



Canadian Hospital Reporting Project Technical Notes—Clinical Indicators

March 2013

Health System Performance



Canadian Institute
for Health Information

Institut canadien
d'information sur la santé



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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1 About the Canadian Hospital Reporting Project

The Canadian Institute for Health Information (CIHI) developed the Canadian Hospital Reporting Project (CHRP) to create a set of standardized, comparable hospital performance indicators across participating jurisdictions.

The objectives of the project are to

- Provide comparable indicators to support performance measurement and quality improvement among Canadian hospitals;
- Help senior executives and board members with strategic planning and priority-setting;
- Enable quality improvement managers to monitor improvements and outcomes that are related to specific quality initiatives and to trend hospital performance over time; and
- Enable hospitals to compare themselves with other hospitals in their category (for example, teaching, community or small), against the provincial average, within their regional health authority and across jurisdictions.

The clinical aspect of this project focuses on four main dimensions of the health system's performance: effectiveness, patient safety, appropriateness and accessibility.

All provinces and territories are participating in CHRP.

More Information

For more information about CHRP, please send an email to hospitalreporting@cihi.ca.

2 Purpose of the Technical Notes

The purpose of the technical notes is to give users the methodological details behind the CHRP indicators so they can better understand the results of these measures. Please note that there are separate technical notes for the clinical and financial indicators for this project.

3 What's New?

This section summarizes the main changes to the CHRP clinical indicators for the March 2013 update.

Please note that a “new” icon has been added to the relevant sections of the document to indicate an update in methodology. What follows describes the methodological changes that have been implemented for this release:

- In 2011–2012, the Discharge Abstract Database (DAD) introduced the valid value “9999” for unknown admission and discharge times, which increased the number of records with missing or unknown times. All inpatient DAD records with an admission or discharge time of “9999” were excluded from CHRP clinical indicators as part of the non-clinical exclusion criteria, whereas day surgery records with unknown admission or discharge times were imputed (please see Identifying Acute Care and Day Procedure Data).
- The methodology to calculate the indicator [Hip Fracture Surgical Procedures Performed Within 48 Hours: Wait Time Across Facilities](#) has changed. Please see the relevant section for details.
- The definition of surgical revisions has been refined for the indicators [90-Day Readmission After Hip Replacement](#) and [90-Day Readmission After Knee Replacement](#).
- The definition of palliative records in Quebec has been refined for the [30-Day Overall Readmission](#) indicators (including [Obstetric](#), [Patients Age 19 and Younger](#), [Surgical](#) and [Medical Readmissions](#)).
- The upper age limit (105 years) has been removed from the following indicators:
 - [5-Day In-Hospital Mortality Following Major Surgery](#)
 - [30-Day In-Hospital Mortality Following Acute Myocardial Infarction](#)
 - [30-Day In-Hospital Mortality Following Stroke](#)
 - [28-Day Readmission After Acute Myocardial Infarction](#)
 - [28-Day Readmission After Stroke](#)
 - [90-Day Readmission After Hip Replacement](#)
 - [90-Day Readmission After Knee Replacement](#)
 - [In-Hospital Hip Fracture in Elderly \(65+\) Patients](#)
 - [Nursing-Sensitive Adverse Events for Medical Patients](#)
 - [Nursing-Sensitive Adverse Events for Surgical Patients](#)
 - [Use of Coronary Angiography Following Acute Myocardial Infarction](#)
 - [Hip Fracture Surgical Procedures Performed Within 48 Hours: Wait Time Across Facilities](#)

Please see the relevant indicator sections for complete details; additionally, [Appendix F: Summary of Indicator Changes](#) provides a complete summary of all indicator changes.

Hip Fracture Surgical Procedures Performed Within 48 Hours: Wait Time Across Facilities

In an effort to align the methodologies for similar indicators across CIHI, the methodology used to calculate this indicator has been updated. The methodological changes are as follows:

- The time interval between the admission date for the index hospitalization and the admission date for the surgical hospitalization must be within 28 days (the previous methodology did not have a time interval limit).
- Data from both the current and previous fiscal years is used to identify index cases (the previous methodology considered only the current fiscal year).
- The exclusion of records at the end of the fiscal year (on or after March 16) has been removed.
- The upper age limit (105 years) has been removed.
- A new exclusion criterion has been introduced: a hip fracture event is excluded if another hip fracture is coded as a post-admission diagnosis on the index hospitalization or on the surgical record, regardless of admission category.

In addition to the new data for 2011–2012, this indicator has been recalculated for 2009–2010 and 2010–2011.

Data Refresh

2011–2012 Indicator Results

Indicator results for 2011–2012 are now available in the public eTool.

Quebec Data

Quebec data is included in nine CHRP clinical indicators. Please see the following table for details:

Indicator	Fiscal Year Data Availability
90-Day Readmission After Hip Replacement	2008–2009, 2009–2010, 2010–2011
90-Day Readmission After Knee Replacement	2008–2009, 2009–2010, 2010–2011
30-Day Overall Readmission	2009–2010, 2010–2011
30-Day Medical Readmission	2009–2010, 2010–2011
30-Day Obstetric Readmission	2009–2010, 2010–2011
30-Day Readmission—Patients Age 19 and Younger	2009–2010, 2010–2011
30-Day Surgical Readmission	2009–2010, 2010–2011
Caesarean Section Rate: Excluding Pre-Term and Multiple Gestations	2008–2009, 2009–2010, 2010–2011
Vaginal Birth After Caesarean Section	2008–2009, 2009–2010, 2010–2011

All of the above indicators have been newly calculated for fiscal year 2010–2011 for Quebec.

With the finalization of data, users may notice slight differences in facility, peer, provincial and national results for 2010–2011 and 2011–2012.

4 Data Sources

In 2011–2012, most participating hospitals submitted acute care and day procedure data to CIHI’s Discharge Abstract Database (DAD) and NACRS. For 2010–2011, hospitals in Quebec submitted data to MED-ÉCHO; MED-ÉCHO then submitted the data to CIHI and integrated it into the Hospital Morbidity Database (HMDB). Please note that prior to 2010–2011, Alberta’s day procedure data was submitted to the Alberta Ambulatory Care Reporting System (AACRS) and then provided to CIHI by Alberta Health Services. Please see Appendix E: Potential Acute Care and Day Procedure Records—AACRS Data for 2007–2008 to 2009–2010 for more details.

Non-DAD data was converted to DAD’s data layout for the CHRP project and grouped using standard CIHI protocols. Nevertheless, some differences remain due to differing data collection standards and definitions among hospitals that submit to the DAD and those that do not.

The clinical indicator results are based on data for patients who died, were dischargedⁱ or signed out between 2007–2008 and 2011–2012.ⁱⁱ Results from nursing stations and stand-alone day surgery clinics/cancer institutions are excluded from all clinical indicator averages. Results from pediatric hospitals are excluded from all clinical indicator averages except for the following indicators: [30-Day Overall Readmission](#), [30-Day Obstetric Readmission](#), [30-Day Surgical Readmission](#), [30-Day Medical Readmission](#) and [30-Day Readmission—Patients Age 19 and Younger](#).

5 Identifying Acute Care and Day Procedure Data

The following approach is used to identify qualifying acute care and day procedure cases.

Step 1: Select potential acute care and day procedure records

Table 1A: Potential Acute Care and Day Procedure Records—DAD Data

	Criteria	Codes
Include	All acute care and day procedure records	Facility Type Code* = 1 (acute care) or A (day surgery)
Exclude	Stillbirths and cadaveric donors	Admission Category Code = S or R
	Potential duplicate records	Duplicate records are excluded if they match on the following data elements: Facility Province, Institution Number, Health Card Number, Birth Date, Gender, Patient Postal Code, Admission Date, Admission Time, Weight, Discharge Date, Discharge Time, Most Responsible Diagnosis and Principal Intervention

Note

* Facility Type Code is a CIHI variable that identifies the level of care of an institution (for example, acute care, day surgery, subacute).

i. Please note that abstracts from NACRS are based on admissions rather than discharges.

ii. A fiscal year runs from April 1 to March 31 of the following calendar year. Included in the indicator calculations are patients who died, were discharged or signed out of hospital during the relevant fiscal year.

Table 1B: Potential Day Procedure Records—NACRS Data

	Criteria	Codes
Include	Ontario day surgery functional centres	See Appendix D
	Ontario and Alberta cardiac catheterization labs	MIS functional centre 7*3403700 or 7*4155500
	Nova Scotia day surgery functional centres	See Appendix D
	Alberta day surgery functional centres	See Appendix D
	Scheduled emergency department (ED) procedures for Ontario, Nova Scotia, British Columbia, Prince Edward Island, Yukon, Manitoba and Alberta	MIS functional centre 7*3100000, 7*3102000, 7*3104000, 7*3106000, 7*3102500 or 7*3107000
	Cases with specific procedures of interest that were performed in non-ED centres and that do not fit into any of the above criteria	<p>AND</p> <p>ED_VISIT_INDICATOR = 0</p> <p>Hysterectomy: CCI code 1.RM.89, 1.RM.91 or 1.RM.87 with extent attribute = SU</p> <p>Prostatectomy: CCI code 1.QT.59 or 1.QT.87</p> <p>Percutaneous coronary intervention (PCI): CCI code 1.IJ.50.^, 1.IJ.57.GQ.^ or 1.IJ.54.GQ-AZ</p> <p>Coronary artery bypass graft (CABG): CCI code 1.IJ.76</p> <p>Hip replacement: CCI code 1.VA.53.^</p> <p>Knee replacement: CCI code 1.VG.53.^</p> <p>Angiography: CCI code 3.IP.10.VX</p> <p>Cholecystectomy: CCI code 1.OD.89.^</p> <p>Labour and delivery: CCI code 5.MD.50.^, 5.MD.51.^, 5.MD.52.^, 5.MD.53.^, 5.MD.54.^, 5.MD.56.^, 5.MD.57.^, 5.MD.58.^, 5.MD.59.^ or 5.MD.60.^</p>
Exclude	All potential duplicate records	<p>Prior to 2011–2012, duplicate records are excluded if they match on the following data elements: Chart Number, Health Card Number, Date of Registration and Time of Registration. For records from Alberta, additional variables were used to identify potential duplicates: Diagnosis Code, Procedure Code, MIS Functional Centre Code and Provider Number.</p> <p>In 2011–2012, a common list of variables was used to identify duplicates in NACRS: Chart Number, Health Card Number, Date of Registration, Time of Registration, Facility Ambulatory Care Number, Gender, Visit Disposition, Main Problem, Main Intervention and MIS Functional Centre Code.</p>
	NEW NEW Main provider is not a physician	Provider_Type = M and Provider_Service_Code = (00000–01003, 01012, 01013)

Table 1C: Potential Acute Care and Day Procedure Records—HMDB Data

	Criteria	Codes
Include	All acute and day surgery records for Quebec only	Facility Type Code* = 1 (acute care) or A (day surgery)
Exclude	Stillbirths and cadaveric donors Potential duplicate records	Admission Category Code = S or R Duplicate records are excluded if they match on the following data elements: Facility Province, Institution Number, Health Card Number, Gender, Admission Date, Admission Time, Weight, Discharge Date, Discharge Time and Most Responsible Diagnosis

Notes

* Facility Type Code is a CIHI variable that identifies the level of care of an institution (for example, acute care, day surgery, subacute). Quebec does not submit birth date, patient postal code or principal intervention data.

Step 2: Apply inclusion and exclusion criteria (where applicable)**Table 2A: Non-Clinical Criteria**

	Criteria
Include	Gender recorded as male or female (Gender = M or F) Valid unique Health Card Number
Exclude	Records with an invalid date of birth* Records with an invalid admission date or time [†] Records with an invalid discharge date or time [‡] Records with Canada (CA) as the province/territory issuing the Health Card Number

Notes

* This exclusion does not apply to Quebec records, as date of birth is not available.

[†] Registration date/time is used for NACRS records.

[‡] Disposition date/time is used for NACRS records. As there are a large number of records in NACRS with invalid disposition times, these records are not excluded. Instead, a disposition time was imputed based on the average lengths of stay observed in the NACRS data. In 2011–2012, the DAD introduced the valid value of “9999” for unknown admission and discharge times. For DAD day surgery records with unknown admission and discharge times, the NACRS imputation method was used.

Table 2B: Clinical Exclusion Criteria

	Criteria	ICD-10-CA Codes
Exclude	Records with any one of the following diagnoses recorded in any position:	
	Cancer	C00–C97, Z51.0 or Z51.1
	HIV	B24, Z21, R75 or O98.7
	Trauma	One of the following external cause codes: V01–V99, W00–W23, W25–W27, W30, W31, W33–W40, W44, W45, W50–W60, W64–W70, W73–W77, W81, W83–W84, W85–W99, X00–X09, X10–X19, X20–X29, X30, X31, X33–X38, X51, X53, X54, X57, X60–X84, X85–Y09, Y35.0–Y35.4, Y35.6, Y35.7 or Y36 AND at least one S or T code but not one of the following: S00, S10, S20, S30, S40, S50, S60, S70, S80, S90, T00, T090, T110, T130, T140, T201, T205, T211, T215, T221, T225, T231, T235, T241, T245, T251, T255, T291, T295, T301, T305, T33, T350, T900, T36–T65, T96, T97, T78 or T80–T88

6 Grouping Methodologies

When a patient is discharged from a hospital, information relating to his or her care is recorded on an abstract and electronically submitted to CIHI. CIHI then uses some of this information to assign inpatients to a MCC as well as to a specific CMG. CMGs and MCCs are then used to group patients with similar clinical characteristics for analysis.

Please note that all clinical data was grouped using the grouping methodology that is native to the data year.

7 Building Episodes of Care—Linking Cases Across Hospitals

The unit of analysis for most of the indicators is an episode of care. An episode of care refers to all contiguous inpatient hospitalizations and day procedure visits. This avoids analyzing transfers as two separate hospitalizations. To construct an episode of care, a transfer is assumed to have occurred if either of the following conditions is met:

- Admission to an acute care institution or day surgery facility occurs within six hours of discharge from another acute care institution or day surgery facility, regardless of whether either institution codes the transfer; or
- Admission to an acute care institution or day surgery facility occurs within 6 to 12 hours of discharge from another acute care institution or day surgery facility and at least one of the institutions codes the transfer.

Record Linkage

For CHRP, all records with valid health card numbers (HCNs), birth dates, genders, admission dates and discharge dates from the DAD, as well as day surgery data from NACRS, are linked across provinces. An acute care or day procedure record from one facility is linked to a subsequent acute care or day procedure record in any facility by matching the encrypted HCN and patient birth date.

The linkage methodology used in CHRP allows for linkage across Canada, with the exception of Quebec and Manitoba. In these provinces, linkage can be done only within the province due to the submission format of the HCNs.

As we are unable to link patients who are transferred in and out of Quebec and Manitoba, results from hospitals that routinely transfer patients to or from these provinces may be affected. For example, hospitals that routinely transfer patients to Manitoba or Quebec for cardiac procedures may appear to have higher rates for the indicator 28-Day Readmission After Acute Myocardial Infarction and lower rates for the indicator Use of Coronary Angiography Following AMI. This issue has specifically been identified for Zone 4 in New Brunswick, as patients from this zone are often transferred to Quebec. Please use caution when interpreting these rates.

8 Peer Group Methodology

The purpose of assigning hospitals to a peer group is to facilitate standard comparisons by categorizing acute care hospitals that have similar structural and patient characteristics. There are two categories of peer groups: custom and standard.

The **custom peer group**, part of the final product in the eTool, will allow users to choose peers based on hospital capacity, patient complexity, operations and resources using the following characteristics:

- Total inpatient weighted cases;
- Average typical Resource Intensity Weight;
- Average typical expected length of stay; and
- Total beds staffed and in operation.

The **standard peer groups** were developed based on literature reviews and consultations with internal and external experts. Based on 2008–2009 data, hospitals were assigned to one of four standard peer groups: T (Teaching), H1 (Community—Large), H2 (Community—Medium) and H3 (Community—Small).

Teaching hospitals are defined as hospitals with full membership in the Association of Canadian Academic Healthcare Organizations (ACAHO). ACAHO members are 1) stand-alone teaching hospitals with their own governance structure or 2) made up of a network of single-hospital organizations or multi-site regional facilities that are governed by a regional (or provincial) health authority structure. A distinguishing characteristic of ACAHO members is that they have formal partnerships with universities and work closely with them to provide undergraduate and post-graduate medical education.¹ For some provinces, ACAHO's website lists full members at the regional level rather than the hospital level. For hospitals in these regions, the hospitals' websites were examined to determine whether they self-identified as full ACAHO members. Exceptions to ACAHO's teaching designation are Quebec hospitals that are designated as teaching based on their provincial ministry–approved designation and qualifying ACAHO characteristics. The resulting list of teaching hospitals was then verified internally with other CIHI departments and externally with ACAHO and jurisdictional contacts.

Non-teaching hospitals are allocated to the larger, medium or smaller community hospital peer group based on their volumes (using inpatient cases, total weighted cases and inpatient days). Hospitals are categorized as H1 if they meet two of the following three criteria:

- More than 8,000 inpatient cases
- More than 10,000 weighted cases
- More than 50,000 inpatient days

Hospitals that do not meet the above criteria were classified as H2 or H3 depending on the hospital's total weighted cases (H2—2,000 weighted cases or more, H3—fewer than 2,000 weighted cases). Borderline cases were reviewed and reassigned based on averages across multiple years. The hospital-level peer group for multi-site hospitals is assigned based on the hierarchy of the site-level peer groups. The hierarchical order is T, H1, H2 and then H3.

Peer Group Updates for This Release

Please note that for this release, the peer group for the Children's and Women's Health Centre of British Columbia has been reclassified as Teaching; this change has been implemented for all fiscal years. As a result, there may be slight changes in historical peer group averages for the Community—Large and Teaching peer groups.

9 Indicator Development

To determine which clinical indicators were most relevant to performance measurement and quality improvement among Canadian hospitals, CIHI's Hospital Reports team conducted an extensive review of existing indicators from peer-reviewed literature. The purpose of the review was to identify potential measures of hospital clinical performance and conditions considered important by other sources in the field. From this review, and with input from experts in the field, potential indicators were selected according to specified criteria: feasibility, scientific soundness, relevance and whether they are amenable to intervention and improvement by hospitals.

The team also conducted an environmental scan of various national and international hospital performance measurement organizations, tools and projects, such as the Agency for Healthcare Research and Quality, the Programs for Assessment of Technology in Health, the Ontario Hospital Association's *Hospital Reports* and the CIHI–Hay Group benchmarking project. To further inform the selection of indicators, an information needs survey was disseminated to stakeholders to identify strategic information needs.

The list of potential indicators and the proposed methodology were presented to and discussed with internal and external experts to ensure the selected indicators were relevant, easy to interpret and actionable. Throughout the development phase, preliminary findings were discussed with experts, researchers and clinicians to review and refine the indicator methodology and to ensure face validity. Indicators were excluded if limitations in data availability prevented their measurement, even if they had the potential to provide relevant important information.

Due to changes in classification coding and grouping methodologies, refinements are made to the indicators on a yearly basis.

If you have any suggestions or comments, please send an email to hospitalreporting@cihi.ca.

10 Interpreting the Results

Comparisons of hospital performance indicators are best used as screening tests. These results do not provide a final conclusion about hospital performance but can be used as the first step in an improvement process to identify areas for follow-up and potential improvements.

11 Risk Adjustment

When comparing outcomes across hospitals, it is important to account for differences in patient characteristics that may vary among hospitals; without adjustment, data comparisons can be skewed by differences in patient populations. Risk adjustment is a method used to control for patient characteristics that may affect health care outcomes and improves hospital comparability after the pre-existing influence of patient population is removed.

Statistical regression modelling, an indirect method of standardization in risk adjustment, was used to risk-adjust patient characteristics. Risk factors that were controlled for include age, gender and selected pre-admit comorbid diagnoses that were applicable to the indicator. The selected risk factors were identified based on a literature review, clinical evidence and expert group consultations using the principles of appropriateness, viability (that is, sufficient number of events) and data availability. Risk factors must be listed as significant pre-admit conditions on the patient's abstract for them to be identified for risk adjustment. For indicators relating to readmission after certain medical conditions (for example, 28-Day Readmission After AMI and 28-Day Readmission After Stroke), diagnoses were flagged as risk factors if they were recorded as pre-admit conditions on any of the records within patients' episodes of care. For all other indicators, risk factors were flagged if conditions were recorded as pre-admit diagnoses on the record where the outcome/denominator was abstracted.

The logistic regression model was employed, except for indicators that had low outcome rates (<1%); in these cases, the Poisson regression model was used, as it gives more accurate values for rare-event outcomes. Coefficients derived from the regression models were used to calculate the probability of an outcome for each denominator case; these were then summed for each hospital (or for other reporting levels such as regions, provinces and peer groups) to calculate the expected number of cases of each outcome. The risk-adjusted rate was calculated by dividing the observed number of cases by the expected number of cases and multiplying by the Canadian average.

The formula is as follows:

$$\text{Risk-Adjusted Rate} = \frac{\text{Observed Cases} \times \text{Canada Average}}{\text{Expected Cases}}$$

Where

Observed cases (O) = the number of observed events (or numerator cases, such as actual number of deaths)

Expected cases (E) = the number of expected events, adjusted for the distribution of risk factors in the hospitals (regions, provinces, etc.). Coefficients derived from regression models used data from each fiscal year to obtain the expected number of cases.

Canada average = the standard population rate, or the Canadian average rate for all provinces and territories for each fiscal year (total number of numerator cases nationally divided by the total number of denominator cases nationally multiplied by 100 if the indicator is expressed as a rate per 100 or multiplied by 1000 if the indicator is expressed as a rate per 1000)

In addition, 95% confidence interval (CI) limits for the risk-adjusted rates were calculated using Daly's formula for exact Poisson confidence limits.² The formulas for calculating the lower (LCL) and upper (UCL) limits of the 95% CIs are shown below.

Calculate lower and upper confidence limit numerator:

$$\text{LCL}_{\text{numerator}} = \text{GAMINV}(0.025, \text{numerator})$$

$$\text{UCL}_{\text{numerator}} = \text{GAMINV}(0.975, \text{numerator} + 1)$$

Calculate the confidence limits for an adjusted rate:

$$\text{LCL}_{\text{adjusted rate}} = (\text{LCL}_{\text{numerator}} / \text{expected}) \times \text{Canada average}$$

$$\text{UCL}_{\text{adjusted rate}} = (\text{UCL}_{\text{numerator}} / \text{expected}) \times \text{Canada average}$$

Where

Numerator = the observed number of event cases for a given reporting level (for example, hospital site, hospital, peer group, province, region or peer group by province)

Expected = the expected value of the event cases

Canada average = the standard population rate, or the Canadian average rate for all provinces and territories for each fiscal year

Notes

The Poisson method uses the inverse gamma function in its calculation.

If the UCL is greater than the maximum possible value of the indicator, the UCL is reset to be equal to that maximum possible value. That is, for an indicator that is calculated per 100 cases, a UCL greater than 100 is reset to 100, and for an indicator that is calculated per 1,000 cases, a UCL greater than 1,000 is reset to 1,000. Also, if there is a risk-adjusted rate equal to 0, the associated LCL is also set to 0.

Confidence intervals are provided to aid interpretation. The width of the confidence interval illustrates the degree of variability associated with the rate. Indicator values are estimated to be accurate within the upper and lower confidence interval 19 times out of 20 (95% confidence interval). Risk-adjusted rates with confidence intervals that do not contain the Canada average can be considered statistically different from the Canada average.

Risk-adjusted rates are calculated at the hospital, health administration region and provincial/territorial levels. Regional and provincial risk-adjusted rates are aggregated hospital-level data.

It is important to note that the expected performance level of an institution in this indirect method of standardization of risk-adjustment is based on how all institutions perform, because the number of expected cases is calculated based on regression models fitted on all cases from all hospitals. Furthermore, risk-adjustment modelling cannot entirely eliminate differences in patient characteristics among hospitals, because not all pre-admission influences are adjusted for; if left unadjusted for (due to reasons such as viability), hospitals with the sickest patients or that treat rare or highly specialized groups of patients could still score poorly. Finally, when interpreting risk-adjusted results, it is recommended that the hospital's result be compared with the Canada average.

Information on Canada averages, model specifications (coefficients and p-values) and ICD-10-CA codes used to flag risk factors can be found in [CHRP Technical Notes—Risk-Adjustment Tables](#). Also, please see [Appendix C](#) for more information about diagnoses types that were used to calculate and risk-adjust indicator rates.

References

1. Association of Canadian Academic Healthcare Organizations (ACAHO). About our Members-Members. <http://www.achho.org/?members>. Updated 2013. Accessed April 9, 2010.
2. Daly L. Simple SAS macros for the calculation of exact binomial and Poisson confidence limits. *Computers in Biology & Medicine*. September, 1992;22(5):351-361.

12 Suppression Rule

To maintain privacy and for public reporting purposes, a suppression rule is applied to the indicator results, following the definitions below:

- The indicator rates will be suppressed for public reporting if the indicator has a denominator less than 5;
- The indicator rates are classified as low volume rates (unstable) if they have a denominator less than 50 or an expected value less than 1 with a numerator greater than 0; and
- The indicator rates are considered to be stable if they did not meet any of the above criteria.

It is important to note that low volume rates should be interpreted with caution. It is not recommended to compare low volume rates with stable rates.

13 Performance Allocation

Performance allocation is intended to help hospitals identify other hospitals they can learn from to assist in identifying areas where improvement is needed, increase collaboration as well as track the success of improvement initiatives.

Clinical performance allocation results for 2011–2012 are not available. Additionally, 2010–2011 performance allocation results for the 90-Day Readmission After Hip Replacement and 90-Day Readmission After Knee Replacement indicators have not been updated with Quebec data. (Please note that with the inclusion of Quebec, results for all facilities in all jurisdictions would have been affected.)

Performance allocation was previously assigned to seven indicators from the Clinical Effectiveness domain:

- 5-Day In-Hospital Mortality Following Major Surgery (2007–2008 to 2010–2011)
- 30-Day In-Hospital Mortality Following Acute Myocardial Infarction (2007–2008 to 2010–2011)
- 30-Day In-Hospital Mortality Following Stroke (2007–2008 to 2010–2011)
- 28-Day Readmission After Acute Myocardial Infarction (2007–2008 to 2010–2011)
- 28-Day Readmission After Stroke, (2007–2008 to 2010–2011)
- 90-Day Readmission After Hip Replacement; and (2007–2008 to 2010–2011 for hospitals outside Quebec, 2008–2009 and 2009–2010 for Quebec hospitals)
- 90-Day Readmission After Knee Replacement (2007–2008 to 2010–2011 for hospitals outside Quebec, 2008–2009 and 2009–2010 for Quebec hospitals)

Performance allocation was completed within and across fiscal years. The method was developed to suit both stable and low volume rates. Please refer to [Suppression Rule](#) section for the definition of stable and low volume rates.

Assigning Performance Allocation Within a Fiscal Year

Hospitals' risk-adjusted rates for each indicator were compared with a performance range for each indicator. The above performance range suggests better performance. The **performance range** for each indicator was defined as the range between the **performance average** and the **performance 75th percentile**.

- **Performance average** = the average of three years (2007–2008, 2008–2009 and 2009–2010) of data for all hospitals for the indicator.
- **Performance 75th percentile** = top 25th percentile indicator rates for three years (2007–2008, 2008–2009 and 2009–2010) for all stable rate hospital for the indicator.

Performance Allocation Assignment

For stable rate:

- **Above performance range:** Hospital risk-adjusted rate was equal to or better than the performance 75th percentile.
- **Within performance range:** Hospital risk-adjusted rate was between the performance average and the performance 75th percentile.
- **Below performance range:** Hospital risk-adjusted rate was worse than the performance average.

For low volume rate:

- **Above performance range:** Hospital risk-adjusted rate was equal to or better than the performance average.
- **Below performance range:** Hospital risk-adjusted rate was worse than the performance average.

Note: For all indicators to which performance allocation is applied, a lower rate is more desirable. A lower value on these indicators suggests better performance.

The following table shows the performance allocation ranges used in the April 2012 CHRP public release. **Kindly note that performance allocation has not been calculated for the CHRP public update in March 2013.**

Performance Allocation Range							
	28-Day Readmission After Acute Myocardial Infarction (rate per 100)	28-Day Readmission After Stroke (rate per 100)	90-Day Readmission After Hip Replacement (rate per 100)	90-Day Readmission After Knee Replacement (rate per 100)	30-Day In-Hospital Mortality Following Acute Myocardial Infarction (rate per 100)	30-Day In-Hospital Mortality Following Stroke (rate per 100)	5-Day In-Hospital Mortality Following Major Surgery (rate per 1,000)
Performance 75th Percentile	9.52	5.12	2.09	2.28	6.39	13.37	5.81
Performance Average	11.66	7.09	3.53	3.44	8.26	16.87	10.08

14 Indicators: Effectiveness (Quality and Outcomes)

i. 5-Day In-Hospital Mortality Following Major Surgery

Definition

This indicator measures the rate of in-hospital deaths due to all causes occurring within five days of major surgery.

- **Unit of analysis:** The measuring unit of this indicator is a single admission. The indicator is expressed as a rate of in-hospital deaths within five days of major surgery per 1,000 major surgical cases.
- **Denominator:** Hospitalizations with major surgery performed between April 1 and March 25 of the fiscal year.
- **Numerator:** Cases within the denominator where an in-hospital death occurred within five days of major surgery.

Notes

In the denominator population, major surgery must have been performed in an inpatient setting.

This indicator links patients across facilities. For example, if a patient had major surgery in Hospital A and was then immediately transferred to Hospital B, where no major surgery CMG was coded but died two days later, Hospital A would be attributed both the denominator and the numerator, while Hospital B would not be attributed either the denominator or the numerator.

The in-hospital death can occur between April 1 and March 31 of the fiscal year.

Rationale

The volume of surgical procedures undertaken every year is considerably large.¹ It is estimated globally that one major surgery is performed per 25 living humans annually.¹ Complications in surgical care have become a major cause of death² as a result, surgical safety has been recognized as a significant public health concern and was one of the areas selected for the Global Patient Safety Challenges by the World Health Organization.

Studies have shown the importance of pre-operative assessment of patient conditions and risk,²⁻⁴ intra-operative surgical and anaesthetic management²⁻⁴ and post-operative support in preventing surgical deaths.^{3,4} Although not all deaths are preventable, reporting on and comparing mortality rates for major surgical procedures may increase awareness of surgical safety and act as a signal for hospitals to investigate their processes of care before, during or immediately after the surgical procedure for quality improvement opportunities.

While 30-day mortality is commonly used for reporting hospital mortality,⁴⁻⁷ the 5-day time frame was selected to capture deaths that occur shortly after major surgery. This time criterion is based on the median length of stay after surgery for major surgical cases.ⁱⁱⁱ

Method of Calculation

Numerator		
	Criteria	Codes
Include	All-cause in-hospital deaths occurring in an acute care setting within five days following major surgery	Discharge Disposition Code = 07 (died) AND Facility Type Code = 1 (acute care) AND (Discharge date) – (CMG intervention date) ≤5 days
Denominator		
	Criteria	Codes
Include	All major surgical procedures performed in an acute care facility between April 1 and March 25 of the fiscal year	Major surgery, as defined by the CMG+ list (see Appendix A) AND Facility Type Code = 1 (acute care) AND Procedure date for major surgery = April 1 to March 25
Exclude	<div style="border: 1px solid black; border-radius: 50%; width: 20px; height: 20px; display: flex; align-items: center; justify-content: center; margin-bottom: 5px;">NEW</div> Patients age 19 and younger at admission Missing/invalid major surgery date Non-clinical criteria	Age (in years) associated with major surgery record ≤19 CMG intervention date = "." or 01JAN9999 Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A

Interpretation Note

For this indicator, a lower rate is more desirable.

iii. Based on data from CIHI's Discharge Abstract Database for 2007–2008.

References

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ii. 30-Day In-Hospital Mortality Following Acute Myocardial Infarction

Definition

This indicator measures the rate of in-hospital deaths due to all causes occurring within 30 days after the first acute myocardial infarction (AMI) admission to an acute care hospital.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of in-hospital deaths per 100 first AMI admission episodes.
- **Denominator:** Episodes of first AMI occurrence admitted between April 1 and March 1 of the fiscal year.
- **Numerator:** Cases within the denominator where an in-hospital death occurred within 30 days of the AMI admission.

Notes

In the denominator population, an AMI episode must start as an inpatient case with a diagnosis of AMI.

For multi-hospital episodes of care, the death must have been attributed to the hospital to which the patient was admitted at the beginning of the episode of care (index record).

If the patient was admitted for an AMI multiple times throughout the fiscal year, only the first episode is included in the denominator.

AMI episodes where the patient had a previous AMI admission within the last 12 months are excluded (washed out).

Rationale

AMIs, or heart attacks, are a manifestation of heart disease, which is the second leading cause of death in Canada after cancer¹ and one of the top 10 causes of death in the world.² Over the past several decades, advances in the treatment of AMI have made it a highly treatable condition.³ Clinical guidelines have been created to assist health care providers in clinical decision-making for the purpose of improving the quality of cardiovascular care.⁴⁻⁶

In addition, performance measures based on existing clinical guidelines have been developed to evaluate the three domains of Donabedian's concept of quality of care: 1) the structure of care, such as provider training/experience and treatment/discharge plans; 2) the process of care; and 3) the outcomes of care, which are the results of the care provided.⁷ Measuring and monitoring patient outcomes have been identified as essential components of quality improvement,^{3, 6} and reductions in mortality rates for patients with AMI have been related to better processes of care.^{8, 9}

Not all deaths are preventable. Nevertheless, 30-day risk-adjusted mortality is considered an appropriate measure to reflect the quality of care for AMI,^{3, 10} which could be used to potentially identify opportunities for improving patient outcomes.

Method of Calculation

Numerator		
	Criteria	Codes
Include	All-cause in-hospital deaths occurring in an acute care setting within 30 days of admission for AMI	Discharge Disposition Code = 07 (died) AND Facility Type Code = 1 (acute care) AND (Discharge date on death record) – (Admission date on AMI record) ≤30 days
Denominator (Index Episode)		
	Criteria	Codes
Include	Urgent inpatient admission for first AMI during the first 11 months of the fiscal year AND AMI	Admission Category Code = U AND Facility Type Code = 1 (acute care) AND Admission date = April 1 to March 1 AND a) AMI (ICD-10-CA: I21.^ or I22.^) is coded as diagnosis type M but not also as type 2; OR b) Where another diagnosis is coded as type M and also as type 2, and a diagnosis of AMI is coded as type 1 (or type W, X or Y but not also as type 2); OR c) Coronary artery disease (ICD-10-CA: I25.0, I25.1^, I25.8 or I25.9) is coded as type M and AMI is coded as type 1 or type W, X or Y but not also as a type 2 AND A revascularization procedure is coded: <ul style="list-style-type: none"> • Percutaneous coronary intervention (CCI: 1.IJ.50^^, 1.IJ.57.GQ^^ or 1.IJ.54.GQ.AZ*) or • Coronary artery bypass (CCI: 1.IJ.76^^)

Denominator (Index Episode)		
	Criteria	Codes
Exclude	Previous AMI in the last 12 months	AMI admissions (ICD-10-CA: I21.^ or I22.^ as a diagnosis type M, 1, 2, W, X or Y in the 12 months preceding the admission date on the index AMI record
NEW	Patients age 19 and younger at admission	Age (in years) associated with index AMI record ≤19
	Non-clinical criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A .

Note

* CCI code 1.IJ.54.GQ-AZ was deactivated in 2009. It was used in indicator calculations for 2007–2008 and 2008–2009 only.

Interpretation Note

For this indicator, a lower rate is more desirable.

References

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iii. 30-Day In-Hospital Mortality Following Stroke

Definition

This indicator measures the rate of in-hospital deaths due to all causes occurring within 30 days after the first stroke admission to an acute care hospital.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of in-hospital deaths per 100 first stroke admission episodes.
- **Denominator:** Episodes of first stroke occurrence admitted between April 1 and March 1 of the fiscal year.
- **Numerator:** Cases within the denominator where an in-hospital death occurred within 30 days of the stroke admission.

Notes

In the denominator population, a stroke episode must start as an inpatient case with a diagnosis of stroke.

For multi-hospital episodes of care, death was attributed to the hospital to which the patient was admitted at the beginning of the episode of care (index record).

If the patient was admitted for a stroke multiple times throughout the year, only the first episode was included in the denominator.

Stroke episodes where the patient had a previous stroke admission within the last 12 months are excluded (washed out).

Rationale

Stroke and other cerebrovascular diseases are one of the top 10 causes of death in the world¹ and the third leading cause of death in Canada.²

Improving care for stroke patients has become a priority, and expert working groups have been formed to develop guidelines, best practices and performance measures for quality improvement for stroke care.³⁻⁵ Mortality 30 days following stroke is influenced by certain processes of care and may be improved by involving an interdisciplinary stroke team,^{3, 4, 6} using brain imaging for diagnostic testing and managing intracerebral hemorrhage.^{3, 4}

Not all deaths are preventable. Nevertheless, an examination of the rate of death within 30 days after stroke could identify improvement opportunities in the processes of stroke care.^{6, 7}

Method of Calculation

Numerator		
	Criteria	Codes
Include	All-cause in-hospital deaths occurring in an acute care setting within 30 days of admission for stroke	Discharge Disposition Code = 07 (died) AND Facility Type Code = 1 (acute care) AND (Discharge date on death record) – (Admission date on stroke record) ≤30 days
Denominator (Index Episode)		
	Criteria	Codes
Include	Urgent inpatient admission for first stroke during the first 11 months of the fiscal year	Admission Category Code = U AND Facility Type Code = 1 (acute care) AND Admission date = April 1 to March 1 AND
	Stroke	a) Stroke (ICD-10-CA: I60–I64) is coded as diagnosis type M but not also as type 2; OR b) Where another diagnosis is coded as type M and also type 2, a diagnosis of stroke is coded as type 1 (or type W, X or Y but not also as type 2); OR c) Rehabilitation (ICD-10-CA: Z50.1 or Z50.4–Z50.9) is coded as type M and stroke is coded as type 1 (or type W, X or Y but not also as type 2)
Exclude	Previous stroke in the last 12 months	Stroke admission (ICD-10-CA: I60–I64) coded as type M, 1, 2, W, X or Y in the 12 months preceding the admission date on the index stroke record
NEW	Patients age 19 and younger at admission	Age (in years) associated with index stroke record ≤19
	Non-clinical criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A .

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. World Health Organization. Fact Sheet: The Top 10 Causes of Death.http://www.who.int/mediacentre/factsheets/fs310_2008.pdf. Updated 2008. Accessed July 21, 2010.
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iv. 28-Day Readmission After Acute Myocardial Infarction

Definition

This indicator measures the rate of urgent readmissions within 28 days of discharge for an acute myocardial infarction (AMI) episode of care.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 AMI episodes.
- **Denominator:** AMI episodes discharged between April 1 and March 3 of the fiscal year.
- **Numerator:** Cases within the denominator with an urgent readmission within 28 days of discharge for an AMI episode.

Notes

In the denominator population, an episode must start as an inpatient case, with the diagnosis of interest in the first hospitalization of the episode of care.

For multi-hospital episodes of care, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.

Readmission must occur on an inpatient record with an urgent admission.

Patients can be in the denominator more than once if they have multiple AMI episodes between April 1 and March 3 of the fiscal year.


Rationale

Hospital readmission rates can be influenced by a variety of factors, including poor hospital discharge planning¹ and a lack of timely follow-up care.² Monitoring unplanned/potentially avoidable readmissions within approximately one month of discharge can be useful for hospital quality surveillance³ and can be combined with other indicators to provide additional information.⁴ Data from the United States has shown that hospital readmissions contribute significantly to health care costs.⁵

Providing feedback to hospitals on their performance, including readmission rates, has previously been shown to stimulate quality of care initiatives.⁶ As CHRP will be providing updated results annually, hospitals may be able to track the impact of implementing quality initiatives on their readmission rates over time.

Readmission to hospital after AMI has been shown to negatively affect the quality of life of patients and their families.⁷ Research has shown that there are lower readmission rates after a first AMI when there are more intensive cardiac management practices, as measured by the appropriate use of initial emergency department assessments, early interventions and drug therapy.⁸

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases starting in an inpatient setting	Facility Type Code = 1 (acute care)
	Readmission occurring within 28 days of discharge	(Admission date on readmission record) – (Discharge date on the last record of the episode of care) ≤28 days
Exclude	Elective admissions	Admission Category = L
Denominator		
	Criteria	Codes
Include	Cases starting in an inpatient setting with an AMI diagnosis	Facility Type Code = 1 (acute care)
	AND Episode end date (discharge date associated with the record at the end of the episode of care) from April 1 to March 3 of the fiscal year	AND Discharge date associated with record at end of episode of care = April 1 to March 3
	AND AMI	AND a) AMI (ICD-10-CA: I21.^ or I22.^) is coded as diagnosis type M but not also as type 2; OR b) Where another diagnosis is coded as type M and also as type 2, a diagnosis of AMI is coded as type 1 (or type W, X or Y but not also as type 2); OR c) Coronary artery disease (ICD-10-CA: I25.0, I25.1^, I25.8 or I25.9) is coded as type M and AMI is coded as type 1 (or type W, X or Y but not also as type 2)
Exclude	Episodes ending in a discharge where the patient signed himself or herself out, died or, for 2008–2009 onward, did not return from a pass	Discharge Disposition Code associated with record at end of episode of care = 06 (sign out), 07 (death) or, for 2008–2009 onward, 12 (patient does not return from a pass)
	Patients age 19 and younger at admission	Age (in years) associated with record at end of episode of care ≤19
	Non-clinical and clinical criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Tables 2A and 2B

Note

* CCI code 1.IJ.54.GQ-AZ was deactivated in 2009. It was used in indicator calculations for 2007–2008 and 2008–2009 only.

Interpretation Note

For this indicator, a lower rate is more desirable. For some jurisdictions, planned readmissions are included in the readmission rate.

References

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v. 28-Day Readmission After Stroke

Definition

This indicator measures the rate of urgent readmissions within 28 days following discharge for a stroke episode of care.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 stroke episodes.
- **Denominator:** Stroke episodes discharged between April 1 and March 3 of the fiscal year.
- **Numerator:** Cases within the denominator with an urgent readmission within 28 days of discharge for a stroke episode.

Notes

In the denominator population, an episode must start as an inpatient case, with the diagnosis of interest in the first hospitalization of the episode of care.

For multi-hospital episodes of care, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.

Readmission must occur on an inpatient record with an urgent admission.

Patients can be in the denominator more than once if they have multiple stroke episodes between April 1 and March 3 of the fiscal year.

Rationale

Hospital readmission rates can be influenced by a variety of factors, including poor hospital discharge planning¹ and a lack of timely follow-up care.² Monitoring unplanned/potentially avoidable readmissions within approximately one month of discharge can be useful for hospital quality surveillance³ and can be combined with other indicators to provide additional information.⁴ Data from the United States has shown that hospital readmissions contribute significantly to health care costs.⁵

Providing feedback to hospitals on their performance, including readmission rates, has previously been shown to stimulate quality of care initiatives.⁶ As CHRP will be providing updated results annually, hospitals may be able to track the impact of implementing quality initiatives on their readmission rates over time.

Patient outcomes after stroke can be influenced by many factors, including age, socio-economic status and the type of institution to which the patient is admitted.⁷ Differences in the level of follow-up care provided have also been associated with readmission rates after stroke. For example, one study found that different health care professionals were associated with different 30-day readmission rates after stroke; this variation was likely a result of differences in using swallowing assessments and providing rehabilitation therapy.⁸

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases starting in an inpatient setting	Facility Type Code = 1 (acute care)
	AND Readmission occurring within 28 days of discharge	AND (Admission date on readmission record) – (Discharge date on the last record of the episode of care) ≤ 28 days
Exclude	Elective admissions	Admission Category = L
Denominator		
	Criteria	Codes
Include	Cases starting in an inpatient setting with a stroke diagnosis	Facility Type Code = 1 (acute care)
	AND Episode end date (discharge date associated with the record at the end of the episode of care) from April 1 to March 3 of the fiscal year	AND Discharge date associated with record at end of episode of care = April 1 to March 3
AND Stroke	AND	AND
		a) Stroke (ICD-10-CA: I60–I64) is coded as diagnosis type M but not also as type 2; OR b) Where another diagnosis is coded as type M and also as type 2, and a diagnosis of stroke is coded as type 1 (or type W, X or Y but not also as type 2); OR c) Rehabilitation (ICD-10-CA: Z50.1 or Z50.4–Z50.9) is coded as type M and stroke is coded as type 1 (or type W, X or Y but not also as type 2)
Exclude	Episodes ending in a discharge where the patient signed himself or herself out, died or, for 2008–2009 onward, did not return from a pass	Discharge Disposition Code associated with record at end of episode of care = 06 (sign out), 07 (death) or, for 2008–2009 onward, 12 (patient does not return from a pass)
NEW	Patients age 19 and younger at admission	Age (in years) associated with record at end of episode of care ≤ 19
	Non-clinical and clinical criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Tables 2A and 2B

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Shepperd S, McClaran J, Phillips CO, et al. Discharge planning from hospital to home. [Review] [83 refs][Update of Cochrane Database Syst Rev. 2004;(1):CD000313; PMID: 14973952]. *Cochrane Database of Systematic Reviews (1):CD000313, 2010.* 2010;(1):CD000313.
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vi. 90-Day Readmission After Hip Replacement

Definition

This indicator measures the rate of urgent readmissions within 90 days of discharge for an elective hip replacement surgery episode of care.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 elective hip replacement surgery episodes.
- **Denominator:** Hip replacement surgery episodes discharged between April 1 and December 31 of the fiscal year.
- **Numerator:** Cases within the denominator with an urgent readmission within 90 days of discharge for an elective hip replacement surgery episode.

Notes

In the denominator population, an episode can start as either an inpatient or day surgery case, with the intervention of interest in the first hospitalization of the episode.

For multi-hospital episodes of care, readmissions were attributed to the first hospital at which the patient had the surgery.

Based on feedback from our clinical experts, certain conditions, such as mechanical complications and infection/inflammatory reaction, are more likely to occur after a month. To capture these cases, the readmission time frame was extended to 90 days.

Quebec data is included in results for 2008–2009, 2009–2010 and 2010–2011.

Rationale

According to recent statistics, joint replacement surgical procedures are some of the most commonly performed elective procedures in Canada, and their frequency is rapidly increasing.¹ Evidence shows that unplanned readmission within approximately one month of hip replacement surgery is largely associated with procedure-related complications.² These may include wound complications such as infection or hematoma, non-traumatic dislocation and swelling of the affected limb.² Incidence rates of complications such as deep infection and dislocation have also been found to be elevated for up to three months following hip replacement surgery.³

Data from the United States has shown that hospital readmissions contribute significantly to the cost of health care.⁴ Investigating hospital readmission rates after a surgical procedure may help provide insight into a facility's quality of care⁵ and processes of care.^{6, 7}

Providing feedback to hospitals on their performance, including readmission rates, has previously been shown to stimulate quality of care initiatives.⁸ As CHRP will be providing updated results annually, hospitals may be able to track the impact of implementing quality initiatives on their readmission rates over time.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases starting in an inpatient setting	Facility Type Code = 1 (acute care)
	AND	AND
	Records occurring within 28 days of discharge	(Admission date on readmission record) – (Discharge date of the hip replacement episode of care) ≤28 days
	OR	OR
	Records containing any of the following conditions occurring within 90 days of the hip replacement surgery:	(Admission date on readmission record) – (Discharge date of the hip replacement episode of care) ≤90 days
		AND
		One of the following ICD-10-CA codes (with diagnosis type M and not type 2, except where specified)
	Mechanical complications:	
	• Mechanical complication of hip prosthesis	T84.03
	Infection and inflammatory reaction:	
• Infection and inflammatory reaction due to hip prosthesis	T84.53	
Fracture of bone following insertion of orthopedic implant	M96.6 (with Y83.1 as type 9)	
Nerve damage:		
• Other post-procedural disorders of nervous system	G97.8	
• Post-procedural disorder of nervous system, unspecified	G97.9	
CCI (non-abandoned procedures only)		
	Revisions:* Hip replacement surgery with a status of revision (on the same side as the replacement surgery)	CCI: 1.VA.53.^ where status = R (not including 1.VA.53.LA-SL-N)
	Removal of device* (on the same side as the replacement surgery)	CCI: 1.VA.55.^
Exclude	Elective admissions	Admission Category = L

Denominator		
	Criteria	Codes
Include	<p>Cases with an elective admission to an acute or day surgery institution</p> <p>AND</p> <p>Episode end date (discharge date associated with the record at the end of the episode of care) from April 1 to December 31</p> <p>AND</p> <p>Hip replacement procedures</p>	<p>Facility Type Code = 1 (acute care) or A (day surgery)</p> <p>AND</p> <p>Admission Category Code = L</p> <p>AND</p> <p>Discharge date associated with record at end of episode of care = April 1 to December 31</p> <p>AND</p> <p>CCI: 1.VA.53.^^(excluding 1.VA.53.LA-SL-N)</p>
Exclude	<p>Episodes ending in a discharge where the patient signed himself or herself out, died or, for 2008–2009 onward, did not return from a pass</p> <p>NEW Patients who are younger than 40 at admission</p> <p>NEW Abandoned or revision hip replacement surgical procedures</p> <p>Non-clinical and clinical criteria</p>	<p>Discharge Disposition Code associated with record at end of episode of care = 06 (sign out), 07 (death) or, for 2008–2009 onward, 12 (patient does not return from a pass)</p> <p>Age (in years) associated with hip replacement record <40</p> <p>Status Attribute = A or R</p> <p>OR</p> <p>ICD-10-CA: T84.03 (as type M or 1, but not 2) or T84.53 (as type M or 1, but not 2) in conjunction with CCI code 1.VA.53.^^(</p> <p>Refer to Section 5: Identifying Acute Care and Day Procedure Data—Tables 2A and 2B</p>

Note

* Interventions in the methodology table refer to non-abandoned interventions only.

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Canadian Institute for Health Information. Hospitalizations, Early Revisions, and Infections Following Joint Replacement Surgery. https://secure.cihi.ca/free_products/joint_complications_aib_e.pdf. Updated 2008. Accessed October 16, 2012.
2. Cullen C, Johnson DS, Cook G. Re-admission rates within 28 days of total hip replacement. *Annals of the Royal College of Surgeons of England*. September, 2006;88(5):475-478.
3. Phillips CB, Barrett JA, Losina E, et al. Incidence rates of dislocation, pulmonary embolism, and deep infection during the first six months after elective total hip replacement. *Journal of Bone & Joint Surgery - American Volume*. January, 2003;85-A(1):20-26.
4. Friedman B, Basu J. The rate and cost of hospital readmissions for preventable conditions. *Medical Care Research & Review*. June, 2004;61(2):225-240.
5. Courtney ED, Ankrett S, McCollum PT. 28-Day emergency surgical re-admission rates as a clinical indicator of performance. *Annals of the Royal College of Surgeons of England*. March, 2003;85(2):75-78.
6. Bozic KJ, Maselli J, Pekow PS, Lindenauer PK, Vail TP, Auerbach AD. The influence of procedure volumes and standardization of care on quality and efficiency in total joint replacement surgery. *Journal of Bone & Joint Surgery - American Volume*. November 17, 2010;92(16):2643-2652.
7. Riggs RV, Roberts PS, Aronow H, Younan T. Joint replacement and hip fracture readmission rates: impact of discharge destination. *Pm & R*. September, 2010;2(9):806-810.
8. Tu JV, Cameron C. Impact of an acute myocardial infarction report card in Ontario, Canada. *International Journal for Quality in Health Care*. April, 2003;15(2):131-137.

vii. 90-Day Readmission After Knee Replacement

Definition

This indicator measures the rate of urgent readmissions within 90 days of discharge for an elective knee replacement surgery episode of care.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 elective knee replacement surgery episodes.
- **Denominator:** Knee replacement surgery episodes discharged between April 1 and December 31 of the fiscal year.
- **Numerator:** Cases within the denominator with an urgent readmission within 90 days of discharge for the knee replacement surgery episode.

Notes

In the denominator population, an episode can start as either an inpatient or day surgery case, with the intervention of interest in the first hospitalization of the episode.

For multi-hospital episodes of care, readmissions were attributed to the first hospital at which the patient had surgery.

Based on feedback from our clinical experts, certain conditions, such as mechanical complications and infection/inflammatory reaction, are more likely to occur after a month. To capture these cases, the readmission time frame was extended to 90 days.

Quebec data is included in results for 2008–2009, 2009–2010 and 2010–2011.

Rationale

Joint replacement surgery is one of the most commonly performed elective procedures in Canada, and its frequency is rapidly increasing.¹ According to experts, certain post-surgical outcomes, like infection, are often related to the quality of care provided during the initial joint replacement surgery.¹ Investigating hospital readmission rates after a surgical procedure may help provide insight into a facility's quality of care² and processes of care.³

Providing feedback to hospitals on their performance, including readmission rates, has previously been shown to stimulate quality of care initiatives.⁴ As CHRP will be providing updated results annually, hospitals may be able to track the impact of implementing quality initiatives on their readmission rates over time. Data from the United States has shown that hospital readmissions contribute significantly to the cost of health care.⁵

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases starting in an inpatient setting	Facility Type Code = 1 (acute care)
	AND	AND
	Records occurring within 28 days of discharge	(Admission date on readmission record) – (Discharge date of the knee replacement episode) ≤28 days
	OR	OR
	Records containing any of the following conditions occurring within 90 days of the knee replacement surgery:	(Admission date on readmission record) – (Discharge date of the knee replacement episode) ≤90 days
		AND
		One of the following ICD-10-CA codes (with diagnosis type M and not type 2, except where specified):
	Mechanical complication:	
	<ul style="list-style-type: none"> Mechanical complication of knee prosthesis 	T84.04
	Infection and inflammatory reaction:	
<ul style="list-style-type: none"> Infection and inflammatory reaction due to knee prosthesis 	T84.54	
Fracture of bone following insertion of orthopedic implant	M96.6 (with Y83.1 as type 9)	
Nerve damage:		
<ul style="list-style-type: none"> Other post-procedural disorders of nervous system 	G97.8	
<ul style="list-style-type: none"> Post-procedural disorder of nervous system, unspecified 	G97.9	
CCI (non-abandoned procedures only)		
	Revisions:* Knee replacement surgery with a status of revision (on the same side as the replacement surgery)	CCI: 1.VG.53. ^{^^} where status = R (not including 1.VG.53.LA-SL-N)
	Removal of device* (on the same side as the replacement surgery)	CCI: 1.VG.55. ^{^^}
Exclude	Elective admissions	Admission Category = L

Denominator		
	Criteria	Codes
Include	<p>Cases with an elective admission to an acute care or day surgery institution</p> <p>AND</p> <p>Episode end date (discharge date associated with the record at the end of the episode of care) from April 1 to December 31</p> <p>AND</p> <p>Knee replacement surgical procedures</p>	<p>Facility Type Code = 1 (acute care) or A (day surgery)</p> <p>AND</p> <p>Admission Category = L</p> <p>AND</p> <p>Discharge date associated with record at end of episode of care = April 1 to December 31</p> <p>AND</p> <p>CCI: 1.VG.53.^ (excluding 1.VG.53.LA-SL-N)</p>
Exclude	<p>Episodes ending in a discharge where the patient signed himself or herself out, died or, for 2008–2009 onward, did not return from a pass</p> <p>NEW Patients who are younger than 40 at admission</p> <p>NEW Abandoned or revision knee replacement surgical procedures</p> <p>Non-clinical and clinical criteria</p>	<p>Discharge Disposition Code associated with record at end of episode of care = 06 (sign out), 07 (death) or, for 2008–2009 onward, 12 (patient does not return from a pass)</p> <p>Age (in years) associated with knee replacement record <40</p> <p>Status Attribute = A or R</p> <p>OR</p> <p>ICD-10-CA: T84.04 (as type M or 1, but not 2) or T84.54 (as type M or 1, but not 2) in conjunction with CCI code 1.VG.53.^</p> <p>Refer to Section 5: Identifying Acute Care and Day Procedure Data—Tables 2A and 2B</p>

Note

* Interventions in the methodology table refer to non-abandoned interventions only.

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Canadian Institute for Health Information. Hospitalizations, Early Revisions, and Infections Following Joint Replacement Surgery. https://secure.cihi.ca/free_products/joint_complications_aib_e.pdf. Updated 2008. Accessed October 16, 2012.
2. Courtney ED, Ankrett S, McCollum PT. 28-Day emergency surgical re-admission rates as a clinical indicator of performance. *Annals of the Royal College of Surgeons of England*. March, 2003;85(2):75-78.
3. Phillips CB, Barrett JA, Losina E, et al. Incidence rates of dislocation, pulmonary embolism, and deep infection during the first six months after elective total hip replacement. *Journal of Bone & Joint Surgery - American Volume*. January, 2003;85-A(1):20-26.
4. Tu JV, Cameron C. Impact of an acute myocardial infarction report card in Ontario, Canada. *International Journal for Quality in Health Care*. April, 2003;15(2):131-137.
5. Friedman B, Basu J. The rate and cost of hospital readmissions for preventable conditions. *Medical Care Research & Review*. June, 2004;61(2):225-240.

viii. 30-Day Overall Readmission

Definition

This indicator measures the rate of urgent readmissions within 30 days of discharge for episodes of care for the following patient groups:

- a) Obstetric;
 - b) Patients age 19 and younger;
 - c) Adult surgical; and
 - d) Adult medical.
- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 episodes.
 - **Denominator:** Obstetric, patients age 19 and younger, adult surgical and adult medical episodes of care discharged between April 1 and March 1 of the fiscal year. Please refer to the flowchart ([Appendix B](#)) for an illustration of how each index episode was identified.
 - **Numerator:** Cases within the denominator with an urgent readmission within 30 days of discharge.

Notes

This indicator measures overall readmission for the above patient groups.

Episodes of care are assigned to one of the above patient groups based on the following hierarchy: 1) obstetric; 2) patients age 19 and younger; 3) adult surgical; 4) adult medical.

In the denominator population, an episode might start or end in an inpatient or day surgery setting; however, episodes that both start and end in day surgery settings are excluded.

For episodes of care that involved transfers, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.

Patients can appear in the denominator more than once if they have multiple episodes of care between April 1 and March 1 of the fiscal year.

Readmission must occur on an inpatient record with an urgent admission and can be counted only once.

Details on the specific patient groups are provided below.

Rationale

Hospital readmission rates can be influenced by a variety of factors, including poor hospital discharge planning¹ and a lack of timely follow-up care.² Monitoring unplanned/potentially avoidable readmissions within approximately one month of discharge can be useful for hospital quality surveillance³ and can be combined with other indicators to provide additional information.⁴ Data from the United States has shown that hospital readmissions contribute significantly to health care costs.⁵

Urgent, unplanned readmissions to acute care facilities are increasingly being used to measure institutional or regional quality of care and care coordination. Readmission rates can be influenced by a variety of factors, including the quality of inpatient and outpatient care, the effectiveness of the care transition and coordination, and the availability and use of effective disease management community-based programs. While not all unplanned readmissions are avoidable, interventions during and after a hospitalization can be effective in reducing readmission rates.

Method of Calculation

This indicator measures the overall readmission rate for the obstetric, patients age 19 and younger, adult surgical and adult medical patient groups, which is the roll-up of these four patient groups' specific indicators. The overall expected value for this indicator is the sum of the expected values from each of the four patient groups. Please refer to the section Risk Adjustment for details about calculating aggregate levels.

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Shepperd S, McClaran J, Phillips CO, et al. Discharge planning from hospital to home. [Review] [83 refs][Update of Cochrane Database Syst Rev. 2004;(1):CD000313; PMID: 14973952]. *Cochrane Database of Systematic Reviews (1):CD000313, 2010. 2010;(1):CD000313.*
2. Misky GJ, Wald HL, Coleman EA. Post-hospitalization transitions: Examining the effects of timing of primary care provider follow-up. *Journal of Hospital Medicine (Online)*. September, 2010;5(7):392-397.
3. Halfon P, Egli Y, Pretre-Rohrbach I, Meylan D, Marazzi A, Burnand B. Validation of the potentially avoidable hospital readmission rate as a routine indicator of the quality of hospital care. *Medical Care*. November, 2006;44(11):972-981.
4. Rumball-Smith J, Hider P. The validity of readmission rate as a marker of the quality of hospital care, and a recommendation for its definition. [Review] [39 refs]. *New Zealand Medical Journal*. February 13, 2009;122(1289):63-70.
5. Friedman B, Basu J. The rate and cost of hospital readmissions for preventable conditions. *Medical Care Research & Review*. June, 2004;61(2):225-240.

ix. 30-Day Obstetric Readmission

Definition

This indicator measures the rate of urgent readmissions within 30 days of discharge for an obstetric episode of care.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 obstetric episodes.
- **Denominator:** Obstetric episodes discharged between April 1 and March 1 of the fiscal year.
- **Numerator:** Cases within the denominator with an urgent readmission within 30 days of discharge.

Notes

In the denominator population, an episode might start or end in an inpatient or day surgery setting; however, episodes that both start and end in day surgery settings are excluded.

For episodes of care that involved transfers, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.

Patients can be in the denominator more than once if they have multiple episodes of care between April 1 and March 1 of the fiscal year.

Readmission must occur on an inpatient record with an urgent admission and can be counted only once.

Rationale

Hospital readmission rates can be influenced by a variety of factors, including poor hospital discharge planning¹ and a lack of timely follow-up care.² Monitoring unplanned/potentially avoidable readmissions within approximately one month of discharge can be useful for hospital quality surveillance³ and can be combined with other indicators to provide additional information.⁴ Data from the United States has shown that hospital readmissions contribute significantly to health care costs.⁵

Urgent, unplanned readmissions to acute care facilities are increasingly being used to measure institutional or regional quality of care and care coordination. Readmission rates can be influenced by a variety of factors, including the quality of inpatient and outpatient care, the effectiveness of the care transition and coordination, and the availability and use of effective disease management community-based programs. While not all unplanned readmissions are avoidable, interventions during and after a hospitalization can be effective in reducing readmission rates.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Episodes starting in an inpatient setting	Facility Type Code = 1 (acute care)
	AND Readmission occurring within 30 days of discharge	AND (Admission date on readmission record) – (Discharge date on the last record of the index episode of care) ≤30 days
Exclude	Elective admissions	Admission Category = L
	Admission for delivery	ICD-10-CA: O10–O16, O21–O26, O28–O37, O40–O46, O48, O60–O75, O85–O92, O95 or O98–O99 with a sixth digit of 1 or 2
	Admission for mental illness	OR Z37
	Admission for chemotherapy as the most responsible diagnosis	MCC = 17 ICD-10-CA: Z51.1 as type M
	All Records: Admission for palliative care as the most responsible diagnosis	All Records: ICD-10-CA: Z51.5 as type M
	Quebec Records: Admission for cancer as the most responsible diagnosis in conjunction with a palliative care diagnosis	Quebec Records: ICD-10-CA: C00–C97, Z51.0 or Z51.1 as type M
		AND Z51.5
Denominator		
	Criteria	Codes
Include	Cases starting in an inpatient or day surgery setting	Facility Type Code = 1 (acute care) or A (day surgery)
	AND Episode end date (discharge date associated with the record at the end of the episode of care) from April 1 to March 1 of the fiscal year	AND Discharge date associated with record at end of episode of care = April 1 to March 1
	AND Episodes involving obstetric inpatient care	AND Presence of at least one record in the episode with MCC = 13 and Facility Type Code = 1 (acute care)
	Female	Gender = F

NEW

Denominator		
	Criteria	Codes
Exclude	Episodes ending in a discharge where the patient signed herself out, died or, for 2008–2009 onward, did not return from a pass	Discharge Disposition Code associated with record at end of episode of care = 06 (sign out), 07 (death) or, for 2008–2009 onward, 12 (patient does not return from a pass)
	Episodes that start and end in the day surgery setting (that is, episodes must involve inpatient care)	Facility Type Code ≠ 1 for the start AND end records of the episode
	Episodes involving mental illness inpatient care	Presence of at least one record in the episode with MCC = 17 and Facility Type Code = 1 (acute care)
	All Records: Episodes involving palliative inpatient care coded as the most responsible diagnosis	All Records: ICD-10-CA: Z51.5 as type M
	Quebec Records: Admission for cancer as the most responsible diagnosis in conjunction with a palliative care diagnosis	Quebec Records: ICD-10-CA: C00–C97, Z51.0 or Z51.1 as type M
		AND
		Z51.5
	Non-clinical exclusion criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data—Table 2A

NEW

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Shepperd S, McClaran J, Phillips CO, et al. Discharge planning from hospital to home. [Review] [83 refs][Update of Cochrane Database Syst Rev. 2004;(1):CD000313; PMID: 14973952]. *Cochrane Database of Systematic Reviews (1):CD000313, 2010. 2010;(1):CD000313.*
2. Misky GJ, Wald HL, Coleman EA. Post-hospitalization transitions: Examining the effects of timing of primary care provider follow-up. *Journal of Hospital Medicine (Online)*. September, 2010;5(7):392-397.
3. Halfon P, Egli Y, Pretre-Rohrbach I, Meylan D, Marazzi A, Burnand B. Validation of the potentially avoidable hospital readmission rate as a routine indicator of the quality of hospital care. *Medical Care*. November, 2006;44(11):972-981.
4. Rumball-Smith J, Hider P. The validity of readmission rate as a marker of the quality of hospital care, and a recommendation for its definition. [Review] [39 refs]. *New Zealand Medical Journal*. February 13, 2009;122(1289):63-70.
5. Friedman B, Basu J. The rate and cost of hospital readmissions for preventable conditions. *Medical Care Research & Review*. June, 2004;61(2):225-240.

x. 30-Day Readmission—Patients Age 19 and Younger

Definition

This indicator measures the rate of urgent readmissions within 30 days of discharge for an episode of care for patients age 19 and younger.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 episodes for patients age 19 and younger.
- **Denominator:** Episodes of care for patients age 19 and younger, discharged between April 1 and March 1 of the fiscal year.
- **Numerator:** Cases within the denominator with an urgent readmission within 30 days of discharge.

Notes

In the denominator population, an episode might start or end in an inpatient or day surgery setting; however, episodes that both start and end in day surgery settings are excluded.

For episodes of care that involved transfers, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.

Readmission must occur on an inpatient record with an urgent admission.


Patients can be in the denominator more than once if they have multiple episodes of care between April 1 and March 1 of the fiscal year.

Rationale

Hospital readmission rates can be influenced by a variety of factors, including poor hospital discharge planning¹ and a lack of timely follow-up care.² Monitoring unplanned/potentially avoidable readmissions within approximately one month of discharge can be useful for hospital quality surveillance³ and can be combined with other indicators to provide additional information.⁴ Data from the United States has shown that hospital readmissions contribute significantly to health care costs.⁵

Urgent, unplanned readmissions to acute care facilities are increasingly being used to measure institutional or regional quality of care and care coordination. Readmission rates can be influenced by a variety of factors, including the quality of inpatient and outpatient care, the effectiveness of the care transition and coordination, and the availability and use of effective disease management community-based programs. While not all unplanned readmissions are avoidable, interventions during and after a hospitalization can be effective in reducing readmission rates.

Method of Calculation

Numerator		
	Criteria	Codes
Include	<p>Episodes starting in an inpatient setting</p> <p>AND</p> <p>Readmission occurring within 30 days of discharge</p>	<p>Facility Type Code = 1 (acute care)</p> <p>AND</p> <p>(Admission date on readmission record) – (Discharge date on the last record of the index episode of care) ≤30 days</p>
Exclude	<p>Elective admissions</p> <p>Admission for delivery</p> <p>Admission for mental illness</p> <p>Admission for chemotherapy as the most responsible diagnosis</p> <p>All Records: Admission for palliative care as the most responsible diagnosis</p> <p>Quebec Records: Admission for cancer as the most responsible diagnosis in conjunction with a palliative care diagnosis</p>	<p>Admission Category = L</p> <p>ICD-10-CA: O10–O16, O21–O26, O28–O37, O40–O46, O48, O60–O75, O85–O92, O95 or O98–O99 with a sixth digit of 1 or 2</p> <p>OR</p> <p>Z37</p> <p>MCC = 17</p> <p>ICD-10-CA: Z51.1 as type M</p> <p>All Records: ICD-10-CA: Z51.5 as type M</p> <p>Quebec Records: ICD-10-CA: C00–C97, Z51.0 or Z51.1 as type M</p> <p>AND</p> <p>Z51.5</p>
		
Denominator		
	Criteria	Codes
Include	<p>Cases starting in an inpatient or day surgery setting</p> <p>AND</p> <p>Episode end date (discharge date associated with the record at the end of the episode of care) from April 1 to March 1 of the fiscal year</p> <p>AND</p> <p>Episodes involving inpatient care for patients age 19 and younger</p>	<p>Facility Type Code = 1 (acute care) or A (day surgery)</p> <p>AND</p> <p>Discharge date associated with record at end of episode of care = April 1 to March 1</p> <p>AND</p> <p>Age ≤19 and Facility Type Code = 1 (acute care)</p>

Denominator		
	Criteria	Codes
Exclude	Episodes ending in a discharge where the patient signed himself or herself out, died or, for 2008–2009 onward, did not return from a pass	Discharge Disposition Code associated with record at end of episode of care = 06 (sign out), 07 (death) or, for 2008–2009 onward, 12 (patient does not return from a pass)
	Episodes that start and end in the day surgery setting (that is, episodes must involve inpatient care)	Facility Type Code ≠ 1 for the start AND end records of the episode
	Episodes involving mental illness inpatient care	MCC = 17 and Facility Type Code = 1 (acute care)
	Episodes involving obstetric inpatient care	MCC = 13 and Facility Type Code = 1 (acute care)
	Newborn episodes	Admission Category = N
	All Records: Episodes involving palliative inpatient care coded as the most responsible diagnosis	All Records: ICD-10-CA: Z51.5 as type M
	Quebec Records: Admission for cancer as the most responsible diagnosis in conjunction with a palliative care diagnosis	Quebec Records: ICD-10-CA: C00–C97, Z51.0 or Z51.1 as type M
	AND	
		Z51.5
	Non-clinical exclusion criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A

NEW

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Shepperd S, McClaran J, Phillips CO, et al. Discharge planning from hospital to home. [Review] [83 refs][Update of Cochrane Database Syst Rev. 2004;(1):CD000313; PMID: 14973952]. *Cochrane Database of Systematic Reviews (1):CD000313, 2010.* 2010;(1):CD000313.
2. Misky GJ, Wald HL, Coleman EA. Post-hospitalization transitions: Examining the effects of timing of primary care provider follow-up. *Journal of Hospital Medicine (Online)*. September, 2010;5(7):392-397.
3. Halfon P, Egli Y, Pretre-Rohrbach I, Meylan D, Marazzi A, Burnand B. Validation of the potentially avoidable hospital readmission rate as a routine indicator of the quality of hospital care. *Medical Care*. November, 2006;44(11):972-981.
4. Rumball-Smith J, Hider P. The validity of readmission rate as a marker of the quality of hospital care, and a recommendation for its definition. [Review] [39 refs]. *New Zealand Medical Journal*. February 13, 2009;122(1289):63-70.
5. Friedman B, Basu J. The rate and cost of hospital readmissions for preventable conditions. *Medical Care Research & Review*. June, 2004;61(2):225-240.

xi. 30-Day Surgical Readmission

Definition

This indicator measures the rate of urgent readmissions within 30 days of discharge for an adult surgical episode of care.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 adult surgical episodes.
- **Denominator:** Adult surgical episodes discharged between April 1 and March 1 of the fiscal year.
- **Numerator:** Cases within the denominator with an urgent readmission within 30 days of discharge.

Notes

In the denominator population, an episode might start or end in an inpatient or day surgery setting; however, episodes that both start and end in day surgery settings are excluded.

For episodes of care that involved transfers, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.

Readmission must occur on an inpatient record with an urgent admission.

Patients can be in the denominator more than once if they have multiple episodes of care between April 1 and March 1 of the fiscal year.

Rationale

Hospital readmission rates can be influenced by a variety of factors, including poor hospital discharge planning¹ and a lack of timely follow-up care.² Monitoring unplanned/potentially avoidable readmissions within approximately one month of discharge can be useful for hospital quality surveillance³ and can be combined with other indicators to provide additional information.⁴ Data from the United States has shown that hospital readmissions contribute significantly to health care costs.⁵

Urgent, unplanned readmissions to acute care facilities are increasingly being used to measure institutional or regional quality of care and care coordination. Readmission rates can be influenced by a variety of factors, including the quality of inpatient and outpatient care, the effectiveness of the care transition and coordination, and the availability and use of effective disease management community-based programs. While not all unplanned readmissions are avoidable, interventions during and after a hospitalization can be effective in reducing readmission rates.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Episodes starting in an inpatient setting	Facility Type Code = 1 (acute care)
	AND Readmission occurring within 30 days of discharge	AND (Admission date on readmission record) – (Discharge date on the last record of the index episode of care) ≤30 days
Exclude	Elective admissions	Admission Category = L
	Admission for delivery	ICD-10-CA: O10–O16, O21–O26, O28–O37, O40–O46, O48, O60–O75, O85–O92, O95 or O98–O99 with a sixth digit of 1 or 2
NEW	Admission for mental illness	OR Z37
	Admission for chemotherapy as the most responsible diagnosis	MCC = 17 ICD-10-CA: Z51.1 as type M
NEW	All Records: Admission for palliative care as the most responsible diagnosis	All Records: ICD-10-CA: Z51.5 as type M
	Quebec Records: Admission for cancer as the most responsible diagnosis in conjunction with a palliative care diagnosis	Quebec Records: ICD-10-CA: C00–C97, Z51.0 or Z51.1 as type M
		AND Z51.5
Denominator		
	Criteria	Codes
Include	Cases starting in an inpatient or day surgery setting	Facility Type Code = 1 (acute care) or A (day surgery)
	AND Episode end date (discharge date associated with the record at the end of the episode of care) from April 1 to March 1 of the fiscal year	AND Discharge date associated with record at end of episode of care = April 1 to March 1
	AND Episodes involving surgical inpatient care	AND MCC Partition Code = I (intervention) and Facility Type Code = 1 (acute care)

Denominator		
	Criteria	Codes
Exclude	Episodes ending in a discharge where the patient signed himself or herself out, died or, for 2008–2009 onward, did not return from a pass	Discharge Disposition Code associated with record at end of episode of care = 06 (sign out), 07 (death) or, for 2008–2009 onward, 12 (patient does not return from a pass)
	Episodes that start and end in the day surgery setting (that is, episodes must involve inpatient care)	Facility Type Code ≠ 1 for the start AND end records of the episode
	Episodes involving mental illness inpatient care	MCC = 17 and Facility Type Code = 1 (acute care)
	Episodes involving obstetric inpatient care	MCC = 13 and Facility Type Code = 1 (acute care)
	Patients age 19 and younger	Age (in years) ≤19
	All Records: Episodes involving palliative inpatient care coded as the most responsible diagnosis	All Records: ICD-10-CA: Z51.5 as type M
	Quebec Records: Admission for cancer as the most responsible diagnosis in conjunction with a palliative care diagnosis	Quebec Records: ICD-10-CA: C00–C97, Z51.0 or Z51.1 as type M
	AND	
		Z51.5
	Non-clinical exclusion criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A

NEW

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Shepperd S, McClaran J, Phillips CO, et al. Discharge planning from hospital to home. [Review] [83 refs][Update of Cochrane Database Syst Rev. 2004;(1):CD000313; PMID: 14973952]. *Cochrane Database of Systematic Reviews (1):CD000313, 2010. 2010;(1):CD000313.*
2. Misky GJ, Wald HL, Coleman EA. Post-hospitalization transitions: Examining the effects of timing of primary care provider follow-up. *Journal of Hospital Medicine (Online)*. September, 2010;5(7):392-397.
3. Halfon P, Egli Y, Pretre-Rohrbach I, Meylan D, Marazzi A, Burnand B. Validation of the potentially avoidable hospital readmission rate as a routine indicator of the quality of hospital care. *Medical Care*. November, 2006;44(11):972-981.
4. Rumball-Smith J, Hider P. The validity of readmission rate as a marker of the quality of hospital care, and a recommendation for its definition. [Review] [39 refs]. *New Zealand Medical Journal*. February 13, 2009;122(1289):63-70.
5. Friedman B, Basu J. The rate and cost of hospital readmissions for preventable conditions. *Medical Care Research & Review*. June, 2004;61(2):225-240.

xii. 30-Day Medical Readmission

Definition

This indicator measures the rate of urgent readmissions within 30 days of discharge for adult medical episodes of care.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of urgent readmissions per 100 adult medical episodes.
- **Denominator:** Adult medical episodes discharged between April 1 and March 1 of the fiscal year.
- **Numerator:** Cases within the denominator with an urgent readmission within 30 days of discharge.

Notes

In the denominator population, an episode might start or end in an inpatient or day surgery setting; however, episodes that both start and end in day surgery settings are excluded.

For episodes of care that involved transfers, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.

Readmission must occur on an inpatient record with an urgent admission.

Patients can be in the denominator more than once if they have multiple episodes of care between April 1 and March 1 of the fiscal year.

Rationale

Hospital readmission rates can be influenced by a variety of factors, including poor hospital discharge planning¹ and a lack of timely follow-up care.² Monitoring unplanned/potentially avoidable readmissions within approximately one month of discharge can be useful for hospital quality surveillance³ and can be combined with other indicators to provide additional information.⁴ Data from the United States has shown that hospital readmissions contribute significantly to health care costs.⁵

Urgent, unplanned readmissions to acute care facilities are increasingly being used to measure institutional or regional quality of care and care coordination. Readmission rates can be influenced by a variety of factors, including the quality of inpatient and outpatient care, the effectiveness of the care transition and coordination, and the availability and use of effective disease management community-based programs. While not all unplanned readmissions are avoidable, interventions during and after a hospitalization can be effective in reducing readmission rates.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Episodes starting in an inpatient setting	Facility Type Code = 1 (acute care)
	<p>AND</p> <p>Readmission occurring within 30 days of discharge</p>	<p>AND</p> <p>(Admission date on readmission record) – (Discharge date on the last record of the index episode of care) ≤30 days</p>
Exclude	Elective admissions	Admission Category = L
	<p>Admission for delivery</p> <p>Admission for mental illness</p> <p>Admission for chemotherapy as the main responsible diagnosis</p> <p>All Records: Admission for palliative care as the main responsible diagnosis</p> <p>Quebec Records: Admission for cancer as the most responsible diagnosis in conjunction with a palliative care diagnosis</p>	<p>ICD-10-CA: O10–O16, O21–O26, O28–O37, O40–O46, O48, O60–O75, O85–O92, O95 or O98–O99 with a sixth digit of 1 or 2</p> <p>OR</p> <p>Z37</p> <p>MCC = 17</p> <p>ICD-10-CA: Z51.1 as type M</p> <p>All Records: ICD-10-CA: Z51.5 as type M</p> <p>Quebec Records: ICD-10-CA: C00–C97, Z51.0 or Z51.1 as type M</p> <p>AND</p> <p>Z51.5</p>

NEW

Denominator		
	Criteria	Codes
Include	<p>Cases starting in an inpatient or day surgery setting</p> <p>AND</p> <p>Episode end date (discharge date associated with the record at the end of the episode of care) from April 1 to March 1 of the fiscal year</p> <p>AND</p> <p>Episodes involving medical inpatient care</p>	<p>Facility Type Code = 1 (acute care) or A (day surgery)</p> <p>AND</p> <p>Discharge date associated with record at end of episode of care = April 1 to March 1</p> <p>AND</p> <p>MCC Partition Code = D (diagnosis) and Facility Type Code = 1 (acute care)</p>
Exclude	<p>Episodes ending in a discharge where the patient signed himself or herself out, died or, for 2008–2009 onward, did not return from a pass</p> <p>Episodes that start and end in the day surgery setting (that is, episodes must involve inpatient care)</p> <p>Episodes involving mental illness inpatient care</p> <p>Episodes involving obstetric inpatient care</p> <p>Patients age 19 and younger</p> <p>Episodes involving adult surgical inpatient care</p> <p>All Records: Episodes involving palliative inpatient care coded as the most responsible diagnosis</p> <p>Quebec Records: Admission for cancer as the most responsible diagnosis in conjunction with a palliative care diagnosis</p> <p>Non-clinical exclusion criteria</p>	<p>Discharge Disposition Code associated with record at end of episode of care = 06 (sign out), 07 (death) or, for 2008–2009 onward, 12 (patient does not return from a pass)</p> <p>Facility Type Code ≠ 1 for start AND end records of the episode</p> <p>MCC = 17 and Facility Type Code = 1 (acute care)</p> <p>MCC = 13 and Facility Type Code = 1 (acute care)</p> <p>Age (in years) ≤ 19</p> <p>MCC Partition Code = I (intervention) and Facility Type Code = 1 (acute care)</p> <p>All Records: ICD-10-CA: Z51.5 as type M</p> <p>Quebec Records: ICD-10-CA: C00–C97, Z51.0 or Z51.1 as type M</p> <p>AND</p> <p>Z51.5</p> <p>Refer to Section 5: Identifying Acute Care and Day Procedure Data—Table 2A</p>

NEW

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Shepperd S, McClaran J, Phillips CO, et al. Discharge planning from hospital to home. [Review] [83 refs][Update of Cochrane Database Syst Rev. 2004;(1):CD000313; PMID: 14973952]. *Cochrane Database of Systematic Reviews (1):CD000313, 2010. 2010;(1):CD000313.*
2. Misky GJ, Wald HL, Coleman EA. Post-hospitalization transitions: Examining the effects of timing of primary care provider follow-up. *Journal of Hospital Medicine (Online)*. September, 2010;5(7):392-397.
3. Halfon P, Egli Y, Pretre-Rohrbach I, Meylan D, Marazzi A, Burnand B. Validation of the potentially avoidable hospital readmission rate as a routine indicator of the quality of hospital care. *Medical Care*. November, 2006;44(11):972-981.
4. Rumball-Smith J, Hider P. The validity of readmission rate as a marker of the quality of hospital care, and a recommendation for its definition. [Review] [39 refs]. *New Zealand Medical Journal*. February 13, 2009;122(1289):63-70.
5. Friedman B, Basu J. The rate and cost of hospital readmissions for preventable conditions. *Medical Care Research & Review*. June, 2004;61(2):225-240.

15 Indicators: Patient Safety

i. In-Hospital Hip Fracture in Elderly (65+) Patients

Definition

This indicator measures the rate of in-hospital hip fractures among acute care inpatients age 65 and older.

- **Unit of analysis:** The measuring unit of this indicator is a single admission. The indicator is expressed as a rate of in-hospital hip fractures per 1,000 inpatient cases.
- **Denominator:** Acute care discharges of patients age 65 and older.
- **Numerator:** Cases within the denominator with a post-admission hip fracture.

Rationale

With nearly 1 in every 1,000 elderly patients (age 65 and older) suffering a hip fracture after admission to a Canadian acute care hospital,^{1,iv} in-hospital hip fractures remain a significant patient safety concern. The rate and risk of patient falls resulting in hip fracture increase with age.^{1,2} Other known risk factors include cognitive impairment,²⁻⁴ gait or balance instability,^{2,3} weakness³ and the use of certain medications.^{2,3}

In addition to the profound impact hip fractures can have on the independence and quality of life of elderly patients,^{2,5} such injuries occurring within hospital are also associated with longer lengths of stay and increased health care costs.^{2,4} Thus patient falls represent an important issue for hospital risk management. Many falls and their consequences are potentially preventable by knowing about and identifying known risk factors.^{2,3,6}

This indicator is intended to help hospitals monitor prevention efforts; high rates should be used to identify areas for improvement.

iv. Based on data from CIHI's Discharge Abstract Database from 2000–2001 to 2002–2003, excluding patients from Quebec and Manitoba.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases within the denominator with a post-admission hip fracture diagnosis: <ul style="list-style-type: none"> • Fracture of neck of femur • Intertrochanteric fracture • Unspecified trochanteric fracture • Subtrochanteric fracture 	One of the following ICD-10-CA codes, coded as type 2: S72.0^ S72.10^ S72.19^ S72.2^
Exclude	Other specified misadventures during surgical and medical care OR Fracture of bone following insertion of orthopedic implant, joint prosthesis or bone plate	One of the above S codes and Y65.8 coded as type 9 OR M96.6 coded as type 2
Denominator		
	Criteria	Codes
Include	Discharges from an acute care facility	Facility Type Code = 1 (acute care)
Exclude	<div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-bottom: 5px;">NEW</div> Patients who are younger than 65 at admission Non-clinical criteria	Age (in years) <65 Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A

Interpretation Note

For this indicator, a lower rate is more desirable.

References

1. Pulcins I, Wan E.^v In-hospital hip fractures in Canada: using information to improve patient safety. *Healthcare Quarterly*. 2004;7(4):25-27.
2. Corsinovi L, Bo M, Ricauda AN, et al. Predictors of falls and hospitalization outcomes in elderly patients admitted to an acute geriatric unit. *Archives of Gerontology & Geriatrics*. July, 2009;49(1):142-145.
3. Oliver D, Daly F, Martin FC, McMurdo ME. Risk factors and risk assessment tools for falls in hospital in-patients: a systematic review. [Review] [100 refs]. *Age & Ageing*. March, 2004;33(2):122-130.
4. Salgado RI, Lord SR, Ehrlich F, Janji N, Rahman A. Predictors of falling in elderly hospital patients. *Archives of Gerontology & Geriatrics*. May, 2004;38(3):213-219.
5. Ziden L, Wenestam CG, Hansson-Scherman M. A life-breaking event: early experiences of the consequences of a hip fracture for elderly people. *Clinical Rehabilitation*. September, 2008;22(9):801-811.
6. Johal KS, Boulton C, Moran CG. Hip fractures after falls in hospital: a retrospective observational cohort study. *Injury*. February, 2009;40(2):201-204.

v. The author's name was misspelled in the original publication. It should read "E. Wen."

ii. Nursing-Sensitive Adverse Events for Medical Patients

Definition

This indicator measures the rate of nursing-sensitive adverse events for all medical patients. The following adverse events are captured in this indicator:

- a) Urinary tract infections;
- b) Pressure ulcers;
- c) In-hospital fractures; and
- d) Pneumonia.

- **Unit of analysis:** The measuring unit of this indicator is a single admission. The indicator is expressed as a rate of nursing-sensitive adverse events per 1,000 medical discharges.
- **Denominator:** Acute care hospitalizations with medical conditions.
- **Numerator:** Cases within the denominator with one or more adverse events.

Notes

Due to the new coding standard for post-intervention conditions that came into effect on April 1, 2009, capturing post-admission pneumonia has improved. As a result, hospitals may notice a slight increase in their adverse event rate in 2009–2010. For more information on the new coding standard for post-intervention conditions, please refer to Chapter XIX—Injury, Poisonings and Certain Other Consequences of External Causes in the *Canadian Coding Standards for Version 2009 ICD-10-CA and CCI*.

Based on our findings, approximately 90% of these adverse events happen to patients who are age 55 and older. Thus, this indicator focuses on patients age 55 and older.

Rationale

A study of adverse events estimated that approximately 70,000 preventable adverse events occur annually in Canadian hospitals.¹ Based on the definition used by the World Health Organization and other studies, adverse events refer to incidents caused by medical management instead of complications of disease.^{1–3}

Some studies have found that adverse events increase the costs of patient care^{4, 5} and have suggested that nurse staffing, in particular, is associated with adverse events such as pneumonia,⁶ urinary tract infections,^{6, 7} pressure ulcers⁷ and in-hospital falls.^{7, 8}

While nurses are not solely responsible for adverse events that occur in hospital, many believe that there is a strong relationship between nurse staffing and patient outcomes.^{9, 10} This indicator can help hospitals identify potential issues in nursing care. Further investigation and analysis based on the indicator results may possibly lead to quality improvement in nursing care.

Method of Calculation

Numerator		
	Criteria	Codes
Include	<p>Cases within the denominator with at least one nursing-sensitive adverse event, coded as type 2 diagnosis of any of the following conditions:</p> <ul style="list-style-type: none"> • Urinary tract infection, site not specified • Pressure ulcers: decubitus ulcer • In-hospital fractures: <ul style="list-style-type: none"> – Fracture of shoulder and upper arm – Fracture of forearm – Fracture at wrist and hand level – Fracture of femur – Fracture of lower leg, including ankle (includes malleolus) – Fracture of foot, except ankle – Fractures involving multiple regions of one upper limb – Fractures involving multiple regions of one lower limb – Fractures involving multiple regions of both upper limbs – Fractures involving multiple regions of both lower limbs – Fractures involving multiple regions of upper limb(s) – Fracture of upper limb, level unspecified – Fracture of lower limb, level unspecified • Pneumonia: non-viral pneumonia 	<p>One of the following ICD-10-CA codes, coded as type 2:</p> <p>N39.0 L89.^ S42.^ S52.^ S62.^ S72.^ S82.^ S92.^ T02.2^ T02.3^ T02.4^ T02.5^ T02.6^ T10.^ T12.^ J13, J14, J15.^, J16.^, J18.^, J85.1 or J69.0</p>
Denominator		
	Criteria	Codes
Include	<p>Patients within an inpatient setting</p> <p>AND</p> <p>Patients within the medical patient group (based on MCC)</p>	<p>Facility Type Code = 1 (acute care)</p> <p>AND</p> <p>Based on MCC patient groups (see Appendix A)</p>
Exclude	<p>NEW Patients who are younger than 55 at admission</p> <p>Non-clinical criteria</p>	<p>Age (in years) <55</p> <p>Refer to Section 5: Identifying Acute Care and Day Procedure Data—Table 2A.</p>

Interpretation Note

For this indicator, a lower rate is more desirable.

High or low rates for this indicator must be interpreted with caution as they may be a consequence of inconsistent coding practices by hospitals when reporting post-admission adverse events to the DAD.

References

1. Baker GR, Norton PG, Flintoft V, et al. The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada. *Canadian Medical Association Journal*. May 25, 2004;170(11):1678-1686.
2. World Health Organization. WHO Draft Guidelines for Adverse Event Reporting and Learning Systems.http://www.who.int/patientsafety/events/05/Reporting_Guidelines.pdf. Updated 2005. Accessed August 3, 2010.
3. Kellogg VA, Havens DS. Adverse events in acute care: an integrative literature review. [Review] [100 refs]. *Research in Nursing & Health*. October, 2003;26(5):398-408.
4. Cho SH, Ketefian S, Barkauskas VH, Smith DG. The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. *Nursing Research*. March, 2003;52(2):71-79.
5. Pappas SH. The cost of nurse-sensitive adverse events. *Journal of Nursing Administration*. May, 2008;38(5):230-236.
6. Needleman J, Buerhaus PI, Stewart M, Zelevinsky K, Mattke S. Nurse staffing in hospitals: is there a business case for quality?.[Erratum appears in Health Aff (Millwood). 2006 Mar-Apr; 25(2):571]. *Health Affairs*. January, 2006;25(1):204-211.
7. Unruh L. Licensed nurse staffing and adverse events in hospitals. *Medical Care*. January, 2003; 41(1):142-152.
8. Blegen MA, Vaughn TE, Goode CJ. Nurse experience and education: effect on quality of care. *Journal of Nursing Administration*. January, 2001;31(1):33-39.
9. White P, Hall ML. Chapter 6: Patient Safety Outcomes. In: Doran DM, ed. *Nursing Sensitive Outcomes: State of the Science*. Sudbury, Massachusetts: Jones and Bartlett Pub.; 2003; 211-242.
10. Canadian Health Services Research Foundation. Staffing for Safety: A Synthesis of the Evidence on Nurse Staffing and Patient Safety.http://www.chsrf.ca/Migrated/pdf/researchReports/commissionedResearch/staffing_for_safety_policy_synth_e.pdf. Updated 2006. Accessed October 16, 2012.

iii. Nursing-Sensitive Adverse Events for Surgical Patients

Definition

This indicator measures the rate of nursing-sensitive adverse events for all surgical patients. The following adverse events are captured in this indicator:

- a) Urinary tract infections;
- b) Pressure ulcers;
- c) In-hospital fractures; and
- d) Pneumonia.

- **Unit of analysis:** The measuring unit of this indicator is a single admission. The indicator is expressed as a rate of nursing-sensitive adverse events per 1,000 surgical discharges.
- **Denominator:** Acute care hospitalizations where a surgical procedure was performed.
- **Numerator:** Cases within the denominator with one or more adverse events.

Notes

Due to the new coding standard for post-intervention conditions that came into effect on April 1, 2009, capturing post-admission pneumonia has improved. As a result, hospitals may notice a slight increase in their adverse event rate in 2009–2010. For more information on the new coding standard for post-intervention conditions, please refer to Chapter XIX—Injury, Poisonings and Certain Other Consequences of External Causes in the *Canadian Coding Standards for Version 2009 ICD-10-CA and CCI*.

Based on our findings, approximately 90% of these adverse events happen to patients who are age 55 and older. Thus, this indicator focuses on patients age 55 and older.

Rationale

A study of adverse events in Canada estimated that approximately 70,000 preventable adverse events occur annually in hospitals.¹ Based on the definition used by the World Health Organization and other studies, adverse events refer to incidents caused by medical management instead of complications of disease.^{1–3}

Some studies have found that adverse events increase the costs of patient care^{4, 5} and have suggested that nurse staffing, in particular, is associated with adverse events such as pneumonia,⁶ urinary tract infections,^{6, 7} pressure ulcers⁷ and in-hospital falls.^{7, 8}

While nurses are not solely responsible for adverse events that occur in hospital, many believe that there is a strong relationship between nurse staffing and patient outcomes.^{9, 10} This indicator can help hospitals identify potential issues in nursing care. Further investigation and analysis based on the indicator results may possibly lead to quality improvement in nursing care.

Method of Calculation

Numerator		
	Criteria	Codes
Include	<p>Cases within the denominator with at least one nursing-sensitive adverse event, coded as type 2 diagnosis of any of the following conditions:</p> <ul style="list-style-type: none"> • Urinary tract infection, site not specified • Pressure ulcers: decubitus ulcer • In-hospital fractures: <ul style="list-style-type: none"> – Fracture of shoulder and upper arm – Fracture of forearm – Fracture at wrist and hand level – Fracture of femur – Fracture of lower leg, including ankle (includes malleolus) – Fracture of foot, except ankle – Fractures involving multiple regions of one upper limb – Fractures involving multiple regions of one lower limb – Fractures involving multiple regions of both upper limbs – Fractures involving multiple regions of both lower limbs – Fractures involving multiple regions of upper limb(s) – Fracture of upper limb, level unspecified – Fracture of lower limb, level unspecified • Pneumonia: non-viral pneumonia 	<p>One of the following ICD-10-CA codes, coded as type 2</p> <ul style="list-style-type: none"> N39.0 L89.^ S42.^ S52.^ S62.^ S72.^ S82.^ S92.^ T02.2^ T02.3^ T02.4^ T02.5^ T02.6^ T10.^ T12.^ J13, J14, J15.^, J16.^, J18.^, J85.1 or J69.0
Denominator		
	Criteria	Codes
Include	<p>Patients within an inpatient setting</p> <p>AND</p> <p>Patients within the surgical patient group (based on MCC)</p>	<p>Facility Type Code = 1 (acute care)</p> <p>AND</p> <p>Based on MCC patient groups (see Appendix A)</p>
Exclude	<p>NEW Patients who are younger than 55 at admission</p> <p>Non-clinical criteria</p>	<p>Age (in years) <55</p> <p>Refer to Section 5: Identifying Acute Care and Day Procedure Data—Table 2A.</p>

Interpretation Note

For this indicator, a lower rate is more desirable.

High or low rates for this indicator must be interpreted with caution as they may be a consequence of inconsistent coding practices by hospitals when reporting post-admission adverse events to the DAD.

References

1. Baker GR, Norton PG, Flintoft V, et al. The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada. *Canadian Medical Association Journal*. May 25, 2004;170(11):1678-1686.
2. World Health Organization. WHO Draft Guidelines for Adverse Event Reporting and Learning Systems.http://www.who.int/patientsafety/events/05/Reporting_Guidelines.pdf. Updated 2005. Accessed August 3, 2010.
3. Kellogg VA, Havens DS. Adverse events in acute care: an integrative literature review. [Review] [100 refs]. *Research in Nursing & Health*. October, 2003;26(5):398-408.
4. Cho SH, Ketefian S, Barkauskas VH, Smith DG. The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. *Nursing Research*. March, 2003;52(2):71-79.
5. Pappas SH. The cost of nurse-sensitive adverse events. *Journal of Nursing Administration*. May, 2008;38(5):230-236.
6. Needleman J, Buerhaus PI, Stewart M, Zelevinsky K, Mattke S. Nurse staffing in hospitals: is there a business case for quality?.[Erratum appears in Health Aff (Millwood). 2006 Mar-Apr; 25(2):571]. *Health Affairs*. January, 2006;25(1):204-211.
7. Unruh L. Licensed nurse staffing and adverse events in hospitals. *Medical Care*. January, 2003; 41(1):142-152.
8. Blegen MA, Vaughn TE, Goode CJ. Nurse experience and education: effect on quality of care. *Journal of Nursing Administration*. January, 2001;31(1):33-39.
9. White P, Hall ML. Chapter 6: Patient Safety Outcomes. In: Doran DM, ed. *Nursing Sensitive Outcomes: State of the Science*. Sudbury, Massachusetts: Jones and Bartlett Pub.; 2003; 211-242.
10. Canadian Health Services Research Foundation. Staffing for Safety: A Synthesis of the Evidence on Nurse Staffing and Patient Safety.http://www.chsrf.ca/Migrated/pdf/researchReports/commissionedResearch/staffing_for_safety_policy_synth_e.pdf. Updated 2006. Accessed October 16, 2012.

iv. Obstetric Trauma—Vaginal Delivery With Instrument

Definition

This indicator measures the rate of obstetric trauma (fourth-degree lacerations or greater in severity) for instrument-assisted vaginal deliveries.

- **Unit of analysis:** The measuring unit of this indicator is a single admission. The indicator is expressed as a rate of obstetric traumas per 100 instrument-assisted vaginal deliveries.
- **Denominator:** Vaginal delivery discharges with instrument-assisted delivery.
- **Numerator:** Cases within the denominator with obstetric trauma.

Note

Based on clinical input and a literature review, this indicator was limited to fourth-degree lacerations and more severe obstetric traumas, such as high vaginal lacerations or trauma to pelvic organs. Fourth-degree lacerations and those greater in severity require surgical repair and are often associated with chronic complications.¹

Rationale

Obstetric trauma is among the most common adverse events in Canada.² Within Canadian hospitals (excluding Quebec), approximately 9,100 obstetric traumas were reported per year between 2003 and 2006.² Obstetric trauma may result in longer lengths of stay for mothers² and chronic complications such as fecal incontinence³ and uterine prolapse.⁴

Risk factors for obstetric trauma include large fetal size, premature delivery, prolonged pregnancy, long labour, maternal age and episiotomy extraction.^{2, 5, 6} One of the most significant and potentially modifiable risk factors for obstetric trauma is the use of instruments during vaginal delivery.^{2, 6} From 2003–2004 to 2005–2006, approximately 15% of all vaginal deliveries in Canada (excluding Quebec) involved instrument assistance.² However, by ensuring appropriate training and adherence with best practice guidelines during instrument-assisted deliveries, hospitals can potentially reduce the risk of obstetric trauma.

The obstetric trauma indicators are intended to be used as flags to identify areas for improvement and to help identify processes of care that require hospital-level evaluation.

Method of Calculation

Numerator		
	Criteria	Codes
Include	<p>Cases within the denominator with at least one obstetric trauma (any of the following conditions or interventions):</p> <ul style="list-style-type: none"> • Fourth-degree perineal laceration during delivery, delivered, with or without mention of antepartum condition • Obstetric laceration of cervix, delivered, with or without mention of antepartum condition • Obstetric high vaginal laceration alone, delivered, with or without mention of antepartum condition • Other obstetric injury to pelvic organs, delivered, with or without mention of antepartum condition • Surgical repair, postpartum, of obstetric laceration: <ul style="list-style-type: none"> – Of corpus uteri – Of current obstetric laceration of cervix occurring at vaginal delivery – Of current obstetric laceration of bladder and urethra – Of current obstetric laceration of rectum and sphincter ani 	<p>One of the following ICD-10-CA codes, coded as type M or type 1 only</p> <p>O70.301</p> <p>O71.301</p> <p>O71.401</p> <p>O71.501</p> <p>CCI codes:</p> <p>5.PC.80.JH</p> <p>5.PC.80.JJ</p> <p>5.PC.80.JR</p> <p>5.PC.80.JQ and one of the above laceration or injury diagnosis codes, coded as type M or type 1</p>
Denominator		
	Criteria	Codes
Include	<p>Vaginal delivery within an inpatient setting</p> <p>AND</p> <p>Delivery codes</p> <p>AND</p> <p>Instrument-assisted vaginal delivery</p>	<p>Facility Type Code = 1 (acute care)</p> <p>AND</p> <p>O10–O16, O21–O26, O28–O37, O40–O46, O48, O60–O75, O85–O92, O95 or O98–O99 with a sixth digit of 1 or 2</p> <p>OR</p> <p>Z37 coded in any position</p> <p>AND</p> <p>CCI code: 5.MD.53^^, 5.MD.54^^, 5.MD.55^^, 5.MD.56.NN, 5.MD.56.PC, 5.MD.56.NR, 5.MD.56.PF, 5.MD.56.NW or 5.MD.56.PJ</p>

Denominator		
	Criteria	Codes
Exclude	Patients who are younger than 13 or older than 64 at admission	Age (in years) <13 or >64
	All Caesarean sections	5.MD.60. ^{^^}
	Delivery in which an abortive procedure or pregnancy with an abortive outcome was recorded	CCI: 5.CA.88. ^{^^} , 5.CA.89. ^{^^} or 5.CA.93. ^{^^} OR ICD-10-CA: Z37 AND O00–O08
	Non-clinical criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A .

Interpretation Note

For this indicator, a lower rate is more desirable.

It has been noted that some provinces/territories have had a much higher rate of major obstetrical lacerations than other jurisdictions. After extensive data mining and discussion, it was determined that this discrepancy may be due to the use of inappropriate codes for the documented diagnoses of minor vaginal lacerations and periurethral lacerations (to O71.401 and O71.501). CIHI has consulted with the Society of Obstetricians and Gynaecologists (SOGC) in this regard. As a result, the alphabetical index and tabular listing have been updated accordingly for v2009 of ICD-10-CA to ensure that minor vaginal and periurethral lacerations are classified appropriately and consistently and, subsequently, the rate of major obstetrical lacerations will be more comparable.

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v. Obstetric Trauma—Vaginal Delivery Without Instrument

Definition

This indicator measures the rate of obstetric trauma (fourth-degree lacerations or greater in severity) for vaginal deliveries without instrument assistance.

- **Unit of analysis:** The measuring unit of this indicator is a single admission. The indicator is expressed as a rate of obstetric traumas per 100 unassisted vaginal deliveries.
- **Denominator:** All vaginal delivery discharges without instrument-assisted delivery.
- **Numerator:** Cases within the denominator with obstetric trauma based on diagnosis or procedure codes.

Note

Based on clinical input and a literature review, this indicator was limited to fourth-degree lacerations and more severe obstetric traumas, such as high vaginal lacerations or trauma to pelvic organs. Fourth-degree lacerations and those greater in severity require surgical repair and are often associated with chronic complications.¹

Rationale

Obstetric trauma is among the most common adverse events in Canada.² Within Canadian hospitals (excluding Quebec), approximately 9,100 obstetric traumas were reported per year between 2003 and 2006.² Obstetric trauma may result in longer lengths of stay for mothers² and chronic complications such as fecal incontinence³ and uterine prolapse.⁴

Risk factors for obstetric trauma include large fetal size, premature delivery, prolonged pregnancy, long labour, maternal age, episiotomy extraction and instrument assistance.^{2, 5, 6}

The obstetric trauma indicators are intended to be used as flags to identify areas for improvement and to help identify processes of care that require hospital-level evaluation.

Method of Calculation

Numerator		
	Criteria	Codes
Include	<p>Cases within the denominator with at least one obstetric trauma (any of the following conditions or interventions):</p> <ul style="list-style-type: none"> • Fourth-degree perineal laceration during delivery, delivered, with or without mention of antepartum condition • Obstetric laceration of cervix, delivered, with or without mention of antepartum condition • Obstetric high vaginal laceration alone, delivered, with or without mention of antepartum condition • Other obstetric injury to pelvic organs, delivered, with or without mention of antepartum condition • Surgical repair, postpartum of obstetric laceration: <ul style="list-style-type: none"> – Of corpus uteri – Of current obstetric laceration of cervix occurring at vaginal delivery – Of current obstetric laceration of bladder and urethra – Of current obstetric laceration of rectum and sphincter ani 	<p>One of the following ICD-10-CA codes, coded as type M or type 1 only</p> <p>O70.301</p> <p>O71.301</p> <p>O71.401</p> <p>O71.501</p> <p>CCI codes:</p> <p>5.PC.80.JH</p> <p>5.PC.80.JJ</p> <p>5.PC.80.JR</p> <p>5.PC.80.JQ and one of the above laceration or injury diagnosis codes, coded as type M or type 1</p>
Denominator		
	Criteria	Codes
Include	<p>Vaginal delivery within an inpatient setting</p> <p>AND</p> <p>Delivery codes</p>	<p>Facility Type Code = 1 (acute care)</p> <p>AND</p> <p>O10–O16, O21–O26, O28–O37, O40–O46, O48, O60–O75, O85–O92, O95 or O98–O99 with a sixth digit of 1 or 2</p> <p>OR</p> <p>Z37 coded in any position</p>
Exclude	<p>Patients who are younger than 13 or older than 64 at admission</p> <p>Instrument-assisted deliveries</p> <p>All Caesarean sections</p> <p>Delivery in which an abortive procedure or pregnancy with an abortive outcome was recorded</p> <p>Non-clinical criteria</p>	<p>Age (in years) <13 or >64</p> <p>CCI code: 5.MD.53^^, 5.MD.54^^, 5.MD.55^^, 5.MD.56.NN, 5.MD.56.PC, 5.MD.56.NR, 5.MD.56.PF, 5.MD.56.NW or 5.MD.56.PJ</p> <p>5.MD.60.^^</p> <p>CCI: 5.CA.88.^^, 5.CA.89.^^ or 5.CA.93.^^</p> <p>OR</p> <p>ICD-10-CA: Z37 AND O00–O08</p> <p>Refer to Section 5: Identifying Acute Care and Day Procedure Data—Table 2A.</p>

Interpretation Note

For this indicator, a lower rate is more desirable.

It has been noted that some provinces/territories have had a much higher rate of major obstetrical lacerations than other jurisdictions. After extensive data mining and discussion, it was determined that this discrepancy may be due to the use of inappropriate codes for the documented diagnoses of minor vaginal lacerations and periurethral lacerations (to O71.401 and O71.501). CIHI has consulted with the Society of Obstetricians and Gynaecologists (SOGC) in this regard. As a result, the alphabetical index and tabular listing have been updated accordingly for v2009 of ICD-10-CA to ensure that minor vaginal and periurethral lacerations are classified appropriately and consistently and, subsequently, the rate of major obstetrical lacerations will be more comparable.

References

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16 Indicators: Appropriateness and Accessibility

i. Caesarean Section Rate: Excluding Pre-Term and Multiple Gestations

Definition

This indicator measures the rate of deliveries via Caesarean section (C-section), excluding pre-term and multiple-gestation pregnancies.

- **Unit of analysis:** The measuring unit of this indicator is a single admission. The indicator is expressed as a rate of C-sections per 100 deliveries.
- **Denominator:** Hospitalizations where a delivery was recorded, excluding pre-term and multiple births.
- **Numerator:** Cases within the denominator where a C-section delivery was recorded.

Note

Quebec data is included in results for 2008–2009, 2009–2010 and 2010–2011.

Rationale

This indicator is intended to supplement the Caesarean Section Rate indicator. Multiple and pre-term deliveries are among the main indications for a C-section delivery.¹⁻³ Teaching and larger community hospitals may have a higher rate of these complex cases. Excluding these cases from analysis will provide hospitals with a more in-depth look at their C-section rate and improve the comparability of rates across hospitals.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases within the denominator with a Caesarean section delivery that was not performed out of hospital	CCI: 5.MD.60.^ and out-of-hospital indicator ≠ Y
Denominator		
	Criteria	Codes
Include	In-hospital deliveries	Facility Type Code = 1 (acute care)
	AND	AND
	Delivery codes	ICD-10-CA: O10–O16, O21–O26, O28–O37, O40–O46, O48, O60–O75, O85–O92, O95 or O98–O99 with a sixth digit of 1 or 2
		OR
		Z37

Denominator		
	Criteria	Codes
Exclude	Delivery in which an abortive procedure or pregnancy with an abortive outcome was recorded	CCI: 5.CA.88.^, 5.CA.89.^ or 5.CA.93.^ OR ICD-10-CA: Z37 AND O00–O08
	Multiple gestations	ICD-10-CA: O30^^
	Pre-term delivery	ICD-10-CA: O60^^
	Patients who are younger than 13 or older than 64 at admission	Age (in years) <13 or >64
	Non-clinical criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A

Interpretation Note

Since unnecessary C-section delivery increases maternal morbidity and mortality and is associated with higher costs, C-section rates are often used to monitor clinical practices. The implicit assumption is that lower rates indicate more appropriate as well as more efficient care; however, variations in rates can serve as a flag to examine appropriateness of care, as well as maternal and neonatal outcomes.

References

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ii. Vaginal Birth After Caesarean Section

Definition

This indicator measures the rate of women who delivered vaginally after previously having had a Caesarean section (C-section).

- **Unit of analysis:** The measuring unit of this indicator is a single admission. The indicator is expressed as a rate of vaginal deliveries per 100 previous C-sections.
- **Denominator:** Hospitalizations for a delivery where a prior C-section was recorded.
- **Numerator:** Cases within the denominator where a vaginal delivery following a prior C-section was recorded.

Note

Quebec data is included in results for 2008–2009, 2009–2010 and 2010–2011.

Rationale

C-section is one of the most commonly performed surgical procedures for Canadian women and now accounts for more than 25% of all deliveries.¹ Approximately 80% of women who had a previous C-section had a repeat C-section in 2007–2008.¹ The increasing rate of C-sections being performed among Canadian women is concerning, as these procedures are associated with increased risk of maternal morbidity^{2,3} and are more costly than vaginal deliveries.⁴ In 2008, in response to the increasing number of C-section births in Canada, the Society of Obstetricians and Gynaecologists of Canada (SOGC) released a joint policy statement to encourage and promote normal childbirth within Canadian hospitals.⁵

According to the SOGC, there is sufficient evidence to support the safety and success of vaginal birth among women who have previously delivered via C-section (vaginal birth after C-section, or VBAC).⁶ Successful VBAC is associated with previous spontaneous vaginal delivery (before the initial C-section), maternal age younger than 40, birth weight less than 4,000 grams and absence of known risk factors for increased maternal morbidity, such as obesity, history of dystocia and multiple prior C-section deliveries.⁷ The most severe risk for women attempting vaginal delivery after a previous C-section is that of uterine rupture, which has been estimated to occur in between 0.7% and 1.3% of cases.^{7,8}

Standard Canadian rates for VBAC and C-section are still unclear; thus comparing rates over time and across hospitals is fundamental to understanding patterns of use and maternal outcomes.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases within the denominator with a vaginal delivery following a prior C-section	ICD-10-CA: O75.701
Exclude	Caesarean deliveries	CCI: 5.MD.60.^
Denominator		
	Criteria	Codes
Include	<p>Delivery within an inpatient setting</p> <p>AND</p> <p>A delivery following a prior C-section was recorded:</p> <ul style="list-style-type: none"> • Uterine scar due to previous Caesarean section • Vaginal delivery following previous Caesarean section • Failed trial of labour following previous Caesarean 	<p>Facility Type Code = 1 (acute care)</p> <p>AND</p> <p>ICD-10-CA code in any position:</p> <p>O34.201</p> <p>O75.701</p> <p>O66.401</p>
Exclude	<p>Patients who are younger than 13 or older than 64 at admission</p> <p>Delivery in which an abortive procedure or pregnancy with an abortive outcome was recorded</p> <p>Non-clinical criteria</p>	<p>Age (in years) <13 or >64</p> <p>CCI: 5.CA.88.^, 5.CA.89.^ or 5.CA.93.^</p> <p>OR</p> <p>ICD-10-CA: Z37 AND O00–O08</p> <p>Refer to Section 5: Identifying Acute Care and Day Procedure Data—Table 2A</p>

Interpretation Note

The implicit assumption is that a higher rate indicates more appropriate as well as more efficient care; however, variations in rates can serve as a flag to examine appropriateness of care, as well as maternal and neonatal outcomes.

References

1. Canadian Institute for Health Information. *Health Indicators 2009*. Ottawa, Ontario: CIHI; 2009.
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iii. Use of Coronary Angiography Following Acute Myocardial Infarction

Definition

This indicator measures the rate of first acute myocardial infarction (AMI) inpatient admissions that have coronary angiography within the episode of care.

- **Unit of analysis:** The measuring unit of this indicator is an episode of care. The indicator is expressed as a rate of coronary angiography per 100 first AMI admission episodes.
- **Denominator:** First AMI episodes in the fiscal year.
- **Numerator:** Cases within the denominator with coronary angiography performed within the same episode of care.

Notes

For multi-hospital episodes of care, the denominator case is attributed to the hospital to which the patient was admitted at the beginning of the episode of care.

If there are multiple AMI episodes of care for a patient within a fiscal year, only the first AMI episode was counted.

In the denominator population, an episode must start as an inpatient case, with the diagnosis of interest in the first hospitalization of the episode of care.

AMI episodes where the patient had a previous AMI admission within the last 12 months are excluded (washed out).

Rationale

Coronary angiography provides detailed structural information on coronary anatomy, which can be very helpful when evaluating patients with heart diseases to assess the severity of the condition¹ and to provide direction for appropriate management.²

Coronary angiography is recommended for ST-elevation myocardial infarction (STEMI, which is the more severe type of MI) patients with cardiac electrical and/or hemodynamic instability. It is also recommended for those who are candidates for revascularization (percutaneous coronary intervention or coronary artery bypass graft) and surgical repair of ventricular septal rupture.³ For non-STEMI patients and patients with angina who are at high risk, invasive diagnostic strategies such as early angiography are generally preferable.^{4, 5} Delays in angiography are associated with a higher risk of adverse events and longer hospital stays for high-risk non-STEMI patients.⁶

The use of angiography might not be suitable for all AMI patients; depending on the patient's conditions and characteristics, health care providers must make the final decision based on the risks and benefits to the patient.^{2, 4} While our current indicator methodology does not differentiate between STEMI and non-STEMI patients, by examining this indicator, hospitals could further investigate the appropriateness of this diagnostic technique.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases with coronary angiography performed within the same episode of care	CCI code: 3.IP.10.VX
Denominator (Index Episode)		
	Criteria	Codes
Include	<p>Episodes where the AMI case started in an inpatient setting</p> <p>AND</p> <p>Admission for first AMI during the current fiscal year</p> <p>AND</p> <p>AMI</p>	<p>Facility Type Code = 1 (acute care)</p> <p>AND</p> <p>Admission date between April 1 and March 31 of the fiscal year</p> <p>AND</p> <p>One of the following criteria:</p> <p>a) AMI (ICD-10-CA: I21 or I22) is coded as diagnosis type M but not also as type 2;</p> <p>OR</p> <p>b) Where another diagnosis is coded as type M and also as type 2, and a diagnosis of AMI is coded as type 1 (or type W, X or Y but not also as type 2);</p> <p>OR</p> <p>c) Coronary artery disease (ICD-10-CA: I25.0, I25.1, I25.8 or I25.9) is coded as type M and AMI is coded as type 1 (or type W, X or Y but not also as type 2)</p> <p>AND</p> <p>A revascularization procedure is coded:</p> <ul style="list-style-type: none"> • Percutaneous coronary intervention (CCI: 1.IJ.50^^, 1.IJ.57.GQ^^ or 1.IJ.54.GQ.AZ*) or • Coronary artery bypass (CCI: 1.IJ.76^^)
Exclude	<p>Previous AMI in the last 12 months</p> <p>NEW Patients age 19 and younger at admission</p> <p>Non-clinical criteria</p>	<p>AMI admissions (ICD-10-CA: I21 or I22 as a diagnosis type M, 1, 2, W, X or Y) in the 12 months preceding the admission date on the index AMI record</p> <p>Age (in years) associated with index AMI record ≤19</p> <p>Refer to Section 5: Identifying Acute Care and Day Procedure Data—Table 2A</p>

Note

* CCI code 1.IJ.54.GQ-AZ was deactivated in 2009. It was used in indicator calculation for 2007–2008 and 2008–2009 only.

Interpretation Note

The implicit assumption is that higher rates indicate more appropriate as well as more efficient care; however, very high rates should be further examined for possible over-utilization.

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iv. Hip Fracture Surgical Procedures Performed Within 48 Hours: Wait Time Across Facilities

NEW Definition

This indicator measures the proportion of hip fracture surgical procedures performed within 48 hours of initial admission across facilities.

- **Unit of analysis:** The measuring unit of this indicator is a single admission or multiple admissions. The indicator is expressed as a rate of hip fracture procedures performed within 48 hours of admission per 100 hip fracture procedures.
- **Denominator:** Inpatient cases with a pre-admission hip fracture and hip fracture surgery.
- **Numerator:** Cases within the denominator with hip fracture surgery performed within 48 hours.

Notes

For wait time calculations involving multi-hospital stays, the total wait time is attributed to the hospital where the surgery was performed.

For hip fracture procedures not performed during the index hospitalization, records are linked according to the following criteria:

- Index and surgery hospitalizations have the same hip fracture diagnosis code(s) matching to the fourth digit of the ICD-10-CA code.
- The time interval between the admission date for the index hospitalization and the admission date for the surgery hospitalization is within 28 days.
- The hospitalization record with a hip fracture diagnosis and a hip fracture surgery (surgery hospitalization) is selected first, per the denominator inclusion/exclusion criteria below. The search for the index hospitalization is then performed.

Rationale

Although the age-adjusted rate of hip fractures in Canada has been declining in recent years, the absolute number of hip fractures continues to increase due to changes in the age distribution of the population.¹ In 2005, provincial and territorial leaders identified wait times for hip fracture surgery as a priority by including them in a list of national wait time benchmarks and stating that the delay for this procedure should be less than 48 hours.²

There is strong evidence to suggest that hip fracture procedures that are delayed by more than 48 hours (compared with those performed within 48 hours) are associated with poorer outcomes, specifically with respect to length of hospital stay,^{3,4} self-reported pain,⁴ 30-day mortality⁵ and one-year mortality rates.⁵ Measuring the delay to hip fracture surgery provides an opportunity for hospitals to monitor and improve access to this health care service.

Method of Calculation

Numerator		
	Criteria	Codes
Include	Cases within the denominator with hip fracture surgery performed within 48 hours of index admission	(Date and time of hip surgery) – (Date and time of hip fracture admission) <48 hours
Denominator		
	Criteria	Codes
Include	<p>Cases with an urgent/emergent admission to an acute care institution</p> <p>AND</p> <p>Pre-admission diagnosis of hip fracture</p> <p>AND</p> <p>Hip surgery was performed (hip joint fixation, hip joint implantation of internal device, femur fixation or pelvis implantation of internal device)</p>	<p>Facility Type Code = 1 (acute care)</p> <p>AND</p> <p>Admission Category Code = U</p> <p>AND</p> <p>ICD-10-CA codes</p> <p>a) S72.0^, S72.1^ or S72.2^ coded as diagnosis type M but not also as type 2;</p> <p>OR</p> <p>b) Where another diagnosis is coded as type M and also type 2, and S72.0^, S72.1^ or S72.2^ is coded as type 1, W, X or Y and not type 2;</p> <p>OR</p> <p>c) Convalescence or rehabilitation code Z50.1, Z50.8, Z50.9, Z54.0, Z54.4, Z54.7, Z54.8 or Z54.9 is coded as type M and S72.0^, S72.1^ or S72.2^ is coded as type 1, W, X or Y and not type 2</p> <p>AND</p> <p>CCI: 1.VA.74.^, 1.VA.53.^, 1.VC.74^^ or 1.SQ.53^^ with Status Attribute ≠ A and out-of-hospital indicator ≠ Y</p> <p>Note: Hip surgery should be flagged only if there is a hip fracture diagnosis code (criterion a, b or c above) on the same hospitalization record.</p>

Denominator		
	Criteria	Codes
Exclude	An invalid procedure date for the hip fracture surgery	Procedure date = missing or 01JAN9999
	An invalid procedure time for the hip fracture surgery	Procedure time missing or 9999
	Patient signed himself or herself out or did not return from a pass	Discharge Disposition Code = 06 (sign out) or 12 (patient does not return from a pass)
	Patients who are younger than 65 at admission	Age (in years) <65
	Non-clinical criteria	Refer to Section 5: Identifying Acute Care and Day Procedure Data— Table 2A
	A hip fracture event where another hip fracture is coded as a post-admission diagnosis on the index hospitalization or on the surgery record, regardless of admission category	Admission Category Code = U or L AND ICD-10-CA codes S72.0^, S72.1^ or S72.2^ coded as type 2 on the earliest hospitalization record or on the surgery record

Interpretation Notes

For this indicator, a higher rate is more desirable. Please note that this indicator captures the wait time across all facilities. In cases where patients were transferred from another hospital to receive surgery, the initial time spent at the other hospital(s) prior to surgery is included in the calculation of the patient's total wait time. Due to the complexity of the methodology, hospitals may not be able to reproduce these results with their own data.

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Appendix A: Patient Group List—MCC and CMG+ 2011

Medical Patient Group

MCC diagnostic partition in which the patient is not also part of the obstetric (MCC 13), neonatal (MCC 14) or mental health (MCC 17) patient group.

Surgical Patient Group

MCC intervention partition in which the patient is not also part of the obstetric (MCC 13), neonatal (MCC 14) or mental health (MCC 17) patient group.

Obstetric (Pregnancy and Childbirth) Patient Group

MCC = 13

Neonatal Patient Group

MCC = 14

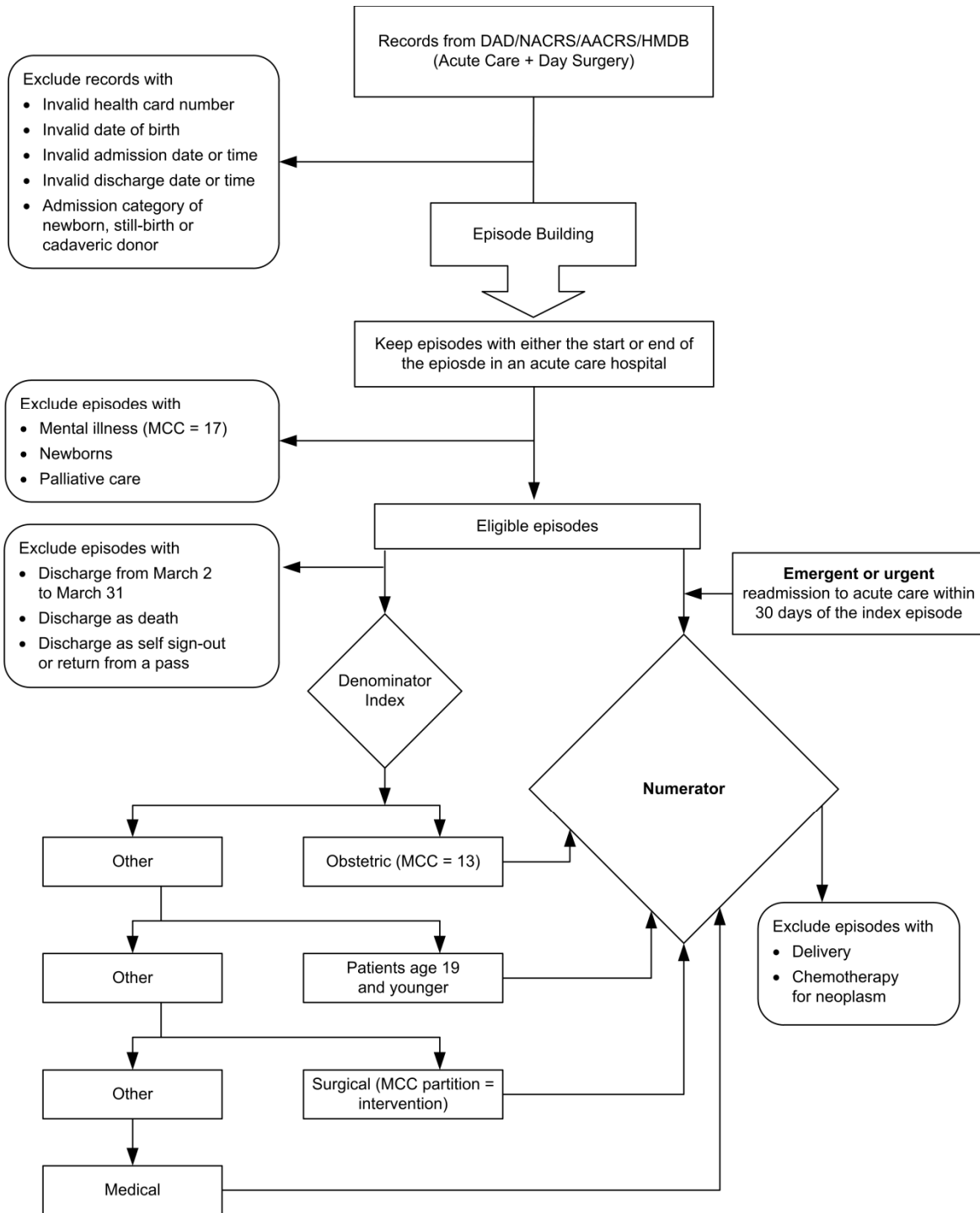
Mental Health Patient Group

MCC = 17

Major Surgery Patient Group

The following CMGs include only CMG+ 2011 codes linked to major surgical procedures: 001, 002, 004, 005, 006, 007, 008, 009, 012, 071, 072, 110, 111, 112, 113, 114, 118, 160, 162, 163, 165, 166, 167, 168, 169, 170, 171, 172, 181, 182, 220, 221, 222, 223, 224, 225, 270, 271, 272, 273, 274, 300, 302, 303, 305, 312, 313, 315, 316, 317, 318, 319, 320, 321, 326, 420, 421, 422, 450, 451, 452, 453, 454, 462, 500, 501, 503, 504, 611, 612, 710, 725, 726, 727, 729, 730, 731, 732, 733, 735

Appendix B: Flowchart: 30-Day Obstetric/ Patients Age 19 and Younger/Surgical/ Medical Readmission



Appendix C: Diagnosis Typing

Diagnosis Type*	Description
M	The one diagnosis or condition that can be described as being most responsible for the patient's stay in hospital. If there is more than one such condition, the one held most responsible for the greatest portion of the length of stay or greatest use of resources is selected.
1	A condition that existed prior to admission
C	CIHI-assigned diagnosis type for Quebec records only, which signifies a condition that existed prior to admission or a secondary diagnosis
2	A condition that arises post-admission
W, X, Y	A condition that is associated with the first/second/third service transfer

Note

* Relevant diagnosis types used in CHRP indicators.

Appendix D: Day Surgery MIS Functional Centre Codes

	Ontario	Nova Scotia
2007–2008	7*260**, 7*262, 7*265**, 7*34020, 7*34025**, 7*34055 (* = 1, 2 or 3; ** = series)	712600000, 722600000, 712602000, 712602500, 712603000, 712604000, 712604500, 712606000, 712606500, 712607000, 712609900, 713402000, 713402500, 713402520, 713403500, 713403700, 713405500
2008–2009	7*260**, 7*262, 7*265**, 7*34025**, 7*34055 (* = 1, 2 or 3; ** = series)	712600000, 722600000, 712602000, 712602500, 712603000, 712604000, 712604500, 712606000, 712606500, 712607000, 712609900, 713402000, 713402500, 713402520, 713403500, 713403700, 713405500
2009–2010	7*260**, 7*262, 7*265, 7*34055, 7*360, 7*362, 7*365, 7*369 (* = 1, 2 or 3; ** = series)	712600000, 722600000, 712602000, 712602500, 712603000, 712604000, 712604500, 712606000, 712606500, 712607000, 712609900, 712650000, 712652000, 712654000, 712656000, 713403500, 713403700, 713405500, 713600000, 713620000, 713650000, 713670000, 713671000, 713672000, 713690000
	Ontario, Nova Scotia and Alberta	
2010–2011	7*2600000, 7*2602000, 7*2602500, 7*2604000, 7*2604500, 7*2606000, 7*2606500, 7*2607000, 7*2620000, 7*2650000, 7*2652000, 7*2654000, 7*2656000, 7*3600000, 7*3620000, 7*3650000, 7*3670000, 7*3690000, 7*3960000, 7*3405500, 7*2603000, 7*2960000	

Appendix E: Potential Acute Care and Day Procedure Records—AACRS Data for 2007–2008 to 2009–2010

	Criteria	Codes
Include	Day surgery records	ACCS codes lower than 100, excluding diagnostic imaging codes 73, 74, 75, 76, 77, 78, 79, 80, 81, 85, 86, 87, 88 and 89
	Cardiac records	ACCS codes 201 to 220 (cardiac)
Include	Cases with specific procedures of interest that were performed outside of EDs/ community and social support centres and that do not fit into any of the above criteria	Hysterectomy: CCI codes 1.RM.89, 1.RM.91 and (1.RM.87 with extent attribute = SU)
		Prostatectomy: CCI codes 1.QT.59 and 1.QT.87
		PCI: CCI codes 1.IJ.50.^, 1.IJ.57.GQ.^ and 1.IJ.54.GQ-AZ
		CABG: CCI code 1.IJ.76
		Hip replacement: CCI code 1.VA.53.^
		Knee replacement: CCI code 1.VG.53.^
		Angiography: CCI code 3.IP.10.VX
		Cholecystectomy: CCI code 1.OD.89.^
		Labour and delivery: CCI codes 5.MD.50.^, 5.MD.51.^, 5.MD.52.^, 5.MD.53.^, 5.MD.54.^, 5.MD.56.^, 5.MD.57.^, 5.MD.58.^, 5.MD.59.^ and 5.MD.60.^
		Exclude
Services provided via telephone	Records grouped to ACCS 2082: Mode of Service—Telephone	

Appendix F: Summary of Indicator Changes

Effectiveness (Quality and Outcomes)	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012
5-Day In-Hospital Mortality Following Major Surgery					
Charlson Index update (risk factor in risk-adjustment model). Please refer to Appendix G : The Charlson Index for more details.	P	P	P	P	P
Upper age limit removed	—	—	—	—	C
30-Day In-Hospital Mortality Following Acute Myocardial Infarction					
Upper age limit removed	—	—	—	—	C
30-Day In-Hospital Mortality Following Stroke					
Upper age limit removed	—	—	—	—	C
28-Day Readmission After Acute Myocardial Infarction					
Upper age limit removed	—	—	—	—	C
28-Day Readmission After Stroke					
Upper age limit removed	—	—	—	—	C
90-Day Readmission After Hip Replacement					
Upper age limit removed	—	—	—	—	C
Refined definition of revision surgical procedures	—	—	—	—	C
90-Day Readmission After Knee Replacement					
Upper age limit removed	—	—	—	—	C
Refined definition of revision surgical procedures	—	—	—	—	C
30-Day Overall Readmission Rate					
Refined definition for palliative records in Quebec (Obstetric, Patients Age 19 and Younger, Surgical, Medical)	—	—	—	—	C

Notes

P indicates a change that took effect in a previous data release, for the specified fiscal year of data (previous or current release).

C indicates a new change implemented in the current data release, for the specified fiscal year of data.

— Not applicable.

Patient Safety	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012
In-Hospital Hip Fracture in Elderly (65+) Patients					
Upper age limit removed	—	—	—	—	C
Nursing-Sensitive Adverse Events for Medical Patients					
Medical patient group changed from being CMG-based to MCC-based	P	P	P	P	P
No longer excludes patients with HIV, cancer or trauma	P	P	P	P	P
Cancer is added as a risk factor in the risk-adjustment model	P	P	P	P	P
Upper age limit removed	—	—	—	—	C
Nursing-Sensitive Adverse Events for Surgical Patients					
Surgical patient group changed from being CMG-based to MCC-based	P	P	P	P	P
No longer excludes patients with HIV, cancer or trauma	P	P	P	P	P
Cancer is added as a risk factor in the risk-adjustment model	P	P	P	P	P
Upper age limit removed	—	—	—	—	C
Obstetric Trauma—Vaginal Delivery With Instrument					
No change	—	—	—	—	—
Obstetric Trauma—Vaginal Delivery Without Instrument					
No change	—	—	—	—	—

Notes

P indicates a change that took effect in a previous data release, for the specified fiscal year of data (previous or current release).

C indicates a new change implemented in the current data release, for the specified fiscal year of data.

— Not applicable.

Appropriateness and Accessibility	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012
Caesarean Section Rate: Excluding Pre-Term and Multiple Gestations					
No change	—	—	—	—	—
Vaginal Birth After Caesarean Section					
No change	—	—	—	—	—
Use of Coronary Angiography Following Acute Myocardial Infarction					
Upper age limit removed	—	—	—	—	C
Hip Fracture Surgical Procedures Performed Within 48 Hours: Wait Time Across Facilities					
Major change in methodology (including removal of upper age limit)	—	—	C	C	C

Notes

C indicates a new change implemented in the current data release, for the specified fiscal year of data.

— Not applicable.

Other Changes	2007– 2008	2008– 2009	2009– 2010	2010– 2011	2011– 2012
Medical Patients					
Changed from being CMG-based to MCC-based	P	P	P	P	P
Surgical Patients					
Changed from being CMG-based to MCC-based	P	P	P	P	P

Note

P indicates a change that took effect in a previous data release, for the specified fiscal year of data (previous or current release).

Appendix G: The Charlson Index

The Charlson Index is an overall comorbidity score. Evidence shows it to be highly associated with mortality, and it has been widely used in clinical research on mortality. Based on Quan's methodology,¹ the comorbid conditions below are used to calculate the Charlson Index score for each record. Conditions within each group are counted only once (for example, if I43 and I50 appear on the abstract, the score will be 2). If conditions from different groups are present on the abstract, their weights will be summed (for example, if I50 and F00 are present on the abstract, the score will be 4).²

Description	ICD-10/CCI Codes From Hospital Standardized Mortality Ratio (Original Definitions)	Weight
Myocardial Infarction	I21, I22, I252	0
Congestive Heart Failure	I099, I255, I420, I425, I426, I427, I428, I429, I43*, I50, P290	2
Peripheral Vascular Disease	I70, I71, I731, I738, I739, I771, I790*, I792*, K551, K558, K559, Z958, Z959	0
Cerebrovascular Disease	G45, G46*, H340, I60–I67, I68*, I69	0
Dementia	F00*, F01, F02, F03, F051, G30, G311	2
Chronic Pulmonary Disease	I278, I279, J40, J41, J42, J43, J44, J45, J46, J47, J60, J61, J62, J63, J64, J65, J66, J67, J684, J701, J703	1
Rheumatological Diseases	M05, M06, M315, M32, M33, M34, M351, M353, M360*	1
Peptic Ulcer Disease	K25, K26, K27, K28	0
Mild Liver Disease	B18, K700, K701, K702, K703, K709, K713, K714, K715, K717, K73, K74, K760, K762, K763, K764, K768, K769, Z944	2
Diabetes Without Organ Failure	E100, E101, E106, E109, E110, E111, E116, E119, E130, E131, E136, E139, E140, E141, E146, E149	0
Diabetes With Organ Failure	E102, E103, E104, E105, E107, E112, E113, E114, E115, E117, E132, E133, E134, E135, E137, E142, E143, E144, E145, E147	1
Hemiplegia or Paraplegia	G041, G114, G801, G802, G81, G82, G830, G831, G832, G833, G834, G839	2
Renal Disease	I120, I131, N032, N033, N034, N035, N036, N037, N052, N053, N054, N055, N056, N057, N18, N19, N250, Z490, Z491, Z492, Z940, Z992	1
Moderate or Severe Liver Disease	I850, I859, I864, I982*, K704, K711, K721, K729, K765, K766, K767	4
HIV Infection	B24, O987	4
Primary Cancer	C0, C1, C20, C21, C22, C23, C24, C25, C26, C30, C31, C32, C33, C34, C37, C38, C39, C40, C41, C43, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C6, C70, C71, C72, C73, C74, C75, C76, C81, C82, C83, C84, C85, C88, C90, C91, C92, C93, C94, C95, C96, C97	2
Metastatic Cancer	C77, C78, C79, C80	6

Notes

For provinces other than Quebec, only diagnosis types 1 and (W, X and Y but not 2) are used to calculate the Charlson Index score, with the following exceptions:

- Diagnosis type 3 is also used for all diabetes codes; and
- Only diagnosis type 3 is used for asterisk (*) codes.

For Quebec, only diagnosis types 1, C and (W, X and Y but not 2) are used to calculate the Charlson Index score.

Due to differences in data collection, it is not possible to distinguish comorbidities (DAD diagnosis type 1) from secondary diagnoses (DAD diagnosis type 3) in Quebec data. As a result, Quebec patients in the HMDB will get higher probabilities in the logistic regression model and the results for Quebec hospitals will not be comparable with those for the rest of the country. The distribution of the Charlson Index score was shifted for Quebec patients so that patients with higher Charlson Index scores are included in lower Charlson Index score groups. The Charlson Index was calculated for Quebec data for the overall, obstetric, patients age 19 and younger, surgical and medical readmission indicators.

The distribution is as follows:

Charlson Group	Charlson Scores in the Groups, DAD	Charlson Scores in the Groups, HMDB Quebec
0	0	0 and 1
1	1 and 2	2, 3 and 4
2	3+	5+

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