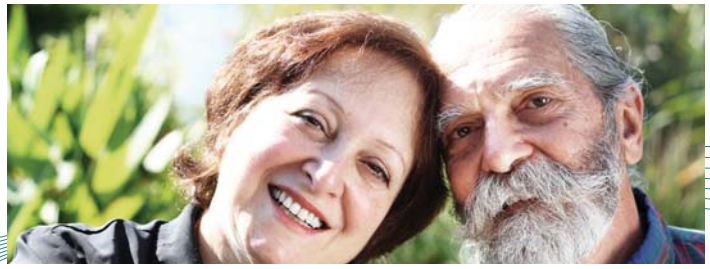

CIHI Data Quality Study of the 2009–2010 Discharge Abstract Database

April 2012

Standards and Data Submission

Canadian Institute for Health Information
Institut canadien d'information sur la santé

Our Vision

Better data. Better decisions.
Healthier Canadians.

Our Mandate

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

Our Values

Respect, Integrity, Collaboration, Excellence, Innovation

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About CIHI

The Canadian Institute for Health Information (CIHI) collects and analyzes information on health and health care in Canada and makes it publicly available. Canada's federal, provincial and territorial governments created CIHI as a not-for-profit, independent organization dedicated to forging a common approach to Canadian health information. CIHI's goal: to provide timely, accurate and comparable information. CIHI's data and reports inform health policies, support the effective delivery of health services and raise awareness among Canadians of the factors that contribute to good health.

The quality of data and information is intrinsic to CIHI's mandate to inform public policy, support health care management and build public awareness about the factors that affect health. CIHI's data quality program includes processes and policies to continuously improve data quality both within CIHI and within the broader health sector.

Acknowledgements

The Canadian Institute for Health Information (CIHI) wishes to acknowledge and thank the following individuals and organizations for their contributions to this data quality study on the Discharge Abstract Database:

- The 19 health information management professionals who collected the data;
- The 85 hospitals across Canada that participated in this study and that welcomed the study coding specialists into their sites;
- The Canadian Health Information Management Association, which assisted with advertising for coding specialists; and
- The provincial and territorial ministries of health and regional health authorities that supported this data quality initiative within their provinces and territories.

Please note that the findings and recommendations outlined in the present document do not necessarily reflect the views of the individuals or organizations mentioned above.

Executive Summary

As part of its comprehensive data quality program, the Canadian Institute for Health Information (CIHI) conducts a variety of data quality analyses and studies on its data holdings, including a systematic program of reabstraction for its Discharge Abstract Database (DAD). This report summarizes the results of a reabstraction study carried out on the 2009–2010 data that was submitted to the DAD. This report also examines the year-over-year results from the 2005–2006, 2007–2008 and 2009–2010 studies.

Specific objectives for this study included the following:

- Evaluate the overall coding quality at the provincial/territorial and national levels for clinical and non-clinical data contained in the DAD for 2009–2010;
- Assess changes in DAD data quality over time from three years of pan-Canadian studies: 2005–2006, 2007–2008 and 2009–2010;
- Evaluate the quality of coding at a national level for the following selected health conditions and interventions: drug-resistant micro-organisms, palliative care, pneumonia, post-admit comorbidities, obstetrical trauma, birth trauma, post-intervention conditions, flagged interventions, intervention pre-admit flag and diagnosis prefixes 5 and 6;
- Assess the impact of any observed coding variations on measures of hospital outputs and resource indicators, as measured by CIHI's acute care grouping methodology, CMG+ 2009; and
- Identify the sources of the coding issues that arise as a result of any observed coding variation.
- The study also focused on identifying systemic data quality and coding issues and articulating possible initiatives for improving the quality of coded data.

Overall Quality of DAD Data

The study findings support that the DAD data is fit for use with respect to the health conditions and interventions studied and the resource indicators derived from CMG+ 2009.

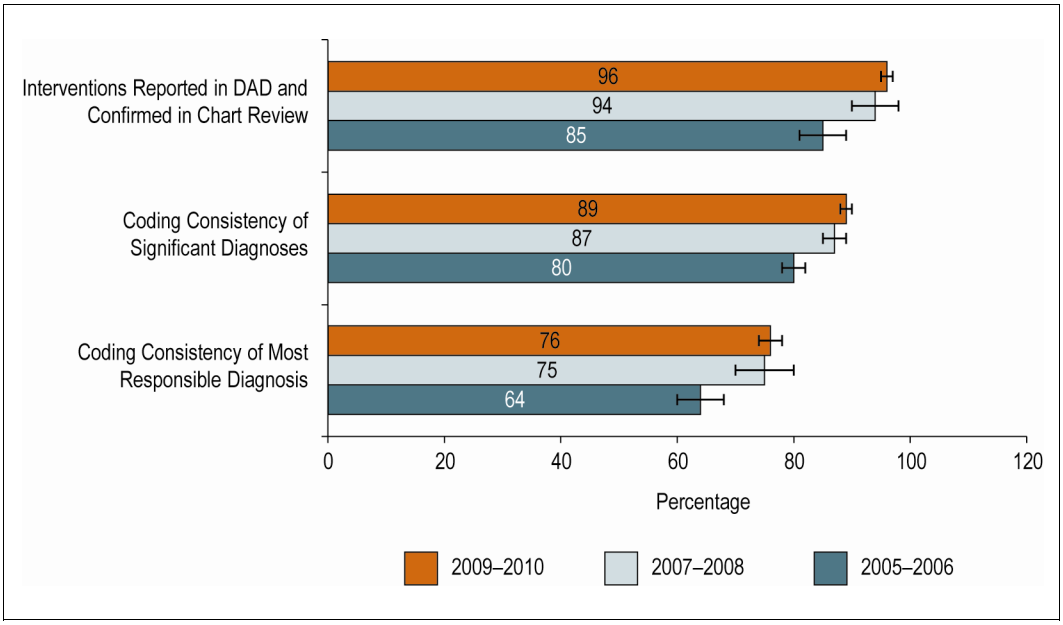
- The 2009–2010 DAD data maintained the high level of quality that was achieved in the 2007–2008 data.
- An acceptable variation was observed in the coding of diagnoses and interventions across all participating provinces and territories. High agreement rates were consistently found in New Brunswick's data.
- The improvements achieved for the selection and coding of the most responsible diagnoses in 2007–2008 were maintained in 2009–2010. This is particularly important because the most responsible diagnosis is a key component in health care system analysis, research and grouping methodologies.
- There was variation with determining if a significant diagnosis was a pre-admit comorbidity or the most responsible diagnosis, or whether the pre-admit comorbidity contributed to the patient's acute care stay. There was also variation with determining if a significant diagnosis was present prior to admission (pre-admit comorbidity) or after admission (post-admit comorbidity).

- Hospital output measures and related resource indicators from CIHI's CMG+ did not vary substantially whether derived from the DAD or the chart review data. However, slightly higher resource utilization indicators were observed in the chart review.

Several areas of improvement in coding quality were noted and are highlighted in Figure 1 below, which compares three years of pan-Canadian studies:

- Interventions reported in the DAD and confirmed in the chart review;
- Consistency of significant diagnoses coded using ICD-10-CA; and
- Consistency of the selection and coding of the most responsible diagnoses.

Figure 1: Highlights of Coding Quality Improvements in 2009–2010



Note
I: 95% confidence interval.
Source
Canadian Institute for Health Information, 2012.

Considerations for Improving Coding Quality

The report supports that enhancing the quality of the information and data in the DAD continues to be a shared responsibility among health care professionals at the facilities who treat patients and document their care, coding specialists who extract patient information and record data on the DAD abstract and those who maintain the DAD database and develop national coding directives.

Ongoing efforts to improve clinical reporting to the DAD among these stakeholders have resulted in overall improvements to its information and data quality. The findings from this study will be used to further enhance CIHI's products, such as CMG+, coding standards, abstracting manuals and educational offerings. Administrators, physicians and health records staff at the study facilities can review the findings from the study along with the information provided in their facility-specific reports to identify areas where improvements may be needed to enhance the quality of DAD data submissions.

For More Information

This report provides detailed information on the coding quality of the DAD. For more information, beyond that presented herein, please write to dataquality@cihi.ca.

Chapter 1: Introduction

1.1 The Discharge Abstract Database

The DAD is a national database that contains demographic, administrative and clinical data on acute care institution separations (discharges, deaths, sign-outs and transfers) across Canada. The DAD was originally developed in 1963 to collect data on institution separations in Ontario. Over time, it expanded to provide national coverage, with the exception of Quebec. Quebec discharge abstract data is reported to CIHI's Hospital Morbidity Database.

Information from the DAD is used by institutions to support institution-specific utilization management decisions and administrative research. Governments use the data for funding and system planning and evaluation. Universities and other academic institutions use the data for various research purposes.[1]

In 2009–2010, CIHI received acute inpatient data from 581 acute care facilities from nine provinces and three territories, as illustrated in Table 1.

Table 1: Volume of Abstracts Submitted to the DAD in 2009–2010, by Province/Territory

Province/Territory	Number of Acute Care Facilities	Number of Inpatient Abstracts
British Columbia	80	411,444
Alberta	96	362,314
Saskatchewan	65	137,225
Manitoba	73	135,115
Ontario	167	1,089,783
Quebec*	—	—
New Brunswick	21	89,774
Nova Scotia	33	92,868
Prince Edward Island	7	15,991
Newfoundland and Labrador	33	55,597
Yukon	1	3,228
Northwest Territories	4	5,745
Nunavut	1	2,141
Total	**581**	**2,401,225**

Note

* Inpatient data from Quebec is submitted to CIHI's Hospital Morbidity Database.

Source

Canadian Institute for Health Information, Data Quality Documentation, Discharge Abstract Database, 2009–2010: Executive Summary (Ottawa, Ont.: CIHI, 2010).

1.2 Study Overview

CIHI conducts a systematic reabstraction program of the DAD as part of its comprehensive data quality program. Reabstraction involves health information management professionals (coding specialists), external to the participating hospital, performing a chart review of acute care

diagnostic, intervention and other selected data elements that were previously collected and submitted to CIHI. Throughout this report, the coding specialists who collected the data in this study are often referred to as "reabstractors."

The main goal of this study was to assess the quality of the coding and abstracting of clinical and non-clinical information in the DAD for 2009–2010, for inpatient acute data, with the aim of providing reliable information at the provincial and territorial levels. The study also focused on specific health conditions and interventions that are of special interest.

Specifically, the objectives of this study were the following:

- Evaluate the overall coding quality at the provincial/territorial and national levels for clinical and non-clinical data contained in the DAD for 2009–2010;
- Assess changes in DAD data quality over time from three years of pan-Canadian studies: 2005–2006, 2007–2008 and 2009–2010;
- Evaluate the quality of coding at a national level for the following selected health conditions and interventions: drug-resistant micro-organisms, palliative care, pneumonia, post-admit comorbidities, obstetrical trauma, birth trauma, post-intervention conditions, flagged interventions, intervention pre-admit flag and diagnosis prefixes 5 and 6;
- Assess the impact of any observed coding variations on measures of hospital outputs and resource indicators, as measured by CIHI's acute care grouping methodology, CMG+ 2009; and
- Identify the sources of the coding issues that arise as a result of any observed coding variation.

Data for this study included approximately 14,000 acute care abstracts collected from 85 hospitals across the country by 19 reabstractors. The data collected during the chart review by these reabstractors was compared with the DAD data previously collected by the hospitals and submitted to CIHI.

The purpose of reabstraction is to identify **systemic** problems in coding and data collection. Coding variations can be the result of a variety of underlying causes, such as the following:

- Misinterpretation of the directives in the *DAD Abstracting Manual*, CIHI's *Canadian Coding Standards for ICD-10-CA and CCI* or the electronic coding books for the International Classification of Diseases and Related Health Problems, 10th Revision, Canada (ICD-10-CA) and the Canadian Classification of Health Interventions (CCI) that make it difficult for the coding specialists to implement these standards and directives consistently;
- Possible non-compliance with or lack of knowledge or awareness of the most up-to-date standards and directives;
- Hospital policies that affect the quality of the data in a negative way;
- The quality and completeness of the chart documentation, which affects the coding specialists' ability to interpret the patient's stay with respect to the coding standards; and
- Invariably, unintentional human error introduced during the abstracting and coding process.

Reabstraction studies enable CIHI to determine the extent of coding inconsistency and also to isolate the areas that are causing inconsistencies. The intent of these studies is not to find fault with either the hospital coding specialists or the reabstractors, but rather to identify areas where the inconsistencies noted between these coding specialists result in possible systemic data quality issues. These studies provide CIHI and hospital facilities with the information needed to improve products and engage in collaborative efforts to improve the quality of data submissions.

1.3 Privacy, Confidentiality and Security

CIHI's policies on privacy, confidentiality and security, with respect to personal privacy and safeguarding the confidentiality of individual records and facilities, were adhered to throughout the course of the study. Information on CIHI's policies for privacy and data protection can be found online at www.cihi.ca/privacy.

1.4 Content of This Report

This report presents the results of the 2009–2010 DAD data quality study. It focuses on the overall coding quality of DAD data, as well as that of selected health conditions. In addition, trends from three years of pan-Canadian DAD reabstractions are presented.

This report contains seven chapters. The present chapter provides an introduction to the study. Chapter 2 presents the study method. The subsequent four chapters address the study objectives: Chapter 3 presents national and regional estimates of overall coding quality as well as trends over three years of pan-Canadian DAD reabstraction studies, Chapter 4 evaluates the coding quality of specific health conditions, Chapter 5 assesses the impact of coding variation on measures of hospital output and resource utilization and Chapter 6 discusses the coding issues identified in this study. The final chapter summarizes the key findings and recommendations.

Chapter 2: Study Method

2.1 Study Design

This study was designed to compare data captured on the inpatient abstract and reported to the DAD with data captured by the reabstractor when looking at the same information (the patient chart).

The primary interest of this reabstraction study was the general population of inpatients, for which **provincial and territorial** estimates of coding quality were desired. The secondary interest was a number of special patient groups (subset of the general inpatient population), defined by diagnoses and interventions, for which **national** estimates were desired. The target population for this level of interest was a subset of the general inpatient population that corresponded to one or more of the special interest groups. The territories were not included in the special patient group target population due to the very small number of patients in these special interest groups (only 0.3%). Since these special interest groups were subsets of the general inpatient population, the combined target population for the two levels of interest can simply be described as including all acute inpatient discharges.

The target population was based on discharges from acute care facilities with a discharge date between April 1, 2009, and March 31, 2010.

Patient records were selected based upon a two-stage probability sample. Facilities that met the following criteria were sampled in the first stage: 1) they were defined as an acute facility; and 2) they submitted 1,000 or more abstracts to the DAD in 2009–2010. This first-stage probability sample resulted in 85 facilities being selected. In the second stage of sampling, patient records were selected for both study aspects from these 85 facilities.

The study design considered hospitalizations with longer lengths of stay (greater than 30 days) as not comparable with those with shorter lengths of stay; thus they were excluded from the main sample population. However, for two of the domains of interest for the flagged interventions special interest group (specifically, tracheostomy and long mechanical ventilation), longer-stay cases could not be ignored without ignoring the majority of cases of interest. For these two domain groups, the long-stay exclusion was for stays of more than 160 days.

2.2 Training and Data Collection

For the purpose of training reabstractors for data collection, guidelines were developed to contribute to the reabstractors' consistency and thoroughness in reviewing and interpreting chart documentation. All guidelines created for this study were developed in consultation with CIHI's Classifications department, which is responsible for developing and maintaining the classifications for diagnoses and interventions in Canada (ICD-10-CA and CCI) and the Canadian Coding Standards. Training focused on diagnosis typing and coding standards for the health conditions and interventions that were the focus of this study. Prior to field collection, reabstractors were required to complete a coding test to assess their understanding of the study guidelines.

For data collection, reabstractors performed a review of the information in the patient's chart regarding the hospital stay.[i] Their findings related to specific data elements, and diagnoses and interventions were recorded using a CIHI software application. The application stored the reabstracted data and then revealed the data submitted to the DAD, noting wherever differences existed between the DAD data and the study data. The reabstractor then reconciled the data by recording a possible reason for each discrepancy.

2.3 Data Processing and Analysis

Data collected for the study underwent two stages of processing. In the first stage, edit, validation and logic checks were performed on the data to ensure that the files were in the proper format and to identify missing and/or invalid data and inconsistencies in the data transmitted. In the second stage of processing, study weights and bootstrap weights were applied to the sampled records. This allowed for representative estimation and variance estimation of the study data. Both stages of processing were critical to ensuring that accurate information was in the study database.

Only weighted estimates for the reabstraction study are presented in this report. Therefore, the almost 14,000 abstracts that were studied represent the study's population of reference of 2,319,672 abstracts.[ii] As estimation is based on a sample taken from the population, many estimates presented include a 95% confidence interval to indicate the amount of sampling error.[iii] Variance estimates were generated using the bootstrap method.

i. Data collection took place from October 2010 to February 2011.

ii. The population of reference of 2,319,672 abstracts excludes long-stay cases of more than 30 days (main study) and long-stay cases of more than 160 days (for tracheostomy and long mechanical ventilation) (83,866 abstracts).

iii. The sample reviewed in this study is only one of many samples, using the same design and size, that could have been selected from the same population. Sampling error is a measure of the variability among all possible samples.

Table 2 compares the characteristics of all abstracts in the DAD with weighted estimates generated when using the study data. These figures provide evidence that the weighted estimates using the study data to describe the patient population are representative of the non–long stay cases (30 days or less) in the full DAD.

Table 2: Characteristics of Abstracts Submitted to the DAD, 2009–2010

	All Acute Care Inpatient Abstracts in DAD	All Acute Care Inpatient Abstracts in DAD With LOS ≤30 Days*	Weighted Estimates Using Study Sample
Number in Population (N)	2,403,538	2,319,672	2,319,672
Age in Years, *Mean (Inter-Quartile Range)*	46 (25–71)	45 (24–70)	48 (27–72)
Hospitalizations Involving One or More of the Studied Health Conditions,† *N (Percentage)*	503,340 (21%)	460,559 (20%)	459,106 (20%)
Total Number of Comorbidities,‡ *N (Mean)*	**2,632,246 (1.1)**	**2,271,132 (1.0)**	**2,413,421(1.0)**
Total Number of Interventions, *N (Mean)*	**2,798,114 (1.2)**	**2,547,451 (1.1)**	**3,054,226 (1.3)**

Notes

* LOS: length of stay. Note that the special interest groups of tracheostomy and long mechanical ventilation had LOS ≤160 days to ensure adequate sample size.

† See Appendix A for the methodology for classifying these hospitalizations.

‡ Type 1 and 2 diagnoses only. The lower estimated number of comorbidities using the study sample is due to the exclusion of patient hospitalizations with a length of stay greater than 30 days from the study design from all but two domains of interest in the special patient group.

Mean: the sum of the values divided by the number (count) of values

Source

Canadian Institute for Health Information, 2012.

Analysis of the data was performed using two methods. The first compared the data reported in the DAD with the data recorded during the chart review, using the analytical model in Table 3.

Table 3: Analytical Model

		Status of Health Condition in Chart Review	
		Recorded	Not Recorded
Status of Health Condition in DAD	Reported	A	B
	Not Reported	C	—

Source
Canadian Institute for Health Information, 2012.

The reference population of DAD data is represented by “A + B,” where A represents those conditions reported in the DAD that were confirmed in the chart review and B represents those conditions reported in the DAD and that were not confirmed in the chart review. A constitutes those conditions found in both the DAD and the chart review data. B constitutes potential extraneous data in the DAD. The presence of systemic patterns in both A and B is of interest: conditions frequently confirmed and conditions where there are differences between the two data sources.

Similarly, the whole of the data recorded in the chart review is represented by “A + C.” A represents those conditions recorded in the chart review that were present in the DAD data, and C represents conditions recorded in the chart review that were not present in the DAD data. A constitutes those conditions found in both the DAD and the chart review data. C constitutes a potential gap in the data in the DAD. Again, it is the presence of systemic patterns in the data of both A and C that is of interest.

A second method of analysis examined those conditions present in the DAD and confirmed in the chart review (A). The rate of agreement of the exact code used to describe these conditions was assessed in this manner.

Chapter 3: Quality of DAD 2009–2010 Data

This chapter focuses on the study's first two objectives:

- Evaluate the overall coding quality at the provincial/territorial and national levels for clinical and non-clinical data contained in the DAD for 2009–2010; and
- Assess changes in DAD data quality over time from three years of pan-Canadian studies: 2005–2006, 2007–2008 and 2009–2010.

These objectives are discussed for the following topics:

i. Interventions;

ii. Significant diagnoses;

iii. Most responsible diagnoses; and

iv. Diagnosis typing.

3.1 Coding of Interventions

This section examines the coding of interventions that were reported in the DAD and recorded during the chart review, as well as the CCI codes used to describe these interventions.

The interventions included in this analysis were those procedures in the sample of patient records that were mandatory to code according to the Canadian Coding Standards as published by CIHI or that had an impact on the case-mix grouping assignment. The capture of CCI mandatory attributes was not included in this analysis.

A summary of the volume of interventions studied in the DAD and the chart review can be found in Table 4.

Table 4: Summary of Interventions Studied

	CCI Code Volume		
	Reported to DAD	Recorded in Chart Review	Reported in DAD and Confirmed in Chart Review
Interventions	2,587,588	2,798,363	2,472,076

Source
Canadian Institute for Health Information, 2012.

3.1.1 Interventions Reported in the DAD

This analysis explores how often the interventions reported in the DAD were confirmed in the chart review, referred to in previous CIHI reabstraction study reports as "correctness of interventions reported to the DAD." Table 5 shows that 96% of the interventions reported in the DAD were confirmed in the chart review.

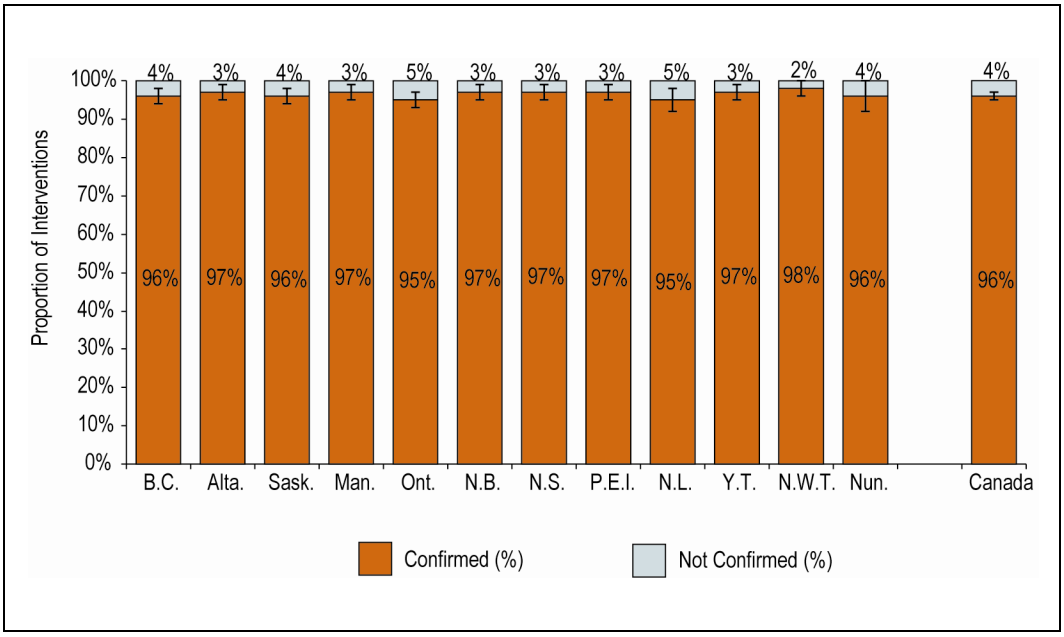
Table 5: Interventions Reported in the DAD Compared With Interventions Confirmed in the Chart Review

	Chart Review Data			
	Confirmed in Chart Review		Not Confirmed in Chart Review	
	Volume	Percentage (95% CI)	Volume	Percentage (95% CI)
All Interventions Reported to DAD	2,472,076	95.5 (94–97)	115,513	4.5 (3–6)

Source
Canadian Institute for Health Information, 2012.

Figure 2 shows that across all provinces and territories, 95% (Newfoundland and Labrador and Ontario) to 98% (Northwest Territories) of the interventions reported in the DAD were confirmed in the chart review.

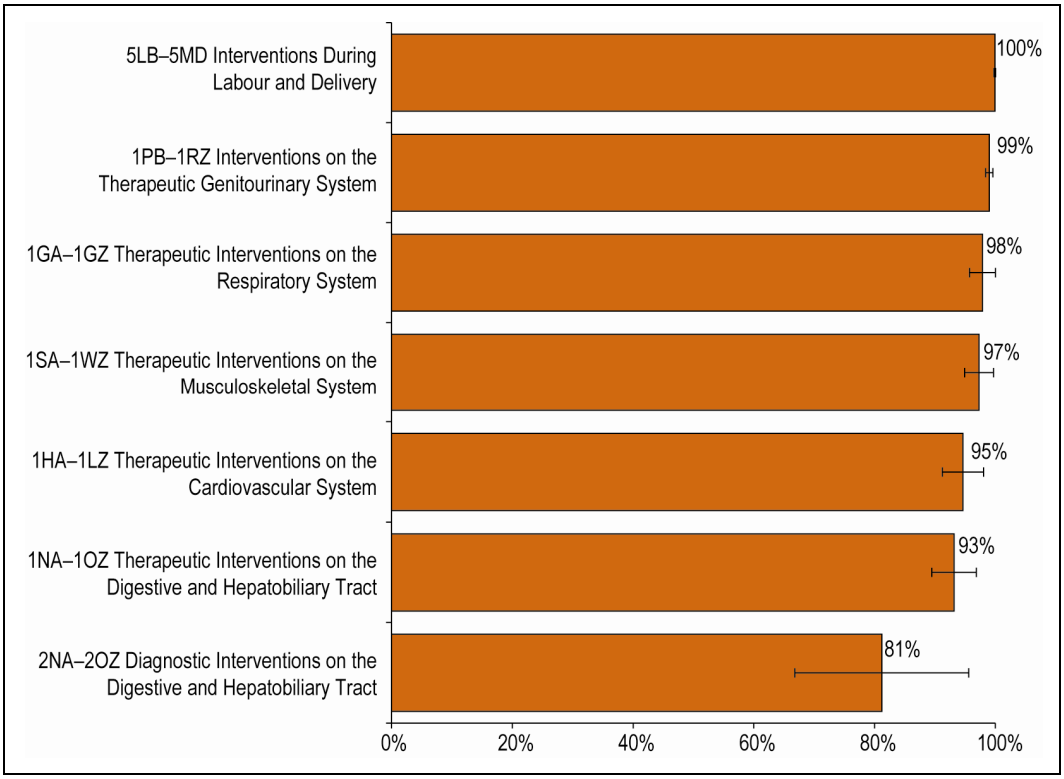
Figure 2: Interventions Reported in the DAD and Confirmed in the Chart Review, by Province/Territory



Note
I: 95% confidence interval of "Confirmed."
Source
Canadian Institute for Health Information, 2012.

This analysis was repeated for specific CCI block ranges of interventions where there was a sufficient sample. This analysis found that diagnostic interventions on the digestive and hepatobiliary tract (block 2NA–2OZ) were more likely to be reported in the DAD and not confirmed in the chart review than other interventions (Figure 3).

Figure 3: Frequency With Which Interventions Reported in the DAD Were Also Confirmed in the Chart Review, by CCI Block



Notes

To be considered for this analysis, the study sample had to contain a minimum of 500 occurrences of CCI codes in the DAD data.

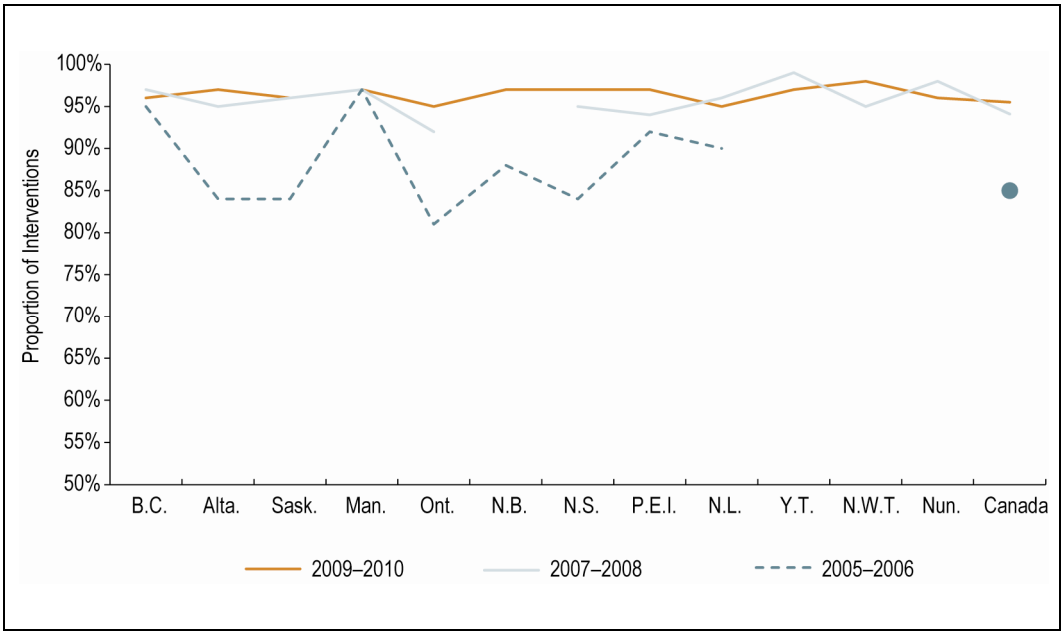
The bars represent the 95% confidence intervals.

Source

Canadian Institute for Health Information, 2012.

Year over year, from 2005 to 2009, improvements have been demonstrated in the reporting of interventions in the DAD across Canada (Figure 4). In 2009–2010, the national estimate was 96%, compared with 94% in 2007–2008 and 85% in 2005–2006.

Figure 4: Year-Over-Year Trend: Interventions Reported in the DAD and Confirmed in the Chart Review



Source
Canadian Institute for Health Information, 2012.

3.1.2 Interventions Recorded in the Chart Review

This analysis explores how often the interventions recorded in the chart review were present in the DAD, referred to in previous CIHI reabstraction study reports as “completeness of reporting interventions to the DAD.”

Table 6 shows that 88% of the interventions recorded in the chart review were present in the DAD.

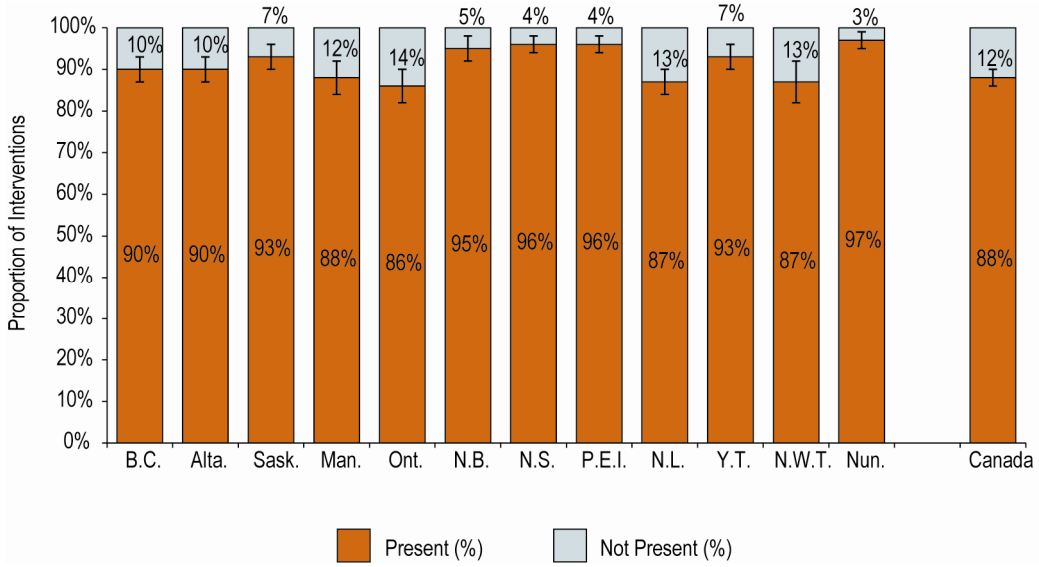
Table 6: Interventions Recorded in the Chart Review Compared With Interventions Present in the DAD

	DAD Data			
	Present in DAD		Not Present in DAD	
	Volume	Percentage (95% CI)	Volume	Percentage (95% CI)
All Interventions Recorded in the Chart Review	2,472,076	88.3 (86–91)	326,288	11.7 (9–14)

Source
Canadian Institute for Health Information, 2012.

Figure 5 shows that across all provinces and territories, 86% to 97% of the interventions recorded in the chart review were present in the DAD.

Figure 5: Interventions Recorded in the Chart Review and Present in the DAD, by Province/Territory



Note

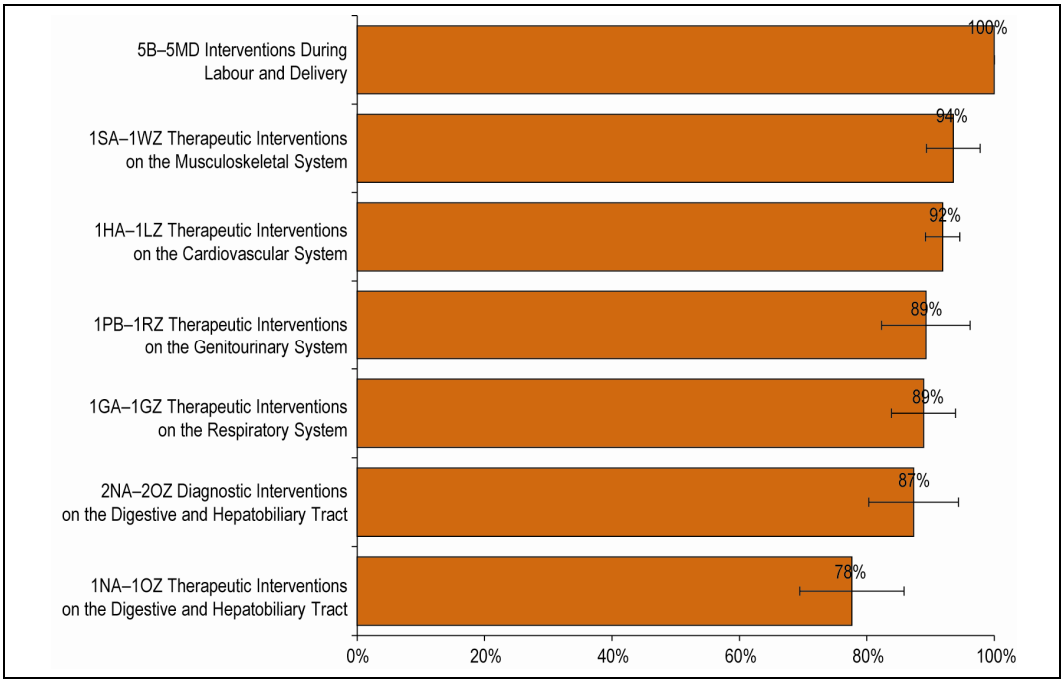
I: 95% confidence interval of "Confirmed."

Source

Canadian Institute for Health Information, 2012.

This analysis was repeated for specific CCI block ranges of interventions where there was a sufficient sample. This analysis found that therapeutic interventions on the digestive and hepatobiliary tract (block 1NA–1OZ) were more likely to be recorded in the chart review and not present in the DAD than other interventions (Figure 6).

Figure 6: Frequency With Which Interventions Recorded in the Chart Review Were Also Present in the DAD, by CCI Block



Notes

To be considered for this analysis, the study sample had to contain a minimum of 500 occurrences of the CCI codes in the chart review data.

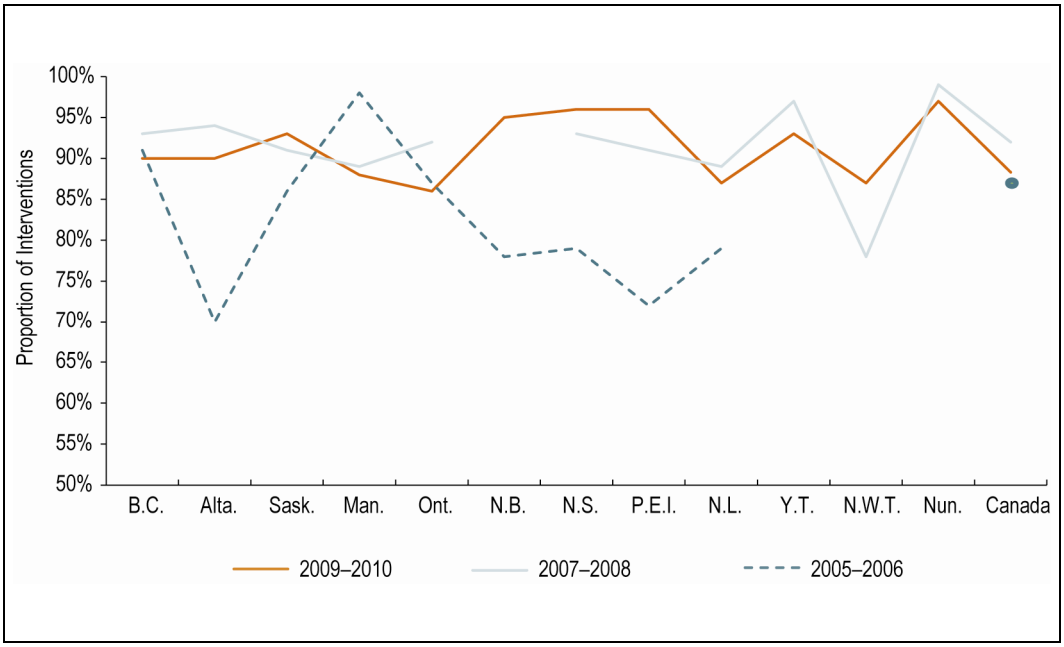
The bars represent the 95% confidence intervals.

Source

Canadian Institute for Health Information, 2012.

Year over year, from 2005 to 2009, variation was found across all provinces and territories in the recording of interventions in the chart review compared with what was present in the DAD (Figure 7). In 2009–2010, the national estimate was 88%, compared with 92% in 2007–2008 and 84% in 2005–2006.

Figure 7: Year-Over-Year Trend: Interventions Recorded in the Chart Review and Present in the DAD



Source
Canadian Institute for Health Information, 2012.

3.1.3 Coding Consistency of Interventions

This analysis examines the consistency of the interventions classified using CCI. To measure coding consistency, this assessment focuses on the interventions reported in the DAD that were confirmed as present in the chart review.

CCI codes are made up of components that describe the type of health intervention, the anatomy site, the intervention performed, the approach/technique, the device/method and the tissue involved in the procedure. Exact CCI agreement (matching up to 10 characters) on all of these components was observed for 91% of the interventions, while agreement to the code rubric (matching on the first 5 characters) was observed for 97% of the interventions (Table 7). The CCI rubric describes the intervention performed and on which anatomy site but does not describe the approach, technique, device, method or tissue involved. The DAD reliably described the interventions experienced in the acute care setting.

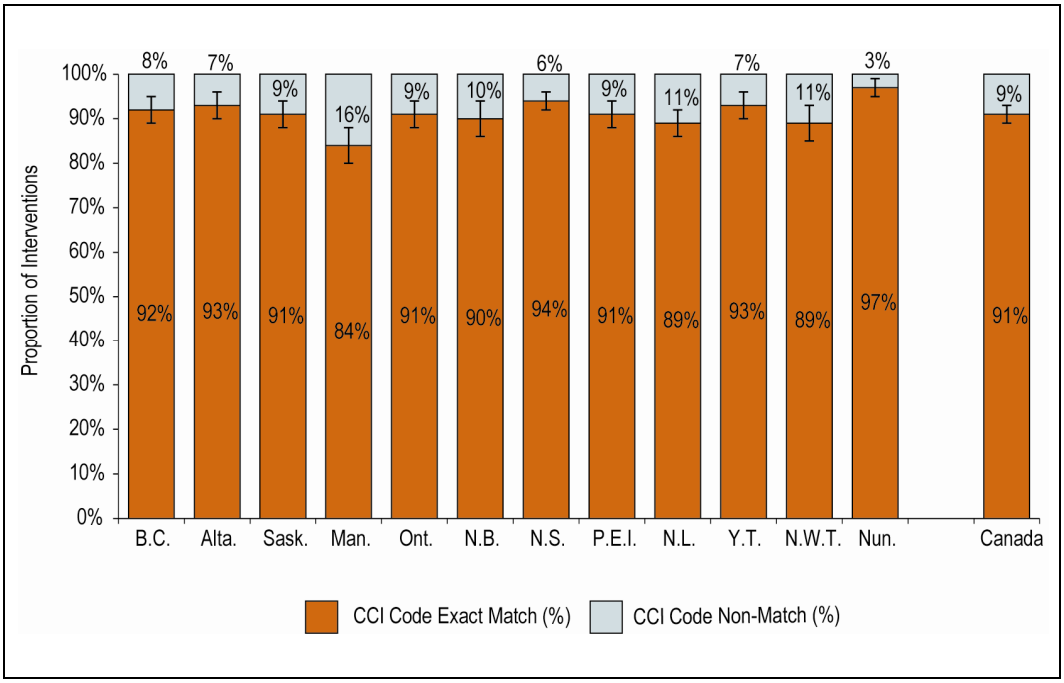
Table 7: CCI Code Agreement Rate for Interventions

Interventions	Agreement Rate (95% CI)
CCI Code, in N.AA.NN.AA-AA-A Format	91.4 (90–93)
CCI Rubric, in N.AA.NN Format	96.8 (96–98)
CCI Group, in N.AA Format	97.4 (96–98)
CCI Block, a Range of CCI Groups (for Example, N.AA$_1$ to N.AA$_2$)	98.6 (98–99)

Notes
A: alpha character; N: numeric character;
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

The agreement on the exact code—that is, the full CCI code (up to 10 characters)—was 91% nationally. This rate varied from 84% (Manitoba) to 97% (Nunavut) across the provinces and territories (Figure 8).

Figure 8: Agreement on the CCI Code Used to Describe the Interventions, by Province/Territory



Note
I: 95% confidence interval of "CCI Code Exact Match."
Source
Canadian Institute for Health Information, 2012.

Table 8 provides a breakdown by each province and territory of the agreement rate of the coding consistency of interventions by exact code, rubric, group and block match.

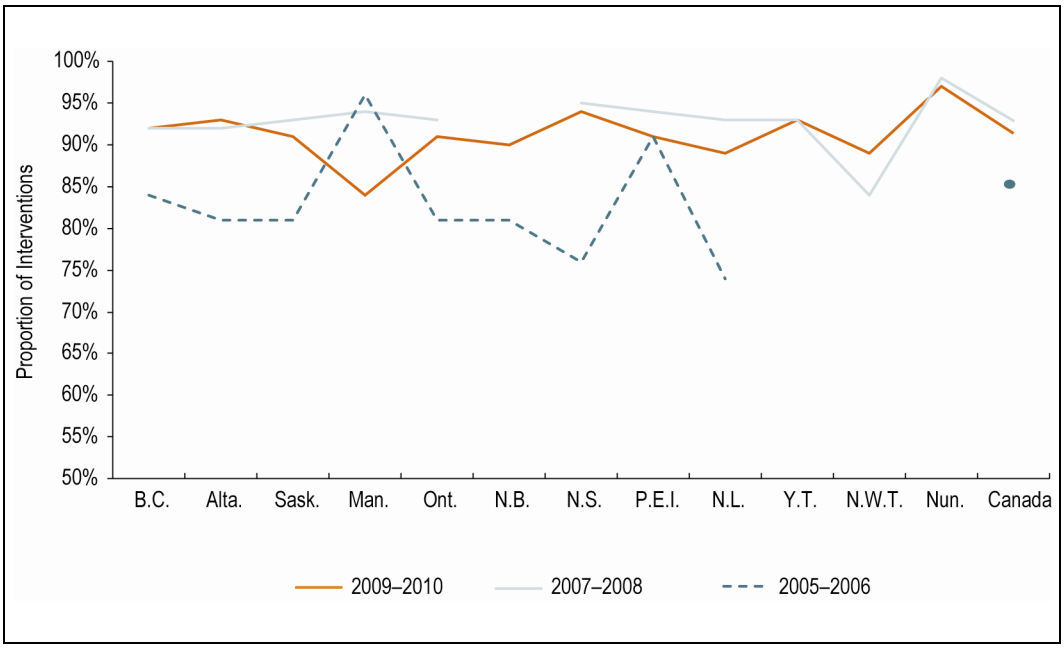
Table 8: Agreement on CCI Coding Consistency of Interventions, by Province/Territory

	Intervention Code Comparisons Percentage (CI)				
	Exact Match	Rubric Match Only	Group Match Only	Block Match Only	No Match
British Columbia	92.1 (89–95)	5.9 (3–8)	1.0 (0–2)	0.6 (0–1)	0.5 (0–1)
Alberta	92.8 (89–96)	5.9 (3–9)	0.8 (0–2)	0.2 (0–0)	0.3 (0–1)
Saskatchewan	90.9 (88–94)	4.9 (3–7)	1.2 (0–2)	1.8 (0–3)	1.1 (0–2)
Manitoba	84.3 (80–89)	10.0 (6–14)	2.0 (0–3)	3.3 (1–5)	0.5 (0–1)
Ontario	91.3 (88–94)	4.8 (2–7)	0.2 (0–0)	1.4 (0–2)	2.3 (1–4)
New Brunswick	89.9 (86–94)	6.6 (3–10)	1.7 (0–3)	1.2 (0–3)	0.5 (0–1)
Nova Scotia	94.2 (92–96)	4.6 (2–7)	0.6 (0–1)	0.4 (0–1)	0.2 (0–1)
Prince Edward Island	91.2 (88–95)	3.6 (2–6)	1.6 (0–3)	2.5 (1–4)	0.9 (0–2)
Newfoundland and Labrador	89.0 (86–92)	4.9 (3–7)	1.8 (1–3)	2.7 (1–5)	1.6 (0–3)
Yukon	93.5 (90–96)	3.9 (2–6)	0.9 (0–2)	1.8 (0–3)	n/a
Northwest Territories	88.9 (85–93)	6.9 (4–10)	1.9 (0–4)	1.9 (0–4)	0.5 (0–1)
Nunavut	97.1 (95–100)	1.8 (0–4)	n/a	0.6 (0–2)	0.6 (0–2)
Canada	**91.4 (90–93)**	**5.4 (4–7)**	**0.6 (0–1)**	**1.2 (1–2)**	**1.4 (1–2)**

Notes
CI: confidence interval.
Percentages may not add up to 100% due to rounding.
Exact Match: match on the complete CCI code (up to 10 characters).
Rubric Match Only: match on the first five characters of the CCI code only.
Group Match Only: match on the first three characters of the CCI code (anatomy site) only.
Block Match Only: match on the body system of the CCI code only.
No Match: no exact, rubric, group or block match, but there could be a match on the first character of the CCI code (section).
n/a: no sample available for analysis.
Source
Canadian Institute for Health Information, 2012.

Year-over-year variation in the coding consistency of interventions using CCI can be seen in Figure 9 across the provinces and territories. In 2009–2010, the national estimate was 91%, compared with 93% in 2007–2008 and 82% in 2005–2006.

Figure 9: Year-Over-Year Trend: Agreement on the CCI Code Used to Describe the Interventions



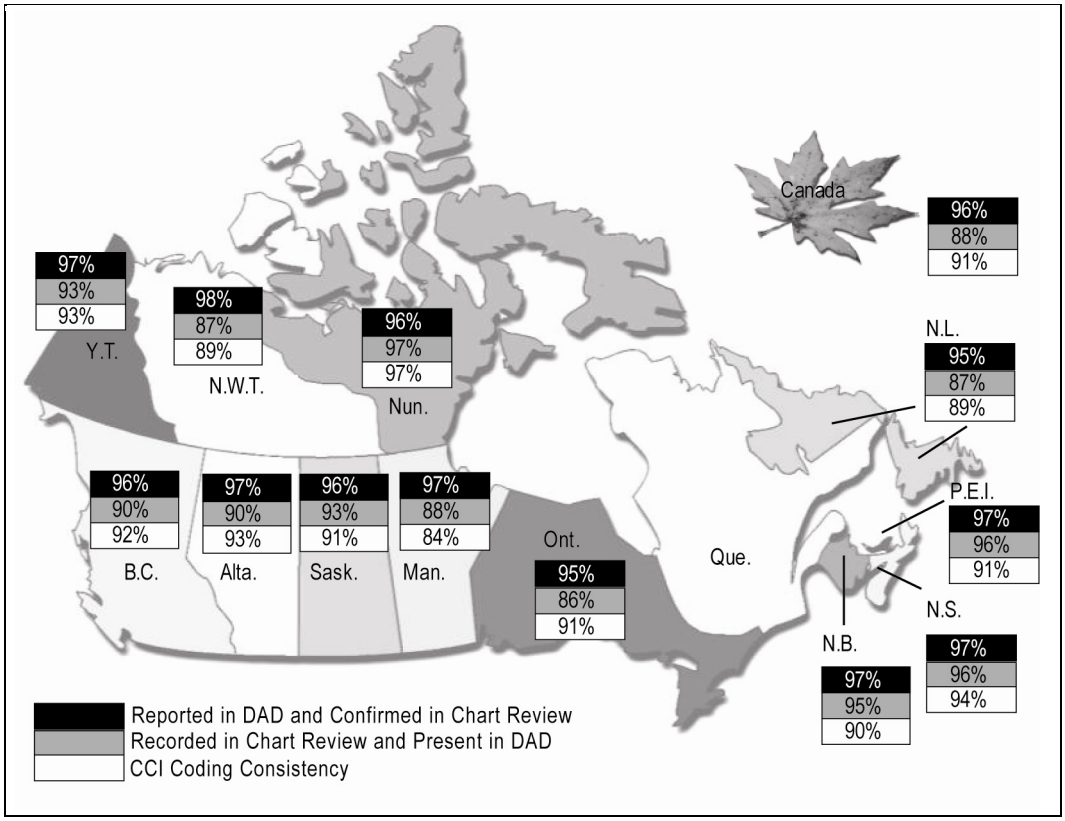
Source
Canadian Institute for Health Information, 2012.

3.1.4 Summary of Intervention Coding

Interventions are well-reported in the DAD. Of the interventions in the DAD, 96% were confirmed in the chart review, and of those interventions recorded in the chart review, 88% were present in the DAD. The agreement on the selection of the CCI code to describe the interventions was very high, with 91% agreement on the exact code (up to 10 characters) and 97% agreement on the rubric (first 5 characters). The DAD interventions were also well-reported from each province and territory. Generally, improvements have been noted in the coding of interventions since 2005–2006; results were similar to those found in 2007–2008, with some variation among all provinces and territories.

Figure 10 summarizes the results of intervention coding across the country.

Figure 10: Summary of Intervention Coding, by Jurisdiction



Source
Canadian Institute for Health Information, 2012.

3.2 Coding of Significant Diagnoses

This section examines the coding of significant diagnoses that were reported in the DAD and recorded during the chart review, as well as the ICD-10-CA codes used to describe these diagnoses.

The diagnoses included in this analysis are those using ICD-10-CA that were deemed to be significant for the patient's visit, that is, those diagnoses that contributed to the patient's length of stay and resource consumption. A significant diagnosis is identified by one of the following diagnosis types: M (most responsible diagnosis), 1 (pre-admit comorbidity), 2 (post-admit comorbidity), 6 (proxy most responsible diagnosis) or W, X or Y (service transfer diagnosis).

A summary of the volume of significant diagnoses studied in the DAD and the chart review can be found in Table 9.

Table 9: Summary of Significant Diagnoses Studied

	ICD-10-CA Code Volume		
	Reported to DAD	Recorded in Chart Review	Reported in DAD and Confirmed in Chart Review
Significant Diagnoses	4,847,887	5,169,172	4,093,269

Source
Canadian Institute for Health Information, 2012.

3.2.1 Significant Diagnoses Reported in the DAD

This analysis explores how often the significant diagnoses reported in the DAD were confirmed in the chart review, referred to in previous CIHI reabstraction study reports as “correctness of significant diagnoses reported to the DAD.” Table 10 shows that 84% of those significant diagnoses reported in the DAD were also confirmed in the chart review.

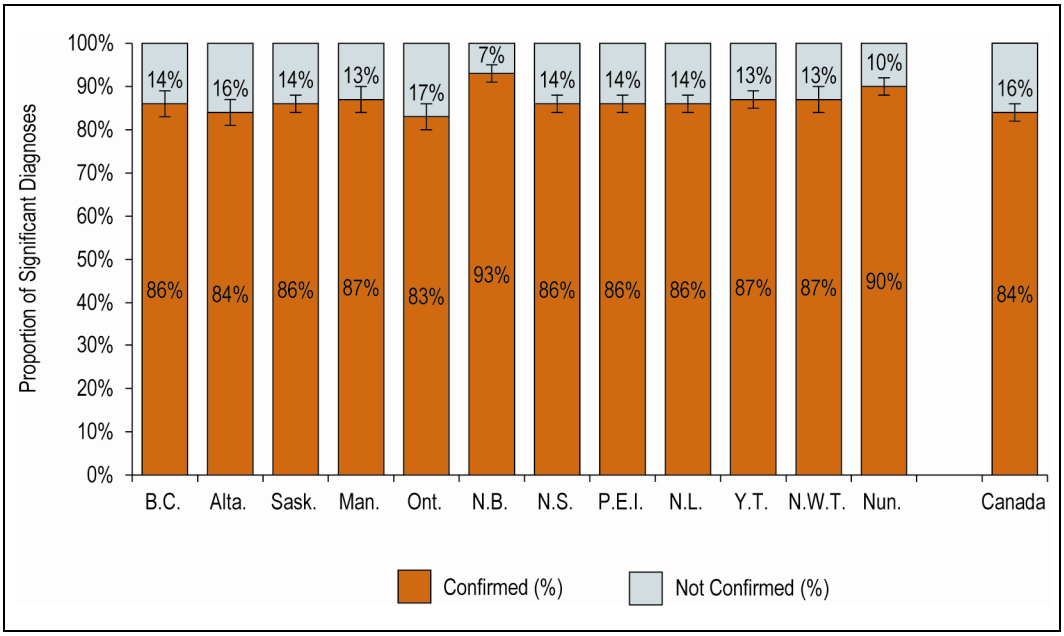
Table 10: Significant Diagnoses Reported in the DAD Compared With Diagnoses Confirmed in the Chart Review

	Chart Review Data			
	Confirmed in Chart Review		Not Confirmed in Chart Review	
	Volume	Percentage (95% CI)	Volume	Percentage (95% CI)
All Significant Diagnoses Reported to DAD	4,093,269	84.4 (83–86)	754,618	15.6 (14–17)

Source
Canadian Institute for Health Information, 2012.

Figure 11 shows that across all provinces and territories, 83% (Ontario) to 93% (New Brunswick) of the significant diagnoses reported in the DAD were confirmed in the chart review.

Figure 11: Significant Diagnoses Reported in the DAD and Confirmed in the Chart Review, by Province/Territory



Note

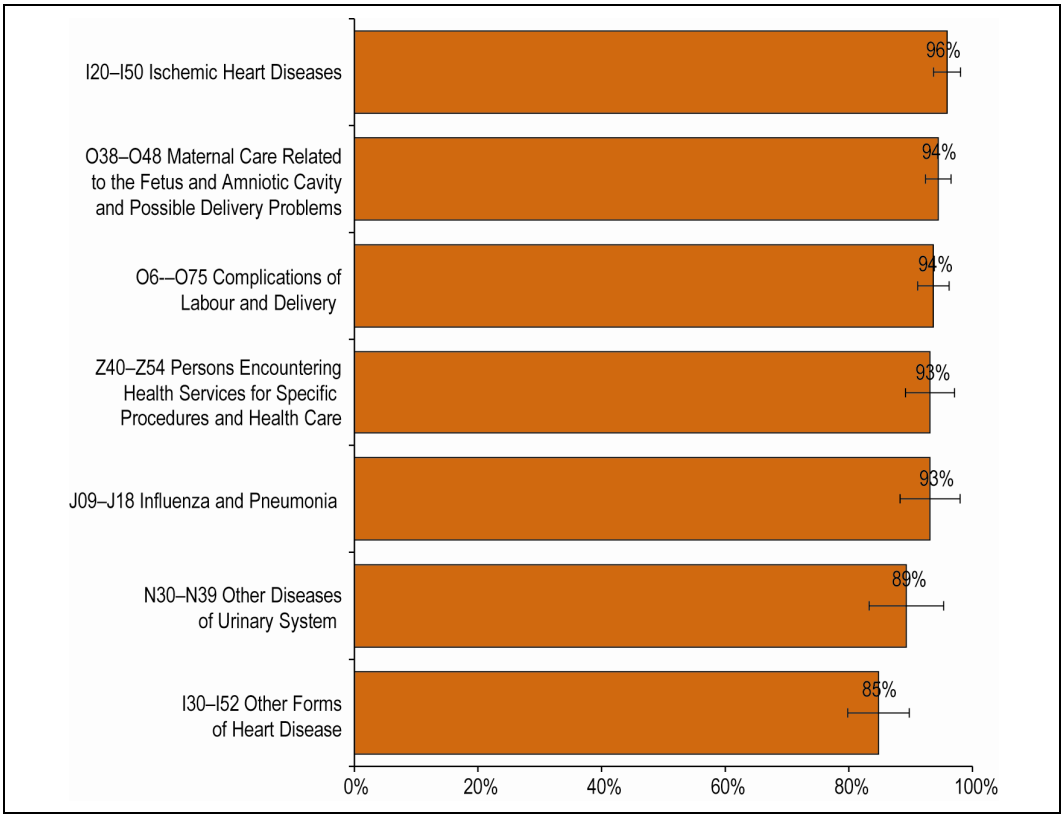
I: 95% confidence interval for "Confirmed."

Source

Canadian Institute for Health Information, 2012.

This analysis was repeated for specific ICD-10-CA block ranges of significant diagnoses where there was a sufficient sample. This analysis found that significant diagnoses found in the ICD-10-CA block I30–I52 (*Other forms of heart disease*) and N30–N39 (*Other diseases of urinary system*) were more likely than the other significant diagnoses to be reported in the DAD and not confirmed in the chart review (Figure 12).

Figure 12: Frequency With Which Significant Diagnoses Reported in the DAD Were Also Confirmed in the Chart Review, by ICD-10-CA Block



Notes

To be considered for this analysis, the study sample had to contain a minimum of 600 occurrences of the ICD-10-CA codes in the DAD data.

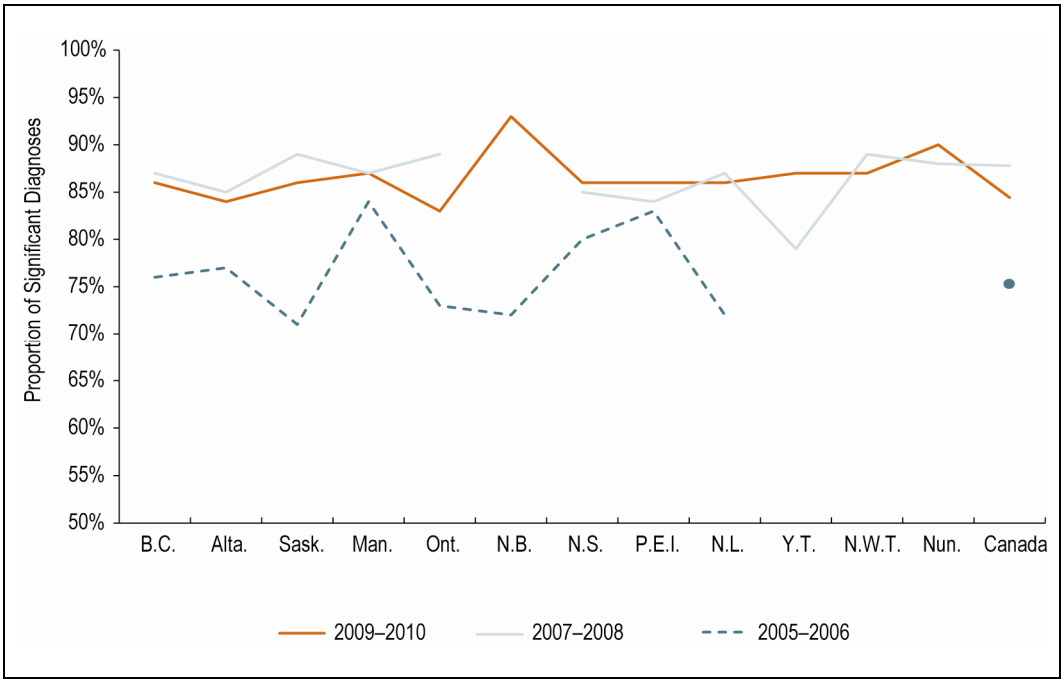
The bars represent the 95% confidence intervals.

Source

Canadian Institute for Health Information, 2012.

Year over year, from 2005 to 2009, improvements were demonstrated in the reporting of significant diagnoses in the DAD across Canada (Figure 13). In 2009–2010, the national estimate was 84%, compared with 88% in 2007–2008 and 75% in 2005–2006. New Brunswick showed substantial improvement, from 72% in 2005–2006 to 93% in 2009–2010.

Figure 13: Year-Over-Year Trend: Significant Diagnoses Reported in the DAD and Confirmed in the Chart Review



Source
Canadian Institute for Health Information, 2012.

3.2.2 Significant Diagnoses Recorded in the Chart Review

This analysis explores how often the significant diagnoses recorded in the chart review were present in the DAD, referred to in previous CIHI reabstraction study reports as "completeness of reporting significant diagnoses to the DAD." Table 11 shows that 79% of those significant diagnoses recorded in the chart review were also present in the DAD.

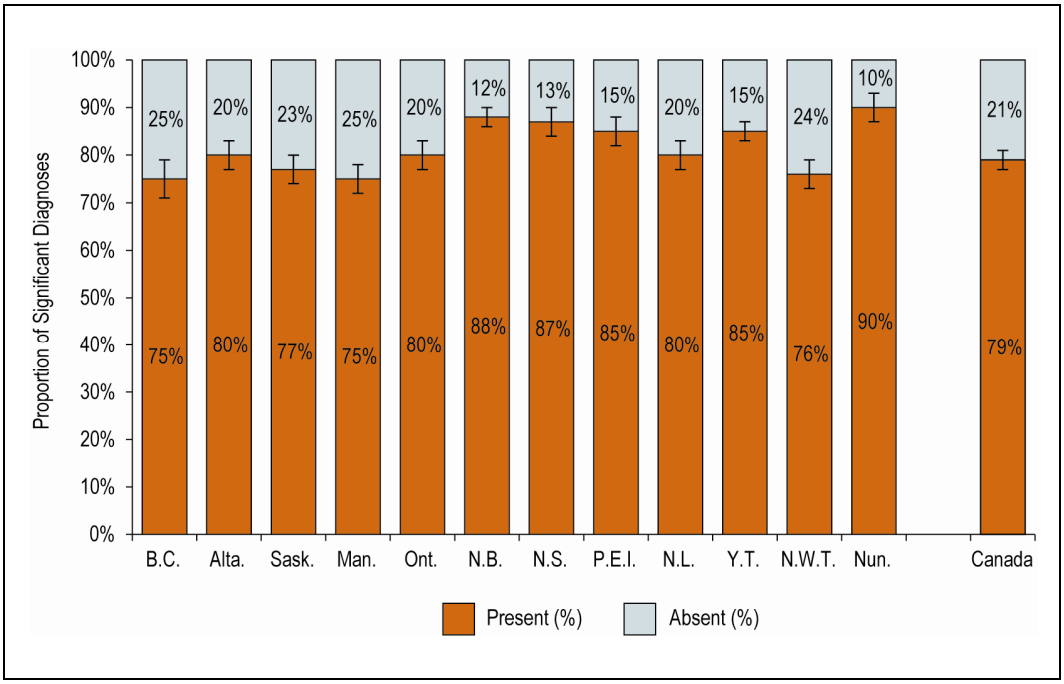
Table 11: Significant Diagnoses Recorded in the Chart Review and Present in the DAD

	DAD Data			
	Present in DAD		Not Present in DAD	
	Volume	Percentage (95% CI)	Volume	Percentage (95% CI)
All Significant Diagnoses Recorded in Chart Review	4,093,269	79.2 (77–81)	1,075,903	20.8 (19–23)

Source
Canadian Institute for Health Information, 2012.

Figure 14 shows that across all provinces and territories, 75% (Manitoba and B.C.) to 90% (Nunavut) of the significant diagnoses recorded in the chart review were present in the DAD.

Figure 14: Significant Diagnoses Recorded in the Chart Review and Present in the DAD, by Province/Territory



Note

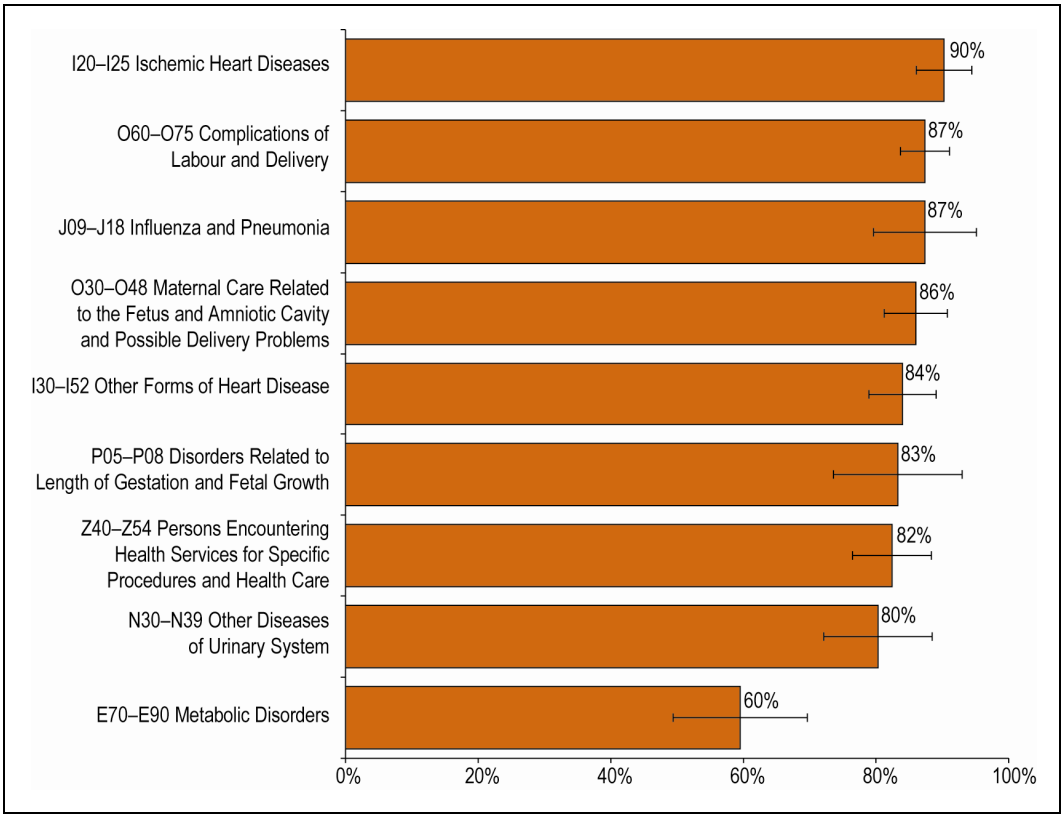
I: 95% confidence interval for "Confirmed."

Source

Canadian Institute for Health Information, 2012.

This analysis was repeated for specific ICD-10-CA block ranges of significant diagnoses that had a sufficient sample from the study. This analysis found that significant diagnoses in the ICD-10-CA block E70–E90 (*Metabolic disorders*) were more likely than the other significant diagnoses to be recorded in the chart review and not reported in the DAD (Figure 15).

Figure 15: Frequency With Which Significant Diagnoses Recorded in the Chart Review Were Also Present in the DAD, by ICD-10-CA Block



Notes

To be considered for this analysis, the study sample had to contain a minimum of 600 occurrences of the ICD-10-CA codes per ICD-10-CA block range in the chart review data.

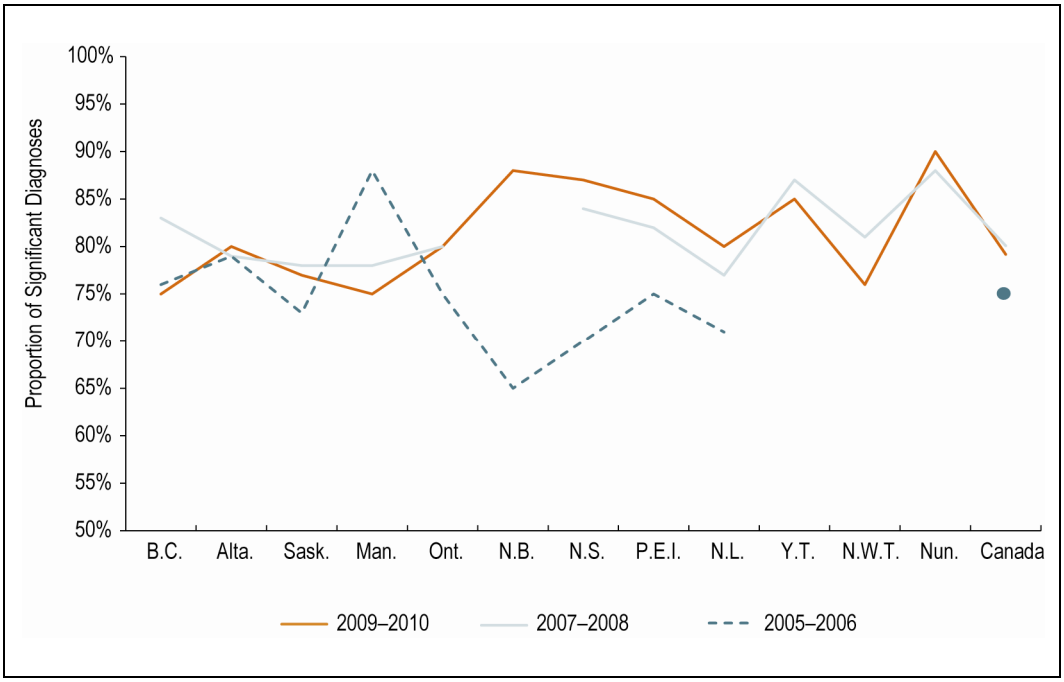
The bars represent the 95% confidence intervals.

Source

Canadian Institute for Health Information, 2012.

Year over year, from 2005 to 2009, variation was found across all provinces and territories in the recording of significant diagnoses in the chart review compared with what was present in the DAD (Figure 16). In 2009–2010, the national estimate was 79%, compared with 80% in 2007–2008 and 76% in 2005–2006.

Figure 16: Year-Over-Year Trend: Significant Diagnoses Recorded in the Chart Review and Present in the DAD



Source
Canadian Institute for Health Information, 2012.

3.2.3 Coding Consistency of Significant Diagnoses

This analysis examines the consistency of the significant diagnoses classified using ICD-10-CA. To measure coding consistency, this assessment focuses on the significant diagnoses reported in the DAD that were confirmed as present in the chart review.

ICD-10-CA codes primarily describe an illness, a condition, a health problem, a circumstance or an external cause affecting the patient. These codes are indexed within ICD-10-CA into categories, blocks and chapters. Exact ICD-10-CA agreement (up to six characters) was observed for 89% of the significant diagnoses reported in the DAD and confirmed in the chart review, whereas agreement to the code category (match on the first three characters) was observed for 95% of the significant diagnoses (Table 12). The DAD reliably described the various diseases and health-related problems experienced in the acute care setting for broad definitions of disease, albeit some precision was lacking regarding the six characters of the ICD-10-CA code.

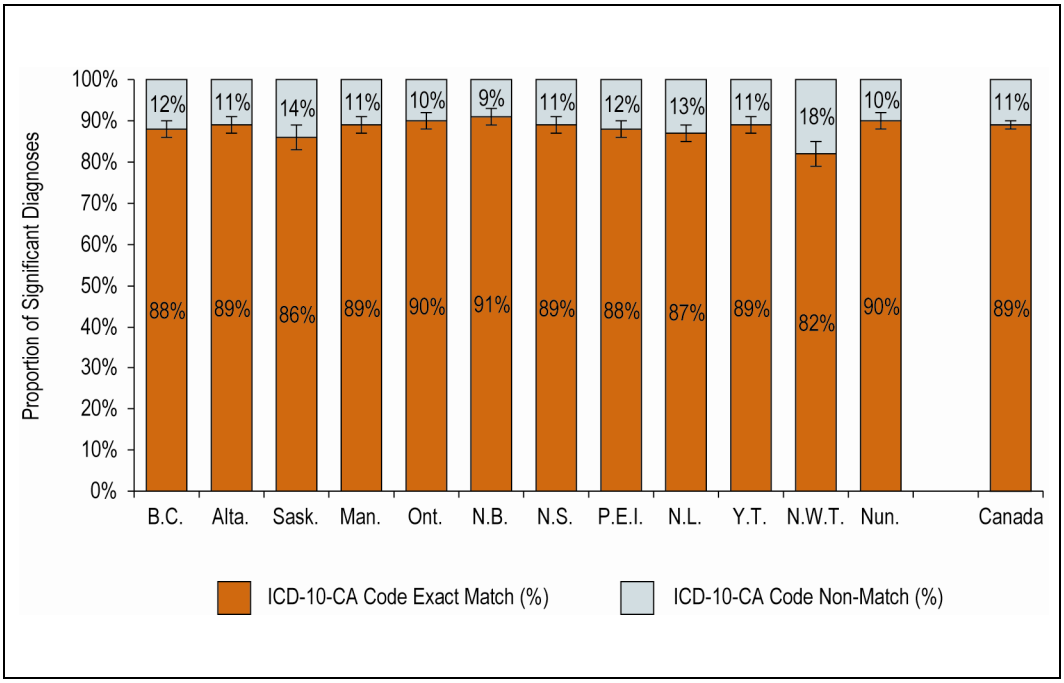
Table 12: ICD-10-CA Code Agreement Rate for Significant Diagnoses

	Agreement Rate (95% CI)
ICD-10-CA Code, in ANN.NNN Format	89.0 (88–90)
ICD-10-CA Category, in ANN Format	95.1 (94–96)
ICD-10-CA Block, a Range of ICD-10-CA Categories in ANN Format (for Example, ANN1 to ANN2)	97.5 (97–98)
ICD-10-CA Chapter, a Grouping of ICD-10-CA Blocks	98.9 (98–99)

Notes
A: alpha character; N: numeric character;
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

The agreement on the exact code—that is, the full ICD-10-CA code (up to six characters)—was 89% nationally. This rate varied from 82% (Northwest Territories) to 91% (New Brunswick) across the provinces and territories (Figure 17).

Figure 17: Agreement on the ICD-10-CA Code Used to Describe the Significant Diagnosis, by Province/Territory



Note
I: 95% confidence interval for "ICD-10-CA Code Exact Match."
Source
Canadian Institute for Health Information, 2012.

Table 13 provides a further breakdown by province and territory of the agreement rate of the coding consistency of significant diagnoses by exact code, category, block and chapter match.

Table 13: Agreement on ICD-10-CA Coding Consistency of Significant Diagnoses, by Province/Territory

	Significant Diagnosis Code Comparisons Percentage (CI)				
	Exact Match	Category Match Only	Block Match Only	Chapter Match Only	No Match
British Columbia	87.5 (85–90)	6.7 (5–8)	3.0 (2–4)	1.6 (1–2)	1.1 (0–2)
Alberta	89.1 (87–91)	8.0 (6–10)	1.3 (1–2)	1.2 (0–2)	0.5 (0–1)
Saskatchewan	86.0 (83–89)	6.3 (4–8)	4.0 (2–5)	2.8 (2–4)	0.9 (0–2)
Manitoba	88.7 (86–91)	7.8 (6–10)	2.2 (1–3)	0.9 (0–2)	0.4 (0–1)
Ontario	89.8 (88–92)	5.1 (3–7)	2.5 (2–3)	1.3 (0–2)	1.4 (1–2)
New Brunswick	91.1 (89–93)	5.1 (3–7)	1.1 (0–2)	1.3 (0–2)	1.4 (0–2)
Nova Scotia	88.7 (86–91)	6.7 (5–8)	2.0 (1–3)	1.7 (1–3)	0.9 (0–2)
Prince Edward Island	88.5 (86–91)	6.6 (5–8)	2.0 (1–3)	1.3 (0–2)	1.7 (1–3)
Newfoundland and Labrador	86.8 (85–89)	7.8 (6–9)	2.3 (1–3)	1.6 (1–2)	1.5 (1–2)
Yukon	89.2 (87–91)	5.0 (3–7)	3.5 (2–5)	0.8 (0–2)	1.4 (1–2)
Northwest Territories	82.4 (79–86)	9.8 (7–12)	4.4 (3–6)	1.1 (0–2)	2.3 (1–3)
Nunavut	90.2 (88–92)	5.7 (4–8)	2.4 (1–4)	0.8 (0–2)	0.8 (0–2)
Canada	**89.0 (88–90)**	**6.1 (5–7)**	**2.4 (2–3)**	**1.4 (1–2)**	**1.1 (1–2)**

Notes

CI: confidence interval.

Percentages may not add up to 100% due to rounding.

Exact Match: match on the entire ICD-10-CA code (up to six characters).

Category Match Only: match on the first three characters of the ICD-10-CA code only.

Block Match Only: match on the first two characters of the ICD-10-CA code only.

Chapter Match Only: match on the first character of the ICD-10-CA code only.

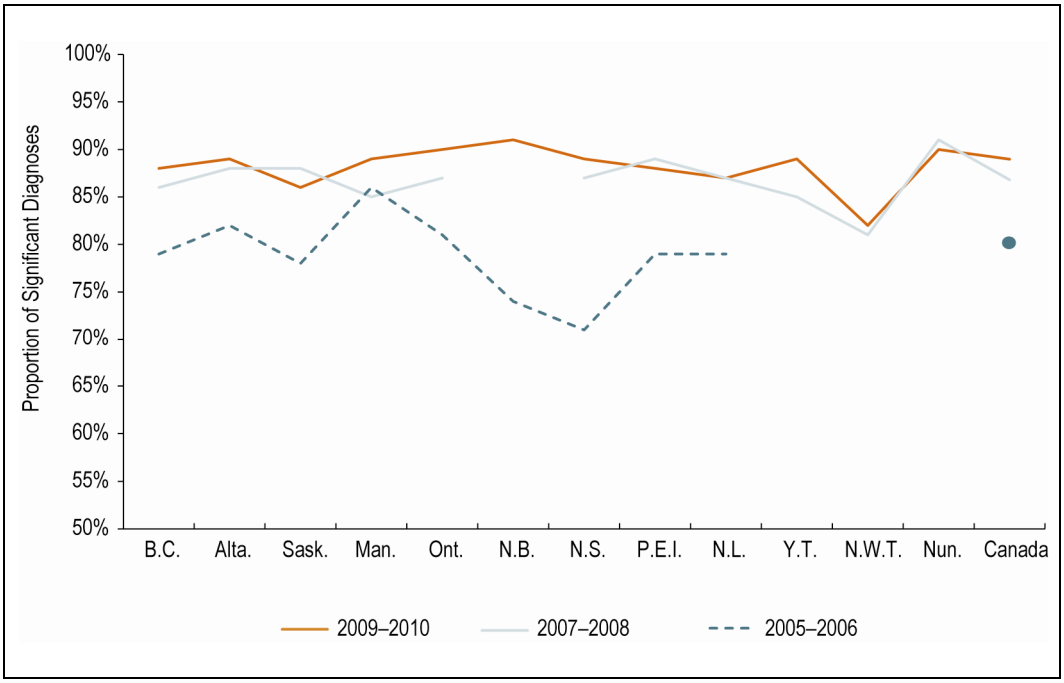
No Match: no match on any of the characters of the ICD-10-CA code.

Source

Canadian Institute for Health Information, 2012.

Similar to what was observed for the coding consistency of interventions, there was year-over-year variation in the coding consistency of significant diagnoses from 2005 to 2009 (Figure 18). In 2009–2010, the national estimate was 89%, compared with 87% in 2007–2008 and 80% in 2005–2006.

Figure 18: Year-Over-Year Trend: Agreement on the ICD-10-CA Code Used to Describe the Significant Diagnosis



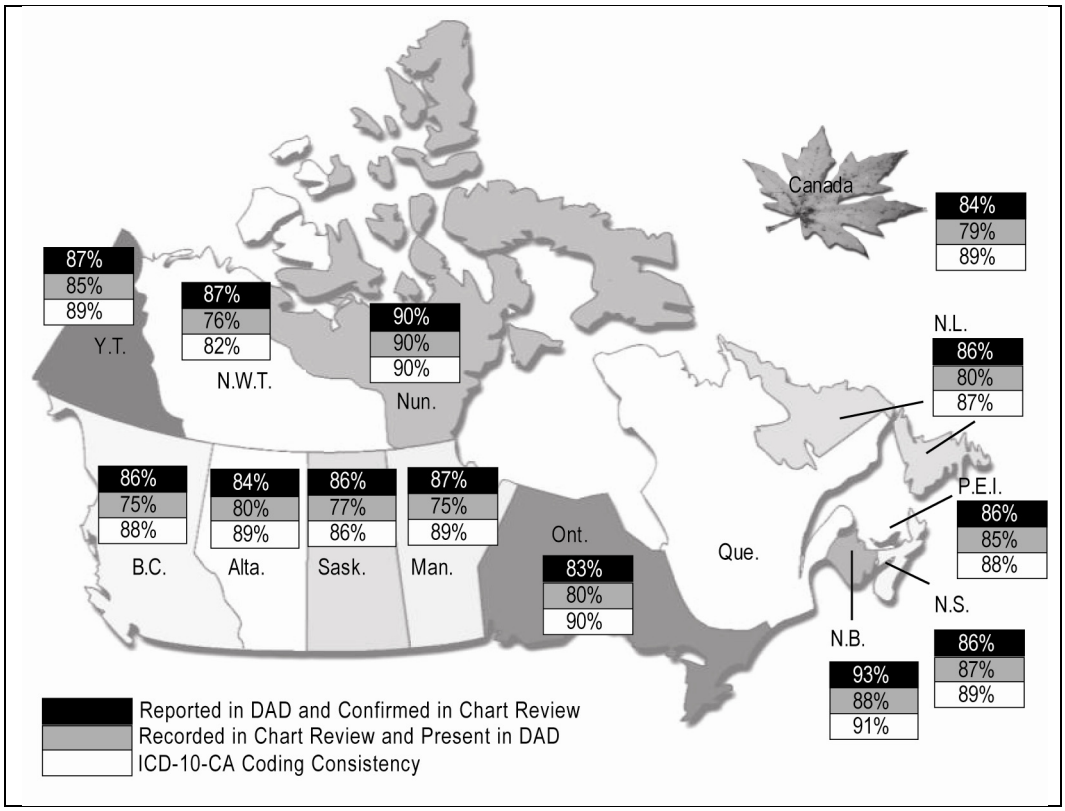
Source
Canadian Institute for Health Information, 2012.

3.2.4 Summary of Significant Diagnosis Coding

Of the significant diagnoses in the DAD, 84% were confirmed in the chart review; of those significant diagnoses recorded in the chart review, 79% were present in the DAD. These results are lower than what was observed for the coding of interventions. This is not unexpected, given the complexity of medical conditions and diseases and their manifestation. The agreement on the selection of ICD-10-CA codes to describe significant diagnoses was very high, with 89% agreement on the exact code (up to six characters) and 95% agreement on the category (first three characters). The significant diagnoses were also well-reported from each province and territory. As was observed with the coding of interventions, improvements have been noted in the coding of significant diagnoses since 2005–2006; results were similar to those found in 2007–2008, with some variation among all provinces and territories.

Figure 19 summarizes the results of significant diagnosis coding across the country.

Figure 19: Summary of Coding of Significant Diagnoses, by Jurisdiction



Source
Canadian Institute for Health Information, 2012.

3.3 Coding of the Patient's Most Responsible Diagnosis

This section examines the findings related to the coding of the most responsible diagnosis that were reported in the DAD and recorded during the chart review.

The most responsible diagnosis is the one diagnosis or condition that can be described as being most responsible for the patient's stay in hospital, such as the greatest portion of the stay or the greatest use of resources. Since each patient has only one most responsible diagnosis, this analysis compares the most responsible diagnosis on the DAD abstract with the one documented in the chart review. To achieve agreement on the most responsible diagnosis reported on the DAD abstract, both of the following conditions must have been met: the same diagnosis or condition was selected as the one most responsible for the patient's stay in hospital, and the same ICD-10-CA code that describes this diagnosis or condition was selected.

3.3.1 Coding Consistency of Most Responsible Diagnosis

Agreement on the selection and coding of the most responsible diagnosis was observed for 76% of the hospitalizations reported in the DAD—this included an exact code match of up to six characters of the ICD-10-CA code. Agreement to the code category (match up to the first three characters of the ICD-10-CA code) was 82% (Table 14).

Note that the agreement on coding consistency of the most responsible diagnosis included obstetrical conditions. Obstetrical cases are different from other acute care cases, and selecting the most responsible diagnosis in a complicated obstetrical case can be challenging.

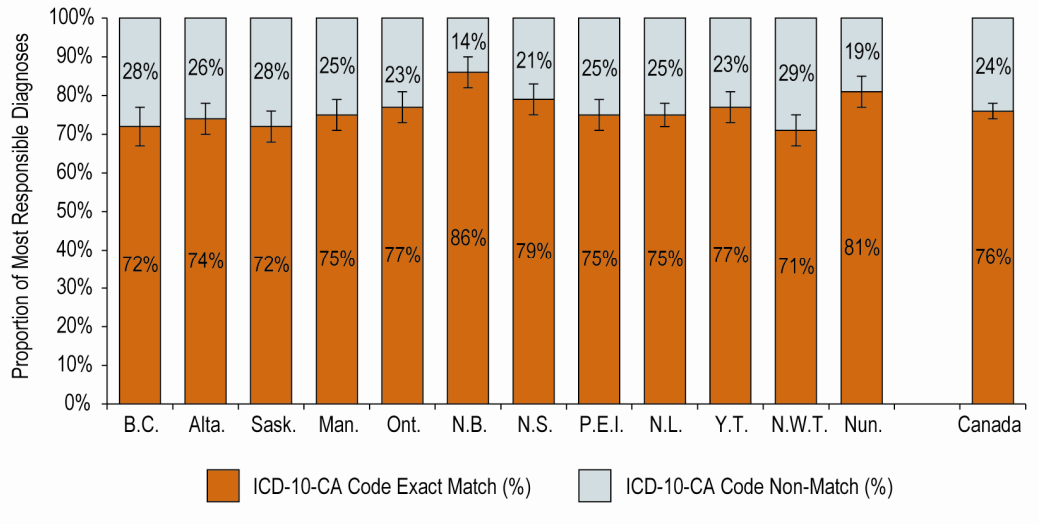
Table 14: Summary of Coding Consistency for Most Responsible Diagnosis

Most Responsible Diagnosis	Agreement Rate (95% CI)
ICD-10-CA Code, in ANN.NNN Format	75.7 (73–78)
ICD-10-CA Category, in ANN Format	81.6 (80–84)
ICD-10-CA Block, a Range of ICD-10-CA Categories in ANN Format (for Example, ANN1 to ANN2)	85.8 (84–88)
ICD-10-CA Chapter, a Grouping of ICD-10-CA Blocks	90.8 (89–92)

Notes
A: alpha character; N: numeric character.
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

Across all provinces and territories, agreement on the selection and coding of the most responsible diagnosis ranged from 71% (Northwest Territories) to 86% (New Brunswick) for an exact code match (Figure 20).

Figure 20: Agreement on the ICD-10-CA Code Used to Describe the Most Responsible Diagnosis, by Province/Territory



Note

I: 95% confidence interval.

Source

Canadian Institute for Health Information, 2012.

Table 15 provides a further breakdown by province and territory of the agreement rate of the coding consistency of the most responsible diagnosis by exact code, category, block and chapter match.

Table 15: Agreement on Coding Consistency of Most Responsible Diagnosis, by Province/Territory

	Exact Match Percentage (CI)	Non-Exact Match Percentage (CI)			
		Category Match Only	Block Match Only	Chapter Match Only	No Match
British Columbia	72.2 (68–77)	6.8 (5–9)	5.1 (3–7)	4.4 (3–6)	11.6 (8–15)
Alberta	74.2 (70–79)	9.0 (6–12)	3.7 (2–5)	5.1 (3–7)	8.0 (6–10)
Saskatchewan	71.7 (68–76)	5.5 (3–8)	7.5 (5–10)	6.0 (4–8)	9.2 (7–12)
Manitoba	75.3 (71–80)	6.2 (4–9)	4.9 (3–7)	3.2 (2–5)	10.4 (7–13)
Ontario	77.0 (73–81)	4.4 (2–6)	3.7 (2–5)	5.7 (4–8)	9.2 (6–12)
New Brunswick	86.4 (83–90)	5.6 (3–8)	0.9 (0–2)	2.6 (1–4)	4.5 (2–7)
Nova Scotia	79.0 (75–83)	6.0 (4–8)	4.4 (3–6)	3.8 (2–6)	6.9 (5–9)
Prince Edward Island	75.3 (71–79)	6.2 (4–8)	4.1 (2–6)	4.5 (3–6)	9.9 (7–13)
Newfoundland and Labrador	75.3 (72–79)	9.4 (7–12)	4.3 (3–6)	3.1 (2–4)	7.9 (6–10)
Yukon	76.8 (73–81)	6.2 (4–9)	6.0 (4–8)	3.3 (2–5)	7.7 (5–10)
Northwest Territories	70.8 (67–75)	9.4 (7–12)	6.1 (4–8)	3.7 (2–5)	10.0 (7–13)
Nunavut	80.6 (77–84)	5.8 (3–8)	4.9 (3–7)	2.2 (1–4)	6.6 (4–9)
Canada	**75.7 (73–78)**	**5.9 (5–7)**	**4.2 (3–5)**	**5.0 (4–6)**	**9.2 (8–11)**

Notes

CI: confidence interval.

Percentages may not add up to 100% due to rounding.

Exact Match: match on the entire ICD-10-CA code (up to six characters).

Category Match Only: match on the first three characters of the ICD-10-CA code only.

Block Match Only: match on the first two characters of the ICD-10-CA code only.

Chapter Match Only: match on the first character of the ICD-10-CA code only.

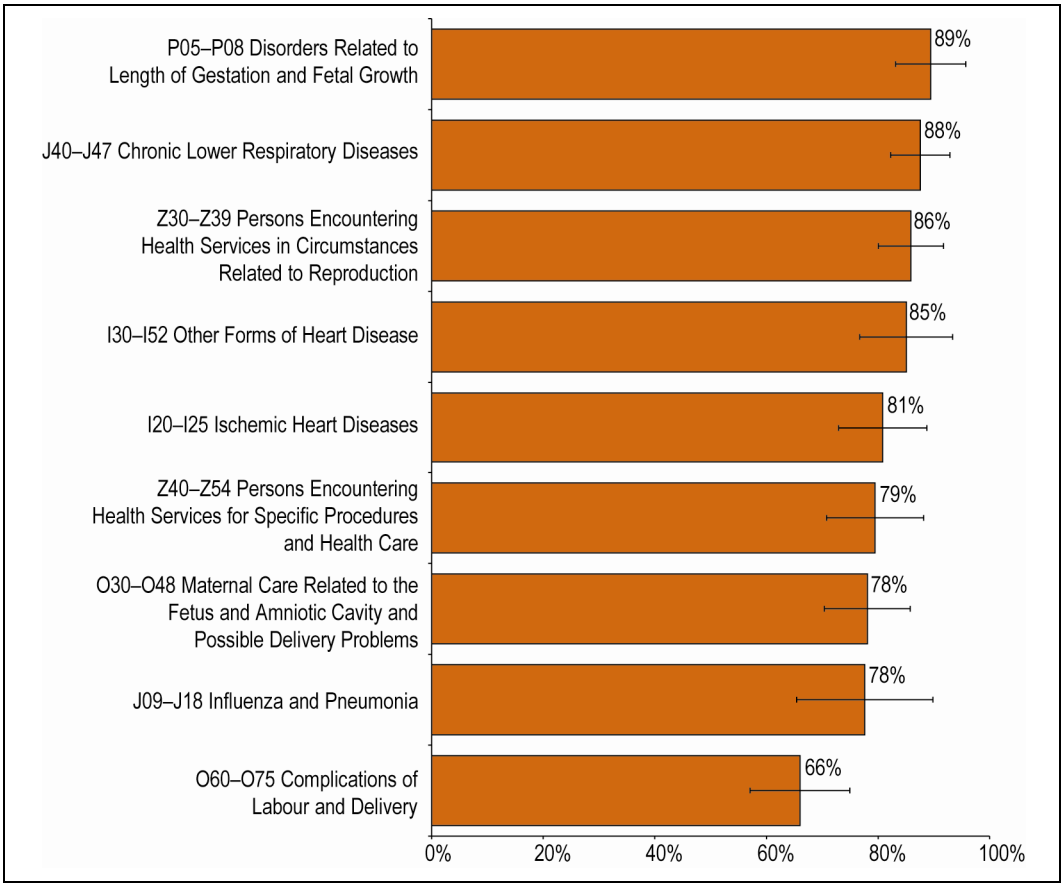
No Match: no match on any of the characters of the ICD-10-CA code.

Source

Canadian Institute for Health Information, 2012.

This analysis was repeated for specific ICD-10-CA block ranges of most responsible diagnoses that had a sufficient sample from the study. This analysis found that the most responsible diagnoses in the ICD-10-CA block O60–O75 (*Complications of labour and delivery*), J09–J18 (*Influenza and pneumonia*), O30–O48 (*Maternal care related to the fetus and amniotic cavity and possible delivery problems*) and Z40–Z54 (*Persons encountering health services for specific procedures and health care*) were more likely to have lower agreement in the chart review (Figure 21).

Figure 21: Agreement on the Most Responsible Diagnoses, by ICD-10-CA Block



Notes

To be considered for this analysis, the study sample had to contain a minimum of 200 occurrences of the ICD-10-CA codes per ICD-10-CA block range in the chart review data.

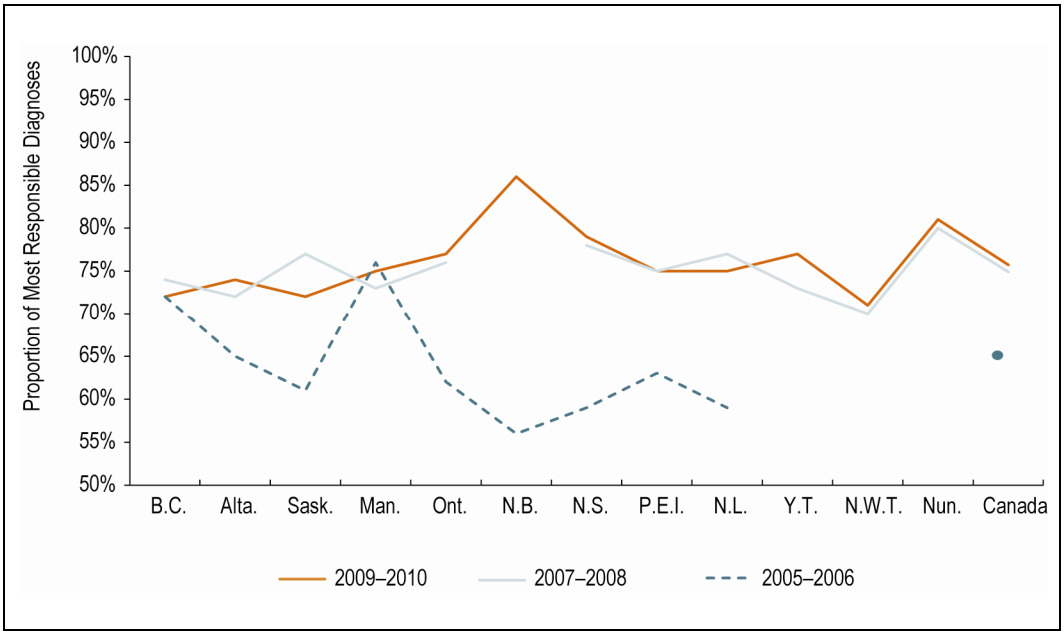
The bars represent the 95% confidence intervals.

Source

Canadian Institute for Health Information, 2012.

Significant improvements have been observed in the selection and coding of the most responsible diagnosis from 2005 to 2009. The national averages in 2009–2010 and 2007–2008 were 76% and 75%, respectively, compared with 64% in 2005–2006. Variation was still seen across the provinces and territories (Figure 22).

Figure 22: Year-Over-Year Trend: Agreement on the ICD-10-CA Code Used to Describe the Most Responsible Diagnosis, by Province/Territory



Source
Canadian Institute for Health Information, 2012.

3.3.2 Summary of Coding of Most Responsible Diagnoses

Agreement on the most responsible diagnosis required that the same condition and ICD-10-CA code were selected. In previous studies, this has often produced a lower result. In the 2009–2010 study, there continued to be significant improvement in the coding of the most responsible diagnosis since 2005–2006 (76% compared to 64%). Similar results to what was observed in 2007–2008 were achieved in 2009–2010. There continued to be some variation among provinces and territories, but less than what was observed in 2005–2006.

3.4 Consistency of Diagnosis Typing and the Assignment of Significance

A diagnosis type accompanies every diagnosis on the DAD abstract. It is used to indicate the impact of a diagnosis on the patient's stay in a hospital as evidenced in the physician's documentation. Diagnosis typing is an important component of the DAD abstract for differentiating conditions that have an effect on the patient's length of stay or resource utilization. These are termed "significant diagnoses" and include the following: the patient's most responsible diagnosis (type M), proxy most responsible diagnosis (type 6), pre-admit comorbidity (type 1), post-admit comorbidity (type 2) and service transfer diagnoses (types W, X and Y).

This analysis examines the agreement rate for the significant diagnoses that matched on type or that matched on significance (that is, the type may not have matched but the type was still significant upon chart review). Note that the agreement rates on diagnosis typing include obstetrical conditions. Obstetrical cases are different from other acute care cases, and applying the diagnosis typing definitions can be challenging. The rate of significant diagnoses that were assigned a diagnosis type that was not significant (that is, a secondary diagnosis or type 3) or that were not reabstracted at all upon chart review is also provided.

For those significant diagnoses in the DAD, there was 82% agreement overall on the assignment of the diagnosis type to these diagnoses in the chart review; another 9% of diagnoses did not match on diagnosis type, although the diagnosis type still remained significant. For the remaining 9% of significant diagnoses, their assignment as significant could not be substantiated in the chart documentation (Table 16). Agreement on diagnosis type ranged from 75% (pre-admit comorbidities) to 88% (most responsible diagnosis); however, the chart documentation further supported the assignment of significance for 85% (pre-admit comorbidities) to 99% (service transfer diagnoses) of diagnoses. The assignment of significance to pre-admit comorbid conditions presented some challenges (15% of diagnoses were reabstracted as secondary conditions or not reabstracted at all).

Table 16: Agreement Rates on Diagnosis Typing and the Assignment of Significance

	Volume of Diagnosis Types	Agreement Rate (95% CI)		Reabstracted as Secondary or Not Reabstracted at All
		On Diagnosis Type	On Assignment of Significance	
Most Responsible Diagnosis (Type M)	2,319,672	85.7	93.5	6.5
		(84–88)	(92–95)	(5–8)
Proxy Most Responsible Diagnosis (Type 6)	8,044	—	—	—
Comorbidity (Type 1 or 2)	2,413,421	69.5	76.0	24.0
		(67–72)	(73–79)	(21–27)
Pre-Admit Comorbidity (1)	2,026,556	67.1	75.8	24.2
		(64–70)	(73–79)	(21–27)
Post-Admit Comorbidity (2)	386,865	65.2	76.6	23.4
		(59–72)	(70–83)	(17–30)
Service Transfer Diagnosis (Type W, X or Y)	106,749	70.8	80.1	19.9
		(55–87)	(63–97)	(3–37)
All Significant Diagnoses	4,847,887	75.9	84.4	15.6
		(74–78)	(83–86)	(14–17)

Note

— Insufficient sample available for analysis.

Source

Canadian Institute for Health Information, 2012.

Additional analysis was performed to explain the changes in the diagnosis typing observed in the chart review (Table 17). The following matrix shows the shifts in diagnosis typing in the significant diagnoses reported in the DAD (left column). Agreement on the diagnosis types can be found along the diagonal (dark teal). As demonstrated in the changes in diagnosis type from DAD type M to type 1 (8% and 175,511 diagnoses) and from DAD type 1 to type M (8% and 143,396 diagnoses), there was some confusion about which condition should have been selected as the most responsible diagnosis or pre-admit comorbid condition when both were present upon admission. As noted above, 15% of the pre-admit comorbidities were reabstracted as non-significant diagnoses. For post-admit comorbidities reported in the DAD, there was also confusion about whether these diagnoses were actually present prior to admission (11%) or their significance could not be supported in the chart documentation (10%).

Table 17: Diagnosis Typing Agreement Matrix

		Diagnosis Types in the Chart Review					
		Most Responsible Diagnosis (Type M)	Proxy Most Responsible Diagnosis (Type 6)	Pre-Admit Comorbidity (Type 1)	Post-Admit Comorbidity (Type 2)	Transfers (Types W, X and Y)	Secondary Diagnosis or Not Reabstracted at All
Diagnosis Types in DAD	**Most Responsible Diagnosis (Type M)**	86% (1,987,815)	0% (909)	8% (175,511)	0% (4,352)	0% (1,070)	6% (150,014)
	Proxy Most Responsible Diagnosis (Type 6)	—	—	—	—	—	—
	Pre-Admit Comorbidity (Type 1)	7% (143,396)	0% (2,734)	67% (1,358,831)	2% (31,080)	0% (766)	24% (489,749)
	Post-Admit Comorbidity (Type 2)	2% (8,005)	n/a	9% (36,126)	65% (252,368)	n/a	23% (90,366)
	Transfers (Types W, X and Y)	4% (3,878)	n/a	6% (6,092)	0% (18)	71% (75,532)	20% (21,230)

Notes

Percentages may not add up to 100% due to rounding.

— Insufficient sample available for analysis.

n/a: no sample available for analysis.

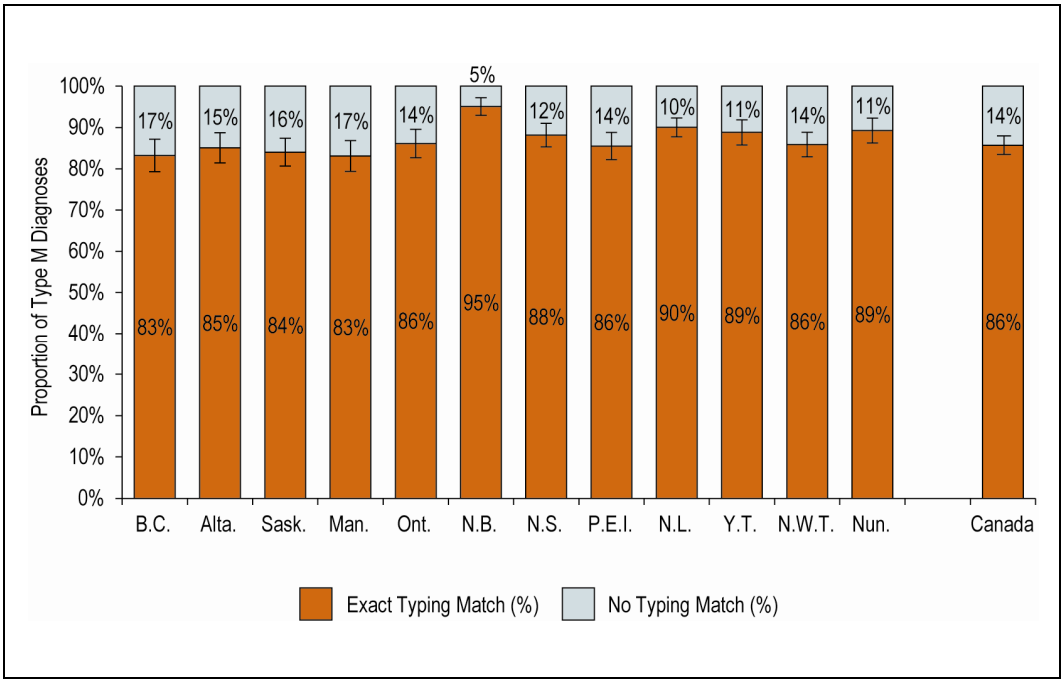
Source

Canadian Institute for Health Information, 2012.

3.4.1 Consistency of Diagnosis Typing: Most Responsible Diagnosis

The consistency of diagnosis typing for the most responsible diagnosis varied across the country from 85% (Manitoba and B.C.) to 96% (New Brunswick), as shown in Figure 23.

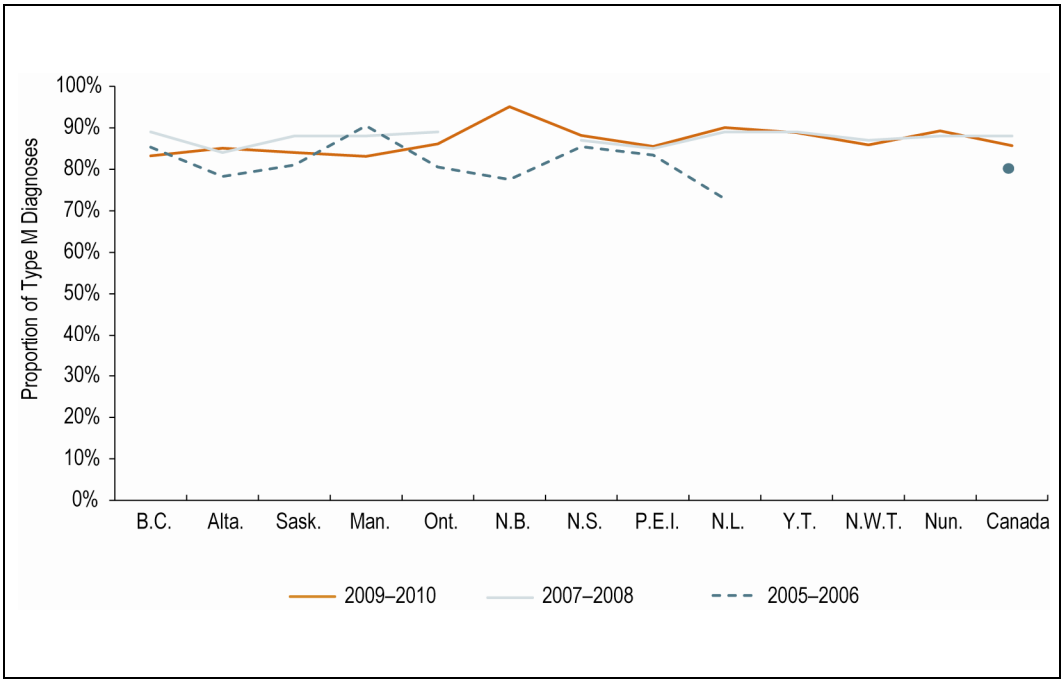
Figure 23: Agreement on Typing for Most Responsible Diagnosis (Type M), by Province/Territory



Note
I: 95% confidence interval.
Source
Canadian Institute for Health Information, 2012.

The year-over-year analysis of the typing of the most responsible diagnosis showed remarkable consistency in all three years of study, as well as across all provinces and territories (Figure 24). The national estimate was 88% in 2009–2010, compared with 91% in 2007–2008 and 90% in 2005–2006.

Figure 24: Year-Over-Year Trend: Agreement on Diagnosis Typing for Most Responsible Diagnosis (Type M)

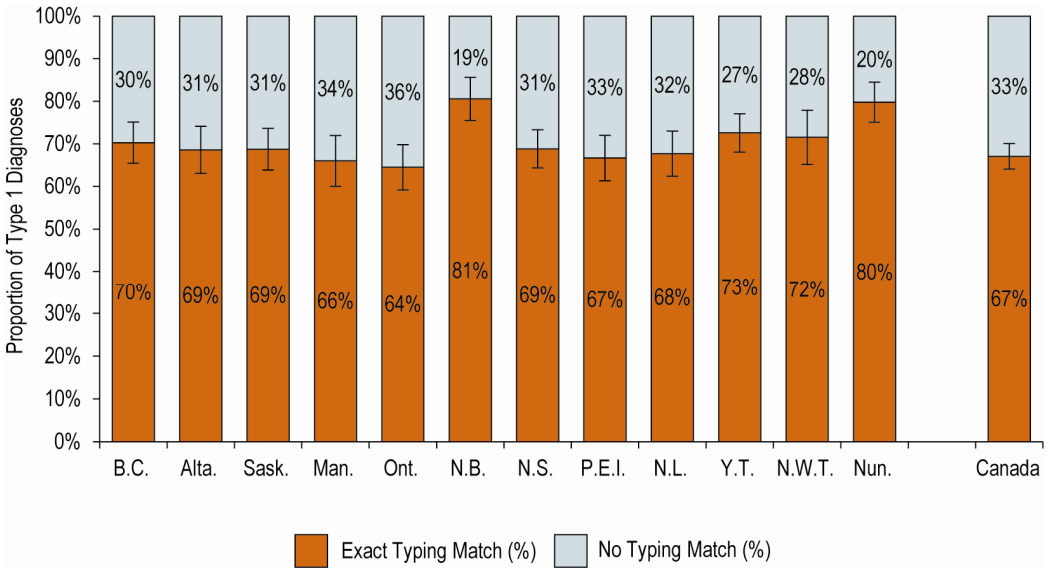


Source
Canadian Institute for Health Information, 2012.

3.4.2 Consistency of Diagnosis Typing: Pre-Admit Comorbidities

The consistency of diagnosis typing for pre-admit comorbidities varied across the country, from 71% (Ontario) to 89% (Nunavut), as shown in Figure 25.

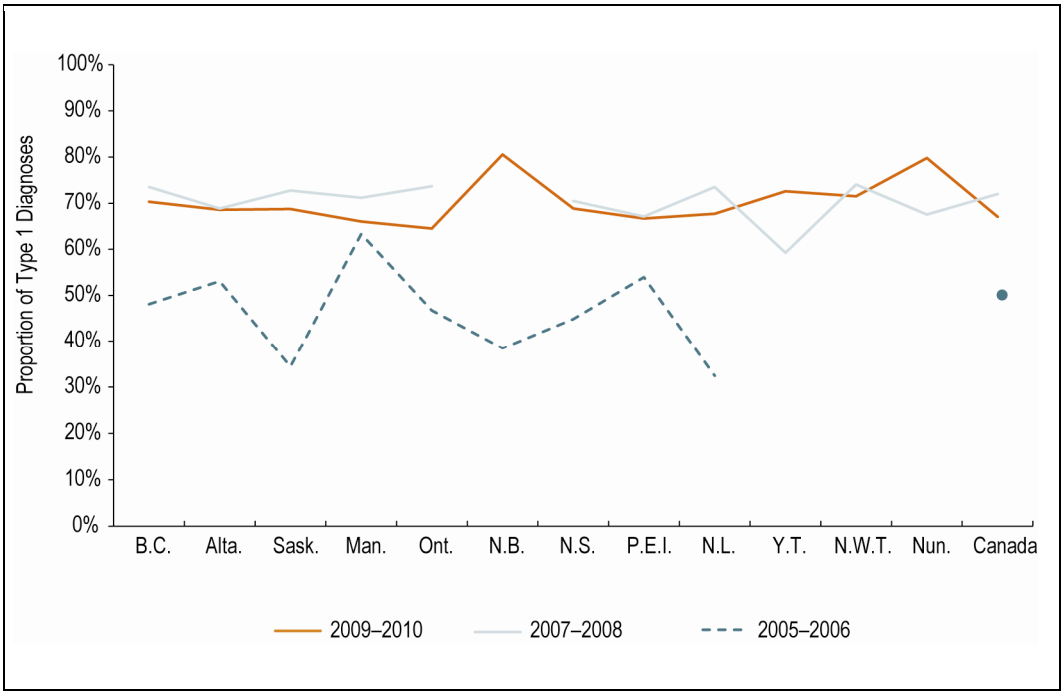
Figure 25: Agreement on Diagnosis Typing for Pre-Admit Comorbidities (Type 1), by Province/Territory



Note
I: 95% confidence interval.
Source
Canadian Institute for Health Information, 2012.

More variation was observed in the year-over-year analysis of the typing of pre-admit comorbidities than for the typing of the most responsible diagnosis (Figure 26). The national estimate for agreement on the typing of pre-admit comorbidities was 75% in 2009–2010, compared with 84% in 2007–2008 and 74% in 2005–2006.

Figure 26: Year-Over-Year Trend: Agreement on Typing for Pre-Admit Comorbidities (Type 1)

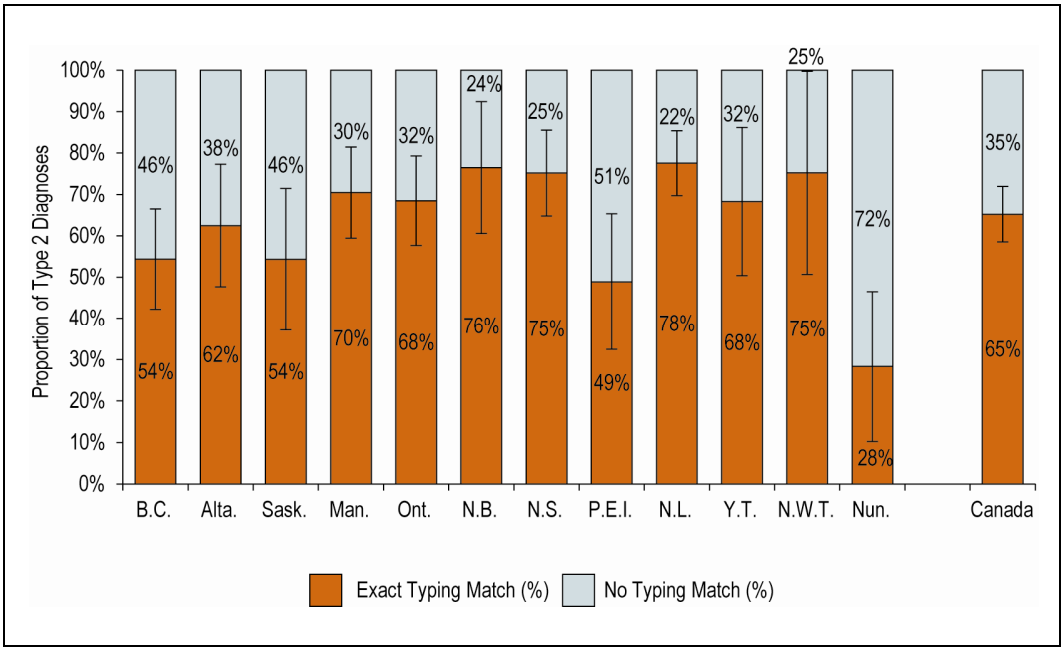


Source
Canadian Institute for Health Information, 2012.

3.4.3 Consistency of Diagnosis Typing: Post-Admit Comorbidities

The consistency of diagnosis typing for post-admit comorbidities varied across the country, from 36% (Nunavut) to 68% (B.C.) to 91% (Nova Scotia), as shown in Figure 27. Wider confidence intervals were noted in this analysis.

Figure 27: Agreement on Diagnosis Typing for Post-Admit Comorbidities (Type 2), by Province/Territory



Note

I: 95% confidence interval.

Source

Canadian Institute for Health Information, 2012.

Even more variation was observed in the year-over-year analysis of the typing of post-admit comorbidities than for the pre-admit comorbidities (Figure 28). This variation produced very similar national estimates of agreement in all three years: 77% in 2009–2010, 80% in 2007–2008 and 76% in 2005–2006.

Figure 28: Year-Over-Year Trend: Agreement on Typing for Post-Admit Comorbidities (Type 2)

Notes

* The high variance for this estimate arose from a small number of records that differed from the mean and had large study design weights.

There was an insufficient sample of type 2 diagnoses in the Northwest Territories for this analysis.

Source

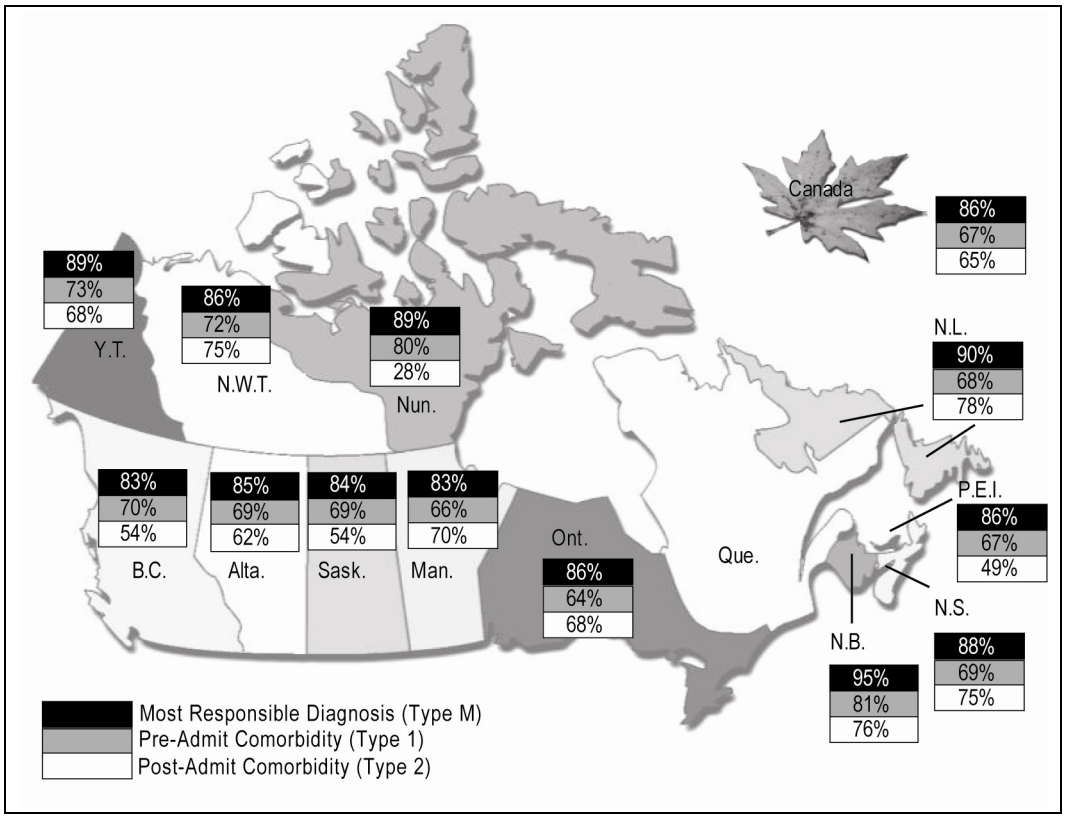
Canadian Institute for Health Information, 2012.

3.4.4 Summary of Diagnosis Typing

Although the specificity of diagnosis typing presented some challenges, the identification of the diagnoses that significantly affected the patient's length of stay and resource use was well-reported: 96% for most responsible diagnosis, 85% for pre-admit comorbidities and 90% for post-admit comorbidities. There existed some uncertainty about whether a significant diagnosis was a pre-admit comorbidity or the diagnosis most responsible for the patient's stay in hospital, or whether the pre-admit comorbidity contributed to the patient's acute care stay. There was also some uncertainty about whether a significant diagnosis was present prior to admission (pre-admit comorbidity) or after admission (post-admit comorbidity). There was some variation in the typing of diagnoses across the provinces and territories.

Figure 29 summarizes the results for the diagnosis typing agreement across the country.

Figure 29: Summary of Diagnosis Typing Agreement, by Jurisdiction



Source
Canadian Institute for Health Information, 2012.

3.5 Summary of Findings for the Quality of DAD Data

Tables 18 and 19 summarize the overall and provincial- and territorial-level results for 2009–2010. Note that some jurisdictions showed significantly different results than the national average for specific statistics.

Cells shaded in dark green show where provincial or territorial results were significantly higher ($p<0.05$) than the national average. Cells shaded in dark orange show where provincial or territorial results were significantly lower ($p<0.05$) than the national average.

Table 18: Summary of Findings for the Coding Quality for Significant Diagnoses in 2009–2010

	Metric	Optimal Value	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	P.E.I.	N.L.	Y.T.	N.W.T.	Nun.	Can.
Diagnoses Recorded During Chart Review That Were Present in DAD	Percentage	100	75.4	80.4	77.2	75.1	79.7	87.8	86.7	84.7	80.2	85.3	76.3	89.8	79.2
	(95% CI)		(72–79)	(78–83)	(74–80)	(72–78)	(76–83)	(85–90)	(84–89)	(82–88)	(77–83)	(83–88)	(73–80)	(87–92)	(77–81)
Diagnoses Reported to DAD That Were Confirmed in Chart Review	Percentage	100	85.6	84.2	85.7	86.5	82.9	93.0	86.5	85.6	85.8	87.4	87.1	90.4	84.4
	(95% CI)		(83–88)	(81–87)	(83–88)	(84–89)	(80–86)	(91–95)	(84–89)	(83–88)	(84–88)	(85–90)	(84–90)	(88–93)	(83–86)
Consistency of ICD-10-CA Coding															
Agreement on the ICD-10-CA Code Used to Describe the Significant Diagnosis															
ICD-10-CA Code Match	Percentage	100	87.5	89.1	86.0	88.7	89.8	91.1	88.7	88.5	86.8	89.2	82.4	90.2	89.0
	(95% CI)		(85–90)	(87–91)	(83–89)	(86–91)	(88–92)	(89–93)	(86–91)	(86–91)	(85–89)	(87–91)	(79–86)	(88–92)	(88–90)
ICD-10-CA Category Match	Percentage	100	94.2	97.0	92–3	96.5	94.9	96.2	95.4	95.0	94.6	94.2	92.2	95.9	95.1
	(95% CI)		(92–96)	(96–98)	(90–94)	(95–98)	(93–96)	(95–98)	(94–97)	(93–97)	(93–96)	(93–96)	(90–94)	(94–98)	(94–96)
Consistency in Diagnosis Typing	Percentage	100	75.3	76.0	76.0	75.5	74.7	89.2	79.4	76.4	80.7	80.2	80.9	83.4	75.9
Reabstractor Diagnosis Type Matched Diagnosis Type in DAD	(95% CI)		(72–79)	(72–80)	(73–79)	(72–79)	(71–78)	(87–92)	(76–82)	(73–80)	(78–83)	(77–84)	(78–84)	(80–86)	(74–78)

Table 18: Summary of Findings for the Coding Quality for Significant Diagnoses in 2009–2010 (cont'd)

	Metric	Optimal Value	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	P.E.I.	N.L.	Y.T.	N.W.T.	Nun.	Can.
Reliability of ICD-10-CA Code of Most Responsible Diagnosis (MRDx)															
Abstracts Where the Reabstractors Agreed on the Code Assigned to MRDx															
ICD-10-CA Code Match	Percentage	100	72.2	74.2	71.7	75.3	77.0	86.4	79.0	75.3	75.3	76.8	70.8	80.6	75.7
	(95% CI)		(68–77)	(70–79)	(68–76)	(71–80)	(73–81)	(83–90)	(75–83)	(71–79)	(72–79)	(73–81)	(67–75)	(77–84)	(73–78)
ICD-10-CA Category Match	Percentage	100	79.0	83.2	77.2	81.5	81.4	92.0	85.0	81.5	84.7	83.0	80.2	86.3	81.6
	(95% CI)		(74–83)	(80–87)	(73–81)	(78–85)	(77–85)	(89–95)	(82–88)	(78–85)	(82–87)	(79–87)	(77–84)	(83–90)	(80–84)

Notes

CI: confidence interval.

Cells shaded in grey show the national average.

Cells shaded in dark teal show where provincial or territorial results were significantly higher ($p<0.05$) than the national average.

Cells shaded in dark orange show where provincial or territorial results were significantly lower ($p<0.05$) than the national average.

Source

Canadian Institute for Health Information, 2012.

Table 19: Summary of Findings for the Coding Quality for Interventions in 2009–2010

	Metric	Optimal Value	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	P.E.I.	N.L.	Y.T.	N.W.T.	Nun.	Can.
Interventions Recorded in Chart Review That Were Present in DAD	Percentage	100	90.1	90.2	92.9	87.9	86.3	95.0	96.4	96.1	87.2	93.1	86.9	96.7	88.3
	(95% CI)		(87–94)	(87–93)	(90–96)	(84–92)	(82–91)	(92–98)	(95–98)	(94–98)	(84–91)	(90–96)	(82–92)	(94–99)	(86–91)
Interventions Reported to DAD and Confirmed in Chart Review	Percentage	100	95.7	97.0	96.4	97.4	94.7	97.5	97.0	97.3	94.9	96.6	97.8	96.2	95.5
	(95% CI)		(94–98)	(96–99)	(94–98)	(96–99)	(92–97)	(96–99)	(95–99)	(95–99)	(92–97)	(94–99)	(96–100)	(92–100)	(94–97)
Consistency of CCI Coding															
Agreement on the CCI Code Used to Describe the Intervention															
CCI Code Match	Percentage	100	92.1	92.8	90.9	84.3	91.3	89.9	94.2	91.2	89.0	93.5	88.9	97.1	91.4
	(95% CI)		(89–95)	(89–96)	(88–94)	(80–89)	(88–94)	(86–94)	(92–96)	(88–95)	(86–92)	(90–96)	(85–93)	(95–100)	(90–93)
CCI Rubric Match	Percentage	100	97.9	98.7	95.8	94.3	96.1	96.6	98.8	94.9	93.9	97.4	95.8	98.8	96.8
	(95% CI)		(97–99)	(98–100)	(94–98)	(92–97)	(94–98)	(94–99)	(98–100)	(92–98)	(91–97)	(95–99)	(93–98)	(97–100)	(96–98)

Notes

CI: confidence interval.

Cells shaded in grey show the national average.

Cells shaded in dark teal show where provincial or territorial results were significantly higher ($p<0.05$) than the national average.

Cells shaded in dark orange show where provincial or territorial results were significantly lower ($p<0.05$) than the national average.

Source

Canadian Institute for Health Information, 2012.

Chapter 4: Quality of Coding for Selected Health Conditions

This chapter focuses on the study's third objective:

- Evaluate the quality of coding at a national level for the following selected health conditions and interventions: drug-resistant micro-organisms, palliative care, pneumonia, post-admit comorbidities, obstetrical trauma, birth trauma, post-intervention conditions, flagged interventions, intervention pre-admit flag and diagnosis prefixes 5 and 6.
- Appendix A contains details on the methodology used to identify hospitalizations for each of the health conditions and interventions examined.

4.1 Infections Due to Drug-Resistant Micro-Organisms

Infections due to drug-resistant micro-organisms are a topic of high public interest. The costs associated with the drug-resistant organism methicillin-resistant Staphylococcus aureus (MRSA) in Canadian hospitals have been pegged as high as $59 million annually. A study found that patients infected with a drug-resistant organism stay 2.5 times longer than uninfected patients.[9]

The most common examples of drug-resistant micro-organisms include MRSA and vancomycin-resistant enterococci (VRE).[5]

The Canadian Coding Standards state that when there is documentation of a current infection due to a drug-resistant organism, it is mandatory to code all of

- The site of the infection, as a comorbid diagnosis type;
- The infectious organism, from categories B95–B97 *Bacterial, viral and other infectious agents*, as a diagnosis type (3), when it is not included in the combination code; and
- The drug resistance from the range of codes U82.– *Resistance to betalactam antibiotics* to U85 *Resistance to antineoplastic drugs,* as a comorbid diagnosis type (1) or type (2).[5]

Seventy-four percent of hospitalizations for which drug resistance (U82 to U85) was reported in the DAD were confirmed in the chart review (Table 20).

Table 20: Quality of Coding of Drug-Resistant Micro-Organisms: DAD Hospitalizations

		Confirmed in Chart Review	95% CI
DAD Hospitalizations: Drug-Resistant Micro-Organisms	8,059	73.7	(69–78)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

For the drug-resistant micro-organisms that are identified by ICD-10-CA codes U82 to U85 that were reported in the DAD and recorded in the chart review, there was 92% agreement on the ICD-10-CA codes used. This analysis examined the exact match, up to four characters (Table 21).

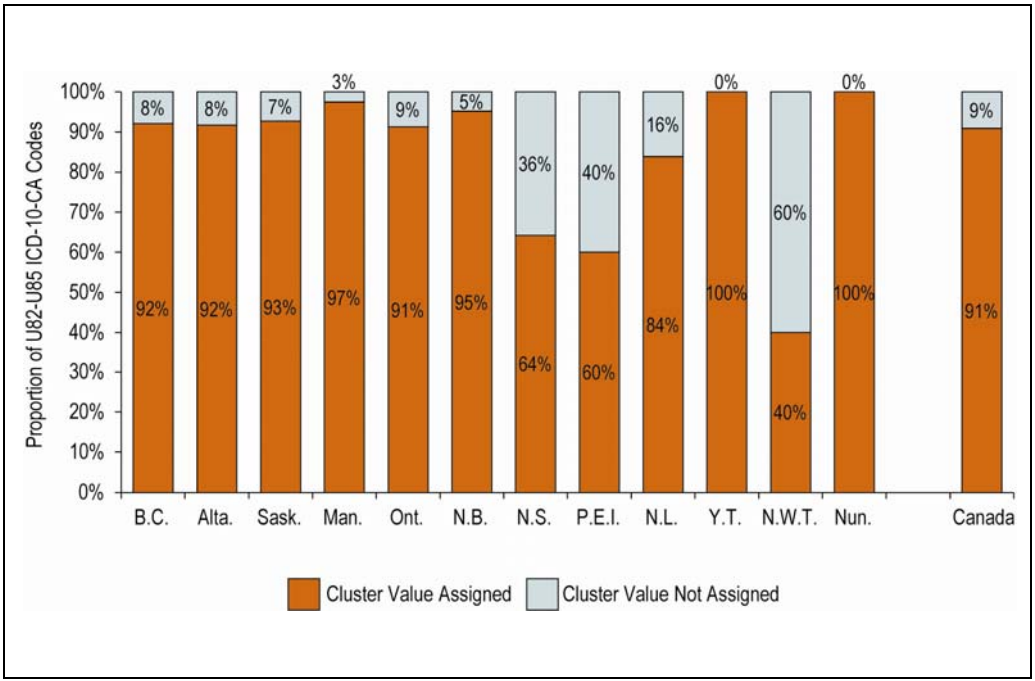
Table 21: Quality of Coding of Drug-Resistant Micro-Organisms: ICD-10-CA Codes

		Agreement on ICD-10-CA Code	95% CI
Drug-Resistant Micro-Organisms	6,042	91.9	(87–96)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

The data element diagnosis cluster was new in the DAD for 2009–2010. A diagnosis cluster is a character assigned to two or more diagnoses when more than one code is needed to describe a circumstance or condition. Effective April 1, 2009, the assignment of a diagnosis cluster became mandatory for infections due to drug-resistant micro-organisms and post-intervention conditions. Figure 30 examines the proportion of drug-resistant micro-organisms identified by the presence of U82 to U85 reported in the DAD that included the mandatory cluster value. Nationally, 91% of the U82 to U85 codes were reported with the mandatory cluster in the DAD. The use of the cluster value varied across the country from 40% (Northwest Territories) and 64% (Nova Scotia) to 95% (New Brunswick) and 100% (Nunavut).

Figure 30: Quality of Assigning the Diagnosis Cluster With Drug-Resistant Micro-Organisms



Source
Canadian Institute for Health Information, 2012.

4.2 Palliative Care

Palliative care is an approach that improves the quality of life of patients and their families who are facing problems associated with life-threatening illness, through the prevention and relief of suffering.[6]

Accurate coding of palliative care is important to many uses of the data, including indicators on health care outcomes. In 2006–2007, an interim CIHI guideline was released that required the code Z51.5 *Palliative Care* to be abstracted when a patient with a terminal illness was receiving palliative care. Since then, CIHI has released comprehensive coding directives for palliative care, including definitions and examples.[8] Palliative care was also studied in CIHI's data quality study of the 2007–2008 DAD.[3]

Ninety-six percent of hospitalizations for which palliative care was reported as a significant diagnosis type in the DAD were confirmed in the chart review. Of the hospitalizations with palliative care recorded in the chart review, 81% were reported in the DAD (Table 22). This table also shows that these 2009–2010 results were as good as those produced in the 2007–2008 study, even though there was almost a twofold increase in the volume of patients with palliative care in the DAD in this most recent year.

Table 22: Quality of Coding of Palliative Care: Hospitalizations

	Volume of Hospitalizations	DAD Hospitalizations		Chart Review Hospitalizations	
		Confirmed in Chart Review	95% CI	Present in DAD	95% CI
Hospitalizations for Patients Receiving Palliative Care: 2009–2010*	60,984	96.4	(95–98)	81.2	(73–89)
Hospitalizations for Patients Receiving Palliative Care: 2007–2008†	38,681	92.8	(91–95)	76.1	(72–80)

Notes

* Includes diagnosis types M, 1, W, X and Y.

† Includes diagnosis types M, 1, 2, W, X and Y.

CI: confidence interval.

Source

Canadian Institute for Health Information, 2012.

Table 23 examines the diagnosis typing for patients receiving palliative care. Of the patients receiving palliative care reported in the DAD, there was 82% agreement in the chart review that the palliative care was the most responsible diagnosis. A further 16% of these most responsible diagnoses were recorded as pre-admit comorbidities in the chart review. For palliative care reported as a pre-admit comorbidity (type 1) in the DAD, 86% were confirmed as type 1 in the chart review and 12% were recorded as the most responsible diagnosis. These results demonstrate discrepancies in assignment of palliative care as the most responsible diagnosis or pre-admit comorbidity.

Table 23: Quality of Coding of Palliative Care: Diagnosis Typing

DAD	Volume of Codes	Chart Review Percentage (95% CI)		
		Most Responsible Diagnosis (Type M)	Pre-Admit Comorbidity (Type 1)	Service Transfer Diagnosis (Type W, X or Y)
Most Responsible Diagnosis (Type M)	20,003	81.7 (78–85)	15.8 (12–19)	2.5 (1–4)
Pre-Admit Comorbidity (Type 1)	26,075	11.7 (9–15)	85.6 (82–89)	2.7 (1–5)
Service Transfer Diagnosis (Type W, X or Y)	13,352	6.6 (4–10)	16.7 (9–25)	76.7 (69–85)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

The new prefix value 8 was introduced in 2009–2010 to be assigned to the ICD-10-CA code Z51.5 *Palliative Care* when palliative care was documented as a known component of the patient's care plan prior to arrival at the hospital.[5]

For those patients reported in the DAD for whom palliative care was part of their care plan prior to arrival at the hospital, that is Z51.5 was coded with prefix 8, 83% were confirmed in the chart review as having this in their pre-admit care plan. Similarly, for those patients reported in the DAD without palliative care as part of their pre-admit care plan, 87% were recorded in the chart review without prefix 8 (Table 24).

Table 24: Quality of Coding of Palliative Care: Diagnosis Prefix

DAD Palliative Care*	Volume of Codes	Chart Review Palliative Care* Percentage (95% CI)	
		Prefix 8	No Prefix 8
Prefix 8	14,970	83.3 (80–87)	16.7 (13–20)
Without Prefix 8	44,113	12.5 (10–15)	87.5 (85–90)

Notes
* Z51.5 as type M, 1, W, X or Y.
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

4.3 Pneumonia

Pneumonia is a condition characterized by the inflammation of the lung. There are two main kinds of pneumonia, as determined by lung involvement: either an entire lobe of a lung is inflamed (lobar pneumonia) or the inflammation is scattered throughout the lungs (bronchopneumonia).[5]

This analysis examined the following coding of pneumonia: 1) influenza and pneumonia as the most responsible diagnosis; 2) bacterial, unspecified and aspiration pneumonia as a post-admit comorbidity; and 3) bacterial, unspecified and aspiration pneumonia as significant diagnosis type other than post-admit comorbidity. The methodology detailing each of these can be found in Appendix A. Eighty-one percent of hospitalizations for patients with influenza and pneumonia as the most responsible diagnosis reported in the DAD were confirmed in the chart review, whereas 87% of these same types of hospitalizations recorded in the chart review were present in the DAD. Almost 90% of hospitalizations for bacterial, unspecified and aspiration pneumonia as a significant diagnosis type other than post-admit comorbidity were confirmed in the chart review. For the hospitalizations for bacterial, unspecified and aspiration pneumonia that presented post-admission, lower agreement rates were noted: 73% of the DAD hospitalizations were confirmed in the chart review, and 58% of these post-admit hospitalizations recorded in the chart review were present in the DAD (Table 25).

Table 25: Quality of Coding of Pneumonia: Hospitalizations

	Volume of Hospitalizations	DAD Hospitalizations		Chart Review Hospitalizations	
		Confirmed in Chart Review	95% CI	Present in DAD	95% CI
Influenza and Pneumonia (MRDx)	42,134	80.5	(76–85)	87.1	(76–99)
Bacterial, Unspecified and Aspiration Pneumonia (Type 2)	8,290	73.1	(68–78)	58.0	(41–75)
Bacterial, Unspecified and Aspiration Pneumonia (Type M, 1, W, X or Y)	85,973	88.4	(86–91)	88.9	(81–97)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

As shown in Table 26, the analysis of the coding consistency for pneumonia revealed that there was 73% agreement on the exact ICD-10-CA code used to describe influenza and pneumonia as the most responsible diagnosis, 82% agreement for bacterial, unspecified and aspiration pneumonia as a post-admit comorbidity and 78% agreement for the bacterial, unspecified and aspiration pneumonia as a significant diagnosis type other than post-admit comorbidity.

Table 26: Quality of Coding of Pneumonia: ICD-10-CA Code

	Volume of Codes	Agreement on ICD-10-CA Code	95% CI
Influenza and Pneumonia (MRDx)	40,852	72.9	(68–78)
Bacterial, Unspecified and Aspiration Pneumonia (Type 2)	7,211	81.5	(75–88)
Bacterial, Unspecified and Aspiration Pneumonia (Type M, 1, W, X or Y)	80,747	77.9	(75–81)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

Table 27 examines the agreement on selection of influenza and pneumonia as the most responsible diagnosis in the DAD. Eighty-six percent matched on the most responsible diagnosis in the chart review; a further 13% were typed as pre-admit comorbidities in the chart review.

Table 27: Quality of Coding of Pneumonia: Agreement on Typing for Influenza and Pneumonia (Most Responsible Diagnosis)

DAD Diagnosis Type	Volume of Codes	Diagnosis Type in Chart Review Percentage (95% CI)				
		Most Responsible Diagnosis (Type M)	Pre-Admit Comorbidity (Type 1)	Post-Admit Comorbidity (Type 2)	Proxy Most Responsible Diagnosis (Type 6)	Service Transfer Diagnosis (Type W, X or Y)
Influenza and Pneumonia (MRDx)	40,783	85.5 (81–90)	13.2 (9–17)	n/a	1.2 (0–3)	0.1 (0–0)

Notes
CI: confidence interval.
n/a: no sample available for analysis.
Source
Canadian Institute for Health Information, 2012.

A similar analysis on diagnosis typing was performed on the bacterial, unspecified and aspiration pneumonia. Generally, there was 85% to 90% agreement on the diagnosis types for these pneumonia codes (Table 28). The disagreement in diagnosis typing was observed in two scenarios: 1) between the most responsible diagnosis (type M) and the pre-admit comorbidity (type 1) in both the DAD and the chart review; and 2) in distinguishing whether the pneumonia met the definition of a pre-admit comorbidity (type 1) or post-admit comorbidity (type 2). This result for diagnosis typing disagreement for these pneumonias was also observed generally for significant diagnoses in Section 3.4.

Table 28: Quality of Coding of Pneumonia: Agreement on Typing for Bacterial, Unspecified and Aspiration Pneumonia (Significant Types)

DAD Diagnosis Type	Volume of Codes	Diagnosis Type in Chart Review Percentage (95% CI)				
		Most Responsible Diagnosis (Type M)	Pre-Admit Comorbidity (Type 1)	Post-Admit Comorbidity (Type 2)	Proxy Most Responsible Diagnosis (Type 6)	Service Transfer Diagnosis (Type W, X or Y)
Bacterial, Unspecified and Aspiration Pneumonia (Type M)	41,840	85.4 (81–89)	13.6 (10–18)	n/a	1.0 (0–2)	0.1 (0–0)
Bacterial, Unspecified and Aspiration Pneumonia (Type 1)	38,793	7.7 (5–11)	88.4 (85–92)	3.9 (2–6)	n/a	n/a
Bacterial, Unspecified and Aspiration Pneumonia (Type 2)	7,211	2.4 (1–4)	7.3 (4–10)	90.3 (87–94)	n/a	n/a
Bacterial, Unspecified and Aspiration Pneumonia (Type W, X or Y)	114	13.2 (0–39)	n/a	n/a	n/a	86.8 (61–100)

Notes
CI: confidence interval.
n/a: no sample available for analysis.
Source
Canadian Institute for Health Information, 2012.

4.4 Post-Admit Comorbidities, Obstetrical Trauma and Birth Trauma

Comorbidities are health conditions, beyond the most responsible diagnosis, that play a significant role in the care provided and resources used during a patient's hospital stay. The inclusion of comorbidities on the DAD abstract makes for a richer source of health information. A post-admit comorbidity is a condition that arose post-admission, was assigned an ICD-10-CA code and satisfied the requirements for determining comorbidity.

Certain post-admit comorbidities of interest were selected for this year's study, including urinary tract infections and post-admit comorbidities present in CIHI's comorbidity factor code list. ICD-10-CA diagnoses on the comorbidity factor code list have been demonstrated, through analysis of cost and activity data, to increase resource use (costs and/or lengths of stay) by 25% or more.

Obstetrical trauma is one of the most commonly reported adverse events; it occurs to the mother during the birthing process. Obstetrical trauma includes third- or fourth-degree perineal lacerations; laceration of the cervix, vaginal wall or sulcus; and injury to the bladder or urethra. It can also be identified if a procedure to repair obstetric lacerations of the uterus, cervix, corpus uteri, bladder, urethra, rectum and/or sphincter after childbirth was performed.

Birth trauma refers to when newborns suffer injuries to their scalps or nervous systems, or when they experience a skull fracture during the birthing process.

Table 29 presents the results for the quality of coding of hospitalizations with post-admit comorbidities, obstetrical trauma and birth trauma. Eighty-two percent of hospitalizations where a post-admit comorbidity on the comorbidity factor code list was reported in the DAD were confirmed in the chart review. Also, 62% of hospitalizations where a post-admit comorbidity on the comorbidity factor code list was recorded in the chart review were present in the DAD. Of the urinary tract infections that were reported as post-admission in the DAD, 81% were confirmed in the chart review; however, 61% of the urinary tract infections recorded in the chart review were present in the DAD. More than two-thirds of the obstetrical trauma and birth trauma reported in the DAD as most responsible diagnosis or a pre-admit comorbidity were confirmed in the chart review.

Table 29: Quality of Coding of Post-Admit Comorbidities, Obstetrical Trauma and Birth Trauma: Hospitalizations

	Volume of Hospitalizations	DAD Hospitalizations		Chart Review Hospitalizations	
		Confirmed in Chart Review	95% CI	Present in DAD	95% CI
Comorbidity Factor Code List	105,736	81.6	(79–84)	62.2	(54–70)
Urinary Tract Infections	13,073	81.0	(76–86)	61.0	(51–71)
Obstetrical Trauma	3,001	70.9	(61–81)	—	—
Birth Trauma	2,526	73.2	(64–83)	—	—

Notes

CI: confidence interval.

— Insufficient sample available for analysis.

Source

Canadian Institute for Health Information, 2012.

For coding consistency using ICD-10-CA, there was 99% agreement on the exact codes used to describe urinary tract infections and 86% to 87% agreement for obstetrical and birth trauma and for post-admit comorbidities on the comorbidity factor code list (Table 30).

Table 30: Quality of Coding of Post-Admit Comorbidities, Obstetrical Trauma and Birth Trauma: ICD-10-CA Code

	Volume of Codes	Agreement on ICD-10-CA Code	95% CI
Comorbidity Factor Code List	134,081	87.3	(86–89)
Urinary Tract Infections	11,520	99.2	(98–100)
Obstetrical Trauma	2,309	86.1	(77–95)
Birth Trauma	2,006	86.6	(78–95)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

The agreement on diagnosis typing for the post-admit comorbidities on the comorbidity factor code list confirmed that 90% of these were recorded as post-admit diagnoses in the chart review. Nine percent were typed as being present prior to admission (Table 31).

Table 31: Quality of Coding of Comorbidity Factor Code List: Agreement on Typing

		Diagnosis Type in Chart Review Percentage (95% CI)		
Diagnosis Type in DAD	**Volume of Codes**	Most Responsible Diagnosis (Type M)	Pre-Admit Comorbidity (Type 1)	Post-Admit Comorbidity (Type 2)
Post-Admit Comorbidity on Comorbidity Factor Code List (Type 2)	134,081	1.0 (0–2)	9.0 (7–10)	90.0 (88–92)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

4.5 Post-Intervention Conditions

A post-intervention condition is defined as a condition that arises within 30 days of an intervention (during a continuous episode of care) that is not attributable to another cause or a condition for which a cause-and-effect relationship is documented, regardless of the timeline. Conditions that arise *during* an intervention (intra-operative) and those that arise *following* an intervention (post-operative) are included in the definition.[14]

Significant changes to the classification of conditions that arise following an intervention were implemented in version 2009 of ICD-10-CA and the Canadian Coding Standards. The classification of a post-intervention condition requires a minimum of two ICD-10-CA codes: a primary code—either T80–T88 *Complications of surgical and medical care, not elsewhere classified* (T-code) or a post-procedural disorder code found in most body system chapters (PP-code) or a regular code (the usual code in the classification)—and an external cause code from Y60–Y84.[5] In addition, a diagnosis cluster value must be assigned to the set of codes used to describe the post-intervention condition.

In this reabstraction study, several categories of post-intervention conditions were examined. They were identified by the presence of an ICD-10-CA external cause code (Y60–Y84), which identifies external causes of morbidity and mortality related to complications of medical and surgical care other than adverse effects of drugs in therapeutic use. For the abstract to be chosen for the study, the external cause code had to be present on the abstract and be assigned a cluster value, as well as have one of the following diagnosis codes (primary codes) with a significant diagnosis type present in this same cluster:

- Complication code (T-code): These codes range from T80–T88 and describe complications of surgical and medical care, not elsewhere classified.
- Post-procedural code (PP-code): Most body system chapters contain subcategories for conditions that occur either as a consequence of specific procedures or techniques or as a result of the removal of an organ. These conditions are classified to a post-procedural disorders category at the end of the body system chapter.
- Regular code (comorbidity factor code): A condition or symptom that meets the definition of post-intervention condition and is not assigned to either the injury chapter (T-code) or to a post-procedural disorders category (PP-code). The condition or symptom is on the comorbidity factor code list.
- Regular code (non-comorbidity factor code): A condition or symptom that meets the definition of post-intervention condition and is not assigned to either the injury chapter (T-code) or to a post-procedural disorders category (PP-code). The condition or symptom is **not** on the comorbidity factor code list.

Table 32 examines the quality of coding of the hospitalizations for patients experiencing a post-intervention condition. For the four types of primary codes described above, 87% of the complication codes (T-codes) reported in the DAD were confirmed in the chart review, and 73% to 75% of the post-procedural codes (PP-codes) and regular codes reported in the DAD were confirmed in the chart review. However, the agreement on the hospitalizations for these primary codes recorded in the chart review and present in the DAD was much lower: 29% (post-procedural codes) and 48% to 57% (regular codes and complication codes).

Table 32: Quality of Coding Primary Codes in Post-Intervention Conditions: Hospitalizations

	Volume of Hospitalizations	DAD Hospitalizations		Chart Review Hospitalizations	
		Confirmed in Chart Review	95% CI	Present in DAD	95% CI
Complication Code (T-Code)	64,571	86.6	(83–90)	51.6	(38–66)
Post-Procedural Code (PP-Code)	21,405	72.8	(64–81)	29.3	(11–48)
Regular Code (Comorbidity Factor Code)	30,973	75.2	(69–81)	56.7	(44–70)
Regular Code (Non-Comorbidity Factor Code)	48,313	73.1	(68–78)	48.1	(37–59)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

The consistency of the coding of the primary codes in post-intervention conditions is examined in Table 33. Generally, the agreement on the selection of the exact ICD-10-CA code for the four types of primary codes was 78% to 87% in the chart review.

Table 33: Quality of Coding of Primary Codes in Post-Intervention Conditions: ICD-10-CA Code

	Volume of Codes	Agreement on ICD-10-CA Code	95% CI
Complication Code (T-Code)	62,893	87.3	(84–90)
Post-Procedural Code (PP-Code)	18,257	81.6	(75–88)
Regular Code (Comorbidity Factor Code)	38,193	84.5	(79–90)
Regular Code (Non-Comorbidity Factor Code)	44,542	78.0	(73–84)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

Table 34 examines the agreement on diagnosis typing for all four types of primary codes in post-intervention conditions. The agreement rate for the most responsible diagnosis and post-admit comorbidity was 96% in the chart review. The agreement rate of the primary code as a pre-admit comorbidity was much lower, at 66%, with most of these typed as the most responsible diagnosis in the chart review.

Table 34: Quality of Coding of Post-Intervention Conditions: Agreement on Diagnosis Typing (All Primary Codes)

Diagnosis Type in DAD	Volume of Codes	Diagnosis Type in Chart Review Percentage (95% CI)		
		Most Responsible Diagnosis (Type M)	Pre-Admit Comorbidity (Type 1)	Post-Admit Comorbidity (Type 2)
Most Responsible Diagnosis (Type M)	42,582	95.9 (94–98)	2.7 (1–4)	1.3 (0–3)
Pre-Admit Comorbidity (Type 1)	13,026	27.0 (16–38)	65.8 (55–76)	7.3 (2–13)
Post-Admit Comorbidity (Type 2)	107,508	1.0 (0–2)	3.5 (2–5)	95.6 (94–97)

Note

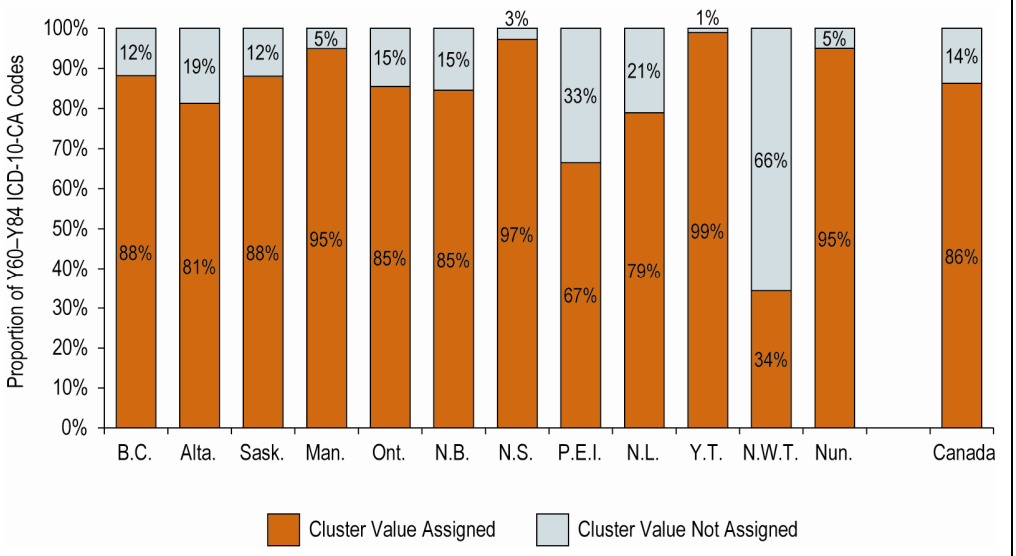
CI: confidence interval.

Source

Canadian Institute for Health Information, 2012.

As a reminder, a post-intervention condition is identified by the presence of an external cause code (Y60–Y84). In keeping with the Canadian Coding Standards, the external cause code must be assigned a cluster value and the primary code assigned the same cluster value as the external cause code to which it relates. Figure 31 examines the assignment of the mandatory cluster value with the external cause codes (Y60–Y84) in the entire DAD for 2009–2010, independent of the chart review. Nationally, 86% of the external cause codes in the DAD included the mandatory cluster value. Across the country, the presence of the cluster value ranged from 34% (Northwest Territories) and 67% (P.E.I.) to 97% (Nova Scotia) and 99% (Yukon) of the external cause codes in the DAD.

Figure 31: Quality of Assigning the Diagnosis Cluster With Post-Intervention Conditions in the DAD



Source
Canadian Institute for Health Information, 2012.

4.6 Flagged Interventions

In the CMG+ methodology, there are 16 categories of interventions that are identified as flagged interventions, representing approximately 150 CCI codes. These flagged interventions are used to identify patients who are more complex and resource-intensive than similar patients who have not required these interventions. While the interventions may not necessarily be expensive on their own, they are indicative of patients with higher expected resource use and are therefore used to adjust CMG+ resource indicators. For 2009, two new categories were added to the flagged intervention list: non-invasive biopsy and per orifice endoscopy.[15]

Several categories of flagged interventions were selected as a focus in this reabstraction study: non-invasive biopsy, per orifice endoscopy, tracheostomy, feeding tube, mechanical ventilation (long) and mechanical ventilation (short). These categories were chosen for inclusion in the

reabstraction study because of their significant impact on cost and/or because they were among the most frequently recorded in the chart.

Table 35 presents the results for quality of coding of hospitalizations where patients received a flagged intervention. Generally, the flagged interventions studied were well-reported in the DAD. Between 95% and 98% of the non-invasive biopsies, feeding tubes, and short and long mechanical ventilations reported in the DAD were confirmed in the chart review. Per orifice endoscopies and tracheostomies were confirmed in the chart review for 88% and 85%, respectively, of the DAD hospitalizations. From 80% to 93% of these flagged interventions recorded in the chart review were present in the DAD.

Table 35: Quality of Coding of Flagged Interventions: Hospitalizations

	Volume of Hospitalizations	DAD Hospitalizations		Chart Review Hospitalizations	
		Confirmed in Chart Review	95% CI	Present in DAD	95% CI
Non-Invasive Biopsy	55,727	97.6	(96–99)	87.4	(79–96)
Per Orifice Endoscopy	72,804	88.1	(85–91)	86.4	(79–94)
Tracheostomy	4,104	84.5	(77–92)	—	—
Feeding Tube	7,534	95.4	(92–99)	93.1	(84–100)
Mechanical Ventilation (Long)	18,526	96.5	(94–98)	79.6	(61–98)
Mechanical Ventilation (Short)	53,670	94.5	(93–97)	92.8	(87–98)

Notes

CI: confidence interval.

— Insufficient sample available for analysis.

Source

Canadian Institute for Health Information, 2012.

The coding consistency of these flagged interventions is examined in Table 36. Generally, there was high agreement (90% to 99%) in the selection of the exact CCI code to describe non-invasive biopsy, per orifice endoscopy, and long and short mechanical ventilation. The agreement rates for tracheostomy and feeding tube were 84% and 81%, respectively.

Table 36: Quality of Coding of Flagged Interventions: CCI Code

		Procedure Present in DAD and Chart Review	
	Volume of Codes	Agreement on CCI Code	95% CI
Non-Invasive Biopsy	68,595	93.9	(92–96)
Per Orifice Endoscopy	74,219	89.9	(87–93)
Tracheostomy	3,882	83.6	(75–92)
Feeding Tube	7,711	80.8	(72–89)
Mechanical Ventilation (Long)	20,503	96.3	(94–98)
Mechanical Ventilation (Short)	52,598	99.2	(98–100)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

4.7 Intervention Pre-Admit Flag

The intervention pre-admit flag indicates that a service performed for the patient was initiated prior to admission and, in some cases, continued into the inpatient stay.[4] The pre-admit flag was a new DAD data element in 2009–2010.

This study focuses on the three types of interventions where it is mandatory to assign the pre-admit flag:

- Selected flagged interventions when they continue into the inpatient stay;
- Thrombolytic therapy; and
- Induction of labour.

Table 37 presents the results for the quality of coding of hospitalizations where an intervention of interest was initiated prior to admission (presence of the pre-admit flag). Eighty-six percent of pre-admit flags for selected flagged interventions reported in the DAD were confirmed in the chart review. Conversely, 58% of pre-admit flags for selected flagged interventions recorded in the chart review were present in the DAD. The pre-admit flags for thrombolytic therapy were well-reported in the DAD (94% confirmed in the chart review). About 88% of the pre-admit flags for induction of labour were confirmed in the DAD and the chart review.

Table 37: Quality of Coding of Intervention Pre-Admit Flag: Hospitalizations

	Volume of Hospitalizations	DAD Hospitalizations		Chart Review Hospitalizations	
		Confirmed in Chart Review	95% CI	Present in DAD	95% CI
Selected Flagged Interventions	17,634	88.6	(84–93)	57.8	(39–76)
Thrombolytic Therapy	4,286	93.8	(89–98)	—	—
Induction of Labour	16,431	87.3	(83–92)	88.4	(78–99)

Notes
CI: confidence interval.
— Insufficient sample available for analysis.
Source
Canadian Institute for Health Information, 2012.

Table 38 examines agreement on the presence of the pre-admit flag (that is, DAD pre-admit flag = yes), which confirms that the intervention was initiated prior to admission. Generally, most of the selected flagged interventions (91%), thrombolytic therapies (96%) and inductions of labour (90%) were confirmed in the chart review as being provided prior to admission to hospital.

Table 38: Quality of Coding of Intervention Pre-Admit Flag: Agreement on Intervention Pre-Admit Flag

DAD Intervention Pre-Admit Flag	Volume of Flags	Chart Review Pre-Admit Flag	
		Percentage (95% CI)	
		Yes	No
Selected Flagged Interventions	19,053	91.3 (85–98)	8.7 (2–15)
Thrombolytic Therapy	4,170	96.4 (93–100)	3.6 (0–7)
Induction of Labour	16,615	89.8 (86–94)	10.2 (6–14)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

4.8 Diagnosis Prefixes 5 and 6

Prefixes 5 and 6 were new in 2009–2010. Prefix 5 or 6 is attached to all post-admit comorbidities (diagnosis type 2) that are on the same abstract as one of the following qualifying interventions:[4]

- Location of intervention is main operating room (01);
- Location of intervention is cardiac catheterization room (08); or
- Location of intervention is out-of-hospital (OOH) facility for the following selected cardiac interventions:

- 3.IP.10.^^ Xray, heart with coronary arteries;
- 1.IJ.50.^^ Dilation, coronary arteries; and
- 1.IJ.57.^^ Extraction, coronary arteries.

Prefixes 5 and 6 describe the chronological relationship between the post-admit comorbidity and the patient's first visit to one of these locations.

Prefix 5 identifies a post-admit comorbidity that arose **after admission and before** the first qualifying intervention episode on the abstract.

Prefix 6 identifies a post-admit comorbidity that arose **during or after** the first qualifying intervention episode on the abstract.[4]

CIHI's analysis[10] has shown variation in the presence of prefixes 5 and 6 on qualifying cases. For hospitalizations where a post-admit comorbidity occurred after admission and **before** the qualifying intervention, 69% of the prefix 5s reported in the DAD were confirmed in the chart review (Table 39). For hospitalizations where a post-admit comorbidity occurred **during or after** the qualifying intervention, 93% of the prefix 6s were reported in the DAD and confirmed in the chart review. Fifty-nine percent of these prefix 6s recorded in the chart review were present in the DAD.

Table 39: Quality of Coding of Diagnosis Prefixes 5 and 6: Hospitalizations

	Volume of Hospitalizations	DAD Hospitalizations		Chart Review Hospitalizations	
		Confirmed in Chart Review	95% CI	Present in DAD	95% CI
Prefix 5	5,475	69.1	(62–76)	31.3*	(11–51)
Prefix 6	76,231	93.1	(91–95)	58.9	(46–72)

Notes

* Very wide confidence interval.

CI: confidence interval.

Source

Canadian Institute for Health Information, 2012.

Analysis of the agreement of the actual prefix used for a post-admit comorbidity is shown in Table 40. This analysis examined each occurrence of the prefix, rather than the hospitalization. Seventy percent of the prefix 5s in the DAD were confirmed in the chart review; 20% of the post-admit comorbidities with prefix 5 reported in the DAD were recorded in the chart review with no prefix. The agreement rate for prefix 6 in the DAD was very high, with confirmation in the chart review that the post-admit comorbidity occurred after the qualifying intervention.

Table 40: Quality of Coding of Diagnosis Prefixes 5 and 6: Agreement on Prefix Assignment

DAD Prefix	Volume of Prefixes	Chart Review Prefix Percentage (95% CI)		
		Agree on Prefix	Other Prefix	No Prefix
Prefix 5	6,752	70.4 (63–77)	10.2 (6–14)	19.3 (13–25)
Prefix 6	114,168	95.0 (93–97)	0.8 (0–1)	4.3 (3–6)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

Chapter 5: Quality of Case-Mix Grouping Variables

This fifth chapter focuses on the study's fourth objective:

- Assess the impact of any observed coding variations on measures of hospital outputs and resource indicators, as measured by CIHI's acute care grouping methodology, CMG+ 2009.

CIHI's 2009 case-mix grouping methodology, CMG+ 2009, is based on version 2009 of ICD-10-CA and CCI diagnosis and intervention data and cost data. Case-mix grouping methodologies categorize patients into statistically and clinically homogeneous groups based on this clinical and administrative data. Adjusting for patients of different levels of acuity forms the basis for health care organization comparisons and case mix–adjusted resource utilization (www.cihi.ca/casemix). Case Mix Group (CMG) resource indicators include expected length of stay (ELOS) and Resource Intensity Weight (RIW).

This analysis focuses on the CMG+ 2009 grouping methodology. The following tables and figures describe the impact of the DAD and chart review coding differences as they relate to case-mix variables. Note that three year trends are not presented for case-mix variables, as different grouping methodologies were used across the three study years and these results are therefore not comparable.

5.1 Major Clinical Category and Case Mix Group

There are 21 major clinical categories (MCCs) that identify either a body system or a specific type of clinical problem. The patient's most responsible diagnosis generally determines assignment to an MCC. Within each MCC, there is a surgical and medical partition for CMG assignment. CMGs categorize patients into clusters based on clinical diagnoses, interventions and resource utilization. Intervention CMGs are determined by the presence of an intervention on the CCI intervention partition list; otherwise, the case is assigned to the diagnosis partition.

Table 41 summarizes the agreement rates for MCCs and CMGs. Of the hospitalizations studied, 94% remained within the same MCC when grouped using the data obtained in the chart review. Similarly, 88% of the hospitalizations remained within the same CMG. These results were very similar to those found in the 2007–2008 reabstraction study of the DAD (96% MCC; 90% CMG) where data was grouped using the same CMG+ 2009 grouping methodology.

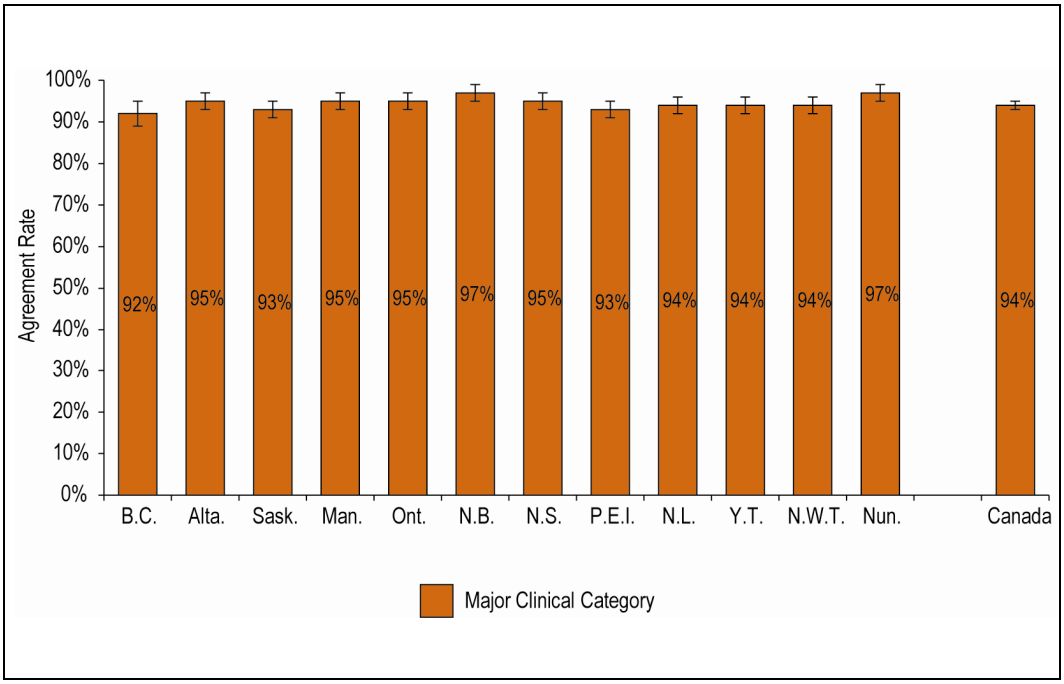
Table 41: Agreement Rates on Major Clinical Category and Case Mix Group

	Canada (95% CI)
Agreement Rate on Major Clinical Category	94.3 (93–95)
Agreement Rate on Case Mix Group	87.8 (86–89)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

Figure 32 provides a breakdown by province and territory of the changes observed in MCCs. From 92% (P.E.I.) to 97% (New Brunswick and Nunavut) of hospitalizations studied remained within the same MCC.

Figure 32: Agreement Rates on Major Clinical Category, by Province/Territory



Note

I: 95% confidence interval.

Source

Canadian Institute for Health Information, 2012.

Further analysis of the data revealed the MCCs with *high* agreement rates (Table 42) and with *low* agreement rates (Table 43) when compared with the data obtained in the chart review. More detailed analysis of agreement rates for MCCs can be found in Appendix B.

Table 42: Major Clinical Categories With High Agreement Rates

Grouping Based on DAD Data			Agreement Rate (95% CI)
Major Clinical Category	Volume in DAD	Percentage of All Cases	
14—Newborns and Neonates With Conditions Originating in the Perinatal Period	259,707	11.2%	100.0 (100–100)
13—Pregnancy and Childbirth	340,226	14.7%	99.7 (99–100)
12—D & D of the Female Reproductive System	84,824	3.7%	98.8 (98–100)
08—D & D of the Musculoskeletal System and Connective Tissue	120,140	5.2%	97.0 (95–99)
05—D & D of the Circulatory System	313,963	13.5%	96.6 (95–99)
03—D & D of the Ear, Nose, Mouth and Throat	38,228	1.6%	95.6 (92–99)
04—D & D of the Respiratory System	184,446	8.0%	94.8 (92–98)
01—D & D of the Nervous System	77,348	3.3%	93.8 (89–99)
19—Significant Trauma, Injury, Poisoning and Toxic Effects of Drugs	142,349	6.1%	93.5 (88–99)
17—Mental D & D	63,749	2.7%	92.9 (90–96)

Notes

To be included in this analysis, the study sample had to contain a minimum of 100 hospitalizations assigned to the major clinical category in the DAD data.

CI: confidence interval.

D & D: diseases and disorders.

Source

Canadian Institute for Health Information, 2012.

Table 43: Major Clinical Categories With Lower Agreement Rates

Grouping Based on DAD Data			Agreement Rate (95% CI)
Major Clinical Category	Volume in DAD	Percentage of All Cases	
15—D & D of the Blood and Lymphatic System	29,678	1.3%	58.5 (38–79)
16—Multisystemic or Unspecified Site Infections	26,968	1.2%	73.7 (58–89)
20—Other Reasons for Hospitalization	104,412	4.5%	83.0 (74–92)

Notes

To be included in this analysis, the study sample had to contain a minimum of 100 hospitalizations assigned to the major clinical category in the DAD data.

CI: confidence interval.

D & D: diseases and disorders.

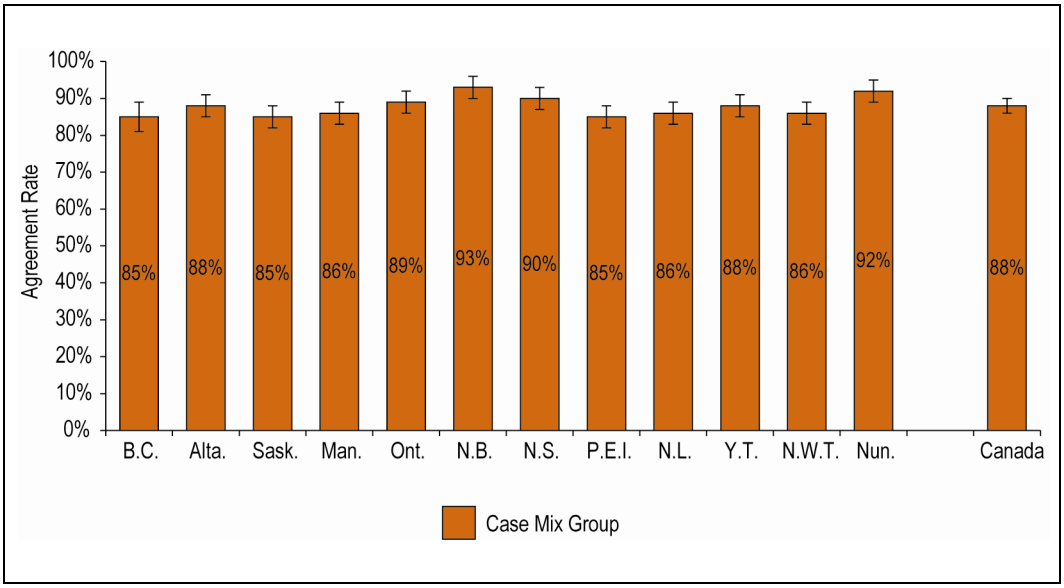
Agreement rates for all other MCCs were 90% or higher.

Source

Canadian Institute for Health Information, 2012.

Compared with the national agreement rate of 88% for hospitalizations that remained within the same CMG when grouped using the data obtained in the chart review, Figure 33 provides a breakdown by province and territory of the changes observed in CMGs. From 85% (P.E.I., Saskatchewan and B.C.) to 93% (New Brunswick) of hospitalizations studied remained within the same CMG.

Figure 33: Agreement Rates on Case Mix Group, by Province/Territory



Note

I: 95% confidence interval.

Source

Canadian Institute for Health Information, 2012.

Further analysis of the data revealed the CMGs with *high* agreement rates when compared with data obtained in the chart review (Table 44). There was insufficient sample size to be able to analyze the CMGs with *low* agreement rates. More detailed analysis of agreement rates for CMGs can be found in Appendix B.

Table 44: Case Mix Groups With High Agreement Rates

Grouping Based on DAD Data			Agreement Rate (95% CI)
Case Mix Group	Volume in DAD	Percentage of All Cases	
536—Caesarean Section With Previous Uterine Scar	39,144	1.7%	100.0 (100–100)
537—Primary Caesarean Section	55,847	2.4%	99.3 (99–100)
545—Vaginal Delivery, No Other Intervention	185,908	8.1%	99.1 (98–100)
557—Antepartum Disorder Treated Medically	17,737	0.8%	95.2 (89–100)
139—Chronic Obstructive Pulmonary Disease	35,773	1.6%	94.7 (92–98)
194—Myocardial Infarction/Shock/Arrest Without Cardiac Catheter	33,002	1.4%	94.2 (89–99)
138—Viral/Unspecified Pneumonia	78,061	3.4%	94.1 (89–99)
576—Normal Newborn, Singleton Vaginal Delivery	151,138	6.6%	92.2 (88–97)
810—Palliative Care	33,038	1.4%	91.3 (84–99)
196—Heart Failure Without Cardiac Catheter	47,227	2.1%	90.9 (81–100)

Notes

To be included in this analysis, the study sample had to contain a minimum of 100 hospitalizations assigned to the Case Mix Group in the DAD data.

CI: confidence interval.

Source

Canadian Institute for Health Information, 2012.

5.2 Comorbidity Level

CIHI's comorbidity level is intended to enhance the prediction of resource utilization in acute care. It identifies diagnoses in the DAD, over and above the main diagnoses, for which prolonged length of stay and/or more costly treatment could reasonably be expected. These additional diagnoses are then used to further subdivide a CMG into five subgroups. These subgroups contain a more homogeneous aggregation of patients with regards to length of stay and resource use than the CMG as a whole. There are six comorbidity levels:

- Level 0: no significant comorbidity
- Level 1: increase the case resources by 25% to 49%
- Level 2: increase the case resources by 50% to 74%
- Level 3: increase the case resources by 75% to 124%
- Level 4: increase the case resources by at least 125%
- Level 8: comorbidities do not apply or are not used in the CMG

Table 45 presents the agreement rates for all comorbidity levels when grouped using the data from the chart review. Ninety-four percent of the hospitalizations that were originally assigned to level 0 (no significant comorbidity) remained the same, as did 93% of the hospitalizations where a comorbidity was not applied (level 8). Comorbidity levels assigned to more complicated hospitalizations (levels 1 to 4) had lower agreement rates: 62% (level 3), 66% (level 2), 67% (level 1) and 75% (level 4). These findings were similar to the results of the 2007–2008 reabstraction study of the DAD.

Table 45: Agreement on Comorbidity Level Assigned to Hospitalizations

Comorbidity Level Using DAD Data	Canada (95% CI)
Level 0: No Significant Comorbidity	93.8 (92–95)
Level 1: Increase the Case Resources by 25%–49%	67.5 (63–72)
Level 2: Increase the Case Resources by 50%–74%	66.1 (62–70)
Level 3: Increase the Case Resources by 75%–124%	62.0 (58–66)
Level 4: Increase the Case Resources by at Least 125%	75.1 (71–79)
Level 8: Comorbidity Not Applied	92.5 (89–96)
Overall Agreement Rate on Comorbidity Level	89.5 (88–91)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

The comorbidity level matrix in Table 46 illustrates the original assignment of comorbidity level in the DAD (left column) and the assignment of comorbidity level when using the data obtained in the chart review (top row). The percentages on the diagonal (dark teal) represent agreement in the DAD and the chart review. Most of the hospitalizations (almost 2 million) were assigned to comorbidity level 0 (no significant comorbidity), which had a high agreement rate (94%). All increases in comorbidity level represent 146,998 hospitalizations, whereas the decreases in comorbidity level represent 77,617 hospitalizations, resulting in a net increase in comorbidity levels assigned in the data obtained in the chart review.

Table 46: Comorbidity Level Assigned When Using DAD Data and Chart Review Data

DAD		Chart Review					
	Volume	Level 0	Level 1	Level 2	Level 3	Level 4	Level 8
Level 0	1,771,368	94%	4%	2%	0%	0%	0%
Level 1	183,708	20%	67%	5%	6%	2%	0%
Level 2	89,981	14%	8%	66%	8%	3%	n/a
Level 3	57,246	7%	10%	7%	62%	14%	n/a
Level 4	25,277	3%	4%	4%	14%	75%	n/a
Level 8	192,092	7%	n/a	n/a	n/a	n/a	93%

Notes
CI: confidence interval.
n/a: no sample available for analysis.
Source
Canadian Institute for Health Information, 2012.

5.3 Expected Length of Stay

Expected length of stay (ELOS) is the average typical acute length of stay for various types of patients based on data found in the DAD. ELOS is adjusted for comorbidity level, age, flagged intervention and intervention event if they are shown to be statistically significant. There is an ELOS assigned to each inpatient in the DAD.

ELOS values assigned to hospitalizations using data reported in the DAD were compared with the values assigned when regrouped using data recorded in the chart review. There was a 6.2% change nationally in ELOS in the hospitalizations studied when comparing the ELOS originally assigned to a hospitalization in the DAD with the one assigned to the data obtained in the chart review. Table 47 presents the changes in ELOS for the hospitalizations in each province and territory. The percentage net change in ELOS varied from 1.4 (Nova Scotia) to 9.9 (B.C.).

Table 47: Percentage Net Change in Patient's Expected Length of Stay, by Province/Territory

Province/Territory	Percentage Net Change in Patient's Expected Length of Stay (95% CI)
British Columbia	9.9 (5–15)
Alberta	5.6 (3–8)
Saskatchewan	7.3 (4–11)
Manitoba	6.0 (3–9)
Ontario	5.5 (3–8)
New Brunswick	3.2 (0–6)
Nova Scotia	1.4 (0–3)
Prince Edward Island	3.7 (2–6)
Newfoundland and Labrador	5.7 (3–9)
Yukon	3.8 (1–7)
Northwest Territories	6.0 (2–10)
Nunavut	3.8 (1–6)
Canada	**6.2 (4–8)**

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

The national net change in ELOS of 6.2% includes 79% of hospitalizations that did not change ELOS in the chart review (Table 48). A further 7% of hospitalizations changed ELOS by 25% or less. These changes in ELOS are illustrated by number of days in Table 48 and Figure 34.

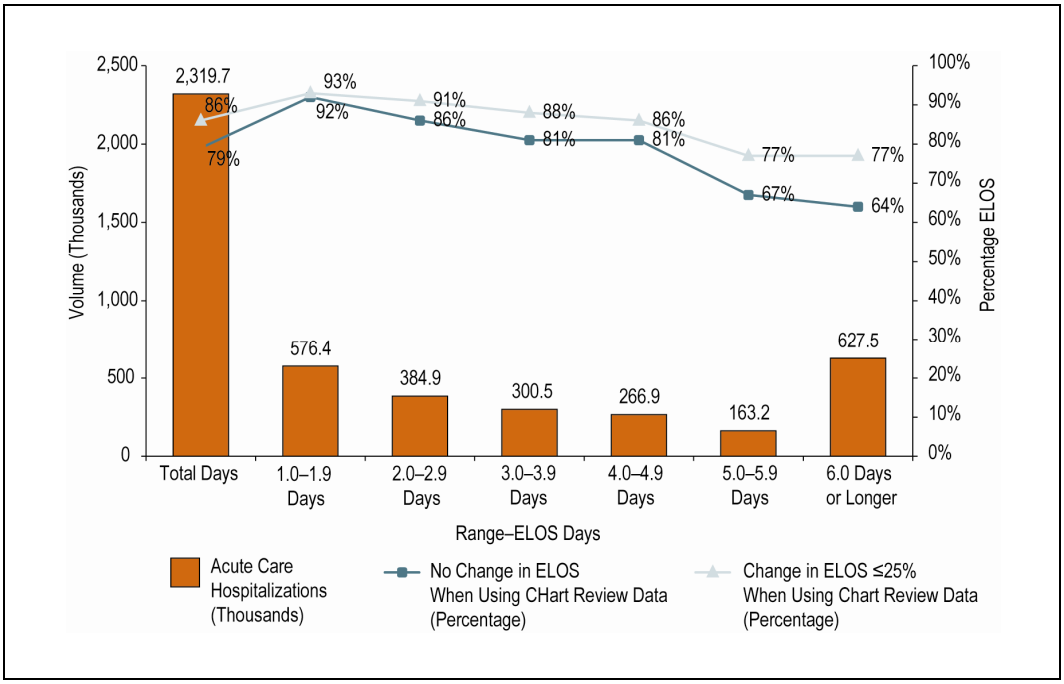
Table 48: Agreement on Expected Length of Stay, by Number of Days

Expected Length of Stay	Volume in DAD	Proportion With No Change in ELOS Using Chart Review (95% CI)	Proportion With Change in ELOS ≤25% Using Chart Review (95% CI)
1.0–1.9 Days	576,404	91.8 (89–95)	92.6 (90–96)
2.0–2.9 Days	384,868	86.0 (82–90)	91.4 (88–95)
3.0–3.9 Days	300,529	81.3 (75–87)	87.7 (83–93)
4.0–4.9 Days	266,925	80.6 (75–87)	85.9 (80–91)
5.0–5.9 Days	163,225	66.5 (56–77)	76.8 (68–85)
6.0 Days or Longer	627,450	63.8 (59–68)	76.5 (73–80)
Total Acute Care Hospitalizations	**2,319,672**	**78.8 (77–81)**	**85.5 (84–87)**

Notes
CI: confidence interval.
ELOS: expected length of stay.
Source
Canadian Institute for Health Information, 2012.

The volume of hospitalizations by the number of days of ELOS is shown in the solid bars of Figure 34. The horizontal trend lines illustrate the percentage agreement for each of the ranges of ELOS days. The lower trend line (in dark teal) gives the percentage of hospitalizations in each ELOS range that had no change in ELOS when compared with results using chart review data. The upper trend line (in light teal) gives the percentage of hospitalizations in each ELOS range that varied by 25% or less when compared with results using chart review data.

Figure 34: Changes in Expected Length of Stay



Note
ELOS: expected length of stay.
Source
Canadian Institute for Health Information, 2012.

5.4 Resource Intensity Weight

Resource Intensity Weight (RIW) is a relative value derived using patient-specific cost data. It is calculated based on the service-recipient cost data collected by health service organizations in Ontario, Alberta and B.C. This derived variable is assigned to each inpatient in the DAD and provides a measure of the resource use of the patient relative to the cost of an average, typical acute inpatient. There is an RIW associated with each combination of CMG, age, comorbidity level, flagged intervention, intervention event and out-of-hospital factors.

RIWs assigned to hospitalizations using the data reported in the DAD were compared with the values assigned when grouped using data recorded in the chart review. There was a 4.3% change nationally in RIW for the hospitalizations studied when comparing the RIW originally assigned to the hospitalization in the DAD with the RIW assigned to the data obtained from the chart review. Table 49 also presents the changes in RIW for the hospitalizations in the DAD from each province and territory. The percentage net change in RIW varied from 0.9 (Nova Scotia) to 8.8 (B.C.).

Table 49: Percentage Net Change in Resource Intensity Weight, by Province/Territory

Province/Territory	Percentage Net Change in Patient's Resource Intensity Weight (95% CI)
British Columbia	8.8 (4–14)
Alberta	4.7 (2–7)
Saskatchewan	3.3 (0–6)
Manitoba	5.6 (3–8)
Ontario	3.0 (1–5)
New Brunswick	1.3 (0–3)
Nova Scotia	0.9 (1–3)
Prince Edward Island	1.6 (0–3)
Newfoundland and Labrador	4.9 (2–8)
Yukon	3.2 (1–6)
Northwest Territories	5.6 (2–9)
Nunavut	5.1 (2–8)
Canada	**4.3 (3–6)**

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

There was a change in 22% of hospitalizations, resulting in a national change in RIW of 4.3% (Table 50). A further 9.5% of hospitalizations changed RIW by 25% or less. These changes in RIW by magnitude of weight are illustrated in Table 50 and in Figure 35.

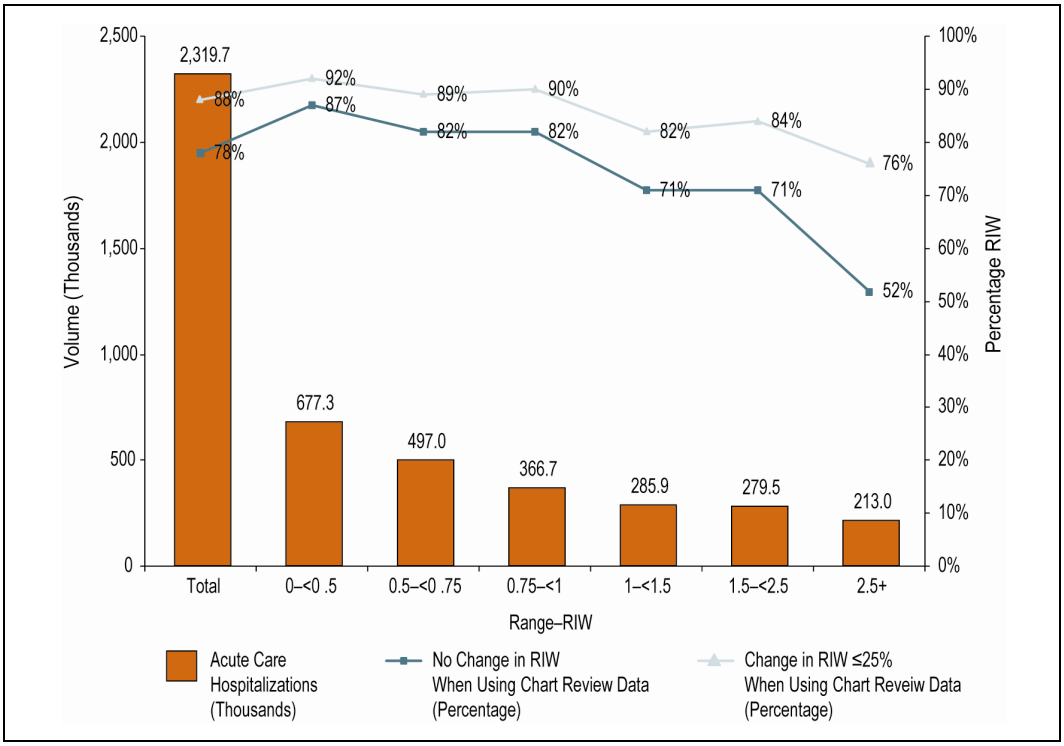
Table 50: Agreement on Resource Intensity Weight, by Magnitude of Weight

Resource Intensity Weight	Volume in DAD	Proportion With No Change in RIW Using Chart Review (95% CI)	Proportion With Change in RIW ≤25% Using Chart Review (95% CI)
0.0001–0.4999	677,281	86.7 (84–89)	92.3 (90–95)
0.5000–0.7499	496,967	82.2 (78–87)	89.2 (85–93)
0.7500–0.9999	366,701	82.0 (77–87)	90.2 (86–94)
1.0000–1.4999	285,865	70.7 (64–78)	81.6 (76–87)
1.5000–2.4999	279,538	71.4 (65–77)	84.1 (79–89)
2.5000 and Higher	213,049	52.0 (45–59)	76.1 (69–83)
Total Acute Care Hospitalizations	**2,319,672**	**78.0 (76–80)**	**87.5 (86–89)**

Notes
CI: confidence interval.
RIW: Resource Intensity Weight.
Source
Canadian Institute for Health Information, 2012.

The volume of hospitalizations by RIW is shown as solid bars. The trend lines illustrate the percentage agreement for each range of RIW values by magnitude of weight. The lower trend line (in dark teal) gives the percentage of hospitalizations by RIW values that had no change in RIW when compared with results using chart review data. The upper trend line (in light teal) gives the percentage of hospitalizations by RIW values that varied by 25% or less when compared with results using chart review data.

Figure 35: Reliability of Resource Intensity Weight Variable



Note
RIW: Resource Intensity Weight.
Source
Canadian Institute for Health Information, 2012.

5.5 Year-Over-Year Observations in Case-Mix Variables

A comparison of the results for case-mix variables from the 2009–2010 and 2007–2008 reabstraction studies of the DAD can be found in Table 51. Results between these two study years were very similar.

Table 51: Year-Over-Year Trends in Case-Mix Variables

	2007–2008	2009–2010
Major Clinical Category Agreement Rate	95.5 (95–96)	94.3 (93–95)
Case Mix Group Agreement Rate	89.5 (88–91)	87.8 (86–89)
Comorbidity Level Agreement Rate	90.4 (89–92)	89.5 (88–91)
Expected Length of Stay		
Agreement Rate	81.8 (80–84)	78.8 (77–81)
Percentage Net Change	7.0 (4–10)	6.2 (4–8)
Resource Intensity Weight		
Agreement Rate	81.3 (79–83)	78.0 (76–80)
Percentage Net Change	4.3 (3–6)	4.3 (3–6)

Note
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

5.6 Summary of Findings for Case-Mix Variables

The impact of the observed differences in the coding of diagnoses and interventions affected the output variables from CIHI's grouping methodology in the following ways:

- Hospitalizations remained within the same MCC (94% agreement) and within the same CMG (88% agreement) when grouped using the data obtained from the chart review.
- About 90% of the hospitalizations retained the same assignment of comorbidity level. For most of the hospitalizations (almost 2 million) that were assigned a comorbidity level of 0, there was 94% agreement. There was a net increase in comorbidity levels assigned in the chart review, which could have arisen because of the changes in diagnosis typing and the completeness of reporting of significant diagnoses to the DAD.
- The data obtained in the chart review tended to be grouped to longer expected lengths of stay and higher RIWs. This could also be a result of the completeness of reporting of interventions and diagnoses to the DAD and the significance of comorbidities to the patient's acute care stay.
- There were no significant differences for case-mix variables in the 2009–2010 and 2007–2008 studies.

Table 52 summarizes the results presented in this chapter and provides additional findings for each of the participating provinces and territories.

Table 52: Summary of Findings for Case-Mix Derived Variables in 2009–2010

	Metric	Optimal Value	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	P.E.I.	N.L.	Y.T.	N.W.T.	Nun.	Can.
Major Clinical Category	Percentage	100	91.5	95.5	93.1	95.1	94.8	96.8	94.6	93.5	94.0	94.3	93.8	97.2	94.3
Agreement Rate	(95% CI)		(88–95)	(94–97)	(91–95)	(93–97)	(93–97)	(95–99)	(93–97)	(91–96)	(92–96)	(92–97)	(92–96)	(96–99)	(93–95)
Case Mix Group	Percentage	100	84.6	87.6	84.9	86.3	89.1	92.6	89.9	85.3	86.1	87.9	85.6	92.0	87.8
Agreement Rate	(95% CI)		(80–89)	(84–91)	(82–88)	(83–90)	(86–92)	(90–95)	(87–93)	(82–89)	(83–89)	(85–91)	(82–89)	(89–95)	(86–89)
Comorbidity Level	Percentage	100	86.0	89.9	89.4	87.7	90.2	92.2	93.4	93.6	92.1	89.2	89.5	93.1	89.5
Agreement Rate	(95% CI)		(82–90)	(87–92)	(87–92)	(85–91)	(88–92)	(90–95)	(91–95)	(92–96)	(90–94)	(86–92)	(87–92)	(91–96)	(88–91)
Expected Length of Stay	Percentage	100	71.7	80.6	78.0	78.2	79.8	86.6	85.6	83.3	78.7	82.1	80.3	89.3	78.8
Agreement Rate	(95% CI)		(67–77)	(77–84)	(74–82)	(74–82)	(76–83)	(83–90)	(83–89)	(80–87)	(75–82)	(79–86)	(77–84)	(86–92)	(77–81)
Percentage Net Change	Percentage	0	9.9	5.6	7.3	6.0	5.5	3.2	1.4	3.7	5.7	3.8	6.0	3.8	6.2
	(95% CI)		(5–15)	(3–8)	(4–11)	(3–9)	(3–8)	(0–6)	(0–3)	(2–6)	(3–9)	(1–7)	(2–10)	(1–6)	(4–8)
Resource Intensity Weight	Percentage	100	71.0	78.6	78.0	77.3	79.1	86.3	85.7	82.6	77.4	81.2	79.0	88.3	78
Agreement Rate	(95% CI)		(66–76)	(75–82)	(74–82)	(73–81)	(75–83)	(83–90)	(83–89)	(79–86)	(74–81)	(78–85)	(76–82)	(85–91)	(76–80)
Percentage Net Change	Percentage	0	8.8	4.7	3.3	5.6	3.0	1.3	0.9	1.6	4.9	3.2	5.6	5.1	4.3
	(95% CI)		(4–14)	(2–7)	(0–6)	(3–8)	(1–5)	(0–3)	(-1–3)	(0–3)	(2–8)	(1–6)	(2–9)	(2–8)	(3–6)

Notes

CI: confidence interval.

Cells shaded in gray show the national average.

Cells shaded in dark teal show where provincial or territorial results were significantly higher ($p<0.05$) than the national average.

Cells shaded in dark orange show where provincial or territorial results were significantly lower ($p<0.05$) than the national average.

Source

Canadian Institute for Health Information, 2012.

Chapter 6: Discussion of Coding Issues

This chapter focuses on the study's fifth objective:

Identify the sources of the coding issues that arise as a result of any observed coding variation.

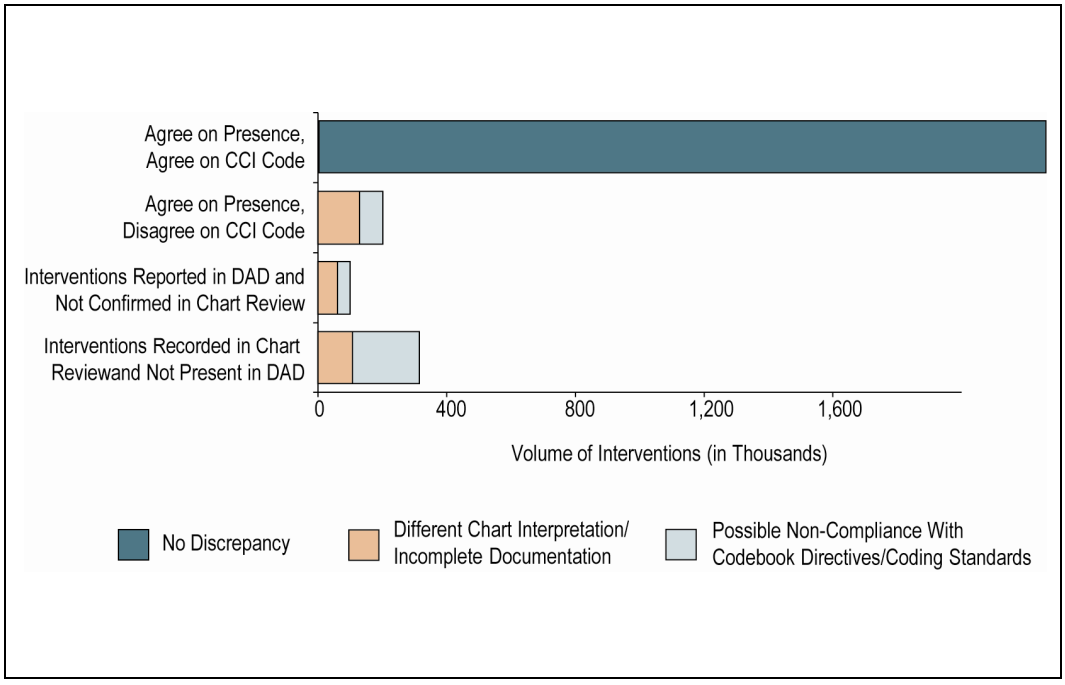
6.1 Coding Issues for Interventions

Figure 36 shows an analysis of the reasons the reabstractors gave for the differences noted between the chart review and the DAD. Most of the interventions were in agreement (note the length of top bar), meaning that no coding issues were identified.

Where there was a disagreement on the CCI code used in the DAD and the chart review (second bar), this was explained almost equally by a difference in chart interpretation and by possible non-compliance with the codebook directives and Canadian Coding Standards.

Where there was disagreement in the reporting of interventions in the chart review compared with those found in the DAD (fourth bar), this difference was in large part due to possible non-compliance with the codebook directives and Canadian Coding Standards.

Figure 36: Analysis of Coding Issues for Interventions



Source
Canadian Institute for Health Information, 2012.

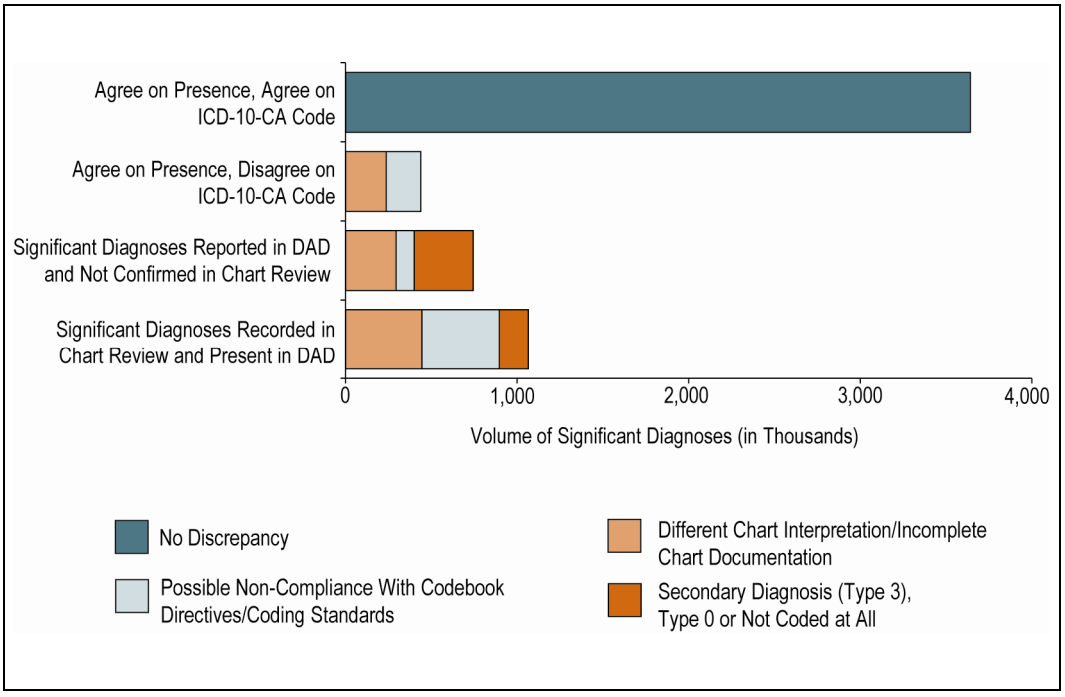
6.2 Coding Issues for Significant Diagnoses

Figure 37 presents a similar analysis for the coding issues identified for significant diagnoses. As with the coding of interventions, most of the significant diagnoses were in agreement (note the length of the top bar), meaning that no coding issues were identified.

Where there was disagreement in the selection of the ICD-10-CA code used in the DAD and the chart review (second bar), this was explained by a difference in chart interpretation by the coding specialists (hospital and chart review) and also by possible non-compliance with the codebook directives and Canadian Coding Standards. A third reason that was not observed for the CCI code selection of interventions is that about half of the disagreement in ICD-10-CA code was attributed to incomplete chart documentation.

For the significant diagnoses reported in the DAD and not confirmed in the chart review, this disagreement was mainly due to different chart interpretation by the coding specialists (third row). Finally, for those significant diagnoses recorded in the chart review and not present in the DAD (fourth bar), disagreement was noted mainly because of different chart interpretation by the coding specialists and by possible non-compliance with the codebook directives and Canadian Coding Standards, and less so because of incomplete chart documentation.

Figure 37: Analysis of Coding Issues for Significant Diagnoses



Source
Canadian Institute for Health Information, 2012.

A description of the reasons is provided in Table 53.

Table 53: Description of Reasons Assigned to Coding Differences

Reason	Reason Description
Different Chart Interpretation	There is conflicting or vague documentation in the chart, which resulted in a difference in interpretation.
Possible Non-Compliance With Codebook Directives and Coding Standards	The DAD data does not comply with the Canadian Coding Standards and/or Classifications indices, includes/excludes notes, etc.
Secondary Diagnosis (Type 3) or Not Coded at All	The hospital coding specialist or the reabstractor assigned a diagnosis type that was not significant to the condition or the condition was not coded at all.

Source
Canadian Institute for Health Information, 2012.

6.3 Summary of Coding Issues

Different chart interpretations by the coding specialists at the hospital and in the chart review were significant contributors to the disagreements noted for both coding of interventions and significant diagnoses. Possible non-compliance with the codebook directives and Canadian Coding Standards was an even greater contributor to the differences observed for both interventions and significant diagnoses. These two major reasons for disagreement point to the need to continue to highlight the importance of good chart documentation, which supports both the management of the patient's care in hospital and the coding specialists who must interpret the information in the chart, which forms the basis upon which health care system management decisions are made. These reasons also point to the importance of following the rules of the classifications and the directives in the Canadian Coding Standards. Additionally, CIHI provides education products to support accurate interpretation and application of ICD-10-CA, CCI and the Canadian Coding Standards.

Chapter 7: Conclusion

7.1 Summary of Findings

7.1.1 Interventions

Interventions were well-represented in the DAD. Of the interventions in the DAD, 96% were confirmed in the chart review; of those interventions recorded in the chart review, 88% were present in the DAD. The agreement on the selection of the CCI code to describe the interventions was very high, with 91% agreement on the exact code (up to 10 characters) and 97% agreement on the rubric (first 5 characters). The DAD interventions were also well-reported from each province and territory. Generally, improvements have been noted in the coding of interventions since 2005–2006; results were similar to those found in 2007–2008, with some variation among all provinces and territories.

7.1.2 Significant Diagnoses

Of the significant diagnoses in the DAD, 84% were confirmed in the chart review; of those significant diagnoses recorded in the chart review, 79% were present in the DAD. These results were lower than what was observed for the coding of interventions. This is not unexpected, given the complexity of medical conditions and diseases and their manifestation. The agreement on the selection of the ICD-10-CA code to describe the significant diagnoses was very high, with 89% agreement on the exact code (up to six characters) and 95% agreement on the category (first three characters). The significant diagnoses were also well-reported from each province and territory. As was observed with the coding of interventions, improvements have been noted in the coding of significant diagnoses since 2005–2006; results were similar to those found in 2007–2008, with some variation among all provinces and territories.

Agreement on the most responsible diagnosis required that the same condition and ICD-10-CA code were selected. In previous studies, this has often produced a lower result. In the 2009–2010 study, there continued to be a significant improvement in the coding of the most responsible diagnosis since 2005–2006 (76% compared with 64%). Similar results to what was observed in 2007–2008 were achieved in 2009–2010. There continued to be some variation among provinces and territories, but less than what was observed in 2005–2006.

7.1.3 Diagnosis Typing

Although inconsistency in assignment of diagnosis type codes continued to be observed, the identification of the diagnoses that significantly affected the patient's length of stay and resource use was well-reported: 96% for most responsible diagnosis, 85% for pre-admit comorbidities and 90% for post-admit comorbidities. Some uncertainty existed about whether a significant diagnosis was a pre-admit comorbidity or the diagnosis most responsible for the patient's stay in hospital, and whether the pre-admit comorbidity actually contributed to the patient's acute care stay. There was also some uncertainty about whether the post-admit comorbidity was actually present prior to admission. There was some variation in the typing of diagnoses across the provinces and territories.

7.1.4 Health Conditions

- Infections due to drug-resistant micro-organisms tended to be reported more in the DAD than in the chart review. However, when indentified in both, there was high agreement on the ICD-10-CA code used to describe them.
- Palliative care was reported well in the DAD, although some hospitalizations for patients receiving palliative care were recorded in the chart review and not present in the DAD. Generally, the diagnosis type assigned to the palliative care diagnosis agreed; however, uncertainty about the assignment of the palliative care as a most responsible diagnosis or as a pre-admit comorbidity was observed.
- Hospitalizations for pneumonia were generally well-reported in the DAD, although the specificity of the ICD-10-CA code and the diagnosis type for the pneumonia were less certain.
- Hospitalizations for patients with post-admit comorbidities, such as those found on the comorbidity factor code list, urinary tract infections or obstetrical and birth trauma, were sometimes well-reported in the DAD. There were more instances of these post-admit comorbidities being recorded in the chart review and not present in the DAD.
- There was some uncertainty over the selection of the ICD-10-CA code for primary codes in post-intervention conditions. As was observed earlier, there was also uncertainty about the primary codes as a pre-admit comorbidity or as the most responsible diagnosis. Several provinces and territories did not assign the mandatory cluster when coding post-intervention conditions.
- Generally, the flagged interventions (non-invasive biopsy, per orifice endoscopy, tracheostomy, feeding tube, and long and short mechanical ventilation) were well-reported in the DAD.
- There was high agreement that the subset of flagged interventions, thrombolytic therapy and induction of labour were initiated prior to admission (use of the pre-admit flag).
- There was more uncertainty about the identification of the post-admit comorbidity that arose after admission and before the first qualifying intervention (prefix 5) than the post-admit comorbidity that arose during or after the qualifying intervention (prefix 6).

7.1.5 Case-Mix Grouping Variables

The impact of the observed differences in the coding of diagnoses and interventions affected the output variables from CIHI's grouping methodology in the following ways:

- Hospitalizations remained within the same MCC (94% agreement) and within the same CMG (88% agreement) when grouped using the data obtained from the chart review.
- About 90% of the hospitalizations retained the same assignment of comorbidity level. For most of the hospitalizations (almost 2 million) that were assigned a comorbidity level of 0, there was 90% agreement. There was a net increase in comorbidity levels assigned in the chart review, which could have arisen because of the changes in diagnosis typing and the completeness of reporting of significant diagnoses to the DAD.

- The data obtained in the chart review tended to be grouped to longer expected lengths of stay and higher RIWs. This could also be a result of the completeness of reporting interventions and diagnoses to the DAD and the significance of comorbidities to the patient's acute care stay.
- There were no significant differences for case-mix variables in the 2009–2010 and 2007–2008 studies.

7.1.6 Coding Issues

Different chart interpretations by the coding specialists at the hospital and in the chart review were significant contributors to the disagreements noted for coding of both interventions and significant diagnoses. Possible non-compliance with the electronic coding book directives and the Canadian Coding Standards was an even greater contributor to the differences observed for both interventions and significant diagnoses. These two major reasons for disagreement point to the need to continue to highlight the importance of good chart documentation that supports both the management of the patient's care in hospital and the coding specialists who must interpret the information in the chart, which forms the basis upon which health care system management decisions are made. These reasons also point to the importance of regularly reviewing the directives within the classifications and the coding standards to ensure their appropriate interpretation and application in the acute care setting, as well as the ongoing emphasis on education about these coding resources.

7.2 Considerations for Improving Coding Quality

This report supports that enhancing the information and data quality of the DAD is a shared responsibility among health care professionals at the facilities who treat patients and document their care, coding specialists who extract patient information and record data on the DAD abstract and those who maintain the DAD database and develop the classifications and the coding standards.

Ongoing efforts to improve clinical reporting to the DAD among these stakeholders have resulted in overall improvements to information and data quality. The findings from this study will be used to further enhance CIHI's products, such as the classifications, CMG+, coding standards, abstracting manuals and educational offerings. Administrators, physicians and coding staff at the study facilities can review the findings from the study along with the information provided in their facility-specific reports to identify areas where improvements are needed to promote high-quality DAD data.

Appendix A: Methodology for Identifying Hospitalizations for Specific Health Conditions and Interventions

Drug-Resistant Micro-Organisms

Hospitalizations with drug-resistant organisms: Any abstract with ICD-10-CA code U82.– (1) or (2); or U83.– (1) or (2); or U84.– (1) or (2); or U85 (1) or (2)

Palliative Care

Hospitalizations for patients receiving palliative care: Any abstract with ICD-10-CA code Z51.5 (M) or (1) or (W) or (X) or (Y)

Palliative care—any significant type (0910): ICD-10-CA code Z51.5 (M) or (1) or (W) or (X) or (Y)

Palliative care as the most responsible diagnosis: ICD-10-CA code Z51.5 (M) with diagnosis prefix 8

Pneumonia

These definitions apply for hospitalization- and ICD-10-CA code–level analysis.

Influenza and pneumonia as the most responsible diagnosis (Case Mix Group 138): ICD-10-CA code J10.0 (M) or J11.0 (M) or J12.0 (M) or J12.1 (M) or J12.2 (M) or J12.3 (M) or J12.8 (M) or J12.9 (M) or J17.1 (6) or J17.2 (6) or J17.3 (6) or J17.8 (6) or J18.0 (M) or J18.1 (M) or J18.2 (M) or J18.8 (M) or J18.9 (M)

Bacterial, unspecified and aspiration pneumonia as post-admit comorbidity: Any abstract with ICD-10-CA code J13 (2) or J14 (2) or J15.^ (2) or J16.^ (2) or J18.^ (2) or [J69.0 (2) with B95.^ (3) or B96.^ (3)]

Bacterial, unspecified and aspiration pneumonia as significant non-post-admit comorbidity: Any abstract with ICD-10-CA code J13 (M, 1 or W, X, Y) or J14 (M, 1 or W, X, Y) or J15.^ (M, 1 or W, X, Y) or J16.^ (M, 1 or W, X, Y) or J18.^ (M, 1 or W, X, Y) or J85.1 (M, 1 or W, X, Y) or [J69.0 (M, 1, W, X or Y) with B95.^ (3) or B96.^ (3)]

Post-Admit Comorbidities, Obstetrical Trauma and Birth Trauma

These definitions apply for hospitalization- and ICD-10-CA code–level analysis.

Comorbidity factor code list: Any abstract with an ICD-10-CA code appearing on the comorbidity factor code list as a diagnosis type (2)

Urinary tract infections: Any abstract with ICD-10-CA code N39.0 as diagnosis type (2)

These definitions apply for hospitalization- and ICD-10-CA code–level analysis:

Obstetrical trauma: ICD-10-CA code O70.301 (M or 1) or O71.301 (M or 1) or O71.401 (M or 1) or O71.501 (M or 1) or any abstract with one of the CCI codes (5.PC.80.JH, 5.PC.80.JJ, 5.PC.80.JR) or [5.PC.80.JQ and one of the Dx {O70.301 (M, 1, 2, W, X, Y) or O71.301 (M, 1, 2, W, X, Y) or O71.401 (M, 1, 2, W, X, Y) or O71.501 (M, 1, 2, W, X, Y)}]

Birth trauma: ICD-10-CA code P10–P15 as a diagnosis type (M) or (1)

Post-Intervention Conditions

These definitions apply for hospitalization- and ICD-10-CA code–level analysis.

Complication code (T-code): Any abstract where ICD-10-CA code Y60–Y84 is present in a cluster and an ICD-10-CA code that is on the complication code list (T-code) with diagnosis type (M, 1, 2, W, X or Y) is also present within this cluster.

Post-procedural code (PP-code): Any abstract where ICD-10-CA code Y60–Y84 is present in a cluster and an ICD-10-CA code that is on the post-procedural code list with diagnosis type (M, 1, 2, W, X or Y) is also present within this cluster.

Regular and comorbidity factor code: Any abstract where ICD-10-CA code Y60–Y84 is present in a cluster and an ICD-10-CA code that is on the comorbidity factor code list with diagnosis type (M, 1, 2, W, X or Y) is also present within this cluster, and this comorbidity factor code is not on the complication code (T-code) list and is not on the post-procedural code (PP-code) list.

Regular and non–comorbidity factor code: Any abstract where ICD-10-CA code Y60–Y84 is present in a cluster and an ICD-10-CA code that is not on the comorbidity factor code list with diagnosis type (M, 1, 2, W, X or Y) is also present within this cluster, and this comorbidity factor code is not on the complication code (T-code) list and is not on the post-procedural code (PP-code) list.

Flagged Intervention

Non-invasive biopsy: Any abstract with any CCI code from the flagged intervention category description “non-invasive biopsy”

Per orifice endoscopy: Any abstract with any CCI code from the flagged intervention category description “per orifice endoscopy”

Tracheostomy: Any abstract with any CCI code from the flagged intervention category description “tracheostomy”

Feeding tube: Any abstract with any CCI code from the flagged intervention category description “feeding tube”

Mechanical ventilation (long): Any abstract with any CCI code from the flagged intervention category description “mechanical ventilation (long)”

Mechanical ventilation (short): Any abstract with any CCI code from the flagged intervention category description “mechanical ventilation (short)”

Pre-Admit Flag

Certain flagged interventions: Any abstract where the intervention pre-admit flag equals Y and the CCI code is on the intervention pre-admit flag subset of flagged interventions list

Thrombolytic therapy: Any abstract where the intervention pre-admit flag equals Y with the CCI code 1.^^.35.H^-1C

Induction of labour: Any abstract where the intervention pre-admit flag equals Y with the CCI code 5.AC.30.^^

Prefixes 5 and 6

Prefixes 5 and 6 qualifying interventions:

- Location of intervention is main operating room (01)
- Location of intervention is cardiac catheterization room (08)
- Location of intervention is out-of-hospital (OOH) facility for the following selected cardiac interventions:
- 3.IP.10.^^ Xray, heart with coronary arteries
- 1.IJ.50.^^ Dilation, coronary arteries
- 1.IJ.57.^^ Extraction, coronary arteries

Prefix 5: Any abstract with presence of diagnosis prefix 5 on ICD-10-CA codes with diagnosis type 2

Prefix 6: Any abstract with presence of diagnosis prefix 6 on ICD-10-CA codes with diagnosis type 2

Appendix B: Detailed Analysis

Table 54 presents agreement rates for MCCs.

Table 54: Agreement Rates for Major Clinical Categories

Major Clinical Category Based on DAD Data	Volume in DAD (in Thousands)	Agreement Rate (95% CI)
01—Diseases and Disorders of the Nervous System	77.3	93.8 (89–99)
03—Diseases and Disorders of the Ear, Nose, Mouth and Throat	38.2	95.6 (92–99)
04—Diseases and Disorders of the Respiratory System	184.4	94.8 (92–98)
05—Diseases and Disorders of the Circulatory System	314.0	96.6 (95–99)
06—Diseases and Disorders of the Digestive System	250.8	92.7 (89–97)
07—Diseases and Disorders of the Hepatobiliary System and Pancreas	65.0	89.8 (81–99)
08—Diseases and Disorders of the Musculoskeletal System and Connective Tissue	120.1	97.0 (95–99)
09—Diseases and Disorders of the Skin, Subcutaneous Tissue and Breast	40.2	91.8 (87–97)
10—Diseases and Disorders of the Endocrine System, Nutrition and Metabolism	61.2	90.4 (83–97)
11—Diseases and Disorders of the Kidney, Urinary Tract and Male Reproductive System	106.4	92.3 (87–97)
12—Diseases and Disorders of the Female Reproductive System	84.8	98.8 (98–100)
13—Pregnancy and Childbirth	340.2	99.7 (99–100)
14—Newborns and Neonates With Conditions Originating in the Perinatal Period	259.7	100.0 (100–100)
15—Diseases and Disorders of the Blood and Lymphatic System	29.7	58.5 (38–79)
16—Multisystemic or Unspecified Site Infections	27.0	73.7 (58–89)
17—Mental Diseases and Disorders	63.7	92.9 (90–96)
19—Significant Trauma, Injury, Poisoning and Toxic Effects of Drugs	142.3	93.5 (88–99)
20—Other Reasons for Hospitalization	104.4	83.0 (74–92)

Notes

To be included in this analysis, the study sample had to contain a minimum of 100 hospitalizations assigned to the major clinical category in the DAD data.

CI: confidence interval.

Source

Canadian Institute for Health Information, 2012.

Table 55 presents agreement rates for CMGs.

Table 55: Agreement Rates for Case Mix Groups

Case Mix Group Based on DAD Data	Volume in DAD (in Thousands)	Agreement Rate (95% CI)
138—Viral/Unspecified Pneumonia	78.1	94.1 (89–99)
139—Chronic Obstructive Pulmonary Disease	35.8	94.7 (92–98)
194—Myocardial Infarction/Shock/Arrest Without Cardiac Catheter	33.0	94.2 (89–99)
196—Heart Failure Without Cardiac Catheter	47.2	90.9 (81–100)
536—Caesarean Section With Previous Uterine Scar	39.1	100.0 (100–100)
537—Primary Caesarean Section	55.8	99.3 (99–100)
545—Vaginal Delivery, No Other Intervention	185.9	99.1 (98–100)
557—Antepartum Disorder Treated Medically	17.7	95.2 (89–100)
576—Normal Newborn, Singleton Vaginal Delivery	151.1	92.2 (88–97)
601—Newborn/Neonate 2,500+ Grams, Other Minor Problem	14.6	86.5 (76–97)
810—Palliative Care	33.0	91.3 (84–99)

Notes

To be included in this analysis, the study sample had to contain a minimum of 100 hospitalizations assigned to the Case Mix Group in the DAD data.

CI: confidence interval.

Source

Canadian Institute for Health Information, 2012.

Table 56 presents agreement rates for CMGs with no change in comorbidity level.

Table 56: Agreement Rates for Comorbidity Level, by Case Mix Group

Case Mix Group Based on DAD Data	Volume in DAD (in Thousands)	Percentage With No Change in Comorbidity Level (95% CI)
138—Viral/Unspecified Pneumonia	78.1	93.2 (88–99)
139—Chronic Obstructive Pulmonary Disease	35.8	82.0 (75–89)
194—Myocardial Infarction/Shock/Arrest Without Cardiac Catheter	33.0	89.5 (80–99)
196—Heart Failure Without Cardiac Catheter	47.2	90.8 (81–100)
536—Caesarean Section With Previous Uterine Scar	39.1	96.5 (93–100)
537—Primary Caesarean Section	55.8	92.9 (89–97)
545—Vaginal Delivery, No Other Intervention	185.9	94.1 (91–97)
557—Antepartum Disorder Treated Medically	17.7	81.1 (67–95)
576—Normal Newborn, Singleton Vaginal Delivery	151.1	92.2 (88–97)
601—Newborn/Neonate 2,500+ Grams, Other Minor Problem	14.6	80.8 (66–96)
810—Palliative Care	33.0	90.4 (82–99)

Notes
To be included in this analysis, the study sample had to contain a minimum of 100 hospitalizations assigned to the Case Mix Group in the DAD data.
CI: confidence interval.
Source
Canadian Institute for Health Information, 2012.

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Production of this report is made possible by financial contributions from Health Canada and provincial and territorial governments. The views expressed herein do not necessarily represent the views of Health Canada or any provincial or territorial government.

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ISBN 978-1-77109-44-5 (PDF)

Cette publication est aussi disponible en français sous le titre *Étude de l'ICIS sur la qualité des données de la Base de données sur les congés des patients pour 2009-2010*.
ISBN 978-1-77109-045-2 (PDF)

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