

*Hospital Report 2006: Acute Care*

**Clinical Utilization and Outcomes Technical Summary**

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# Clinical Utilization and Outcomes

## Overview

*Hospital Report 2006: Acute Care* contains information on ten measures used in both hospital-specific comparisons and at the provincial level. Some of these indicators are presented in the report at a hospital-specific level, while others are only presented at a peer-group, regional, or provincial level (although hospital-specific results are available in the e-Scorecard). This *Technical Summary* provides a detailed explanation of the methods used to select and calculate these indicators and to group hospitals into categories of relative performance.

Sex<sup>1</sup>-stratified data and analyses of the core Clinical Utilization and Outcomes indicators are provided at a provincial level in the Executive Report, and at a hospital and aggregate levels (i.e. peer group, regional and provincial) in the e-Scorecard. As in previous Acute Care reports, a Women's Health section is integrated in *Hospital Report 2006: Acute Care*, which includes women's health-specific clinical indicators in the areas of Labour and Delivery, Gynecological Conditions and Hysterectomy, and Cardiac Care. These women's health-specific indicators are further described in a separate technical summary (*Hospital Report 2006: Acute Care Women's Health Technical Summary*).

For quality improvement and public reporting, it helps to focus on specific, well-defined patient groups. Similar to last year's report, in some cases patients are no longer grouped according to specific clinical conditions. Rather, three broad patient groups, defined based on Case Mix Groups (CMG<sup>TM</sup>), categorize patients as Medical, Surgical or Major Surgical groupings. (see Appendix A for a listing of the specific CMGs that make up each group). These CMG-based groups capture a broader range of patients than the condition-specific groupings used in the past, and establish a larger sample from which indicator results can be drawn. This helps ensure confidence in the results since some of the current indicators capture conditions that are rare. These groupings were selected by researchers from the University of Toronto on the advice of advisory panels composed of physicians, nurses, therapists, and health information experts.

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<sup>1</sup>Sex is biological maleness and femaleness. Gender is made up of multiple dimensions, and reflects the interaction of sex with other economic, cultural, environmental, social characteristics (e.g., age, income, ethnicity, social support), as well as roles ascribed to the sexes, and relations between the sexes. Because of the limited availability of other gender-related variables in routinely collected hospital data, the analysis is limited to sex. Pursuing gender-based analysis is an important long-term goal.

Researchers defined ten indicators of adverse events, readmissions and appropriateness for hospital level and/or province-wide analysis. These indicators were selected based on the results of a comprehensive literature review and the advice of expert panels, and are distributed as follows:

Patient Group	Adverse Events		Readmissions		Appropriateness
	Nurse-Sensitive Adverse Events	Medical Specific Adverse Events	Any Readmission	Specific-cause Readmissions	% Surgeries Done Open vs Laparoscopic
Specific Medical Conditions	H			H	
Specific Surgical Procedures	H			H	H*
All Medical Patients/Conditions		H	H		
All Surgical Procedures				✓	
Major Surgical Procedures				✓	

\*Only % Cholecystectomy performed open is reported at the hospital-level.

✓ = province-wide

H = hospital-level

The Adverse Events and Major/All Surgical Readmissions indicators are aggregates of several specific clinical conditions, which can be found in the numerator tables in the Indicator Definitions section of this *Technical Summary*. The rates for the individual conditions within these aggregate indicators are reported in the e-Scorecard. The e-Scorecard will be available for download (for participating Ontario hospitals only) from the Hospital Report website, [www.hospitalreport.ca](http://www.hospitalreport.ca).

All of these measures should be used as screening tests. Screening tests – such as Pap smears or mammograms – are often used in medicine. Screening tests can produce both false positives (individuals with positive test results who do not have cancer) and false negatives (individuals with cancer whose test results are negative). The same is true for measures of comparative hospital performance. An effort has been made to minimize false positives, but they cannot be totally eliminated. In medicine, screening tests do not provide a final diagnosis, but can help to identify cases that need follow-up. Likewise, the measures of clinical performance in this report should not be taken as a definitive assessment of access, efficiency, or quality. Rather, they are a first step in a quality assessment and improvement process that should involve more detailed analysis.

Although they are screening tests, the Clinical Utilization and Outcomes measures should help health care providers, administrators, and the public to better understand the clinical performance of their institutions and of the hospital system as a whole. Clinical care is the core process of the hospital and information on

clinical performance can be used to support quality improvement as well as for accountability purposes.

The results presented in *Hospital Report 2006: Acute Care* describe a portion of hospital care provided during fiscal 2004/2005. They also describe a system undergoing continual and substantial change. They do not necessarily reflect the system of today and should not be used to identify the best hospital(s) in the province or to guide choices around personal care.

# Methodology

## What's new for Clinical Utilization and Outcomes 2006?

Changes and methodological enhancements for the Clinical Utilization and Outcomes quadrant include:

- Identifying day surgery cases in the National Ambulatory Care Reporting System (NACRS) based on the Ontario Ministry of Health and Long Term Care (MOHLTC) definition of MIS functional centres. For details on last year's methodology, refer to *Technical Summary 2005: Clinical Utilization and Outcomes* found on the Hospital Report website, [www.hospitalreport.ca](http://www.hospitalreport.ca)
- In preparation for investigating new risk-adjustment strategies for CMG-based indicators reporting at the hospital-specific level, a new repatriation methodology for treating cases with adverse events where a new "Hospital Report Most Responsible Diagnosis" is assigned to cases with the same type M and 2 diagnosis, as the goal is to identify conditions that developed before hospital admissions to improve hospital comparability.
- Including post-admission pneumonia into the adverse events indicators.
- Adding episode LOS criteria to the nurse-sensitive adverse events indicators for each medical and surgical patient group.

For province-wide and hospital-specific results presented in the report, data from fiscal year 2004-2005 was used.

## Data Sources

All the clinical utilization and outcome measures were derived from Canadian Institute for Health Information (CIHI) data that have been collected under consistent guidelines, by trained abstractors, in all acute care hospitals in Ontario. These data have been used extensively in previous reports on health care performance, and form the basis for many journal articles. The data undergo extensive edit checks to improve accuracy, but all errors cannot be eliminated. It is important to recognize the limitations of the measures of utilization and outcomes; they will only be as accurate as the data sources on which they are based. However, using these data to produce comparative performance information should lead to refinements and improvements in data quality over time.

Some indicators were previously reported in *Hospital Report 2003: Acute Care*, using ICD-9 and CCP codes. Starting in fiscal 2002-2003, the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada* (ICD-10-CA) and the new *Canadian Classification of Health Interventions*

(CCI) were implemented in Ontario. As a result of the change between the classification systems, the diagnoses and procedure codes were converted from ICD-9 and CCP to ICD-10-CA and CCI. Classification experts at CIHI facilitated this process, however it should be noted that the mapping of codes between the two classification systems might not be perfect.

As a result of a recent re-abstraction study by an auditing group at CIHI, data quality concerns have emerged with the coding of pneumonia. There were new coding standards regarding pneumonia and chronic obstructive pulmonary disease (COPD) due to the change in classification systems from ICD-9 to ICD-10-CA. As a result, a decision was made to exclude any pneumonia patient groups in our methodology again for this year's report; however, we will review these data quality concerns and may include pneumonia patient groups again in the future. We are able to include post-admission pneumonia for the adverse events indicators as we are using pneumonia codes as a type 2, which does not interfere with the issues surrounding the coding of pneumonia and COPD.

Although wound infection is an important indicator of post-procedure clinical quality, we are not including this diagnosis in these indicators as recent analysis at CIHI has indicated that there are significant data quality concerns regarding the use of the code T81.4 'Infection following a procedure, not elsewhere classified'. This analysis and subsequent chart audits show that the code has a high false-positive rate. CIHI has been conducting educational workshops for coders to address this issue and we anticipate that the data quality concerns will improve for future reporting.

Coding variations in type 2 diagnoses have improved. Examples of changes undertaken to help reduce coding variations include the development of a revised grade list grouper as well as clarifying CIHI's Diagnosis Typing Coding Standards and circulating this to all Canadian hospitals. For further details on the *Coding Variations in CIHI Discharge Abstract Database (DAD) Data* project, please visit CIHI's website at [http://secure.cihi.ca/cihiweb/dispPage.jsp?cw\\_page=GR\\_1002\\_E](http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=GR_1002_E).

Since April 1 2003, all Ontario day surgery abstracts have been submitted to the National Ambulatory Care Reporting System (NACRS) (prior to this they were submitted to the Discharge Abstract Database (DAD)). The NACRS database includes data from day surgery units, emergency departments, and other ambulatory care clinics. It uses a different approach for identifying day surgery cases than the DAD. For more information see the "Same Day Surgery Data in Ontario" sidebar below.

### Same Day Surgery Data in Ontario

Effective April 1, 2003, all Ontario hospitals were mandated to report all ambulatory care data to the National Ambulatory Care Reporting System (NACRS) at CIHI. NACRS includes data acquisition and reporting standards intended for hospital- and community-based private and public ambulatory care activity that occurs in clinics, emergency departments, and day surgical units. These data are intended to support: management and operational decision making at the facility level; resource allocation decisions at a global and facility level; provincial and national comparisons; and the effective analysis of ambulatory care services.

This year's methodology for selecting day surgery cases from NACRS is based on the MIS functional centres mandated by the MOHLTC for 'surgical day/night care'.

**Table 1: Identifying day surgery cases**

	Criteria	Codes	
Include	NACRS records identified as 'surgical day/night care'	7 ~ 34020 7 ~ 34025 ** 7 ~ 34055 7 ~ 260 ** 7 ~ 262 7 ~ 265 ** 7 ~ 310	Day/Night Surgical Procedures Excluding OR/PARR Day/Night Surgical Procedures Including OR/PARR Day/Night Endoscopy Main OR Combined OR/PARR Post Anaesthetic Recovery Rooms Emergency (only if surgical D/N care services provided by this FC)
Exclude	All unscheduled ER visits	Functional centre codes 7 ~ 310 where the 'Scheduled ED Visit Indicator' = 'N'	
	Possible duplicate records	MIS functional centre code 7131076	

~ = any numeric value

Please note that this year's methodology for selecting day surgery cases from NACRS is based on the MIS functional centres mandated by the Ontario Ministry of Health and Long Term Care. For details on last year's methodology, refer to *Technical Summary 2005: Clinical Utilization and Outcomes* found on the Hospital Report website, [www.hospitalreport.ca](http://www.hospitalreport.ca)

The record layout of the NACRS database is substantially different than the DAD. However, comprehensive analysis and re-formatting of the NACRS data was performed by CIHI to enable consistent analysis based on the two databases. NACRS same day surgery data was mapped to the DAD layout then joined with the DAD inpatient data to enable consistent analysis. Note that for many fields, imperfect 'mappings' were required to translate the NACRS data to the DAD layout. This may impede Ontario hospitals' ability to replicate results that include day surgery cases.

## Selection of Patient Categories and Eligible Cases

In order to make performance information meaningful to the public and useful for quality improvement, medical and surgical patient groups were examined separately. The selection of the patient groups relied on diagnostic, procedural, and demographic information contained in hospital discharge abstracts submitted to CIHI.

Both patient groups share a set of general exclusions. These general exclusions were designed to remove from the analysis potential data quality problems, patients who could not be linked from hospital to hospital, or patients who would require specific or unusual management. The general exclusion criteria are:

Table 2: General Exclusions

	Criteria	Codes
Exclude:	Patients with a diagnosis of cancer listed on the discharge abstract	ICD-10-CA C00-C43, C45-C96, D00-D09, D37-D48, Z51.0, Z51.1
	Patients with a diagnosis of AIDS/HIV listed on the discharge abstract	ICD-10-CA B24, Z21
	Patients with a diagnosis of violent trauma listed on the discharge abstract	ICD-10-CA V01-V99, W03, W06-W09, W11-W17, W20-W45, W49-W60, W64-W77, W81, W83-W94, W99, X00 -X19, X30-X39, X52, X58-X99, Y00-Y09, Y35.^, Y36.^
	Patients without an Ontario residence	Postal Code that does not begin with: K, L, M, N, P
	Patients without a valid health insurance number (HIN)	HIN equal to 'Zs' (hospitals can check records with an invalid HIN from their CIHI default report)
	Patients less than 15 or greater than 84 years of age	

## **Re-assigning Medical/Surgical Status for Cases with a Significant Post-Admission Comorbidity**

It is possible that a patient was originally admitted for a medical condition, but due to an adverse event received surgical treatment that changed the CMG assignment from a medical CMG to a surgical CMG. For example, a patient is admitted for a heart attack, but later falls and breaks their hip, which leads to a hip replacement in the same hospitalization. In cases like this the patient is 'repatriated' to a medical CMG based on the following criteria:

1. Initial medical/surgical status is assigned based on CMGs (see Appendix A for CMG lists).
2. All cases that have a type 2 diagnosis that is also coded as the case's most responsible diagnosis (type M) are identified.
3. For each case with a type M diagnosis that is also a type 2, each procedure listed on the abstract is compared to a list of non-operative interventions that cannot drive a patient into a surgical CMG. This list, derived from the 2003 CMG/Plx Directory, is available upon request from the Hospital Reports department at CIHI.
4. If the case has an intervention included on the abstract that is NOT on the non-operative intervention list, and the date for this procedure is less than 2 days from their admission date, the case is classified as SURGICAL. If all interventions listed on the abstract are non-operative, OR there is an operative procedure but the procedure date is greater than two days from the admission date, the case is classified as MEDICAL.

## **Repatriating Cases with a Significant Post-Admission Comorbidity**

Patients were included in the diagnostically defined patient groups if the diagnosis of interest was coded as a type M. As in previous years' reports, the goal was to identify conditions that developed before hospital admissions for patients who had a significant adverse event, which impacted hospital resources or prolonged their length of stay in the hospital. In the past, we have adjusted for these adverse events by:

- Excluding patients who had the diagnosis of interest as the M-diagnosis as well as the same type 2 diagnosis listed on the discharge abstract, indicating the most responsible condition developed after admission.
- In order to identify patients who might have been admitted with the diagnosis of interest, but who had developed another most responsible diagnosis after admission, patients were also included if another diagnosis

was coded as a type M and a type 2 (indicating that the M-diagnosis developed after admission) and the diagnosis of interest was coded as a type 1.

Since new CMG-based patient groups were introduced in *Hospital Report 2005: Acute Care*, in an effort to improve the comparability of these cases with other inpatient admissions at the hospital-specific level, a new repatriation method was used for these CMG-based indicators as we could not apply the old repatriation method as it is applicable to diagnostically defined patient groups and not CMG-based patient groups. The criteria for the new repatriation method on CMG-based indicators are:

- If a case has the same type M and 2 diagnosis on an abstract, the type M is replaced;
- For cases that have only one type 1 diagnosis on the abstract, that diagnosis becomes the new "Hospital Report Most Responsible Diagnosis", indicating that if the adverse event had not occurred, this condition likely would have been the main reason for hospitalization.
- For cases that have multiple type 1 diagnoses on the abstract, the type 1 diagnosis that required the most resources used at the hospital was selected to be the new Hospital Report M-diagnosis.
- If there was no type 1 on the abstract, we looked for a type W code (a service transfer which acts like a type 1) and if available, would use that as the new M-diagnosis. If there were multiple type W codes on the abstract, the one that required the most resources used at the hospital was selected to be the new Hospital Report M-diagnosis.
- For cases that did not have a type 1 or W code, the case would be dropped from our analysis. In most of these cases, it appears the diagnosis typing was not coded correctly. CIHI's Classifications team has been notified of this diagnosis typing issue and it is currently being reviewed to incorporate into future educational sessions with hospitals.

This new repatriation method was applied in preparation of investigating potential new risk-adjustment strategies when reporting CMG-based indicators at the hospital-specific level. For further details on the risk-adjustment methodology used, please refer to the Risk-Adjustment section near the end of this Technical Summary.

### **CMG Methodology Overview**

Case Mix Groups, or CMG™, are the foundation of acute inpatient grouping, length of stay and resource intensity weight methodologies. The patient's Most Responsible Diagnosis (MRDx) is used to assign the case to one of 25 Major Clinical Categories (MCC). Within each MCC, based on the presence or absence of an operative procedure, the case is directed towards a surgical or medical partition. Case Mix Groups are ordered within the Major Clinical Categories which identify either a body system, e.g. Respiratory System, or other specific types of clinical problems, e.g. Mental Disorders, Neonates or Burns.

Surgical Case Mix Groups are determined by the presence of a procedure. The grouping methodology loops through all procedures recorded to find one that is in the same MCC as the MRDx. If it finds more than one procedure in this category the case is assigned to the CMG highest on the hierarchy. The surgical hierarchy, a decision rule that generally orders from most to least resource intensive procedure, is defined by clinical judgement and expected resource consumption.

If there are no procedures used for CMG assignment recorded on the abstract, the case is assigned to the medical partition of the MCC. The medical partition consists of groupings of similar diagnoses defined clinically and/or by homogeneity of length of stay. The MRDx is used to assign medical CMGs.

Source: 2003 CMG™/Plx™ Directory, CIHI.

### **Linking Cases Across Hospitals**

The research report draws on data for all of Ontario's acute care hospitals. Transferring patients from one hospital to another is an important facet of health care in Ontario. Although transfers are relatively rare for surgical patients, they occur more frequently in medical patients. In order to avoid analyzing transfers as two separate hospitalizations, the basic unit of analysis studied in *Hospital Report 2006: Acute Care* is the episode of care. An episode includes all continuous hospitalizations in acute care hospitals, and can include transfers from one acute care hospital to another. The rules for transfers are as follows:

1. If the patient is admitted within 24 hours of discharge, and either of the institutions has coded it as a transfer, the case is considered as a transfer.
2. If the patient is admitted more than 24 hours following discharge, it is not considered a transfer and is treated as a new episode.

Unique patients are tracked from one hospital to another based on scrambled health card numbers.

Occasionally, when a patient is transferred from one facility to another, the discharge date/time from the first hospital may be later than the admission date/time from the second hospital. Similarly, some patients are transferred to a day-surgery facility while they are inpatients at another facility; while they receive the day-surgery, their bed at the inpatient facility stays open, waiting for their return. The methodology behind the episode building accounts for these kinds of transfers. In cases with a multi-hospital episode of care, LOS is calculated as follows:

*(Last hospitalization discharge date - first hospital admission date) - ALC days in last hospitalization*

For the broad medical, surgical, and major surgical patient groups an episode is assigned to one of the patient groups on the basis of the CMG listed on the abstract of the first hospitalization in the episode.

## **Replication of Results by Ontario Hospitals**

As part of the verification process for the Clinical Utilization and Outcomes results, many participating hospitals go through a detailed validation of the values that underlie their performance allocations. This is an important step in ensuring the accuracy of the results, and helps to build confidence in the values presented in *Hospital Report: Acute Care*. However, for many of the indicators it is not possible to exactly replicate the results. This is due to the fact that the unit of analysis for the CUO quadrant is an “episode of care”, which can potentially span more than one acute care facility. As such, outcomes are attributed in specific ways for each indicator.

A special advisory panel of hospital chief executive officers and other stakeholders helped to develop rules for assigning outcomes to episodes of care involving more than one hospital. In each case, the rules were based on the principle that the hospital with the most control over the outcome should be assigned that outcome. However, the fact that so many hospitals are involved in the care of a single patient emphasizes the inter-linked nature of the hospital system. In addition, for the CMG based indicators, day surgery cases are assigned a CMG which hospitals cannot replicate, however, a chart numbers file is provided to show all records that were included in the indicator. The following list explains how each outcome indicator is allocated, and to what extent hospitals can expect to replicate the results:

- **Readmissions** are attributed to the last hospital in the episode. For example, if an episode spans two hospitals – i.e. first they are admitted to Hospital A, then transferred to Hospital B, then discharged (marking the end of this episode of care) – then they are admitted to another hospital, Hospital C, within 28 days (or other specified time as per the indicator definition) with a condition of interest in Hospital A (or for any readmission reason as per the indicator

definition), then Hospital B is assigned the readmission outcome for this patient. Because the readmission can be to any hospital in Ontario, hospitals will not likely be able to replicate the exact numerator for any readmission indicators. They should be able to replicate some of the denominator, and a subset of the actual numerator (since they can count cases readmitted to their own facility).

- **Adverse Events** (Nurse-sensitive Adverse Events for specific medical conditions and surgical procedures, and Adverse Events for all medical conditions) are attributed to the hospital treating the patient when the adverse event diagnosis developed. For example, if an episode spans three hospitals – i.e. first they are admitted to Hospital A, then transferred to Hospital B, then transferred to Hospital C, then discharged (marking the end of this episode of care) – and the patient has a valid adverse event in Hospital C, then only Hospital C will be assigned the adverse event outcome. Hospitals A and B will not have an adverse event assigned to them. Hospitals should be able to replicate most of the denominator and a subset of the actual numerator. The denominator consists of both inpatient and day-surgery cases where the day-surgery case must have started as an inpatient in the episode of care. Hospitals will not be able to replicate the day surgery cases that made it into the denominator for the CMG-based indicator (please refer to your chart numbers file to identify the day surgery cases that were included in the denominator). In addition, a hospital may not be able to replicate the entire numerator because a LOS cut-off (used as a screen to identify cases where the adverse event likely impacted the patient's overall LOS) is compared to the episode LOS that cannot be calculated if the episode of care spans across different hospitals.
- **Appropriateness** (Laparoscopic versus Open Rates for Selected Elective Procedures) is attributed to the hospital where the procedure was performed. For example, if an episode spans three hospitals – i.e. first they are admitted to Hospital A, then transferred to Hospital B, then transferred to Hospital C, then discharged (marking the end of this episode of care) – and the patient had the specified procedure in Hospital B, then the procedure will only affect the rate for Hospital B. The rates for hospital A and C will not change. Therefore, hospitals should be able to replicate results for this indicator.

Understanding the rules for attributing episodes to hospitals is important to interpreting hospital-specific results. If care for a specific patient group in a hospital rarely involves a transfer, then the number of episodes assigned to that hospital for the calculation of adverse events, readmission rates, and appropriateness should be very similar. However, if care for a specific patient group in a hospital frequently involves transfers, then the number of episodes assigned to the hospital for calculation of adverse events, readmission rates, and appropriateness may be substantially different.

# Indicator Definitions

## Adverse Events

### *Adverse Events: All Medical Conditions*

**This indicator is presented at a hospital-specific level in the 2006 Executive Report.**

Proportion of medical patients who experience in-hospital adverse effects.

A case was defined as having an adverse event if all three of the following criteria were met:

1. The discharge abstract had a diagnosis that was coded as a type 2 diagnosis (i.e. the diagnosis developed after admission and had an impact on patient management or patient length of stay);
2. the diagnostic code for that type 2 diagnosis was for one of the diagnoses that an expert panel had defined as attributed to in-hospital adverse events ; and,
3. the patient had an episode length of stay that was longer than the Ontario-specific length of stay for the first hospitalization within the episode, or the patient died.

#### Note:

- For multi-hospital episodes of care, adverse events were attributed to the hospital that was treating the patient when the adverse event occurred.
- \*\*Ontario-specific length of stay is calculated by taking the average length of stay of each CMG by three age groups (0-17,18-69,70+), for all cases within Ontario that are flagged as "typical" according to the RIW complexity exclusion variable in the DAD. These tables are available upon request by contacting the Hospital Reports department.
- \*\*\*Denominator cases must have started as a Medical CMG. For example, if a patient started as Surgical CMG and then was transferred to a Medical CMG, that case is not included in the denominator. Hospitals would not be able to validate these cases if the transfer occurred from another hospital. In addition, hospitals will not be able to replicate day surgery cases in the denominator. **Inpatient activity accounted for 97.1% of provincial cases.** Please refer to your chart numbers file to identify any day surgery cases that were included in the denominator.
- Cases must have also started as an inpatient admission to be included in the medical denominator. It is still possible for day surgery cases to be included if a transfer occurred from an acute to a day surgery facility.

- For the Drug or anaesthetic-related in-hospital adverse event criteria of 'Any Type 2 code with Type 9 Y40-Y59', it is possible that we are including cases where the Type 9 code is not necessarily in reference to the Type 2 code. While it is recommended that codes should be organized in a sequence and diagnosis type assigned so that it is possible to identify multiple codes used to describe one condition and to understand the chronology of events pertaining to the patient's encounter, there is no edit check available in DAD to confirm that a Type 9 code that follows a Type 2 code means that the Type 9 code is in reference to the code it directly follows. The only edit check available is to ensure that a range of codes (e.g. S00-T98) must have a Type 9 code on the abstract.

Episodes (Numerator)		
	Criteria	ICD-10-CA Codes
<b>Include:</b>	Cases within denominator with:	Type 2 diagnosis
	Drug or anaesthetic-related in-hospital adverse event	Type 2 T88.2, T88.3, T88.5, T88.6, T88.7 or Any Type 2 code with Type 9 Y40-Y59
	Patient falls (in-hospital hip and limb fractures)	Type 2 S42.^, S52.^, S62.^, S72.^, S82.^, S92.^, T02.2^-T02.6^, T10.^, T12.^
	Pressure ulcers	Type 2 L89.^
	Post-admission urinary tract infections	Type 2 N39.0
	Paralytic ileus	Type 2 K56.0
	Post-admission development of Methicillin-Resistant Staphylococcus Aureus (MRSA) or Vancomycin-Resistant Enterococci (VRE)	Type 2 A41.0, A41.1, A41.2 and Type 3 U00.0, U00.1
	Post-admission bacteraemia*	Type 2 A40.^, A41.^, A49.9
	Post-admission phlebitis and venous thromboembolism	Type 2 I80.^, T80.1, I26.^
	Post-admission AMI, CHF, stroke, TIA or shock †	Type 2 I21.^, I22.^ (AMI) I50.0 (CHF), I60-I64 (stroke), G45.^ (TIA), A41.9, R57.^, T78.0, T78.2, T79.4, T80.2, T80.5, T81.1, T88.2, T88.6 (shock)
	Post-admission delirium	Type 2 F05.^
	Post-admission pneumonia	Type 2 J13, J14, J15.^, J16.^, J18.^, or Type 2 J69.0 and Type 3 B95.^ or B96.^
<b>AND</b>	Episode LOS is greater than Ontario-specific LOS** for first hospitalization within the episode, or the patient died	Episode LOS > Ontario-specific LOS for 1 <sup>st</sup> hospitalization or

		Discharge Disposition = 07 (died)
<b>Exclude:</b>	Cases that are coded as both Type 1 and Type 2	

\* A41.0, A41.1, A41.2 are also being captured by the post admission development of MRSA or VRE condition.

† A41.9 is also being captured by the post-admission bacteraemia condition. T88.2 and T88.6 are also being captured by the drug or anaesthetic-related in-hospital adverse event.

<b>Cases (Denominator)</b>		
	<b>Criteria</b>	<b>Codes</b>
<b>Include:</b>	Medical patients*** (includes inpatient and day-surgery cases – see note above)	See Appendix A for list of Medical CMGs
<b>Exclude:</b>	General Exclusion Criteria	(see the Methodology section of this report)

### **Adverse Events: Nurse-sensitive Medical**

**This indicator is presented at a hospital-specific level in the 2006 Executive Report.**

As in last year’s report, the nursing-related indicators are aggregated by combining the nurse-sensitive adverse events - UTI Following Specific Surgical Procedures, Pressure Ulcers, and Fractures from Falls Following Admission to Hospital – new to this year is the return of Post-admission Pneumonia.

#### Sum of nurse-sensitive adverse events for AMI, heart failure, asthma, GI bleed, and stroke

This indicator identifies selected medical patient groups that had:

- post-admission pressure ulcers
- post-admission fractures from falls (hip and limb fractures)
- post-admission pneumonia

**Note:**

- Medical cases must start as an inpatient case.
- **This indicator includes both inpatient and day surgery cases.**

<b>Episodes (Numerator)</b>		
	<b>Criteria</b>	<b>Codes</b>
<b>Include:</b>	<b>Type 2 diagnosis</b> of any of the following conditions:	Type 2 diagnosis
	Decubitus ulcer	L89.^
	Fracture of shoulder and upper arm	S42.^
	Fracture of forearm	S52.^
	Fracture at wrist and hand level	S62.^
	Fracture of femur	S72.^
	Fracture of lower leg, including ankle	S82.^

	Includes: malleolus	
	Fracture of foot, except ankle	S92.^
	Fractures involving multiple regions of one upper limb	T02.2^
	Fractures involving multiple regions of one lower limb	T02.3^
	Fractures involving multiple regions of both upper limbs	T02.4^
	Fractures involving multiple regions of both lower limbs	T02.5^
	Fractures involving multiple regions of upper limb(s)	T02.6^
	Fracture of upper limb, level unspecified	T10.^
	Fracture of lower limb, level unspecified	T12.^
	Post-admission pneumonia	Type 2 J13, J14, J15.^, J16.^, J18.^, or Type 2 J69.0 and Type 3 B95.^ or B96.^
<b>AND</b>	<i>For AMI cases:</i> Episode LOS greater than provincial median of 6 days or died	Episode LOS > provincial median of 6 days or Discharge Disposition = 07 (died)
	<i>For Heart Failure cases:</i> Episode LOS greater than provincial median of 6 days or died	Episode LOS > provincial median of 6 days or Discharge Disposition = 07 (died)
	<i>For Asthma cases:</i> Episode LOS greater than provincial median of 3 days or died	Episode LOS > provincial median of 3 days or Discharge Disposition = 07 (died)
	<i>For GI Bleed cases:</i> Episode LOS greater than provincial median of 4 days or died	Episode LOS > provincial median of 4 days or Discharge Disposition = 07 (died)
	<i>For Stroke cases:</i> Episode LOS greater than provincial median of 7 days or died	Episode LOS > provincial median of 7 days or Discharge Disposition = 07 (died)

<b>Cases (Denominator)</b>		
	<b>Criteria</b>	<b>Codes</b>
<b>Include:</b>	AMI*	I21.^, I22.^
	Heart failure*	I50.^, I26.0, I27.9
	Asthma*	J45.^
	GI Bleed*	K92.0, K92.1, K92.2, K25.0, K25.2, K25.4, K25.6, K26.0,

		K26.2, K26.4, K26.6, K27.0, K27.2, K27.4, K27.6, K28.0, K28.2, K28.4, K28.6
	Stroke*	I60.^, I61.^, I62.^, I63.^, I64
Exclude:	General Exclusion Criteria	(see the Methodology section of this report)
	<b>AMI:</b>	
	Bypass, coronary arteries	1.IJ.76.^
	Dilation, coronary arteries and Pharmacotherapy (local), vessels of heart	1.IJ.50.^, 1.IL.35.^, 1.IJ.57.^
	Implantation of internal device, heart NEC	1.HZ.53.^
	Implantation of internal device, epicardium	1.HB.53.^
	Implantation of internal device, endocardium	1.HD.53.^
	Management of internal device, epicardium	1.HB.54.^
	Management of internal device, endocardium	1.HD.54.^
	Management of internal device, heart NEC	1.HZ.54.^
	Discharged alive and had an episode LOS less than 3 days (to reduce impact of over coding)	

\*Patients were included in the diagnostically defined groups if the diagnosis of interest was coded as a type M diagnosis. However, since the goal was to identify conditions that developed before hospital admissions, if the M-diagnosis was also listed on the discharge abstract as a type 2 diagnosis, indicating that the most responsible condition developed after admission, the patient was excluded from the analysis. In order to identify patients who might have been admitted with the diagnosis of interest, but who had developed another most responsible diagnosis after admission, patients were also included if another diagnosis was coded as a type M *and* a type 2 (indicating that the M-diagnosis developed after admission) and the diagnosis of interest was coded as a type 1.

### **Adverse Events: Nurse-sensitive Surgical**

**This indicator is presented at a hospital-specific level in the 2006 Executive Report.**

Sum of nurse-sensitive adverse events for cholecystectomy, hysterectomy, and prostatectomy

This indicator identifies selected surgical patient groups that had:

- post-admission urinary tract infections
- post-admission pressure ulcers
- post-admission fractures from falls (hip and limb fractures)
- post-admission pneumonia

Note:

- This indicator includes both inpatient and day surgery cases.
- All possible 20 procedures on the discharge abstract are included in the analysis.

Episodes (Numerator)		
	Criteria	Codes

Include:	Type 2 diagnosis of any of the following conditions:	Type 2 diagnosis
	Urinary tract infection, site not specified	N39.0
	Decubitus ulcer	L89.^
	Fracture of shoulder and upper arm	S42.^
	Fracture of forearm	S52.^
	Fracture at wrist and hand level	S62.^
	Fracture of femur	S72.^
	Fracture of lower leg, including ankle Includes: malleolus	S82.^
	Fracture of foot, except ankle	S92.^
	Fractures involving multiple regions of one upper limb	T02.2^
	Fractures involving multiple regions of one lower limb	T02.3^
	Fractures involving multiple regions of both upper limbs	T02.4^
	Fractures involving multiple regions of both lower limbs	T02.5^
	Fractures involving multiple regions of upper limb(s)	T02.6^
	Fracture of upper limb, level unspecified	T10.^
	Fracture of lower limb, level unspecified	T12.^
	Post-admission pneumonia	Type 2 J13, J14, J15.^, J16.^, J18.^, or Type 2 J69.0 and Type 3 B95.^ or B96.^
<b>AND</b>	<b><i>Cholecystectomy:</i></b> Episode LOS greater than provincial median of 5 days (open cholecystectomy) or 0 days (laparoscopic cholecystectomy) or died	Episode LOS > provincial median of 5 days (open: 1.OD.89.LA 1.OD.89.SM-AG 1.OD.89.SM-AM 1.OD.89.SM-AS 1.OD.89.SM-BD 1.OD.89.SM-GX 1.OD.89.TP) or 0 days (laparoscopic: 1.OD.89.DA 1.OD.89.DT-GX 1.OD.89.EC 1.OD.89.DT-AM 1.OD.89.DT-AG 1.OD.89.DT-AS 1.OD.89.DT-BD) or Discharge Disposition = 07 (died)
	<b><i>Hysterectomy:</i></b> Episode LOS greater than provincial median of 2 days (vaginal hysterectomy) or 3 days (abdominal hysterectomy) or died	Episode LOS > provincial median of 2 days (vaginal: 1.RM.89.AA, 1.RM.89.CA, 1.RM.89.DA, 1.RM.91.CA) or 3 days (abdominal: 1.RM.89.LA, 1.RM.91.LA)

		or Discharge Disposition = 07 (died)
	<i>Prostatectomy:</i> Episode LOS greater than provincial median of 2 days or died	Episode LOS > provincial median of 2 days or Discharge Disposition = 07 (died)

Cases (Denominator)		
	Criteria	Codes
<b>Include:</b>	Cholecystectomy	1.OD.89.^
	Hysterectomy	1.RM.89.^, 1.RM.91.^
	Prostatectomy	1.QT.59.^, 1.QT.87.^
<b>Exclude:</b>	General Exclusion Criteria	(see the Methodology section of this report)
	<i>Cholecystectomy:</i>	
	Transplant, liver	1.OA.85.^
	Excision partial, abdominal aorta	1.KA.87.^
	Bypass, abdominal aorta	1.KA.76.^
	Drainage, liver	1.OA.52.^
	Excision partial, liver	1.OA.87.^
	Destruction, liver	1.OA.59.^
	Excision partial, large intestine	1.NM.87.DF, 1.NM.87.DE, 1.NM.87.DN, 1.NM.87.DX, 1.NM.87.DY, 1.NM.87.RN, 1.NM.87.RD, 1.NM.87.RE, 1.NM.87.TF, 1.NM.87.TG
	Excision total, large intestine	1.NM.89.^
	Excision partial, pancreas with duodenum	1.OK.87.^
	Excision radical, pancreas with duodenum	1.OK.91.^
	Excision partial, stomach	1.NF.87.RP, 1.NF.87.DG, 1.NF.87.RH, 1.NF.87.RJ, 1.NF.87.RK, 1.NF.87.DG, 1.NF.87.DH, 1.NF.87.DQ, 1.NF.87.GX, 1.NF.87.DJ, 1.NF.87.DL, 1.NF.87.RG
	Excision total, stomach	1.NF.89.^
	Excision total with reconstruction, stomach	1.NF.90.^
	Excision radical, stomach	1.NF.91.^
	Excision radical with reconstruction, stomach	1.NF.92.^
	<i>Hysterectomy:</i>	
	Drainage, large intestine	1.NM.52.DA, 1.NM.52.LA, 1.NM.52.LA-TS
	Procurement, large intestine	1.NM.58.^
	Destruction, large intestine	1.NM.59.^
	Bypass, large intestine	1.NM.76.^
	Excision partial, large intestine	1.NM.87.^
	Excision total, large intestine	1.NM.89.^

Excision radical, large intestine	1.NM.91.^
Drainage, small intestine	1.NK.52.DA, 1.NK.52.LA
Removal of device, small intestine of jejunal tube [e.g. drainage, feeding] inserted using open approach	1.NK.55.LA-TS
Removal of foreign body, small intestine	1.NK.56.DA, 1.NK.56.LA
Procurement, small intestine	1.NK.58.^
Bypass, small intestine	1.NK.76.DN, 1.NK.76.DP, 1.NK.76.RE, 1.NK.76.RF
Excision partial, small intestine	1.NK.87.^
Dilation, small intestine	1.NK.50.^
Implantation of internal device, small intestine	1.NK.53.DA-TS, 1.NK.53.LA-TS, 1.NK.53.LA-QB
Fixation, small intestine	1.NK.74.^
Bypass with exteriorization, small intestine	1.NK.77.^
Repair, small intestine	1.NK.80.DA, 1.NK.80.DA-W2, 1.NK.80.DA-W3, 1.NK.80.LA, 1.NK.80.LA-W2, 1.NK.80.LA-W3
Reattachment, small intestine	1.NK.82.^
Construction or reconstruction, small intestine	1.NK.84.^
Transplant, small intestine	1.NK.85.^
Dilation, large intestine	1.NM.50.^
Removal of device, large intestine	1.NM.55.DA-TS, 1.NM.55.LA-TS
Removal of foreign body, large intestine	1.NM.56.DA, 1.NM.56.LA
Fixation, large intestine	1.NM.74.^
Bypass with exteriorization, large intestine	1.NM.77.^
Repair, large intestine	1.NM.80.^
Reattachment, large intestine	1.NM.82.^
Perfusion, small with large intestine	1.NP.16.^
Reduction, small with large intestine	1.NP.73.LA
Transplant, small with large intestine	1.NP.85.^
Closure of fistula, small with large intestine	1.NP.86.^
Excision total, appendix	1.NV.89.^
Drainage, appendix	1.NV.52.^
Drainage, rectum	1.NQ.52.HA, 1.NQ.52.LA, 1.NQ.52.LA-TS
Removal of foreign body, rectum	1.NQ.56.DA, 1.NQ.56.LA
Destruction, rectum	1.NQ.59.^
Release, rectum	1.NQ.72.^
Fixation, rectum	1.NQ.74.^
Repair, rectum	1.NQ.80.^
Closure of fistula, rectum	1.NQ.86.MB, 1.NQ.86.MB-XX-E, 1.NQ.86.MB-XX-F, 1.NQ.86.ME, 1.NQ.86.ME-XX-E, 1.NQ.86.ME-XX-F
Excision partial, rectum	1.NQ.87.^
Excision total, rectum	1.NQ.89.^
Excision total with reconstruction, rectum	1.NQ.90.LA-XX-G

	Construction or reconstruction, anus	1.NT.84.PB, 1.NT.84.PF
	Control of bleeding, anus	1.NT.13.^
	Drainage, anus	1.NT.52.^
	Implantation of internal device, anus	1.NT.53.^
	Removal of device, anus	1.NT.55.^
	Removal of foreign body, anus - open approach	1.NT.56.LA
	Destruction, anus	1.NT.59.^
	Release, anus	1.NT.72.^
	Reduction, anus	1.NT.73.^
	Repair, anus	1.NT.80.^
	Construction or reconstruction, anus	1.NT.84.LF
	Closure of fistula, anus	1.NT.86.^
	Excision partial, anus	1.NT.87.^
	Excision partial, stomach	1.NF.87.RP, 1.NF.87.DG
	Bypass, stomach - gastroenterostomy [diversion around distal stomach]	1.NF.76.DQ, 1.NF.76.RJ
	Endometriosis of pelvic peritoneum	N80.3
	Endometriosis of rectovaginal septum and vagina	N80.4
	Endometriosis of intestine	N80.5
	Repair, bladder neck	1.PL.74.CA, 1.PL.74.DA, 1.PL.74.PK, 1.PL.74.PK-NW
	Pharmacotherapy (local), bladder neck	1.PL.35.BA-W2, 1.PL.35.BA-W8, 1.PL.35.HA-W2, 1.PL.35.HA-W8
	Repair, bladder neck	1.PL.74.AF-FF, 1.PL.74.AF-XX-A, 1.PL.74.AF-XX-L, 1.PL.74.AF-XX-N, 1.PL.74.AL-FF, 1.PL.74.AF-XX-Q, 1.PL.74.CA-XX-K
	Female urethrocele	N81.0
	Cystocele	N81.1
	Rectocele	N81.6
	Uterovaginal prolapse, unspecified	N81.4
	Incomplete uterovaginal prolapse	N81.2
	Complete uterovaginal prolapse	N81.3
	Vaginal enterocele	N81.5
	Other female genital prolapse	N81.8
	Female genital prolapse, unspecified	N81.9
	In situ neoplasms	D00-D09
	Neoplasms of uncertain or unknown behaviour	D37-D48

## Readmissions

### *Readmissions: All Medical Patients*

**This indicator is presented at a hospital-specific level in the 2006 Executive Report.**

Rate of readmissions within 72 hours of discharge for patients initially receiving care for any medical condition

Readmissions are defined using information from both the initial episode and the subsequent hospitalization. An episode of care is counted as having a readmission (in either the same or another Ontario acute care hospital) if all of the following criteria are met:

1. The initial episode did not end with the patient signing him/herself out against medical advice (or died);
2. if the patient is admitted more than 24 hours following discharge, it is not considered a transfer and is treated as a new episode (See 'Linking Cases Across Hospitals' in the Methodology section of this report); and,
3. if the subsequent admission was not defined as being as elective.

**Note:**

- For multi-hospital episodes of care, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.
- \*For the Denominator, cases were selected if they were the last case in the episode of care and the episode started as a Medical CMG. Hospitals will be able to replicate most of the denominator. **Inpatient activity accounted for 99.95% of provincial cases.** Please refer to your chart numbers file to identify any day surgery cases that were included in the denominator.
- As diagnosis typing is not an available field in NACRS, for all fiscal year 2004 day surgery records, the first diagnosis is assumed to be Type M and any subsequent diagnoses is assumed to be Type 1.

Episodes (Numerator)		
	Criteria	Codes
Include:	Readmission occurred within 72 hours of discharge	
Exclude:	Elective admissions	Admission Category not equal to "L"

Cases (Denominator)		
	Criteria	Codes
Include:	Medical Patients* (includes inpatient and day-surgery cases – see note above)	See Appendix A for list of Medical CMGs
Exclude:	Readmissions that followed a discharge where the patient signed him/herself out or the patient died	Discharge Disposition Code not equal to 6 (sign out), 7 (death), or 9 (stillbirth)
	General Exclusion Criteria	(see the Methodology section of this report)

### Readmissions: Major Surgical Procedures

This indicator is presented at a system-wide level only in the 2006 Executive Report.

#### Rate of unplanned readmissions within 7 days of discharge with specified conditions in patients who had a major surgical procedure

Readmissions are defined using information from both the initial episode and the subsequent hospitalization. An episode of care is counted as having a readmission (in either the same or another Ontario acute care hospital) if all of the following criteria are met:

1. The subsequent hospitalization was for specified conditions selected by an expert panel;
2. the initial episode did not end with the patient signing him/herself out against medical advice (or died);
3. if the patient is admitted more than 24 hours following discharge, it is not considered a transfer and is treated as a new episode (See 'Linking Cases Across Hospitals' in the Methodology section of this report); and,
4. if the subsequent admission was not defined as being as elective.

**Note:**

- For multi-hospital episodes of care, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.
- \*For the Denominator, cases were selected if they were the last case in the episode of care that started as a Major Surgical CMG. Hospitals will be able to replicate some of the denominator. **Inpatient activity accounted for 94.4% of provincial cases.** Please refer to your chart numbers file to identify any day surgery cases that were included in the denominator.
- The numerator is the readmission category and the denominator is the surgical category.
- As diagnosis typing is not an available field in NACRS, for all fiscal year 2004 day surgery records, the first diagnosis is assumed to be Type M and any subsequent diagnoses is assumed to be Type 1.

Episodes (Numerator)		
	Criteria	ICD-10-CA Codes
<b>Include:</b>	Cases within denominator with:	
	Gastrointestinal haemorrhage or ulceration following non-gastrointestinal surgery	Type M K25.^, K26.^, K27.^, K62.5, K63.3, K66.1,

Episodes (Numerator)		
		K91.40, K91.43, K91.60, K92.2 with Type 9 Y83.^ or Type M T81.0 and Type 9 Y83.^ with a section 1 CCI code with an anatomy site other than NA-NV or OA-OZ and intervention number greater than or equal to 50
	Decubitus ulcer	Type M L89.^
	Reopening of surgical site/wound dehiscence	Type M T81.3
	Mechanical complication due to device, implant or graft other than from organ transplantation	Type M T82.0-T82.5, T83.0-T83.4, T84.0-T84.4, T85.0-T85.6
	Post procedural-related perforations or lacerations	Type M T81.2
	Foreign body left in during procedure	Type M T81.5
	Pneumothorax	Type M J95.80
	Readmission occurred within 168 hours (7 days) of discharge	
<b>Exclude:</b>	Elective admissions	Admission Category not equal to "L"

Cases (Denominator)		
	Criteria	Codes
<b>Include:</b>	Major Surgical Patients* (see note above)	See Appendix A for list of Major Surgical CMGs*
<b>Exclude:</b>	Readmissions that followed a discharge where the patient signed him/herself out or the patient died	Discharge Disposition Code not equal to 6 (sign out), 7 (death), or 9 (stillbirth)
	General Exclusion Criteria	(see the Methodology section of this report)

\* Case Mix Group™

**Readmissions: All Surgical Procedures**

This indicator is presented at a system-wide level only in the 2006 Executive Report.

Rate of unplanned readmissions within 7 days of discharge with specified conditions in patients who had any surgical procedure

Readmissions are defined using information from both the initial episode and the subsequent hospitalization. An episode of care is counted as having a readmission (in either the same or another Ontario acute care hospital) if all of the following criteria are met:

1. The subsequent hospitalization was for specified conditions selected by an expert panel;
2. the initial episode did not end with the patient signing him/herself out against medical advice (or died);
3. if the patient is admitted more than 24 hours following discharge, it is not considered a transfer and is treated as a new episode (See 'Linking Cases Across Hospitals' in the Methodology section of this report); and,
4. if the subsequent admission was not defined as being as elective.

**Note:**

- For multi-hospital episodes of care, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.
- \*For the Denominator, cases were selected if they were the last case in the episode of care that started as a Surgical CMG. Hospitals will only be able to replicate a portion of the denominator. **Inpatient activity accounted for 31.9% of provincial cases.** Please refer to your chart numbers file to identify day surgery cases that were included in the denominator.
- The numerator is the readmission category and the denominator is the surgical category.
- As diagnosis typing is not an available field in NACRS, for all fiscal year 2004 day surgery records, the first diagnosis is assumed to be Type M and any subsequent diagnoses is assumed to be Type 1.

Episodes (Numerator)		
	Criteria	ICD-10-CA Codes
<b>Include:</b>	Cases within denominator with:	
	Gastrointestinal haemorrhage or ulceration following non-gastrointestinal surgery	Type M K25.^, K26.^, K27.^, K62.5, K63.3, K66.1, K91.40, K91.43, K91.60, K92.2 with Type 9 Y83.^ or Type M T81.0 and Type 9 Y83.^ with a section 1 CCI code with an anatomy site other than NA-NV or OA-OZ and intervention number greater than or equal to 50

Episodes (Numerator)		
	Decubitus ulcer	Type M L89.^
	Reopening of surgical site/wound dehiscence	Type M T81.3
	Mechanical complication due to device, implant or graft other than from organ transplantation	Type M T82.0-T82.5, T83.0-T83.4, T84.0-T84.4, T85.0-T85.6
	Post procedural-related perforations or lacerations	Type M T81.2
	Foreign body left in during procedure	Type M T81.5
	Pneumothorax	Type M J95.80
	Readmission occurred within 168 hours (7 days) of discharge	
<b>Exclude:</b>	Elective admissions	Admission Category not equal to "L"

Cases (Denominator)		
	Criteria	Codes
<b>Include:</b>	Surgical Patients* (see note above)	See Appendix A for list of Surgical CMGs*
<b>Exclude:</b>	Readmissions that followed a discharge where the patient signed him/herself out or the patient died	Discharge Disposition Code not equal to 6 (sign out), 7 (death), or 9 (stillbirth)
	General Exclusion Criteria	(see the Methodology section of this report)

\*Case Mix Group™

### ***Readmissions: Specific Medical Conditions***

**This indicator is presented at a hospital-specific level in the 2006 Executive Report.**

Sum of readmission rates for AMI, heart failure, asthma, GI bleed, and stroke (medical)

Readmissions are defined using information from both the initial episode and the subsequent hospitalization. An episode of care is counted as having a readmission (in either the same or another Ontario acute care hospital) if all of the following criteria are met:

1. The subsequent hospitalization was for a diagnosis or procedure that was defined by an expert panel as relevant to the initial surgery;

2. the initial episode did not end with the patient signing him/herself out against medical advice (or died);
3. if the patient is admitted more than 24 hours following discharge, it is not considered a transfer and is treated as a new episode. (See 'Linking Cases Across Hospitals' in the Methodology section of this report); and,
4. if the subsequent admission was not defined as being as elective.

Readmissions are excluded if they are for procedures that constitute part of the expected care following a specific type of hospitalization, for example readmission for coronary angioplasty following an initial hospitalization for AMI.

**Note:**

- For multi-hospital episodes of care, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.
- As diagnosis typing is not an available field in NACRS, for all fiscal year 2004 day surgery records, the first diagnosis is assumed to be Type M and any subsequent diagnoses is assumed to be Type 1.

Episodes (Numerator)		
	Criteria	Codes
<b>Include:</b>	<b>AMI:</b>	Type M diagnosis only
	AMI	I21.^, I22.^
	Other acute and subacute forms of ischemic heart disease	I20.0, I24.^
	Old myocardial infarction	I25.2
	Angina pectoris	I20.^
	Other forms of chronic ischemic heart disease	I25.^
	Conduction disorders	I44.^, I45.^
	Cardiac Dysrhythmias	I46.0, I46.9, I47.^, I48.^, I49.^
	Functional disturbances following cardiac surgery	I97.0, I97.1, I97.8, I97.9
	Urinary tract infection	N39.0
	<b>Readmission occurred within 28 days of discharge</b>	
	<b>Asthma:</b>	Type M diagnosis only
	Asthma	J45.^
	Empyema	J86.^
	Pulmonary collapse	J98.1
	Respiratory arrest	J96.^, R09.2
	Respiratory complications resulting from a procedure	J95.4, J95.8, J95.9
	<b>Readmission occurred within 28 days of discharge</b>	
	<b>Heart failure:</b>	Type M diagnosis only
	Acute myocardial infarction	I21.^
	Subsequent myocardial infarction	I22.^
	Other acute ischaemic heart diseases	I24.^
	Old myocardial infarction	I25.2
	Angina pectoris	I20.^
	Atherosclerotic heart disease	I25.1^

	Aneurysm of heart	I25.3
	Coronary artery aneurysm	I25.4
	Ischaemic cardiomyopathy	I25.5
	Silent myocardial ischaemia	I25.6
	Other forms of chronic ischaemic heart disease	I25.8
	Chronic ischaemic heart disease, unspecified	I25.9
	Atrioventricular and left bundle-branch block	I44.^
	Other conduction disorders	I45.^
	Paroxysmal tachycardia	I47.^
	Atrial fibrillation and flutter	I48.^
	Ventricular fibrillation and flutter	I49.0^
	Atrial premature depolarization	I49.1
	Junctional premature depolarization	I49.2
	Ventricular premature depolarization	I49.3
	Other and unspecified premature depolarization	I49.4
	Sick sinus syndrome	I49.5
	Other specified cardiac arrhythmias	I49.8
	Cardiac arrhythmia, unspecified	I49.9
	Cardiac arrest with successful resuscitation	I46.0
	Cardiac arrest, unspecified	I46.9
	Acute bronchitis	J20.^
	Acute bronchiolitis	J21.^
	<b>Readmission occurred within 28 days of discharge</b>	
	<i>GI bleed:</i>	Type M diagnosis only
	Gastric ulcer, acute with haemorrhage	K25.0
	Gastric ulcer, acute with both haemorrhage and perforation	K25.2
	Gastric ulcer, chronic or unspecified with haemorrhage	K25.4
	Gastric ulcer, chronic or unspecified with both haemorrhage and perforation	K25.6
	Duodenal ulcer, acute with haemorrhage	K26.0
	Duodenal ulcer, acute with both haemorrhage and perforation	K26.2
	Duodenal ulcer, chronic or unspecified with haemorrhage	K26.4
	Duodenal ulcer, chronic or unspecified with both haemorrhage and perforation	K26.6
	Peptic ulcer, acute with haemorrhage	K27.0
	Peptic ulcer, acute with both haemorrhage and perforation	K27.2
	Peptic ulcer, chronic or unspecified with haemorrhage	K27.4
	Peptic ulcer, chronic or unspecified with both haemorrhage and perforation	K27.6
	Gastrojejunal ulcer, acute with haemorrhage	K28.0
	Gastrojejunal ulcer, acute with both haemorrhage and perforation	K28.2
	Gastrojejunal ulcer, chronic or unspecified with haemorrhage	K28.4
	Gastrojejunal ulcer, chronic or unspecified with both haemorrhage and perforation	K28.6

	Haematemesis	K92.0
	Melaena	K92.1
	Gastrointestinal haemorrhage, unspecified	K92.2
	<b>Readmission occurred within 7 days of discharge</b>	
	<b>Stroke:</b>	Type M diagnosis only
	Thrombophlebitis migrans	I82.1
	Embolism and thrombosis of vena cava	I82.2
	Embolism and thrombosis of renal vein	I82.3
	Embolism and thrombosis of other specified veins	I82.8
	Embolism and thrombosis of unspecified vein	I82.9
	Haematemesis	K92.0
	Melaena	K92.1
	Gastrointestinal haemorrhage, unspecified	K92.2
	Cardiac arrest with successful resuscitation	I46.0
	Cardiac arrest, unspecified	I46.9
	Respiratory failure, not elsewhere classified	J96.^
	Kwashiorkor	E40
	Marasmic kwashiorkor	E42
	Nutritional marasmus	E41
	Unspecified severe protein-energy malnutrition	E43
	Protein-energy malnutrition of moderate and mild degree	E44.^
	Retarded development following protein-energy malnutrition	E45
	Unspecified protein-energy malnutrition	E46
	Volume depletion	E86.^
	Acute renal failure	N17.^
	Malfunction of external stoma of urinary tract	N99.5^
	Other postprocedural disorders of genitourinary system	N99.8
	Postprocedural disorder of genitourinary system, unspecified	N99.9
	Postprocedural renal failure	N99.0
	Fever of unknown origin	R50.^
	Pneumonitis due to food and vomit	J69.0
	Pulmonary embolism without mention of acute cor pulmonale	I26.9
	Decubitus ulcer	L89.^
	Gangrene, not elsewhere classified	R02
	Urinary tract infection, site not specified	N39.0
	Convulsions, not elsewhere classified	R56.^
	Epidemic louse-borne typhus fever due to Rickettsia prowazekii	A75.0
	Recrudescence typhus [Brill's disease]	A75.1
	Typhus fever due to Rickettsia typhi	A75.2
	Typhus fever due to Rickettsia tsutsugamushi	A75.3
	Typhus fever, unspecified	A75.9
	Spotted fever [tick-borne rickettsioses]	A77.^
	Intracerebral haemorrhage	I61.^
	Cerebral infarction due to thrombosis of precerebral arteries	I63.0

	Cerebral infarction due to embolism of precerebral arteries	I63.1
	Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries	I63.2
	Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction	I65.^
	Occlusion and stenosis of cerebellar arteries	I66.3
	Cerebral infarction due to thrombosis of cerebral arteries	I63.3
	Cerebral infarction due to embolism of cerebral arteries	I63.4
	Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries	I63.5
	Other cerebral infarction	I63.8
	Cerebral infarction, unspecified	I63.9
	Occlusion and stenosis of middle cerebral artery	I66.0
	Occlusion and stenosis of anterior cerebral artery	I66.1
	Occlusion and stenosis of posterior cerebral artery	I66.2
	Occlusion and stenosis of multiple and bilateral cerebral arteries	I66.4
	Occlusion and stenosis of other cerebral artery	I66.8
	Occlusion and stenosis of unspecified cerebral artery	I66.9
	Stroke, not specified as haemorrhage or infarction	I64
	<b>Readmission occurred within 28 days of discharge</b>	
<b>Exclude:</b>	Elective admissions	Admission Category not equal to "L"
	<b><i>AMI and heart failure:</i></b>	
	Bypass, coronary arteries	1.IJ.76.^
	Dilation, coronary arteries or Pharmacotherapy (local), vessels of heart	1.IJ.50.^, 1.IJ.57.^, 1.IL.35.^
	Implantation of internal device, epicardium	1.HB.53.^
	Management of internal device, epicardium	1.HB.54.^
	Implantation of internal device, endocardium	1.HD.53.^
	Management of internal device, endocardium	1.HD.54.^
	Implantation of internal device, heart NEC	1.HZ.53.^
	Management of internal device, heart NEC	1.HZ.54.^
	<b><i>Stroke:</i></b>	
	Extraction, carotid artery	1.JE.57.^

<b>Cases (Denominator)</b>		
	<b>Criteria</b>	<b>Codes</b>
<b>Include:</b>	AMI*	I21.^, I22.^
	Heart failure*	I50.^, I26.0, I27.9
	Asthma*	J45.^
	GI Bleed*	K92.0, K92.1, K92.2, K25.0, K25.2, K25.4, K25.6, K26.0, K26.2, K26.4, K26.6, K27.0, K27.2, K27.4, K27.6, K28.0, K28.2, K28.4, K28.6

	Stroke*	I60.^, I61.^, I62.^, I63.^, I64
<b>Exclude:</b>	Readmissions that followed a discharge where the patient signed him/herself out or the patient died	Discharge Disposition Code not equal to 6 (sign out), 7 (death), or 9 (stillbirth)
	General Exclusion Criteria	(see the Methodology section of this report)
	<i>For AMI cases ONLY:</i> Discharged alive and had an episode LOS less than 3 days (to reduce impact of over coding)	

\*Patients were included in the diagnostically defined groups if the diagnosis of interest was coded as a type M diagnosis. However, since the goal was to identify conditions that developed before hospital admissions, if the M-diagnosis was also listed on the discharge abstract as a type 2 diagnosis, indicating that the most responsible condition developed after admission, the patient was excluded from the analysis. In order to identify patients who might have been admitted with the diagnosis of interest, but who had developed another most responsible diagnosis after admission, patients were also included if another diagnosis was coded as a type M *and* a type 2 (indicating that the M-diagnosis developed after admission) and the diagnosis of interest was coded as a type 1.

### ***Readmissions: Specific Surgical Procedures***

**This indicator is presented at a hospital-specific level in the 2006 Executive Report.**

#### Sum of readmission rates for cholecystectomy, hysterectomy, and prostatectomy (surgical)

Readmissions are defined using information from both the initial episode and the subsequent hospitalization. An episode of care is counted as having a readmission (in either the same or another Ontario acute care hospital) if all of the following criteria are met:

1. The subsequent hospitalization was for a diagnosis or procedure that was defined by an expert panel as relevant to the initial surgery;
2. the initial episode did not end with the patient signing him/herself out against medical advice (or died);
3. if the patient is admitted more than 24 hours following discharge, it is not considered a transfer and is treated as a new episode (See 'Linking Cases Across Hospitals' in the Methodology section of this report); and,
4. if the subsequent admission was not defined as being as elective.

#### **Note:**

- For multi-hospital episodes of care, readmissions were attributed to the last hospital from which the patient was discharged before the readmission.
- All possible 20 procedures on the discharge abstract are included in the analysis for this indicator.

- As diagnosis typing is not an available field in NACRS, for all fiscal year 2004 day surgery records, the first diagnosis is assumed to be Type M and any subsequent diagnoses is assumed to be Type 1.

Episodes (Numerator)		
	Criteria	Codes
Include:	<b><i>Cholecystectomy:</i></b>	Type M diagnosis only
	Haemorrhage and haematoma complicating a procedure, not elsewhere classified	T81.0
	Accidental puncture and laceration during a procedure, not elsewhere classified	T81.2
	Emphysema (subcutaneous) resulting from a procedure	T81.81
	Other complications of procedures, not elsewhere classified	T81.88
	Other postprocedural disorders of circulatory system, not elsewhere classified	I97.8
	Postprocedural disorder of circulatory system, unspecified	I97.9
	Other functional disturbances following cardiac surgery	I97.1
	Mendelson's syndrome	J95.4
	Other postprocedural respiratory disorders	J95.8^
	Postprocedural respiratory disorder, unspecified	J95.9
	Postoperative intestinal obstruction	K91.3
	Gastrostomy complications	K91.6^
	Other postprocedural disorders of digestive system, not elsewhere classified	K91.8
	Postprocedural disorder of digestive system, unspecified	K91.9
	Paralytic ileus	K56.0
	Drainage, gallbladder	1.OD.52.^
	Extraction, gallbladder	1.OD.57.^
	Bypass, gallbladder	1.OD.76.^
	Repair, gallbladder	1.OD.80.^
	Closure of fistula, gallbladder	1.OD.86.^
	Excision total, gallbladder	1.OD.89.^
	Installation of external appliance, bile ducts	1.OE.37.^
	Management of external appliance, bile ducts	1.OE.38.^
	Dilation, bile ducts	1.OE.50.^
	Drainage, bile ducts	1.OE.52.^
	Management of internal device, bile ducts	1.OE.54.BA-TS
	Extraction, bile ducts	1.OE.57.^
	Destruction, bile ducts	1.OE.59.BA-AS
	Bypass, bile ducts	1.OE.76.^
	Repair, bile ducts	1.OE.80.^
	Construction or reconstruction, bile ducts	1.OE.84.^
	Closure of fistula, bile ducts	1.OE.86.^
	Excision partial, bile ducts	1.OE.87.^
	Excision total, bile ducts	1.OE.89.^

	<b>Readmission occurred within 28 days of discharge</b>	
	<b><i>Hysterectomy:</i></b>	Type M diagnosis only
	Acute post-hemorrhagic anemia - 28 days	D62
	Paralytic ileus - 28 days	K56.0, K56.7
	Cardiac complications during or resulting from a procedure - 28 days	I97.8, I97.9
	Respiratory complications resulting from a procedure - 28 days	J95.4, J95.8, J95.9
	Urinary tract infection, site not specified - 7 days	N39.0
	Retention of urine - 7 days	R33, R39.12
	<b><i>Prostatectomy:</i></b>	Type M diagnosis only
	Operations on the Ureter	1.PE.50.^, 1.PE.52.^, 1.PE.54.^, 1.PE.55.^, 1.PE.56.^, 1.PE.57.^, 1.PE.59.^, 1.PE.76.^, 1.PE.77.^, 1.PE.80.^, 1.PE.82.^, 1.PE.87.^, 1.PE.89.^, 1.PG.50.^, 1.PG.52.^, 1.PG.54.^, 1.PG.55.^, 1.PG.56.^, 1.PG.57.^, 1.PG.59.^, 1.PG.72.^, 1.PG.74.^, 1.PG.76.^, 1.PG.77.^, 1.PG.80.^, 1.PG.82.^, 1.PG.86.^, 1.PG.87.^, 1.PG.89.^
	Operations on the urinary bladder	1.PL.50.^, 1.PL.53.^, 1.PL.54.^, 1.PL.55.^, 1.PL.59.^, 1.PL.72.^, 1.PL.74.^, 1.PL.80.^, 1.PL.87.^, 1.PM.50.^, 1.PM.52.^, 1.PM.54.^, 1.PM.55.^, 1.PM.56.^, 1.PM.57.^, 1.PM.58.^, 1.PM.59.^, 1.PM.72.^, 1.PM.77.^, 1.PM.80.^, 1.PM.82.^, 1.PM.84.^, 1.PM.86.^, 1.PM.87.^, 1.PM.89.^, 1.PM.90.^, 1.PM.91.^, 1.PM.92.^
	Operations on the urethra	1.PQ.50.^, 1.PQ.52.^, 1.PQ.53.^, 1.PQ.54.^, 1.PQ.55.^, 1.PQ.56.^, 1.PQ.57.^, 1.PQ.59.^, 1.PQ.72.^, 1.PQ.77.^, 1.PQ.78.^, 1.PQ.80.^, 1.PQ.82.^, 1.PQ.86.^, 1.PQ.87.^, 1.PQ.89.^
	Operations on the urinary tract	1.PV.50.^, 1.PV.57.^, 1.PV.59.^, 1.PZ.94.^
	Operations on the prostate and seminal vesicles	1.QQ.52.^, 1.QQ.87.^,

		1.QQ.89.^, 1.QT.59.^, 1.QT.87.^, 1.QT.91.^, 1.QZ.94.^
	Intestinal infections, other specified bacteria	A04.5, A04.6, A04.7, A04.8
	Urinary tract infection, site not specified	N39.0
	Hematuria	N02.^, R31.^
	Prostatic hypertrophy	N40
	Retention of urine	R33, R39.12
	Cardiac complications during or resulting from a procedure	I97.8, I97.9
	Respiratory complications resulting from a procedure	J95.4, J95.8, J95.9
	Readmission occurred within 28 days of discharge	
Exclude:	Elective admissions	Admission Category not equal to "L"

Cases (Denominator)		
	Criteria	Codes
Include:	Cholecystectomy	1.OD.89.^
	Hysterectomy	1.RM.89.^, 1.RM.91.^
	Prostatectomy	1.QT.59.^, 1.QT.87.^
Exclude:	Readmissions that followed a discharge where the patient signed him/herself out or the patient died	Discharge Disposition Code not equal to 6 (sign out), 7 (death), or 9 (stillbirth)
	General Exclusion Criteria	(see the Methodology section of this report)
	<i>For Hysterectomy cases ONLY:</i>	1.RM.89.^, 1.RM.91.^ with
	Pelvic exenteration	CMG 575
	Major procedures in pregnancy or childbirth	CMG 600
	In situ cancers or neoplasms of uncertain behavior	ICD-10 D00-D09, D37- D38
	<i>For Prostatectomy cases ONLY:</i>	1.QT.59.^, 1.QT.87.^ with
	Radical prostatectomy	1.QT.91.^

## Appropriateness

### Rate of selected elective procedures performed laparoscopically versus open

This indicator is presented at a hospital-specific level in the 2006 Executive Report for Rate of open cholecystectomy only – other selected elective procedures will be reported at the system-wide level only.

Rates for selected elective procedures that could be done using laparoscopic or open approaches were calculated. For the future, we plan to look at other minimally invasive surgeries to include in this indicator.

**Note:**

- Only procedures that could be performed both laparoscopically and open were selected.
- As Admission Category is not an available field in NACRS, all fiscal year 2004 day surgery records are assumed to be elective.
- CMG criteria was added so that we are only including cases where the selected procedures are the most complex procedures performed during that hospitalization.
- Only the *principal procedure* on the abstract was used in the rate calculation.

**Procedure # 1: Cholecystectomy – Open Approach**

Episodes (Numerator)			
	Criteria	Approach	Codes
Include:	Cases within denominator with:		
	Excision total, gallbladder	Open	1.OD.89.LA 1.OD.89.SM-AG 1.OD.89.SM-AM 1.OD.89.SM-AS 1.OD.89.SM-BD 1.OD.89.SM-GX 1.OD.89.TP
	CMG for Cholecystectomy		315

Cases (Denominator)			
	Criteria	Approach	Codes
Include:	Excision total, gallbladder	Open	1.OD.89.LA 1.OD.89.SM-AG 1.OD.89.SM-AM 1.OD.89.SM-AS 1.OD.89.SM-BD 1.OD.89.SM-GX 1.OD.89.TP
		Laparoscopic	1.OD.89.DA 1.OD.89.DT-GX 1.OD.89.EC 1.OD.89.DT-AM 1.OD.89.DT-AG 1.OD.89.DT-AS 1.OD.89.DT-BD
	CMG for Cholecystectomy and Laparoscopic Cholecystectomy		315, 317
	Elective Procedures		Admission code = 'L'
Exclude:	General Exclusion Criteria		(see the Methodology section of this report)

**Procedure # 1: Cholecystectomy – Laparoscopic Approach**

Episodes (Numerator)			
	Criteria	Approach	Codes
Include:	Cases within denominator with:		
	Excision total, gallbladder	Laparoscopic	1.OD.89.DA 1.OD.89.DT-GX 1.OD.89.EC 1.OD.89.DT-AM 1.OD.89.DT-AG 1.OD.89.DT-AS 1.OD.89.DT-BD
	CMG for Laparoscopic Cholecystectomy		317

Cases (Denominator)			
	Criteria	Approach	Codes
Include:	Excision total, gallbladder	Open	1.OD.89.LA 1.OD.89.SM-AG 1.OD.89.SM-AM 1.OD.89.SM-AS 1.OD.89.SM-BD 1.OD.89.SM-GX 1.OD.89.TP
		Laparoscopic	1.OD.89.DA 1.OD.89.DT-GX 1.OD.89.EC 1.OD.89.DT-AM 1.OD.89.DT-AG 1.OD.89.DT-AS 1.OD.89.DT-BD
	CMG for Cholecystectomy and Laparoscopic Cholecystectomy		315, 317
	Elective Procedures		Admission code = 'L'
Exclude:	General Exclusion Criteria		(see the Methodology section of this report)

**Procedure # 2: Partial Oophorectomy - Open Approach**

Episodes (Numerator)			
	Criteria	Approach	Codes
Include:	Cases within denominator with:		
	Excision partial, ovary NEC	Open	1.RB.87.LA

**Cases (Denominator)**

	Criteria	Approach	Codes
Include:	Excision partial, ovary NEC	Open	1.RB.87.LA
		Laparoscopic	1.RB.87.DA
	CMG for: Major Uterine and Adnexal Procedures without Malignancy, Non-extensive Procedures for Injury or Complication of Treatment		579, 804
	Elective Procedures		Admission code = 'L'
Exclude:	General Exclusion Criteria		(see the Methodology section of this report)

### ***Procedure # 2: Partial Oophorectomy - Laparoscopic Approach***

<b>Episodes (Numerator)</b>			
	Criteria	Approach	Codes
Include:	Cases within denominator with: Excision partial, ovary NEC		
		Laparoscopic	1.RB.87.DA

<b>Cases (Denominator)</b>			
	Criteria	Approach	Codes
Include:	Excision partial, ovary NEC	Open	1.RB.87.LA
		Laparoscopic	1.RB.87.DA
	CMG for: Major Uterine and Adnexal Procedures without Malignancy, Non-extensive Procedures for Injury or Complication of Treatment		579, 804
	Elective Procedures		Admission code = 'L'
Exclude:	General Exclusion Criteria		(see the Methodology section of this report)

### ***Procedure # 3: Total Oophorectomy – Open Approach***

<b>Episodes (Numerator)</b>			
	Criteria	Approach	Codes
Include:	Cases within denominator with: Excision total, ovary NEC		
		Open	1.RB.89.LA

<b>Cases (Denominator)</b>			
	<b>Criteria</b>	<b>Approach</b>	<b>Codes</b>
<b>Include:</b>	Excision total, ovary NEC	Open	1.RB.89.LA
		Laparoscopic	1.RB.89.DA
	CMG for: Major Uterine and Adnexal Procedures without Malignancy, Non-extensive Procedures for Injury or Complication of Treatment		579, 804
	Elective Procedures		Admission code = 'L'
<b>Exclude:</b>	General Exclusion Criteria		(see the Methodology section of this report)

***Procedure # 3: Total Oophorectomy – Laparoscopic Approach***

<b>Episodes (Numerator)</b>			
	<b>Criteria</b>	<b>Approach</b>	<b>Codes</b>
<b>Include:</b>	Cases within denominator with:		
	Excision total, ovary NEC	Laparoscopic	1.RB.89.DA

<b>Cases (Denominator)</b>			
	<b>Criteria</b>	<b>Approach</b>	<b>Codes</b>
<b>Include:</b>	Excision total, ovary NEC	Open	1.RB.89.LA
		Laparoscopic	1.RB.89.DA
	CMG for: Major Uterine and Adnexal Procedures without Malignancy, Non-extensive Procedures for Injury or Complication of Treatment		579, 804
	Elective Procedures		Admission code = 'L'
<b>Exclude:</b>	General Exclusion Criteria		(see the Methodology section of this report)

## Performance Rating

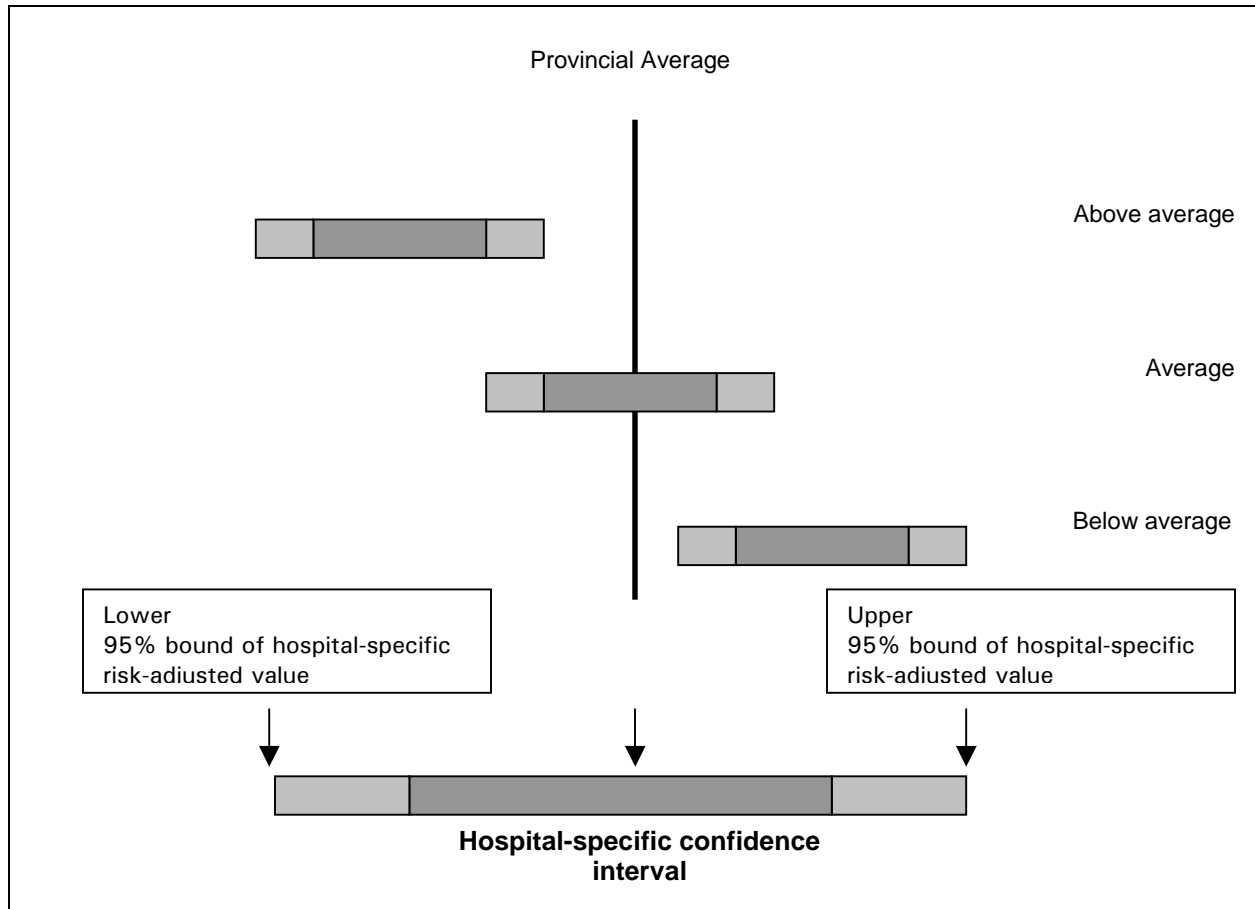
In *Hospital Report 2006: Acute Care*, a shaded cell designates a hospital's performance for each indicator into categories of 'above average', 'provincial average', or 'below average'. These performance allocations are assigned using confidence intervals around the hospital's risk-adjusted value (assessed against the provincial average, which serves as the benchmark).

For these indicators, a lower value indicates better performance. However, no single set of measures should be taken as representative of overall hospital performance. For indicators, performance allocations are assigned as follows:

- If the lower bound of the confidence interval of the hospital's specific risk-adjusted value is above the provincial average, that hospital is classified as having *below average performance*.
- If the upper and lower bounds of the confidence interval of the hospital's specific risk-adjusted value surround the provincial average value, the hospital is classified as having *average performance*.
- If the upper bound of the confidence interval of the hospital's specific risk-adjusted value is below the provincial average value, that hospital is classified as having *above average performance*.

Figure 1 illustrates the methods used for assigning performance for these indicators.

**Figure 1: Performance Rating Methodology for Clinical Utilization and Outcomes Indicators**



In some hospitals, the low volume of specific types of care may raise issues of confidentiality for patients or physicians. In the hospital-specific section of *Hospital Report 2006: Acute Care*, hospitals are assigned a score of not reportable ('NR') in the following cases:

- If case volumes were less than five for a given patient group.
- For medical cases, if there were fewer than two 'most responsible physicians' providing care to patients within the patient group for the given indicator.
- For surgical cases, if there were fewer than two 'most responsible surgeons/physicians', AND fewer than five surgeons/anaesthetists/physicians involved in the care of patients within the patient group for the given indicator.

## Calculating Confidence Intervals

95% confidence intervals around the adjusted values were calculated from the Poisson distribution when the observed numerators were less than 100. Otherwise, the confidence intervals were calculated using Byar's approximation<sup>2</sup>.

When 95% confidence intervals proved to be too stringent or too lenient to yield a reasonable amount of variation in the performance ratings, 90% or 99.9% confidence intervals were used instead.

The following table reports the confidence intervals that were used for each indicator.

**Table 3: Indicator-specific Confidence Intervals**

Indicator	Confidence Interval
Readmissions: Specific Medical Conditions	95%
Readmissions: Specific Surgical Procedures	95%
Readmissions: All Medical Patients	95%
Adverse Events: Nurse-sensitive Medical	95%
Adverse Events: Nurse-sensitive Surgical	90%
Adverse Events: All Medical Patients	99.9%
Appropriateness: Open Cholecystectomy	95%

## Risk-Adjustment

In comparing hospital rates of utilization and outcomes, it is important to take into account differences in patient characteristics that may vary systematically among hospitals. In clinical research this is called risk-adjustment, where hospital data are adjusted to remove pre-existing influences. This issue is particularly important because patients with certain characteristics are less likely to receive some specific treatments or to have positive clinical outcomes than other groups. If a hospital tends to serve a disproportionate number of such patients, it may be unfairly reported as having higher rates of undesirable events, when in fact, these rates may be comparable to another hospital with lower instances that simply serves a different population. Therefore, to improve hospital comparability, appropriate risk-adjustment techniques were used to adjust the data.

It is important to emphasize that risk-adjustment attempts to control for, but cannot entirely eliminate, the impact of differences in patients' pre-admission health status

<sup>2</sup> N. E. Breslow, N. E. Day, *Statistical Methods in Cancer Research: Volume II – The Design and Analysis of Cohort Studies* (Lyon: International Agency for Research on Cancer, 1987).

on performance. There are two key caveats to risk-adjustment. First, the expected performance is a relative measure. It describes the expected level of performance at an institution based on how well all institutions perform. Second, risk-adjustment only *reduces* the effect of differences in the patient population across hospitals; it cannot eliminate the effect of these differences completely. As a result, hospitals with the sickest patients may tend to score more poorly than other institutions, even after risk-adjustment. Likewise, hospitals that treat rare or highly specialized groups of patients may tend to score poorly, even after risk-adjustment. It is important to keep these caveats in mind when comparing hospital performance.

For each of the CUO indicators reported at a hospital-specific level, risk adjustment variables and techniques were selected on the basis of appropriateness and viability (i.e. sufficient numbers of events).

Given the rarity of events across many of the clinical and utilization health indicators, standard modeling techniques were deemed inadequate for purposes of risk adjustment. In order to compensate for indicators with rare events (< 5%), models better suited for this purpose were chosen. Two such models, Poisson and Negative Binomial regressions were used in the risk adjustment, subject to specific model criteria being met. For example when over-dispersion was evident, the Negative Binomial model was used. Otherwise the Poisson model was employed. In addition when sufficient events were available, logistic regression was the model of choice. In order to define the general framework for modeling purposes, all variables were categorized, and subsequently aggregated according to common patient characteristics. For each of the indicators listed in Table 4, the specific type of model (distribution and link) used in the risk adjustment is described. The link describes the functional relationship between the outcome and the linear combination of the predictor variables.

Table 4: Description of Risk-Adjustment Models		
Indicator	Risk-Adjustment Model Distribution	Risk-Adjustment Model Link
Adverse Events: All Medical Conditions	Poisson	Log
Adverse Events: Nurse-sensitive Medical	Poisson	Log
Adverse Events: Nurse-sensitive Surgical	Poisson	Log
Readmissions: All Medical Patients	Poisson	Log
Readmissions: Specific Medical Conditions	Poisson	Log
Readmissions: Specific Surgical Procedures	Poisson	Log
Appropriateness: Open Cholecystectomy	Binomial*	Logit*

\* Logistic Regression was used for this model.

Candidate variables in each of the models consisted of gender, age and Elixhauser co-morbidity variables. The Elixhauser co-morbidities are comprised of 30 disease groups (i.e. Pneumonia, Asthma, CHF, etc). For each of the indicators, the corresponding variables used for risk adjustment are listed.

Model for Adverse Events: All Medical Conditions	
Variables or Pre-Existing Conditions	ICD-10-CA and other codes
Age	0-64, 65 +
Gender	Female, Male
Congestive Heart Failure	I50.0, I50.1, I50.9
Cardiac Arrhythmia	I44.3, I44.7, I44.6, I45.1, I45.9, I45.6, I45.8, I47.1, I47.9, I48.0, I48.1, I49.9, R00.0, Z95.0, Z45.0
Valvular Disease	I38.^, A52.0, I05.0, I05.1, I05.2, I05.8, I06.0, I08.0, I07.0, I07.1, I07.2, I07.8, I07.9, I09.8, I34.9, I35.9, I36.9, I37.9, Q23.0, Q23.1, Q23.2, Q23.3, Z95.3, Z95.4, Z95.2
Pulmonary Circulation Disorders	I27.0, I27.1, I27.2, I27.8, I27.9, I28.9
Peripheral Vascular Disorders	I70.0, I70.1, I70.2, I70.8, I70.9, I71.2, I71.4, I71.6, I71.9, I73.1, I73.8, I73.9, I77.1, K55.1, K559, Z95.8
Hypertension	I10.0, I11.^, I13.^, N18.^, N19.^, I50.0, I15.00, I15.01, I15.80, I15.81, I15.90, I1591
Paralysis	G81.0, G81.1, G81.9, G80.0, G80.1, G80.2, G80.3, G80.4, G80.8, G80.9, G83.0, G83.1, G83.2, G83.3, G83.4, G83.5, G83.8, G83.9
Other Neurological Disorders	G20.^, G10.^, G35.^, G31.9, G25.5, G11.0, G11.1, G11.2, G11.3, G11.4, G11.8, G11.9, G12.0, G12.1, G12.2, G12.9, G37.0, G37.8, G37.9, G40.1, G40.2, G40.3, G40.8, G40.9, G93.1, G93.4, R56.0, R56.8, R47.0
Chronic Pulmonary Disease	J40.^, J41.^, J42.^, J44.^, J47.^, J60.^, J61.^, J62.^, J63.^, J66.^, J65.^, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J45.0, J45.1, J45.8, J45.9, J67.0, J68.4
Diabetes	E10.90, E11.90, E13.90, E10.10, E11.10, E13.10, E14.10, E11.01, E13.01, E14.01, E10.2, E11.2, E13.2, E14.2, E10.3, E11.3, E13.3, E14.3, E10.4, E11.4, E13.4, E14.4, E10.5, E11.5, E13.5, E14.5, E10.9, E11.9, E13.9, E14.9
Hypothyroidism	E00.0, E00.1, E00.2, E00.3, E00.4, E00.5, E00.8, E00.9, E03.0, E03.1, E03.2, E03.8, E03.9, E89.0
Renal Failure	N19.^, N17.0, N17.1, N17.2, N17.8, N17.9, N18.0, N18.1, N18.2, N18.8, N18.9, Z94.0, Z99.2, Z49.1, Z49.2
Liver Disease	B16.9, B17.8, B18.2, I85.0, I85.9, K70.0,

	K70.3, K70.9, K73.0, K73.8, K73.9, K74.6, K74.5, K76.0, K74.1, K76.6, K76.8, Z94.4
Peptic Ulcer Disease	K25.7, K25.9, K26.7, K26.9, K27.7, K27.9, K28.7, K28.9
Rheumatoid Arthritis	L94.0, M32.9, M06.9, M35.3, M45.^
Coagulopathy	D66.^, D69.1, D69.4, D69.5, D69.6, D69.30, D69.38
Obesity	E668
Weight Loss	E40.^, E41.^, E43.^, E44.0, E44.1
Fluid and Electrolyte Disorders	E87.0, E87.1, E87.2, E87.3, E87.4, E87.5, E87.6, E87.7, E87.8
Anemia	D50.0, D50.8, D50.1, D50.9, D64.9, D51.^, D52.^, D53.^
Alcohol Abuse	F10.0, F10.2, F10.3, F10.5, F10.6, F10.7, F10.9, Z86.40
Psychoses	F03.^, F21.^, F10.5, F11.5, F12.5, F13.5, F14.5, F15.5, F16.5, F17.5, F18.5, F19.5, F20.1, F20.2, F20.3, F20.4, F20.5, F20.6, F20.8, F20.9, F20.2, F20.0, F22.0, F22.8, F23.2, F23.3, F25.2, F30.9, F32.3, F84.3, F84.5
Depression	F32.9, F34.0, F34.1, F43.2

Models for Adverse Events: Nurse-sensitive Medical		
Indicator Component	Variables or Pre-Existing Conditions	ICD-10-CA and other codes
AMI	Age	0-69, 70+
	Gender	Female, Male
	Congestive Heart Failure	I50.0, I50.1, I50.9
	Cardiac Arrhythmia	I44.3, I44.7, I44.6, I45.1, I45.9, I45.6, I45.8, I47.1, I47.9, I48.0, I48.1, I49.9, R00.0, Z95.0, Z45.0
	Hypertension	I10.0, I11.^, I13.^, N18.^, N19.^, I50.0, I15.00, I15.01, I15.80, I15.81, I15.90, I1591
	Diabetes	E10.90, E11.90, E13.90, E10.10, E11.10, E13.10, E14.10, E11.01, E13.01, E14.01, E10.2, E11.2, E13.2, E14.2, E10.3, E11.3, E13.3, E14.3, E10.4, E11.4, E13.4, E14.4, E10.5, E11.5, E13.5, E14.5, E10.9, E11.9, E13.9, E14.9
Heart Failure	Age	0-74, 75+

	Gender	Female, Male
	Cardiac Arrhythmia	I44.3, I44.7, I44.6, I45.1, I45.9, I45.6, I45.8, I47.1, I47.9, I48.0, I48.1, I49.9, R00.0, Z95.0, Z45.0
	Peripheral Vascular Disorders	I70.0, I70.1, I70.2, I70.8, I70.9, I71.2, I71.4, I71.6, I71.9, I73.1, I73.8, I73.9, I77.1, K55.1, K559, Z95.8
	Chronic Pulmonary Disease	J40.^, J41.^, J42.^, J44.^, J47.^, J60.^, J61.^, J62.^, J63.^, J66.^, J65.^, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J45.0, J45.1, J45.8, J45.9, J67.0, J68.4
	Renal Failure	N19.^, N17.0, N17.1, N17.2, N17.8, N17.9, N18.0, N18.1, N18.2, N18.8, N18.9, Z94.0, Z99.2, Z49.1, Z49.2
	Coagulopathy	D66.^, D69.1, D69.4, D69.5, D69.6, D69.30, D69.38
	Fluid and Electrolyte Disorders	E87.0, E87.1, E87.2, E87.3, E87.4, E87.5, E87.6, E87.7, E87.8
Asthma	N/A	
GI Bleed	Age	0-69, 70 +
	Gender	Female, Male
Stroke	Age	0-74, 75 +
	Gender	Female, Male
	Cardiac Arrhythmia	I44.3, I44.7, I44.6, I45.1, I45.9, I45.6, I45.8, I47.1, I47.9, I48.0, I48.1, I49.9, R00.0, Z95.0, Z45.0
	Paralysis	G81.0, G81.1, G81.9, G80.0, G80.1, G80.2, G80.3, G80.4, G80.8, G80.9, G83.0, G83.1, G83.2, G83.3, G83.4, G83.5, G83.8, G83.9
	Chronic Pulmonary Disease	J40.^, J41.^, J42.^, J44.^, J47.^, J60.^, J61.^, J62.^, J63.^, J66.^, J65.^, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J45.0, J45.1, J45.8, J45.9, J67.0, J68.4
	Deficiency Anemia	D51.^, D52.^, D53.^, D50.1, D50.8, D50.9, D64.9

Models for Adverse Events: Nurse-sensitive Surgical		
Indicator Component	Variables or Pre-Existing Conditions	ICD-10-CA and other codes
Cholecystectomy	Age	0-49, 50 +
	Gender	Female, Male
Hysterectomy	N/A	

Prostatectomy	Age	0-69, 70 +
	Renal Failure	N19.^, N17.0, N17.1, N17.2, N17.8, N17.9, N18.0, N18.1, N18.2, N18.8, N18.9, Z94.0, Z99.2, Z49.1, Z49.2

Model for Readmissions: All Medical Patients	
Variables or Pre-Existing Conditions	ICD-10-CA and other codes
Age	0-64, 65 +
Gender	Female, Male
Hypertension (uncomplicated)	I10.0
Hypertension (complicated)	I11.^, I13.^ N18.^, N19.^, I50.0, I15.00, I15.01, I15.80, I15.81, I15.90, I15.91
Diabetes	E10.90, E11.90, E13.90, E10.10, E11.10, E13.10, E14.10, E11.01, E13.01, E14.01, E10.2, E11.2, E13.2, E14.2, E10.3, E11.3, E13.3, E14.3, E10.4, E11.4, E13.4, E14.4, E10.5, E11.5, E13.5, E14.5, E10.9, E11.9, E13.9, E14.9
Renal Failure	N19.^, N17.0, N17.1, N17.2, N17.8, N17.9, N18.0, N18.1, N18.2, N18.8, N18.9, Z94.0, Z99.2, Z49.1, Z49.2
Liver Disease	B16.9, B17.8, B18.2, I8.50, I85.9, K70.0, K70.3, K70.9, K73.0, K73.8, K73.9, K74.6, K74.5, K76.0, K74.1, K76.6, K76.8, Z94.4
Drug Abuse	F11.3, F12.3, F13.3, F14.3, F15.3, F16.3, F18.3, F19.3, F11.5, F12.5, F13.5, F14.5, F15.5, F16.5, F18.5, F19.5, F11.6, F12.6, F13.6, F14.6, F15.6, F16.6, F18.6, F19.6, F11.7, F12.7, F13.7, F14.7, F15.7, F16.7, F18.7, F19.7, F19.9, F11.2, F12.2, F13.2, F14.2, F16.2, F19.2

Models for Readmissions: Specific Medical Conditions		
Indicator Component	Variables or Pre-Existing Conditions	ICD-10-CA and other codes
AMI	Age	0-64, 65 +
	Gender	Female, Male
	Hypertension (complicated)	I11.^, I13.^ N18.^, N19.^, I50.0, I15.00, I15.01, I15.80, I15.81, I15.90, I15.91

Heart Failure	Age	0-74, 75 +
	Gender	Female, Male
	Chronic Pulmonary Disease	J40.^, J41.^, J42.^, J44.^, J47.^, J60.^, J61.^, J62.^, J63.^, J65.^, J66.^, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J45.0, J45.1, J45.8, J45.9, J67.0, J68.4
GI Bleed	Age	0-69, 70 +
	Gender	Female, Male
	Anemia	D50.0, D50.8, D50.1, D50.9, D64.9, D51.^, D52.^, D53.^
Asthma	Age	0-44, 45 +
	Gender	Female, Male
	Diabetes (uncomplicated)	E10.90, E11.90, E13.90, E10.10, E11.10, E13.10, E14.10, E11.01, E13.01, E14.01
Stroke	Age	0-69, 70 +
	Gender	Female, Male
	Diabetes	E10.90, E11.90, E13.90, E10.10, E11.10, E13.10, E14.10, E11.01, E13.01, E14.01, E10.2, E11.2, E13.2, E14.2, E10.3, E11.3, E13.3, E14.3, E10.4, E11.4, E13.4, E14.4, E10.5, E11.5, E13.5, E14.5, E10.9, E11.9, E13.9, E14.9

Models for Readmissions: Specific Surgical Procedures		
Indicator Component	Variables or Pre-Existing Conditions	ICD-10-CA and other codes
Cholecystectomy	Age	0-49, 50 +
	Gender	Female, Male
	Hypertension	I10.0, I11.^, I13.^, N18.^, N19.^, I50.0, I15.00, I15.01, I15.80, I15.81, I15.90, I1591
Hysterectomy	Age	0-44, 50 +
	Hypertension	I10.0, I11.^, I13.^, N18.^, N19.^, I50.0, I15.00, I15.01, I15.80, I15.81, I15.90, I1591
	Anemia	D50.0, D50.8, D50.1, D50.9, D64.9, D51.^, D52.^, D53.^
Prostatectomy	Age	0-69, 70 +

	Chronic Pulmonary Disease	J40.^, J41.^, J42.^, J44.^, J47.^, J60.^, J61.^, J62.^, J63.^, J66.^, J65.^, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J45.0, J45.1, J45.8, J45.9, J67.0, J68.4
	Anemia	D50.0, D50.8, D50.1, D50.9, D64.9, D51.^, D52.^, D53.^

Model for Appropriateness: Open Cholecystectomy	
Variables or Pre-Existing Conditions	ICD-10-CA and other codes
Age	(Continuous variable)
Gender	Female, Male
Cholecystitis	K81.^, K80.00, K80.01, K80.10, K80.11, H80.40, K80.41
Hypertension	I10.0, I11.^, I13.^ N18.^, N19.^, I50.0, I15.00, I15.01, I15.80, I15.81, I15.90, I15.91
Diabetes	E10.90, E11.90, E13.90, E10.10, E11.10, E13.10, E14.10, E11.01, E13.01, E14.01, E10.2, E11.2, E13.2, E14.2, E10.3, E11.3, E13.3, E14.3, E10.4, E11.4, E13.4, E14.4, E10.5, E11.5, E13.5, E14.5, E10.9, E11.9, E13.9, E14.9
Chronic Pulmonary Disease	J40.^, J41.^, J42.^, J44.^, J47.^, J60.^, J61.^, J62.^, J63.^, J65.^, J66.^, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J45.0, J45.1, J45.8, J45.9, J67.0, J68.4
Liver Disease	B16.9, B17.8, B18.2, I8.50, I85.9, K70.0, K70.3, K70.9, K73.0, k73.8, K73.9, K74.6, K74.5, K76.0, K74.1, K76.6, K76.8, Z94.4
Obesity	E66.8

In order to produce the adjusted indicator, the observed indicator rates are divided by the expected rates and adjusted to the provincial average.

## Reporting Results by Sex

Provincial-level means for the hospital-specific indicators (stratified by sex) described in this summary were included in the Executive Report. The e-Scorecard included hospital-level risk-adjusted means and components by sex for each indicator, sex difference values [(F-M)/F] for each indicator and an indication of the

direction (i.e.  $F > M$  or  $M > F$ ) and the statistical significance of these values at a hospital level. The indicator quantifying the difference between rates for women and men [i.e.  $(F-M)/F$ ] is the value of the difference between women and men attributable to sex – or a value for “equity”.

The interpretation of these data and notes about suppression will accompany this database. In terms of interpretation, if this value [i.e.  $(F-M)/F$ ] is negative (i.e. it may be the full range of negative values to infinity), males have higher rates than females. If this value is positive (i.e. it may be positive up to a value of 1), females have higher rates than males. A value of “0” is used as the benchmark as it represents true equity between women and men. Furthermore, if a hospital’s confidence interval around their specific value of the difference between women and men for a given indicator includes zero, then the hospital is said to have no statistically significant sex difference for that indicator (which is preferred). If a hospital’s confidence interval around their specific value of the difference between women and men for a given indicator does not include zero and is negative, then the hospital is said to have unequal (i.e.  $M > F$ ) performance or a statistically significant sex difference, in which males have a higher rate than females. If a hospital’s confidence interval around their specific value of the difference between women and men for a given indicator does not include zero and is positive, then the hospital is said to have unequal ( $F > M$ ) performance or a statistically significant sex difference, in which females have a significantly higher rate than males.

## Appendix A – CMG Lists

### Medical CMG List

010–022, 028, 060, 062, 063, 100–102, 104, 107–109, 113–116, 135–147, 200, 205–208, 212, 213, 219, 220, 222, 225, 226, 229, 232–235, 237, 240, 242, 279, 281, 285, 286, 289, 290, 294, 297, 323–326, 329, 391–394, 397–399, 401, 402, 404, 407, 409, 411, 413, 414, 439, 440, 443, 446, 447, 452, 454, 483, 485, 487–489, 520–522, 524, 525–527, 529, 532, 534–536, 538, 560, 561–563, 592, 594–596, 674–696, 704, 709, 710, 726, 730, 735–737, 751, 756, 757, 761, 763, 811, 813, 818, 823, 831, 834, 841, 842, 846, 847, 849, 850–852, 860–868, 895, 898, 910, 997, 999

### Surgical CMG List

001, 003–007, 040, 050–055, 057, 075–078, 081–093, 125–129, 175–179, 181–186, 188, 189, 191, 193, 194, 201–204, 210, 211, 215–218, 250–253, 255, 258, 260–262, 264–266, 269, 271, 310–315, 317, 320, 350–352, 354–356, 358–363, 365, 367–369, 372, 374–386, 425, 427–429, 432, 434, 435–438, 476–480, 482, 500–510, 512, 514, 550–552, 554, 555, 575–579, 581–587, 650–670, 700, 701, 703, 725, 728, 733, 734, 750, 803–805, 830, 832, 833, 840, 880–885, 887, 890–893, 900–902, 906, 908

### Major Surgery CMG List

The following Case Mix Groups are a subset of the surgical CMG list, and only include CMG linked to major surgical procedures:

001, 003, 004, 075, 076, 126, 175–179, 181, 182, 184, 250–253, 255, 310–312, 350–352, 356, 363, 367, 383–385, 476, 500–502, 504, 550, 575–577, 650–659, 661, 664, 665, 701, 803, 830, 885, 890, 900