

# Methodological Appendices

Appendix A Discharge Abstract Database (DAD) / 30

Appendix B The Centers for Medicare and Medicaid Services (CMS)  
Diagnosis Related Groups (DRG) grouper / 33

Appendix C Agency for Healthcare Research and Quality's (AHRQ)  
Inpatient Quality Indicators (IQI) and Patient Safety Indicator (PSI)  
modules / 36

Appendix D Hospital identification / 41

Appendix E List of the Agency for Healthcare Research and Quality's  
Inpatient Quality and Patient Safety Indicators used in the Fraser Institute's  
*Hospital Report Card* / 44

Appendix F Calculating scores, ranks, and statistical significance of  
results / 51

Appendix G Indicators omitted from this report / 54

Appendix H Municipalities and corresponding patient  
Forward Sortation Areas (FSAs) / 56

Appendix I Codes for age / 58

Appendix J International Classification of Diseases (ICD) conversion  
tables / 60

Appendix K Hospitals and health authorities / 66

# Appendix A

## Discharge Abstract Database (DAD)

In the first stage of data processing, records for all hospitals and municipalities were drawn from the DAD data extracts (from the CIHI) for use in the *Hospital Report Card*. The following DAD fields were used in our analysis.

*Province* Province of the patient.

*Institution number* Numeric value corresponding to each acute care facility.

*Postal Code* To protect patient confidentiality, all postal codes were truncated to the first 3 characters (representing the Forward Sortation Area) and grouped into corresponding municipalities as described by Canada Post. Please refer to Appendix H for further details.

*Age code* Unit value to denote how the patient's age was recorded. Please refer to Appendix I for further details.

*Age units* Age of patient at the time of admission, which must be evaluated using the age code. Please refer to Appendix I for further details.

*Gender* Sex of the patient.

*Admission date* Date the patient was admitted to the facility.

*Discharge Date* Date the patient was separated from the facility.

*Institution from type* Code identifying the level of care provided by the facility from which the patient was transferred to the acute-care institution, where

0 = Organized Outpatient Department of Reporting Facility

1 = Acute Care

2 = General Rehabilitation Facility

3 = Chronic Care Facility

4 = Nursing Home

5 = Psychiatric Facility

6 = Unclassified or other type of Facility

7 = Special Rehabilitation Facility

8 = Home Care  
9 = Home for the Aged  
A = Day Surgery  
B = Private Clinic  
E = Emergency Room  
N = Ambulatory Care

*Institution to type* Code identifying the level of care of the facility to which the patient was transferred. See *Institution from type*.

*Admission category* Type of admission to the facility, where

U = Emergent/Urgent  
L = Elective  
N = Newborn (born in reporting hospital or outside reporting facility and admitted within first 24 hours of life)  
S = Stillbirth (in the reporting hospital)  
R = Cadaver (admitted for organ/tissue retrieval).

*Discharge disposition* Disposition of Patient, i.e. whether the patient died while in the facility, where

01 = Transferred to another facility providing inpatient hospital care (includes other acute, sub-acute, psychiatric, rehabilitation, cancer centre/agency, pediatric hospital, etc.)  
02 = Transferred to a long-term care facility (personal care homes, auxiliary care, nursing homes, extended care, homes for the aged, senior's homes, DVA homes, etc.)  
03 = Transferred to other (palliative care/hospice, addiction treatment centre, etc.)  
04 = Discharged to a home setting with support services (senior's lodge, attendant care, home care, meals on wheels, homemaking, supportive housing, etc.)  
05 = Discharged home  
06 = Signed out (against medical advice)  
07 = Died  
08 = Cadaver (admitted for organ/tissue retrieval)  
09 = Stillbirth  
10 = Newborn and pediatric discharges to Child & Family Services (for use by Manitoba only)  
11 = Private Adoption (for use by Manitoba only).

*Entry code* Method of admission to the facility, where

E = Emergency Department from the reporting hospital  
D = Direct

*N* = Newborn (born alive in the reporting hospital)  
*S* = Stillborn (in the reporting hospital)  
*C* = Clinic from the reporting hospital  
*P* = Day Surgery from the reporting hospital.

*Diagnosis codes* International Classification of Disease codes (ICD-10-CA)<sup>1</sup> identifying the condition considered to be the most responsible for the patient's condition treated during hospitalization.

*Procedure and/or Intervention codes* CCI procedure codes that indicate the procedure performed on the patient during the hospitalization.

*Procedure dates* Date the procedure was performed on the patient.

*Intervention out of hospital indicator = Y* Denotes a procedure that was performed in another facility during the patient's hospitalization.<sup>2</sup>

*Intervention status attribute = A* Code denoting a cancelled procedure.<sup>3</sup>

*Acute length of stay* Total number of days the patient was in the acute care facility.

*Weight in grams* Captured for newborns and neonates (age ≤ 28 days) only.

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- 1 For further details on ICD-10-CA, see <[http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass\\_icd10](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass_icd10)>.
  - 2 All procedures denoted as *Intervention out of hospital indicator = Y* were removed from analysis.
  - 3 All procedures denoted as *Intervention status attribute = A* were removed from analysis.

# Appendix B

## The Centers for Medicare and Medicaid Services (CMS) Diagnosis Related Groups (DRG) grouper

In order to use the CMS<sup>1</sup> and 3M™ APR™-DRG Classification System software, the DAD dataset received from the CIHI required several standard modifications to account for differences between Canadian and US coding methodologies. In other cases, no modifications were required. The table below lists all fields imported from the DAD and specifies what modifications, if any, were required.

### Data elements required by the CMS- and 3M™ APR™-DRG classification system software

Variable name (Fraser Institute)	Description of variable required by the software	Value description	DAD Data Element or Comment
Name	Patient name	<i>Alphanumeric</i>	This information is not contained in the DAD used by the Fraser Institute. Left blank.
Mednumb	Medical record number	<i>Alphanumeric</i>	This information is not contained in the DAD used by the Fraser Institute. Left blank.
Accnumb	Account number	<i>Alphanumeric</i>	This information is not contained in the DAD used by the Fraser Institute. Left blank.
Admission_date	Date of admission Used in age and length of stay (LOS) calculation	<i>Numeric</i> mm/dd/yyyy format	Date of Admission was taken directly from DAD. Format changed from yyymmdd.
Discharge_date	Date of discharge Used for LOS calculation	<i>Numeric</i> mm/dd/yyyy format	Date of Discharge was taken directly from DAD. Format changed from yyymmdd.

<sup>1</sup> Version 24 was used for this report in order to retain consistency and compatibility. As of 2007, beginning with version 25 (now called MS-DRG), the groups have been resequenced.

Variable name (Fraser Institute)	Description of variable required by the software	Value description	DAD Data Element or Comment
Discharge_status	Discharge status	<i>Numeric</i> 2 = Discharged to short term hospital 5 = Discharged to other facility 20 = Patient died	Three DAD fields were combined to create the "Discharge status" field.  Patients discharged to a short-term hospital were extracted from the DAD by combining the fields "Institution from type" and "Institution to type" (see Appendix A for further details).  NB: All patients who died in hospital were extracted from DAD field "Discharge Disposition" = 07 (died).  All records not classified as being discharged to a short-term hospital or that died in hospital were classified as "other".
Prim	Expected primary payer.	<i>Primary pay source</i> 01 = Medicare 02 = Medicaid 03 = Title V 04 = Other Government 05 = Work Comp 06 = Blue Cross 07 = Insur Company 08 = Self Pay 09 = Other 10 = No Charge	Due to differences in the Canadian health care system, the DAD does not contain this information.
LOS	Calculated Length of stay overrides entered Length of stay	<i>Numeric</i> (Days)	Field left blank; calculated by the software using "Admit date" and "Discharge date".
Birth	Date of birth	<i>Numeric</i> mm/dd/yyyy format	CIHI encrypts all patient identifiers in the DAD prior to cutting the dataset, including "date of birth" information. "Birth date" remained as a "blank" in order to run the software.
Age_B	Age in years at admission	<i>Numeric</i> Age in years	See Appendix I for details
Gender	Sex of patient	<i>Numeric</i> 1 = Male 2 = Female	The DAD codes Male = M, Female = F. These values were recoded to Male = 1 & Female = 2. All other values of "Other" and "Undifferentiated" were omitted from analysis.
Admit	Admit diagnosis	<i>ICD-9-CM diagnosis code without decimal</i>  All blanks if no value is entered.	Left blank.

Variable name (Fraser Institute)	Description of variable required by the software	Value description	DAD Data Element or Comment
Diag_ code_1A – Diag_ code_25A	ICD-9-CM diagnosis codes: principal diagnosis followed by 24 fields for secondary diagnoses	<i>String</i>	All Diagnosis codes contained in the DAD were converted to ICD-9-CM.  Please refer to Appendix J for further explanation on classification conversions.
Interv_cci_ code_1A – Interv_cci_ code_20A	ICD-9-CM procedure codes: principal procedure followed by 19 secondary procedures.	<i>String</i>	All Procedure codes contained in the DAD were converted to ICD-9-CM.  Please refer to Appendix J for further explanation on classification conversions.

# Appendix C

## Agency for Healthcare Research and Quality's (AHRQ) Inpatient Quality Indicators (IQI) and Patient Safety Indicator (PSI) modules

### 1 Modifications to DAD dataset received from the CIHI

In order to use AHRQ's IQI and PSI modules, the original DAD dataset received from the CIHI required several standard modifications to account for differences between Canadian and US coding methodologies. Other fields required no modifications. The table below lists all relevant fields for AHRQ software (including the 3M™ All Patient Refined™ Diagnosis Related Groups [APR™-DRG Classification System] Software) and what modifications, if any, were performed.

#### Required AHRQ data element and description

Variable name (Fraser Institute)	Description of variable required by the software	Value description	DAD Data Element or Comment
Key	Unique case identifier.	<i>Numeric</i>	Each record analyzed was given a unique case identifier number.
Age_B	Patient's age in years at admission.	<i>Numeric</i> Age in years	See Appendix I for details.
Age_a	Patient's age in days at admission (coded only when the age in years is less than 1).	<i>Numeric</i> Age in days	See Appendix I for details.
Race	Patient's race	<i>Numeric</i> 1 = White 2 = Black 3 = Hispanic 4 = Asian/Pacific Island 5 = Native American 6 = Other	Race information is not captured in the DAD. Accordingly, all patient records were set to "6" (Other).  Note: Patient's race is used for risk-adjustment by the 3M APR™-DRG software.

Variable name (Fraser Institute)	Description of variable required by the software	Value description	DAD Data Element or Comment
Gender	Patient's sex	<i>Numeric</i> 1 = Male 2 = Female	DAD codes: Male = M, Female = F. These values were recoded to Male = 1 and Female = 2. All other values of "Other" and "Undifferentiated" were omitted from all analysis.
Prim	Expected primary payer	<i>Numeric</i> 1 = Medicare 2 = Medicaid 3 = Private, incl. HMO 4 = Self-pay 5 = No charge 6 = Other	Due to differences in the Canadian health care system, the DAD does not contain this information. Accordingly, all patient records were set to "6" (Other).
Muni	FIPS+ State/county code	<i>Numeric</i> Modified Federal Information Processing Standards State/County code	To protect patient confidentiality postal codes were truncated to FSAs by CIHI before the dataset was cut. Once received, FSAs were grouped into municipalities as described by Canada Post. Please see Appendix H for details.
Inst_Code	Data source hospital ID	<i>Numeric</i> Hospital identification number	Institution Number as described by CIHI. No changes were made to this field.
Discharge disposition	Patient's disposition.	<i>Numeric</i> 1 = Routine 2 = Short-term hospital 3 = Skilled nursing facility 4 = Intermediate care 5 = Another type of facility 6 = Home health care 7 = Against medical advice 20 = Died in the hospital	Three DAD fields were combined to create the "Discharge status" field.  Patients discharged to a short term hospital were extracted from the DAD by combining the fields "Institution from type" and "Institution to type" (see Appendix A for further details).  NB: All patients who died in-hospital were extracted from DAD field "Discharge Disposition" = 07 (died).  All records not classified as being discharged to a short term hospital or that died in-hospital were classified as "other".
Atype	Admission Type.	<i>Numeric</i> 1 = Emergency 2 = Urgent 3 = Elective 4 = Newborn 5 = Delivery ('88-'97) = Not used ('98-'02) = Trauma Center ('03-) 6 = Other	Please see Appendix C, 2A for further details.

Variable name (Fraser Institute)	Description of variable required by the software	Value description	DAD Data Element or Comment
Asource	Admission Source.	<i>Numeric</i> 1 = ER 2 = Another Hospital 3 = Another facility 4 = Court/law enforcement 5 = Routine/birth/other	Please see Appendix C, 2B for further details.
LOS2	Length of Stay.	<i>Numeric</i>	Information taken from DAD fields "Admission Date" and "Discharge Date".
APR_DRG	3M™ APR™-DRG Classification System category	<i>Numeric</i>	APR™-DRG from the 3M™ APR™-DRG Classification System software built into the AHRQ software.
DRG	Diagnosis Related Group.	<i>Numeric</i> DRG from CMS DRG Grouper	Produced by 3M™ CMS Grouper with Medicare Code Editor software. Groups patients' records based on the primary diagnosis.  The MDC (Major Diagnostic Category) is determined automatically from DRG.
Diag_code_1A - Diag_code_25A	ICD-9-CM diagnoses diagnosis codes. Diagnosis 1A is the principal diagnosis, Diagnosis 2A to Diagnosis 25A are secondary diagnoses.	<i>String, 3, 4, or 5 characters</i>	All Diagnosis codes contained in the DAD were converted to ICD-9-CM.  NB: See Appendix J for further explanation on classification conversions.
Interv_cci_code_1A - Interv_cci_code_20A	ICD-9-CM procedure codes. Interv_cci_code_1A is the principal procedure, Interv_cci_code_2A to Interv_cci_code_20A are secondary procedures.	<i>String, 2, 3, or 4 characters</i>	All Diagnosis codes contained in the DAD were converted to ICD-9-CM.  NB: See Appendix J for further explanation on classification conversions.
VPR1 –VPR20	Days from admission to procedure. Interv_cci_code_1A is the principal procedure, Interv_cci_code_2A to Interv_cci_code_20A are secondary procedures.	<i>Numeric</i>	Some PSIs require this field for calculating a given indicator.

Variable name (Fraser Institute)	Description of variable required by the software	Value description	DAD Data Element or Comment
Weight	Birthweight for newborns.	<i>Numeric</i>	Option data element that is passed directly to the APR™ DRG Grouper. This field is not used for pediatric birthweight categories. This information was taken directly from the DAD field "Weight". (ICD-9-CM diagnosis codes can be used to indicate birthweight).
Discharge_date_c	Year of discharge. The patient's year of discharge. For example, a patient discharged on July 7, 2004 would have a discharge year of "2004."	<i>Numeric</i> YYYY	ICD-9-CM diagnosis code for acute ill-defined cerebrovascular disease (436) (required in the denominator of stroke mortality rate/IQI 17) is used only for patients discharged before or on September 30, 2004. In order to be consistent throughout this study (from 2001/02 to 2008/09), this optional data field was created to exclude this code from all years of data analysed for IQI 17.
Discharge_date_b	Quarter of discharge. The calendar quarter of patient's discharge. For example, a patient discharged on July 7, 2004 would have a discharge quarter of "3."	<i>Numeric</i> 1 = January to March 2 = April to June 3 = July to September 4 = October to December	Used to exclude cases with ICD-9-CM code 436 that were discharged after Sept. 30, 2004 from the denominator population of IQI 17. See explanation for "Year" above.

## 2 Other DAD data elements translated for calculation of AHRQ's IQIs and PSIs

### A Admission type (Atype)

All information used for this field was taken from the DAD field "Admission Category" and converted into the required numeric value for AHRQ's IQI and PSI modules. The following translations were performed.<sup>1</sup>

Admission Category (DAD)	Atype (AHRQ)
L = Elective Admissions	3 = Elective
N = Newborn	4 = Newborn

### B Admission source (Asource)

All information used for this field was taken from the DAD field "Admission Category." The following translations were performed.<sup>2</sup>

Institution from type (DAD)	Asource (AHRQ)
1 = Acute Care	2 = Another Hospital
2 = General Rehabilitation Facility	3 = Another Facility including Long Term Care (LTC)
3 = Chronic Care Facility	3 = Another Facility including LTC
4 = Nursing Home	3 = Another Facility including LTC
5 = Psychiatric Facility	3 = Another Facility including LTC
6 = Unclassified or other type of Facility	3 = Another Facility including LTC
7 = Special Rehabilitation Facility	3 = Another Facility including LTC
8 = Home Care	3 = Another Facility including LTC
9 = Home for the Aged	3 = Another Facility including LTC
A = Day Surgery	3 = Another Facility including LTC
0 = Organized Outpatient Department of Reporting Facility	3 = Another Facility including LTC

- 1 The "Admission type" variable is only used in calculating PSI indicators (i.e., not for calculating IQI indicators). The values "3" and "4" are referenced by the PSI code to identify elective surgeries and newborn admissions.
- 2 The value "2" is referenced by the IQI code to identify transfers from another short-term hospital. The values "2" and "3" are referenced by the PSI code to identify transfers from another hospital or facility.

# Appendix D

## Hospital identification

All of British Columbia's 95 acute-care hospitals are identified by name in this report. The following table describes whether and how each hospital submitted DAD data in a given year, where:

Y = Hospital submitted DAD data.

W = Submits data with another institution

— = no data submitted.

Name of hospital	2001 /02	2002 /03	2003 /04	2004 /05	2005 /06	2006 /07	2007 /08	2008 /09
Arrow Lakes Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Ashcroft & District General Hospital	Y	Y	—	—	—	—	—	—
BC Cancer Agency	Y	Y	Y	Y	Y	Y	Y	Y
BC Children's Hospital	Y	Y	Y	Y	Y	Y	Y	Y
B.C. Women's Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Bella Coola General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Boundary Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Bulkley Valley District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Burnaby Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Burnaby Mental Health Ser. Psychiatric In-patient Unit	Y	Y	—	—	—	—	—	—
Burns Lake and District Hospital (Lakes District Hospital and Health Centre)	Y	Y	Y	Y	Y	Y	Y	Y
Campbell River and District General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Cariboo Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Castlegar & District Community Health Centre	Y	Y	—	—	—	—	—	—
Chetwynd General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Chilliwack General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Cormorant Island Health Centre	Y	Y	Y	Y	Y	Y	Y	Y
Cowichan District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Creston Valley Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Dawson Creek and District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Delta Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Dr. Helmcken Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Eagle Ridge Hospital	Y	Y	Y	Y	Y	Y	Y	Y
East Kootenay Regional Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Elk Valley Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Enderby and District Memorial	Y	—	—	—	—	—	—	—

Name of hospital	2001 /02	2002 /03	2003 /04	2004 /05	2005 /06	2006 /07	2007 /08	2008 /09
Fort Nelson General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Fort St. John General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Fraser Canyon Hospital	Y	Y	Y	Y	Y	Y	Y	Y
G.R. Baker Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Golden and District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Invermere and District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Kelowna General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Kimberley and District Hospital	Y	Y	—	—	—	—	—	—
Kitimat General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Kootenay Boundary Regional Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Kootenay Lake Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Lady Minto / Gulf Islands Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Ladysmith Community Health Centre	Y	Y	Y	Y	Y	Y	Y	—
Langley Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Lillooet Hospital and Health Centre	Y	Y	Y	Y	Y	Y	Y	Y
Lions Gate Hospital	Y	Y	Y	Y	Y	Y	Y	Y
MacKenzie and District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Masset Hospital (Northern Haida Gwaii Hospital and Health Centre)	—	—	—	Y	Y	Y	Y	Y
Matsqui-Sumas-Abbotsford General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
McBride and District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Mills Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Mission Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Mount Saint Joseph Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Nanaimo Regional General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Nicola Valley Health Centre	Y	Y	Y	Y	Y	Y	Y	Y
One Hundred Mile District General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Peace Arch District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Penticton Regional Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Port Alice Hospital	Y	Y	—	—	—	—	—	—
Port Hardy Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Port McNeill and District Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Powell River General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Prince George Regional Hospital (The University Hospital of Northern British Columbia)	Y	Y	Y	Y	Y	Y	Y	Y
Prince Rupert Regional Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Princeton General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Queen Alexandra Centre for Children's Health	Y	Y	Y	Y	Y	Y	Y	Y
Queen Charlotte Islands General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Queen Victoria Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Queen's Park Hospital	—	Y	Y	Y	Y	Y	Y	Y

Name of hospital	2001 /02	2002 /03	2003 /04	2004 /05	2005 /06	2006 /07	2007 /08	2008 /09
R.W. Large Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Richmond Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Ridge Meadows Hospital and Health Care Centre	Y	Y	Y	Y	Y	Y	Y	Y
Royal Columbian Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Royal Inland Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Royal Jubilee Hospital	W	W	W	W	W	W	W	W
Saanich Peninsula Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Saint Mary's Hospital (New Westminster)	Y	Y	Y	—	—	—	—	—
Shuswap Lake General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Slocan Community Health Centre	Y	—	—	—	—	—	—	—
South Okanagan General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Sparwood Health Centre	Y	Y	—	—	—	—	—	—
Squamish General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
St. Bartholomew's Health and Healing Centre	Y	Y	—	—	—	—	—	—
St. John Hospital	Y	Y	Y	Y	Y	Y	Y	Y
St. Joseph's General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
St. Mary's Hospital	Y	Y	Y	Y	Y	Y	Y	Y
St. Paul's Hospital	Y	Y	Y	Y	Y	Y	Y	Y
St. Vincent's Hospital	Y	Y	Y	—	—	—	—	—
Stewart General Hospital	Y	Y	Y	Y	Y	Y	—	—
Stuart Lake Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Summerland Health Centre	Y	Y	—	—	—	—	—	—
Surrey Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Tofino General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
UBC Health Sciences Centre	Y	Y	Y	Y	Y	Y	Y	Y
Vancouver General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Vernon Jubilee Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Victoria General Hospital	W	W	W	W	W	W	W	W
Victorian Community Health Centre of Kaslo	Y	Y	—	—	—	—	—	—
West Coast General Hospital	Y	Y	Y	Y	Y	Y	Y	Y
Wrinch Memorial Hospital	Y	Y	Y	Y	Y	Y	Y	Y

# Appendix E

## List of the Agency for Healthcare Research and Quality's Inpatient Quality and Patient Safety Indicators used in the Fraser Institute's Hospital Report Card

The indicators measured in the *Hospital Report Card* are classified into three groups: those related to medical conditions, hospital procedures, and child birth. The indicators are further classified by type: death rates, volumes of procedures, utilization rates, and adverse events. It should be noted that the indicators may vary in their computation according to the version of the AHRQ software used. Version 3.1 was used for the *Hospital Report Card: British Columbia 2008*, *Hospital Report Card: Ontario 2008*, *Hospital Report Card: British Columbia 2009*, and *Hospital Report Card: British Columbia 2011*. However, the *Hospital Report Card: Ontario 2006* (rev. Sept. 2007) uses Version 2.1. Thus, indicators cannot necessarily be compared among the provinces in all years.

### A Conditions

#### Death rates

- 1 *Acute myocardial infarction (AMI) mortality rate (IQI 15)* Deaths from heart attacks. Lower rates are more desirable.
- 2 *Acute myocardial infarction (AMI) mortality rate (without transfers) (IQI 32)* Deaths from heart attacks; excludes patients that were transferred from another short term hospital. Lower rates are more desirable.
- 3 *Congestive heart failure (CHF) mortality rate (IQI 16)* Deaths due to heart failure. Lower rates are more desirable.
- 4 *Acute stroke mortality rate (IQI 17)* Deaths from acute strokes. Lower rates are more desirable.

- 5 *Gastrointestinal hemorrhage mortality rate (IQI 18)* Deaths due to bleeding from the esophagus, stomach, small intestine, or colon. Lower rates are more desirable.
- 6 *Hip fracture mortality rate (IQI 19)* Deaths due to hip fractures. Lower rates are more desirable.
- 7 *Pneumonia mortality rate (IQI 20)* Death due to a condition involving an infection in the lungs. Lower rates are more desirable.
- 8 *Death in low mortality DRG (PSI 2)* Deaths among patients who are considered unlikely to die in the hospital. Lower rates are more desirable.
- 9 *Failure to Rescue (PSI 4)* Deaths in patients who developed specified complications of care. Lower rates are more desirable.

### **Adverse events**

These indicators focus on preventable instances of harm to patients such as complications arising from surgery.

- 1 *Decubitus ulcer (PSI 3)* Pressure sores that develop when a patient lies on his or her back for extended periods. Lower rates are more desirable.
- 2 *Iatrogenic pneumothorax (PSI 6)* The collapse of a patient's lung inadvertently induced by a physician or medical treatment. Lower rates are more desirable.
- 3 *Selected infections due to medical care (PSI 7)* Cases of infection due to medical care, primarily those related to intravenous (IV) lines and catheters. Lower rates are more desirable.
- 4 *Transfusion reaction (PSI 16)* Patients with blood transfusion reactions. Lower rates are more desirable.

## **B Procedures**

### **Death rates**

- 1 *Esophageal resection surgery mortality rate (IQI 8)* Deaths due to the surgical removal of the tube that connects the mouth to the stomach, often due to esophageal cancer. Lower rates are more desirable.

- 2 *Pancreatic resection surgery mortality rate (IQI 9)* Deaths due to the surgical removal of the pancreas, an organ that secretes many important hormones such as insulin, in an attempt to cure pancreatic cancer. Lower rates are more desirable.
- 3 *Coronary artery bypass graft (CABG) mortality rate (IQI 12)* Deaths due to surgery performed to allow blood to bypass a clogged artery and allow it to carry oxygen to the heart. Lower rates are more desirable.
- 4 *Craniotomy mortality rate (IQI 13)* Deaths due to the surgical opening of the skull that is performed to remove a brain tumor, repair an aneurysm (ballooning of blood vessels), perform a biopsy, or to relieve pressure inside the skull. Lower rates are more desirable.
- 5 *Hip replacement mortality rate (IQI 14)* Deaths due to hip replacement surgery. Lower rates are more desirable.
- 6 *Percutaneous transluminal coronary angioplasty (PTCA) mortality rate (IQI 30)* Deaths due to a non-surgical procedure performed to open blockages in the arteries that carry blood to the heart. Lower rates are more desirable.
- 6a<sup>1</sup> *Percutaneous transluminal coronary angioplasty (PTCA) mortality rate (Experimental) (IQI EXP 30)* Deaths due to a non-surgical procedure performed to open blockages in the arteries that carry blood to the heart. Lower rates are more desirable. This experimental indicator includes “out of hospital” procedures, and attributes numbers to the hospital at which the procedure was performed.
- 7 *Carotid endarterectomy mortality rate (IQI 31)* Deaths due to a procedure that removes blockages from arteries in the neck to reduce the chance of stroke and brain damage. Lower rates are more desirable.

### **Volume of procedures**

These indicators are calculated because they reflect procedures for which evidence shows that hospitals performing more of certain highly complex procedures may have better outcomes for those procedures. Providers exceeding these thresholds are considered high volume providers. Please see Appendix F for further details on Volumes of Procedures and their Thresholds.

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1 Note that this is an experimental indicator adapted by the Fraser Institute. See “A note on experimental indicators” at the end of this section for more details.

- 1 *Esophageal resection surgery volume (IQI 1)* Numbers of procedures involving the surgical removal of the tube that connects the mouth to the stomach, often due to esophageal cancer. Numbers above 6 are more desirable.
- 2 *Pancreatic resection surgery volume (IQI 2)* Numbers of procedures involving the surgical removal of the pancreas in an attempt to cure pancreatic cancer. Numbers above 10 are more desirable.
- 3 *Coronary artery bypass graft (CABG) volume (IQI 5)* Numbers of surgeries performed to allow blood to bypass a clogged artery. Numbers above 100 are more desirable.
- 4 *Percutaneous transluminal coronary angioplasty (PTCA) volume (IQI 6)* Number of procedures performed to open blockages in the arteries that carry blood to the heart. Numbers above 200 are more desirable.
- 4a<sup>2</sup> *Percutaneous transluminal coronary angioplasty (PTCA) volume (Experimental) (IQI EXP 6)* Number of procedures performed to open blockages in the arteries that carry blood to the heart. Numbers above 200 are more desirable. This experimental indicator includes “out of hospital” procedures, and attributes numbers to the hospital at which the procedure was performed.
- 5 *Carotid endarterectomy volume (IQI 7)* Number of procedures performed to remove blockages from arteries in the neck to reduce the chance of stroke and brain damage. Numbers above 50 are more desirable.

### Utilization rates

These indicators are calculated because they examine procedures whose use varies significantly across hospitals and for which questions have been raised about overuse, underuse, or misuse. High or low rates for these indicators are likely to represent inappropriate or inefficient delivery of care.

- 1 *Laparoscopic cholecystectomy (IQI 23)* Minimally invasive removal of the gall bladder, a small pear-shaped sac that stores and concentrates bile needed for digestion. Higher rates are more desirable.

### Adverse events

These indicators focus on preventable instances of harm to patients such as complications arising from surgery.

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- 2 Note that this is an experimental indicator adapted by the Fraser Institute. See “A note on experimental indicators” at the end of this section for more details.

- 1 *Foreign body left during procedure (PSI 5)* Foreign object left in a patient during a procedure. Lower rates are more desirable.
- 2 *Post-operative physiologic and metabolic derangements (PSI 10)* Development of disorders that interfere with biochemical processes within the body including kidney failure and diabetes occurring in patients after an elective surgery. Lower rates are more desirable.
- 3 *Post-operative respiratory failure (PSI 11)* Development of respiratory failure occurring in patients after undergoing elective surgery. Lower rates are more desirable.
- 4 *Post-operative sepsis (PSI 13)* Patients that undergo elective surgeries and subsequently develop a hospital-acquired infection. Lower rates are more desirable.
- 5 *Accidental puncture or laceration (PSI 15)* Accidental cut or wound during procedure. Lower rates are more desirable.

## **C Obstetric (birth-related)**

### **Utilization rates**

These indicators examine procedures whose use varies significantly across hospitals and for which questions have been raised about overuse, under-use, or misuse. High or low rates for these indicators are likely to represent inappropriate or inefficient delivery of care.

- 1 *Cesarean delivery (IQI 21)* Surgical removal of a baby through the mother's abdomen. Lower rates are more desirable.
- 2 *Vaginal birth after cesarean (VBAC), uncomplicated (IQI 22)* Rate of vaginal births that occurred for mothers who had delivered previously by Cesarean section. Higher rates are more desirable.
- 3 *Primary cesarean delivery (IQI 33)* Surgical removal of a baby through the mother's abdomen during the first birth inclusively. Lower rates are more desirable.
- 4 *Vaginal birth after cesarean (VBAC), all (IQI 34)* Rate of vaginal births that occurred to mothers who had delivered previously by Cesarean section. Higher rates are more desirable.

### **Adverse events**

These indicators focus on preventable instances of harm to patients such as complications arising from surgery.

- 1 *Birth trauma (PSI 17)* Birth trauma for infants born alive in a hospital. Lower rates are more desirable.
- 2 *Obstetric trauma—vaginal with instrument (PSI 18)* Cases of potentially preventable trauma (4<sup>th</sup> degree lacerations, other obstetric lacerations) during vaginal delivery with an instrument. Lower rates are more desirable.
- 3 *Obstetric trauma—vaginal without instrument (PSI 19)* Cases of potentially preventable trauma (4<sup>th</sup> degree lacerations, other obstetric lacerations) during vaginal delivery without an instrument. Lower rates are more desirable.
- 4 *Obstetric trauma—cesarean section (PSI 20)* Cases of potentially preventable trauma (4<sup>th</sup> degree lacerations, other obstetric lacerations) during Cesarean delivery. Lower rates are more desirable.

## A note on experimental indicators

The AHRQ IQI indicators are designed to be used with hospital *inpatient* discharge data. In response to feedback received, the authors examined and confirmed that many Percutaneous Transluminal Coronary Angioplasties (PTCAs) are transferred and performed *out of hospital* in British Columbia, often as day surgeries. This may have resulted in seemingly low levels of patients or procedures being counted for IQI 6 (Percutaneous Transluminal Coronary Angioplasty volume) and IQI 30 (Percutaneous Transluminal Coronary Angioplasty mortality rate) at hospitals to which these cases were transferred.

In order to provide an alternative measure that may more accurately represent the volume of procedures and mortality rates experienced at institutions, the *Hospital Report Card: British Columbia 2011* includes two new experimental indicators this year. IQI EXP 6 and IQI EXP 30 (as noted above) include out-of-hospital procedures, and attribute rates to the hospitals at which the procedure was performed rather than the acute-care facility at which the patient is registered.

In order to adapt these indicators, our methodology for processing the DAD was altered in the following ways (in a separate analysis). First, we did not remove interventions accompanied by an “Out of Hospital Indicator = Y.” Next, we examined the day surgery institution at which the procedure was performed, mapped it to its corresponding acute-care facility, and then used this identifier number to replace the number identifying the acute care facility at which the patient was previously registered. The remaining methodology for the report remained identical.

# Appendix F

## Calculating the scores, ranks, and statistical significance of results

### 1 Score

Each institution was given a score from 0 to 100 for each indicator. The basis for this scoring is described below, as it varies slightly between types of indicators

#### Volume indicators

Each volume indicator is supported by evidence suggesting that providers performing more than a certain number of procedures have better patient outcomes. The thresholds are listed below. Threshold 1 is the lowest reported threshold in the literature, while threshold 2 is the highest. Providers exceeding these thresholds are considered high-volume providers.

The scores for each volume indicator were calculated in the following manner. If the volume of procedures of a hospital did not exceed Threshold 1, a score of 0 was given. If the volume of procedures of a hospital exceeded Threshold 1 but did not exceed Threshold 2, a score of 75 was given. If the volume of procedures of a hospital exceeded Threshold 2, a score of 100 was given.

#### Thresholds for volume of procedures indicators

Volume Indicator	Threshold 1	Threshold 2	Reference for Threshold 1	Reference for Threshold 2
Esophageal resection (IQI 1)	6	7	Patti, M.G., C.U. Corvera, R.E. Glasgow, et al. (1998). A Hospital's Annual Rate of Esophagectomy Influences the Operative Mortality Rate. <i>J Gastrointest Surg</i> 2, 2: 186–92.	Dudley, R.A., K.L. Johansen, R. Rand, et al. (2000). Selective Referral to High-Volume Hospitals: Estimating Potentially Avoidable Deaths. <i>JAMA</i> 283, 9: 1159–66.
Pancreatic resection (IQI 2)	10	11	Glasgow, R.D., and S.J. Mulvihill (1996). Hospital Volume Influences Outcome in Patients Undergoing Pancreatic Resection for Cancer. <i>West J Med</i> 165, 5: 294–300.	Glasgow and Mulvihill, 1996.

Volume Indicator	Threshold 1	Threshold 2	Reference for Threshold 1	Reference for Threshold 2
Coronary Artery Bypass Surgery (CABG) (IQI 5)	100	200	Eagle, K.A., R.A. Guyton, R. Davidoff, et al. (1999). ACC/AHA Guidelines for Coronary Artery Bypass Graft Surgery: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the 1991 Guidelines for Coronary Artery Bypass Graft Surgery). American College of Cardiology/American Heart Association. <i>J Am Coll Cardiol</i> 34, 4: 1262–347.	Hannan, E.L., H. Kilburn, Jr., H. Bernard, et al. (1991). Coronary Artery Bypass Surgery: The Relationship between Inhospital Mortality Rate and Surgical Volume after Controlling for Clinical Risk Factors. <i>Med Care</i> 29, 11: 1094–107.
Percutaneous Transluminal Coronary Angioplasty (IQI 6)	200	400	Ryan, T.J., W.B. Bauman, J.W. Kennedy, et al. (1993). Guidelines for Percutaneous Transluminal Coronary Angioplasty. A Report of the American Heart Association/American College Of Cardiology Task Force on Assessment of Diagnostic and Therapeutic Cardiovascular Procedures (Committee on Percutaneous Transluminal Coronary Angioplasty). <i>Circulation</i> 88, 6: 2987–3007.	Hannan, E.L., M. Racz, T.J. Ryan, et al. (1997). Coronary Angioplasty Volume-Outcome Relationships for Hospitals and Cardiologists. <i>JAMA</i> 277, 11: 892–98.
Carotid endarterectomy (IQI 7)	50	101	Manheim, L.M., M.W. Sohn, J. Feinglass, et al. (1998). Hospital Vascular Surgery Volume and Procedure Mortality Rates in California, 1982–1994. <i>J Vasc Surg</i> 28, 1: 45–46.	Hannan, E.L., A.J. Popp, B. Tranmer, et al. (1998). Relationship between Provider Volume and Mortality for Carotid Endarterectomies in New York State. <i>Stroke</i> 29, 11: 2292–97.  Dudley, R.A., K.L. Johansen, R. Brand, et al. (2000). Selective Referral to High-Volume Hospitals: Estimating Potentially Avoidable Deaths. <i>JAMA</i> 283, 9: 1159–66.

Source: AHRQ Guide to Inpatient Quality Indicators, version 3.1 (2007).

### All other indicators

The scores for all other indicators, on a scale of 0 to 100, reflect the relative positions of risk-adjusted rates where available, or observed rates for indicators where the AHRQ software does not calculate a risk-adjusted rate. For example, if the range of rates across hospitals for one of the indicators was from 1.0% to 4.0%, a score between 0 and 100 was created where 1.0% = 0 and 4.0% = 100. If an institution demonstrated a rate of 3.0% (the

threshold of the top 1/3 of the range) then the score was 67. More specifically, where the rate is better when it is higher, the score is the absolute difference between the rate and the minimum of the range, divided by the range. Similarly, where the rate is better when it is lower, the score is the absolute difference between the rate and the maximum of the range, divided by the range.

## 2 Rank

All institutions were ranked on each indicator based on their scores, where the highest rank of 1 corresponds to the highest score out of 100.<sup>1</sup>

## 3 Statistical significance of measures

In order to determine the reliability of indicator results, the report card compares the upper and lower bounds of the 95% confidence interval of each institution's and municipality's risk-adjusted rate (where available) to the upper and lower bounds of the 95% confidence interval (CI) of the province's risk-adjusted rate (per indicator). This analysis measures the statistical significance of each result. Institutions and municipalities whose upper-bound risk-adjusted confidence interval lies below the lower bound of the British Columbia risk-adjusted confidence interval are statistically "better than average" for indicators where lower rates are better. Institutions and municipalities whose lower-bound risk-adjusted confidence interval lies above the upper bound of the British Columbia risk-adjusted confidence interval are statistically "worse than average" for indicators where lower rates are better. For IQIs 22, 23, and 34, where higher rates are better, the opposite is true.

This analysis is presented in the interactive web-based tool at [www.hospitalreportcards.ca/bc](http://www.hospitalreportcards.ca/bc) through colour coding, where blue colour coding signifies a statistically significant better-than-average performance, white colour coding signifies a performance that is not statistically significantly different from the average, and red colour coding signifies a performance that is statistically significantly worse than the average performance.

The authors recognize that this is a conservative analysis of statistical significance. Though it is always true that, if the confidence intervals do not overlap then the statistics will be statistically significantly different, the opposite does not hold. That is, it is possible for confidence intervals to overlap even though the statistics are statistically significantly different (Knezevic, 2008).

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<sup>1</sup> Volume indicators were not ranked since they have threshold requirements.

# Appendix G

## Indicators omitted from this report

Difficulties in conversion to ICD-9-CM from ICD-10-CA/CCI led to the omission of some quality indicators from this report.

### A Inpatient Quality Indicators omitted

- 1 *AAA volume/mortality (IQI 4/11)* Numbers of procedures to repair the major artery carrying blood from the heart to the lower part of the body and deaths due to these procedures. Numbers above 10 and lower rates are more desirable respectively. Conversion of the required ICD-10-CA/CCI diagnosis and procedure codes to ICD-9-CM for calculation of IQI 4 & 11 did not produce accurate results. This was caused by intrinsic differences between the classifications.
- 2 *Incidental appendectomy among elderly utilization rate (IQI 24)* Removal of the appendix at the time of another necessary abdominal surgery. This procedure is performed to eliminate the risk of future appendicitis (inflammation of the appendix). Incidental appendectomy is generally not recommended in the elderly because they have both a lower risk for developing appendicitis and a higher risk of complications after surgery (calculated for patients 65 years or older). Lower rates are more desirable. The numerator of IQI 24 is composed of incidental appendectomy procedure codes: Incidental appendectomy (471), Laparoscopic incidental appendectomy (4711), and Other incidental appendectomy (4719). No ICD-10-CA/CCI codes translate directly into the required ICD-9-CM procedure codes.
- 3 *Bilateral cardiac catheterization utilization rate (IQI 25)* A diagnostic test performed to see if the blood vessels to the heart are narrowed or blocked. Lower rates are more desirable. The numerator of IQI 25 is composed of the number of simultaneous right and left heart catheterizations: Right/Left heart cardiac catheterization (3723). No ICD-10-CA/CCI codes translate directly into the required ICD-9-CM procedure code.

## B Patient Safety Indicators omitted

- 1 *Complications of Anesthesia (PSI 1)* Adverse effects from the administration of therapeutic drugs. Lower rates are more desirable. Conversion of the required ICD-10-CA/CCI diagnosis codes to ICD-9-CM for PSI 1 did not produce accurate results. This was caused by intrinsic differences between the classifications.
- 2 *Post-operative Hip Fracture (PSI 8)* Hip fracture after surgery. Lower rates are more desirable. Conversion of the required ICD-10-CA/CCI diagnosis codes to ICD-9-CM for PSI 8 did not produce accurate results. This was caused by intrinsic differences between the classifications.
- 3 *Post-operative Hemorrhage or Hematoma (PSI 9)* Bleeding after surgery. Lower rates are more desirable. Conversion of the required ICD-10-CA/CCI diagnosis codes to ICD-9-CM did not produce accurate results. This was caused by intrinsic differences between the classifications.
- 4 *Post-operative Pulmonary Embolism or Deep Vein Thrombosis (PSI 12)* These conditions occur when a blood clot (usually formed in one of the leg veins) becomes detached and lodges in the lung artery or one of its branches (pulmonary embolism) or lodges in a another part of the body, usually the leg (deep vein thrombosis). This indicator is calculated for patients who develop these conditions after undergoing surgery. Lower rates are more desirable. Conversion of the required ICD-10-CA/CCI diagnosis codes to ICD-9-CM did not produce accurate results. This was caused by intrinsic differences between the classifications.
- 5 *Post-operative Wound Dehiscence (PSI 14)* Parting of the layers of a surgical wound. Either the surface layers separate or the whole wound splits open. Lower rates are more desirable. The numerator of PSI 14 is composed of the number of discharges with an ICD-9-CM code for reclosure of postoperative disruption of the abdominal wall (5461) in any secondary procedure field. No ICD-10-CA/CCI codes translate directly into the required ICD-9-CM procedure code.

# Appendix H

## Municipalities and corresponding patient Forward Sortation Areas (FSAs)

Postal Codes were truncated to Forward Sortation Areas (FSAs) before the Fraser Institute had access to the dataset. All patient FSAs were grouped as shown in the table below into corresponding municipalities as described by Canada Post in 2006/07.<sup>1</sup> The same grouping was used in this year's report.

Municipality	Forward Sortation Areas (FSAs)
Abbotsford	V2S, V2T, V3G, V4X
Burnaby	V5A, V5B, V5C, V5G, V5H, V5J
Campbell River	V9H, V9W
Castlegar	V1N
Central Saanich	V8M
Chilliwack	V2P, V2R, V4Z
Coquitlam	V3J, V3K
Courtenay	V9J, V9M, V9N
Cranbrook	V1C
Dawson	V1G
Delta	V4C, V4E, V4G, V4K, V4L, V4M
Duncan	V9L
Fort St John	V1J
Kamloops	V1S, V2B, V2C, V2E, V2H
Kelowna	V1P, V1V, V1W, V1X, V1Y, V1Z, V4T
Kitimat	V8C
Ladysmith	V9G
Lake Country	V4V
Langley	V2Y, V2Z, V2A, V4W
Maple Ridge	V2W, V2X, V3Y, V4R

<sup>1</sup> All Forward Sortation Areas (FSAs) containing a "0" as their second character were grouped into a "Rural" category (as described by Canada Post). All FSAs not described by Canada Post were placed in a residual group ("Other").

<b>Municipality</b>	<b>Forward Sortation Areas (FSAs)</b>
Merritt	V1K
Mission	V2V, V4S
Nanaimo	V9R, V9S, V9T, V9V, V9X
Nelson	V1L
New Westminster	V3L, V3M, V3N, V5E
Parksville	V9P
Penticton	V2A
Port Alberni	V9Y
Port Coquitlam	V3B, V3C, V3E
Port Moody	V3H
Powell River	V8A
Prince George	V2K, V2L, V2M, V2N
Prince Rupert	V8J
Qualicum	V9K
Quesnel	V2G
Richmond	V6V, V6W, V6X, V6Y, V7A, V7B, V7C, V7E
Salmon Arm	V1E
Salt Spring	V8K
Sidney	V8L
Squamish	V8B
Surrey	V1M, V3R, V3S, V3T, V3V, V3W, V3X, V4N
Terrace	V8G
Trail	V1R
Vancouver	V5K, V5L, V5M, V5N, V5P, V5R, V5S, V5T, V5V, V5W, V5X, V5Y, V5Z, V6A, V6B, V6C, V6E, V6G, V6H, V6J, V6K, V6L, V6M, V6N, V6P, V6R, V6S, V6T, V6Z, V7G, V7H, V7J, V7K, V7L, V7M, V7N, V7P, V7R, V7S, V7T, V7V, V7W, V7X, V7Y
Vernon	V1B, V1H, V1T
Victoria	V8N, V8P, V8R, V8S, V8T, V8V, V8W, V8X, V8Y, V8Z, V9A, V9B, V9C, V9E
White Rock	V4A, V4B, V4P
Whitehorse	Y1A
Williams Lake	V2G
Yellowknife	X1A

# Appendix I

## Codes for Age

Age is coded somewhat differently in the DAD (Discharge Abstracts Database), CMS- and 3M™ APR™-DRG Classification System (Diagnosis Related Grouper) software, and AHRQ IQI (Inpatient Quality Indicator) and PSI (Patient Safety Indicator) modules.

### A Age in DAD

- 1 *Age code* Denotes how the patient's age is recorded
  - a Y = age expressed in years. Patient is 2 or more years old.
  - b E = age is estimated in years. Patient who is less than 1 with a Birth Date that is estimated is recorded as E000. Patient who is between 1 and 2 years old with a Birth Date that is Estimated is recorded as E001.
  - c M = age expressed in months. Patient is less than 2 years old.
  - d D = age expressed in days. Patient is less than 31 days old.
  - e B = age recorded for Newborns/Stillborns.
  - f U = age unknown.
  
- 2 *Age units* Denotes the age of patient at time of admission.
  - a *i* bNB = Newborn
  - ii* bSB = Stillbirth
  - iii* bbU = Patient's age is unknown
  - b All other values in "Age Units" correspond to the age of the patient expressed as a numeric value (000–999). This information was used in conjunction with the "Age Code" field as follows:
    - i* If the age of the patient is less than 31 days, the value is expressed in days.
    - ii* If the age of the patient is less than 2 years, the value is expressed in months.
    - iii* If the age of the patient is 2 years or more the value is expressed in years.

Note: The DAD fields "Entry code" = "S" and "Entry code" = "N" were used to separate stillbirths from newborns. Stillbirths were omitted from analysis.

## B Age requirements for the CMS- and 3M™ APR™-DRG Classification System software

*Age in years* Age of the patient. Valid values: 0–124 years. Age can be an entered or a calculated value. The birth and admit dates are used to calculate the age of the patient; calculated age overrides entered age. Birth date must be ≤ admit date.<sup>1</sup>

In order to accommodate the differences in how the age of a patient is captured in the DAD, the two DAD fields (“Age code” and “Age Units”) were split into the required the equivalent of “Age in years” and “Age in days” fields. Patients ≤ 31 days (corresponding to “D” in “Age code”) were separated into the “Age in days” field. The number of months from the DAD was multiplied by 30 days if a patient was 1 to 12 months old. Patients between 1 and 2 years were defined as “Age in years” = 1. Patients with “Admission Category = N” were defined as “Age in days” = 0 (after removing stillbirths denoted by “S” in the “Entry code” field from analysis).

## C Age Requirements for AHRQ IQI and PSI modules

*Age* Age in years at admission

*Age in Days* Patients less than one year are placed in the “Age in days” category. Valid values 0–364. (See explanation above for modifications applied).

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<sup>1</sup> While the CMS grouper software contains certain rules for the calculation of age dependent on a birth date, the DAD provided to us does not report the birth date of a patient, and hence these rules do not specifically apply.

# Appendix J

## International Classification of Diseases (ICD) conversion tables<sup>1</sup>

In order to use the CMS- and 3M™ APR™-DRG Classification System software as well as the AHRQ IQI and PSI modules, all diagnoses and procedures were converted from ICD-10-CA/CCI to ICD-9-CM codes preceding analysis.

### ICD-10-CA/CCI conversion methodology

The following modifications were made to our database.

- 1 Conversion tables for ICD-10-CA/CCI to ICD-9-CM were purchased from the CIHI and applied to the DAD database.
- 2 The National Center for Health Statistics (NCHS) and the Centers for Medicare & Medicaid Services (CMS) have issued new diagnosis and procedure codes for the International Classification of Diseases, 9<sup>th</sup> Revision, Clinical Modification (ICD-9-CM) every year since 1986. New code assignments are the result of year-long efforts of the ICD-9-CM Coordination and Maintenance Committee, which is sponsored jointly by NCHS and CMS. The effective date for issuing new codes is the same every year, October 1 (Centers for Disease Control and Prevention, 2008).  
Until ICD-10-CA/CCI was adopted in Canada (in FY 2001 in British Columbia), many Canadian hospitals were using ICD-9-CM. This being so, the CIHI continually updated the ICD-9-CM codes produced by NCHS in Washington each year until 1999. Since the present study used data coded in ICD-10-CA/CCI, the corresponding ICD-9-CM codes were updated. This information was extracted from the National Center for Health Statistics (NCHS).
- 3 Since converting ICD-10-CA/CCI to ICD-9-CM is necessarily an imperfect process as a result of changes in the way many diseases and conditions are handled, the CIHI assigns grades to describe the quality of each conversion, where:

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<sup>1</sup> The same methodological approach was applied to the Intervention codes (CCI).

1 = Good to excellent match. Both coding systems are either identical or the ICD-10-CA/CCI terms are indexed to the ICD-9-CM.

2 = Fair match. The ICD-10-CA/CCI code is not indexed in the same manner in ICD-9-CM. An inclusion term may be present, which has influenced the choice but generally some default decision was made, with the typical “default” decision was made, i.e. most probably to default to “other specified” category.

3 = Poor match. This represents a force fit. There is no specific code available: for example, the ICD-10-CA code may represent a new concept that was not available in the previous classification.

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Sources: CIHI 2003, 2004c, 2005b, 2006, 2008

Two of the ICD-10-CA/CCI codes analysed by the AHRQ IQI & PSI indicators are classified as a “3” conversion:

- 1 S130 (Trauma ruptured cervical intervertebral disc) to 83900 (Cervical Vertebra Dislocation Unspecified). Required for calculating PSIs 2, 6, and 8.
  - 2 G463 (Brain stem stroke syndrome) to 34489 (Other specified paralytic syndrome). Required for calculating PSI 3.
- 4 As previously mentioned, ICD-10-CA/CCI is a more specific and updated coding classification than ICD-9-CM. Therefore, numerous ICD-10-CA/CCI codes can map to a single ICD-9-CM code. Alternatively, there may be some codes where there is no direct translation from ICD-10-CA/CCI to ICD-9-CM.

All ICD-9-CM codes that did not translate directly from ICD-10-CA were analysed individually with respect to which indicator(s) they appeared in and where the code was located (i.e. in the numerator, denominator, both, or in the exclusions of a given indicator). In cases where the CIHI provided no translation, the CIHI’s International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> Revision, Tabular List of inclusions and four-character subcategories (CIHI, 2009) and the Incidence and Prevalence Database ICD-9 and ICD-10 conversion (National Center for Health Statistics, 2008) were used to determine whether other ICD-10-CCI codes translated to ICD-9-CM contained equivalent information to that required by the AHRQ indicator.

For example, 00322 (ICD-9-CM—Salmonella Pneumonia) is one of the codes required for calculation of the Pneumonia Mortality Rate (IQI 20). None of the ICD-10-CA/CCI codes listed in the CIHI’s conversion table translates directly to 00322. However, there are two ICD-10-CA/CCI codes that would contain this information that do translate to ICD-9-CM codes.

**ICD-10-CA to ICD-9-CM code conversion table**

ICD-10-CA	ICD-9-CM
A022 Localized salmonella infections	00329 Other localized Salmonella infections
J170 Pneumonia in bacterial disease classified elsewhere	4848 Pneumonia in other infectious diseases elsewhere

Since 4848 is one of the ICD-9-CM codes analysed to calculate IQI 20, the information for Salmonella Pneumonia is already captured within the indicator. Additionally, since this indicator measures deaths due to pneumonia infection, using the information contained in A022 (Localized salmonella infections), the conversion to 00329 (Other localized Salmonella infections) would be inappropriate as it would include information about Salmonella infections that was not specific to Pneumonia infection.

This exercise was performed to ensure that the proper information contained within the ICD-10-CA/CCI codes was being captured by a given indicator, even in the absence of a direct ICD-10-CA to ICD-9-CM translation.

- ICD-10-CA/CCI is a more specific and updated coding classification than ICD-9-CM. Therefore, numerous ICD-10-CA/CCI codes can map to a single ICD-9-CM code. Alternatively, some codes do not translate directly from ICD-10-CA/CCI to ICD-9-CM. The following table contains the ICD-9CM diagnosis codes required for calculating Congestive Heart Failure (IQI 16). The italicized codes do not translate directly from ICD-10-CA/CCI to ICD-9-CM.

**ICD-9-CM codes required for calculation of Congestive Heart Failure mortality rate (IQI 16)**

Code	Description	Code	Description
39891	<i>RHEUMATIC HEART FAILURE</i>	42821	Acute Systolic Heart Failure
40201	<i>MAL HYPERT HRT DIS W CHF</i>	42822	Chronic Systolic Heart Failure
40211	<i>BENIGN HYP HRT DIS W CHF</i>	42823	Acute On Chronic Systolic Heart Failure
40291	<i>HYPERTEN HEART DIS W CHF</i>	4289	Heart Failure NOS
40401	<i>MAL HYPER HRT/REN W CHF</i>	42830	Diastolic Heart Failure NOS
40403	<i>MAL HYP HRT/REN W CHF&amp;RF</i>	42831	Acute Diastolic Heart Failure
40411	<i>BEN HYPER HRT/REN W CHF</i>	42832	Chronic Diastolic Heart Failure
40413	<i>BEN HYP HRT/REN W CHF&amp;RF</i>	42833	Acute On Chronic Diastolic Heart Failure
40491	<i>HYPER HRT/REN NOS W CHF</i>	42840	Systolic/Diastolic Heart Failure NOS
40493	<i>HYP HT/REN NOS W CHF&amp;RF</i>	42841	Acute Systolic/Diastolic Heart Failure
4280	Congestive Heart Failure	42842	Chronic Systolic/Diastolic Heart Failure
4281	Left Heart Failure	42843	Acute/Chronic Systolic/Diastolic Heart Failure
42820	Systolic Heart Failure NOS		

Although a direct translation does not exist from an ICD-10-CA code to an ICD-9-CM code, equivalent information can be found in other ICD-10-CA/CCI codes. For example, Rheumatic Heart Failure (ICD-9-CM code 39891) information is contained in ICD-10-CA code I099 (Rheumatic heart disease, unspecified). However, since this is an “unspecified” code, information that is not specific to Chronic Heart Failure Mortality (IQI 16) will also be contained in this code. For this reason, calculation of IQI 16 was restricted to codes 4280, 4281, and 4289. Moreover, all ICD-10-CA codes corresponding to heart failure (code I50) are translated to either ICD-9-CM code 4280, 4281, or 4289.

- 6 The following ICD-9-CM codes are required for calculation of Acute Myocardial Infarction Mortality (IQIs 15 & 32).

#### ICD-9-CM codes required for calculation of Acute Myocardial Infarction mortality rate (IQIs 15 & 32)

Code	Description	Code	Description
41001	AMI Anterolateral, Initial	41051	AMI Lateral NEC, Initial
41011	AMI Anterior Wall, Initial	41061	True Post Infarct, Initial
41021	AMI Inferolateral, Initial	41071	Subendo Infarct, Initial
41031	AMI Inferopost, Initial	41081	AMI NEC, Initial
41041	AMI Inferior Wall Initial	41091	AMI NOS, Initial

Both IQIs 15 and 32 measure AMI mortality rates. The ICD-10-CA coding classification does not translate directly into any of these ICD-9-CM codes. In order to capture the information contained in ICD-10-CA codes for patients diagnosed with an AMI, the following ICD-10-CA codes were used for calculating AMI mortality rates.

#### ICD-10-CA to ICD-9-CM code conversion table

ICD-10-CA	ICD-9-CM
I210 Acute transmural MI of anterior wall	41010 AMI Other Anterior Wall, Episode NOS
I211 Acute transmural MI of inferior wall	41040 AMI Other Inferior Wall Episode NOS
I212 Acute transmural MI of other site	41080 AMI Other Specified Site Episode NOS
I213 Acute transmural MI of unspecified site	41090 AMI Unspecified, Episode Unspecified
I2140 Acute subendocardial MI of anterior wall	41070 Subendocardial AMI, Episode NOS
I2141 Acute subendocardial MI of inferior wall	41070 Subendocardial AMI, Episode NOS
I2142 Acute subendocardial MI of other sites	41070 Subendocardial AMI, Episode NOS
I2149 Acute subendocardial MI, unspecified site	41070 Subendocardial AMI, Episode NOS
I219 AMI unspecified	41090 AMI Unspecified, Episode Unspecified

- 7 Human Immunodeficiency Virus Disease (ICD-9-CM code 042) is required for calculating Death in low mortality DRGs (PSI 2), Failure to rescue (PSI 4), Infection due to medical care (PSI 7), and Postoperative sepsis (PSI 13). ICD-10-CA/CCI contains this information as HIV disease (B24) which is converted to 0429 in ICD-9-CM by the CIHI's conversion table. Therefore, all information on HIV required for calculation of PSI 2, 4, 7, and 13 was taken from ICD-10-CA/CCI code B24.
- 8 Gastrointestinal Hemorrhage mortality rate (IQI 18) incorporates esophageal hemorrhage and ulcers of the esophagus with bleeding, corresponding to the ICD-9-CM codes 53021 and 53082. The ICD-10-CA codes for ulcers of oesophagus, listed below, translate to the general ICD-9-CM code 5302 but should be included in the indicator when bleeding occurs.

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#### ICD-10-CA codes for ulcer of oesophagus

Code	Description
K2210	Ulcer of oesophagus, acute with hemorrhage
K2211	<i>Ulcer of oesophagus, acute with perforation</i>
K2212	Ulcer of oesophagus, acute with both hemorrhage and perforation
K2213	<i>Ulcer of oesophagus, acute without hemorrhage or perforation</i>
K2214	Ulcer of oesophagus, chronic or unspecified with hemorrhage
K2215	<i>Ulcer of oesophagus, chronic or unspecified with perforation</i>
K2216	Ulcer of oesophagus, chronic or unspecified with both hemorrhage & perforation
K2217	<i>Ulcer of oesophagus, chronic without hemorrhage or perforation</i>
K2219	<i>Ulcer of oesophagus, unspecified as acute or chronic, without hemorrhage or perforation</i>

The non-italicized codes (K2210, K2212, K2214, and K2216) were included in the calculation of IQI 18.

- 9 The following ICD-9-CM codes are required for calculation of Birth Trauma—Injury to Neonate (PSI 17)

Code	Description
7670	Subdural and cerebral hemorrhage
76711	Epicranial subaponeurotic hemorrhage
7673	Injuries to skeleton
7674	Injury to spine and spinal cord
7677	Other cranial and peripheral nerve injuries
7678	Other specified birth trauma
7679	Birth trauma, unspecified

As a result of a change to ICD-9-CM, code 76711 was not included in PSI 17 in years prior to 2003 according to the AHRQ methodology and thus rates may be lower for those years.

The ICD-10-CA coding classification does not translate directly into these ICD-9-CM codes for injuries to scalp.

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### ICD-10-CA codes for birth injury to scalp

Code	Description
P120	<i>Cephalhaematoma due to birth injury</i>
P121	<i>Chignon due to birth injury</i>
P122	<i>Epicranial subaponeurotic hemorrhage due to birth injury</i>
P123	<i>Bruising of scalp due to birth injury</i>
P124	<i>Monitoring injury of scalp of newborn</i>
P128	<i>Other birth injuries to scalp</i>
P129	<i>Birth injury to scalp, unspecified</i>

Only code P122 was included in the calculation of PSI 17.

# Appendix K

## Hospitals and Health Authorities

Since 2001, health care services in British Columbia have been managed and delivered by five regional health authorities and a Provincial Health Services Authority (British Columbia, Ministry of Health Services, 2011a). A list of hospitals in British Columbia, segmented by the authority that governs them, is provided below using information from the British Columbia, Ministry of Health Services website (2011b).<sup>1</sup>

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<b>Fraser Health Authority</b>	
<b>CITY</b>	<b>HOSPITAL</b>
Abbotsford	Abbotsford Regional Hospital and Cancer Centre
Abbotsford	Matsqui-Sumas-Abbotsford General Hospital
Burnaby	Burnaby Hospital
Burnaby	Fellburn Hospital
Chilliwack	Chilliwack General Hospital
Delta	Delta Hospital
Hope	Fraser Canyon Hospital
Langley	Langley Memorial Hospital
Maple Ridge	Ridge Meadows Hospital and Health Care Centre
Mission	Mission Memorial Hospital
New Westminster	Queen's Park Hospital
New Westminster	Royal Columbian Hospital
Port Moody	Eagle Ridge Hospital & Health Care Centre
Surrey	Surrey Memorial Hospital
White Rock	Peace Arch District Hospital

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<sup>1</sup> Hospitals managed by two “societies”; as per address information, are also listed.

**Interior Health Authority**

<b>CITY</b>	<b>HOSPITAL</b>
100 Mile House	100 Mile District General Hospital
Alexis Creek	Red Cross Outpost Nursing Station, Alexis Creek
Armstrong	Pleasant Valley Health Centre
Ashcroft	Ashcroft & District General Hospital
Barriere	Barriere and District Health Centre
Blue River	Red Cross Outpost Nursing Station, Blue River
Castlegar	Castlegar & District Community Health Centre
Chase	Chase and District Health Centre
Clearwater	Dr. Helmcken Memorial Hospital
Cranbrook	East Kootenay Regional Hospital
Creston	Creston Valley Hospital
Edgewood	Red Cross Outpost Nursing Station, Edgewood
Elkford	Elkford and District Diagnostic and Treatment Centre
Fernie	Elk Valley Hospital
Golden	Golden and District General Hospital
Grand Forks	Boundary Hospital
Invermere	Invermere and District Hospital
Kamloops	Overlander Extended Care Hospital
Kamloops	Royal Inland Hospital
Kaslo	Victorian Community Health Centre of Kaslo
Kelowna	Kelowna General Hospital
Keremeos	South Similkameen Health Centre
Lillooet	Lillooet Hospital and Health Centre
Logan Lake	Logan Lake Health Centre
Lytton	St. Bartholomew's Hospital
Merritt	Nicola Valley Health Centre
Nakusp	Arrow Lakes Hospital

CITY	HOSPITAL
Nelson	Kootenay Lake Hospital
New Denver	Slocan Community Health Centre
Oliver	South Okanagan General Hospital
Penticton	Penticton Regional Hospital
Princeton	Princeton General Hospital
Revelstoke	Queen Victoria Hospital
Salmon Arm	Shuswap Lake General Hospital
Sparwood	Sparwood Health Centre
Summerland	Summerland Memorial Health Centre
Trail	Kootenay Boundary Regional Hospital
Vernon	Vernon Jubilee Hospital
Williams Lake	Cariboo Memorial Hospital

### Northern Health Authority

CITY	HOSPITAL
Atlin	Atlin Health Centre
Burns Lake	Lakes District Hospital and Health Centre
Chetwynd	Chetwynd General Hospital
Dawson Creek	Dawson Creek and District Hospital
Dease Lake	Stikine Regional Health Centre
Fort Nelson	Fort Nelson General Hospital
Fort St James	Stuart Lake Hospital
Fort St John	Fort St. John General Hospital
Fort St. John	Peace Lutheran Extended Care Centre
Fraser Lake	Fraser Lake Diagnostic and Treatment Centre
Houston	Houston Health Centre
Hudson's Hope	Hudson's Hope Gething Diagnostic and Treatment Centre

CITY	HOSPITAL
Kitimat	Kitimat General Hospital
Mackenzie	Mackenzie and District Hospital
Masset	Northern Haida Gwaii Hospital and Health Centre
McBride	McBride and District Hospital
Pouce Coupe	Pouce Coupe Care Home
Prince George	The University Hospital of Northern British Columbia
Prince Rupert	Prince Rupert Regional Hospital
Quesnel	G.R. Baker Memorial Hospital
Smithers	Bulkley Valley District Hospital
Stewart	Stewart General Hospital
Terrace	Mills Memorial Hospital
Tumbler Ridge	Tumbler Ridge Health Care Centre
Ueen Charlotte	Queen Charlotte Islands General Hospital
Valemount	Valemount Health Centre
Vanderhoof	St. John Hospital

### Vancouver Coastal Health Authority

CITY	HOSPITAL
North Vancouver	Lions Gate Hospital
Pemberton	Pemberton and District Health Centre
Powell River	Powell River General Hospital
Richmond	The Richmond Hospital
Sechelt	St. Mary's Hospital
Squamish	Squamish General Hospital
Vancouver	G.F. Strong Centre
Vancouver	George Pearson Centre
Vancouver	Mary Pack Arthritis Centre

CITY	HOSPITAL
Vancouver	UBC Health Sciences Centre Hospital
Vancouver	Vancouver General Hospital
Whistler	Whistler Diagnostic and Treatment Centre

### Vancouver Island Health Authority

CITY	HOSPITAL
Alert Bay	Cormorant Island Community Health Centre
Bamfield	Red Cross Outpost Nursing Station, Bamfield
Campbell River	Campbell River & District General Hospital
Chemainus	Chemainus Health Care Centre
Comox	St. Joseph's General Hospital
Duncan	Cowichan District Hospital
Gold River	Gold River Health Clinic
Kyuquot	Red Cross Outpost Nursing Station, Kyuquot
Ladysmith	Ladysmith Community Health Centre
Nanaimo	Nanaimo Regional General Hospital
Parksville	Trillium Lodge
Port Alberni	West Coast General Hospital
Port Alice	Port Alice Hospital
Port Hardy	Port Hardy Hospital
Port McNeill	Port McNeill and District Hospital
Qualicum Beach	Eagle Park Health Care Facility
Saanichton	Saanich Peninsula Hospital
Salt Spring Island	The Lady Minto Gulf Islands Hospital
Tahsis	Tahsis Health Centre
Tofino	Tofino General Hospital
Victoria	Juan de Fuca Hospitals (Aberdeen, Glengarry, Mt. Tolmie, Priory)

CITY	HOSPITAL
Victoria	Queen Alexandra Centre for Children's Health
Victoria	Royal Jubilee Hospital
Victoria	The Gorge Road Hospital
Victoria	Victoria General Hospital

### Provincial Health Services Authority

CITY	HOSPITAL
Coquitlam	Riverview Hospital
Vancouver	British Columbia Cancer Agency
Vancouver	British Columbia's Children's Hospital
Vancouver	British Columbia's Women's Hospital and Health Centre
Vancouver	Sunny Hill Health Centre for Children

### United Church Health Services Society

CITY	HOSPITAL
Bella Bella	R.W. Large Memorial Hospital
Bella Coola	Bella Coola General Hospital
Hazelton	Wrinch Memorial Hospital

### Providence Health Care Society

CITY	HOSPITAL
Vancouver	Brock Fahrni Pavilion
Vancouver	Holy Family Hospital
Vancouver	Mount Saint Joseph Hospital
Vancouver	St. Paul's Hospital
Vancouver	St. Vincent's Hospital

