The indicators are listed according to their placement in the Health Indicator Framework. To view the Framework schematic, see page 6 of this document.
# Table of Contents

General Methodology Notes ........................................................................................................................... 3
Health Indicator Framework ............................................................................................................................... 6
1.0 Health Status ............................................................................................................................................... 7
   HEALTH CONDITIONS ................................................................................................................................. 7
1.1 Injury Hospitalization Rate ........................................................................................................................... 7
1.2 Hospitalized Acute Myocardial Infarction Event Rate ......................................................................................... 8
1.3 Hospitalized Stroke Event Rate ...................................................................................................................... 9
2.0 Health System Performance .......................................................................................................................... 12
   ACCESSIBILITY ........................................................................................................................................... 12
2.1 Wait Time for Hip Fracture Surgery .................................................................................................................. 12
2.2 Caesarean Section Rate .................................................................................................................................. 14
   EFFECTIVENESS .......................................................................................................................................... 16
2.3 Ambulatory Care Sensitive Conditions Hospitalization Rate .................................................................................. 16
2.4 30-Day Acute Myocardial Infarction (AMI) In-Hospital Mortality Rate ................................................................. 17
2.5 30-Day Stroke In-Hospital Mortality Rate .......................................................................................................... 19
2.6 Asthma Readmission Rate .................................................................................................................................. 23
2.7 Hysterectomy Readmission Rate ....................................................................................................................... 24
2.8 Prostatectomy Readmission Rate ....................................................................................................................... 26
   SAFETY ............................................................................................................................................................ 28
2.10 Hospitalized Hip Fracture Event Rate .................................................................................................................. 28
3.0 Health System Characteristics ......................................................................................................................... 32
   HEALTH SYSTEM ....................................................................................................................................... 32
3.1 Coronary Artery Bypass Graft Surgery (Bypass Surgery) Rate .................................................................................. 32
3.2 Percutaneous Coronary Intervention Rate ........................................................................................................ 33
3.3 Cardiac Revascularization Rate ......................................................................................................................... 35
3.4 Hip Replacement Rate ...................................................................................................................................... 36
3.5 Knee Replacement Rate..................................................................................................................................... 38
3.6 Hysterectomy Rate .......................................................................................................................................... 39
3.7 Inflow/Outflow Ratio ....................................................................................................................................... 41
   RESOURCES .................................................................................................................................................. 43
3.8 General/Family Physicians and Specialist Physicians ........................................................................................... 43
4.0 Disparity ......................................................................................................................................................... 45
   DISPARITY .................................................................................................................................................... 45
4.1 Disparity Rate Ratio ........................................................................................................................................ 45
4.2 Potential Rate Reduction (PRR) ........................................................................................................................ 46
General Methodology Notes

This document describes methodology used to calculate health indicators produced by the Canadian Institute for Health Information (CIHI). The methodology used for these indicators was designed to maximize inter-regional comparability given the characteristics of available national datasets. For this reason, there may be differences between definitions, data sources, and extraction procedures used in some local, regional, or provincial/territorial reports when compared to those described here. In addition, discrepancies may exist due to on-going updates to databases. Data presented in Health Indicators publications include the latest updates available at the time of indicator calculation.

Indicators are calculated for provinces and territories as well as for health regions. Health regions with a population of at least 50,000 are featured both in the print publication and e-publication. In addition, selected indicators for health regions with a population ranging from 20,000 to 50,000 are reported in the Health Indicators e-publication.

Health Region Assignment

- Health regions are defined by provincial governments as areas of responsibility for regional health boards (that is, legislated) or as regions of interest to health care authorities. In order to determine what health region a patient belongs to, postal codes are first mapped to census geography using Statistics Canada’s Postal Code Conversion File (Vintage March 2009) and then to a health region using another Statistics Canada product, “Health Regions: Boundaries and Correspondence with Census Geography”. Boundaries are those that were in effect as of December 2007.
- Health region level analyses do not include records with invalid, missing, or partial postal codes.
- Non-Canadian residents are excluded from overall rates. They are identified by a mini postal code relating to one of the U.S. States or by a postal code value indicating out-of-country residents.

Neighbourhood Income Quintiles

- Patients were assigned neighbourhood level income quintiles using the Statistics Canada postal code conversion file plus (PCCF +, version 5E). By use of this program, the postal code of a patient’s place of residence at the time of hospitalization was mapped to the smallest geographical unit in 2006 Canadian Census: dissemination area (DA), and the corresponding neighbourhood income quintile of that DA was assigned to the patient. Detailed methodology on neighbourhood income quintile assignment is available upon request.
- Patients from DAs without income information can not be assigned to a neighbourhood income quintile, therefore can not be included in disparity measure analysis.

Population estimates
• Population estimates are used as denominators for all population-based indicators (expressed as rates per 100,000 population).

• Population estimates for health regions were produced by Statistics Canada, Demography Division. 2008 population counts used are preliminary postcensal population estimates. They are based on the latest census and administrative sources on births, deaths and migration, adjusted for net under-coverage. Population estimates for Health regions are derived from the Census Division population estimates which are produced using the components method. Population growth for health regions in British Columbia was supplied by BC Stats. Unless otherwise specified, population estimates are based on the boundaries in effect as of December 2007.

• At the national level and provincial/territorial levels, rates for health data that are based on a fiscal year (April to March) use October 1st population estimates derived from the 2006 census. Physician rates for Canada and provinces/territories are based on July 1st population estimates derived from the 2006 census. Regional rates are based on July 1st population estimates derived from the 2006 census.

• Population counts by neighbourhood income quintile were estimated based on DA-level population counts from 2001 and 2006 census. Detailed methodology is available upon request. Due to missing income information for about 3% DAs in both 2001 census and 2006 census, the population estimates used for income quintile analysis are usually smaller than the provincial population estimates provided by Statistics Canada.

Hospitalization Data and Rates

• Unless otherwise specified, data are reported based on the region of the patient’s residence, not region of hospitalization. Consequently, these figures reflect the hospitalization experience of residents of the region wherever they are treated, including out-of-province, as opposed to the comprehensive activity of the region’s hospitals (who will also treat people from outside of the region). Hospitalizations occurring in the U.S. or abroad are not included.

• In-hospital hip fracture rate is reported by the jurisdiction where hospitalization has occurred rather than by the jurisdiction of patient residence.

• Rates are standardized wherever possible to facilitate comparability across provinces/regions and over time.
Standardized rates are adjusted by age (collapsed to 5-year groupings) using a direct method of standardization based on the July 1st, 1991 Canadian population as follows:

<table>
<thead>
<tr>
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<td>70-74</td>
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<td>40-44</td>
<td>2,138,891</td>
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</table>

Source: Statistics Canada Cat. No. 82-221-x, Causes of Death 1997, Appendix 3

Unless otherwise specified, hospitalizations include discharges and deaths for inpatients in acute care hospitals for the reference period. Same day surgery (outpatient) cases are included in several indicators (see indicator definitions for exceptions). Patients admitted to non-acute care hospitals (e.g. chronic care, psychiatric or rehabilitation facilities) are generally not included in the totals.

Wherever information is available, procedures that have been cancelled, performed previously or out-of-hospital, and procedures abandoned after onset are excluded from the calculations.

Technical notes for Ambulatory Care Sensitive Conditions (ACSC), AMI and Stroke 30-day mortality, as well as the readmission indicators (AMI, asthma, hysterectomy, prostatectomy), in-hospital hip fracture, and wait time for hip fracture surgery can be accessed from links at the respective definition. Model specifications for the risk-adjusted indicators including comorbid conditions and coefficient values are also available from the links. The method used to calculate confidence intervals for the risk-adjusted indicators is available upon request.
### Health Indicator Framework

#### Health Status

<table>
<thead>
<tr>
<th>Well-being</th>
<th>Health Conditions</th>
<th>Human Function</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Injury hospitalization</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Hospitalized acute myocardial infarction event rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospitalized stroke event rate</td>
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#### Non-Medical Determinants of Health

<table>
<thead>
<tr>
<th>Health Behaviours</th>
<th>Living and Working Conditions</th>
<th>Personal Resources</th>
<th>Environmental Factors</th>
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#### Health System Performance

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<th>Appropriateness</th>
<th>Competence</th>
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<tbody>
<tr>
<td></td>
<td>Wait time for hip fracture surgery</td>
<td>Caesarean section</td>
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</table>

<table>
<thead>
<tr>
<th>Continuity</th>
<th>Effectiveness</th>
<th>Efficiency</th>
<th>Safety</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Ambulatory care sensitive conditions</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>30-day acute myocardial infarction in-hospital mortality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30-day stroke in-hospital mortality</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Acute myocardial infarction readmission</td>
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<td></td>
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<tr>
<td></td>
<td>Asthma readmission</td>
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<tr>
<td></td>
<td>Hysterectomy readmission</td>
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<tr>
<td></td>
<td>Prostatectomy readmission</td>
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</tbody>
</table>

#### Community and Health System Characteristics

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<tr>
<th>Community</th>
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<th>Resources</th>
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<tr>
<td>Total population</td>
<td>Coronary artery bypass graft</td>
<td>General/Family physicians</td>
</tr>
<tr>
<td>Population age 20+</td>
<td>Percutaneous coronary intervention</td>
<td>Specialist physicians</td>
</tr>
<tr>
<td>Population age 65+</td>
<td>Cardiac revascularization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knee replacement</td>
<td></td>
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<tr>
<td></td>
<td>Hip replacement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hysterectomy</td>
<td></td>
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<tr>
<td></td>
<td>Inflow/outflow ratios</td>
<td></td>
</tr>
</tbody>
</table>

(Disparity Rate Ratio, Potential Rate Reduction)
1.0 Health Status

Health Conditions

1.1 Injury Hospitalization Rate

Definition
Age-standardized rate of acute care hospitalization due to injury resulting from the transfer of energy (excluding poisoning and other non-traumatic injuries), per 100,000 population.

Method of Calculation
(Total number of hospitalizations due to injury/Total mid-year population) * 100,000
(Age adjusted)

Injury is identified by the first occurrence of the following external cause of injury codes with a diagnosis type of ‘9’:

**ICD-9**
E800-E807, E810-E838, E840-E848, E880-E888, E890-E902, E906-E910, E913-E928,
E953-E958, E960-E961, E963-E968, E970-E976, E978, E983-E988, E990-E998

**ICD-10-CA**
V01-V06, V09-V99, W00-W45, W46, W49-W60, W64-W70, W73-W77, W81, W83-W94,
W99, X00-X06, X08-X19, X30-X39, X50, X52, X58, X59, X70-X84, X86, X91-X99, Y00-Y05,
Y07-Y09, Y20-Y36

Interpretation
This indicator contributes to an understanding of the adequacy and effectiveness of injury prevention efforts, including public education, product development and use, community and road design, and prevention and treatment resources.

Standards/Benchmarks
Benchmarks have not been identified for this indicator.

Data Source
National Trauma Registry (NTR), CIHI;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

Reference Period
April 1, 2008 - March 31, 2009.

Comprehensiveness
Available for all provinces and territories.

Comments
Poisoning, adverse effects of drugs/medicine, choking, late effects, and several other conditions do not meet the definition of trauma developed by the National Trauma Registry Advisory Committee and are therefore excluded. Newborns are also excluded.
Rates are not comparable to those appearing in the NTR annual report due to differences in the method of assigning cases to geography. The NTR data reflect region of hospitalization, while the indicator rates are based on region of residence.

### 1.2 Hospitalized Acute Myocardial Infarction (AMI) Event Rate

**Definition**

Age-standardized rate of new AMI events admitted to an acute care hospital per 100,000 population age 20 and older. New event is defined as a first-ever hospitalization for an AMI or a recurrent hospitalized AMI occurring more than 28 days after the admission for the previous event in the reference period.

**Method of Calculation**

(Total number of new AMI events for persons age 20 and older) / Total mid-year population age 20 and older) * 100,000 (Age-adjusted)

**Numerator Inclusion Criteria:**

1. AMI present on admission
   - ICD-10-CA: I21, I22 is coded as diagnosis type (1) or [type (M), (W), (X) or (Y), but not also as a diagnosis type (2)]
2. Age at admission 20 years and older
3. Gender recorded as male or female
4. Admission to an acute care institution
5. Canadian resident

**Numerator Exclusion Criteria:**

1. Records with an invalid health card number or date of birth
2. Records with an invalid admission date
3. AMI admissions within 28 days after the admission date of the previous AMI hospitalization
4. Transfers

**Interpretation**

AMI is one of the leading causes of morbidity and death. Measuring its occurrence in the population is important for planning and evaluating preventive strategies, allocating health resources and estimating costs. From a disease surveillance perspective, there are three groups of AMI events: non-diagnosed events, fatal events occurring outside the hospital and those admitted to acute care hospitals. Although AMIs admitted to a hospital do not reflect all acute myocardial infarctions in the community, this information provides a useful and timely estimate of the disease occurrence in the population.

---

1 If a subsequent AMI admission occurs on the same day as or prior to the discharge date of a previous AMI admission, it is considered as a transfer.
Standards/Benchmarks
Benchmarks have not been identified for this indicator.

Data Sources
Discharge Abstract Database (DAD), CIHI;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

Reference Period

Comprehensiveness
Available for all provinces and territories.

Comments
This indicator includes all new hospitalized AMI events in the reference period encompassing first-ever and recurrent AMIs. A person may have more than one AMI event in the reference period. AMI events not admitted to an acute care hospital and in-hospital AMIs are not included in this indicator.

Myocardial infarction is labelled as acute with a stated duration of four weeks (28 days) or less in ICD-10-CA and eight weeks or less in ICD-9/9-CM. Therefore, a 28-day period to define a new AMI event is applicable only to the records coded in ICD-10-CA.

References


1.3 Hospitalized Stroke Event Rate

Definition
Age-standardized rate of new stroke events admitted to an acute care hospital per 100,000 population age 20 and older. New event is defined as a first-ever hospitalization for stroke or a recurrent hospitalized stroke occurring more than 28 days after the admission for the previous event in the reference period.

Method of Calculation
(Total number of new stroke events for persons age 20 and older) / Total mid-year population age 20 and older) * 100,000 (Age-adjusted)

Numerator Inclusion Criteria:
1. Stroke present on admission
   ICD-10-CA: I60–I64; ICD-9-CM: 430–432; 433–434 with fifth digit of 1; 436 coded as diagnosis type (1), or [type (M), (W), (X) or (Y), but not also as a diagnosis type (2)]
2. Age at admission 20 years and older
3. Gender recorded as male or female
4. Admission to an acute care institution
5. Canadian resident

Numerator Exclusion Criteria:
1. Records with an invalid health card number or date of birth
2. Records with an invalid admission date
3. Stroke admissions within 28 days after the admission date of the previous stroke hospitalization
4. Transfers²

Interpretation
Stroke is one of the leading causes of long-term disability and death. Measuring its occurrence in the population is important for planning and evaluating of preventive strategies, allocating health resources and estimating costs. From a disease surveillance perspective, there are three groups of strokes: fatal events occurring out of the hospital, non-fatal strokes managed outside acute care hospitals and those admitted to an acute care facility. Although strokes admitted to a hospital do not reflect all stroke events in the community, this information provides a useful and timely estimate of the disease occurrence in the population.

Standards/Benchmarks
Benchmarks have not been identified for this indicator.

Data Sources
Discharge Abstract Database (DAD), CIHI.

Reference Period

Comprehensiveness
Available for all provinces and territories, except Quebec. Rate for Quebec is not available due to differences in data collection.

Comments
This indicator includes all new hospitalized stroke events in the reference period encompassing first-ever and recurrent strokes. A person may have more than one stroke event in the reference period. Stroke events not admitted to an acute care hospital and in-hospital strokes are not included in his indicator.

Note that identification of strokes resulting from occlusion of precerebral arteries, included in this indicator, is not possible in the ICD-9 coding system.

References

² If a subsequent stroke admission occurs on the same day as or prior to the discharge date of a previous stroke admission, it is considered as a transfer.


2.0 Health System Performance

Accessibility

2.1 Wait Time for Hip Fracture Surgery

Definition
Proportion with surgery same or next day: Risk-adjusted proportion of hip fracture patients age 65 and older who underwent hip fracture surgery on the day of admission or the next day.

Proportion with surgery same, next day or day after: Risk-adjusted proportion of hip fracture patients age 65 and older who underwent hip fracture surgery on the day of admission, the next day or the day after that.

Method of Calculation

Denominator: The number of hip fracture patients age 65 and older who underwent hip fracture surgery in an acute care hospital.

Numerator: Numerator is a subset of the denominator according to one of the two available definitions. Wait time is measured from the date of the first admission with hip fracture (index admission) to the date when hip surgery was received.

A Technical Note describes case selection and inclusion/exclusion criteria.

Two separate logistic regression models were fitted with age, sex and selected pre-admission co-morbid diagnoses (heart failure, ischemic heart disease, hypertension, COPD, diabetes with complications and cardiac dysrhythmia) as independent variables, one modeling the probability of having hip fracture surgery on the same/the next day and the second one modeling the probability of having hip fracture surgery on the same/next/day after. Coefficients derived from the logistic models are used to calculate the probability for each case. The expected number of patients in a region is the sum of these case probabilities for that region. The risk-adjusted proportion is calculated by dividing the observed number by the expected number of cases and multiplying by the Canadian average. A 95 percent confidence interval is also calculated and the method used to calculate confidence intervals is available upon request. Refer to the Model Specifications for a list of variables entered in the model and coefficient values.

Interpretation
Operative delay in older patients with hip fracture is associated with a higher risk of postoperative complications and mortality. Wait time for surgery following hip fracture provides a measure of access to care. The wait time may be influenced by co-morbid conditions, hospital transfers and practice differences related to certain types of medications, like blood thinners. However, longer waits may indicate lack of resources, physician unavailability or/and other issues related to the access to care.
Standards/Benchmarks
Benchmark of hip fracture fixation within 48 hours was set by Federal, Provincial and Territorial governments in December 2005.

Data Source
Discharge Abstract Database (DAD), CIHI.

Reference Period
April 1, 2008 – March 31, 2009.

Comprehensiveness
Available for all provinces and territories, except Quebec. Rate for Quebec is not available due to differences in data collection.

References


Canadian Institute for Health Information, Waiting for Health Care in Canada: What we know and what we don’t know. Ottawa: CIHI, 2006


Comments
The indicators are calculated in days rather than hours since the procedure time was not available in the DAD.

Note, due to differences in methodology this indicator may differ from similar indicators developed and reported by jurisdictions.
Appropriateness

2.2 Caesarean Section Rate

Definition
Proportion of women delivering babies in acute care hospitals by Caesarean section.

Method of Calculation
(Number of Caesarean sections/Number of deliveries (live births and stillbirths)) * 100

Denominator (Delivery):
Inclusion:
Delivery coded in any diagnosis field:
**ICD-9**
641-676 with a fifth digit of 1 or 2; 650 or V27

**ICD-10-CA**
010 - 016, 021 - 029, 030 - 037, 040 - 046, 048, 060 - 069, 070 - 075, 085 - 089,
090 - 092, 095, 098, 099 with a sixth digit of 1 or 2; or Z37

Exclusion:
Delivery in which an abortive procedure* was recorded:
**CCP**
78.52, 86.3, 86.4, 87.0, 87.1 or 87.2

**CCI**
5.CA.88^^, 5.CA.89^^, or 5.CA.93^^

Numerator (Caesarean section):
The numerator is a subset of the denominator. Caesarean section is identified as any
procedure code* of:
**CCP**
86.0-86.2, 86.4, 87.0 or 87.2

**CCI**
5.MD.60^^

*Code may be recorded in any position. Procedures coded as cancelled, previous, out-of-
hospital and “abandoned after onset” are excluded.

Interpretation
Caesarean section rates provide information on the frequency of surgical birth delivery
relative to all modes of birth delivery. Since Caesarean section delivery increases maternal
morbidity/mortality and is associated with higher costs, Caesarean section rates are often
used to monitor clinical practices with an implicit assumption that lower rates indicate
more appropriate, as well as more efficient care.
Standards/Benchmarks
Guidelines defining the appropriate indications for Caesarean section are available.

Data Source
Discharge Abstract Database (DAD), CIHI;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

Reference Period
April 1, 2008 - March 31, 2009.

Comprehensiveness
Available for all provinces and territories.

References


Comments
Prior to 2001–2002 rate, deliveries were based on adjusted newborn counts. Beginning with 2002 – 2003 rate, stillbirths are included in the delivery count. Prior to that, stillbirths were excluded.
Effectiveness

2.3 Ambulatory Care Sensitive Conditions Hospitalization Rate

Definition
Age-standardized acute care hospitalization rate for conditions where appropriate ambulatory care prevents or reduces the need for admission to hospital, per 100,000 population under age 75.

Method of Calculation
(Total number of acute care hospitalizations for ambulatory care sensitive conditions under age 75 / Total mid-year population under age 75) * 100,000 (Age adjusted)

Inclusion criteria:
Based on a list of conditions developed by Billings et al, any one most responsible diagnosis code of:
- Grand mal status and other epileptic convulsions
- Chronic obstructive pulmonary diseases
- Asthma
- Heart failure and pulmonary edema
- Hypertension
- Angina
- Diabetes

See Technical Note for codes used.

Exclusion criteria:
1. Individuals age 75 years and older.
2. Death before discharge.

Interpretation
Hospitalization for an Ambulatory Care Sensitive Condition is considered to be a measure of access to appropriate primary health care. While not all admissions for these conditions are avoidable, it is assumed that appropriate ambulatory care could prevent the onset of this type of illness or condition, control an acute episodic illness or condition, or manage a chronic disease or condition. A disproportionately high rate is presumed to reflect problems in obtaining access to appropriate primary care.

Standards/Benchmarks
The "right" level of utilization is not known and large regional variations in the rate of hospitalization for these conditions exist.

Data Source
Discharge Abstract Database (DAD), CIHI;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.
Reference Period
April 1, 2008 - March 31, 2009.

Comprehensiveness
Available for all provinces and territories.

References


Comments
Beginning with 2006-2007 rate, the definition of the ambulatory care sensitive conditions indicator was refined to better align as a measure of primary health care. In the revised definition, diabetes component will only include diabetes with short-term complications or diabetes without mention of complication; angina, hypertension and heart failure components will exclude records where cardiac procedures were also coded. Rates based on the new definition were calculated for the previous years to allow for comparisons over time.

2.4 30-Day Acute Myocardial Infarction (AMI) In-Hospital Mortality Rate

Definition
The risk adjusted rate of all-cause in-hospital death occurring within 30 days of first admission to an acute care hospital with a diagnosis of Acute Myocardial Infarction (AMI).

Method of Calculation
Numerator: Number of deaths from all causes occurring in-hospital within 30 days of admission for AMI
Denominator: Total number of AMI episodes in an 11-month period

A Technical Note describes the episode building and case selection.

A logistic regression model is fitted with age, gender, and select preadmission comorbid diagnoses as independent variables. Coefficients derived from the logistic model are used
to calculate the probability of in-hospital death following AMI for each case (episode). The expected number of in-hospital deaths in a region is the sum of the case probabilities of that region. The risk adjusted mortality rate (RAMR) is calculated by dividing the observed number of in-hospital deaths of each region by the expected number of in-hospital deaths of the region and multiplying by the Canadian average in-hospital death rate. A 95 percent confidence interval for the RAMR is also calculated and the method used to calculate confidence intervals is available upon request. Refer to the Model Specifications for a list of variables entered in the model and coefficient values.

**Interpretation**

A lower risk-adjusted mortality rate following AMI may be related to quality of care or other factors. It has been shown that the 30-day in-hospital mortality rate is highly correlated \((r = 0.9)\) with total mortality (death in and out of hospital) following AMI (Tu et al., 1999). Inter-regional variations in 30-day in-hospital mortality rates may be due to jurisdictional and institutional differences in standards of care, as well as other factors that were not included in the adjustment.

**Standards/Benchmarks**

Benchmarks have not been identified for this indicator.

**Data Source**

Discharge Abstract Database (DAD), CIHI

**Reference Period**

Rates are based on the 3 years of pooled data: April 1, 2006 – March 31, 2009.

**Comprehensiveness**

Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.

**References**


**Comments**

Beginning with the rates based on 2003-2004 to 2005-2006 data, AMI case selection criteria were revised to account for the fact that an increasing number of AMI patients are undergoing revascularization procedure (percutaneous coronary intervention or coronary
artery bypass) at their index admission. In the case of revascularization procedure, AMI may not be coded as the most responsible diagnosis and these cases were previously excluded from the indicator. In addition, exclusion criteria were revised and patients with a length of stay of less than 3 days and discharged alive are no longer excluded. Comparison of rates for this time period with those of previous years should be made with caution.

These rates should be interpreted with caution due to potential differences in the coding of comorbid conditions across provinces and territories.

2.5 30-Day Stroke In-Hospital Mortality Rate

Definition
The risk adjusted rate of all-cause in-hospital death occurring within 30 days of first admission to an acute care hospital with a diagnosis of stroke.

Method of Calculation

**Numerator:** Number of deaths from all causes occurring in-hospital within 30 days of admission for stroke

**Denominator:** Total number of stroke episodes in an 11-month period

A Technical Note describes the episode building and case selection.

A logistic regression model is fitted with age, gender, type of stroke and select preadmission comorbid diagnoses as independent variables. Coefficients derived from the logistic model are used to calculate the probability of in-hospital death following stroke for each case (episode). The expected number of in-hospital deaths of a region is the sum of these case probabilities in that region. The risk-adjusted mortality rate (RAMR) is calculated by dividing the observed number of in-hospital deaths of each region by the expected number of in-hospital deaths of the region and multiplying by the Canadian average in-hospital death rate. A 95 percent confidence interval for the RAMR is also calculated and the method used to calculate confidence intervals is available upon request. Refer to Model Specifications for a list of variables entered in the model and coefficient values.

Interpretation
Stroke is a leading cause of death and long-term disability. Adjusted mortality rates following stroke may reflect the underlying effectiveness of treatment and quality of care. Inter-regional variations in the stroke mortality rates may be due to jurisdictional and institutional differences in standards of care, as well as other factors that are not included in the adjustment.

Standards/Benchmarks
Benchmarks have not been identified for this indicator.

Data Sources
Discharge Abstract Database (DAD), CIHI.
Reference Period
Rates are based on the 3 years of pooled data: April 1, 2006 – March 31, 2009.

Comprehensiveness
Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.

References


Comments
Beginning with rates based on 2003-2004 to 2005-2006 data, case selection criteria for stroke were revised to include patients transferred to rehabilitation during their index admission. In this case, stroke may not be coded as most responsible diagnosis and these cases were previously excluded from the indicator. In addition, stroke resulting from occlusion of precerebral arteries is now included in the indicator. These cases were previously excluded since their identification was not possible in the ICD-9 coding system. Comparison of rates for this time period with those of previous years should be made with caution.

This indicator is based on the methodology used to calculate the 30-day Acute Myocardial Infarction in-hospital mortality rate. Rates should be interpreted with caution due to potential differences in the coding of comorbid conditions across provinces and territories.

### 2.6 Acute Myocardial Infarction (AMI) Readmission Rate

**Definition**
Risk adjusted rate of unplanned readmission following discharge for Acute Myocardial Infarction (AMI). A case is counted as a readmission if it is for a relevant diagnosis and occurs within 28 days after the index AMI episode of care. An episode of care refers to all contiguous in-patient hospitalizations and same-day surgery visits.

Relevant diagnoses for assigning readmission cases:
- Acute myocardial infarction
- Other acute and subacute forms of ischemic heart disease
• Old myocardial infarction
• Angina pectoris
• Other forms of chronic ischemic heart disease
• Conduction disorders
• Cardiac dysrhythmias
• Functional disturbances following cardiac surgery
• Pneumococcal pneumonia
• Other bacterial pneumonia
• Bronchopneumonia, organism unspecified
• Pneumonia, organism unspecified
• Urinary tract infection

Method of Calculation

Numerator: Number of AMI episodes with a readmission for a given year
Denominator: Total number of AMI episodes in an 11-month period

A Technical Note describes the episode building and case selection.

A logistic regression model is fitted with age, gender and multiple previous AMI admissions (2 and more) as independent variables. Coefficients derived from the logistic model are used to calculate the probability of readmission for each case (episode). The expected number of readmissions in a region is the sum of the case probabilities of that region. The risk adjusted readmission rate (RARR) is calculated by dividing the observed number of readmissions of each region by the expected number of readmissions of the region and multiplying by the Canadian average readmission rate. A 95 percent confidence interval for the RARR is also calculated and the method used to calculate confidence intervals is available upon request. Refer to the Model Specifications for a list of variables entered in the model and coefficient values.

Interpretation

Readmission rates provide one measure of quality of care. The risk of readmission following an AMI may be related to the type of drugs prescribed at discharge, patient compliance with post-discharge therapy, the quality of follow-up care in the community, or the availability of appropriate diagnostic or therapeutic technologies during the initial hospital stay. Although readmission for medical conditions may involve factors outside the direct control of the hospital, high rates of readmission act as a signal to hospitals to look more carefully at their practices, including the risk of discharging patients too early and the relationship with community physicians and community-based care.

Standards/Benchmarks

Benchmarks have not been identified for this indicator.

Data Sources

Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness.
Reference Period
Rates are based on the 3 years of pooled data: April 1, 2006 – March 31, 2009.

Comprehensiveness
Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.

References


Comments
Beginning with rates based on 2003-2004 to 2005-2006 data, AMI case selection criteria were revised to account for the fact that increasing number of AMI patients are undergoing revascularization procedures (percutaneous coronary intervention or coronary artery bypass) at their index admissions. In the case of revascularization procedure, AMI diagnosis may not be coded as most responsible and these cases were previously excluded from the indicator. In addition, exclusion criteria were revised and patients with length of stay less than 3 days and discharged alive are no longer excluded. Comparison of rates for this time period with those of previous years should be made with caution.

All jurisdictions for which this indicator can be calculated are now coding to the ICD-10-CA/CCI standard. Therefore, an adjustment that was made to this indicator to enable comparison of rates between ICD-9/ICD-9-CM and ICD-10-CA jurisdictions for data years 2000-2001 to 2002-2003 and 2001-2002 to 2003-2004 has been discontinued. This adjustment was to exclude AMI cases that occurred in the 4-8 week period following an earlier AMI (ICD-9/ICD-9-CM labels these as acute AMI while ICD-10-CA considers such cases to be chronic). Effective with the rates based on 2002-2003 to 2005-2006, this exclusion was no longer applied and only AMI occurring within four weeks of a previous AMI is considered acute. Comparisons with the rates for the previous years should be made with caution.

A new “combination” code for acute lower respiratory infections in patients with Chronic Obstructive Pulmonary Disease (J44.0) was introduced with ICD-10-CA. According to the Canadian Coding Standards, if COPD patients presented with pneumonia, only J44.0 should be used, but not the other codes from the J44 rubric. This code should be assigned as most responsible diagnosis (MRDx) with pneumonia assigned as a secondary diagnosis. To correct the evident erroneous applications of this coding standard, pneumonia cases coded as MRDx will be removed if J44 was also recorded in any of the secondary diagnosis positions.
Effective with the rates based on the 2001-2002 to 2003-2004 data, the methodology for this indicator no longer excludes readmissions associated with a transfer for catheterization, angiography, angioplasty, insertion of pacemaker or coronary artery bypass graft surgery. This change may affect the comparability of rates with those appearing in previous releases.

2.7 Asthma Readmission Rate

Definition
Risk adjusted rate of unplanned readmission following discharge for asthma. A case is counted as a readmission if it is for a relevant diagnosis and occurs within 28 days after the index episode of care. An episode of care refers to all contiguous in-patient hospitalizations and same-day surgery visits.

Relevant diagnoses for assigning readmission cases:
- Pneumococcal pneumonia
- Other bacterial pneumonia
- Bronchopneumonia, organism unspecified
- Pneumonia, organism unspecified
- Asthma
- Empyema
- Pulmonary collapse
- Respiratory arrest
- Respiratory complications during or resulting from a procedure

Method of Calculation
Numerator: Number of asthma episodes with a readmission for a given year
Denominator: Total number of asthma episodes in an 11-month period

A Technical Note describes the episode building and case selection.

A logistic regression model is fitted with age, gender and multiple previous admissions for asthma (2 and more) as independent variables. Coefficients derived from the logistic model are used to calculate the probability of readmission for each case (episode). The expected number of readmissions of a region is the sum of these case probabilities in that region. The risk adjusted readmission rate (RARR) is calculated by dividing the observed number of readmissions of each region by the expected number of readmissions of the region and multiplying by the Canadian average readmission rate. A 95 percent confidence interval for the RARR is also calculated and the method used to calculate confidence intervals is available upon request. Refer to the Model Specifications for a list of variables entered in the model and coefficient values.

Interpretation
Readmission rates provide one measure of quality of care. Although readmission for medical conditions may involve factors outside the direct control of the hospital, high rates of readmission act as a signal to hospitals to look more carefully at their practices,
including the risk of discharging patients too early and the relationship with community physicians and community-based care.

**Standards/Benchmarks**
Benchmarks have not been identified for this indicator.

**Data Sources**
Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness.

**Reference Period**
Rates are based on the 3 years of pooled data: April 1, 2006 – March 31, 2009.

**Comprehensiveness**
Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.

**References**


**Comments**
A new “combination” code for acute lower respiratory infections in patients with Chronic Obstructive Pulmonary Disease (J44.0) was introduced with ICD-10-CA. According to the Canadian Coding Standards, if COPD patients presented with pneumonia, only J44.0 should be used, but not the other codes from the J44 rubric. This code should be assigned as most responsible diagnosis (MRDx) with pneumonia assigned as a secondary diagnosis. To correct the evident erroneous applications of this coding standard, pneumonia cases coded as MRDx will be removed if J44 was also recorded in any of the secondary diagnosis positions.

### 2.8 Hysterectomy Readmission Rate

**Definition**
Risk adjusted rate of unplanned readmission following discharge for hysterectomy. A case is counted as a readmission if it is for a relevant diagnosis and occurs within 7 or 28 days (depending on condition) after the index episode of care. An episode of care refers to all contiguous in-patient hospitalizations and same-day surgery visits.
Relevant diagnoses for assigning readmission cases:
- Acute posthemorrhagic anemia - 28 days
- Paralytic ileus - 28 days
- Cardiac complications during or resulting from a procedure - 28 days
- Respiratory complications resulting from a procedure - 28 days
- Postoperative infection - 28 days
- Urinary tract infection, site not specified - 7 days
- Retention of urine - 7 days

Method of Calculation
Numerator: Number of hysterectomy episodes with a readmission for a given year
Denominator: Total number of hysterectomy episodes in an 11-month period

A Technical Note describes the episode building and case selection.

A logistic regression model is fitted with age as an independent variable. Coefficients derived from the logistic model are used to calculate the probability of readmission for each case (episode). The expected number of readmissions of a region is the sum of these case probabilities for that region. The risk adjusted readmission rate (RARR) is calculated by dividing the observed number of readmissions of each region by the expected number of readmissions of the region and multiplying by the Canadian average readmission rate. A 95 percent confidence interval for the RARR is also calculated and the method used to calculate confidence intervals is available upon request. Refer to Model Specifications for a list of variables entered in the model and coefficient values.

Interpretation
Readmission rates provide one measure of quality of care. Although readmission following surgery may involve factors outside the direct control of the hospital, high rates of readmission act as a signal to hospitals to look more carefully at their practices, including the risk of discharging patients too early and the relationship with community physicians and community-based care.

Standards/Benchmarks
Benchmarks have not been identified for this indicator.

Data Sources
Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness.

Reference Period
Rates are based on the 3 years of pooled data: April 1, 2006– March 31, 2009.

Comprehensiveness
Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.
References


Comments
Effective with the rates based on the 2006-2007 to 2008-2009 data, hysterectomy cases include both total and sub-total hysterectomies. Sub-total hysterectomy was not uniquely identified in the Canadian Classification of Health Interventions (CCI) versions 2001 and 2003; therefore rates based on 2001-2002 to 2005-2006 data included only total hysterectomies. Identification of sub-total hysterectomies became possible with version 2006 of CCI. For jurisdictions with higher volumes of sub-total hysterectomies comparability with the previous years might be affected.

2.9 Prostatectomy Readmission Rate

Definition
Risk adjusted rate of unplanned readmission following discharge for prostatectomy. A case is counted as a readmission if it is for a relevant diagnosis or procedure and occurs within 28 days after the index episode of care. An episode of care refers to all contiguous in-patient hospitalizations and same-day surgery visits.

Relevant procedures for assigning readmission cases:
- Operations on the ureter
- Operations on the urinary bladder
- Operations on the urethra
- Other operations on the urinary tract
- Operations on the prostate and seminal vesicles
Relevant diagnoses for assigning readmission cases:
- Intestinal infections, other specified bacteria
- Pneumonia, organism unspecified
- Urinary tract infection, site not specified
- Hematuria
- Prostatic hypertrophy
- Retention of urine
- Pneumococcal pneumonia
- Other bacterial pneumonia
- Bronchopneumonia, organism unspecified
- Cardiac complications during or resulting from a procedure
- Respiratory complications resulting from a procedure
- Postoperative infection

**Method of Calculation**

**Numerator:** Number of prostatectomy episodes with a readmission for a given year

**Denominator:** Total number of prostatectomy episodes in an 11-month period

A Technical Note describes the episode building and case selection.

A logistic regression model is fitted with age and select preadmission comorbid diagnosis as independent variables. Coefficients derived from the logistic model are used to calculate the probability of readmission for each case (episode). The expected number of readmissions of a region is the sum of these case probabilities for that region. The risk adjusted readmission rate (RARR) is calculated by dividing the observed number of readmissions of each region by the expected number of readmissions of the region and multiplying by the Canadian average readmission rate. A 95 percent confidence interval for the RARR is also calculated and the method used to calculate confidence intervals is available upon request. Refer to Model Specifications for a list of variables entered in the model and coefficient values.

**Interpretation**

Readmission rates provide one measure of quality of care. Although readmission following surgery may involve factors outside the direct control of the hospital, high rates of readmission act as a signal to hospitals to look more carefully at their practices, including the risk of discharging patients too early and the relationship with community physicians and community-based care.

**Standards/Benchmarks**

Benchmarks have not been identified for this indicator.

**Data Sources**

Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness.

**Reference Period**
Rates are based on the 3 years of pooled data: April 1, 2006 – March 31, 2009.

**Comprehensiveness**
Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.

**References**


**Comments**
A new “combination” code for acute lower respiratory infections in patients with Chronic Obstructive Pulmonary Disease (J44.0) was introduced with ICD-10-CA. According to the Canadian Coding Standards, if COPD patients presented with pneumonia, only J44.0 should be used, but not the other codes from the J44 rubric. This code should be assigned as most responsible diagnosis (MRDx) with pneumonia assigned as a secondary diagnosis. To correct the evident erroneous applications of this coding standard, pneumonia cases coded as MRDx will be removed if J44 was also recorded in any of the secondary diagnosis positions.

These rates should be interpreted with caution due to potential differences in the coding of comorbid conditions across provinces and territories.

**Safety**

2.10  **Hospitalized Hip Fracture Event Rate**

**Definition**
Age-standardized rate of new hip fractures admitted to an acute care hospital per 100,000 population age 65 and older. New event is defined as a first-ever hospitalization for hip fracture or a subsequent hip fracture occurring more than 28 days after the admission for the previous event in the reference period.

**Method of Calculation**
(Total number of new hip fracture events for persons age 65 and older) / Total mid-year population age 65 and older) * 100,000 (Age adjusted)

**Numerator Inclusion Criteria:**
1. Hip fracture present on admission  
   ICD-10-CA: S72.0, S72.1, S72.2; ICD-9/ICD-9-CM: 820.0-820.3, 820.8, 820.9 coded as diagnosis type (1), or [type (M), (W), (X) or (Y), but not also as a diagnosis type (2)]  
2. Age at admission 65 years and older  
3. Gender recorded as male or female  
4. Admission to an acute care institution  
5. Canadian resident

**Numerator Exclusion Criteria:**
1. Records with an invalid Health Card Number or date of birth  
2. Records with an invalid admission date  
3. Hip fracture admissions within 28 days after the admission date of the previous hip fracture hospitalization  
4. Transfers\(^3\)

**Interpretation**
Hip fractures represent a significant health burden for seniors and for the health system. As well as causing disability or death, hip fracture may have a major effect on independence and quality of life. Measuring occurrence of hip fractures in the population is important for planning and evaluating preventive strategies, allocating health resources and estimating costs.

**Standards/Benchmarks**
Benchmarks have not been identified for this indicator.

**Data Source**
Discharge Abstract Database (DAD), CIHI;  
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

**Reference Period**
April 1, 2008 - March 31, 2009.

**Comprehensiveness**
Available for all provinces and territories.

**Comments**
This indicator includes all new hospitalized hip fractures in the reference period encompassing first-ever and recurrent events. A person may have more than one hip fracture event in the reference period. Hip fractures not admitted to an acute care hospital

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\(^3\) If a subsequent hip fracture admission occurs on the same day as or prior to the discharge date of a previous hip fracture admission, it is considered as a transfer.
and in-hospital hip fractures are not included in this indicator. Hip fractures occurring in a hospital are reported separately in the In-hospital Hip Fracture indicator.

References


2.11 In-Hospital Hip Fracture Rate

Definition
Risk-adjusted rate of in-hospital hip fracture among acute care inpatients age 65 and older, per 1,000 discharges.

Method of Calculation
Numerator: Total number of discharges coded with in-hospital hip fracture for patients age 65 and older
Denominator: Total number of discharges among inpatients age 65 and older

A Technical Note describes the selection of cases.

A logistic regression model is fitted with age, sex, whether a surgical procedure was provided, and the following preadmission comorbid conditions: cancer, seizure, syncope, stroke, coma, cardiac arrest, anoxic brain injury, poisoning, delirium and other psychosis, trauma and musculoskeletal/connective tissue disorder (MCC-8) as independent variables. Coefficients derived from the logistic model are used to calculate the probability of in-hospital hip fracture for each case. The expected number of in-hospital hip fractures of a region is the sum of these case probabilities for that region. The risk adjusted in-hospital hip fracture rate (RAR) is calculated by dividing the observed number of in-hospital hip fractures of each region by the expected number of in-hospital hip fractures of the region and multiplying by the Canadian average rate. A 95 percent confidence interval for the RAR is also calculated and the method used to calculate confidence intervals is available upon request. Refer to Technical Note for a list of variables entered in the model and to Model Specifications for the coefficient values.

Interpretation
Proposed by the Agency for Healthcare Research and Quality (AHRQ) and based on the Complications Screening Program, this indicator represents a potentially preventable complication resulting from an inpatient stay in an acute care facility. Variation in the rates may be attributed to numerous factors, including hospital processes, environmental safety, and availability of nursing care. High rates may prompt investigation of potential quality of care deficiencies.
**Standards/Benchmarks**
Benchmarks have not been identified for this indicator.

**Data Source**
Discharge Abstract Database (DAD), CIHI.

**Reference Period**
Rates are based on 3 years of pooled data: April 1, 2006 – March 31, 2009.

**Comprehensiveness**
Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.

**References**

**Comments**
Effective with the rates based on the 2004-2005 to 2006-2007 data, in-hospital hip fracture rate is reported by the jurisdiction where hospitalization has occurred rather than by the jurisdiction of patient residence. With this change the indicator will better reflect the concept of patient safety in the hospitals. This change may affect the comparability with the rates for the previous years.

“Fracture of bone following insertion of orthopaedic implant, joint prosthesis, or bone plate” (ICD-10-CA code M96.6) and in-hospital hip fracture coded in conjunction with an external cause of injury code of “misadventure during surgical or medical care” have been excluded because these events do not reflect patient safety in the context with which it is currently understood. These exclusions are applicable as of the rate based on the 2001-2002 to 2003-2004 data.

These rates should be interpreted with caution due to potential differences in the coding of comorbid conditions across provinces and territories.
3.0 Health System Characteristics

Health System

3.1 Coronary Artery Bypass Graft Surgery (Bypass Surgery) Rate

Definition
Age-standardized rate of coronary artery bypass graft (CABG) surgery performed on inpatients in acute care hospitals, per 100,000 population age 20 and older.

Method of Calculation
(Total number of discharges for CABG for inpatients age 20 and older / Total mid-year population age 20 and older) * 100,000 (Age adjusted)

CCP*
48.1^*

CCI*
1.IJ.76^^

*Code may be recorded in any position. Procedures coded as cancelled, previous, out-of-hospital and “abandoned after onset” are excluded.

Interpretation
As with other types of surgical procedures, variation in CABG surgery rates can be attributed to numerous factors, including differences in population demographics, physician practice patterns, and availability of services. In cases amenable to treatment with less invasive procedures percutaneous coronary intervention (PCI), an alternative intervention to improve blood flow to the heart muscle, may be used. Variations in the extent to which PCI is utilized may result in variations in the rate of bypass surgery.

Standards/Benchmarks
In 2004, the Cardiac Care Network of Ontario recommended a minimum provincial target rate for CABG of 120 interventions per 100,000 adults, to be achieved by 2005–2006. This recommendation is based on analyses of the historical trends in Ontario procedure rates, as well as incidence rates of the underlying conditions linked to CABG surgery.

Data Source
Discharge Abstract Database (DAD), CIHI; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

Reference Period
April 1, 2008 - March 31, 2009
**Comprehensiveness**
Available for all provinces and territories.

**References**
Cardiovascular Health and Services in Ontario. ICES, 1999


Faris PD, Grant FC, Galbraith PD, Gong Y, Ghali WA; Canadian Cardiovascular Outcomes Research Team. *Diagnostic cardiac catheterization and revascularization rates for coronary heart disease*. Canadian Journal of Cardiology 2004; 20:391-397.


**Comments**
Rates are based on the total number of discharges for CABG in a given year. Therefore, a patient who received more than one CABG procedure during the same hospitalization were counted once.
CABG surgeries can only be performed in designated cardiac centres, therefore procedures reported by facilities without on-site CABG services were excluded from the indicator calculation.

### 3.2 Percutaneous Coronary Intervention Rate

**Definition**
Age-standardized rate of percutaneous coronary interventions (PCI) performed on patients in acute care hospitals, same day surgery facilities or catheterization laboratories, per 100,000 population age 20 and older.

**Method of Calculation**
(Total number of discharges for PCI for patients age 20 and older / Total mid-year population age 20 and older) * 100,000 (Age adjusted)

**CCP***
48.02, 48.03

**CCI***
1.IJ.50^^, 1.IJ.57.GQ^^, 1.IJ.54.GQ-AZ
* Code may be recorded in any position. Procedures coded as cancelled, previous, out-of-hospital and “abandoned after onset” are excluded.

**Interpretation**

In many cases, PCI serves as a non-surgical alternative to coronary artery bypass graft (CABG) surgery and is undertaken for the purpose of opening obstructed coronary arteries. While PCI encompasses several techniques, angioplasty is the procedure most frequently provided. The choice of revascularization mode (i.e. PCI or CABG) depends on numerous factors including physician preferences, availability of services, referral patterns, as well as differences in population health and socio-economic status.

**Standards/Benchmarks**

In 2004, the Cardiac Care Network of Ontario recommended a minimum provincial target rate for PCI of 221 interventions per 100,000 adults, to be achieved by 2005-2006, and 260 procedures to be achieved by 2008-2009. These recommendations are based on analyses of the historical trends in Ontario procedure rates, as well as incidence rates of the underlying conditions linked to PCI.

**Data Sources**

Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness.

**Reference Period**

April 1, 2008 - March 31, 2009.

**Comprehensiveness**

Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.

**References**


Faris PD, Grant FC, Galbraith PD, Gong Y, Ghali WA; Canadian Cardiovascular Outcomes Research Team. *Diagnostic cardiac catheterization and revascularization rates for coronary heart disease*. Canadian Journal of Cardiology 2004; 20:391-397.


Comments
Rates are based on the total number of discharges for PCI in a given year. Therefore, a patient who received more than one PCI procedure during the same hospitalization were counted once.

PCI can only be performed in designated cardiac centres, therefore procedures reported by facilities without on-site PCI services were excluded from the indicator calculation.

3.3 Cardiac Revascularization Rate

Definition
Age-standardized rate of coronary artery bypass graft (CABG) surgery performed on inpatients in acute care hospitals or percutaneous coronary interventions (PCI) performed on patients in acute care hospitals, same day surgery facilities or catheterization laboratories, per 100,000 population age 20 and older.

Method of Calculation
(Total number of discharges for CABG or PCI for patients age 20 and older / Total mid-year population age 20 and older) * 100,000 (Age adjusted)

CCP*
48.1^, 48.02, 48.03

CCI*
1.IJ.76^^, 1.IJ.50^^, 1.IJ.57.GQ^^, 1.IJ.54.GQ-AZ

* Code may be recorded in any position. Procedures coded as cancelled, previous, out-of-hospital and “abandoned after onset” are excluded

Interpretation
The choice of revascularization mode (i.e. PCI or CABG) depends on numerous factors including physician preferences, availability of services, referral patterns, as well as differences in population health and socio-economic status. The combined cardiac revascularization rate represents total activity of cardiac revascularization in a jurisdiction.

Standards/Benchmarks
In 2004, the Cardiac Care Network of Ontario recommended a minimum provincial target rate for CABG of 120 interventions per 100,000 adults and 221 interventions per 100,000 adults for PCI to be achieved by 2005–2006, as well as a minimum provincial target rate for PCI of 260 procedures per 100,000 adults to be achieved by 2008-2009. These recommendations are based on analyses of the historical trends in Ontario procedure rates, as well as incidence rates of the underlying conditions linked to CABG and PCI surgery.

Data Sources
Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness.
Reference Period
April 1, 2008 - March 31, 2009.

Comprehensiveness
Available for all provinces and territories, except Quebec. Rates for Quebec are not available due to differences in data collection.

References


Faris PD, Grant FC, Galbraith PD, Gong Y, Ghali WA; Canadian Cardiovascular Outcomes Research Team. *Diagnostic cardiac catheterization and revascularization rates for coronary heart disease*. Canadian Journal of Cardiology 2004; 20:391-397.

Comments
Rates are based on the total number of discharges for a cardiac revascularization procedure in a given year. Therefore, a patient who received more than one procedure (either CABG or PCI) during the same hospitalization were counted once.

Cardiac revascularization procedures can only be performed in designated cardiac centres, therefore procedures that reported by facilities without on-site cardiac services were excluded from indicator calculation.

### 3.4 Hip Replacement Rate

**Definition**
Age-standardized rate of unilateral or bilateral hip replacement surgery performed on inpatients in acute care hospitals per 100,000 population age 20 and older.

**Method of Calculation**
(Total number of discharges for hip replacement surgery for inpatients age 20 and older / Total mid-year population age 20 and older) * 100,000 (Age adjusted)

*CCP*
93.51, 93.52, 93.53, 93.59

*CCI*
1.VA.53.LA-PN^^, 1.VA.53.PN-PN^^

*Code may be recorded in any position. Procedures coded as cancelled, previous, out-of-hospital and “abandoned after onset” are excluded.*
**Interpretation**
Hip replacement surgery has the potential to improve functional status, reduce pain, as well as contribute to other gains in health-related quality of life. Over the past two decades, rates of hip replacement surgery have increased substantially. Wide inter-regional variations in joint replacement rates may be attributable to numerous factors including the availability of services, provider practice patterns, and patient preferences.

**Standards/Benchmarks**
Benchmarks have not been established for this procedure.

**Data Source**
Discharge Abstract Database (DAD), CIHI;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

**Reference Period**
April 1, 2008 - March 31, 2009.

**Comprehensiveness**
Available for all provinces and territories.

**References**


Wright CJ, Robens-Paradise Y. *Evaluation of Indications and Outcomes in Elective Surgery.* May 2001. Centre for Clinical Epidemiology and Evaluation, Vancouver Hospital and Health Services Centre.

**Comments**
Rates are based on the total number of discharges for hip replacement surgery in a given year. Therefore, a patient who received both a left and a right hip replacement in the same year but at separate admissions were counted twice.

Beginning with 2005-2006 rate, this indicator is calculated for the population age 20 and older and therefore is not comparable with rates reported for previous years. Rates based on the new definition were calculated for the previous years to allow for comparisons over time.
3.5 Knee Replacement Rate

**Definition**
Age-standardized rate of unilateral or bilateral knee replacement surgery performed on patients in acute care hospitals or same-day surgery facilities, per 100,000 population age 20 and older.

**Method of Calculation**
(Total number of discharges for knee replacement surgery for patients age 20 and older / Total mid-year population age 20 and older) * 100,000 (Age adjusted)

**CCP**
93.40, 93.41

**CCI**
1.VG.53**

*Code may be recorded in any position. Procedures coded as cancelled, previous, out-of-hospital and “abandoned after onset” are excluded.

**Interpretation**
Knee replacement surgery has the potential to improve functional status, reduce pain, as well as contribute to other gains in health-related quality of life. Over the past two decades, rates of knee replacement surgery have increased substantially. Wide inter-regional variation in joint replacement rates may be attributable to numerous factors including the availability of services, provider practice patterns, and patient preferences.

**Standards/Benchmarks**
Benchmarks have not been established for this procedure.

**Data Sources**
Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

**Reference Period**
April 1, 2008 - March 31, 2009.

**Comprehensiveness**
Available for all provinces and territories.

**References**


Wright CJ, Robens-Paradise Y. *Evaluation of Indications and Outcomes in Elective Surgery.* May 2001. Centre for Clinical Epidemiology and Evaluation, Vancouver Hospital and Health Services Centre.

**Comments**

Rates are based on the total number of discharges for knee replacement surgery in a given year. Therefore a patient who received both a left and a right knee replacement in the same year but at separate admissions were counted twice.

Beginning with 2005-2006 rate, this indicator is calculated for the population age 20 and older and includes same day surgery procedures, and therefore is not comparable with rates reported for previous years. Rates based on the new definition were calculated for the previous years to allow for comparisons over time.

### 3.6 Hysterectomy Rate

**Definition**

Age-standardized rate of hysterectomy provided to patients in acute care hospitals or same-day surgery facilities, per 100,000 women age 20 and older.

**Method of Calculation**

(Total number of discharges for hysterectomy for women age 20 and older / Total mid-year female population age 20 and older) * 100,000 (Age adjusted)

**CCP***

80.2-80.6

**CCI***

1.RM.89^^, 1.RM.91^^ or 1.RM.87.BA-GX, 1.RM.87.CA-GX, 1.RM.87.DA-GX, 1.RM.87.LA-GX with extent attribute coded as “SU”

*Code may be recorded in any position. Procedures coded as cancelled, previous, out-of-hospital, and “abandoned after onset” are excluded.

**Interpretation**

As with other types of surgical procedures, variation in hysterectomy rates can be attributed to numerous factors, including differences in population demographics, physician practice patterns, and availability of services. Utilization rates may reflect the level of
uncertainty about the appropriate use of this surgical procedure. The "right" level of utilization is not known.

**Standards/Benchmarks**
Benchmarks have not been established for this procedure.

**Data Sources**
Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

**Reference Period**
April 1, 2008 - March 31, 2009

**Comprehensiveness**
Available for all provinces and territories.

**References**


**Comments**
Beginning with 2006-2007 rate, hysterectomy cases include both total and sub-total hysterectomies, similar to the reporting prior to 2001-2002 data. Sub-total hysterectomy was not uniquely identified in the Canadian Classification of Health Interventions (CCI) versions 2001 and 2003, therefore hysterectomy rates reported for 2001-2002 to 2005-2006 included only total hysterectomies. Identification of sub-total hysterectomies became possible again with version 2006 of CCI. For jurisdictions with higher volumes of sub-total hysterectomies comparability with the previous years might be affected.

Beginning with 2005-2006 rate, this indicator includes same day surgery procedures. However, due to small volumes of hysterectomy in the same day surgery settings, comparability with the previous years should not be affected.
3.7 Inflow/Outflow Ratio

Definition
A ratio of the number of separations (discharges and deaths) from acute care/same day surgery facilities within a given region divided by the number of acute care/same day surgery separations generated by residents of that region.

Method of Calculation
Numerator: Number of separations (discharges and deaths) from acute care/same day surgery facilities within a given region (including non-residents).
Denominator: Number of separations generated by residents of a given region, where region is as specified in the numerator.

An Overall Ratio was calculated for discharges associated with any diagnosis or procedure for acute care discharges only, and separately for coronary artery bypass graft (CABG), percutaneous coronary intervention (PCI), hip replacement, knee replacement, and hysterectomy procedures*.

CABG (Acute care discharges only):
CCP 48.1^  
CCI 1.IJ.76^^

PCI (Acute care and same day surgery discharges):
CCP 48.02, 48.03  
CCI 1.IJ.50^^, 1.IJ.57.GQ^^, 1.IJ.54.GQ-AZ

Hip Replacement (Acute care discharges only):
CCP 93.51, 93.52, 93.53, 93.59  
CCI 1.VA.53.LA-PN^^, 1.VA.53.PN-PN^^

Knee Replacement (Acute care and same day surgery discharges):
CCP 93.40, 93.41  
CCI 1.VG.53^^

Hysterectomy (Acute care and same day surgery discharges):
CCP
CCI
1.RM.89^^, 1.RM.91^^ or 1.RM.87.BA-GX, 1.RM.87.CA-GX, 1.RM.87.DA-GX, 1.RM.87.LA-GX with extent attribute coded as “SU”

*Code may be recorded in any position. Procedures coded as cancelled, previous, out-of-hospital, and “abandoned after onset” are excluded.

Interpretation
This indicator reflects the balance between the quantity of hospital stays provided to both residents and non-residents by all relevant facilities (acute care/same day surgery) in a given region and the extent of utilization by residents of that region, whether they receive care within or outside of the region. A ratio of less than one indicates that health care utilization by residents of a region exceeded care provided within that region, suggesting an outflow effect. A ratio of greater than one indicates that care provided by a region exceeded the utilization by its residents, suggesting an inflow effect. A ratio of one indicates that care provided by a region is equivalent to the utilization by its residents, suggesting that inflow and outflow activity, if it exists at all, is balanced. A ratio of zero is an indication that none of the institutions in the region provided the service and residents received care outside of their region.

Standards/Benchmarks
Benchmarks are not available for this measure.

Data Sources
Discharge Abstract Database (DAD), CIHI;
National Ambulatory Care Reporting System (NACRS), CIHI;
Alberta Ambulatory Care Database, Alberta Health and Wellness;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

Reference Period
April 1, 2008 - March 31, 2009.

Comprehensiveness
Available for all provinces and territories.

Comments
Beginning with 2006-2007 rate, hysterectomy cases include both total and sub-total hysterectomies, similar to the reporting prior to 2001-2002. Sub-total hysterectomy was not uniquely identified in the Canadian Classification of Health Interventions (CCI) versions 2001 and 2003, therefore hysterectomy rates reported for 2001-2002 to 2005-2006 included only total hysterectomies. Identification of sub-total hysterectomies became possible again with version 2006 of CCI. For jurisdictions with higher volumes of sub-total hysterectomies comparability with the previous years might be affected.
Beginning with 2005-2006 rate, hysterectomy and knee replacement totals include same
day surgery procedures. Due to small volumes of these procedures in the same day surgery
settings, comparability with previous years should not be affected.

Resources

3.8 General/Family Physicians and Specialist Physicians

Definition
General practitioners or family practitioners (family medicine and emergency medicine
specialists) on December 31st of the reference year, per 100,000 population;
Specialist physicians (medical, surgical and laboratory specialists) on December 31st of the
reference year, per 100,000 population.

The data include active physicians in clinical practice and those not working in a clinical
practice. Active physicians are defined as physicians that have an MD degree, are
registered with a provincial/territorial medical college and have a valid address (mail sent to
the physician by Scott’s Directories is not returned). The data exclude residents and non-
licensed physicians who requested that their information not be published in the Canadian
Medical Directory as of December 31 of the reference year.

Method of Calculation
(Total number of General and Family Practitioners / Total mid-year population) * 100,000
(Total number of Specialists / Total mid-year population) * 100,000

Physicians are geo-coded to a region based on the postal code of correspondence
submitted to the Scott’s Medical Database. Records with invalid, missing, or partial postal
codes are excluded from the regional totals.

Interpretation
Physician to population ratios are used to support health human resource planning. While
physician density ratios are useful indicators of changes in physician numbers relative to the
population, inference from total numbers or ratios as to the adequacy of provider resources
should not be made. Various factors influence whether the supply of physicians is
appropriate, such as: distribution and location of physicians within a region or province;
physician type (i.e., family medicine physicians vs. specialists); level of service provided (full-
time vs. part-time); physician age and gender; population’s access to hospitals, health care
facilities, technology and other types of health care providers; population needs
(demographic characteristics and health problems); and society’s perceptions and
expectations.

In some regions, health facilities and personnel provide services to a larger community than
the residents of the immediate region. In others, residents may seek care from physicians
and specialists outside the region where they live. The ratio of physicians to population
reflects the number of doctors in a region and has not been adjusted to take these
movements into account. The extent to which this affects individual regions is likely to vary.

**Standards/Benchmarks**
Benchmarks are not available for this measure.

**Data Source**
Scott’s Medical Database, CIHI.

**Reference Period**
December 31, 2008.

**Comprehensiveness**
Available for all provinces and territories.

**Comments**
While the postal code of correspondence may not necessarily reconcile with a physician’s place of practice, approximately 90% of postal codes submitted refer to the physician’s office, office-in-home or hospital address.

For all jurisdictions and data years specialist physicians include certificants of the Royal College of Physicians and Surgeons of Canada (RCPSC) and/or the Collège des médecins du Québec (CMQ). As of 2004, Saskatchewan and Newfoundland and Labrador specialists also include physicians who are licensed as specialists but who are not certified by the RCPSC or the CMQ (i.e., non-certified specialists). This methodology was extended to Nova Scotia, New Brunswick, and Yukon starting from 2007. For all other jurisdictions, for Saskatchewan and Newfoundland and Labrador prior to 2004, and for Nova Scotia, New Brunswick, and Yukon prior to 2007, non-certified specialists are counted as family practitioners. With the exception of the criteria just noted all other physicians are counted as family practitioners, including certificants of the College of Family Physicians of Canada (CCFP and CCFP-Emergency Medicine). For further information on physician count methodologies please see CIHI’s reports “Supply, Distribution and Migration of Canadian Physicians” and “Certified and Non-Certified Specialists: Understanding the Numbers” (www.cihi.ca).

It is recognized that physician specialty classification as noted above does not necessarily reflect the services provided by individual physicians. The range of services provided by a physician is subject to provincial licensure rules, medical service plan payment arrangements, and individual practice choices. Due to differences in data collection, processing and reporting methodology, these indicators may differ from provincial and territorial data.

Note: Scott’s Medical Database (SMDB) information may undercount physicians due to Provincial/Territorial licensing authority data supply interruptions. SMDB data does not reflect licensing authority updates for the following jurisdictions and years: British Columbia 2004; Québec 2003; Ontario 2002; Alberta and the Yukon 2000.
4.0 Disparity

4.1 Disparity Rate Ratio

Definition
Ratio of the rate of a health indicator for the least affluent neighbourhood income quintile to the rate for the most affluent neighbourhood income quintile.

Method of Calculation
Indicator rate for the least affluent neighbourhood income quintile / indicator rate for the most affluent neighbourhood income quintile

Interpretation
This indicator reflects the rate for the least affluent socio-economic group compared to the most affluent. It provides a summary measure of the magnitude of the socio-economic disparity for a health indicator in a jurisdiction. It should be evaluated together with other measures, such as the indicator rate for each socio-economic group as well as potential rate reduction.

Standards/Benchmarks
A rate ratio of 1 indicates no disparity between the least affluent and the most affluent groups.

Data Sources
2006 Census, Statistics Canada;
Discharge Abstract Database, Canadian Institute for Health Information;
National Ambulatory Care Reporting System, Canadian Institute for Health Information;
Alberta Ambulatory Care Database, Alberta Health and Wellness;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

Reference Period
April 1, 2008 - March 31, 2009

Comprehensiveness
Available for all provinces. Not available for the territories due to the small population in each quintile.

References

4.2 Potential Rate Reduction (PRR)

**Definition**
Potential reduction in a health indicator rate that would occur in the hypothetical scenario that each socio-economic group in the jurisdiction experienced the rate of the most affluent socio-economic group.

**Method of Calculation**
\[
P_{PRR} = \frac{\sum_{i=1}^{5} N_i R_i \left(\frac{R_i}{P_i} - 1\right)}{1 + \sum_{i=1}^{5} N_i R_i \left(\frac{R_i}{P_i} - 1\right)}
\]

Where \( R_i \) and \( P_i \) are the age-standardized rate and the proportion of population in each of the five income quintiles, respectively.

**Interpretation**
This indicator is based on the concept of population-attributable risk and provides a summary measure of the overall effect of socio-economic disparity on a health indicator in a jurisdiction. This indicator is relevant when disparity has been identified by other measures such as the indicator rates for each socio-economic group as well as the disparity rate ratio.

**Standards/Benchmarks**
Benchmarks are not available for this measure.

**Data Sources**
2006 Census, Statistics Canada;
Discharge Abstract Database, Canadian Institute for Health Information;
National Ambulatory Care Reporting System, Canadian Institute for Health Information;
Alberta Ambulatory Care Database, Alberta Health and Wellness;
Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux.

**Reference Period**
April 1, 2008 - March 31, 2009

**Comprehensiveness**
Available for all provinces. Not available for the territories due to the small population in each quintile.

**References**


**Comments**
Socio-economic status was measured using neighbourhood income quintile. In the absence of personal socio-economic characteristics (that is, individual-level data) in the administrative health databases, small geographic area characteristics based on census data were used to derive neighbourhood income quintile. The methodology for defining neighbourhood income quintile is provided on page 3.