2)				
2. South West		**45 (55.6, 95.7)**				
3. Waterloo Wellington		7 (8.6, 23.3)	**13 (92.9, 43.3)**	7 (6.8, 23.3)		
4. Hamilton Niagara Haldimand Brant		**		**81 (78.6, 85.3)**		**
5. Central West				**	**12 (80.0, 26.7)**	**
6. Mississauga Halton				**	**	**14 (77.8, 33.3)**
7. Toronto Central					**	**
8. Central						
9. Central East						
10. South East						
11. Champlain						
12. North Simcoe Muskoka		**		7 (6.8, 18.9)		
13. North East		**		**		
14. North West						
Ontario	**29 (100, 3.8)**	**81 (100, 10.6)**	**14 (100, 1.8)**	**103 (100, 13.5)**	**15 (100, 2.0)**	**18 (100, 2.4)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having ovarian cancer surgery in a given LHIN were residents of that LHIN at the time of diagnosis, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all ovarian cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings

- Only 64 percent of surgical procedures performed on women in the Ovarian Cancer Surgery Cohort occurred in hospitals located in the Local Health Integration Network (LHIN) where the women lived at the time they were diagnosed.
- Hospitals located in six LHINS (South West, Toronto Central, South East, Central, Hamilton Niagara Haldimand Brant and Mississauga Halton) performed more than 20 percent of all their surgeries for ovarian cancer on women who did not live in the LHIN where each hospital was located.

Exhibit 7.4 (cont'd) Hospital admissions for surgical procedures among women in the Ovarian Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN where care was received								
7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West	Ontario
number (col%, row %)[1]								
								52 (6.8, 100)
								47 (6.1, 100)
								30 (3.9, 100)
8 (3.6, 8.4)	**							95 (12.4, 100)
24 (10.8, 53.3)	**							45 (5.9, 100)
22 (9.9, 52.4)	**							42 (5.5, 100)
56 (25.1, 86.2)	6 (8.7, 9.2)	**						65 (8.5, 100)
55 (24.7, 51.9)	**49 (71.0, 46.2)**	**						106 (13.9, 100)
34 (15.2, 39.5)	6 (8.7, 7.0)	**34 (91.9, 39.5)**	12 (28.6, 14.0)					86 (11.2, 100)
			30 (71.4, 90.9)					33 (4.3, 100)
				89 (95.7, 100)				89 (11.6, 100)
16 (7.2, 59.3)	**				**9 (100, 33.3)**			27 (3.5, 100)
**						**24 (100, 64.9)**		37 (4.8, 100)
							8 (100, 72.7)	11 (1.4, 100)
223 (100, 29.2)	**69 (100, 9.0)**	**37 (100, 4.8)**	**42 (100, 5.5)**	**93 (100, 12.2)**	**9 (100, 1.2)**	**24 (100, 3.1)**	**8 (100, 1.0)**	**765 (100, 100)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having ovarian cancer surgery in a given LHIN were residents of that LHIN at the time of diagnosis, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all ovarian cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings (cont'd)

- In hospitals located in the Toronto Central LHIN, just 25 percent of surgeries for ovarian cancer was performed on women who resided in that LHIN at the time of diagnosis.

Exhibit 7.5a Type of definitive surgical procedure among women in the Ovarian Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Ovarian Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]			
		USO/BSO and lymph node[2] excision	USO/BSO and omentectomy	USO/BSO	Other[3]
Ontario	700	63 (8.1)	394 (57.6)	198 (27.3)	45 (6.9)
Age group (years)[4]					
20–39	59	9 (15.3)	22 (37.3)	21 (35.6)	7 (11.9)
40–49	133	14 (10.5)	63 (47.4)	48 (36.1)	8 (6.0)
50–69	337	33 (9.8)	201 (59.6)	89 (26.4)	14 (4.2)
70+	171	7 (4.1)	108 (63.2)	40 (23.4)	16 (9.4)
Neighbourhood income quintile					
Q1 (Lowest)	**	** (7.5)	** (58.1)	** (25.5)	** (8.9)
Q2	130	9 (6.1)	78 (61.1)	33 (25.1)	10 (7.7)
Q3	158	15 (8.6)	83 (53.3)	51 (31.0)	9 (7.1)
Q4	147	** (9.2)	78 (54.4)	42 (27.4)	** (8.9)
Q5 (Highest)	**	** (8.1)	** (63.2)	**	**
Community size (population)					
≥ 1,250,000	270	21 (6.9)	160 (60.4)	68 (25.2)	21 (7.5)
100,000–1,249,999	264	29 (10.0)	147 (56.9)	72 (26.1)	16 (7.0)
< 100,000	166	13 (7.4)	87 (52.9)	58 (34.6)	8 (5.2)
LHIN					
1. Erie St. Clair	47	**	22 (45.1)	21 (43.6)	**
2. South West	45	**	21 (44.3)	13 (26.9)	**
3. Waterloo Wellington	27	**	18 (69.4)	6 (20.7)	**
4. Hamilton Niagara Haldiamnd Brant	89	**	50 (59.6)	26 (27.2)	**
5. Central West	41	**	23 (57.4)	13 (33.5)	**
6. Mississauga Halton	36	**	20 (64.5)	13 (30.4)	**
7. Toronto Central	61	**	42 (66.8)	13 (22.6)	**
8. Central	93	12 (11.5)	55 (61.3)	20 (19.8)	6 (7.4)
9. Central East	81	7 (7.1)	42 (51.0)	23 (30.1)	9 (11.8)
10. South East	33	**	18 (51.7)	11 (35.4)	**
11. Champlain	79	**	44 (58.9)	20 (23.4)	**
12. North Simcoe Muskoka	26	**	16 (65.7)	6 (19.3)	**
13. North East	32	**	17 (54.0)	11 (34.1)	**
14. North West	10	**	**	**	**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Percent of subgroup that had each type of definitive procedure, age-standardized to the Overall Ovarian Cancer Cohort.

2 Includes pelvic nodes only or pelvic and para-aortic lymph nodes.

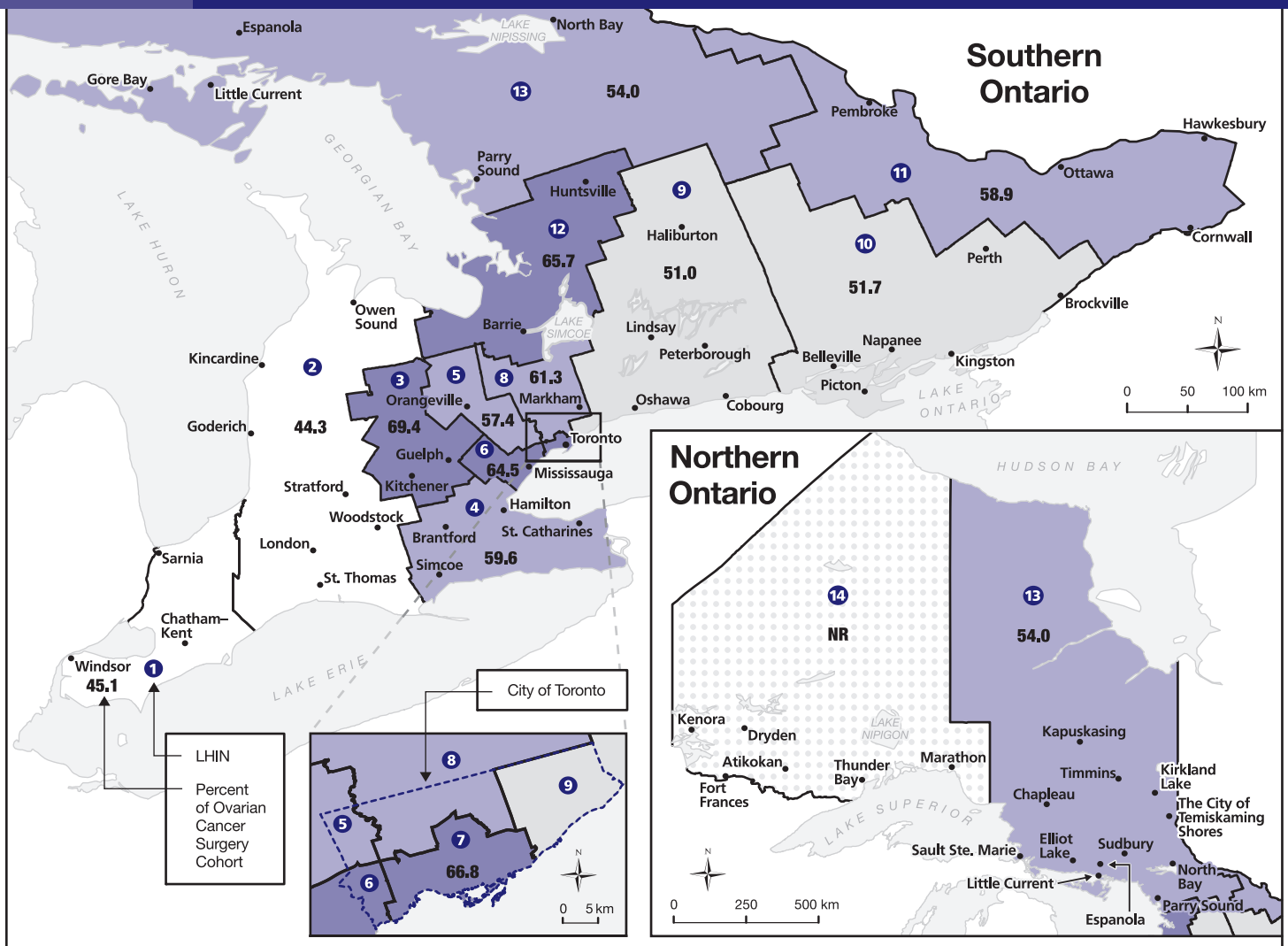
3 Please see Technical Appendix at the end of this Atlas for definition of "other."

4 Age-specific rates have not been standardized.

Findings

- The most common type of surgery among women in the Ovarian Cancer Surgery Cohort was unilateral (USO) or bilateral (BSO) salpingo-oophorectomy—the removal of one or both ovaries and fallopian tubes—combined with omentectomy.
- Lymph node excision was done in just eight percent of women with ovarian cancer.

Exhibit 7.5b Proportion of women in the Ovarian Cancer Surgery Cohort [2003/04] whose definitive surgery was unilateral or bilateral salpingo-oophorectomy (BSO/USO) and omentectomy, by Local Health Integration Network (LHIN) of patient residence, in Ontario



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Percent of women in the Ovarian Cancer Surgery Cohort whose definitive surgery was USO/BSO and omentectomy, by LHIN of patient residence, in Ontario

Ontario rate (OR) = 57.6 percent

Percent of Ovarian Cancer Surgery Cohort	LHIN rate compared to OR	Number of LHINs in each category
> 69.4	More than 20% above OR	0
63.1–69.4	10% to 20% above OR	4
52.2–63.0	Within 10% of OR	5
45.8–52.1	10% to 20% below OR	2
< 45.8	More than 20% below OR	2
NR	Not reportable due to small cell size	1

Findings

- Fifty-eight percent of women in the Ovarian Cancer Surgery Cohort underwent a unilateral or bilateral salpingo-oophorectomy (USO/BSO) and omentectomy as their definitive surgery.
- The proportion of women in this study cohort who had USO/BSO with omentectomy as their definitive surgery varied across Local Health Integration Networks (LHINs). Women living in the South West LHIN at the time they were diagnosed had the lowest rate (44 percent); those residing in the Waterloo Wellington LHIN had the highest (69 percent).

Exhibit 7.6a Overall pattern of surgical care provided to women in the Ovarian Cancer Surgery Cohort [2003/04], by physician specialty, in Ontario

Physician specialty	Physicians performing ovarian cancer surgery *number (% physicians)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				USO/BSO and lymph node[2] excision	USO/BSO and omentectomy	USO/BSO	Other	Total
Gynecologic oncology	17 (6.5)	375 (49.1)	347 (53.3)	46 (13.3)	243 (70.0)	48 (13.8)	10 (2.9)	347
Obstetrics and gynecology	175 (67.3)	300 (39.7)	267 (41.0)	15 (5.6)	118 (44.2)	119 (44.6)	15 (5.6)	267
General surgery other	68 (26.2)	89 (11.6)	37 (5.7)	**	12 (32.4)	18 (48.6)	7 (18.9)	37
Ontario	**260**	**764**	**651**	**61 (9.4)**	**373 (57.3)**	**185 (28.4)**	**32 (4.9)**	**651**

** Cell value suppressed and removed from totals for reasons of privacy and confidentiality.

1 Based on one definitive procedure per patient.

2 Includes pelvic nodes only or pelvic and para-aortic lymph nodes.

Findings

- During the study period, gynecologic oncologists comprised about seven percent of all physicians performing ovarian cancer surgery in Ontario. Yet these sub-specialists performed nearly half (49) percent of all the surgeries among women in the Ovarian Cancer Surgery Cohort.
- Obstetrician/gynecologists performed 40 percent of surgeries on women in this study cohort; the remaining 12 percent of procedures were done by physicians with other specialties.
- Gynecologic oncologists were more likely than obstetrician/gynecologists to perform omentectomy (70 percent vs. 44 percent respectively) and lymph node excision (13 percent vs. six percent).

Exhibit 7.6b Overall pattern of surgical care provided to women in the Ovarian Cancer Surgery Cohort [2003/04], by hospital type, in Ontario

Hospital type	Hospitals performing ovarian cancer surgery *number (% hospitals)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				USO/BSO and lymph node[2] excision	USO/BSO and omentectomy	USO/BSO	Other	Total
Academic	12 (13.8)	462 (60.3)	434 (62.0)	50 (11.5)	285 (65.7)	82 (18.9)	17 (3.9)	434
Community/Small	71 (86.2)	304 (39.7)	266 (38.0)	13 (4.9)	109 (41.4)	116 (43.0)	28(10.6)	266
Ontario	**83**	**766**	**700**	**63 (9.0)**	**394 (56.3)**	**198 (28.3)**	**45 (6.4)**	**700**

1 Based on one definitive procedure per patient.

2 Includes pelvic nodes only or pelvic and para-aortic lymph nodes.

Findings

- The majority (60 percent) of ovarian cancer surgeries performed on women in the Ovarian Cancer Surgery Cohort took place in an academic (teaching) hospital setting.
- Women treated in academic (teaching) hospitals were more likely to undergo USO/BSO with omentectomy (66 vs. 41 percent, respectively).
- Women whose surgeries took place in community hospitals were more likely to have a USO/BSO alone compared to women who underwent surgery in teaching hospitals (43 percent vs. 19 percent).

Exhibit 7.7a Diagnostic, screening and staging services received by women in the Ovarian Cancer Surgery Cohort [2003/04], in the 12 months before their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Ovarian Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*					
		Biopsy under ultrasound or CT scan	Surgical biopsy	Paracentesis	Pelvic/intracavity/ transvaginal ultrasound	Pelvic CT scan	Pelvic MRI scan
1. Erie St. Clair	47	0 (0.0)	**	**	41 (0.9)	22 (0.5)	0 (0.0)
2. South West	45	**	**	27 (0.6)	41 (0.9)	22 (0.5)	0 (0.0)
3. Waterloo Wellington	27	**	**	**	37 (1.4)	30 (1.1)	**
4. Hamilton Niagara Haldimand Brant	89	6 (0.1)	7 (0.1)	24 (0.3)	100 (1.1)	59 (0.7)	**
5. Central West	41	14 (0.3)	**	28 (0.7)	65 (1.6)	46 (1.1)	0 (0.0)
6. Mississauga Halton	36	**	7 (0.2)	10 (0.3)	46 (1.3)	40 (1.1)	**
7. Toronto Central	61	**	**	8 (0.1)	94 (1.5)	41 (0.7)	**
8. Central	93	14 (0.2)	13 (0.1)	26 (0.3)	100 (1.1)	63 (0.7)	**
9. Central East	81	8 (0.1)	6 (0.1)	27 (0.3)	103 (1.3)	64 (0.8)	**
10. South East	33	**	**	**	37 (1.1)	**	**
11. Champlain	79	**	14 (0.2)	19 (0.2)	89 (1.1)	51 (0.6)	7 (0.1)
12. North Simcoe Muskoka	26	6 (0.2)	0 (0.0)	6 (0.2)	31 (1.2)	24 (0.9)	**
13. North East	32	**	**	**	31 (1.0)	27 (0.8)	**
14. North West	10	0 (0.0)	0 (0.0)	**	11 (1.1)	**	0 (0.0)
Ontario	**700**	**74 (0.1)**	**64 (0.1)**	**191 (0.3)**	**826 (1.2)**	**509 (0.7)**	**30 (0.0)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Ovarian Cancer Surgery Cohort.

Findings

- Very few biopsies were performed on women in the Ovarian Cancer Surgery Cohort in the 12 months before their definitive surgery.
- Out of 700 women in this study cohort, just 64 underwent a surgical biopsy related to their cancer; another 74 had needle biopsies guided by ultrasound or computed tomography (CT) scanning.

Exhibit 7.7b Diagnostic, screening and services received by women in the Ovarian Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Ovarian Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*				
		Chest X-ray	Abdominal ultrasound	Abdominal CT scan	Thoracentesis	Lower gastrointestinal endoscopy
1. Erie St. Clair	47	99 (2.1)	52 (1.1)	59 (1.3)	0 (0.0)	8 (0.2)
2. South West	45	116 (2.6)	55 (1.2)	62 (1.4)	**	16 (0.4)
3. Waterloo Wellington	27	58 (2.1)	33 (1.2)	62 (2.3)	0 (0.0)	7 (0.3)
4. Hamilton Niagara Haldimand Brant	89	200 (2.2)	103 (1.2)	174 (2.0)	15 (0.2)	12 (0.1)
5. Central West	41	77 (1.9)	66 (1.6)	118 (2.9)	6 (0.1)	15 (0.4)
6. Mississauga Halton	36	88 (2.4)	46 (1.3)	91 (2.5)	**	5 (0.1)
7. Toronto Central	61	110 (1.8)	88 (1.4)	141 (2.3)	**	13 (0.2)
8. Central	93	152 (1.6)	127 (1.4)	160 (1.7)	6 (0.1)	15 (0.2)
9. Central East	81	127 (1.6)	98 (1.2)	150 (1.9)	**	17 (0.2)
10. South East	33	63 (1.9)	27 (0.8)	52 (1.6)	**	**
11. Champlain	79	179 (2.3)	48 (0.6)	157 (2.0)	**	**
12. North Simcoe Muskoka	26	58 (2.2)	35 (1.3)	79 (3.0)	**	8 (0.3)
13. North East	32	70 (2.2)	32 (1.0)	62 (1.9)	**	9 (0.3)
14. North West	10	31 (3.1)	11 (1.1)	32 (3.2)	**	**
Ontario	**700**	**1,428 (2.0)**	**821 (1.2)**	**1,399 (2.0)**	**48 (0.1)**	**135 (0.2)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Ovarian Cancer Surgery Cohort.

Findings

- Most patients in the Ovarian Cancer Surgery Cohort had radiologic imaging—including X-rays, computed tomography (CT) scans and/or ultrasounds of the chest, pelvis or abdomen—in the 24 months surrounding their definitive surgery.

Exhibit 7.7c Consultations and services received by women in the Ovarian Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Ovarian Cancer Surgery Cohort *number*	Gynecologic oncology		Obstetrics and gynecology		General surgery	
		% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a visit[1]	Average[2] # visits per patient
1. Erie St. Clair	47	34.0	3.1	87.2	4.3	42.6	1.8
2. South West	45	57.8	3.8	68.9	4.2	48.9	2.8
3. Waterloo Wellington	27	51.9	3.4	77.8	3.7	48.1	4.8
4. Hamilton Niagara Haldimand Brant	89	71.9	6.7	60.7	3.6	48.3	2.4
5. Central West	41	85.4	4.0	68.3	3.5	56.1	2.8
6. Mississauga Halton	36	77.8	3.8	86.1	3.3	38.9	2.7
7. Toronto Central	61	83.6	4.4	70.5	3.5	31.1	2.2
8. Central	93	80.6	5.3	78.5	3.1	37.6	2.3
9. Central East	81	59.3	4.3	80.2	3.3	32.1	3.1
10. South East	33	15.2	5.0	36.4	4.6	21.2	2.1
11. Champlain	79	92.4	5.5	57.0	2.5	40.5	2.8
12. North Simcoe Muskoka	26	88.5	2.8	84.6	2.4	57.7	2.5
13. North East	32	37.5	1.5	78.1	3.0	62.5	3.0
14. North West	10	20.0	1.5	80.0	4.0	**	**
Ontario	**700**	**67.4**	**4.7**	**71.3**	**3.4**	**42.0**	**2.7**

LHIN of patient residence	Ovarian Cancer Surgery Cohort *number*	Medical oncology		Chemotherapy	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient
1. Erie St. Clair	47	31.9	1.0	51.1	3.1
2. South West	45	11.1	1.2	68.9	3.3
3. Waterloo Wellington	27	48.1	1.3	66.7	3.1
4. Hamilton Niagara Haldimand Brant	89	32.6	1.2	60.7	4.4
5. Central West	41	29.3	1.8	68.3	4.3
6. Mississauga Halton	36	36.1	1.0	66.7	6.4
7. Toronto Central	61	19.7	1.3	60.7	3.3
8. Central	93	16.1	1.3	71.0	4.0
9. Central East	81	17.3	1.2	46.9	4.5
10. South East	33	27.3	1.7	27.3	4.7
11. Champlain	79	6.3	1.0	67.1	4.2
12. North Simcoe Muskoka	26	57.7	1.5	76.9	3.3
13. North East	32	84.4	1.1	62.5	3.2
14. North West	10	**	**	70.0	5.0
Ontario	**700**	**26.6**	**1.3**	**61.3**	**4.0**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Visits include assessments, consultations and counselling.

2 Denominator includes only those patients in the Ovarian Cancer Surgery Cohort who had at least one service (consult or session).

Findings

- A majority of women (71 percent) in the Ovarian Cancer Surgery Cohort were seen by a gynecologist during the study period; 67 percent were seen by a gynecologic oncologist; and 42 percent saw a general surgeon.
- More than 60 percent of women in this study cohort also underwent chemotherapy as part of their treatment, yet only 27 percent saw a medical oncologist. It is likely that for many women, chemotherapy treatment was managed by their gynecologic oncologists.

Exhibit 7.8a Diagnostic, screening and staging services received by women in the Ovarian Cancer/No Surgery Cohort [2003/04], in the 12 months before their diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Ovarian Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*					
		Biopsy under ultrasound or CT scan	Surgical biopsy	Paracentesis	Pelvic/intracavity/ transvaginal ultrasound	Pelvic CT scan	Pelvic MRI scan
1. Erie St. Clair	6	0 (0.0)	**	**	**	**	0.0
2. South West	23	**	**	**	14 (0.6)	9 (0.4)	0.0
3. Waterloo Wellington	11	**	**	**	6 (0.5)	7 (0.6)	0.0
4. Hamilton Niagara Haldimand Brant	44	**	0.0	**	17 (0.4)	13 (0.3)	0.0
5. Central West	10	**	0.0	**	8 (0.8)	**	
6. Mississauga Halton	19	**	0.0	**	11 (0.6)	14 (0.7)	0.0
7. Toronto Central	28	**	0.0	**	15 (0.5)	13 (0.5)	0.0
8. Central	25	**	0.0	6 (0.5)	16 (0.6)	12 (0.5)	**
9. Central East	24	**	0.0	**	10 (0.4)	10 (0.4)	**
10. South East	17	**	0.0	**	10 (0.6)	8 (0.5)	0.0
11. Champlain	21	**	0.0	**	14 (0.7)	7 (0.3)	0.0
12. North Simcoe Muskoka	13	**	**	6 (0.5)	6 (0.5)	6 (0.5)	0.0
13. North East	14	**	0.0	**	**	**	0.0
14. North West	8	0 (0.0)	0.0	**	6 (0.8)	**	0.0
Ontario	**263**	**20 (0.1)**	**	**39 (0.1)**	**139 (0.5)**	**109 (0.4)**	**

** Cell value suppressed for reasons of privacy and confidentiality

[1] Denominator includes all patients in the Ovarian Cancer/No Surgery Cohort.

Findings

- Women in the Ovarian Cancer/No Surgery Cohort received fewer diagnostic services, on average, than those in the Ovarian Cancer Surgery Cohort. For example, an average of 1.2 pelvic computed tomography (CT) scans were performed on each woman in the Ovarian Cancer Surgery Cohort vs. an average of 0.4 pelvic CT scans performed on each woman in the Ovarian Cancer/No Surgery Cohort.
- Some women with ovarian cancer who did not have surgery underwent palliative procedures designed to ease symptoms rather than cure their cancer. This included procedures such as paracentesis (done to remove excess fluid that has accumulated in the abdominal cavity).

Exhibit 7.8b Radiologic services received by women in the Ovarian Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Ovarian Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*				
		Chest X-ray	Abdominal ultrasound	Abdominal CT scan	Thoracentesis	Lower gastrointestinal endoscopy
1. Erie St. Clair	6	11 (1.8)	10 (1.7)	7 (1.2)	**	**
2. South West	23	45 (2.0)	15 (0.7)	21 (0.9)	**	**
3. Waterloo Wellington	11	18 (1.6)	11 (1.0)	19 (1.7)	0 (0.0)	**
4. Hamilton Niagara Haldimand Brant	44	77 (1.8)	37 (0.8)	70 (1.6)	**	8 (0.2)
5. Central West	10	18 (1.8)	12 (1.2)	10 (1.0)	0 (0.0)	**
6. Mississauga Halton	19	61 (3.2)	38 (2.0)	31 (1.6)	7 (0.4)	**
7. Toronto Central	28	50 (1.8)	27 (1.0)	49 (1.8)	**	**
8. Central	25	49 (2.0)	57 (2.3)	33 (1.3)	**	7 (0.3)
9. Central East	24	37 (1.5)	27 (1.1)	37 (1.5)	**	**
10. South East	17	33 (1.9)	14 (0.8)	25 (1.5)	7 (0.4)	0 (0.0)
11. Champlain	21	39 (1.9)	19 (0.9)	28 (1.3)	**	**
12. North Simcoe Muskoka	13	25 (1.9)	18 (1.4)	32 (2.5)	**	**
13. North East	14	19 (1.4)	52 (3.7)	15 (1.1)	0 (0.0)	8 (0.6)
14. North West	8	13 (1.6)	7 (0.9)	**	0 (0.0)	**
Ontario	**263**	**495 (1.9)**	**344 (1.3)**	**382 (1.5)**	**43 (0.2)**	**50 (0.2)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Ovarian Cancer/No Surgery Cohort.

Findings

- Chest X-ray was the most frequently used radiologic test among women in the Ovarian Cancer/No Surgery Cohort.
- Women in this study cohort underwent fewer computed tomography (CT) scans compared to women who did undergo surgery for ovarian cancer. For example, women who did not have surgery underwent 1.5 abdominal CT scans on average, compared to two abdominal CT scans among those who had surgery.

Exhibit 7.8c Consultations and services received by women in the Ovarian Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Ovarian Cancer/ No Surgery Cohort *number*	Gynecologic oncology		Obstetrics and gynecology		General surgery	
		% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a visit[1]	Average[2] # visits per patient
1. Erie St. Clair	6	**	**	**	**	**	**
2. South West	23	26.1	3.3	39.1	3.0	60.9	2.4
3. Waterloo Wellington	11	**	**	**	**	72.7	1.5
4. Hamilton Niagara Haldimand Brant	44	31.8	4.1	36.4	1.4	65.9	2.1
5. Central West	10	**	**	**	**	**	**
6. Mississauga Halton	19	**	3.5	36.8	1.6	63.2	2.3
7. Toronto Central	28	39.3	3.0	53.6	1.9	39.3	2.2
8. Central	25	32.0	3.0	36.0	2.4	32.0	1.9
9. Central East	24	25.0	1.3	33.3	1.6	29.2	2.0
10. South East	17	0.0	0.0	**	**	**	**
11. Champlain	21	66.7	3.5	**	**	33.3	1.9
12. North Simcoe Muskoka	13	**	**	**	**	76.9	1.9
13. North East	14	**	**	**	**	64.3	3.9
14. North West	8	0.0	0.0	**	**	**	**
Ontario	**263**	**27.0**	**3.1**	**34.2**	**1.8**	**49.4**	**1.2**

LHIN of patient residence	Ovarian Cancer/ No Surgery Cohort *number*	Medical oncology		Chemotherapy	
		% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient
1. Erie St. Clair	6	0.0	0.0	**	**
2. South West	23	**	**	39.1	2.0
3. Waterloo Wellington	11	**	**	**	**
4. Hamilton Niagara Haldimand Brant	44	34.1	1.0	40.9	2.8
5. Central West	10	**	**	**	**
6. Mississauga Halton	19	36.8	1.1	31.6	3.5
7. Toronto Central	28	32.1	1.1	28.6	2.9
8. Central	25	**	**	36.0	1.7
9. Central East	24	**	**	**	3.7
10. South East	17	**	**	**	**
11. Champlain	21	**	**	47.6	2.1
12. North Simcoe Muskoka	13	76.9	1.6	53.8	2.4
13. North East	14	42.9	1.0	**	**
14. North West	8	**	**	**	**
Ontario	**263**	**26.6**	**1.2**	**33.1**	**2.4**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Visits include assessments, consultations and counselling.

2 Denominator includes only those patients in the Ovarian Cancer/No Surgery Cohort who had at least one service (visit, consult or session).

Findings

- During the 24-month period surrounding their diagnosis, nearly 50 percent of women in the Ovarian Cancer/No Surgery Cohort saw a general surgeon (vs. 42 percent of those who had surgery). However, they were much less likely to see an obstetrician/gynecologist (34 percent vs. 71 percent respectively) or a gynecologic oncologist (27 percent vs. 67 percent respectively).
- About 33 percent of women who did not have ovarian cancer-related surgery received chemotherapy (vs. 61 percent of those who had surgery). But the proportion of women who saw a medical oncologist during the study period was the same in both cohorts (27 percent).

Discussion and Conclusions

The incidence of ovarian cancer in Ontario in 2003/04 increased with age, rising from 15 cases per 100,000 women aged 40–49 years to 58 cases per 100,000 among women 70 years of age or older.

We did not find any association between ovarian cancer incidence and women's socioeconomic status or their geographical area of residence at the time of diagnosis. However, the data suggest that those living in the lowest-income neighbourhoods in Ontario who were diagnosed with ovarian cancer were less likely to undergo surgery for their disease compared to women residing in more affluent neighbourhoods.

Our analyses revealed a number of patterns in how women in Ontario were diagnosed with and treated for ovarian cancer during the study period. For example, two out of every five women in our study cohort who underwent surgery for ovarian cancer received their surgery at a hospital located outside their Local Health Integration Network (LHIN) of residence.

The pattern of surgery varied by age, with older women less likely to receive any type of surgery for their ovarian cancer. Treatment for younger women (i.e., those under age 50 years) was more likely to involve the surgical removal of one or both fallopian tubes and ovaries (USO/BSO) without other staging maneuvers such as an omentectomy or lymph node excision. The likelihood of undergoing an omentectomy as part of ovarian cancer surgery increased with age: 63 percent of women over age 70 had this procedure. Only eight percent of women received extensive surgical staging of their cancers, including pelvic and para-aortic node dissection.

Gynecologic oncologists comprised about seven percent of physicians doing ovarian cancer surgery in Ontario during the study period. However, these sub-specialists performed 50 percent of the surgeries undergone by women in the Ovarian Cancer Surgery Cohort. Women who were treated by gynecologic oncologists were more likely to have either a lymph node excision or an omentectomy compared with those treated by an obstetrician/gynecologist. Even so, the rate of lymph node excision was low across all physician specialties.

The use of chemotherapy varied substantially, according to whether or not a patient received surgery: 61 percent of women in the Ovarian Cancer Surgery Cohort received chemotherapy compared to only 33 percent of those in the Ovarian Cancer/No Surgery Cohort.

Implications for clinical practice

It is difficult to draw conclusions about the clinical care of women with ovarian cancer because our data lacked detailed clinical information (e.g., cancer stage and volume of residual disease at the conclusion of the first surgical procedure).[2,3,4] Therefore, we cannot make inferences about the quality of surgical care in Ontario during the study period. Further research is needed to better understand why the use of cancer staging procedures such as omentectomy and lymph node excision varied so widely among women who received surgery.

All women with a suspected ovarian cancer should have access to a single attempt at surgery in a timely fashion. This is important because ovarian cancer is known to progress rapidly and also because women's quality of life may deteriorate if they develop symptoms such as ascites (fluid accumulation in the abdominal cavity).

To shorten the length of time from symptoms to diagnosis, health care providers must keep ovarian cancer on their diagnostic "radar." They must then intervene quickly in suspected cases by utilizing CA 125 blood testing and pelvic ultrasound.

We observed that one in four women with ovarian cancer in our Overall Ovarian Cancer Cohort did not have surgery; furthermore, few of those women received any non-surgical treatments such as chemotherapy for their disease. There are a number of possible explanations for this finding. Some women may have had advanced and/or inoperable cancer at the time of their diagnosis. It is also possible that some had medical conditions that made them unfit for both surgery and systemic chemotherapy. It is also possible that some women lacked timely access to cancer services.

Novel treatment strategies for ovarian cancer are emerging. These include the use of intra-peritoneal ports, which are small devices implanted in the body to make administration of chemotherapy easier and, in some cases, more direct.

Implications for policy and planning

Our study found that some Local Health Integration Networks (LHINs) functioned as "referral centres" for women with ovarian cancer. Hospitals located within these LHINs provided surgical care to a sizable proportion of patients who lived outside their borders. Planning for the delivery of ovarian cancer services should take into account the existence of these specialized centres and current referral patterns in Ontario.

Research suggests that the proportion of ovarian cancer surgeries done by gynecologic oncologists in Ontario is increasing, from 36 percent in a 1996–1998 study[3,4] to 49 percent in 2003/04 (the current study). If this trend towards sub-specialty care is to continue, and if care is to be delivered in a timely fashion, additional human resources will be required, along with improved access to facilities in referral centres (such as more operating room time and more staffed hospital beds).

Our own research shows that both gynecologic oncologists and obstetrician/gynecologists provided surgical care to women with ovarian cancer during the study period. More research is needed to help clarify what roles should be played by various specialists in the management of ovarian cancer in Ontario.

Finally, vital information that might allow researchers to correctly measure the appropriateness of care delivery is currently unavailable in administrative health databases, including the Ontario Cancer Registry (OCR). Steps must be taken to expand the data available on cancer patients, including information such as stage, the degree of residual disease and whether or not patients have completed chemotherapy.[5]

References

1. Canadian Cancer Society/National Cancer Institute of Canada. *Canadian Cancer Statistics* 2007. Toronto: CCS/NCI; 2007.
2. Elit L, Bondy SJ, Paszat L, Przybysz R, Levine M. Outcomes in surgery for ovarian cancer. *Gynecol Oncol* 2002; 87(3):260–7.
3. Elit L, Bondy S, Chen Z, Law C, Paszat L. The quality of the operative report for women with ovarian cancer in Ontario. *J Obstet Gynaecol Can* 2006; 28(10):892–7.
4. Elit LM, Bondy SJ, Paszat LP, Hollowaty EJ, Thomas GM, Stukel TA, Levine MN. Surgical outcomes in women with ovarian cancer. *Can J Surg* 2008; 51(5):346–54.
5. Elit L, Chartier C, Oza A, Hirte H, Levine M, Paszat L. Outcomes for systemic therapy in women with ovarian cancer. *Gynecol Oncol* 2006; 103(2):554–8.

INSIDE

8

Chapter

Surgery for Cervical Cancer

Laurie Elit, MD, MSc, FRCSC, Lisa Barbera, MD, MPA, FRCPC, Susan E. Schultz, MA, MSc, Raymond Przybysz, MSc, Andrew S. Wilton, MSc, David R. Urbach, MD, MSc, FRCSC, FACS and Marko Simunovic, MD, MPH, FRCSC,

Executive Summary

Issue

Cervical cancer is a cancer of the female genital tract which affects the cervix, the last portion of the uterus located at the top of the vagina. Cancer of the cervix is the second leading cause of cancer deaths worldwide. It is also the second most common cause of cancer in Canadian women aged 20–44 years.

Study

This chapter examines patterns of treatment provided to women in Ontario who were newly-diagnosed with cancer of the cervix in 2003/04. It explores the role of certain demographic, geographic and health care system factors on the use of surgery and related health services. Special attention is paid to women who underwent potentially curative surgery for their disease and those who did not.

Key Findings

- More than half (57 percent) of women diagnosed with cervical cancer received surgery within 12 months before or after their diagnosis date. This percentage decreased by age group (i.e., women over age 70 years at the time of their diagnosis were less likely to have surgery than younger women with cervical cancer).
- The percentage of women receiving surgery varied from 45 percent among women living in the Hamilton Niagara Haldimand Brant Local Health Integration Network (LHIN) at the time of their diagnosis to 75 percent of women who resided in the South East LHIN.
- Forty-two percent of women had more than one operative procedure related to their cancer. Approximately half of these procedures were done in an inpatient hospital setting.
- Some LHINs appeared to serve as referral centres for women with cervical cancer—that is, they provided cancer surgery to large numbers of patients who resided in other parts of the province during the study period. For example, 67 percent of the surgical procedures for cervical cancer performed in hospitals located within the Toronto Central LHIN were for patients from outside that LHIN.
- The most common surgical procedure performed on women with cervical cancer was radical hysterectomy (39 percent of women in the study cohort). Other procedures included total hysterectomy or cervicectomy, with or without lymph node excision (32 percent) and cone biopsy alone (27 percent).
- In 2003/04, gynecologic oncologists comprised 13 percent of Ontario surgeons who performed surgery for cervical cancer. However, these sub-specialists did 39 percent of all procedures on patients in the study cohort. More resource-intensive procedures (e.g., radical hysterectomies) were more likely to be done by gynecologic oncologists.
- Nearly half of all operations for cervical cancer undergone by women in our study cohort were done in community hospitals.

Implications

- Further research is necessary to understand why the surgical treatment of women with cervical cancer in the study cohort varied by patient age group and LHIN of residence.
- There is a logical triaging of more resource-intense cervical cancer operations to gynecologic oncologists working in affiliation with Ontario's regional cancer centres. Plans for improving surgical services related to the treatment of cervical cancer should factor in this existing referral network.
- There are relatively few gynecologic oncologists in Ontario; these sub-specialists provide care to a relatively large number of women with cervical cancer. The role of gynecologic oncologists requires further evaluation. For example, are more gynecologic oncologists needed in Ontario? Or should the focus be on increasing support for obstetrician/gynecologists?
- Cervical cancer is now largely preventable by vaccination against certain strains of the human papilloma virus (HPV) which have been linked to cervical cancer. The disease can also be identified in its pre-invasive stage by regular screening with the Pap smear test. Increased use of screening and widespread use of the HPV vaccine may eventually reduce the demand for cervical cancer surgery.

Introduction

Cancer of the cervix is the second leading cause of cancer deaths worldwide.[1] It is the second most common cause of cancer in Canadian women aged 20–44 years.[2] The most recently published cancer statistics estimated that in 2007, 1,350 Canadian women would be diagnosed with a new cervical cancer, and that 390 women would die from the disease.[2]

The cervix, which forms the opening of the uterus, is located at the top of the vagina, and thus can be directly visualized during a vaginal exam. Symptoms of cervical cancer include unexplained vaginal bleeding and discharge. Unfortunately these are often associated with more advanced disease.

In Canada, regular cervical screening via Pap smears can detect pre-cancerous lesions of the cervix. Unfortunately, recent research shows that only 70 percent of Ontario women aged 18 to 65 years undergo annual cervical screening.[3] Research in Canada and the United States also shows that some population groups such as new immigrants and First Nations women have poor access to regular Pap smear testing.

Primary prevention of cervical cancer is now possible via a relatively new vaccine which prevents infection with strains 16 and 18 of the human papilloma virus (HPV). These strains account for 70 percent of cervical cancers.[4] As of 2007, Grade 8 female students in Ontario have been able to access the vaccine free of charge. Older women up to the age of 26 years can also be vaccinated, although they must pay for this service.

An abnormal Pap smear typically leads to a colposcopic examination, which is a visual assessment of the cervix using high magnification. During this exam, any abnormal areas are biopsied. In most cases, the biopsy will define the problem. However, if the diagnosis is still not clear, a larger biopsy is performed using a loop electrocautery excision procedure (LEEP), a laser or a knife (a cone biopsy).

Treatments for cervical cancer

Once a patient is diagnosed with cervical cancer, treatment depends on a number of factors:

- whether the disease is microscopic (i.e., it can only be seen using a magnifying instrument) or whether it is macroscopic (i.e., it can be seen without the use of a magnifying instrument)
- how deeply the lesion has invaded the cervix
- the size of the lesion
- other tumour factors
- whether the lesion is confined to the cervix or has spread to other parts of the body such as lymph nodes around the uterus

Although lesion size is the most important criterion, it is the combination of all factors that determines which of the following treatments is chosen.

Cone biopsy

During this procedure, surgeons use a scalpel ("cold knife biopsy") or a laser to remove a cone-shaped wedge of tissue from the cervix which is then examined under a microscope. A small amount of normal tissue around the wedge of abnormal tissue is also removed to ensure that no abnormal cells are left behind. This procedure is usually curative for women with early cervical cancers.

Hysterectomy

A hysterectomy involves removing the entire uterus, including the cervix. In addition to removing the uterus, a radical hysterectomy involves removal of the parametrium (connective tissue around the portion of the uterus closest to the cervix) and upper vagina, and a pelvic lymph node dissection. If a woman wants to preserve her fertility, it may be possible to perform a radical cervicectomy (removal of the cervix with preservation of the uterus) and a pelvic node dissection.

Primary radiation with or without chemotherapy treatment

Primary radiation therapy with or without concurrent cisplatin chemotherapy is the recommended treatment for women whose cervical cancer is more advanced (e.g., a large visible lesion, or a cancer that has spread to surrounding lymph nodes or to other distant sites).[5] Primary radiation therapy, with or without concurrent cisplatin chemotherapy, is also often used in women who are older or in patients with significant comorbid conditions which make surgery especially risky, even if their cancers are not that advanced.

Notes:

- If a patient had more than one type of procedure, the most extensive procedure is identified in this Atlas as the "definitive" surgery.
- All patients who receive radiation therapy as part of cancer treatment first undergo radiation therapy planning. This involves positioning the person's body, marking the skin and taking imaging scans to determine the best way to deliver the radiation dose. Because complete data on which patients in our study cohorts actually received radiation therapy were not available, we have used radiation therapy planning as a surrogate measure for radiation therapy treatment.

How the study cohorts were defined

This chapter provides detailed information about the characteristics of Ontario women newly-diagnosed with cervical cancer in 2003/04. This includes information regarding their demographic characteristics, preoperative workup and their interaction in the hospital environment. It includes women who underwent surgery and those who did not.

The study population included all Ontario women 20 years of age or older identified with cervical cancer in the Ontario Cancer Registry (OCR) whose diagnosis date fell between April 1, 2003 and March 31, 2004. This is referred to as the **Overall Cervical Cancer Cohort.**

The Overall Cervical Cancer Cohort was then subdivided into two smaller groups:

- The **Cervical Cancer Surgery Cohort** included all Ontario women 20 years of age or older identified with cervical cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had cervical cancer surgery within 12 months before or after their diagnosis date.
- The **Cervical Cancer/No Surgery Cohort** included all Ontario women 20 years of age or older identified with cervical cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have cervical cancer surgery within 12 months before or after their diagnosis date.

Chapter 8—List of Exhibits

Exhibits and Findings

Exhibit 8.1 Incidence of cervical cancer in Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Cervical Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Cervical Cancer Cohort				
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**11.0**	**513 (100.0)**	**293**	**57.1**	**220**	**42.9**
Age group (years)[2]						
20–39	8.7	152 (29.6)	107	70.4	45	29.6
40–49	14.3	136 (26.5)	85	62.5	51	37.5
50–69	13.5	159 (31.0)	81	50.9	78	49.1
70+	10.6	66 (12.9)	20	30.3	46	69.7
Neighbourhood income quintile						
Q1 (Lowest)	12.2	106 (21.2)	51	48.1	55	51.9
Q2	11.8	106 (21.2)	66	62.8	40	37.2
Q3	12.0	109 (21.8)	69	63.0	40	37.0
Q4	10.0	88 (17.6)	50	57.7	38	42.3
Q5 (Highest)	10.6	90 (18.0)	52	58.6	38	41.4
Community size (population)						
≥ 1,250,000	10.0	186 (36.3)	112	61.0	74	39.0
100,000–1,249,999	11.8	195 (38.0)	107	54.1	88	45.9
< 100,000	13.3	132 (25.7)	74	56.8	58	43.2
LHIN						
1. Erie St. Clair	10.4	26 (5.1)	12	48.9	14	51.1
2. South West	14.0	47 (9.2)	23	48.0	24	52.0
3. Waterloo Wellington	12.6	32 (6.2)	20	63.1	12	36.9
4. Hamilton Niagara Haldimand Brant	12.3	62 (12.1)	28	44.5	34	55.5
5. Central West	12.8	31 (6.0)	17	51.7	14	48.3
6. Mississauga Halton	10.1	36 (7.0)	24	66.8	12	33.2
7. Toronto Central	10.2	46 (9.0)	29	62.2	17	37.8
8. Central	9.7	53 (10.3)	32	63.1	21	36.9
9. Central East	8.8	50 (9.7)	26	54.1	24	45.9
10. South East	8.5	**	**	74.9	**	25.1
11. Champlain	11.7	55 (10.7)	33	57.8	22	42.2
12. North Simcoe Muskoka	12.6	17 (3.3)	11	61.3	6	38.7
13. North East	13.6	33 (6.4)	23	69.3	10	30.7
14. North West	9.6	**	**	44.3	**	55.7

** Cell value suppressed for reasons of privacy and confidentiality.

1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Cervical Cancer Cohort.

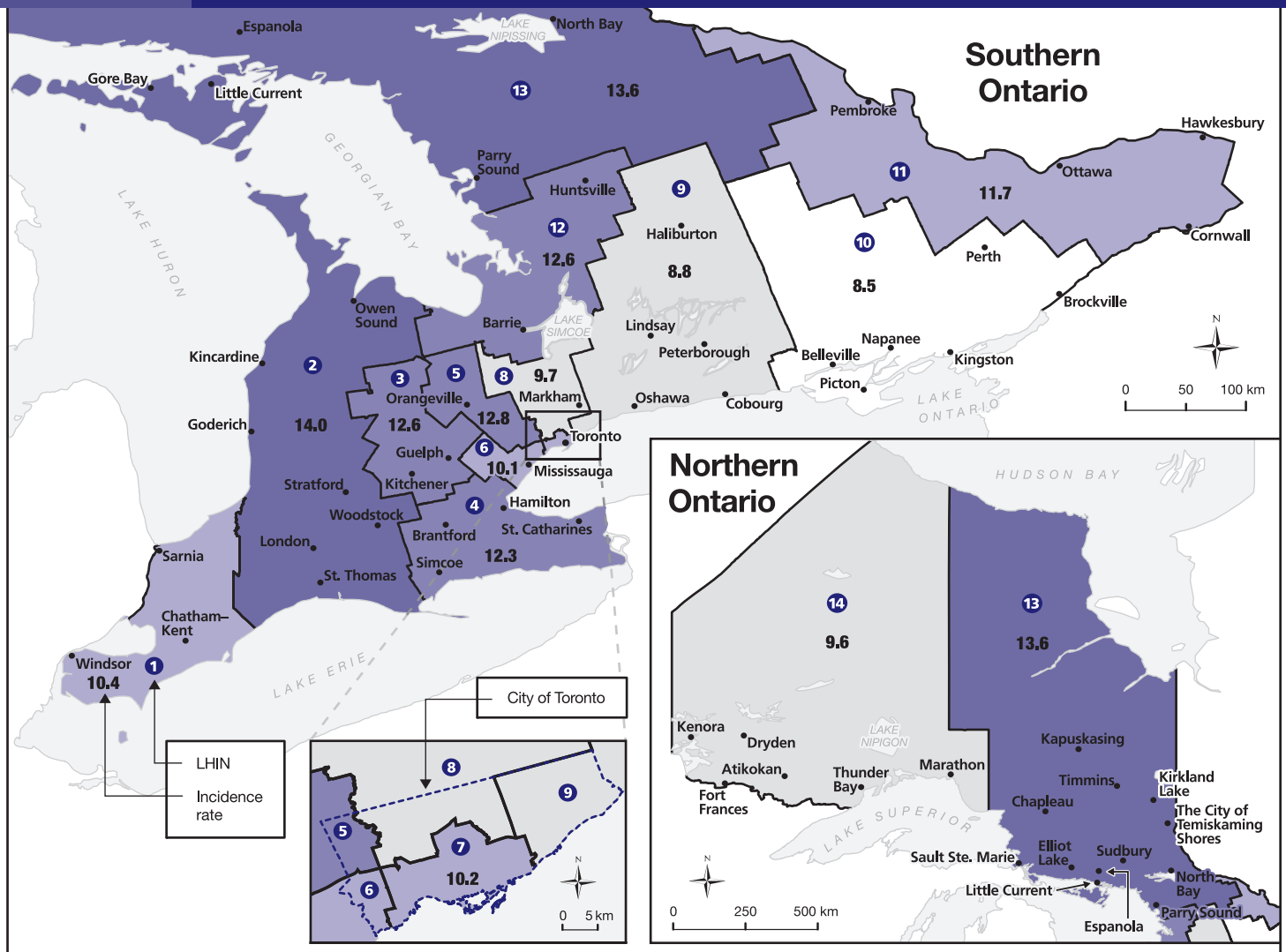
2 Age-specific rates have not been standardized.

Exhibit 8.1 (cont'd) **Incidence of cervical cancer in Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Cervical Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence**

Findings

- In 2003/04, the incidence of cervical cancer was highest in women aged 40–49 years. It was slightly higher among women who lived in the lowest-income neighbourhoods at the time they were diagnosed compared to those residing in more affluent areas.
- Incidence was slightly higher among women living in smaller communities (13 new cases per 100,000 women per year) compared to those who resided in larger urban areas (10 new cases per 100,000 women per year).
- Of the 513 women in the Overall Cervical Cancer Cohort, just over half (57 percent) underwent a surgical procedure related to their cancer.
- The probability that women would be treated with surgery decreased with age. Less than one-third of women over age 70 at the time of diagnosis underwent surgery for their cervical cancer.
- The percentage of women who underwent surgery to diagnose and/or treat their cervical cancer varied from 45 percent among women living in the Hamilton Niagara Haldimand Brant LHIN when they were diagnosed to 75 percent of those who resided in the South East LHIN.

Exhibit 8.2 Age-standardized cervical cancer incidence per 100,000 women 20 years of age or older, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04



Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age-standardized cervical cancer incidence rate per 100,000 women in the Overall Cervical Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 11.0 per 100,000 women

LHIN rate per 100,000 women	LHIN rate compared to OR	Number of LHINs in each category
> 13.2	More than 20% above OR	2
12.1–13.2	10% to 20% above OR	4
10.0–12.0	Within 10% of OR	4
8.8–9.9	10% to 20% below OR	3
< 8.8	More than 20% below OR	1

Findings

- Across Ontario in 2003/04, incidence rates of cervical cancer in women 20 years of age or older ranged across their Local Health Integration Networks (LHINs) of residence—from a low of about eight cases per 100,000 among women who lived in the South East LHIN when they were diagnosed to a high of 14 cases per 100,000 among those who resided in the South West LHIN.

Exhibit 8.3 Health care utilization among women in the Cervical Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Cervical Cancer Surgery Cohort: Total number of patients	Cervical Cancer Surgery Cohort: Average # visits with treating surgeon[2]	Cervical Cancer Surgery Cohort: % with more than one hospital admission	Hospital admissions[1]: Total number of admissions	Hospital admissions[1]: Same-day surgery	Hospital admissions[1]: Inpatient admissions
	number	*visits/patient*	*% patients*	*number (average per patient)*	*standardized % total admissions[3]*	
Ontario	**293**	**3.2**	**42.0**	**434 (1.5)**	**47.0**	**53.0**
Age group (years)[3]						
20–39	107	3.3	42.1	160 (1.5)	52.5	47.5
40–49	85	3.4	45.9	131 (1.5)	45.0	55.0
50–69	81	3.1	44.4	120 (1.5)	46.7	53.3
70+	20	2.5	**	23 (1.2)	21.7	78.3
Neighbourhood income quintile						
Q1 (Lowest)	56	3.2	41.1	85 (1.5)	51.8	48.2
Q2	64	3.3	48.4	100 (1.6)	43.0	57.0
Q3	63	3.5	44.4	95 (1.5)	50.5	49.5
Q4	53	3.0	35.8	73 (1.4)	38.4	61.6
Q5 (Highest)	53	2.9	41.5	77 (1.5)	49.4	50.6
Community size (population)						
≥ 1,250,000	112	3.3	35.7	162 (1.4)	48.8	51.2
100,000–1,249,999	107	3.1	43.9	159 (1.5)	45.3	54.7
< 100,000	74	3.3	48.6	113 (1.5)	46.9	53.1
LHIN						
1. Erie St. Clair	13	3.8	**	19 (1.5)	47.4	52.6
2. South West	23	3.5	43.5	34 (1.5)	50.0	50.0
3. Waterloo Wellington	19	3.0	42.1	28 (1.5)	35.7	64.3
4. Hamilton Niagara Haldimand Brant	28	3.5	42.9	40 (1.4)	45.0	55.0
5. Central West	18	3.1	38.9	26 (1.4)	57.7	42.3
6. Mississauga Halton	25	3.7	28.0	33 (1.3)	48.5	51.5
7. Toronto Central	29	2.9	34.5	42 (1.4)	47.6	52.4
8. Central	31	3.3	45.2	48 (1.5)	50.0	50.0
9. Central East	25	3.8	40.0	38 (1.5)	50.0	50.0
10. South East	12	3.2	75.0	23 (1.9)	43.5	56.5
11. Champlain	33	2.6	51.5	51 (1.5)	39.2	60.8
12. North Simcoe Muskoka	**	3.9	**	12 (1.2)	41.7	58.3
13. North East	23	2.6	47.8	35 (1.5)	51.4	48.6
14. North West	**	**	**	**	**	**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Time frame for hospital admissions is from 12 months before to 12 months after diagnosis.

2 Time frame for surgeon visits is from 6 months before to 6 months after the first surgery.

3 Standardized to the Overall Cervical Cancer Cohort; age-specific rates have not been standardized.

Findings

- More than four in 10 women (42 percent) in the Cervical Cancer Surgery Cohort had more than one hospital admission related to their cancer during the 24 months surrounding their diagnosis.
- Nearly half (47 percent) of these procedures were outpatient surgical interventions such as cone biopsy. The remainder involved more invasive and complex surgeries such as hysterectomy which required an inpatient stay.
- On average, women who underwent surgery visited their treating surgeons three times during the 12-month period (i.e., six months before to six months after) their first surgery for cervical cancer.

Exhibit 8.4 Hospital admissions for surgical procedures among women in the Cervical Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN of patient residence	LHIN where care was received					
	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton
	number (col%, row %)[1]					
1. Erie St. Clair	**9 (100, 56.3)**	7 (15.9, 43.8)				
2. South West		**32 (72.7, 97.0)**				
3. Waterloo Wellington			**15 (88.2, 51.7)**	6 (11.8, 20.7)		
4. Hamilton Niagara Haldimand Brant				**39 (76.5, 100)**		
5. Central West					**8 (100, 33.3)**	
6. Mississauga Halton						**16 (84.2, 51.6)**
7. Toronto Central						
8. Central						
9. Central East						
10. South East						
11. Champlain						
12. North Simcoe Muskoka						
13. North East						
14. North West						
Ontario	**9 (100, 2.1)**	**44 (100, 10.3)**	**17 (100, 4.0)**	**51 (100, 11.9)**	**8 (100, 1.9)**	**19 (100, 4.4)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having cervical cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all cervical cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings

- About 70 percent of women in the Cervical Cancer Surgery Cohort received their cervical cancer surgery in a hospital located within their Local Health Integration Network (LHIN) of residence.

Exhibit 8.4 (cont'd) Hospital admissions for surgical procedures among women in the Cervical Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, compared with LHIN where care was received, in Ontario

LHIN where care was received								
7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West	Ontario
number (col%, row %)[1]								
								16 (3.7, 100)
								33 (7.7, 100)
								29 (6.8, 100)
								39 (9.1, 100)
13 (11.3, 54.2)								24 (5.6, 100)
10 (8.7, 32.3)								31 (7.2, 100)
38 (33.0, 90.5)								42 (9.8, 100)
29 (25.2, 60.4)	**17 (63, 35.4)**							48 (11.2, 100)
14 (12.2, 34.1)		**19 (86.4, 46.3)**						41 (9.6, 100)
			21 (77.8, 100)					21 (4.9, 100)
				49 (98, 96.1)				51 (11.9, 100)
					9 (81.8, 64.3)			14 (3.3, 100)
						23 (100, 67.6)		34 (7.9, 100)
							**	**
115 (100, 26.9)	**27 (100, 6.3)**	**22 (100, 5.1)**	**27 (100, 6.3)**	**50 (100, 11.7)**	**11 (100, 2.6)**	**23 (100, 5.4)**	**	**428 (100, 100)**

** Cell value suppressed for reasons of privacy and confidentiality. Totals may not sum due to small cell suppression.

1 **"col %"** is used to show what proportion of all patients having cervical cancer surgery in a given LHIN were residents of that LHIN, and what proportion were residents of other LHINs.

"row %" is used to show what proportion of all cervical cancer surgery patients from a given LHIN had surgery in their LHIN of residence, and what proportion had their surgery in other LHINs.

Findings (cont'd)

- The Toronto Central LHIN appeared to serve as a referral region for cervical cancer surgery during the study period. Only one in three admissions (33 percent) for cervical cancer surgery that took place in hospitals located in the Toronto Central LHIN were for women who actually resided in that LHIN when they were diagnosed.

Exhibit 8.5 Type of definitive surgical procedure among women in the Cervical Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence, in Ontario

Characteristic	Cervical Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]			
		Radical hysterectomy	Total hysterectomy and lymph node excision, total hysterectomy or cervicectomy	Cone biopsy	Other
Ontario	**293**	**117 (38.5)**	**89 (32.1)**	**81 (26.8)**	**
Age group (years)[2]					
20–39	107	46 (43.0)	24 (22.4)	37 (34.6)	0
40–49	85	38 (44.7)	25 (29.4)	19 (22.4)	**
50–69	81	28 (34.6)	31 (38.3)	21 (25.9)	**
70+	20	**	9 (45.0)	**	**
Neighbourhood income quintile					
Q1 (Lowest)	51	16 (41.8)	16 (26.0)	18 (30.7)	**
Q2	66	37 (52.2)	17 (28.6)	12 (19.2)	0
Q3	69	25 (34.2)	23 (35.3)	21 (30.5)	0
Q4	50	24 (47.3)	11 (22.3)	13 (26.2)	**
Q5 (Highest)	52	13 (23.6)	20 (41.7)	16 (28.8)	**
Community size (population)					
≥ 1,250,000	112	42 (36.0)	32 (30.4)	34 (28.7)	**
100,000–1,249,999	107	46 (43.8)	34 (32.7)	25 (21.4)	**
< 100,000	74	29 (36.8)	23 (33.6)	22 (29.6)	0
LHIN					
1. Erie St. Clair	12	**	**	**	**
2. South West	23	9 (42.3)	7 (31.9)	7 (25.8)	**
3. Waterloo Wellington	**	10 (54.2)	6 (25.4)	**	**
4. Hamilton Niagara Haldiamnd Brant	**	16 (53.0)	**	7 (19.9)	**
5. Central West	**	**	6 (28.2)	7 (36.3)	**
6. Mississauga Halton	24	9 (32.8)	**	10 (41.5)	**
7. Toronto Central	29	9 (34.9)	11 (35.4)	7 (20.5)	**
8. Central	32	12 (36.0)	11 (37.0)	9 (27.0)	**
9. Central East	26	12 (49.6)	**	9 (31.6)	**
10. South East	11	**	7 (63.7)	**	**
11. Champlain	33	21 (66.6)	9 (26.1)	**	**
12. North Simcoe Muskoka	11	**	**	**	**
13. North East	23	7 (35.8)	8 (30.0)	8 (34.2)	**
14. North West	**	0 (0.0)	**	**	**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Percent of each subgroup that had each type of definitive procedure, age-standardized to the Overall Cervical Cancer Cohort.

2 Age-specific rates have not been standardized.

Findings

- The most common definitive surgical procedures performed on women in the Cervical Cancer Surgery Cohort were: radical hysterectomy (39 percent); total hysterectomy (32 percent); and cone biopsy alone (27 percent).
- The type of definitive surgical procedure varied by age, with women 50 years of age or older less likely than younger women to have a radical hysterectomy.
- The type of definitive surgical procedure undergone by women in the study cohort varied little by neighbourhood income quintile or community size.

Exhibit 8.6a Overall pattern of surgical care provided to women in the Cervical Cancer Surgery Cohort [2003/04], by physician specialty, in Ontario

Physician specialty	Physicians performing cervical cancer surgery *number (% physicians)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				Radical hysterectomy	Total hysterectomy with or without lymph node excision or cervicectomy	Cone biopsy	Other	Total
Gynecologic oncology	17 (13.3)	142 (38.8)	125 (50.4)	90 (72.0)	25 (20.0)	10 (8.0)	**	125
Obstetrics and gynecology	111 (86.7)	224 (61.2)	123 (49.6)	15 (12.2)	49 (39.8)	59 (48.0)	**	123
Other	**	**	**	**	**	**	**	**
Ontario	**128**	**366**	**248**	**105 (42.3)**	**74 (29.8)**	**69 (27.8)**	**	**248**

** Cell value suppressed and removed from totals for reasons of privacy and confidentiality.

1 Based on one definitive procedure per patient.

Findings

- Gynecologic oncologists performed nearly 40 percent of the operations provided to women in Cervical Cancer Surgery Cohort, even though these sub-specialists represented only 13 percent of all surgeons performing cervical cancer surgery in Ontario during the study period. The remainder of the procedures were performed by obstetrician/gynecologists.
- Women with cervical cancer who were treated by a gynecologic oncologist were more likely to have a radical or total hysterectomy (92 percent) compared with those treated by an obstetrician/gynecologist (52 percent). (This suggests that patients with more advanced tumours were triaged to gynecologic oncologists.)

Exhibit 8.6b Overall pattern of surgical care provided to women in the Cervical Cancer Surgery Cohort [2003/04], by hospital type, in Ontario

Hospital Type	Hospitals performing cervical cancer surgery *number (% hospitals)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*				
				Radical hysterectomy	Total hysterectomy and lymph node excision, total hysterectomy or cervicectomy	Cone biopsy	Other	Total
Academic	11 (15.7)	233 (54.3)	181 (63.0)	109 (60.2)	40 (22.1)	32 (17.7)	**	181
Community/Small	59 (84.3)	196 (45.7)	106 (37.0)	8 (7.5)	49 (46.2)	49 (46.2)	**	106
Ontario	**70**	**429**	**287**	**117 (40.8)**	**89 (31.0)**	**81 (28.2)**	**	**287**

** Cell value suppressed and removed from totals for reasons of privacy and confidentiality.

1 Based on one definitive procedure per patient.

Findings

- Approximately half of all cervical cancer surgeries (54 percent) done on women in the Cervical Cancer Surgery Cohort were performed in an academic (teaching) hospital setting. The remainder (46 percent) were performed in community hospitals.
- Radical hysterectomy was more likely to be done in academic rather than in community hospital settings.

Exhibit 8.7a Diagnostic, screening and staging services received by women in the Cervical Cancer Surgery Cohort [2003/04], in the 12 months before their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Cervical Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*					
		Pap smear	Cervical biopsy	LEEP/ Laser	Cold knife cone biopsy	Pelvic CT scan	Pelvic MRI scan
1. Erie St. Clair	12	14 (1.2)	8 (0.7)	**	**	**	0 (0.0)
2. South West	23	9 (0.4)	19 (0.8)	**	11 (0.5)	**	0 (0.0)
3. Waterloo Wellington	20	15 (0.8)	14 (0.7)	**	11 (0.6)	**	**
4. Hamilton Niagara Haldimand Brant	28	8 (0.3)	27 (1.0)	**	17 (0.6)	11 (0.4)	**
5. Central West	17	8 (0.5)	14 (0.8)	**	8 (0.5)	**	**
6. Mississauga Halton	24	10 (0.4)	21 (0.9)	9 (0.4)	6 (0.3)	**	8 (0.3)
7. Toronto Central	29	16 (0.6)	24 (0.8)	9 (0.3)	12 (0.4)	7 (0.2)	13 (0.4)
8. Central	32	17 (0.5)	28 (0.9)	10 (0.3)	15 (0.5)	8 (0.3)	11 (0.3)
9. Central East	26	12 (0.5)	31 (1.2)	6 (0.2)	12 (0.5)	**	**
10. South East	**	**	**	0 (0.0)	**	**	**
11. Champlain	33	17 (0.5)	32 (1.0)	7 (0.2)	17 (0.5)	**	**
12. North Simcoe Muskoka	11	7 (0.6)	10 (0.9)	**	**	**	**
13. North East	23	11 (0.5)	14 (0.6)	8 (0.3)	8 (0.3)	6 (0.3)	**
14. North West	**	**	**	0 (0.0)	**	0 (0.0)	0 (0.0)
Ontario	**292**	**155 (0.5)**	**249 (0.9)**	**65 (0.2)**	**128 (0.4)**	**64 (0.2)**	**54 (0.2)**

** Cell value suppressed for reasons of privacy and confidentiality.
1 Denominator includes all patients in the Cervical Cancer Surgery Cohort.

Findings

- On average, only 50 percent of women in the Cervical Cancer Surgery Cohort had undergone a Pap smear to screen for cervical abnormalities in the year before their cancer diagnosis.
- Many women in this study cohort underwent a "cone type" biopsy procedure, such as loop electrosurgical excision procedure (LEEP) or laser procedure (0.2 per patient), or a cold knife cone biopsy (0.4 per patient).

Exhibit 8.7b Radiologic services received by women in the Cervical Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Cervical Cancer Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*		
		Chest X-ray	Abdominal CT scan	Abdominal and/or renal ultrasound
1. Erie St. Clair	12	12 (1.0)	9 (0.8)	8 (0.7)
2. South West	23	36 (1.6)	17 (0.7)	8 (0.3)
3. Waterloo Wellington	20	20 (1.0)	17 (0.9)	**
4. Hamilton Niagara Haldimand Brant	28	43 (1.5)	36 (1.3)	11 (0.4)
5. Central West	17	23 (1.4)	13 (0.8)	9 (0.5)
6. Mississauga Halton	24	40 (1.7)	24 (1.0)	11 (0.5)
7. Toronto Central	29	25 (0.9)	19 (0.7)	12 (0.4)
8. Central	32	36 (1.1)	27 (0.8)	19 (0.6)
9. Central East	26	35 (1.3)	16 (0.6)	14 (0.5)
10. South East	**	**	**	**
11. Champlain	33	45 (1.4)	25 (0.8)	11 (0.3)
12. North Simcoe Muskoka	11	8 (0.7)	11 (1.0)	**
13. North East	23	22 (1.0)	19 (0.8)	7 (0.3)
14. North West	**	**	**	**
Ontario	**292**	**372 (1.3)**	**250 (0.9)**	**126 (0.4)**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Cervical Cancer Surgery Cohort.

Findings

- Chest X-ray was the most common diagnostic imaging test performed on women in the Cervical Cancer Surgery Cohort.

Exhibit 8.7c

Consultations and services received by women in the Cervical Cancer Surgery Cohort [2003/04], from 12 months before to 12 months after their definitive surgery, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Cervical Cancer Surgery Cohort *number*	Gynecologic oncology		Obstetrics/Gynecology		Medical oncology	
		% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	12	**	**	100.0	7.6	**	**
2. South West	23	60.9	4.6	87.0	5.0	**	**
3. Waterloo Wellington	20	60.0	4.7	100.0	5.0	0.0	0.0
4. Hamilton Niagara Haldimand Brant	28	75.0	6.3	89.3	4.4	0.0	0.0
5. Central West	17	76.5	3.6	88.2	5.1	**	**
6. Mississauga Halton	24	87.5	3.8	100.0	4.1	**	**
7. Toronto Central	29	79.3	4.8	86.2	3.7	**	**
8. Central	32	81.3	4.4	93.8	4.2	**	**
9. Central East	26	57.7	4.4	92.3	4.0	0.0	0.0
10. South East	**	0.0	0.0	81.8	4.0	**	**
11. Champlain	33	84.8	2.9	81.8	5.0	0.0	0.0
12. North Simcoe Muskoka	11	54.5	4.0	100.0	4.7	**	**
13. North East	23	52.2	2.3	100.0	4.5	26.1	1.0
14. North West	**	0.0	0.0	**	**	**	**
Ontario	**293**	**66.6**	**4.1**	**91.8**	**4.6**	**7.5**	**1.3**

LHIN of patient residence	Cervical Cancer Surgery Cohort *number*	Chemotherapy		Radiation oncology		Radiation therapy planning[3]	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient
1. Erie St. Clair	12	**	**	75.0	1.2	**	**
2. South West	23	30.4	3.0	56.5	1.3	39.1	1.0
3. Waterloo Wellington	20	**	**	50.0	1.2	35.0	1.0
4. Hamilton Niagara Haldimand Brant	28	**	5.0	46.4	1.0	32.1	1.0
5. Central West	17	**	**	41.2	1.0	29.4	1.4
6. Mississauga Halton	24	25.0	3.7	41.7	1.1	37.5	1.8
7. Toronto Central	29	20.7	3.2	27.6	1.8	20.7	2.0
8. Central	32	25.0	3.1	56.3	1.1	37.5	1.5
9. Central East	26	**	**	46.2	1.1	26.9	1.9
10. South East	**	0.0	0.0	**	**	**	**
11. Champlain	33	30.3	4.1	78.8	1.0	45.5	1.1
12. North Simcoe Muskoka	11	**	**	**	**	**	**
13. North East	23	26.1	4.7	56.5	1.1	34.8	1.1
14. North West	**	**	**	**	**	**	**
Ontario	**293**	**21.8**	**3.8**	**51.5**	**1.1**	**34.1**	**1.3**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Visits include assessments, consultations and counselling.

2 Denominator includes only those patients in the Cervical Cancer Surgery Cohort who had at least one service (visit, consult or session).

3 Please refer to the Introduction at the beginning of this chapter for a definition of radiation therapy planning.

Findings

- More than one-third (34 percent) of women in the Cervical Cancer Surgery Cohort received radiation therapy; 22 percent received chemotherapy treatment.
- Only eight percent of women in the study cohort saw a medical oncologist. This suggests that gynecologic oncologists provided the majority of chemotherapy services to patients who received this treatment.

Exhibit 8.8a Diagnostic, screening and staging services received by women in the Cervical Cancer/No Surgery Cohort [2003/04], in the 12 months before their diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Cervical Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*					
		Pap smear	Cervical biopsy	LEEP/ Laser	Cold knife cone biopsy	Pelvic CT scan	Pelvic MRI scan
1. Erie St. Clair	14	8 (0.6)	**	0 (0.0)	**	0 (0.0)	0 (0.0)
2. South West	23	7 (0.3)	10 (0.4)	0 (0.0)	**	**	0 (0.0)
3. Waterloo Wellington	12	**	6 (0.5)	0 (0.0)	**	**	0 (0.0)
4. Hamilton Niagara Haldimand Brant	34	8 (0.2)	16 (0.5)	0 (0.0)	**	**	0 (0.0)
5. Central West	14	7 (0.5)	7 (0.5)	**	**	**	**
6. Mississauga Halton	12	**	**	**	0 (0.0)	**	0 (0.0)
7. Toronto Central	17	11 (0.6)	8 (0.5)	**	**	**	**
8. Central	21	7 (0.3)	9 (0.4)	**	**	**	0 (0.0)
9. Central East	24	15 (0.6)	9 (0.4)	**	0 (0.0)	**	0 (0.0)
10. South East	**	**	0 (0.0)	0 (0.0)	0 (0.0)	**	0 (0.0)
11. Champlain	22	10 (0.5)	8 (0.4)	0 (0.0)	0 (0.0)	7 (0.3)	0 (0.0)
12. North Simcoe Muskoka	**	**	**	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
13. North East	10	**	**	0 (0.0)	**	0 (0.0)	0 (0.0)
14. North West	**	**	**	0 (0.0)	0 (0.0)	**	0 (0.0)
Ontario	**218**	**92 (0.4)**	**92 (0.4)**	**	**9 (0.0)**	**21 (0.1)**	**

** Cell value suppressed for reasons of privacy and confidentiality.
1 Denominator includes all patients in the Cervical Cancer/No Surgery Cohort.

Findings

- Fewer than half of women in the Cervical Cancer/No Surgery Cohort had undergone Pap smear testing in the year before their cancer diagnosis.

Exhibit 8.8b Radiologic services received by women in the Cervical Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Cervical Cancer/ No Surgery Cohort *number*	Total number of services provided *(average[1] # services per patient)*		
		Chest X-ray	Abdominal CT scan	Abdominal and/or renal ultrasound
1. Erie St. Clair	14	27 (1.9)	22 (1.6)	8 (0.6)
2. South West	23	53 (2.3)	39 (1.7)	**
3. Waterloo Wellington	12	18 (1.5)	15 (1.3)	**
4. Hamilton Niagara Haldimand Brant	34	60 (1.8)	47 (1.4)	14 (0.4)
5. Central West	14	21 (1.5)	14 (1.0)	**
6. Mississauga Halton	12	19 (1.6)	14 (1.2)	7 (0.6)
7. Toronto Central	17	31 (1.8)	18 (1.1)	9 (0.5)
8. Central	21	35 (1.7)	32 (1.5)	11 (0.5)
9. Central East	24	38 (1.6)	34 (1.4)	13 (0.5)
10. South East	**	**	**	**
11. Champlain	22	39 (1.8)	37 (1.7)	11 (0.5)
12. North Simcoe Muskoka	**	8 (1.6)	14 (2.8)	**
13. North East	10	15 (1.5)	16 (1.6)	11 (1.1)
14. North West	**	**	**	**
Ontario	**218**	**379 (1.7)**	**314 (1.4)**	**106 (0.5)**

** Cell value suppressed for reasons of privacy and confidentiality.
1 Denominator includes all patients in the Cervical Cancer/No Surgery Cohort.

Findings

- The average number of radiologic services per person in the 12 months before and after diagnosis was higher among women in the Cervical Cancer/No Surgery Cohort than it was among those who underwent surgery for their cancers. For example, there were 1.7 chest X-rays on average per woman in the Cervical Cancer/No Surgery Cohort vs. 1.3 per woman in the Cervical Cancer Surgery Cohort.
- There was little variation across Local Health Integration Networks (LHINs) of patient residence in the use of radiologic services among women in the Cervical Cancer/No Surgery Cohort.

Exhibit 8.8c Consultations and services received by women in the Cervical Cancer/No Surgery Cohort [2003/04], from 12 months before to 12 months after diagnosis, by Local Health Integration Network (LHIN) of patient residence, in Ontario

LHIN of patient residence	Cervical Cancer/ No Surgery Cohort *number*	Gynecologic oncology		Obstetrics/Gynecology		Medical oncology	
		% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a visit[1]	Average[2] # visits per patient	% cohort who had a consult	Average[2] # consults per patient
1. Erie St. Clair	14	**	**	100.0	3.6	42.9	1.2
2. South West	23	66.7	4.3	87.5	3.7	**	**
3. Waterloo Wellington	12	66.7	2.4	83.3	2.6	**	**
4. Hamilton Niagara Haldimand Brant	34	79.4	2.9	88.2	2.4	**	**
5. Central West	14	85.7	2.6	100.0	2.1	**	**
6. Mississauga Halton	12	83.3	1.7	91.7	1.6	**	**
7. Toronto Central	17	82.4	2.8	82.4	2.4	**	**
8. Central	21	100.0	2.3	100.0	2.9	**	**
9. Central East	24	66.7	1.8	87.5	2.4	**	**
10. South East	**	0.0	0.0	**	**	0.0	0.0
11. Champlain	22	86.4	2.6	81.8	2.1	0.0	0.0
12. North Simcoe Muskoka	**	**	**	**	**	**	**
13. North East	10	**	**	100.0	2.5	70.0	1.0
14. North West	**	**	**	**	**	**	**
Ontario	**218**	**72.3**	**2.6**	**88.6**	**2.6**	**15.5**	**1.2**

LHIN of patient residence	Cervical Cancer/ No Surgery Cohort *number*	Chemotherapy		Radiation oncology		Radiation therapy planning[3]	
		% cohort who received service	Average[2] # sessions per patient	% cohort who had a consult	Average[2] # consults per patient	% cohort who received service	Average[2] # sessions per patient
1. Erie St. Clair	14	85.7	3.4	92.9	1.3	85.7	1.2
2. South West	23	62.5	3.2	66.7	1.1	87.5	1.2
3. Waterloo Wellington	12	33.3	3.0	66.7	1.1	58.3	1.1
4. Hamilton Niagara Haldimand Brant	34	47.1	4.1	79.4	1.0	91.2	1.1
5. Central West	14	64.3	3.8	85.7	1.1	85.7	2.1
6. Mississauga Halton	12	50.0	2.7	75.0	1.0	58.3	2.3
7. Toronto Central	17	41.2	3.4	82.4	1.2	76.5	2.2
8. Central	21	38.1	4.0	100.0	1.0	90.5	1.9
9. Central East	24	50.0	4.5	95.8	1.1	91.7	1.9
10. South East	**	0.0	0.0	**	**	**	**
11. Champlain	22	50.0	4.0	90.9	1.4	90.9	1.5
12. North Simcoe Muskoka	**	**	**	**	**	**	**
13. North East	10	60.0	4.0	100.0	1.1	100.0	1.2
14. North West	**	**	**	**	**	**	**
Ontario	**218**	**50.9**	**3.7**	**84.5**	**1.1**	**84.5**	**1.5**

** Cell value suppressed for reasons of privacy and confidentiality.

1 Visits include assessments, consultations and counselling.

2 Denominator includes only those patients in the Cervical Cancer Surgery Cohort who had at least one service (visit, consult or session).

3 Please refer to the Introduction at the beginning of this chapter for a definition of radiation therapy planning.

Findings

- A majority of women (85 percent) in the Cervical Cancer/No Surgery Cohort saw a radiation oncologist and received radiation therapy during the 12 months before and the 12 months after their diagnosis.
- Just over 70 percent of women in this study cohort saw a gynecologic oncologist during the same time period, while 16 percent saw a medical oncologist.
- Fifty-one percent of women in the Cervical Cancer/No Surgery Cohort received chemotherapy.

Discussion and Conclusions

Access to surgery for cervical cancer in Ontario during the study period did not appear to be related to women's socioeconomic status (SES) or where they lived at the time they were diagnosed. Younger women were more likely to receive surgical management, either because they were more likely to present with earlier stage disease, or because their overall health status made them good candidates for surgery. One-third of women newly-diagnosed with cervical cancer travelled to hospitals outside their Local Health Integration Network (LHIN) of residence to obtain surgical care.

Implications for clinical practice

The surgical treatment of women in the Cervical Cancer Surgery Cohort varied by patient age group and also by LHIN of patient residence (i.e., where they lived when they were diagnosed with cancer). Without access to information on cancer stage, it is impossible to comment on the appropriateness of these variations, although they suggest a need for further research.

We noted little variation in the use of surgery or in the types of surgery performed according to women's SES or the size of the community in which they resided. The one exception was that women living in the poorest neighborhoods were less likely than all other women to undergo surgery for cervical cancer. But again, because the Ontario Cancer Registry (OCR) does not contain data on cancer stage, we cannot offer any explanation for this finding. It could be that women in poorer neighbourhoods presented with relatively advanced cancers that made them ineligible for surgery. Or it could be that their access to surgical resources following a diagnosis of cervical cancer was inadequate. While both possibilities are of concern, the former scenario would suggest the need for more effective screening and diagnostic services; the latter scenario would suggest the need for more effective treatment services.

Our data also suggest that during the study period, there was a logical triaging of patients who required more resource-intense services to gynecologic oncologists. This triaging is evidenced by the large number of women in our study cohort who left their LHIN of residence for surgery elsewhere, and the high percentage of radical hysterectomies that were provided by gynecologic oncologists.

In Ontario, such sub-specialists typically work in affiliation with regional cancer centres. Plans for improving surgical services related to the treatment of cervical cancer should build onto this existing referral network. The role of gynecologic oncologists also requires ongoing consideration. For example, are more gynecologic oncologists needed in Ontario? Should their roles shift to provide increased support and training for their gynecologic specialist colleagues? Or can we make the case that both approaches are required?

Less than half of women with cervical cancer in our study cohorts had undergone a Pap smear—aimed at detecting pre-invasive cervical disease—within the year prior to their diagnosis. There is a need for processes of care which ensure a higher level of recruitment into regular screening programs for cervical cancer. Centralized population-based databases for recruitment, as well as follow-up and screening reminders to women and their physicians, have been successful in other jurisdictions, including Australia and the Scandinavian countries.[6,7]

Implications for policy and planning

A substantial proportion of women in the study cohort travelled outside their Local Health Integration Networks (LHINs) of residence to receive surgical treatment for cervical cancer. We also found that gynecologic oncologists provided a relatively high percentage of the more resource-intense surgical procedures to women with this disease. Policy makers should consider opportunities to further improve this regional care model.

Future research should focus on collecting more detailed clinical information on women with cervical and other cancers, including data on cancer stage. The current absence of this information in both the Ontario Cancer Registry and in other health data sets limits researchers' ability to assess the appropriateness and quality of care. We also have no way to track variations in the quality of pre-operative evaluation maneuvers. For example, the completeness of Pap smear data[8] and radiologic test results may depend on where, and by whom, these tests were done. Information on chemotherapy delivery may also be incomplete. If so, researchers and clinicians may be unable to estimate the effectiveness of chemotherapy for advanced disease.

Cervical cancer is now a largely preventable disease, thanks to the use of regular Pap smears and also to the recent development of a vaccine against strains of the human papilloma virus (HPV) that account for 70 percent of cervical cancers. It is known that some populations—such as new immigrants and First Nations women—have poor access to regular Pap smear testing.[9-13] Programs aimed at increasing women's access to regular Pap testing and providing useful information on the HPV vaccine should remain public health priorities.

References

1. Bosch FX, de Sanjosé S. Chapter 1: Human papillomavirus and cervical cancer—burden and assessment of causality. *J Natl Cancer Inst Monogr* 2003; (31):3–13.
2. Canadian Cancer Society/National Cancer Institute of Canada. *Canadian Cancer Statistics 2007*. Toronto: CCS/NCIC; 2007.
3. Cancer Care Ontario. Cancer System Quality Index. Accessed June 4, 2008 at http://www.cancercare.on.ca/english/home/ocs/qpi/csqi/.
4. Foerster V, Murtagh J. Human papillomavirus (HPV) vaccines: a Canadian update. *Issues Emerg Health Technol* 2007; (109):1–8.
5. Barbera L, Paszat L, Thomas G, Covens A, Fyles A, Elit L, et al. The rapid uptake of concurrent chemotherapy for cervix cancer patients treated with curative radiation. *Int J Radiat Oncol Biol Phys* 2006; 64(5):1389–94.
6. Morrell S, Taylor R, Zeckendorf S, Niciak A, Wain G, Ross J. How much does a reminder letter increase cervical screening among under-screened women in NSW? *Aust N Z J Public Health* 2005; 29(1):78–84.
7. Madlensky L, Goel V, Polzer J, Ashbury FD. Assessing the evidence for organised cancer screening programmes. *Eur J Cancer* 2003; 39(12):1648–53.
8. Kupets R. Do doctors follow the provincial and national guidelines for the management of low grade cervical smear abnormalities? A retrospective population-based cohort study. MSc thesis, University of Toronto, 2007.
9. Hislop TG, Clarke HF, Deschamps M, Joseph R, Band PR, Smith J, et al. Cervical cytology screening. How can we improve rates among First Nations women in urban British Columbia? *Can Fam Physician* 1996; 42:1701–8.
10. Marrett LD, Chaudhry M. Cancer Incidence and mortality in Ontario First Nations, 1968–1991 (Canada). *Cancer Causes Control* 2003; 14(3):259–68.
11. Brotto LA, Chou AY, Singh T, Woo JS. Reproductive health practices among Indian, Indo-Canadian, Canadian East Asian and Euro-Canadian women: the role of acculturation. *J Obstet Gynaecol Can* 2008; 30(3):229–38.
12. Lofters A, Glazier RH, Agha MM, Creatore MI, Moineddin R. Inadequacy of cervical cancer screening among urban recent immigrants: a population-based study of physician and laboratory claims in Toronto, Canada. *Prev Med* 2007; 44(6):536–42.
13. McDonald JT, Kennedy S. Cervical cancer screening by immigrant and minority women in Canada. *J Immigr Minor Health* 2007; 9(4):323–34.

INSIDE

9

Chapter

Surgery for Vulvar Cancer

Laurie Elit, MD, MSc, FRCSC, Lisa Barbera, MD, MPA, FRCPC, Susan E. Schultz, MA, MSc, Raymond Przybysz, MSc, Nadia Gunraj, BSc, MPH, Andrew S. Wilton, MSc, Marko Simunovic, MD, MPH, FRCSC, and David R. Urbach, MD, MSc, FRCSC, FACS

Executive Summary

Issue

Vulvar cancer is a rare cancer of the female genital tract.

Study

This chapter describes health services provided to women in Ontario who were newly-diagnosed with cancer of the vulva in 2003/04, with a focus on the use of surgery and related health services. We studied how demographic, geographic and health care system factors affected the treatment of women with vulvar cancer who received surgery as well as those women with the disease who did not.

Key Findings

- The majority (80 percent) of vulvar cancers occurred in women aged 50 years or older.
- Eighty-two percent of women with vulvar cancer underwent some kind of surgery for their disease.
- One-third of women (33 percent) underwent more than one surgical procedure related to their cancer. Approximately two-thirds of all surgical procedures were done in an inpatient hospital setting.
- The most common surgical procedure was an excision (removal) of the vulvar tumour with dissection of lymph nodes in the groin (54 percent).
- Gynecologic oncologists comprised 43 percent of all surgeons in Ontario who performed surgery for vulvar cancer during the study period. These sub-specialists did 76 percent of the procedures on women in our study cohort.
- More than 80 percent of surgery for vulvar cancer was performed in academic (teaching) hospitals.

Implications

- **Vulvar cancer differs from many other cancers, mainly because treatment is commonly provided by sub-specialist cancer surgeons (e.g., gynecologic oncologists) in academic hospital settings. This may have implications for access to care.**

Introduction

Cancer of the vulva is a relatively rare disease most commonly seen in women over age 60. It develops in the external female genitals—the labia majoris, labia minoris, clitoris and vestibule, which are collectively referred to as the "vulva." (This is different from vaginal cancer which affects the vagina, the inner channel leading from the cervix to the vulva.) The most common type of vulvar cancer is "squamous cell" cancer.

Vulvar cancer responds best when treated at an early stage. Although symptoms of early, pre-cancerous disease are rare, the condition can be detected by careful visual inspection of the vulva by a physician. Later symptoms include a lump in the vulva, and unexplained itching, tenderness and/or bleeding.

The age at which vulvar cancer develops seems related to how the cancer is likely to manifest itself. Younger women (those under age 60), are more likely to present with multifocal disease (i.e., many sites on the vulva showing evidence of pre-invasive or invasive cancer). Older women (those over age 60) tend to have unifocal disease (i.e., they present with a single site on the vulva showing malignancy).

Risk factors for vulvar cancer include a history of smoking (more commonly seen in younger women), and human papilloma virus (HPV) infection which is detected in about half of all cases.

Decisions about treating vulvar cancer depend on the stage of disease at the time of diagnosis. In Ontario, both gynecologists and gynecologic oncologists are usually involved in caring for women with vulvar cancer.

Surgery for early vulvar cancer

For early disease, management usually involves wide local excision (removal) of the primary vulvar lesion and inguinal lymph node dissection (removal and examination of lymph nodes in the groin) to see if the cancer has spread.

If the vulvar lesion is located more than one centimetre away from midline structures, then only the ipsilateral lymph nodes (the nodes on the same side as the tumour) are removed. If the vulvar lesion is located within one centimetre from the midline, or if the ipsilateral nodes are found to be cancerous, the lymph nodes in the opposite groin are also removed and examined.

Surgery for later-stage vulvar cancer

For later-stage disease where the tumour involves the urethra, vagina and/or anus, the goal is to preserve the function of organs such as the bladder and bowel. Pelvic radiation therapy, with or without concurrent chemotherapy, may be used to preserve normal bowel and bladder function. If the disease persists or recurs without evidence of distant spread, then radical excision or an exenteration (removal of the pelvic organs such as the bladder and rectum) is undertaken.

How the study cohorts were defined

This chapter provides detailed information about surgical and other health services delivered to Ontario women diagnosed with vulvar cancer in 2003/04. This includes information regarding women who underwent surgery, as well as those who did not.

The study population for this chapter included all Ontario women 20 years of age or older identified with vulvar cancer in the Ontario Cancer Registry (OCR) whose diagnosis date fell between April 1, 2003 and March 31, 2004. This is referred to as the **Overall Vulvar Cancer Cohort.**

The Overall Vulvar Cancer Cohort was then subdivided into two smaller groups.

- The **Vulvar Cancer Surgery Cohort** included all Ontario women age 20 years or older identified with vulvar cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who had vulvar cancer surgery within 12 months before or after their diagnosis date.
- The **Vulvar Cancer/No Surgery Cohort** included all Ontario women age 20 years or older identified with vulvar cancer in the OCR whose diagnosis date fell between April 1, 2003 and March 31, 2004 and who did not have vulvar cancer surgery within 12 months before or after their diagnosis date.

Notes:

- If a patient had more than one type of procedure, the most extensive procedure is identified in this Atlas as the "definitive" surgery.
- All patients who receive radiation therapy as part of cancer treatment first undergo radiation therapy planning. This involves positioning the person's body, marking the skin and taking imaging scans to determine the best way to deliver the radiation dose. Because complete data on which patients in our study cohorts actually received radiation therapy were not available, we have used radiation therapy planning as a surrogate measure for radiation therapy treatment.

Chapter 9—List of Exhibits

Exhibits and Findings

Exhibit 9.1 Incidence of vulvar cancer in Ontario women 20 years of age or older in 2003/04, and use of surgery in the Overall Vulvar Cancer Cohort [2003/04], by age, neighbourhood income quintile, community size and Local Health Integration Network (LHIN) of patient residence

Characteristic	Age-standardized[1] incidence rate per 100,000	Overall Vulvar Cancer Cohort				
		Total	Had surgery		Did not have surgery	
		number of cases (% Ontario)	*number*	*age-standardized[1] % total*	*number*	*age-standardized[1] % total*
Ontario	**3.0**	**148 (100.0)**	**122**	**82.4**	**26**	**17.6**
Age group (years)[2]						
20–49	1.1	**	**	93.5	**	**
50+	6.5	**	**	79.5	**	20.5
Neighbourhood income quintile						
Q1 (Lowest)	3.9	**	**	71.5	**	28.5
Q2	2.8	**	**	79.3	**	20.7
Q3	3.1	**	**	90.5	**	**
Q4	2.7	**	**	71.8	**	**
Q5 (Highest)	2.3	**	**	95.1	**	**
Community size (population)						
≥ 1,250,000	2.2	**	**	83.7	**	16.3
100,000–1,249,999	3.4	**	**	80.7	**	19.3
< 100,000	3.8	**	**	84.9	**	15.1

** Cell value suppressed for reasons of privacy and confidentiality.

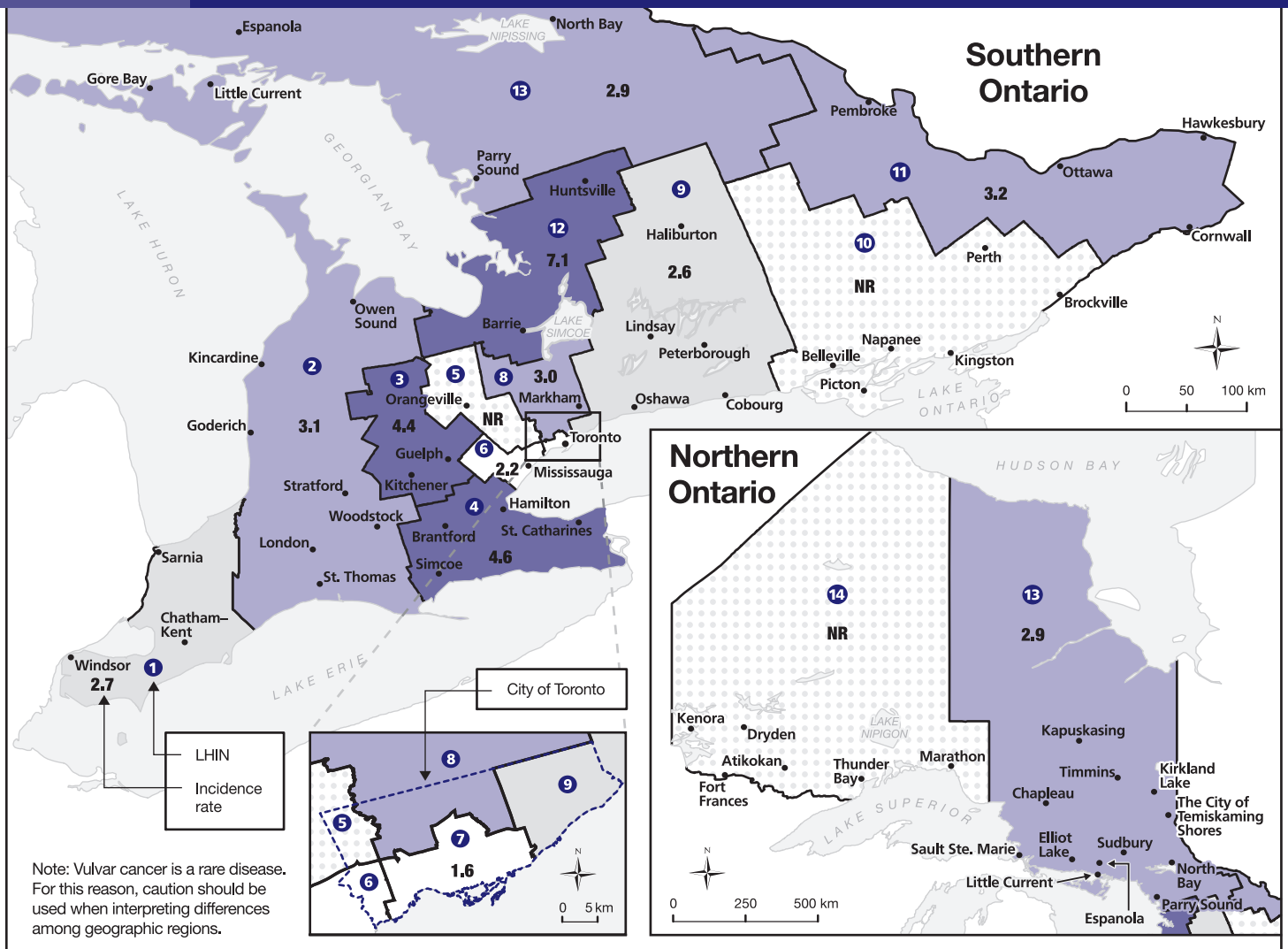
1 Incidence rates have been standardized to the Canadian population on July 1, 1991. Subgroup proportions (% Total) have been standardized to the Overall Vulvar Cancer Cohort.

2 Age-specific rates have not been standardized.

Findings

- In 2003/04, 148 women in Ontario were diagnosed with vulvar cancer; 82 percent were treated with surgery.
- In 2003/04, the incidence of vulvar cancer was higher in women aged 50 years or over (6.5 cases per 100,000) compared with women under age 50 (1.1 cases per 100,000).
- Nearly all women with vulvar cancer under age 50 (94 percent) had surgery compared to 80 percent of those over age 50.
- The incidence of vulvar cancer was noticeably higher among women living in Ontario's lowest income neighbourhoods (3.9 cases per 100,000) at the time they were diagnosed compared with those who resided in the highest income neighbourhoods (2.3 cases per 100,000).
- We found a similar difference in the incidence of vulvar cancer by community size—the incidence rates were higher among women living in smaller communities (3.8 cases per 100,000) compared to those who resided in the largest communities (2.2 cases per 100,000).

Exhibit 9.2 Age-standardized vulvar cancer incidence per 100,000 women 20 years of age or older, by Local Health Integration Network (LHIN) of patient residence, in Ontario, 2003/04



Note: Vulvar cancer is a rare disease. For this reason, caution should be used when interpreting differences among geographic regions.

Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age-standardized vulvar cancer incidence per 100,000 women in the Overall Vulvar Cancer Cohort, by LHIN of patient residence, in Ontario, 2003/04

Ontario rate (OR) = 3.0 per 100,000 women

LHIN rate per 100,000 women	LHIN rate compared to OR	Number of LHINs in each category
> 3.6	More than 20% above OR	3
3.4–3.6	10% to 20% above OR	0
2.7–3.3	Within 10% of OR	4
2.4–2.6	10% to 20% below OR	2
< 2.4	More than 20% below OR	2
NR	Not reportable due to small cell size	3

Findings

- The highest incidence rate of vulvar cancer in 2003/04 was 7.1 cases per 100,000 among women living in the North Simcoe Muskoka Local Health Integration Network (LHIN) at the time they were diagnosed. This was more than twice the Ontario rate of 3.0 cases per 100,000 women during the study period.

Exhibit 9.3 Health care utilization among women in the Vulvar Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile and community size, in Ontario

Characteristic	Vulvar Cancer Surgery Cohort			Hospital admissions[1]		
	Total number of patients	Average # visits with treating surgeon[2]	% with more than one hospital admission	Total number of admissions	Same-day surgery	Inpatient admissions
	number	*visits/patient*	*% patients*	*number (average per patient)*	*standardized % total admissions[3]*	
Ontario	**122**	**3.2**	**32.7**	**165 (1.4)**	**31.3**	**68.7**
Age group (years)[3]						
20–49	29	3.4	34.5	40 (1.4)	50.0	50.0
50+	93	3.2	32.3	125 (1.3)	26.4	73.6
Neighbourhood income quintile						
Q1 (Lowest)	27	3.6	40.6	39 (1.4)	28.1	71.9
Q2	23	2.6	52.1	36 (1.6)	41.2	58.8
Q3	26	3.6	32.0	35 (1.3)	23.1	76.9
Q4	19	3.0	13.0	22 (1.2)	40.3	59.7
Q5 (Highest)	20	3.9	25.3	25 (1.3)	30.6	69.4
Community size (population)						
≥ 1,250,000	32	3.3	21.8	42 (1.3)	38.3	61.7
100,000–1,249,999	51	3.6	48.3	75 (1.5)	31.5	68.5
< 100,000	39	2.6	22.8	48 (1.2)	27.1	72.9

1 Time frame for hospital admissions is from 12 months before to 12 months after diagnosis.
2 Time frame for surgeon visits is from 6 months before to 6 months after the first surgery.
3 Standardized to the Overall Vulvar Cancer Cohort; age-specific rates have not been standardized.

Findings

- Nearly seven out of 10 surgical procedures (69 percent) undergone by women in the Vulvar Cancer Surgery Cohort were done on an inpatient basis. On average, women in this study cohort visited their treating surgeons slightly more than three times during the study period (i.e., from six months before to six months after their first surgery).

Exhibit 9.4 Type of definitive surgical procedure among women in the Vulvar Cancer Surgery Cohort [2003/04], by age, neighbourhood income quintile and community size, in Ontario

Characteristic	Vulvar Cancer Surgery Cohort *number*	Definitive procedure *number (%)*[1]	
		Vulva procedure with groin node excision	Vulva procedure only, groin node only or other
Ontario	**122**	**65 (53.7)**	**57 (46.7)**
Age group (years)[2]			
20–49	29	12 (41.4)	17 (58.6)
50+	93	53 (57.0)	40 (43.0)
Neighbourhood income quintile			
Q1 (Lowest)	27	12 (44.6)	15 (55.4)
Q2	23	16 (67.6)	7 (32.4)
Q3	26	18 (69.6)	8 (30.4)
Q4	19	7 (28.0)	12 (72.0)
Q5 (Highest)	20	9 (46.4)	11 (53.6)
Community size (population)			
≥ 1,250,000	32	17 (52.3)	15 (46.9)
100,000–1,249,999	51	26 (53.3)	25 (49.0)
< 100,000	39	22 (54.9)	17 (43.6)

1 Percent of each subgroup that had each type of definitive procedure, age-standardized to the Overall Vulvar Cancer Cohort.
2 Age-specific rates have not been standardized.

Findings

- More than half of women in the Vulvar Cancer Surgery Cohort (54 percent) underwent radical vulvectomy and groin lymph node excision. Nearly half (47 percent) of women had a vulvectomy only, a groin lymph node excision only, or another type of procedure. This finding may represent treatments recommended to women with microinvasive disease or certain specific types of vulvar cancer (e.g., basal cell cancer). Or it could suggest that some women underwent incomplete surgery.
- Women aged 50 years or older were more likely to be treated by vulvectomy and groin node excision than women under age 50.

Exhibit 9.5a Overall pattern of surgical care provided to women in the Vulvar Cancer Surgery Cohort [2003/04], by physician specialty, in Ontario

Physician specialty	Physicians performing vulvar cancer surgery *number (% physicians)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*		
				Vulva procedure with groin node excision	Vulva procedure only, groin node excision only or other	Total
Gynecologic oncology	16 (43.2)	103 (75.7)	83 (82.2)	52 (62.6)	31 (31.3)	83
Obstetrics and gynecology	20 (54.1)	31 (22.8)	18 (17.8)	7 (38.9)	11 (61.1)	18
Ontario	**37**	**136**	**101**	**59 (58.4)**	**42 (34.6)**	**101**

[1] Based on one definitive procedure per patient.

Findings

- Gynecologic oncologists performed 76 percent of all surgeries and 82 percent of definitive surgeries among women in the Vulvar Cancer Surgery Cohort.

Exhibit 9.5b Overall pattern of surgical care provided to women in the Vulvar Cancer Surgery Cohort [2003/04], by hospital type, in Ontario

Hospital type	Physicians performing vulvar cancer surgery *number (% physicians)*	Total surgeries *number (% surgeries)*	Total patients *number (% patients)*	Definitive procedure[1] *number (%) of patients*		
				Vulva procedure with groin node excision	Vulva procedure only, groin node excision only or other	Total
Academic	10 (32.2)	135 (82.8)	107 (89.9)	62 (57.9)	45 (42.0)	107
Community/Small	21 (67.8)	28 (17.2)	12 (10.1)	**	12 (100.0)	12
Ontario	**31**	**163**	**119**	**62 (100.0)**	**57 (47.1)**	**119**

** Cell value suppressed and removed from totals for reasons of privacy and confidentiality.

[1] Based on one definitive procedure per patient.

Findings

- The majority of women in the Vulvar Cancer Surgery Cohort (90 percent) received their operations at an academic (teaching) hospital.

Exhibit 9.6 Health services received by women in the Overall Vulvar Cancer Cohort, from 12 months before to 12 months after their definitive surgery (among those who had surgery) or their diagnosis (among those who did not have surgery), by surgery status, in Ontario

	Vulvar Cancer Surgery Cohort		Vulvar Cancer/No Surgery Cohort	
Ontario	**122**		**25**	
A. Diagnostic services	**Total number of services (services/patient)[1]**			
Vulva biopsy	96 (0.8)		14 (0.6)	
Groin fine needle aspiration	12 (0.1)		0 (0.0)	
Surgical biopsy	22 (0.2)		8 (0.3)	
B. Radiologic services	**Total number of services (services/patient)[1]**			
Chest X-ray	186 (1.5)		23 (0.9)	
Abdominal CT scan	94 (0.8)		17 (0.7)	
Pelvic CT scan	88 (0.7)		17 (0.7)	
Pelvic MRI scan	7 (0.1)		6 (0.2)	
C. Consultations and services	**% cohort who received service**	**Average[2] # sessions per patient**	**% cohort who received service**	**Average[2] # services per patient**
Radiation oncology consults	41.0	1.2	61.5	1.3
Radiation therapy planning[3]	24.6	1.5	43.2	1.3
Gynecologic oncology visits	83.6	4.9	69.2	3.7
Obstetrics and gynecology visits	85.2	3.5	73.1	3.5
Medical oncology consults	6.6	1.3	**	**
Chemotherapy sessions	**	**	23.1	2.8

** Cell value suppressed for reasons of privacy and confidentiality.

1 Denominator includes all patients in the Vulvar Cancer Surgery Cohort or No Surgery Cohort, as appropriate.

2 Denominator includes only patients in the Vulvar Cancer Surgery Cohort or No Surgery Cohort (as appropriate) who had at least one consultation, session or visit.

3 Please refer to the Introduction at the beginning of this chapter for a definition of radiation therapy planning.

Findings

- Most women in the Vulvar Cancer Surgery Cohort (80 percent) and many in the Vulvar Cancer/No Surgery Cohort (60 percent) underwent a vulvar biopsy.
- Chest X-ray was the most common radiologic test done on women in both study cohorts. Many women had abdominal and pelvic computed tomography (CT) scans (0.7–0.8 per patient, on average). These rates were similar for women in both the Vulvar Cancer Surgery and the Vulvar Cancer/No Surgery Cohorts.
- Eighty-four percent of women in the Vulvar Cancer Surgery Cohort saw a gynecologic oncologist in the 12 months before and after their definitive surgery. Nearly 70 percent of women in the No Surgery Cohort saw a gynecologic oncologist in the 12 months before and after their diagnosis.
- About four in 10 women (41 percent) who underwent surgery for vulvar cancer were seen by a radiation oncologist during the study period; the proportion was 62 percent among those who did not have surgery.
- Women with vulvar cancer who did not undergo surgery were more likely to receive radiation therapy compared to women with this disease who did have surgery (43 percent vs. 25 percent, respectively.)

Discussion and Conclusions

Most cases of vulvar cancer newly-diagnosed in Ontario in 2003/04 occurred in women over 50 years of age. The disease occurred more frequently among women living in lower-income neighbourhoods and among those who lived in smaller communities.

More than 80 percent of patients underwent surgical intervention for their cancer. About 54 percent of women in the Vulvar Cancer Surgery Cohort received combined vulvar and groin lymph node excision surgery. These procedures were performed primarily by gynecologic oncologists.

Surgery was usually preceded by a biopsy and a chest X-ray; many women also underwent a pelvic and abdominal computed tomography (CT) scan.

Implications for clinical practice

Family physicians and gynecologists alike have a central role to play in reducing both the incidence of and morbidity from vulvar cancer. Early detection of pre-invasive disease can be achieved through careful inspection of the vulva at the time of cervical screening. Another important role for health care providers is to educate their patients about the risk of vulvar cancer associated with smoking, and to encourage them to quit.

Early biopsy of any vulvar lesion should be undertaken to detect invasive disease. Early detection means the cancer can be treated with minimal morbidity.

We observed a lower-than-expected rate of groin lymph node surgery among women with vulvar cancer in our study cohort. The reasons for this are not clear and should be the subject of further enquiry.[1] Any such investigation would require that researchers have access to detailed pathologic information, such as the depth of invasion of the primary disease, as well as information about how decisions regarding treatment for this disease are currently being made.

Implications for policy and planning

The use of sentinel lymph node biopsy for the staging of squamous cell carcinoma of the vulva (which comprises the majority of vulvar cancers) is currently undergoing evaluation. This biopsy is the standard procedure for vulvar melanoma in Ontario. Making it the standard of care for other vulvar cancers as well will have resource implications for both nuclear medicine and pathology.

References

1. Barbera L, Thomas G, Elit L, Covens A, Fyles A, Osborne R, et al. Treating vulvar cancer in the new millennium: are patients receiving optimal care? *Gyncol Oncol* 2008; 109(1):71–5.

INSIDE

10

Chapter

Reflections and Recommendations

Marko Simunovic, MD, MPH, FRCSC, and David R. Urbach, MD, MSc, FRCSC, FACS

Introduction

Cancer is a leading cause of death in western countries. Besides the toll taken by this group of diseases on individuals and families, cancer is responsible for a major portion of health care expenditures. Indeed, many of the major crises confronting health care in Canada—access, quality and sustainability—are especially relevant to cancer care.

The burden of cancer on our health care system can only be expected to increase over time. Several factors will contribute to this increase:

- Many cancers are age-related, and the average age of Canada's population is increasing each year as the baby boomers move into their 60s and 70s.
- As researchers develop new and better methods to diagnose, treat and manage cancer, the costs of new cancer drugs and improved health technologies will add to the overall burden.
- Many patients with cancer are now living longer than ever before. And because they live longer with cancer, they receive more cancer treatments and also receive treatment over longer periods of time.

The Key Role of Cancer Surgery

This ICES Atlas focuses on cancer surgery in Ontario. Why is it so important to understand cancer surgery-related health services now?

Surgeons play a key role in the diagnosis of many cancers, are central to curative surgery for most cancers including the ones assessed in this Atlas, and are often involved in palliating symptoms in patients with advanced disease.

Cancer surgery is provided in almost all acute care hospitals in Ontario and is performed most frequently by surgeons who do not exclusively treat cancer patients. As well, surgeons often coordinate cancer services for patients, effectively serving as gatekeepers to the cancer care system. Yet surgical services are far less centralized and coordinated than other types of cancer care, such as radiation therapy and systemic therapy (chemotherapy).

Since surgery is an expensive form of cancer treatment, we must ensure that these resources are used wisely and effectively. There is evidence from our own findings and from those of others that variations exist in how surgical care is delivered to cancer patients in different regions of Ontario.

Improving the quality of cancer surgery in Ontario is an ongoing challenge. The intent of this Atlas was to provide data which could be used to inform regional, population-based planning of cancer surgery services. We also sought to support policy-making with respect to cancer surgery, to create a foundation for a program of research into cancer surgery-related health services in Ontario, and to provide important new information that would be of interest to providers, patients and researchers.

The five cancer sites presented in this Atlas—breast, prostate, colorectal, lung and cancers of the female genital tract (uterine, ovarian, cervical and vulvar cancer)—represented nearly 60 percent of all newly-diagnosed cancers in Ontario during the study period. While this Atlas focuses on surgery, it provides information on a wide spectrum of surgical services, including prevention and screening, treatment, palliation and supportive care.

We hope that the fresh information contained here accelerates us towards a more effective system of cancer care for Ontarians—one that minimizes the burden of these terrible diseases on patients, their families and their friends.

Reflections on Research Findings

We have distilled our research findings into a number of themes which are discussed below. We thought it would also be useful to offer some reflections on cancer surgery in Ontario, and also to point out some limitations regarding the current study.

Regional trends in cancer incidence and the use of surgery

We noted variations in the age-standardized incidence rates for many of the cancers we studied. For example:

- The incidence of breast cancer varied from 133 to 157 cases annually per 100,000 population among women from different neighbourhood income groups. It also varied across Ontario's 14 Local Health Integration Networks (LHINs) of patient residence, ranging from 131 to 163 cases annually per 100,000 population.

- Similarly, the incidence of prostate cancer varied by LHIN of patient residence, from 132 to 197 cases annually per 100,000 population.

- Lung cancer incidence rates showed some of the greatest variation, ranging from 56 to 90 cases annually per 100,000 population among men from different income groups. The incidence of lung cancer also varied across LHINs of patient residence—from a low of 50 cases annually per 100,000 population in some LHINs to a high of 96 cases per 100,000 population in other parts of the province.

How might these differences be explained? They could reflect true differences in the incidence of cancer among people living in different regions of Ontario. This is likely to be true for lung cancer—which is caused by cigarette smoking—since rates of smoking are known to vary geographically.

However, differences in the incidence of other cancers may also be due to variations in the use of cancer screening and other diagnostic services. For example, while some prostate cancers are serious and may cause death if left undiagnosed and untreated, many prostate cancers are not harmful; in most cases, they are only discovered if doctors actively search for them by screening. In this case, more frequent cancer screening in one part of Ontario will result in a higher number of cancers being detected, even if no true difference in cancer incidence exists between this region and other parts of the province.

Many people with cancer undergo one or more surgical procedures during the course of diagnosis and treatment. We found that the age-standardized percentages of patients who underwent surgery for certain cancers—such as breast and colorectal cancer—were remarkably consistent among people living in different geographic regions of Ontario at the time of their diagnoses.

Such findings suggest that once patients were diagnosed with one of these cancers, their access to surgery was equitable across Ontario. However, for other cancers—such as lung and prostate cancer—the age-standardized percentage of patients who had surgery did vary according to sociodemographic and geographic characteristics. This variation could be explained by several factors: differing opinions among providers about the role of surgery for these cancers; differences in cancer stage or patient characteristics; and/or a true lack of access to surgical care in some parts of the province.

The use of potentially curative cancer surgery

In general, the cancers studied in this Atlas cannot be cured without surgical removal of the tumour. Even so, we found that large percentages of patients in our study cohorts did not have major surgery to remove their cancers. For example, 22 percent of patients with rectal cancer did not undergo surgery. Only 40 percent of patients with lung cancer had operations, and just 19 percent—fewer than one in five—had a surgical resection that might have made cure possible. Of course, many of these patients likely had advanced stage disease, which precluded the use of major potentially curative surgery. Other factors, such as patient choice or poor baseline health, might also be factors in the low rates of definitive surgery we observed.

Besides finding that many cancer patients did not receive surgery, we also noted that palliation (i.e., symptom relief) appeared to be the main intent of many surgical procedures which were provided. For example, among patients with colon cancer who did undergo major surgery, 15 percent had procedures that were clearly palliative in nature (e.g., bypass, stoma formation, local excision). We also recognize that a certain percentage of patients who underwent a major resection for their cancers might have had advanced or metastatic disease.

Some of these findings are cause for concern. The use of potentially curative cancer treatment for many patients in Ontario can and should be improved. Since curative surgery is most likely when cancer is discovered at an early stage, it is important that patients are diagnosed before the disease has progressed to a point where curative surgery is no longer possible. This may be achieved though development of better screening methods, improved use of current screening methods, and heightened awareness of early cancer signs and symptoms by all Ontarians and their primary care physicians.

Regional variations in patterns of cancer surgery

We noted treatment variations in the type of surgery used to treat patients with particular types of cancer. These differences were most noticeable at the LHIN level. For example, the percentage of patients with breast cancer treated with mastectomy and lymph node excision ranged from a low of 15 percent to a high of 42 percent across different LHINs of patient residence. Similarly, we observed considerable variation in the percentage of patients with rectal cancer who were treated with resection and permanent stoma—ranging from a low of 16 percent to a high of 43 percent across different LHINs.

Others have noted similar regional variations in cancer surgery throughout the province. Several factors might explain why such variations in practice persist: differing access to adjuvant treatments (such as radiation therapy for breast cancer); physician uncertainty about the risks and benefits of treatments; differences in patients' preferences for specific treatments; and varying enthusiasm for particular treatment approaches among surgeons and other care providers. Further research is needed to help us understand why the use of different surgical procedures varies so widely across the province.

The quality of surgical care for cancer in Ontario

It is impossible to comment definitively on the appropriateness or quality of care provided to the patients with cancer studied in this Atlas, mainly because we lack critical information. The most important gaps are in patient-level information such as tumour stage, patients' general health at the time of diagnosis and patients' treatment preferences.

However, in some cases, our findings do suggest there were gaps in the quality of surgical care during the study period; indeed, such gaps may persist today. For example, although lymph node sampling is an important part of establishing tumour stage in breast cancer, 24 percent of the breast cancer patients we studied did not receive any form of axillary lymph node sampling. While this might be explained, at least in some cases, by patients' older chronological age, nearly half of the women we studied were under the age of 70 at the time of their breast cancer diagnoses. Similarly, 46 percent of patients who underwent major vulvar cancer surgery did not receive groin lymph node dissection to determine disease spread.

About the providers of cancer surgery

For most cancers, especially those involving common sites such as the breast, prostate and colon, we observed that the great majority of surgery was delivered by surgeons who did not identify themselves as surgical oncologists. A majority of these procedures were also performed in community hospitals located in the LHIN of patient residence.

By contrast, the overwhelming majority of relatively resource-intense procedures—such as radical surgery for vulvar or cervical cancers—were delivered in academic (teaching) hospitals. A relatively high percentage of patients with gynecologic malignancies of the vulva, cervix and ovary travelled outside their LHINs of residence for surgical care. We believe this can be explained in large part by policy decisions to situate gynecologic oncologists at Ontario cancer centres rather than in local hospitals.

For common cancers, such as colorectal and breast, it may be more effective to have routine cancer procedures done in an expert fashion close to the patient's residence. Cases requiring more complex care would be referred to a more highly resourced centre. While this type of referral for complex care already occurs to some extent, we do not know whether it is being done in an optimal fashion.

These observations suggest that province-level quality improvement and/or knowledge translation strategies must engage all surgeons (surgical oncologists as well as surgeons who do not specialize solely in cancer surgery). They should also include surgeons practicing in community hospitals as well as in academic (teaching) hospital settings.

The central role of surgeons in the cancer patient's journey

The patients with cancer we studied for this Atlas received numerous diagnostic and therapeutic services which were provided to them by surgeons. However, it is also important to remember that many patients with other conditions—such as a benign breast lump or rectal bleeding due to hemorrhoids—also required the services of surgeons, either to rule out cancer or to help treat the underlying condition.

Since surgeons often act as the gatekeepers of the cancer care system by coordinating a variety of cancer resources, we were not surprised to find that the overwhelming majority of cancer patients in our study received care from surgeons (either general surgeons or those with sub-specialties). This was true even for patients who did not undergo major surgery. Any future attempts to optimize resource use in the cancer care system should take into account the central role which surgeons play in caring for Ontarians with cancer.

Limitations of the Current Study

Limitations related to data on tissue type

Each chapter of this Atlas includes information on all patients with a particular type of cancer, regardless of the specific histology (tissue type) of these cancers. While most cancers affecting the patients we studied were adenocarcinomas (malignant tumours originating in glandular tissue), our analysis also included a small number of patients diagnosed with other tumours such as sarcomas (usually malignant tumours arising from connective tissue such as bone or muscle), or neuroendocrine tumours. Treatment patterns for patients with rarer types of cancer may be quite different from those with more common types of cancer.

Because the available data lacked information on certain common, pre-cancerous conditions, we were unable to include large numbers of patients who underwent surgery during the study period. For example, a large proportion of procedures done each year in Ontario involve "ductal carcinoma in situ (DCIS)," an early, localized cluster of cancer cells that start in the milk ducts of the breast but have not penetrated the duct walls into the surrounding tissue. While DCIS of the breast is "non-invasive," if the condition is left untreated, it may progress to invasive breast cancer by spreading into the surrounding healthy breast tissue. In fact, studies suggest that between 30 and 40 percent of women who have breast cancer surgery are found to have DCIS.

However, because the Ontario Cancer Registry (OCR)—our main source of data—did not include cases of DCIS, we were unable to include information about patients with these common, non-invasive cancers. (Note: This limitation principally affects Chapter 2 on breast cancer; surgery for non-invasive lesions is much less common for other cancer sites.)

The exclusion of prevalent cancers from our analysis

Our aim in producing this Atlas was to provide a snapshot of care provided to patients who were newly-diagnosed with certain types of cancer during the one-year period from April 1, 2003 to March 31, 2004. We focused on newly-diagnosed ("incident") cancers, since surgery frequently follows a diagnosis of cancer, and because we wanted to estimate the health resources necessary to treat newly-diagnosed patients in the future.

Thanks to improvements in screening and treatment, many patients with cancer will survive for many years after diagnosis. This means they will continue using resources available to them through Ontario's health care system. This includes physician visits for cancer surveillance (i.e., to catch a recurrence), and treatment if cancer reoccurs. These patients fall into the category of "prevalent" cancers.

Surgical treatment of people with prevalent cancer is of particular importance when it comes to certain types of cancer. For example, men diagnosed with prostate cancer who elect to be treated via "watchful waiting" or "active surveillance" may undergo surgery for their cancer many years after the initial diagnosis. Many of these same patients will survive for years, since surgery for prostate cancer is often curative.

Similarly, some patients with colorectal cancer will have surgery or additional treatment to deal with a cancer recurrence several years after the initial diagnosis. Or else they may require reconstructive surgery for abdominal wall hernias. Also, women treated for breast cancer via mastectomy may decide to delay reconstructive breast surgery for several years.

Although they were not studied for the purposes of this Atlas, patients with an existing (prevalent) cancer must be considered an important part of the patient population and should be factored into decision-making about care cancer services in Ontario.

Limitations related to a lack of key clinical and other data on cancer patients

A key limitation of the analyses presented in this Atlas was the fact that detailed information on our patient cohorts was lacking. Data on cancer incidence came from the Ontario Cancer Registry (OCR); data on hospitalization were derived from statistics collected by the Canadian Institute of Health Information (CIHI); information on surgical procedures came from CIHI and also from Ontario Health Insurance Plan (OHIP) records; information about where patients lived was obtained from the Registered Persons Database (RPDB); socioeconomic information (i.e., neighbourhood income quintile) came from Statistics Canada; and finally, physician specialty information came from the ICES Physician Database (IPDB), supplemented with sub-specialty information from the Canadian Medical Directory (CMD).

However, none of these sources contained detailed clinical information on patients' overall health and any comorbid medical conditions which might have affected decisions about treatment or treatment success. More importantly, we had no information regarding cancer stage (i.e., how far each patient's cancer had spread) for the patients in our study cohorts. Currently, the OCR does not contain information on cancer stage for most patients included in the registry.

Since decisions about cancer treatment depend to a large extent on the stage of a patient's disease, it was impossible for us to definitively judge the appropriateness of surgical care received. Nor could we determine whether variations in stage at the time of cancer diagnosis were responsible for the regional variations we observed in the patterns of surgical care.

Limitations related to new technologies and data coding

Some new cancer-related health technologies—such as the use of sentinel lymph node biopsy in breast cancer and laparoscopic surgery in colorectal cancer—were not studied for the purposes of this Atlas. As data coding for these procedures improves, it will be possible for other researchers to assess such treatments in the future using administrative health data.

While the focus of this Atlas is on cancer surgery, we also looked at other treatment modalities delivered to patients in our study cohorts. To determine chemotherapy rates, we relied on fee codes for intravenous (IV) chemotherapy used by OHIP; however, we were unable to measure the use of oral chemotherapy among our patients. This would have resulted in an underestimation of oral chemotherapy. Treatment regarding the use of radiation therapy relied on OHIP fee codes. However, these codes only reflect radiation therapy planning; the actual delivery of radiation therapy is not coded reliably by OHIP.

Similarly, since our data included only those health care services that were actually provided, we could only measure actual clinical encounters rather than referrals for a clinical encounter. The fact that some patients did not receive a consultation from a medical oncologist, for example, does not necessarily mean that their surgeons neglected to refer them for a consultation. Rather, it is possible that they were referred but chose to decline the consultation, or that a medical oncologist reviewed the referral and decided that a consultation was not necessary.

Our classification of surgical specialists was partially based on self-reported information contained in the Canadian Medical Directory (CMD). However, this information may have been incomplete, since inclusion in the CMD is entirely voluntary. Also, there is no formal sub-specialty certification for some types of surgical practice, such as breast cancer surgery or surgical oncology. Furthermore, self-reported sub-specialty information does not distinguish surgeons with specialized training in a particular practice area from surgeons who focus on that practice area but who have not received formal sub-specialty training.

Limitations related to study period, cancer sites, geography and SARS

The cancer patients studied for this Atlas were diagnosed between April 1, 2003 and March 31, 2004, which may seem like a long time ago. We chose this interval because it was the most recent time period for which complete information on treatment was available when the study began. In fact, it took several years for the patient information in our data sources to became complete enough for our analyses.

This Atlas focuses on some of the most common cancers affecting Ontarians: cancers of the breast, prostate, lung, female genital tract (uterine, ovarian, cervical and vulvar cancer) and colorectal cancers. Patients with these cancers are more likely than those with rarer or more complex malignancies to be cared for locally. For example, surgical treatment of patients with pancreatic cancer, cancers of the central nervous system, and head and neck cancers is more likely to take place in specialized centres than in community hospitals. Therefore, our findings about whether patients with cancer were treated locally or in regional cancer centres may not be applicable to all patients with cancer in Ontario.

It is important to acknowledge some idiosyncratic features of the time period selected for our analysis that we believe are worthy of discussion. A portion of the time period during which we measured health services utilization coincided with an outbreak of Severe Acute Respiratory Syndrome (SARS) in Ontario. SARS had a major impact on hospital use in the Greater Toronto Area and—to a lesser extent—throughout the province, due to intensive infection control maneuvers aimed at halting disease spread.

It is not clear how the occurrence of the SARS outbreak during our study period might have influenced the data presented in this Atlas. We do not think that decreased access to hospital care during SARS affected our estimates regarding the proportion of patients with cancer who had surgery. However, it might have affected other analyses, including findings about referral patterns for surgical care.

Limitations related to geographical factors and funding variations

Our estimates of surgical services provided to cancer patients in our study cohorts may have been affected by the fact that some Ontario residents travelled from their places of residence to other regions, provinces or countries to receive cancer care. For example, some patients residing in northwestern Ontario may have received care in Winnipeg, Manitoba. It is also likely that a small number of patients travelled to other provinces or to the United States for cancer surgery.

We also realize that the use of alternate funding plans (vs. fee-for-service) in some parts of Ontario (such as in the South East LHIN) may have reduced our ability to accurately measure procedure rates using data based on OHIP fee codes.

Summary and Recommendations

Summary

In this Atlas we have highlighted several important findings related to the provision of surgical cancer care in Ontario during the study period:

- Surgeons provided a large number of health care services to patients with cancer, even when those patients did not undergo a surgical procedure to manage their disease.
- A large proportion of the cancer surgery provided to patients in our study cohort was delivered by surgeons who did not specialize solely in cancer surgery (i.e., they did not identify themselves as surgical oncologists). Most cancer surgery delivered to patients in our study cohorts was provided in the community hospital setting.
- We noted considerable variations in the type of care provided to patients who resided in different Local Health Integration Networks (LHINs) at the time of their diagnosis and treatment. There were variations in the proportion of patients who had surgery; in the types of surgical procedures they underwent (such as lymph node sampling); and in patients' use of other cancer-related health services (such as chemotherapy and radiation therapy).
- We noted potential gaps in the quality of care provided to patients with cancer in Ontario. For example, among women with breast cancer, 24 percent did not receive any form of axillary lymph node sampling—a procedure which helps determine whether cancer has spread.
- Finally, we observed that many patients with cancer did not undergo potentially curative surgery.

Recommendations

There is a need for quality improvement in Ontario's system of cancer care.

Taken together, our findings suggest that there is an opportunity to improve the quality of cancer care in Ontario. Quality improvement programs must engage not only surgical oncologists, but also other surgeons. We found that general surgeons, general urologists and general obstetrician gynecologists provided a significant amount of surgical care to patients with common cancers. Community hospitals should also be included in quality improvement programs, since we found that a substantial amount of cancer surgery in Ontario was delivered in community hospital settings.

Ontario needs a program of cancer-related health services research.

We used the Ontario Cancer Registry (OCR) and various provincial administrative health databases to study basic patterns of cancer surgery. These rich sources of information could be further utilized by researchers interested in answering any number of clinical and policy questions about cancer care. For example:

- Why did we find large variations in the types of surgical care provided to patients with cancer living in different regions of Ontario?
- What is the best way for cancer surgery services to be organized in Ontario?
- What types of surgeons and hospitals should provide cancer surgery services?

A program of research in cancer-related health services could yield valuable information which might facilitate planning and improve the quality of cancer services in Ontario. We recommend that such a program of cancer-related health services research be established.

The comprehensiveness of information about cancer must be improved.

The lack of information on cancer stage in the OCR greatly limited our ability to study the appropriateness of cancer surgery services. Improving the scope and comprehensiveness of population-based cancer-related information would enhance researchers' ability to study cancer-related health services in Ontario.

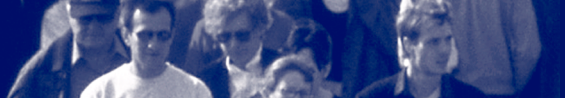
New health technologies must be included in administrative data sources.

In recent years, a number of new surgical technologies—such as sentinel lymph node biopsy, laparoscopic colorectal cancer surgery and ablation of prostate tumours—have been introduced into clinical cancer care. However, data related to these new technologies is lacking. Currently, it takes several years for procedure codes for new technologies to be developed and introduced into administrative health databases including those kept by the Ontario Health Insurance Plan (OHIP). Because it is especially important to study new health technologies, procedure codes for new health technologies should be developed and implemented in these databases as quickly as possible.

Better evaluation of cancer surgery structures, processes and outcomes is required.

We did not evaluate the outcomes of cancer surgery among the patients in our study cohorts. More research is needed to help us better understand the short- and long-term outcomes of cancer care in Ontario.

According to a conceptual model proposed by the late Dr. Avedis Donabedian, an expert in quality measurement and improvement activities, the quality of health care includes not only outcomes of care, but also "structures of care" (fixed characteristics of the facilities where care is provided) and "processes of care" (the content of care that is delivered to an individual patient). Further improvements in the quality of cancer surgery, and in cancer care overall, will require a better understanding of the structures and processes of care, including which ones are associated with better clinical outcomes.



INSIDE

Technical Appendix (abbreviated)

Susan E. Schultz, MA, MSc, Marko Simunovic, MD, MPH, FRCSC, and David R. Urbach, MD, MSc, FRCSC, FACS

A. Data Sources

The Ontario Cancer Registry (OCR), Cancer Care Ontario

The OCR is a computerized database of information on all Ontario residents who have been newly-diagnosed with cancer or who have died of cancer. All cancers are included, with the exception of non-melanoma skin cancer and ductal carcinoma in situ (DCIS), a type of pre-invasive breast cancer.

The Discharge Abstract Database (DAD), Canadian Institute for Health Information

The DAD is a database of information abstracted from hospital records. It includes patient-level data for acute- and chronic-care hospitals, rehabilitation hospitals and day surgery clinics in Ontario.

The Ontario Health Insurance Plan (OHIP) database of physician billings

The OHIP database contains all claims made by Ontario physicians for insured services rendered to Ontario residents. Each record represents a separate service (identified by feecode) rendered to a specific person on a specific day. It includes the following information: type of service, diagnosis, who provided the service, who received it, service date, physician's practice group and referring physician (where applicable).

The Registered Persons Database (RPDB)

The Registered Persons Database (RPDB) is a population-based registry maintained by the Ministry of Health and Long-Term Care (MOHLTC) to manage publicly funded health care services covered under the Ontario Health Insurance Plan (OHIP). The RPDB is essentially a historical listing of the unique health numbers issued to each person eligible for Ontario health services. This listing includes corresponding demographic information such as date of birth, sex, address, date of death (where applicable) and changes in eligibility status. When new RPDB data arrive at ICES, personal information such as name and street address is removed, and each unique health number is converted into an anonymous identifier, ensuring the protection of each individual's privacy.

The ICES Physician Database (IPDB)

The IPDB is a database containing information about physicians practising in Ontario. It is created and maintained by ICES, using data from several sources. These sources include: the Ontario Physician Human Resource Data Centre (OPHRDC), the OHIP Corporate Provider Database; and the OHIP database of physician billings. The IPDB includes: demographic information about each physician (i.e., age, sex); his/her practice location; physician specialty; the types of service provided; where each physician was trained; and the year he/she graduated from medical school.

The Canadian Medical Directory (CMD)

The CMD is a proprietary database of information about physicians in Canada published by Scott's Directories Inc., in association with the Canadian Medical Association. Inclusion in the directory is voluntary.

2001 Census Area Profiles, Statistics Canada

These Statistics Canada files contain population-based information from the 2001 census for different geographic areas (including census division and census metropolitan area). The files contain information on age, sex, ethnicity, educational level attained, employment, income and socioeconomic status.

Intercensal and postcensal population estimates, Statistics Canada

Intercensal estimates use data from two different censuses (e.g., the 1991 census and the 1996 census) to calculate population estimates for the intervening years (e.g., 1992–1995). Postcensal estimates use data from a single census. Both these population estimates are adjusted using other data about births, deaths, migration and immigration.

B. Methods

I. Study populations and timelines

The study populations for each cancer site discussed in *Cancer Surgery in Ontario* included all Ontario residents 20 years of age or older who were newly-diagnosed with cancer between April 1, 2003 and March 31, 2004 inclusive.

Several look-back and look-forward "utilization windows" were used:

Purpose	Time window
To determine if an individual had surgery for their cancer	- from 12 months before to 12 months after their cancer diagnosis
To estimate the number of visits a person undergoing cancer-related surgery had with their treating surgeon	- from 6 months before to 6 months after their first surgery
To measure use of non-surgical health services by individuals who had cancer	- from 12 months before to 12 months after their definitive surgery
To measure use of non-surgical health services by individuals who did not have surgery	- from 12 months before to 12 months after their cancer diagnosis

II. Age grouping of study populations

Because certain cancers are known to affect a wider range of age groups than others, the choice of age groupings for each study population was based on the actual age range of that population. The age groups in each chapter of this Atlas are as follows:

Type of cancer	Age groups (years)
Breast	20–39, 40–49, 50–59, 60–69, 70+
Prostate	20–54, 55–64, 65–69, 70–74, 75+
Colon	20–54, 55–64, 65–69, 70–74, 75+
Rectal	20–54, 55–64, 65–69, 70–74, 75+
Lung	20–54, 55–64, 65–69, 70–74, 75+
Uterine	20–39, 40–49, 50–69, 70+
Ovarian	20–39, 40–49, 50–69, 70+
Cervical	20–39, 40–49, 50–69, 70+
Vulvar	20–49, 50+

III. Standardization method

All incidence rates were standardized to the 1991 population of Canada as of July 1, 1991 using the direct method of standardization. Sub-group proportions, such as the proportion of each particular cancer cohort who underwent surgery, were standardized to either the Overall Cancer Cohort or to the Cancer Surgery Cohort.

IV. Cancer definitions

Cancers were defined using the diagnosis code variable in the Ontario Cancer Registry (OCR). These are based on the International Classification of Disease, 9th revision (ICD-9) developed by the World Health Organization. The cancer sites studied in this Atlas were defined as follows:

Site	ICD-9 code
Female breast cancer	174
Prostate cancer	185
Colon cancer	153
Rectal cancer	154
Lung cancer	162
Uterine cancer	182
Ovarian cancer	183
Cervical cancer	180
Vulvar cancer	184.1, 184.2, 184.3, 184.4

V. Definition of patient residence

For all analyses presented in this Atlas, the definition of "Local Health Integration Network (LHIN) of patient residence" is based on where each person lived when he or she was diagnosed with cancer.

VI. Identification and categorization of cancer surgeries

Most analyses of cancer surgery begin with a set of predefined procedures; the next step is to examine who received each procedure. The current study differed in that we started with a number of cohorts (our study populations) who had been diagnosed with specific cancers during a given period. We then looked backward and forward in time to determine what types of procedures related to their cancer they received.

Below is a description of the entire multi-stage process:

Step 1. All individuals newly-diagnosed with cancer during the study period were identified from the OCR.

Step 2. Data on these individuals were then linked to the Canadian Institute for Health Information (CIHI) Discharge Abstract Database (DAD) to see what procedures they underwent during the time period from 12 months before to 12 months after their diagnosis.

Step 3. The list of procedures developed for each cancer site was reviewed by a group of experts to determine which were cancer-related. Five-digit codes contained in the Canadian Classification of Health Interventions (CCI)[1] were used to identify procedures associated with surgical cancer treatment (excluding biopsy).

Step 4. More detailed CCI codes (up to 10 digits) were used to define analytic surgical subgroups (i.e., definitive procedures).

Tables listing the CCI codes associated with the surgical procedures identified for each type of cancer included in this Atlas, and lists of the definitive procedures for each type of cancer can be found on the ICES website at: **http://www.ices.on.ca** under **Publications, Atlases.**

[1] The CCI is the current national standard for classifying health care procedures. It replaces the Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures (CCP) and the intervention portion of ICD-9-CM in Canada. CCI classifies a broad range of diagnostic, therapeutic and support interventions.

VII. Identification of diagnostic, radiologic and other non-surgical health services

OHIP feecodes were used to identify the procedures listed below:

- AUS/urethral sling/bulking agents
- Barium enema
- Biopsy–non-surgical
- Biopsy–surgical
- Bladder declotting
- Bone scan
- Brachytherapy
- Bronchoscopy
- Chemotherapy
- Chest tube
- Cold knife cone
- CT scan
- Cytoscopy
- Dilatation and curettage (D&C)
- Emergency department visits
- Endoscopy
- External beam radiation
- Groin fine needle aspiration
- Home care visits
- Hormone injection
- Intensive care unit (ICU) days
- LEEP/Laser
- Lower GI endoscopy
- Mammography
- Mediastinoscopy
- Mediastinotomy
- MRI scan
- Pap smear
- Paracentesis
- Pleurodesis
- Radiation therapy planning
- Specialist consultations
- Stoma reversal (using CCI codes from CIHI-DAD)
- Surgeon visits
- Thoracentesis
- Thoroscopy
- Ultrasound
- Ureteric stent insertion
- Urethral catheterization
- Visual internal urethrotomy (VIU)
- Wire localization procedures
- X-ray

Utilization of these procedures was examined in Exhibits X.7 and X.8. For a complete list of the OHIP feecodes associated with each procedure, please go to our website at : **http://www.ices.on.ca** under **Publications, Atlases.**

VIII. Identification of physician specialties and sub-specialties

Identifying physician specialties and sub-specialties presented several challenges.

- The fact that the physician identifiers used in the CIHI-DAD are not standard across all Ontario hospitals made it necessary to use OHIP data for the physician specialty analysis. The OHIP billings then had to be matched back to the procedures identified in the CIHI-DAD, a challenging process because the procedures are not defined the same way in the two data sources.

- There is variation in the feecodes which physicians use to bill OHIP for surgical procedures (i.e., they do not always bill as one might expect).

- Some physician sub-specialties are not listed in the OHIP data, so it was necessary to link to other sources. Each additional data source used increases the potential sources of misclassification error.

- Because the OHIP fee schedule does not follow the same structure as the CIHI-DAD, it was necessary to use an iterative process to identify and match billings with surgeries.

Description of process used to identify physician specialties/sub-specialties

1. A list of OHIP billing codes used for cancer surgery was developed by the clinician/authors involved in each Atlas chapter.

2. For each cancer site, all OHIP records were extracted that matched the following criteria: the service date was between April 1, 2002 and March 31, 2005; the patient was a member of the cancer cohort; the feecode was one of those on the list provided by the clinician/authors.

3. OHIP billings were matched with the CIHI-DAD procedures on patient and date. This was done twice: first, we sought an exact match between the procedure date on the DAD record and the service date on the OHIP billing; then we utilized a date window of +/-2 days.

4. In situations where there was still a high proportion of unmatched surgeries, the process was started over, using a slightly different methodology. Rather than extracting OHIP billings using a defined list of feecodes, we extracted all OHIP billings for services other than office/emergency department or long-term care visits for the patient cohort within the defined time frame.

5. After going through the matching exercise outlined in #3 (above), the matched OHIP billings were examined to see what other feecodes might have been missed in the original list of probable billing codes.

6. After consultation with the clinician/authors, the original list of feecodes was amended, and the initial process was re-run, resulting in the final match.

For the definitive surgeries, match rates ranged from a low of 82.8 percent for vulvar cancer to a high of 96.0 percent for breast cancer. Below is a list of the OHIP feecodes used to identify surgery for different cancers.

Once the OHIP billings for the surgeries were identified, the specialty of the physician who submitted the billing was obtained from the ICES Physician Database. This data was then linked to the Canadian Medical Dictionary to check for any self-reported sub-specialties.

Type of Cancer	OHIP Feecodes Extracted
Breast	R105, R107, R108, R109, R111, R117, R913, R914, E505, E525, E546, Z139, Z141
Prostate	S645, S646, S647, S648, S649, S650, S651, S652, S653, S654, S655, Z712
Colon	S149, S154, S156, S157, S158, S160, S162, S164, S165, S166, S167, S168, S169, S170, S171, S172, S173, S176, S180, S185, S188, S213, S214, S215, S217, S312, Z750
Rectal	S149, S154, S156, S157, S158, S160, S162, S164, S165, S166, S167, S168, S169, S170, S171, S172, S173, S176, S180, S185, S188, S213, 214, S215, S217, S249, S312, Z750, Z754, Z784, Z785
Lung	M142, M143, M144, M145, M111, M135, M137, Z328, Z329, Z330, Z331, Z332, Z333, Z335, Z337, Z339, Z341, Z347, Z348, Z357
Gynecological cancers (uterine, ovarian, cervical, vulvar)	R912, R913, S213, S312, S704, S705, S710, S714, S738, S744, S745, S750, S754, S757, S758, S759, S762, S763, S764, S765, S766, S767, S776, S781, S782, S810, Z553, Z563, Z583, Z720, Z723, Z729, Z730, Z731, Z735, Z766, Z769 (Note: A combined extraction was done for the gynecological cancers because of overlap in procedures and billing)