



Hospital Cost Drivers Technical Report

What Factors Have Determined
Hospital Expenditure Trends in Canada?

Spending and Health Workforce



Canadian Institute
for Health Information

Institut canadien
d'information sur la santé

The page features decorative wavy lines in grey and teal that sweep across the background, framing the central content area.

Our Vision

Better data. Better decisions.
Healthier Canadians.

Our Mandate

To lead the development and maintenance of comprehensive and integrated health information that enables sound policy and effective health system management that improve health and health care.

Our Values

Respect, Integrity, Collaboration,
Excellence, Innovation

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Executive Summary

This report presents the results of an analysis done by the Canadian Institute for Health Information (CIHI) on hospital cost drivers, concentrating on the most recent 10 years for which comprehensive data was available (1998 to 2008). Total expenditure for hospital services was \$49.5 billion in 2008 and was expected to increase to \$58.4 billion in 2011. Hospital expenditure as a percentage of gross domestic product (GDP) has fluctuated within a fairly narrow range (2.8% to 3.8%) most years since the introduction of medicare in Canada and was expected to be 3.4% in 2011.

The analysis of cost drivers used an analytical framework consisting of

- Price effects;
- Population growth;
- Aging;
- Volume and mix of health care services; and
- Technology and innovation.

Summary of Cost Drivers

The organization of this report follows a presentation prepared by CIHI for consultation with key stakeholders. The first section provides an analysis of trends in hospital expenditure. It is followed by a summary of cost drivers during the 10 years from 1998 to 2008. The estimated average annual growth rates for hospitals in this decade are the following:

- Price effects: 2.8%
- Population growth: 1.0%
- Population aging: 1.0%
- Other effects: 1.7% to 1.9%ⁱ
- Total expenditure: 6.7%

Other effects include volume and mix of services and the effects of technology and innovation. These factors are difficult to estimate explicitly in the hospital sector since there have been myriad changes in models of care during the last decade. Some of these changes have tended to reduce costs (for example, the shift from inpatient to ambulatory care) while others have tended to increase costs (for example, higher average resource requirements for inpatient care).

Increases in hospital expenditure due to aging, at 1% per year, were higher in the hospital sector than in total health expenditure (0.8% of total growth). This is due to a steeper age gradient in hospital expenditure. Nonetheless, the analysis shows that average expenditure per capita did not increase more rapidly for the elderly than for the overall population.

i. Compounding the increases for each component leaves a residual of 1.7%. Adding the increases leaves a residual of 1.9%.

Growth in Hospital Compensation and Employment

An analysis of the effects of increases in hospital employees' compensation and growth in the number of hospital full-time equivalent (FTE) employees shows that hospital compensation rates grew more rapidly than industrial composite wage rates. Rates of growth in hospital FTEs were less than rates of growth in wage rates. Respective annual rates of growth were 3.3% for wage rates and 2.1% for the number of FTEs.ⁱⁱ

Technology

An analysis of the growth in the use of diagnostic imaging technology shows that the number of computerized tomography (CT) and magnetic resonance imaging (MRI) scanners has increased in Canadian hospitals. As well, the number of scans using these technologies has increased at higher rates than the number of scanners. An analysis of cost trends shows double-digit annual rates of growth for each of the two technologies. Interestingly, however, the overall rate of growth in hospital expenditure for all forms of diagnostic imaging has been only slightly higher than the rate of growth in total hospital expenditure. It appears that the high rates of growth in expenditure for CT and MRI scans represent a replacement effect within diagnostic imaging in hospitals.

Drugs represented a relatively modest share of hospital expenditures, at 4.1% in 2007. The share of drugs has been decreasing in recent years (it was 4.5% in 2004). Costs for outpatient drugs have surpassed those for inpatient drugs, increasing from 38% of drug expenditure in 1995 to 50% in 2007.

Utilization

Indicators of inpatient utilization show decreases in beds staffed and in operation, from 3.6 to 3.1 per 1,000 population between 1999 and 2008. Trends in inpatient separations were examined back to 1990 to show the large movement from inpatient to ambulatory settings during the last two decades. During that period, average separations decreased from 129 to 83 per 1,000 population. Average length of stay increased from 7.0 to 7.3 days between 2001 and 2008, presumably due to higher levels of acuity in admitted cases.

Over the last four years, day surgery cases have increased by more than 200,000, while inpatient surgery tended to remain constant, with minor fluctuations from year to year. Day surgery accounted for almost 79% of all surgical procedures in Canada in 2007–2008.

ii. Total growth rates from 1999 to 2008 were 33% for wage rates and 21% for FTEs.

Expenditure Trends by Type of Activity

Hospital expenditure per capita followed two distinct trends during the last two decades. Expenditure per capita decreased from the early 1990s to 1997. From 1999 to 2003, expenditure per capita grew at annual rates of 6.5% at current prices. Between 2003 and 2008, rates of growth moderated, with expenditure per capita increasing by 5.4% per year.

The share of inpatient services in hospital expenditure dropped by six percentage points between 1999–2000 and 2007–2008 (from 61.2% to 55.2% of hospital expenditure). Outpatient services (principally emergency and other ambulatory care) grew to 37.4% of hospital expenditure during that time. Other activities, which include research, education and ambulance services, also increased.

A review of ambulatory services and costs shows that average cost per service has been a more important factor in expenditure trends than have increases in the number of services. Emergency department visits per 1,000 population, for example, increased by only 0.1% annually on average during the last five years, while cost per visit increased by 8.1%. During the same period, other ambulatory care visits per 1,000 population increased by 1.8% annually on average, while average cost per service increased by 9%.

Among the functional centres used to report expenditures and services in CIHI's Canadian MIS Database, the share of nursing inpatient services and support services declined while the share for operating room expenses, emergency, other ambulatory care and systems support increased. The share for research expenses also increased. The picture from these evolving shares is one of a hospital sector that is concentrating more on ambulatory care, assuming a greater role in knowledge production and adapting to the greater role of technology in administrative systems.

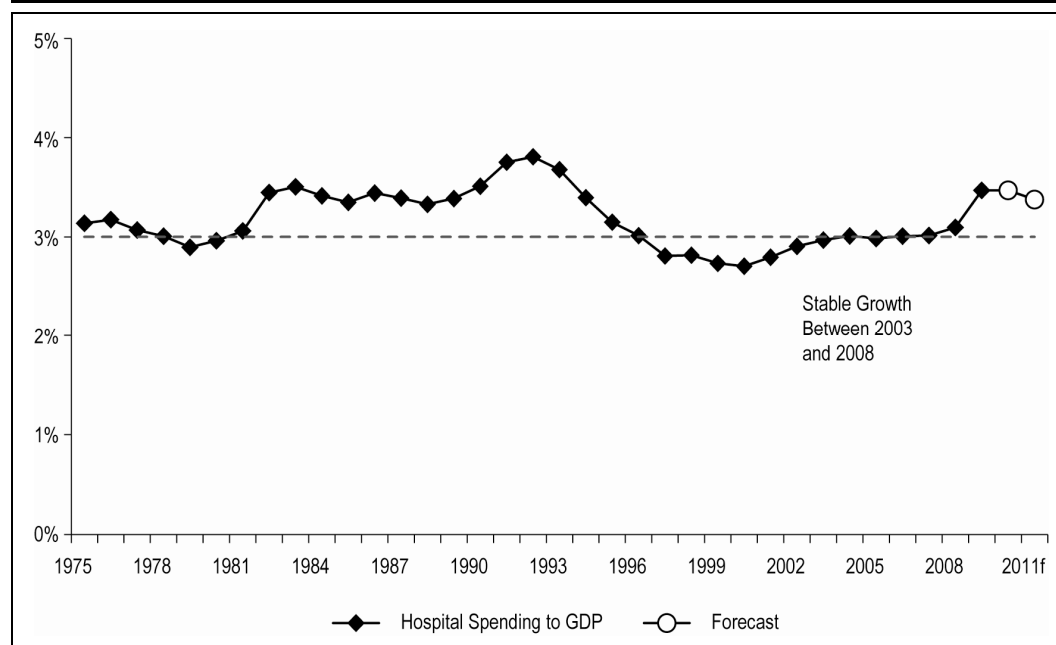
Hospital Expenditure Trends

Expenditure as a Percentage of GDP

Hospital expenditures in Canada increased moderately as a share of gross domestic product (GDP) from the mid-1970s to 1992, when they reached a peak of 3.8% of GDP (Figure 1). Between 1992 and 2000, hospital expenditures as a share of GDP decreased steadily, reaching a low of 2.7% in 2000. Since then, hospital expenditures have tended to grow more rapidly than GDP, peaking at a forecast value of 3.5% in 2009 and 2010.

The ratios of hospital expenditure and total health expenditure to GDP have been affected by economic cycles: they increased during recessions or slow GDP growth during the early years of the 1980s, 1990s and the most recent recession of 2008 and 2009. These departures from the trend are known as the denominator effect and are caused by the fact that health expenditure, in aggregate, is determined by long- or medium-term government funding commitments and multi-year wage or fee agreements in the public sector. In the private sector, health spending is relatively inelastic to short-term fluctuations in income.

Figure 1: Total Hospital Expenditure as a Percentage of GDP



Note

f: forecast.

Sources

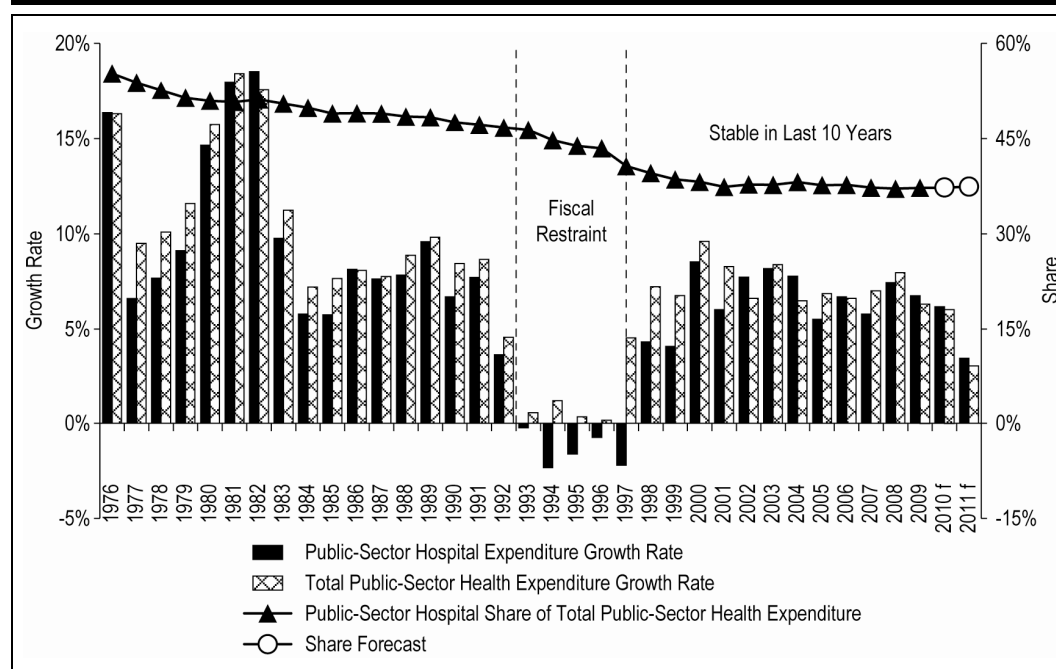
National Health Expenditure Database, Canadian Institute for Health Information; GDP Estimates, Statistics Canada.

Public-Sector Hospital Expenditure

The public sector accounts for 90% of total hospital expenditure. Public-sector hospital expenditure has grown at lower rates than total public-sector health expenditure, and its share of total health expenditure has declined (Figure 2). The trend lines for hospital expenditure and total health expenditure have a similar shape. There are two reasons for this correspondence: 1) hospital expenditure accounts for a large share of total health expenditure; and 2) similar forces have affected cyclical trends in both hospital and total health expenditure as a percentage of GDP.

From the mid-1970s to the early 1990s, the growth rate in public-sector hospital expenditure was slightly lower than that in public-sector health expenditure. In the mid-1990s, public-sector hospital expenditure decreased, while public-sector health expenditure continued to grow, albeit at a very diminished pace. Hospitals were particularly affected at that time by fiscal restraint measures as federal and provincial/territorial governments focused on reducing or eliminating budget deficits. This was a period of hospital consolidation, restructuring and bed closures. There was systematic shifting from inpatient to outpatient care, especially to day surgery procedures and ambulatory clinics in hospital settings. These measures resulted in a sharp fall in the hospital share of public-sector health expenditure. Over the last 10 years, the two growth rates have been similar and the hospital share of public-sector health expenditure has been relatively stable.

Figure 2: Hospital Share of Public-Sector Health Expenditure



Note

f: forecast.

Sources

National Health Expenditure Database, Canadian Institute for Health Information; Statistics Canada.

National Health Expenditure Database—Sources of Finance

CIHI's National Health Expenditure Database (NHEX) records macro-level health spending trends since 1975. Data is recorded by source of finance and type of expenditure. Sources of finance are the following:

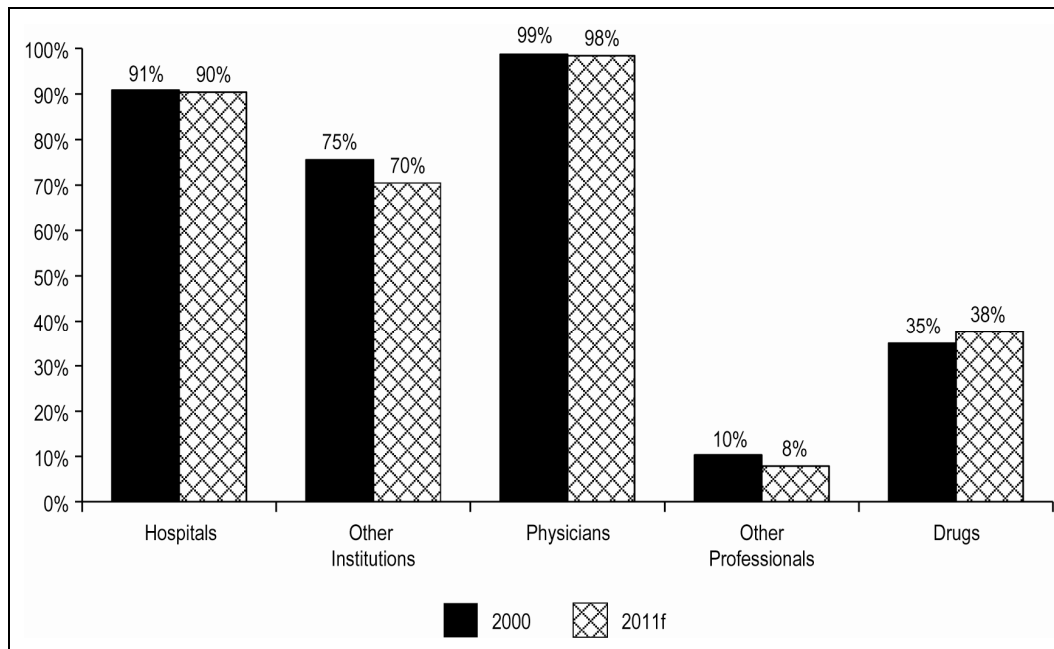
- **Public sector**—includes health care spending by governments and government agencies. The public sector is subdivided into the provincial government, federal direct, municipal and social security sectors.
- **Private sector**—includes out-of-pocket expenditure made by individuals; health insurance claims paid by commercial and not-for-profit insurance firms, as well as the cost of administering those claims; non-patient revenues received by health care institutions, such as donations and investment income; private spending on health-related capital construction and equipment; and health research funded by private sources.

Source

Canadian Institute for Health Information, *National Health Expenditure Trends, 1975 to 2010* (Ottawa, Ont.: CIHI, 2010): pp. 72–73.

The public sector is the main source of finance for hospitals. Physician expenditure is the only category of service in NHEX that has a higher share of public-sector expenditure (Figure 3).

Figure 3: Public-Sector Share of Total Health Expenditure by Use of Funds



Note

f: forecast.

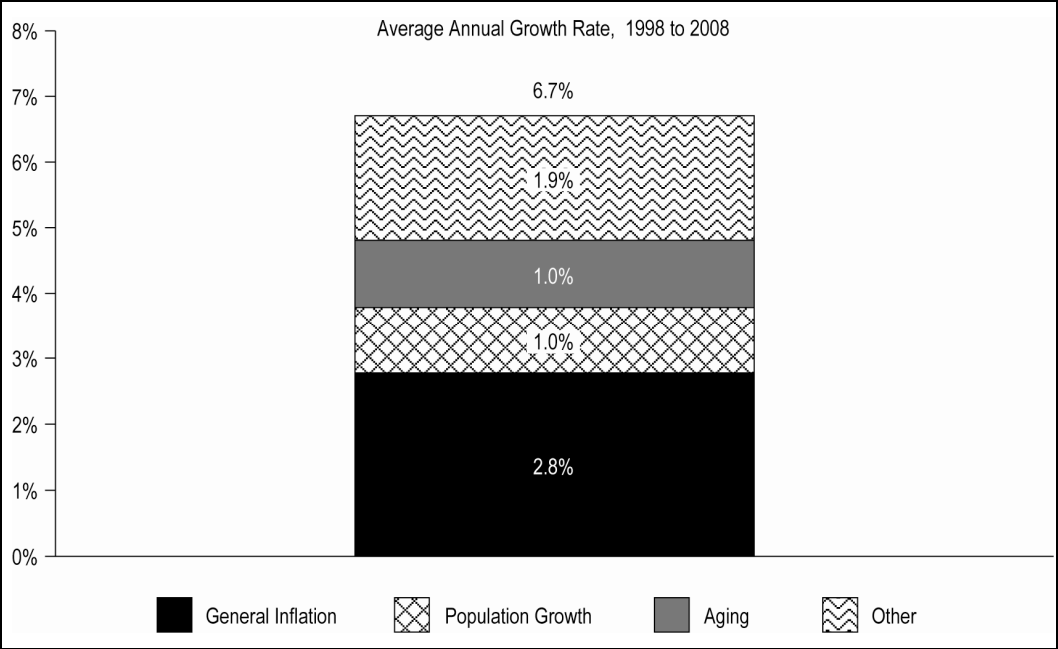
Source

National Health Expenditure Database, Canadian Institute for Health Information.

Cost Drivers Summary

The contributions to annual expenditure increases from population growth, aging, general inflation and other factors are summarized in Figure 4. The measure of overall inflation used in Figure 4 was Statistics Canada’s GDP deflator. Actual hospital inflation would be expected to be greater. Overall, hospital expenditures increased at an average annual rate of 6.7% per year. General inflation accounted for 2.8% annually. Population growth and aging were each responsible for 1% per year. Removing the effects of these three cost drivers leaves 1.9% per year in expenditure growth per capita.ⁱⁱⁱ Factors influencing this increase would be changes in utilization per capita, technological innovations and hospital-specific inflation in excess of general inflation. Subsequent sections of this report analyze trends in hospital expenditure and patient utilization of services with a view to clarifying the influences that have shaped hospital expenditures during the last decade.

Figure 4: Cost Driver Shares of Average Annual Growth Rate in Public-Sector Hospital Expenditure, 1998 to 2008



Source
 National Health Expenditure Database, Canadian Institute for Health Information.

iii. These calculations add the effects of inflation, population growth and aging as considered independently of each other and subtract the sum from the average annual increase in total hospital expenditure. This approach is a simplification; these effects would normally be compounded due to the interaction of the three cost drivers. When the individual percentage increases are compounded, they account for 4.9% and the unexplained residual is 1.7%.

Population Growth and Aging

The effects of population growth and aging on health expenditure are topical issues in view of the growth of the elderly population and the transition of the baby boom generation (persons age 44 to 62 in 2008¹) into the ranks of the elderly (age 65 and older). This section analyzes the effects of population growth and aging on hospital expenditure during the 10 years from 1998 to 2008. Projections are also provided for future years.

Methodology for Calculating the Effects of Population Growth and Aging

Population growth was calculated using the population data in Appendix C of the report *National Health Expenditure Trends, 1975 to 2010*, which was sourced from Statistics Canada. The population average annual growth rate for Canada from 1998 to 2008 was 1.01%.

Population aging was calculated as follows:

The population in 1998, broken down by province/territory, sex and five-year age groups, was multiplied by expenditure per capita in 2008 for each of the corresponding age–sex cells (population younger than age 5 was broken down further into younger than age 1 and age 1 to 4; population older than 90 was combined into one age category). The results of the multiplication were summed to obtain simulated expenditures in each jurisdiction in 2008, assuming population size and the age–sex structure had remained the same as in 1998. All expenditure and population data is from *National Health Expenditures Trends, 1975 to 2010*, Appendix C.

The simulated hospital expenditure by provincial/territorial governments at the 1998 population level was \$36.2 billion. This compares with an actual expenditure of \$44.3 billion in 2008. This represents an average annual rate of increase of 2.04%. Dividing 1.0204 (1 plus the average annual rate of increase in expenditure) by 1.0101 (1 plus the population average annual growth rate) yielded 1.0102. Therefore, the change in the distribution by age and sex accounted for an average annual increase in expenditure of 1.02%.

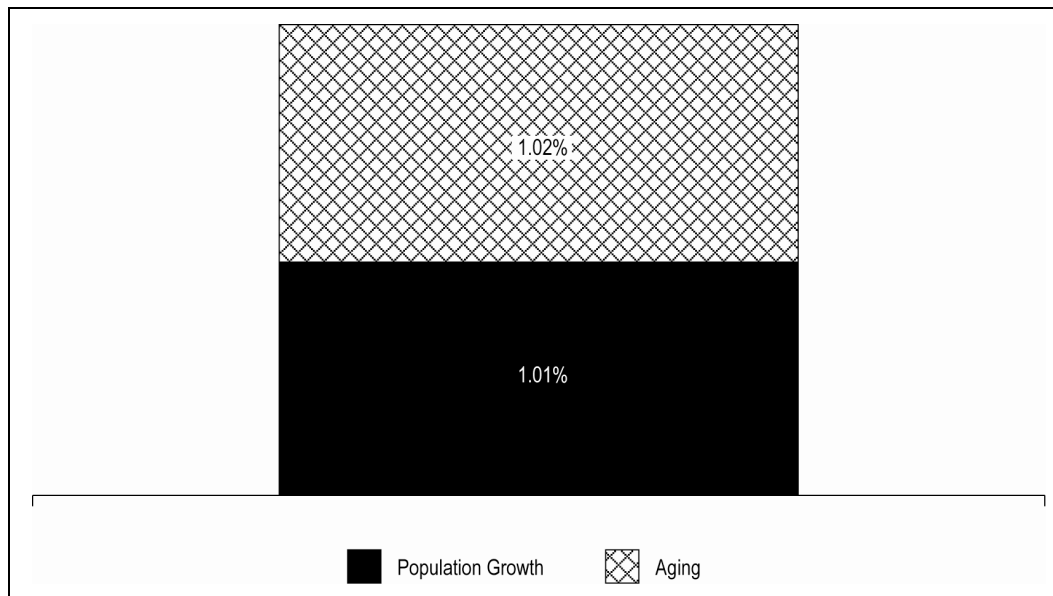
From 1998 to 2008, population growth accounted for an average annual increase in expenditure of 1.01%, and demographic change (population distribution by age and sex) accounted for an average annual increase of 1.02% for Canada (Figure 5). The aging effect in hospital expenditure was higher than that in physician services and total health expenditure due to a steeper age gradient in expenditure per capita for hospital care.

Estimated expenditure by provincial/territorial governments with the 1998 population and 2008 expenditure per capita would have been \$36.2 billion (Figure 6). Actual expenditure in 2008 was \$44.3 billion—an increase of 22.3%, equivalent to an average annual increase of 2.04%.

Provincial and territorial increases or decreases varied according to each jurisdiction's demographic profile and rate of population growth^{iv} (Figure 7):

- Newfoundland and Labrador experienced negative population growth and the highest rate of growth due to aging.
- Alberta had the highest rate of population growth (2.2%) and a relatively low rate of growth due to aging (0.8%). Alberta had the highest combined growth rate (3.0%).
- Manitoba and Saskatchewan had the lowest rates of growth from population aging (0.59% and 0.64%, respectively).

Figure 5: Average Annual Increase in Expenditure, Canada, 1998 to 2008

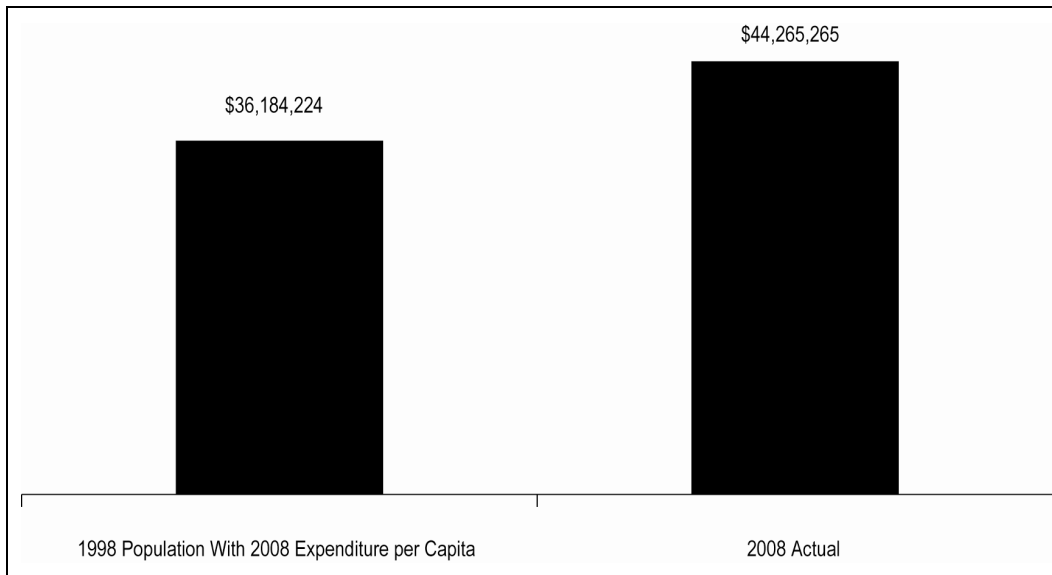


Sources

National Health Expenditure Database, Canadian Institute for Health Information; Population Estimates, Statistics Canada.

iv. The Northwest Territories and Nunavut were combined in the estimates, as they did not separate until the early 2000s.

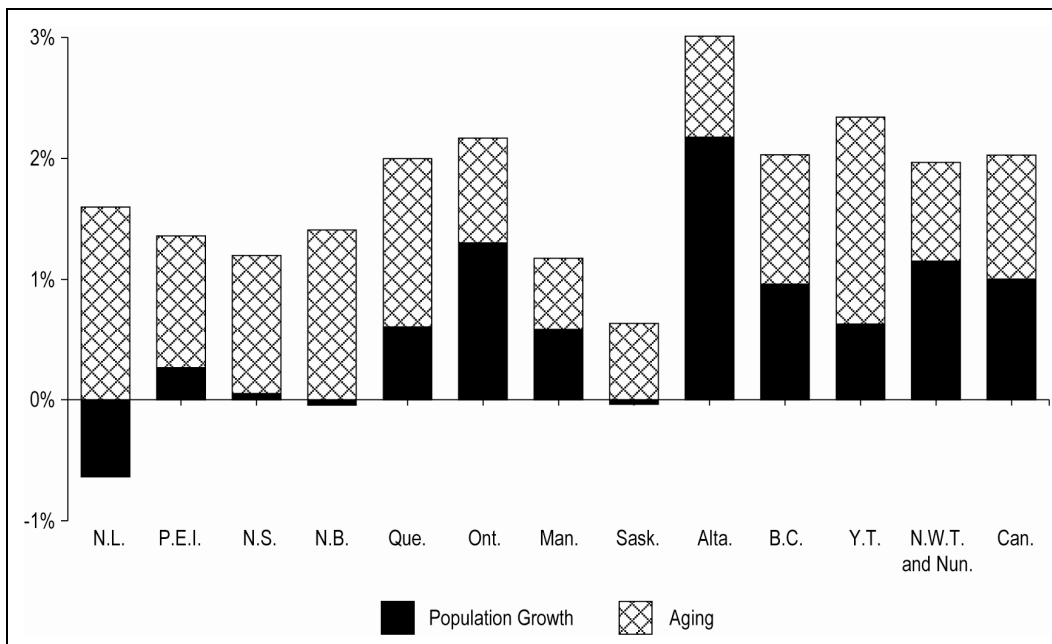
Figure 6: Simulated Hospital Expenditure—1998 Population With 2008 Expenditure per Capita Versus 2008 Actual Expenditure (\$000)



Sources

National Health Expenditure Database, Canadian Institute for Health Information; Population Estimates, Statistics Canada.

Figure 7: Average Annual Hospital Expenditure Increase From Demographic Factors, 1998 to 2008

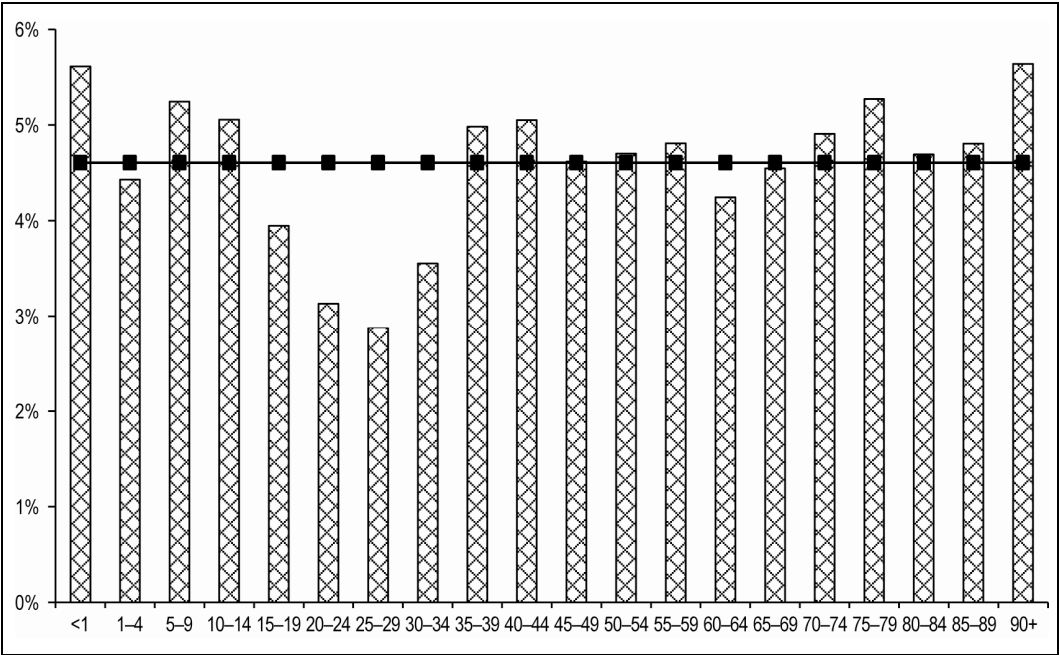


Sources

National Health Expenditure Database, Canadian Institute for Health Information; Population Estimates, Statistics Canada.

While changes in expenditure due to aging effects were shown to be modest, there is also a question of whether or not expenditure for the elderly is increasing more rapidly than that for other age groups due to increased demand for services or greater possibilities for treatment. Figure 8 shows rates of increase in expenditure per capita from 1998 to 2008. Increases in expenditure per capita for the elderly since 1998 have been similar to increases for the population age 35 to 64. The highest rates of expenditure increase have been for newborns and persons age 90 and older (5.6% for both).

Figure 8: Annual Growth in Hospital Expenditure per Capita, 1998 to 2008



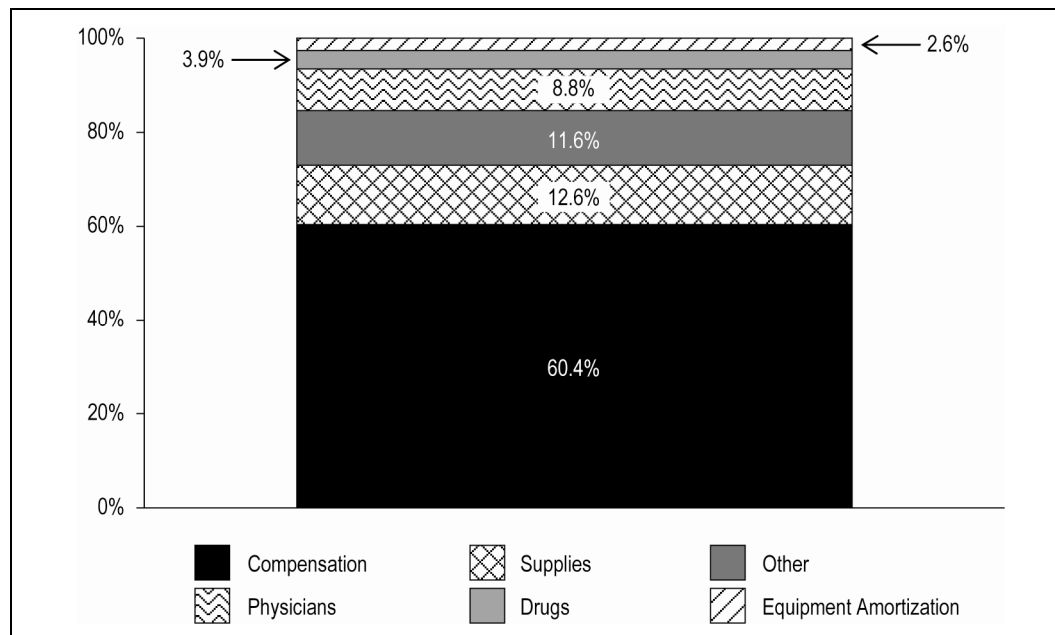
Source
 National Health Expenditure Database, Canadian Institute for Health Information.

Effects of Price Increases in the Hospital Sector

Hospital expenditures have grown at annual rates of between 4.0% and 8.4% since 1998. These expenditures have increased due to a combination of price increases and increases in real resources allocated to the hospital sector. Price increases in the hospital sector were estimated from the Implicit Price Index for the GDP. Hospital inflation can be expected to exceed general inflation in the economy due to the fact that compensation (salaries and benefits) comprise the largest component of hospital expenditure and that most hospital employees are health professionals. Increased investment in the hospital sector since 1998 has occurred within a general perception of shortages of nurses, physicians and other health professionals. These circumstances can be expected to have led to rates of increase in compensation of hospital employees that exceeded average rates of increase within the economy.

Employee compensation (excluding physicians) accounted for approximately 60% of total hospital expenditure (Figure 9). This share has decreased from 10 years ago, when it was approximately 64%. Due to its large share, compensation is a major driver of hospital expenditure. The next largest categories were supplies and other, which includes services that have been contracted out and expenditures not otherwise classified in Figure 9. Drugs accounted for a relatively small share of hospital expenditure.

Figure 9: Distribution of Hospital Expenditure by Type of Expense, 2008–2009



Note

Figure does not include Quebec data.

Source

Canadian MIS Database, Canadian Institute for Health Information.

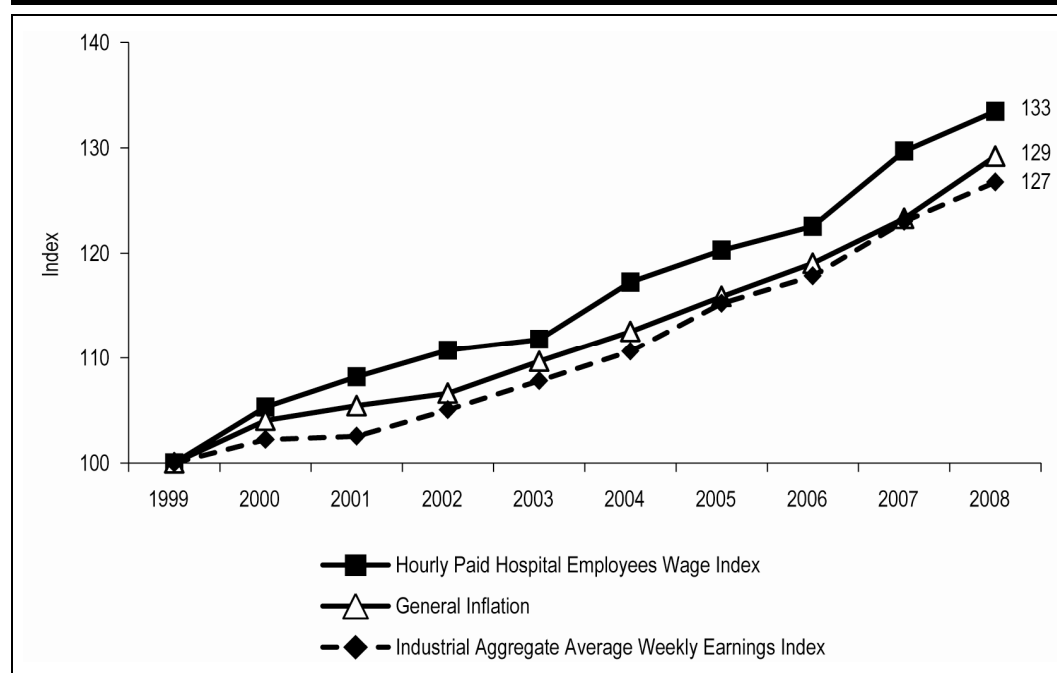
Wage Increases

Expenditure for compensation has grown considerably in absolute terms. An index of growth in hospital wages for hourly employees shows higher rates of growth than other indices of compensation and inflation since 1999 (Figure 10). Increases in hospital employees' wages have been greater than increases in the Industrial Aggregate wage rates reported in Statistics Canada's Survey of Employment, Payrolls and Hours.² The Hourly Paid Hospital Employees Wage Index increased by 33% between 1999 and 2008.

Factors that could have affected the higher rates of increase for hospital wages include the following:

- Increased reinvestment in hospital services during the early years of the decade would be expected to result in a higher demand for hospital staff.
- Recruitment of professionals in the diagnostic and therapeutic category (such as occupational therapists and laboratory technologists) would tend to increase average wages.
- Contracting out support services would be expected to lead to lower rates of growth in total compensation and an increase in average wages where jobs that were contracted out were relatively low in hospital salary ranges. For example, housekeeping, laundry and linen, and food services accounted for 71% of expenditure for contracted-out services in 2008–2009.

Figure 10: Indices of Growth



Note

1999 = 100.

Sources

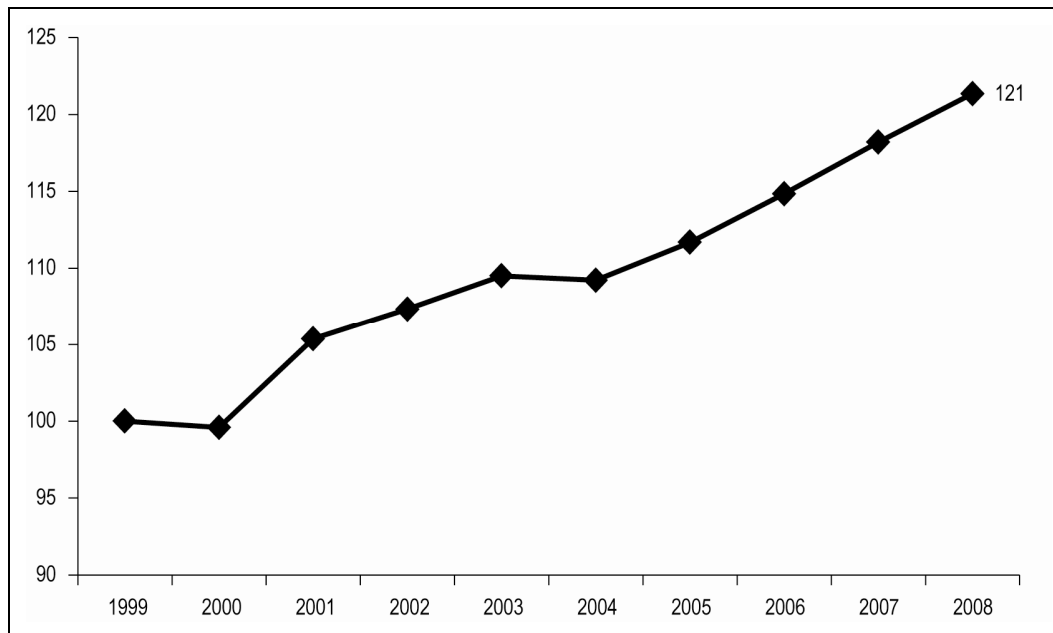
General inflation: GDP Implicit Price Index, Statistics Canada.

Hourly Paid Hospital Employee Wage Index and Industrial Aggregate Average Weekly Earnings Index: Survey of Employment, Payrolls and Hours, Statistics Canada.

Hospital Employment

The number of full-time equivalent employees calculated from earned hours in Canadian hospitals increased by 21% between 1999 and 2008 (Figure 11). Earned hours include worked hours, benefit hours and purchased hours. The data does not include Quebec.

Figure 11: Index of Growth in Hospital Full-Time Equivalent Employees



Notes

1999 = 100.

Figure does not include Quebec data.

Source

Canadian MIS Database, Canadian Institute for Health Information.

Technology and Innovation

Technology and innovation in hospital care include

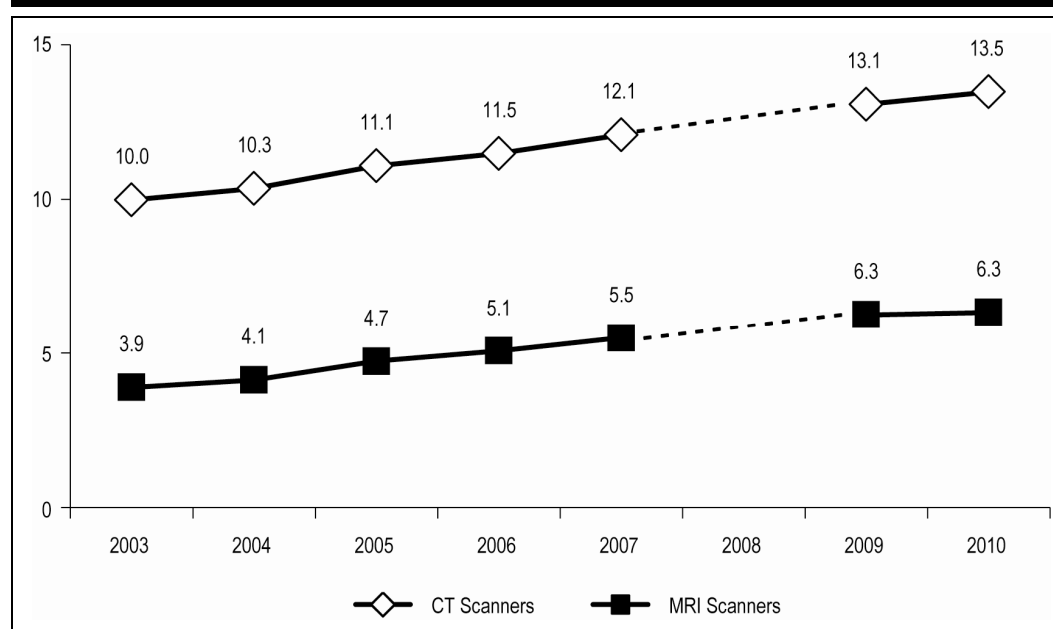
- Diagnostic imaging equipment and other medical devices, such as
 - Computed tomography (CT) and magnetic resonance imaging (MRI) scanners;
 - Robotic devices that facilitate delicate surgical procedures; and
 - Computers that help clinicians in decision-making;
- Electronic medical records;
- New pharmaceuticals; and
- Innovative procedures, applications and techniques, and changes in clinical practices.

It is difficult to ascribe specific expenditure weights to each of these components. Some technology may improve efficiency and reduce overall system costs. Electronic medical records (EMRs) are an example, although the extent to which potential savings are actually realized depends largely on the way in which EMRs are implemented and on how widespread their acceptance and use among medical clinics and professionals are. This section examines trends in the use of and expenditure for diagnostic imaging in hospitals.^v

In the last seven years, an increasing number of CT and MRI scanners was installed and in operation in Canadian hospitals (Figure 12). As part of the September 2000, February 2003 and September 2004 federal–provincial–territorial agreements on health care, the federal government provided a total of \$3 billion to provinces and territories over five years to support investments in diagnostic and medical equipment to improve access to publicly funded diagnostic services, including

- \$1 billion over two years (2000–2001 and 2001–2002) through the 2000 Medical Equipment Fund to help provinces and territories acquire medical diagnostic and treatment equipment (such as MRI machines, CT scanners and radiation therapy machines);
- \$1.5 billion over three years (2003–2004 to 2005–2006) through the 2003 Diagnostic and Medical Equipment Fund to support specialized staff training and acquisition of equipment; and
- An additional \$500 million for medical equipment in 2004–2005 through the 2004 agreement (10-Year Plan to Strengthen Health Care).

Figure 12: CT and MRI Scanners in Hospitals, per Million Population



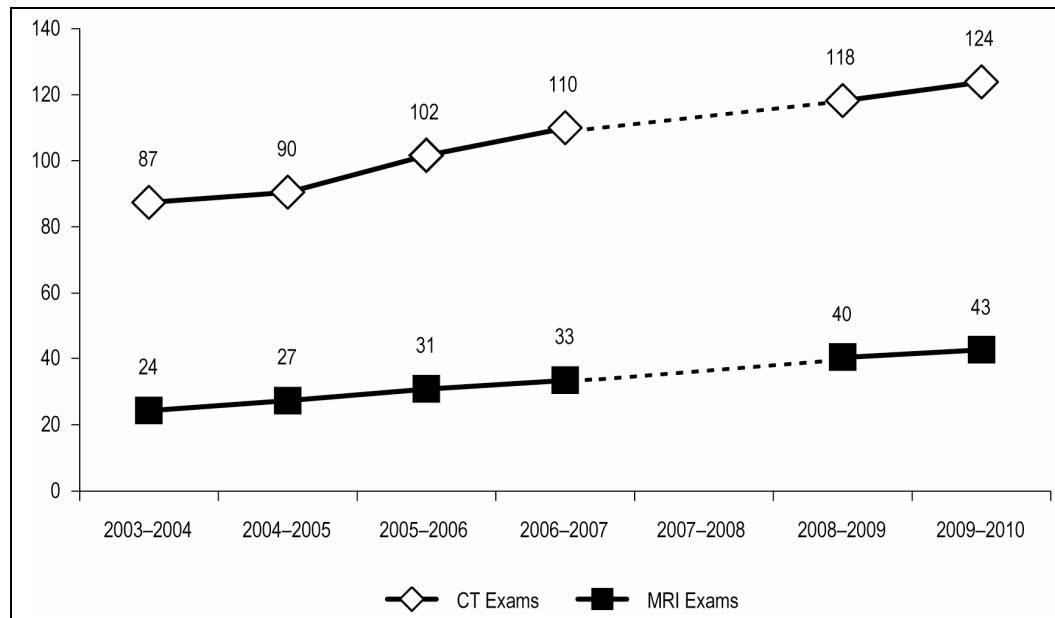
Source

Medical Imaging Technology Database, Canadian Institute for Health Information.

v. Data in this section comes from two CIHI sources. The number of imaging devices and exams is from CIHI's Medical Imaging Technology Database. Expenditure on diagnostic imaging is from the Canadian MIS Database; Quebec data is included in both series.

In the last six years, the number of CT and MRI exams has increased at a higher pace than the number of scanners, reflecting increased intensity of utilization (Figure 13).

Figure 13: CT and MRI Exams in Hospitals, per 1,000 Population



Source

Medical Imaging Technology Database, Canadian Institute for Health Information.

Hospital Expenditure for Diagnostic Imaging

Expenditure per capita for CT and MRI scans increased at annual average rates of 12% and 18%, respectively, between 2003 and 2008 (Table 1). The rapid expenditure growth for the two types of imaging, combined with below-average rates of growth for other imaging types, suggests that there might have been a replacement effect, with CT and MRI scans replacing other forms of diagnostic imaging. Expenditures for other diagnostic imaging increased during the five-year period, but their rate of increase was less than the overall rate of increase in hospital expenditure during that time. These facts suggest that the replacement effect would have been most evident in marginal rates of growth, with almost all of the increase in the volume of diagnostic imaging accounted for by CT, MRI and, to a lesser extent, nuclear medicine scans.

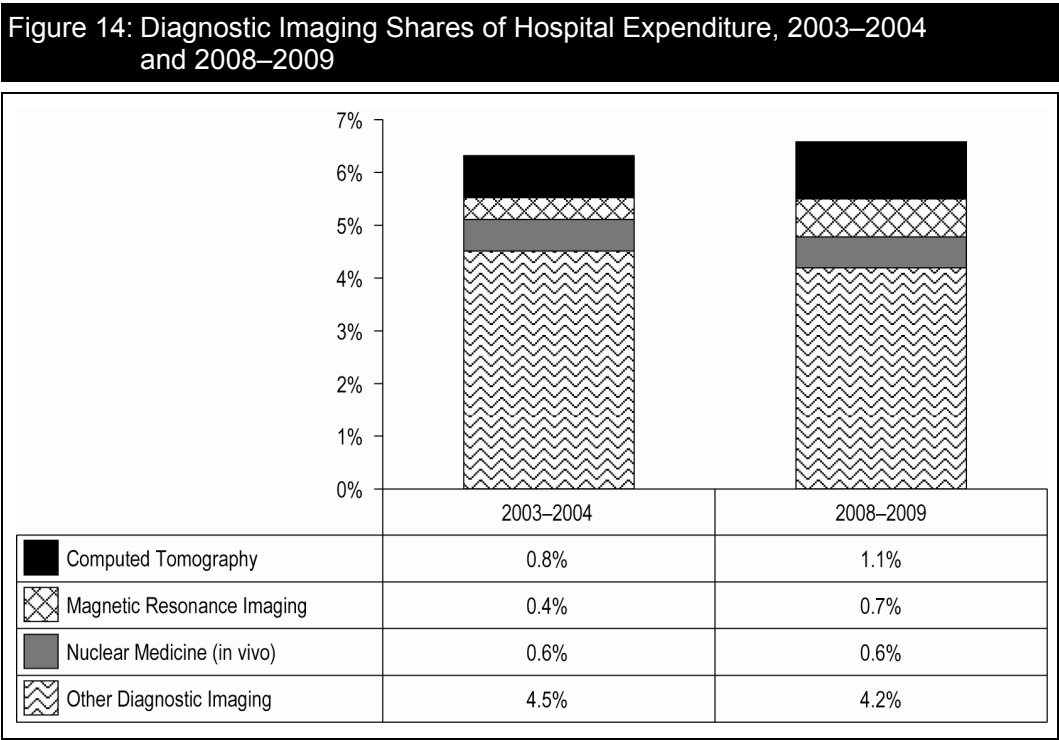
Table 1: Expenditure per Capita for Diagnostic Imaging in Hospitals

Type of Diagnostic Imaging Technology	2003	2008	Annual Rate of Increase
Computed Tomography	\$9.09	\$16.29	12.4%
Magnetic Resonance Imaging	\$4.70	\$10.84	18.2%
Nuclear Medicine (in Vivo)	\$6.71	\$8.77	5.5%
Other Diagnostic Imaging	\$51.48	\$63.16	4.2%
Total Diagnostic Imaging	\$71.98	\$99.06	6.6%

Source

Canadian MIS Database, Canadian Institute for Health Information.

The share of hospital expenditure for diagnostic imaging has increased by only 0.3 percentage points during the last five years, from 6.3% to 6.6%. Within the diagnostic imaging group of functional centres, however, there was a notable change in the relative importance of different types of imaging (Figure 14). The shares of both CT and MRI exams in hospital expenditure increased, while the share of the other diagnostic imaging category decreased.

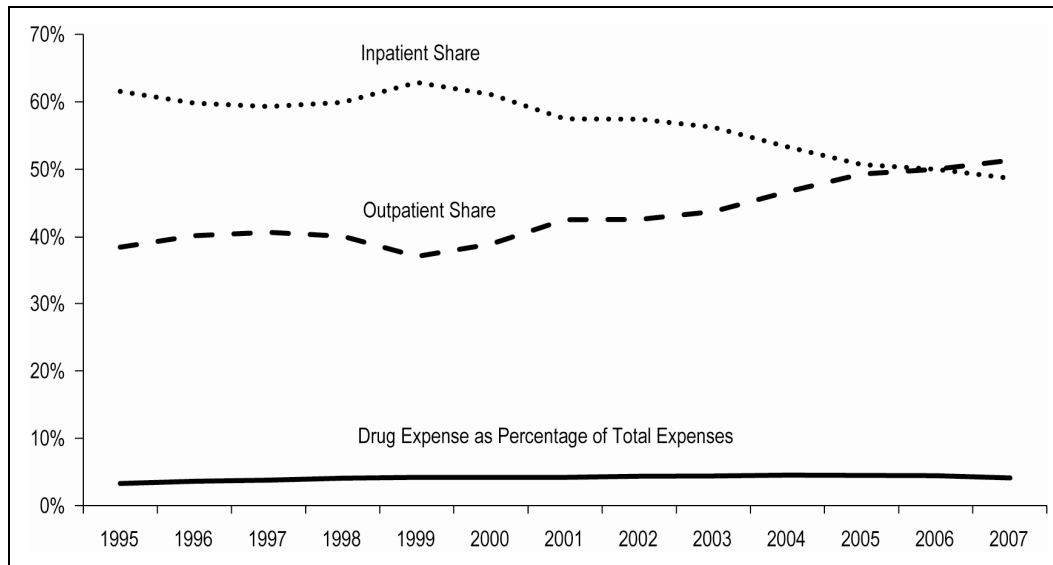


Source
 Canadian MIS Database, Canadian Institute for Health Information.

Expenditure on Drugs

The share of drugs in total hospital expenditure increased from 3.3% in 1995 to 4.5% in 2004 and then decreased to 4.1% in 2007 (Figure 15). About two-thirds of total drug expenditure can be broken down between inpatients and outpatients (the analysis could not determine the breakdown for the other third of drug expenditure). The relative expenses for inpatients and outpatients changed, however, with outpatients increasing from 38% of the drug expenditure (that could be broken down) in 1995 to 50% in 2007.

Figure 15: Hospital Expenditure on Drugs



Note

Figure does not include Quebec data.

Source

Canadian MIS Database, Canadian Institute for Health Information.

Hospital Utilization

The number of hospital beds per 1,000 population is the most frequent measure of the resources that are available for inpatient care. Beds in Canada have been measured by different variables over the last three decades. These measures included rated bed capacity, approved beds and beds staffed and in operation. The third definition is used in the Canadian MIS Database (CMDB) and is considered to be the best measure of beds actually available for inpatient care. Bed supply has decreased over the past two decades, as a substantial amount of hospital care has been transferred to ambulatory clinics. During the last 10 years, bed supply levelled off at approximately 3.1 to 3.2 beds per 1,000 population (Figure 16).

Adjustments to Reported Statistics on Beds Staffed and in Operation

Beds staffed and in operation (BSIO) are reported in the CMDB under the secondary statistical account 825 of the MIS national chart of accounts.

Adjustments to reported BSIO statistics were made to correct data quality issues, particularly in earlier years when the reported BSIO count in some provinces was unreasonably high. If the percentage difference between two years was greater than 25%, the BSIO of the nearest year that was deemed accurate was used instead. If the BSIO was missing, the rated bed capacity (RBC) multiplied (adjusted) by the provincial BSIO/RBC ratio of the nearest year that was deemed accurate was used.

Specific adjustments by province and year are as follows:

Newfoundland and Labrador: The 2003 BSIO count was used, at the hospital level, to correct the 1999 BSIO data. Where the BSIO was missing, the RBC multiplied by the provincial BSIO/RBC ratio of the nearest year that was deemed accurate was used.

Prince Edward Island: For all years, the BSIO was missing. The reported RBC was multiplied by the national BSIO/RBC ratio (for each year) to estimate the BSIO.

Nova Scotia: The 2006 BSIO was used to correct the 1999 and 2000 data, as it was the nearest year that was deemed accurate (the BSIO was not reported between 2001 and 2005). For 2001 to 2005, the reported RBC was multiplied by the provincial BSIO/RBC ratio of 2006 to estimate the BSIO.

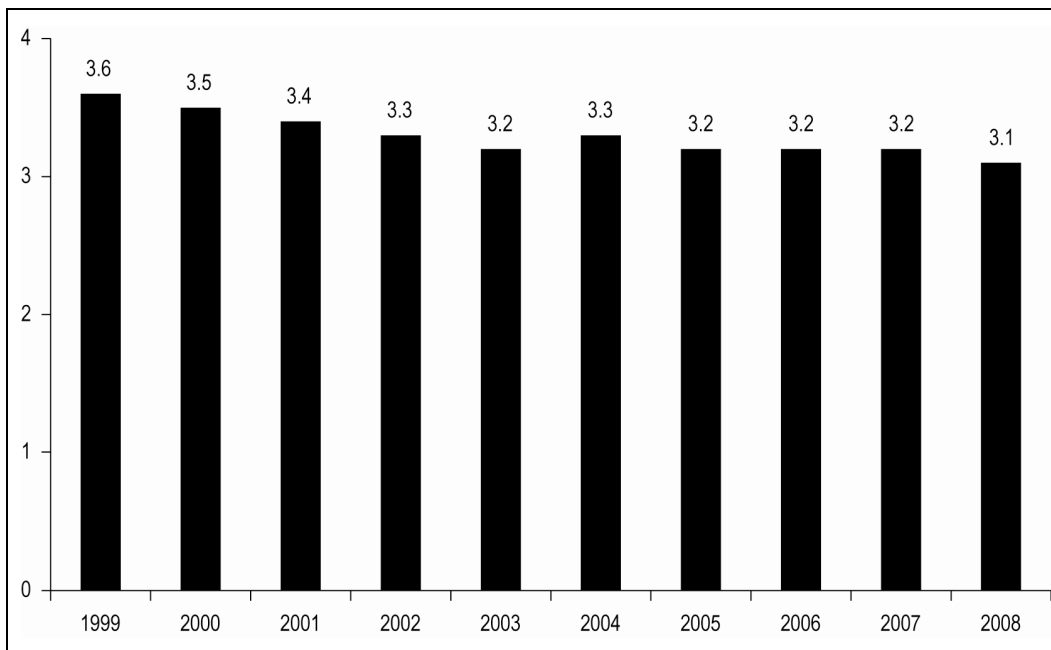
New Brunswick: Unreasonably high numbers for the BSIO were reported from 1999 to 2002; the 2003 BSIO data was used to correct these.

Ontario: The BSIO was not reported from 2001 to 2003; the reported RBC was multiplied by the provincial BSIO/RBC ratio of 2004 to estimate the BSIO.

Alberta: The 2000 BSIO was used for 1999; the 2003 BSIO was used for 2001 and 2002; the 2007 BSIO was used for 2005 and 2006. If the BSIO was missing, the RBC multiplied by the provincial BSIO/RBC ratio of the nearest year that was deemed accurate was used.

British Columbia: The 2001 BSIO was used for 2000. If the BSIO was missing, the RBC multiplied by the provincial BSIO/RBC ratio of the nearest year that was deemed accurate was used.

Figure 16: Hospital Beds Staffed and in Operation, per 1,000 population



Note

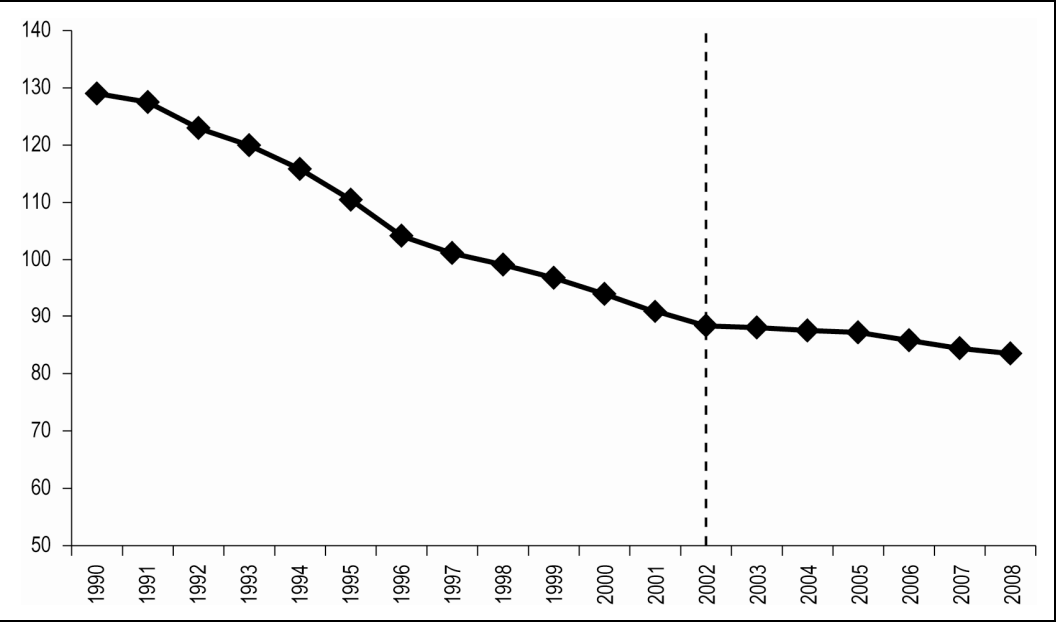
Figure does not include Quebec data.

Source

Canadian MIS Database, Canadian Institute for Health Information.

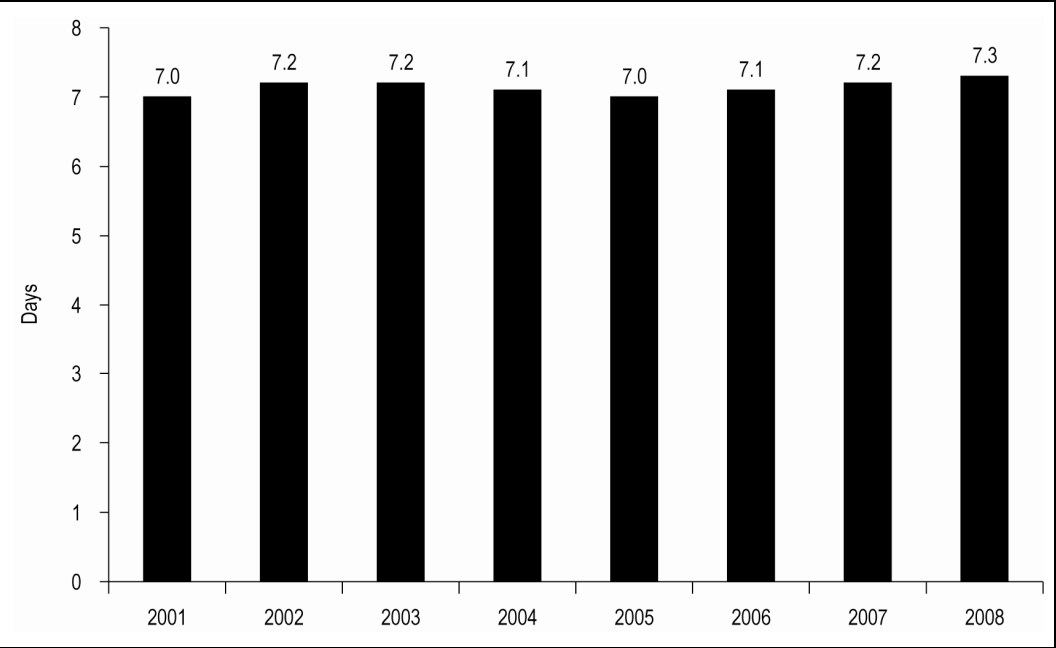
Hospital discharges per 1,000 population and average length of stay are two commonly used measures of hospital utilization. Discharges declined dramatically, from 129 per 1,000 in 1990 to 88 per 1,000 in 2002, about 3% annually. During the next six years, discharges diminished at a much slower pace, about 1% annually; the rate was 83 per 1,000 in 2008 (Figure 17). Average length of stay has been relatively stable at 7.0 to 7.3 days during the last eight years (Figure 18).

Figure 17: Total Discharges per Thousand Population—Acute Care Hospitals



Sources
 Discharge Abstract Database, Hospital Morbidity Database and Ontario Mental Health Reporting System, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec.

Figure 18: Average Length of Stay—Acute Care Hospitals



Note
 Figure does not include Quebec data.

Source
 Discharge Abstract Database, Canadian Institute for Health Information.

Length of Stay for Leading Case Mix Groups

Length of stay varies by type of hospitalization. Average length of stay for the five leading Case Mix Groups (CMGs) in terms of hospital costs are illustrated in Figure 19. CMG 545 (Vaginal Delivery, No Other Intervention) accounted for 143,000 separations and an estimated hospital expenditure of \$433 million in 2008. Average length of stay was two days. Palliative care accounted for the longest length of stay, at 13.5 days; this was a decrease from 14.3 days in 2005.

The five leading CMGs indicate that trends in the nature of basic medical care have often been more important factors in hospital expenditure and in expenditure increases than the use of relatively new technologies. For example, both vaginal delivery and chronic obstructive pulmonary diseases accounted for higher costs in 2008 than unilateral knee replacement or cardiac valve replacement. The five CMGs combined accounted for \$1.669 billion of hospital expenditure in 2008, a 24.4% increase over expenditure in 2006 (\$1.343 billion).

The average Resource Intensity Weights (RIWs) of the five leading CMGs tended to decrease over time (Figure 20), although the decreases were relatively minor (for example, 1.71 to 1.68 in the case of unilateral knee replacement). RIWs in Figure 20 were measured using the CMG+ 2010 methodology, which provides a common metric for measuring average resource costs each year (normally, the RIW for a typical case is reset to a value of one each year).

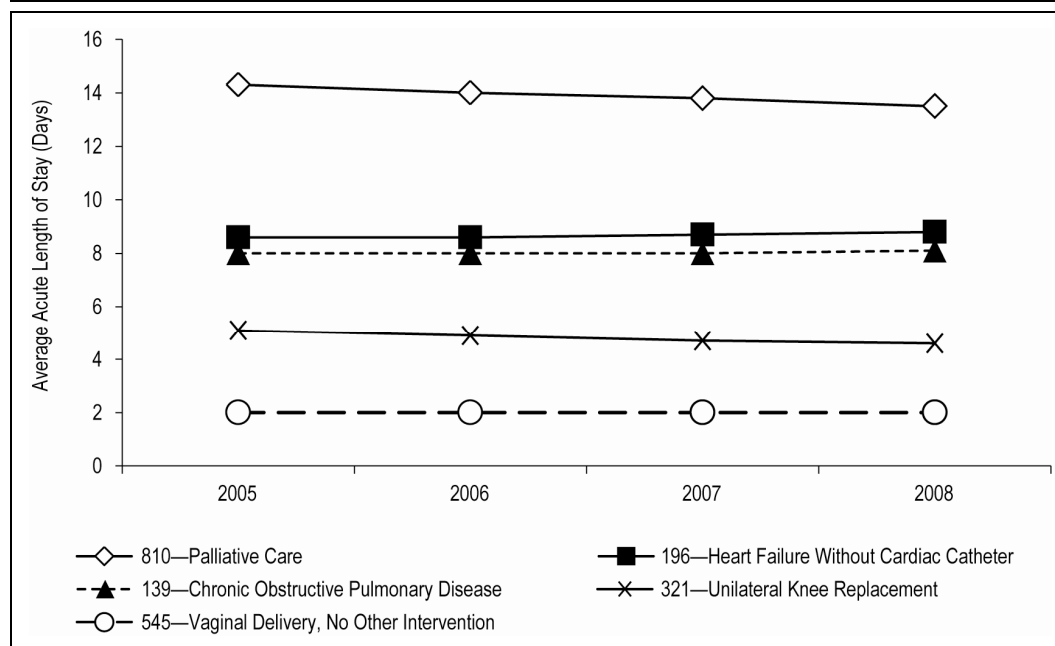
The average RIW for all cases has increased during the last five years (Figure 21). This could be due to a changing mixture of inpatient cases, with the number of more complex cases increasing more rapidly than that of less complex cases. The trend for cases to be treated on an ambulatory basis could also affect trends in the average RIW over time.

Case Mix Groups and Resource Intensity Weights^{3, 4}

Case-mix methodologies categorize patients into statistically and clinically homogeneous groups based on the collection of clinical and administrative data. Case Mix Group+ (CMG+), Day Procedure Groups (DPGs) and the Comprehensive Ambulatory Classification System (CACS) are de facto standards for grouping acute care episodes captured in CIHI's databases.

Resource Intensity Weight (RIW) is a relative value that describes the expected resource use for any specific case as compared to the average typical non-factor inpatient case in CIHI's Discharge Abstract Database. The typical average non-factor case is attributed a value of 1.0000. A case with an RIW of 1.5000, for example, would therefore require 50% more resources than the average typical non-factor case. The calculation of the RIW for any specific case takes into account its CMG and also the full effects of such factors as age, comorbidity level and selected flagged interventions, while the effects of these factors are down-weighted in the calculation of the average typical non-factor case with a value of 1.0000.

Figure 19: Acute Length of Stay Trend (2005 to 2008) of the Five CMGs With the Largest Expenditure in 2008



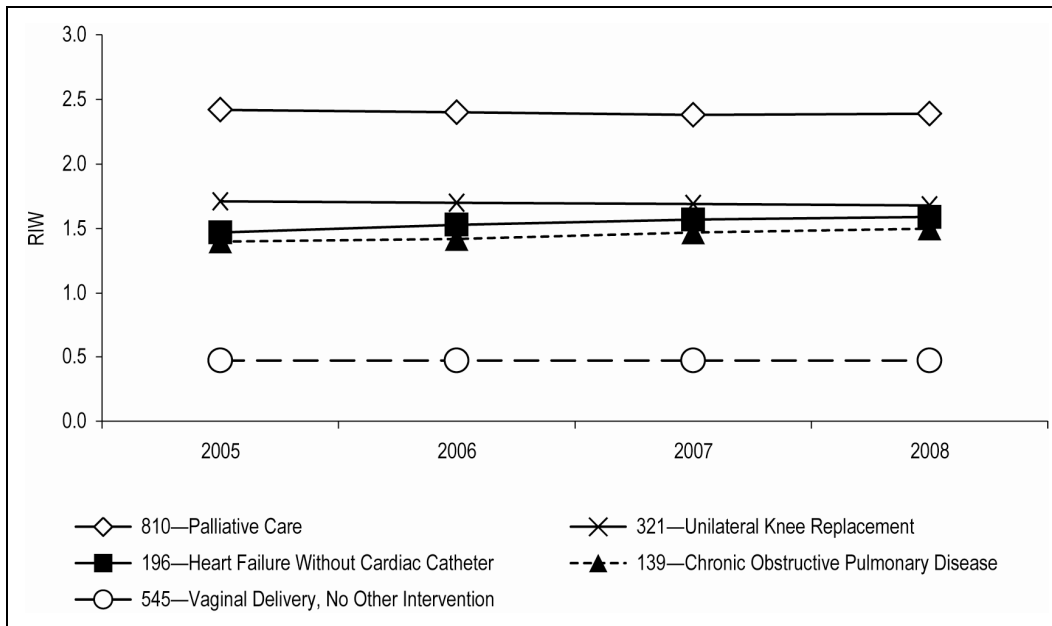
Note

Figure does not include Quebec data.

Sources

Discharge Abstract Database and Canadian MIS Database, Canadian Institute for Health Information.

Figure 20: RIW Trend (2005 to 2008) of the Five CMGs With the Largest Expenditure in 2008



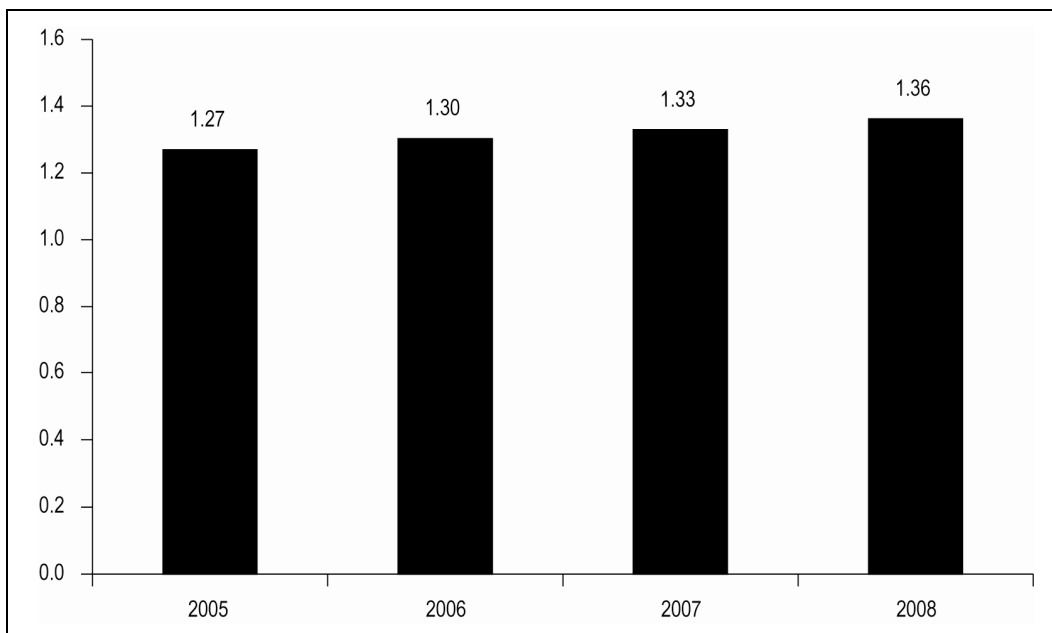
Note

Figure does not include Quebec data.

Sources

Discharge Abstract Database and Canadian MIS Database, Canadian Institute for Health Information.

Figure 21: CMG+ 2010 Average RIW—All Discharges



Note

Figure does not include Quebec data.

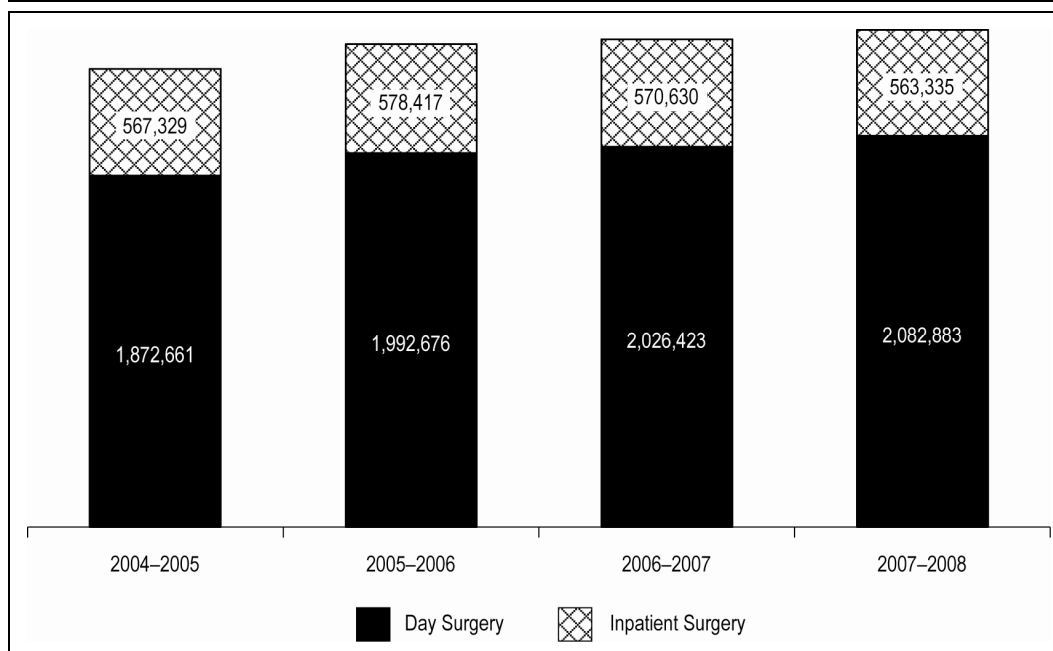
Source

Discharge Abstract Database, Canadian Institute for Health Information.

Inpatient and Day Surgery

There has been a trend to a greater share of day surgery cases since the early 1990s. Over the last four years, day surgery cases have increased by more than 200,000, while inpatient surgery tended to remain constant, with minor fluctuations from year to year (Figure 22). Day surgery accounted for almost 79% of all surgical procedures in Canada in 2007–2008.

Figure 22: Inpatient and Day Surgery Trends



Note

Figure does not include Quebec data.

Sources

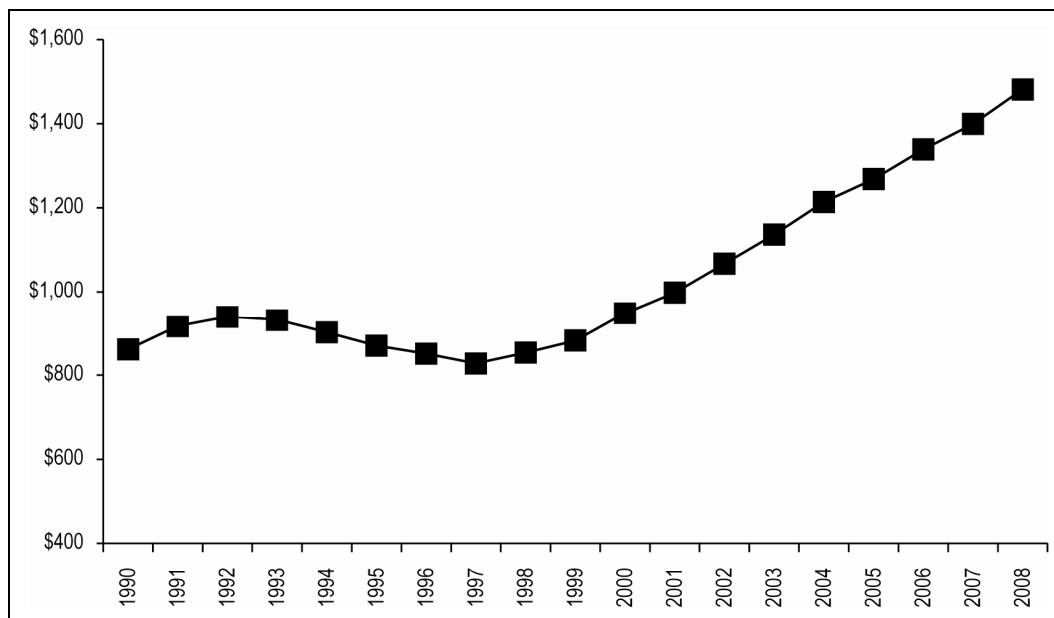
Discharge Abstract Database and National Ambulatory Care Reporting System, Canadian Institute for Health Information; special tabulation from the Alberta Ambulatory Care Data Set, Alberta Health and Wellness.

Trends in Expenditure per Capita

Hospital expenditure per capita has followed two distinct trends during the last two decades (Figure 23). Expenditure per capita increased at the beginning of the 1990s; however, it began to decrease after 1992. This was the first period of decreasing hospital expenditure per capita during the period for which national health expenditures are reported (since 1975). Expenditure per capita continued to decline until 1997, and then it began to increase. The years from 1993 to 1997 were a period of fiscal restraint in Canada characterized by a reduction of federal transfers to provinces and a retrenchment in provincial/territorial expenditure. Public-sector expenditure decreased in real terms during four consecutive years, during which the ratio of public-sector health spending to GDP dropped from 7.4% to 6.4%.⁵ Analysts have observed that the rapid pace of reforms during that period had a destabilizing effect on the Canadian health system.⁶ A backlash against cost restraint was led by physicians, who raised concerns that the public system was underfunded and that there was an emerging crisis in the supply of hospital beds, professionals and technology.

Hospital expenditures per capita began increasing in 1998, and the following few years were a period of reinvestment in health care resources in Canada. From 1999 to 2003, expenditure per capita grew at annual rates of 6.5%. Since 2003, rates of growth have moderated, with expenditure per capita increasing by 5.4% per year (Figure 24).

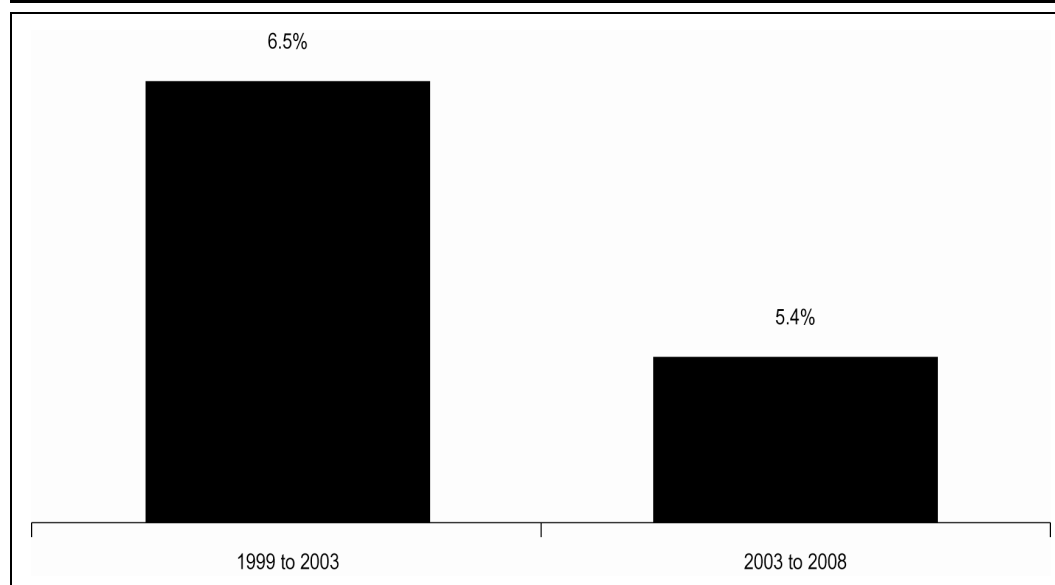
Figure 23: Hospital Expenditure per Capita, 1990 to 2008 (Current Dollars)



Source

National Health Expenditure Database, Canadian Institute for Health Information.

Figure 24: Annual Rates of Growth in Hospital Expenditure (Current Dollars)



Source

National Health Expenditure Database, Canadian Institute for Health Information.

Hospital Expenditure by Type of Care

Hospital expenditure in NHEX is compiled from a number of sources that report aggregate expenditures. Provincial public accounts, which are the source of provincial expenditure estimates, normally report at highly aggregate levels. This is also true of estimates in the other public sectors (federal, municipal and social security). Private expenditures are obtained from the insurance sector, Statistics Canada's household expenditure surveys⁷ and the CMDB.

The CMDB contains data on hospital expenditures reported by health regions and individual hospitals. The CMDB data is highly detailed and reported in formats defined in CIHI's *Standards for Management Information Systems in Canadian Health Service Organizations* (MIS Standards).⁸ The financial data recorded in the CMDB is reported by hospital functional centres and by type of expense.

The CMDB and the MIS Standards

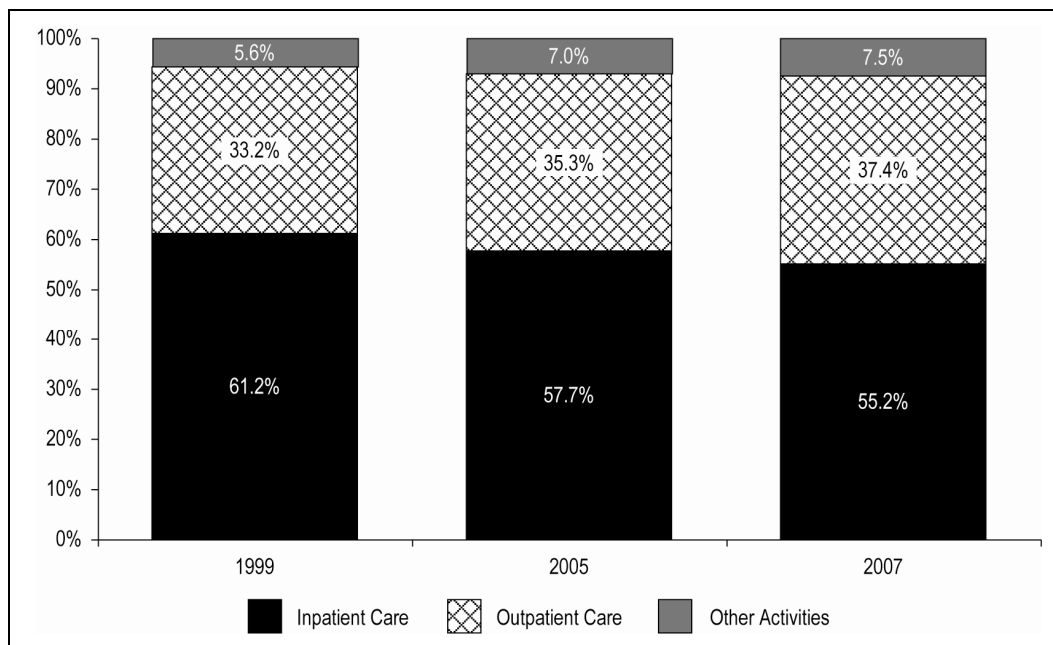
The CMDB is the national data source for financial and statistical information about hospitals and health regions. The data is collected according to the MIS Standards, a standardized framework for collecting and reporting financial and statistical data on the day-to-day operations of health service organizations.

Data collected within the MIS Standards framework of definitions includes data by

- Functional centres (a type of primary account) or service centres of health care organizations;
- Expense categories (secondary financial accounts); and
- Statistical categories (secondary statistical accounts), such as earned hours, and service activity statistics, such as visits, attendance days, exams and procedures.

Trends in hospital expenditure show a decreasing share for inpatient services and an increasing share for outpatient services during the last decade (Figure 25). The share of hospital expenditures for inpatient services dropped by approximately six percentage points, while that for outpatient services (principally emergency and other ambulatory care) grew. Other activities, which include research, education, and ambulance and social services, also increased. The broad categories in Figure 25 include administrative and support services, systems support services, laboratory, diagnostic imaging, and other diagnostic and therapeutic services, which were allocated between inpatient and outpatient care. In subsequent analyses, hospital expenditures are shown in greater detail, using the functional centres defined in the MIS Standards.

Figure 25: Hospital Expenditure by Broad Functional Categories



Source

CIHI data submission to the Organisation for Economic Co-operation and Development.

Expenditure by MIS Functional Centre

The CMDB data used in this report was summarized in the 30 major functional centre groupings defined within the MIS Standards primary accounts. These 30 groupings were further combined into 10 categories. The mapping of major functional centre groupings to the aggregate categories is shown in the appendix.

Expenditure trends within functional centre groups are illustrated in figures 26 and 27, which compare the percentage of hospital expenditure for each category in 1999–2000 with that in 2008–2009. Figure 26 summarizes functional categories that provide direct patient care. Figure 27 summarizes other categories, which provide essential services required by hospitals. Highlights of the comparisons follow.

The share of nursing inpatient services declined by 3.3 percentage points—the largest decline in share of any of the 10 major expenditure categories.

Operating room (OR) expenditures increased. OR expenditures include recovery room expenses and both inpatient and day surgery.

Emergency department (ED) and other ambulatory care expenditures both increased. Between 1999–2000 and 2008–2009, their combined share of hospital expenditure increased from 10.8% to 13.6% of total expenditures. The increase in these categories, together with the decrease in nursing inpatient services, indicates a trend in shifting the location of care from inpatient to ambulatory settings. Higher rates of expenditure increase for emergency care may also reflect issues with access to care or medical practice conditions in the communities where hospitals are located.^{vi} For example, a recent Commonwealth Fund survey found that 47% of persons who visited an ED and who have a regular doctor said that they could have been treated by their regular care provider had he or she been available.⁹ A recent report on emergency care usage in Nova Scotia noted that many visits to EDs, especially in smaller communities, occurred because patients could not see their physicians in a timely manner. The report recommended providing better access to primary care in communities with small hospitals.¹⁰

Diagnostic and therapeutic services maintained approximately the same share of expenditures during the nine-year period.

Community and social services declined as a share of total hospital expenditures. Health regions have transferred responsibilities for community and social services from hospitals to other regional organizational entities.

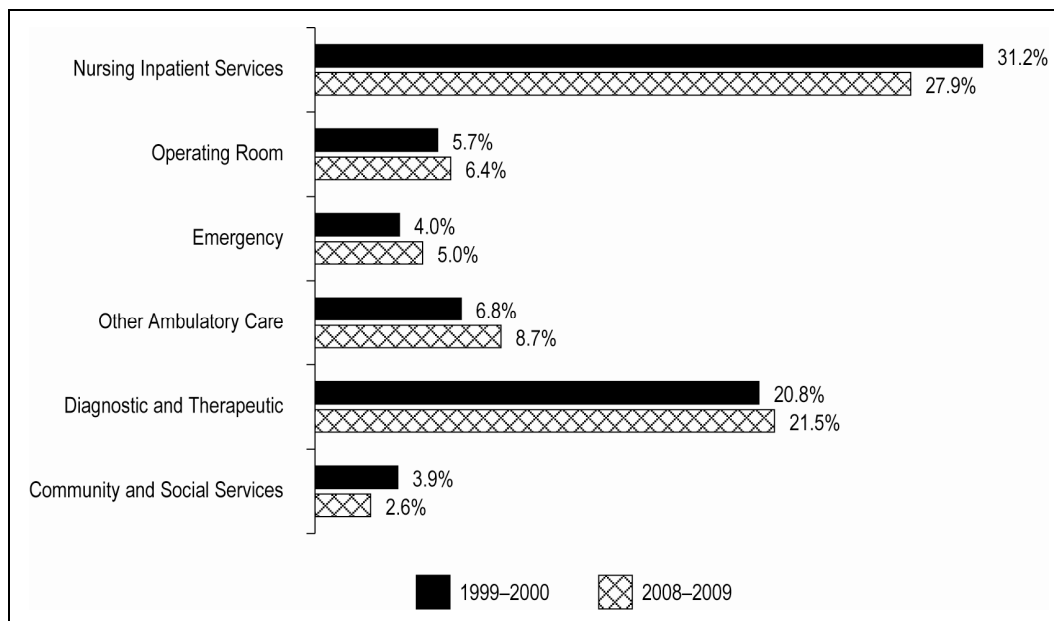
The share of expenditure for administration was stable at 5.5% of expenditure during the nine-year period. The information systems support category increased from 1.8% to 2.4% of hospital expenditures. A higher share for systems support may reflect the increasing complexity and widespread adoption of electronic systems for clinical records, monitoring and management of hospital functions.

vi. The physician cost drivers report contains a section on access to physician care, including results from the National Physician Survey on time to access urgent care in community-based practices and the prevalence of closed practices, which do not accept or limit acceptance of new patients.

The share of expenditure for support services decreased by 1.4 percentage points. Support services in this analysis include materials management, plant operation, security, housekeeping and other services required to operate health care institutions. Rates of change in support services expenditure would have been affected by efficiencies, such as centralized purchasing or sharing resources within regional health authorities or hospitals located in the same geographical area. Contracting out services could also reduce costs through competitive bidding.

The share of research and education increased. Most of this increase was in the research component, which increased from 0.9% to 2.4% of hospital expenditures. This increase in research probably reflects the increasing involvement in research of hospitals that are part of academic health sciences centres (AHSCs). Research costs recorded in the CMDB do not capture the full financial impact of research activities in AHSC hospitals. A considerable amount of expenditure for research in these hospitals would flow through the financial accounts of their associated universities.

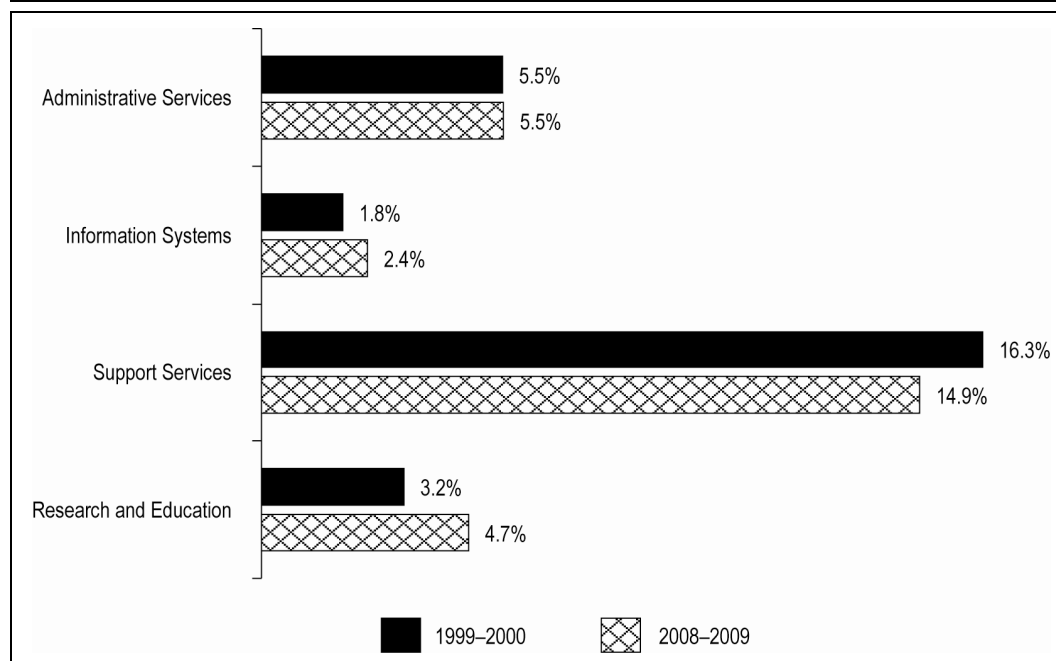
Figure 26: Expenditures by Patient Care Functional Categories, 1999–2000 and 2008–2009



Source

Canadian MIS Database, Canadian Institute for Health Information.

Figure 27: Expenditures by Other Functional Categories, 1999–2000
and 2008–2009



Source

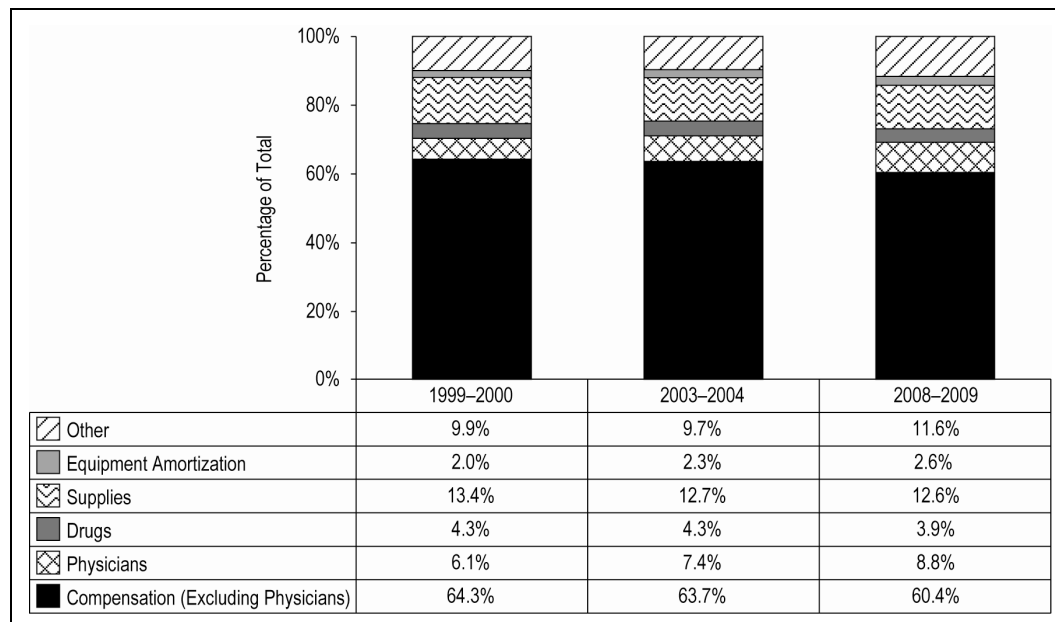
Canadian MIS Database, Canadian Institute for Health Information.

Expenditure by Type of Expense

The functional centres used in this hospital expenditure analysis are part of the primary account structure found in the MIS Standards. Major expense categories discussed here are shown in Figure 28.

- Employee compensation is the largest category of hospital expense, but its share of expenditure declined by four percentage points between 1999–2000 and 2008–2009.
- Physician compensation increased its share. Physician compensation is recorded in patient care functional centres, although the majority is in the diagnostic and therapeutic category, where there are extensive requirements for physicians in radiology and laboratory medicine specialties. Additional analysis of physician expenditures is necessary to determine if reported expenditures include some alternative payment plans funded through provincial physician services budgets.
- Drugs have been decreasing as a percentage of expenditure since 2003–2004, and supplies have been decreasing since 1999–2000.
- An increasing share for equipment amortization suggests that hospitals have been increasing capital expenditures for equipment.
- The “other” category includes services that were contracted out. Contracted-out services have increased in support services functional centres, from 2.2% of expenditure in 1999–2000 to 9.0% in 2008–2009. If the contracted-out expenditure in support services were subtracted from the other category of expense in Figure 28, the other category’s share in 2008–2009 would be reduced to 10.6%.

Figure 28: Distribution of Hospital Expenditure by Type of Expense



Note

Figure does not include Quebec data.

Source

Canadian MIS Database, Canadian Institute for Health Information.

Emergency Department Visits

There were approximately 12.5 million ED visits in 2008–2009, not including visits in Quebec hospitals. Visits per capita have been relatively stable during the last five years (Table 2). Cost per visit has increased notably, however, and has been the main factor in the increasing share of hospital expenditure for ED visits.

Table 2: Utilization and Expenditures for Emergency Department Visits, 2003–2004 and 2008–2009

	2003–2004	2008–2009
ED Visits per 1,000 Population*	486.0	489.6
Cost per Visit*	\$113	\$166
Share of Hospital Expenditure†	4.5%	5.0%

Notes

* Does not include Quebec.

† Includes Quebec.

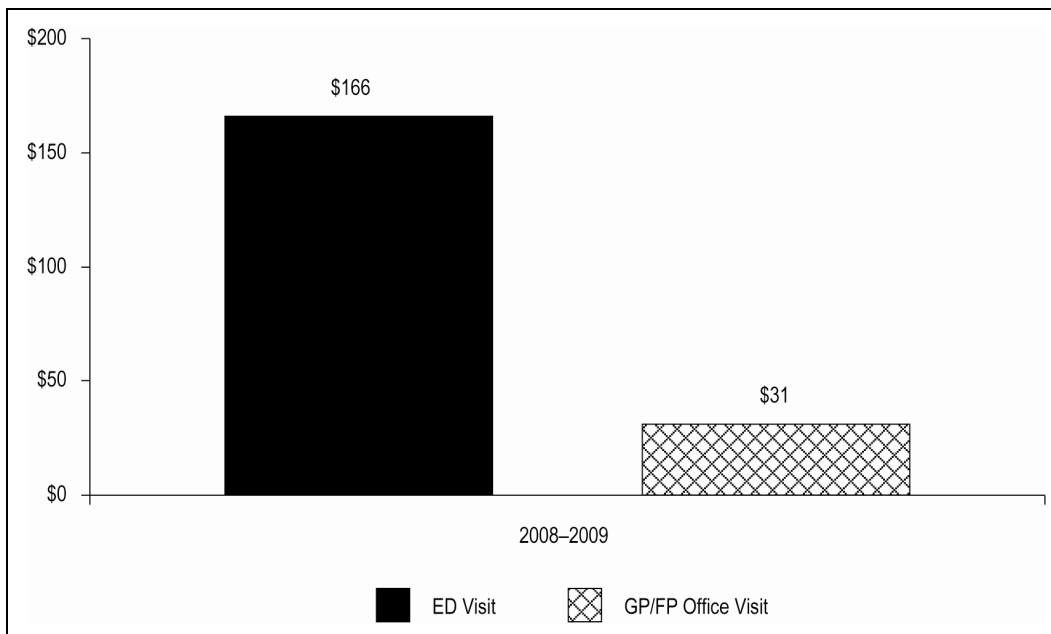
Source

Canadian MIS Database, Canadian Institute for Health Information.

Patients often report using EDs as a source of care when family doctors are not available. ED visits are a much more costly alternative to care in the community, however, with the average direct cost of ED visits more than five times the average fee-for-service cost of visits to family physicians or general practitioners (Figure 29).^{vii} The family physician/general practitioner average for after-hours or weekend care typically would be about 25% higher than the average shown in Figure 26, but even at approximately \$40 per visit it would be less than one-quarter of the cost of an ED visit. However, ED visits include those of patients with trauma, injuries and life-threatening medical conditions that require intensive and costly interventions.

vii. The direct cost of an ED visit includes only costs in the emergency functional centre and does not include costs for administration, support or diagnostic services that would be allocated to the ED in full-cost accounting. In the vast majority of Canadian hospitals, most if not all physician compensation is not included in ED direct expense. The average for family physician/general practitioner fee-for-service care was calculated from the National Physician Database (National Grouping System) and would include overhead costs in physician offices or clinics.

Figure 29: Direct Cost per ED Visit, 2008–2009



Notes

GP: general practitioner.

FP: family physician.

Sources

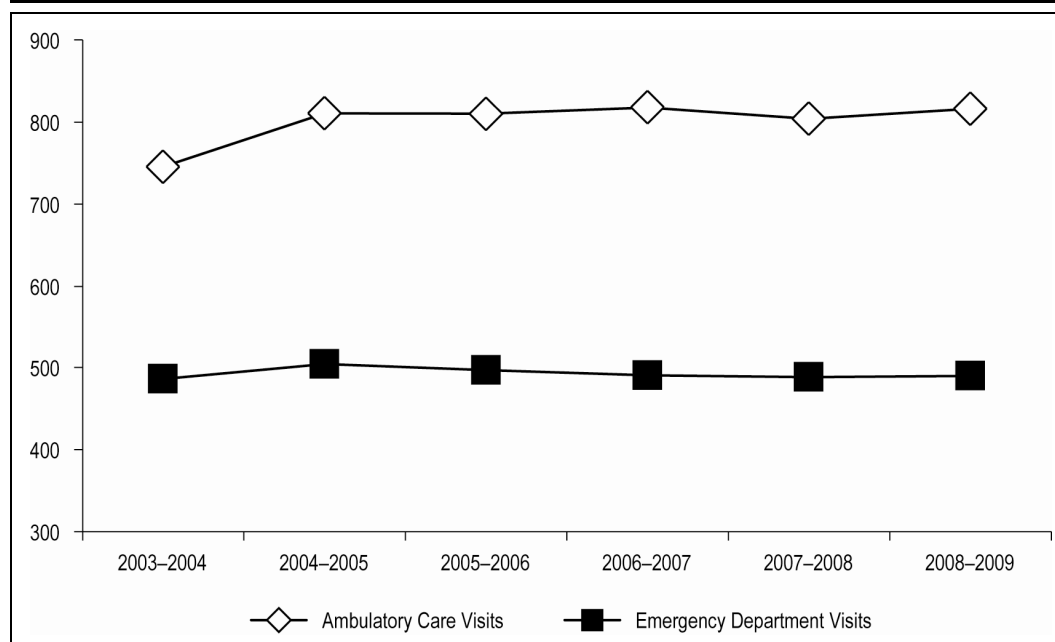
Canadian MIS Database and National Physician Database, Canadian Institute for Health Information.

Hospital Ambulatory Care Visits

Ambulatory care visits include visits to specialty clinics and day/night care services where patients attend for three or more hours. Ambulatory visits are normally arranged through referrals by the patient's attending physician in hospital or by a family physician in the community.

The number of ambulatory care visits exceeds the number of ED visits. During 2008–2009, there were 816.3 ambulatory care visits per 1,000 population and 489.6 ED visits per 1,000 population. Ambulatory visits have increased since 2003–2004, although most of the increase occurred between 2003–2004 and 2004–2005 (Figure 30). During that time, expenditure per 1,000 population increased more rapidly for ambulatory care visits (Figure 31).

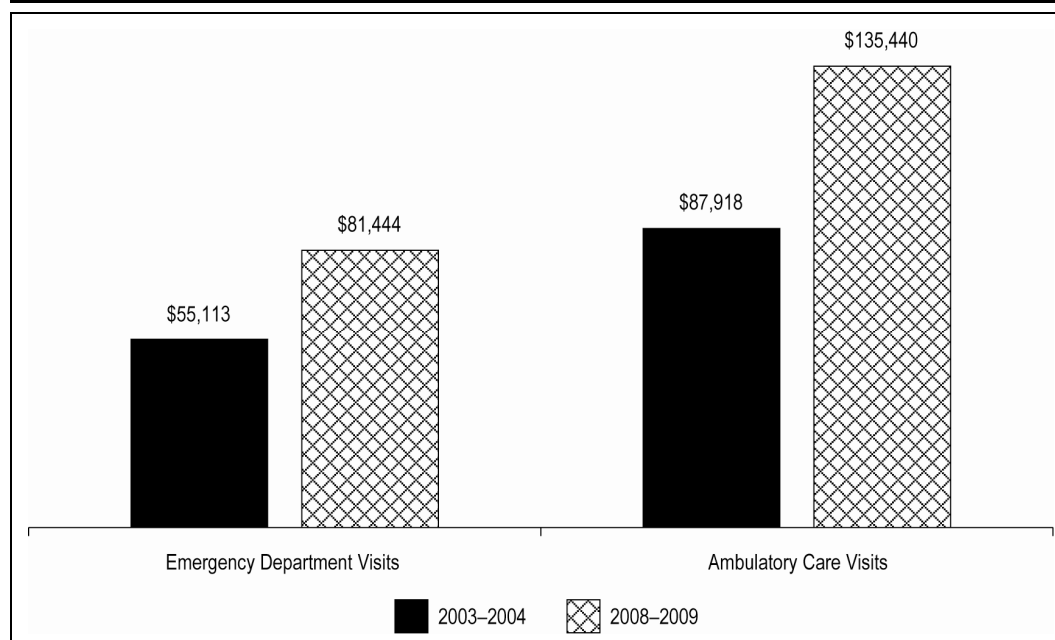
Figure 30: Number of Emergency and Ambulatory Care Visits per 1,000 Population



Source

Canadian MIS Database, Canadian Institute for Health Information.

Figure 31: Expenditure per 1,000 Population—Emergency and Ambulatory Care Visits



Source

Canadian MIS Database, Canadian Institute for Health Information.

Imputation of Emergency and Ambulatory Care Visits

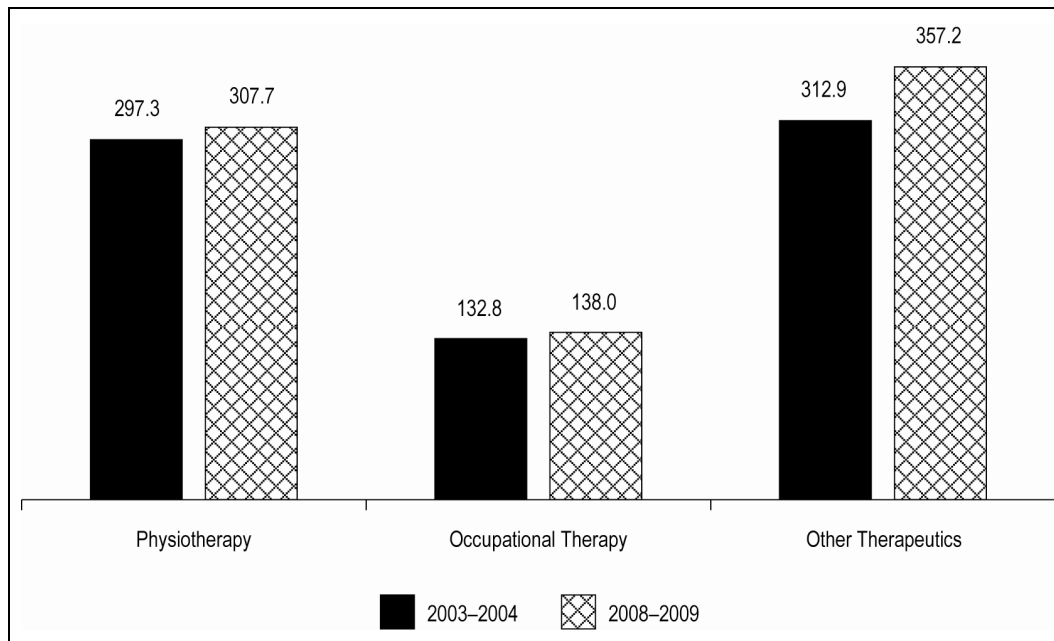
Visits are reported for several functional centres in the CMDB under the secondary statistical accounts 450 and 451 of the MIS national chart of accounts.

When, for a given functional centre, a hospital reported expenses but failed to report visits, total visits in the functional centre were imputed by assuming the same average expense per visit as in hospitals of the same jurisdiction that reported both expenses and visits.

Attendance Days in Therapeutic Units

Therapeutic units in hospitals record attendance days, which are defined as the number of days in which a patient visited a unit, regardless of the number of services received. Therapeutic units see both inpatients and outpatients. Physiotherapy and occupational therapy accounted for the largest number of attendance days and expenditure within the therapeutic functional centres (figures 32 and 33). The other therapeutic units referred to in the figures include a wide range of services, such as clinical nutrition, audiology, rehabilitation engineering and psychology.

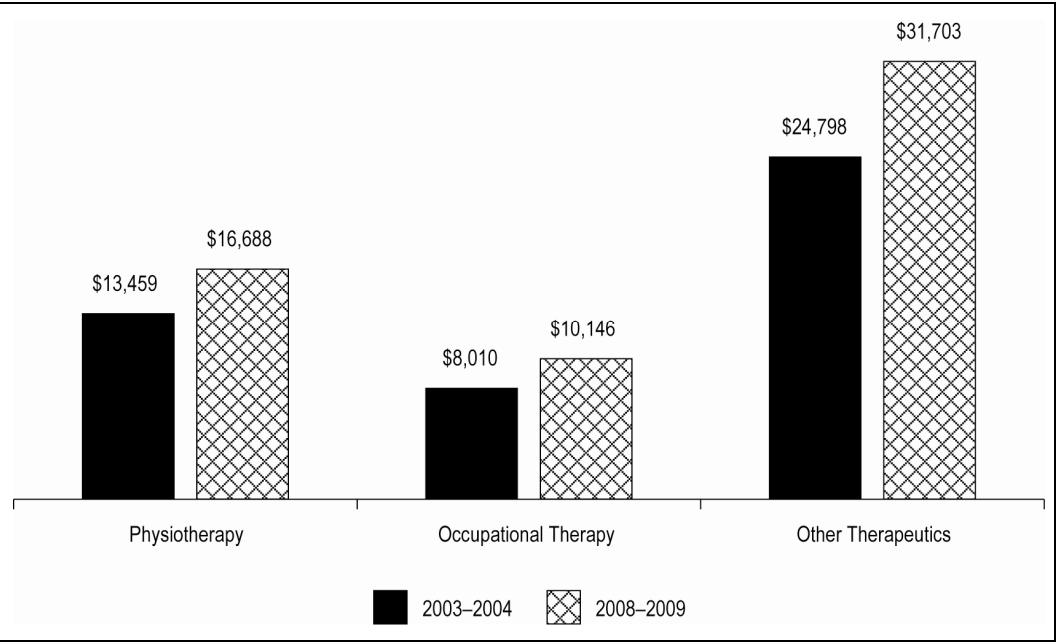
Figure 32: Patient Attendance Days per 1,000 Population—Therapeutics



Source

Canadian MIS Database, Canadian Institute for Health Information.

Figure 33: Expenditure per 1,000 Population—Therapeutics



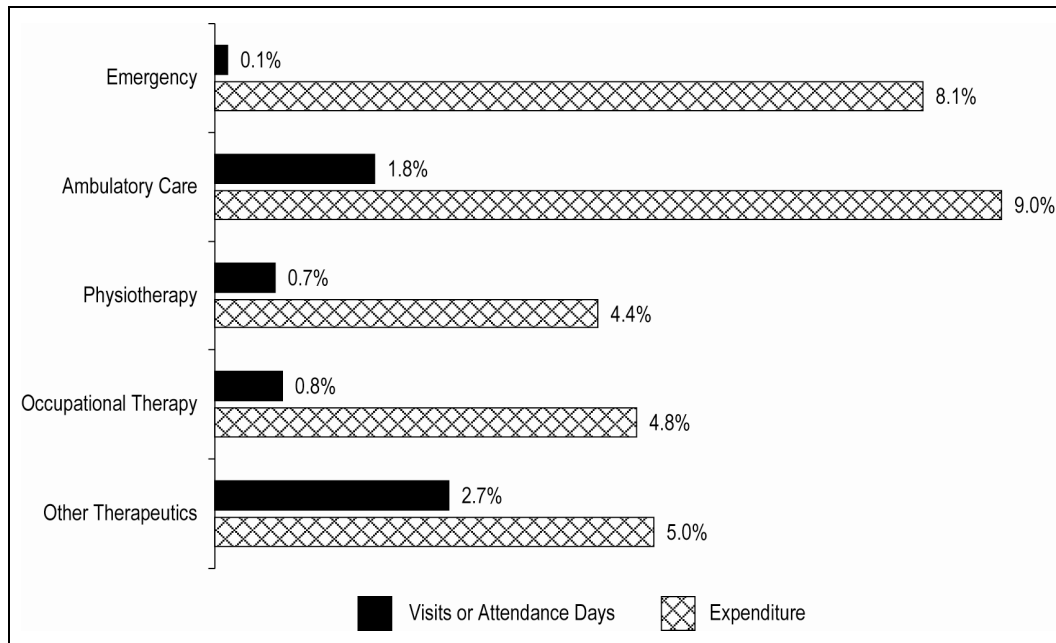
Source
 Canadian MIS Database, Canadian Institute for Health Information.

The data discussed above illustrates that hospitals provide a wide range of services in addition to inpatient care. Some of these services are for patients who are not admitted as inpatients, while others are provided to both inpatients and outpatients.

Expenditure and Utilization

In all categories of service discussed in this section, expenditure has increased more rapidly than the number of services (Figure 34). Increases in demand for emergency, ambulatory care and therapeutic services have been modest in the last five years. The average cost per service has increased considerably in emergency and ambulatory services, which could be due to such things as higher employee compensation, increased use of new technology, drugs and an expanded basket of services.

Figure 34: Average Annual Rates of Increase per 1,000 Population, 2003–2004 to 2008–2009



Source
Canadian MIS Database, Canadian Institute for Health Information.

Key Issues for Hospital Expenditure in the Future

The following issues will affect hospital expenditure trends in the future. The first three can be seen as cost drivers, while the fourth suggests that administrative action to limit the effects of cost drivers may be more difficult in the future:

- Hospital inflation has been outpacing general inflation.
- Technological changes are having a growing impact on hospital expenditure.
- Hospital resources required by the average inpatient are increasing.
- There are more limited opportunities for cost savings from shifting care from an inpatient to an outpatient setting.

Appendix: Documentation of Functional Centre Categories

This table shows the mapping of CMDB functional centres to the categories used in the section CMDB Expenditure by Functional Centre Categories.

Table 3: Mapping of CMDB Functional Centres	
Categories Used in Report	MIS Standards Functional Centres
Administrative	Administrative Services
Support Services	Functional Centre Support Services Service Recipient Support Services
Systems Support	System Support Services
Nursing Inpatient Services	Nursing Inpatient/Resident Services Psychiatry/Addiction Psychiatric Long-Term Care Physical Rehabilitation Long-Term Care Combined Services—Long-Term Care
Operating Room	Operating Room and Recovery Room
Emergency	Emergency
Ambulatory Care Services	Specialty Day/Night Care and Specialty Clinics Other Ambulatory
Diagnostic and Therapeutic	Diagnostic and Therapeutic Nursing Clinical Laboratory Computed Tomography Nuclear Medicine (in Vivo) Magnetic Resonance Imaging Other Diagnostic Imaging Radiation Oncology Other Diagnostic Pharmacy Physiotherapy Occupational Therapy Other Therapeutics
Community and Social Services	Community Health Services
Research and Education	Research Education
All Other	Undistributed

Source

Canadian Institute for Health Information, *Standards for Management Information Systems in Canadian Health Services Organizations* (Ottawa, Ont.: CIHI, 2011).

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ISBN 978-1-77109-030-8 (PDF)

© 2012 Canadian Institute for Health Information

How to cite this document:

Canadian Institute for Health Information, *Hospital Cost Drivers Technical Report—What Factors Have Determined Hospital Expenditure Trends in Canada?* (Ottawa, Ont.: CIHI, 2012).

Cette publication est aussi disponible en français sous le titre *Rapport technique sur les facteurs d'accroissement des dépenses hospitalières — Quels facteurs ont influé sur les tendances des dépenses hospitalières au Canada?*

ISBN 978-1-77109-031-5 (PDF)

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