CIHI Data Quality Study of the 2008–2009 Discharge Abstract Database

December 2010

Canadian Institute for Health Information

Institut canadien d'information sur la santé

Who We Are

Established in 1994, CIHI is an independent, not-for-profit corporation that provides essential information on Canada's health system and the health of Canadians. Funded by federal, provincial and territorial governments, we are guided by a Board of Directors made up of health leaders across the country.

Our Vision

To help improve Canada's health system and the well-being of Canadians by being a leading source of unbiased, credible and comparable information that will enable health leaders to make better-informed decisions.

Table of Contents

About CIHI v
Acknowledgements vii
Executive Summary ix
Chapter 1—Introduction 1
1.1 The Discharge Abstract Database 2
1.2 Study Overview, Rationale and Objectives 3
1.3 Privacy, Confidentiality and Security 4
1.4 Objectives of This Report 4
Chapter 2—Study Method 5
2.1 Study Design 7
2.2 Training and Data Collection 8
2.3 Data Processing and Analysis 8
Chapter 3—Coding Quality of Strokes 11
3.1 Completeness of Reporting Stroke to the DAD 13
3.2 Correctness of Reporting Strokes to the DAD 15
3.3 Special-Focus Topics on Strokes 18
3.4 Coding Quality of Other Health Conditions for Stroke Patients 21
3.5 Quality of Case Mix Grouping Variables 23
3.6 Coding Quality of Strokes Over Time 25
3.7 Consistency of Data for Stroke Patients in the DAD and NACRS 26
3.8 Summary of Findings for the Coding Quality of Strokes 29
Chapter 4—Coding Quality of Thrombolytic Therapy 31
4.1 Completeness of Reporting Thrombolytic Therapy to the DAD 33
4.2 Special-Focus Topics on Thrombolytic Therapy 35
4.3 Coding Quality of Other Health Interventions for Treating Stroke Patients 37
4.4 Summary of Findings for the Coding Quality of Thrombolytic Therapy 38
Chapter 5—Coding Data for the Stroke Improvement Project 39
5.1 Availability of Information for Stroke Project 340 41
5.2 Summary of Findings for Stroke Project 340 44
Chapter 6—Discussion of Coding Issues 45
6.1 Coding Issues for Strokes 47
6.2 Coding Issues for Thrombolytic Therapy 48
Chapter 7—Conclusion 49
7.1 Summary of Findings 50
7.2 Considerations for Improving Coding Quality 52
Appendix A: Associated Symptom Codes for Stroke Patients 53
References 55

List of Tables

Table 1 Volume of Abstracts Submitted to the DAD in 2008–2009, by Province/Territory 2

Table 2 Characteristics of Abstracts Submitted to the DAD in 2008–2009 Compared to Those Represented by the Study Sample 9

Table 3 Analytical Model 10

Table 4 Stroke Diagnoses Captured During the Chart Review Compared With Stroke Diagnoses on the DAD Abstract 13

Table 5 Strokes on the DAD Abstract Compared to Strokes Captured During the Chart Review 15

Table 6 Strokes Identified During the Chart Review as Significant Compared to Conditions on the DAD Abstract 18

Table 7 Analysis of the Coding Quality of Post-Admission Strokes 20

Table 8 Proportion of Hospitalizations for Transient Ischemic Attack That Also Have a Stroke Coded as a Separate Event 20

Table 9 Coding Quality of Other Health Conditions for Stroke Patients, at the Hospitalization Level 21

Table 10 Coding Quality of Other Diagnoses for Stroke Patients, by ICD-10-CA Code Block at the Hospitalization Level 22

Table 11 Changes to Case Mix Group as a Result of Coding Quality Issues 23

Table 12 Coding Consistency of Non-Clinical Data Elements Between the DAD Abstract and the Emergency Department Abstract 27

Table 13 Coding Consistency of Strokes Between the DAD Abstract and the Emergency Department Abstract 28

Table 14 Interventions for Thrombolytic Therapy Captured During the Chart Review Compared With Interventions on the DAD Abstract 33

Table 15 Changes to Intervention Location Code 37

Table 16 Coding Quality of Health Interventions at the Hospitalization Level for Stroke Patients 38

Table 17 Availability of Information in the Patient Chart for Stroke Project 340 42

Table 18 Availability of Information in the Patient Chart for Abstracting the Date and Time of Administration of Acute Thrombolysis, for Patients Who Had This Agent Administered 43

Table 19 Availability of Information in the Patient Chart for Select Data Elements in Stroke Project 340, by Stroke Type 43

Table 20 Associated Symptom Codes for Stroke Patients 53

List of Figures

Figure 1 Frequency With Which Significant Stroke Diagnoses Found During the Chart Review Were Also Present and Coded as Significant in the DAD 14

Figure 2 Frequency With Which Significant Strokes Found During the Chart Review Were Also Coded in the DAD as Significant 16

Figure 3 Frequency With Which Significant Strokes Found During the Chart Review Were Also Coded in the DAD as Significant, by Entry Code Reported to the DAD 17

Figure 4 Consistency of ICD-10-CA Codes Assigned to Strokes 19

Figure 5 Net Change of Resource Intensity Weight in Three Stroke Case Mix Groups 24

Figure 6 Coding Quality of Strokes in 2007–2008 and 2008–2009 25

Figure 7 Consistency of the Presence of Stroke Between the DAD Abstract and the Emergency Department Abstract 28

Figure 8 Comparisons of Interventions for Thrombolytic Therapy That Were Found During the Chart Review to Information Coded on the DAD Abstract 34

Figure 9 Appropriateness of Coding Thrombolytic Therapy Based on Stroke Type ... 35

Figure 10 Discrepancies in the Date and Location for Thrombolytic Therapy 36

Figure 11 Analysis of Coding Issues for Strokes Reported to the DAD 47

Figure 12 Analysis of Coding Issues for Thrombolytic Therapy Reported to the DAD .. 48

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.

Data and information quality 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 implements a complete data quality program that 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 wishes to acknowledge and thank the following individuals and organizations for their contributions to this data quality study on the Discharge Abstract Database:

- The 11 health information management professionals who collected the data;
- The 28 hospitals across Canada that participated in this study and that welcomed the reabstractors into their sites;
- The Canadian Health Information Management Association, which assisted with advertising for reabstractors; and
- The provincial ministries of health and regional health authorities that supported this data quality initiative within their provinces.

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 data that was submitted to the DAD for the 2008–2009 fiscal year. Specific goals for this study were to assess the coding quality of strokes and thrombolytic therapy and to evaluate whether chart documentation contained the information required for the Canadian Stroke Strategy Performance Improvement Project.

Note: the results for this study are not representative of the DAD; rather, they are representative of a targeted stroke patient population.

Coding Quality of Strokes

- There is a tendency to report I64– *Unspecified Stroke* to the DAD when chart documentation indicates that the stroke was ischemic. The Canadian Coding Standards require that the most specific ICD-10-CA code be reported to the DAD. As a consequence, it is incorrect to capture stroke as I64– *Unspecified Stroke* if there is documentation in the chart that supports a more specific code, for example, ischemic or hemorrhagic stroke.
- Most coding inconsistencies for ischemic and hemorrhagic stroke did not result in a change in the type of stroke but rather consisted of differences in the code specificity that describes the cause of the ischemic event or the place in the brain where the hemorrhage occurred.
- Of the stroke codes reported to the DAD that had a significant impact on the patient's length of stay or resource use, 94% had chart documentation that supported their inclusion as significant conditions. That is, 6% of the reported significant strokes could be over-reported to the DAD.
- Of all the stroke diagnoses found during the chart review that played a significant role in the care provided and resources used (that is, *significant* diagnoses), 97% were reported on the DAD abstract as significant. That is, there is potential under-reporting to the DAD of 3% of strokes that can affect the patient's length of stay or resource utilization.

Coding Quality of Thrombolytic Therapy

- Of the instances in which chart documentation showed that thrombolytic therapy was administered to a stroke patient, 81% had thrombolytic therapy reported on the DAD abstract. This indicates potential under-reporting to the DAD of 19% of thrombolytic therapies that are administered in the inpatient setting to stroke patients.
- Few discrepancies were found with the Canadian Classification of Health Interventions (CCI) code assigned to thrombolytic therapy; however, more discrepancies were found in the recording of *when* the agent was administered (5% discrepancy rate for intervention date) and *where* it was administered in the health care facility (22% discrepancy rate for Intervention Location Code).

Availability of Documentation for Stroke Project 340

- Chart documentation was frequently unavailable for Stroke Symptom Onset Date and Time, which is defined as the date and time that the patient first started to experience stroke symptoms, regardless of location of the patient at the time of symptom onset. The capture of these data elements allows one to understand the quality of care for patients in relation to the date and time when they are treated for the stroke symptoms. The study found that for 37% of the charts reviewed, the time the patient started to exhibit stroke symptoms was not recorded in the patient chart; in 11% of the charts reviewed, the date was unavailable.
- Clinical notes did not include details on the Prescription of Antithrombotic Medication at Discharge for 3% of the charts.
- For hospitalizations in which thrombolytic therapy was administered, 4% lacked documentation on the Time of Acute Thrombolysis Administration.

Coding Issues

- Inconsistencies in coding strokes were attributed either to different interpretations of the chart documentation or to the lack of documentation.
- The coding standard related to the administration of thrombolytic therapy may not have been followed consistently, resulting in its under-reporting to the DAD.
- For the fiscal year prior to its launch, chart documentation did not always contain information needed to allow complete collection of data for the Canadian Stroke Strategy Performance Improvement Project (Stroke Project 340).

Considerations for Improving Coding Quality

The results of this report reiterate 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, coders who extract patient information and record data on the DAD abstract and those who maintain the DAD and develop national coding directives.

Administrators, physicians and health records staff at the study facilities can review the findings from the study with the information provided in their facility-specific report to identify areas where improvements are needed to promote high-quality DAD data.

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 Discharge Abstract Database (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).

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 2008–2009, the population of reference for the DAD included all separations (excluding stillbirths and cadaveric donors) from acute inpatient and day surgery institutions. For this population of reference, the Canadian Institute for Health Information (CIHI) received inpatient data from 584 acute care facilities from nine provinces and three territories, as illustrated in Table 1.

Table 1: Volume of Abstracts Submitted to the DAD in 2008–2009, by Province/Territory*

Province/Territory	Number of Acute Care Facilities	Number of Inpatient Abstracts
Newfoundland and Labrador	33	55,446
Prince Edward Island	7	15,914
Nova Scotia	33	91,789
New Brunswick	22	93,173
Quebec†	N/A	N/A
Ontario	169	1,085,025
Manitoba	73	133,191
Saskatchewan	64	135,710
Alberta	96	355,773
British Columbia	81	409,143
Yukon	1	3,353
Northwest Territories	4	5,628
Nunavut	1	2,147
Total	**584**	**2,386,292**

Notes

* The figures included in this table are for the DAD abstracts, which belong to the DAD's population of reference, that were submitted by acute care facilities.

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

1.2 Study Overview, Rationale and Objectives

The main goal of this study was to assess the quality of the coding of clinical information in the DAD for 2008–2009 for patients who had experienced a stroke, with an aim of providing results for the coding quality of the type of stroke and the completeness of coding of the administration of thrombolytic therapy. A separate review was performed to assess the ability to capture additional data fields for key process and outcome information based on stroke best practices.

Specifically, the objectives of this study were the following:

- Evaluate the coding quality of stroke data, with special attention to the coding of unspecified stroke.
- Assess the coding quality of thrombolytic therapy for stroke patients.
- Evaluate whether the information required for the Canadian Stroke Strategy Performance Improvement Project was readily available in the chart.

Data collected for this study required health information management professionals (that is, hospital health record coders) to perform a chart review and abstract data that was then compared with the DAD in a process called reabstraction. Throughout this report, the coders who collected the data in this study are referred to as reabstractors. The purpose of collecting and analyzing reabstraction data is to identify systemic problems in coding and data collection. Coding problems could result from many areas, such as the following:

- Unclear directives in the *DAD Abstracting Manual* and CIHI's Canadian Coding Standards 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 coders to implement these standards and directives consistently;
- Coders' noncompliance with or need for education on these directives, for any number of reasons, which affects the data;
- Hospital policies that unintentionally affect the quality of the data in a negative way;
- The quality and completeness of the chart documentation, which affects the coders' ability to interpret the patient's stay with respect to the coding standards; and
- Invariably, unintentional human error introduced during the coding and abstracting process.

Reabstraction studies enable CIHI to determine the extent of coding inconsistency and also isolate the areas that are causing inconsistencies. The intent of these studies is not to find fault with either the hospital coder or the reabstractor but, rather, to identify areas where the inconsistencies noted between these coders point to data quality issues. These studies provide CIHI with the information needed to improve its products and to engage in discussion with its stakeholders.

1.3 Privacy, Confidentiality and Security

CIHI 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 policies for privacy and data protection can be found online at www.cihi.ca/privacy.

1.4 Objectives of This Report

This report presents the results of the 2008–2009 DAD data quality study. It focuses on stroke patients.

This report contains seven chapters. This chapter provides an introduction to the study. Chapter 2 presents the study method. The subsequent three chapters address the study objectives: Chapter 3 presents the coding quality of stroke diagnoses, Chapter 4 evaluates the coding quality of thrombolytic therapy and Chapter 5 assesses the availability of chart documentation required for the Canadian Stroke Strategy Performance Improvement Project. The final two chapters summarize coding issues, the key findings and recommendations.

Chapter 2—Study Method

This study was designed to compare data captured on the inpatient abstract and reported to the DAD to the information documented in the patient chart.

2.1 Study Design

As part of its main objective, the study was designed to assess the validity of the high volume of unspecified strokes reported to the DAD. Unspecified stroke should only be coded when there is missing documentation in the patient's chart with respect to whether the stroke event was hemorrhagic or ischemic. There were questions about whether the type of stroke was documented in the chart for many of the strokes reported as unspecified. Facilities with computed tomography (CT) and/or magnetic resonance imaging (MRI) technology were targeted because these diagnostic imaging scan results can contribute to the determination of the type of stroke.

The patient records selected for this study were not designed to be representative of the entire DAD population but, rather, were designed to be representative of a targeted population.

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 required to have CT and/or MRI scan technology; and 2) they were required to have submitted 1,000 or more abstracts in 2008–2009. This first-stage probability sample resulted in 28 facilities being selected. In the second stage of sampling, patient records were selected from these 28 facilities. Patient records that were sampled had to meet certain clinical requirements, such as the presence of certain ICD-10-CA codes on the DAD abstract, as well as logistical requirements, such as the patient's length of stay having to be 30 days or less. In regard to the latter requirement, hospitalizations with longer stays were considered to be not comparable to those with shorter lengths of stay.

As a consequence of excluding certain facilities and long-stay hospitalizations, the study sample represented 23,053 stroke hospitalizations, or 61% of the 37,572 stroke hospitalizations reported to the DAD. The study sample also represented 5,297 other hospitalizations that did not involve a stroke but were of interest to meet the other study objectives, which were to assess the coding quality of thrombolytic therapy and to evaluate the availability of information in the chart that is needed to collect data for the Canadian Stroke Strategy Improvement Project.

2.2 Training and Data Collection

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

For data collection, study coders performed reviews of the information in the patient's chart regarding the hospital stay.[i] Their findings were recorded using a CIHI software application. The application stored the study data and then revealed the DAD data for the selected charts, noting wherever discrepancies existed between the DAD data and the study data. The study coder then reconciled data by recording a reason for each discrepancy or by entering a comment with additional pertinent information.

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. Where needed, CIHI staff corrected the data manually. 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 are critical to ensure that accurate and representative information is in the study database.

Only weighted estimates for the reabstraction study are presented in this report. Therefore, the 4,102 abstracts that were studied represent the study's population of reference of 28,350 abstracts. 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.[ii] Variance estimates were generated using the bootstrap method.

i. Data collection took place from September to November 2009. Data collected for this study exceeded its target number of 4,080 reabstractions for a total of 4,102.

ii. The sample reviewed in this study is only one of many samples, using the same design and size, which 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 to 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 generally comparable to, but not fully representative of, all stroke patients from facilities that have CT and/or MRI scan technology.

Table 2: Characteristics of Abstracts Submitted to the DAD in 2008–2009 Compared to Those Represented by the Study Sample

	All Acute Care Inpatient Abstracts in DAD	Abstracts in DAD, Submitted From a Facility With CT and/or MRI Scan Technology	Weighted Estimates Using Study Sample*
Number of Abstracts	**2,386,292**	**2,032,490**	**--**
Number of Abstracts With a Length of Stay ≤30 Days	**2,301,536**	**1,959,341**	**--**
Abstracts Eligible for Stroke Project 340	**39,423**	**33,356**	**25,544**
Abstracts for Stroke Patients†	**37,572**	**32,750**	**23,053**
Patients Who Received Thrombolytic Therapy or Antithrombolytics‡	*1,636*	*1,594*	*1,248*
Age in Years, Mean (Inter-Quartile Range)	*72 (63–83)*	*71 (62–83)*	*71 (61–82)*
Number of Comorbidities,§ N (Mean)	*86,817 (2.3)*	*78,701 (2.4)*	*43,304 (1.9)*
Number of Interventions, N (Mean)	*61,401 (1.6)*	*57,162 (1.7)*	*33,488 (1.5)*

Notes

N: number in population.

* The study sample represents short-stay (≤30 days) hospitalizations from facilities that have CT and/or MRI scan technology and that also submitted 1,000 or more abstracts for patients who had experienced a stroke. The symbol -- is used for estimates in which the study sample is not comparable.

† ICD-10-CA code between I60.– and I64 with a significant diagnosis type (M, 1, 2, 6, W, X or Y).

‡ CCI code of 1.^ ^.35.H^-C1.

§ These are type 1 and 2 diagnoses only. The lower estimated number of stroke patients and the lower number of comorbidities using the study sample are due to the exclusion of patient hospitalizations with a length of stay greater than 30 days from the study design.

Agreement rates were calculated for various parameters. Data from this study was also analyzed using the analytical model shown in Table 3. Note that this model was used to analyze strokes, thrombolytic therapy, case mix grouping output variables and other data elements of interest.

Table 3: Analytical Model

		Status of Heath Condition in the Study Data—Criterion Standard	
		Present	Absent
Status of Health Condition in DAD	Present	A	B
	Absent	C	D

Sensitivity and **positive predictive value** are two statistics used throughout this report. These statistics describe the quality of a test that determines the presence or absence of some characteristic (here, a health condition) by comparing the results of the test to another categorization that is believed to be without error. This perfect categorization is often called the "gold standard" or "criterion standard."

- **Sensitivity:** A / (A + C) × 100%—the percentage of true positives of all patients with a health condition in the study data.
- **Positive predictive value:** A / (A + B) × 100%—the percentage of patients with a health condition in the DAD who also have the health condition in the study data.

Ideally, the criterion standard indicates whether a health condition is truly present for a patient. In this study, the results obtained by the reabstractors are considered the criterion standard only for the purpose of calculating these statistics.[iii] It is important to note in this study that these statistics must be used with caution, as the study method used was a chart review of the documentation for the patient. Therefore, the reabstraction data is more of a reference standard than a gold standard, as this study does not capture charting errors that could occur when patient histories are taken, diagnoses are made and other clinical information is recorded in the chart.

iii. Data collected from reabstractors is not perfect. Coding variation between reabstractors is known to exist and was assessed in a previous reabstraction study on the DAD 2005–2006 data.[2]

Chapter 3—Coding Quality of Strokes

This chapter focuses on the study's first objective: to evaluate the coding quality of stroke data, with special attention on the coding of unspecified stroke.

A stroke is the sudden death of brain cells in a localized area due to inadequate blood flow to that part of the brain. A stroke involves either an ischemic or a hemorrhagic event. Ischemic stroke occurs when the flow of blood to the brain is blocked; hemorrhagic stroke occurs when a blood vessel ruptures around or inside the brain.[3]

3.1 Completeness of Reporting Stroke to the DAD

This section examines the *completeness*[4] of DAD data by determining if all of the associated stroke diagnoses that were documented in the patient chart were also included on the DAD abstract.

Of all the significant stroke diagnoses found during the chart review, 97% were reported on the DAD abstract as significant diagnoses. This percentage is known as *sensitivity* (Table 4). This sensitivity result indicates potential under-reporting to the DAD[iv] of 3% of strokes that can affect the patient's length of stay or resource utilization. This is a positive finding that supports that nearly all strokes experienced in the inpatient setting are reported to the DAD.

Table 4: Stroke Diagnoses Captured During the Chart Review Compared With Stroke Diagnoses on the DAD Abstract

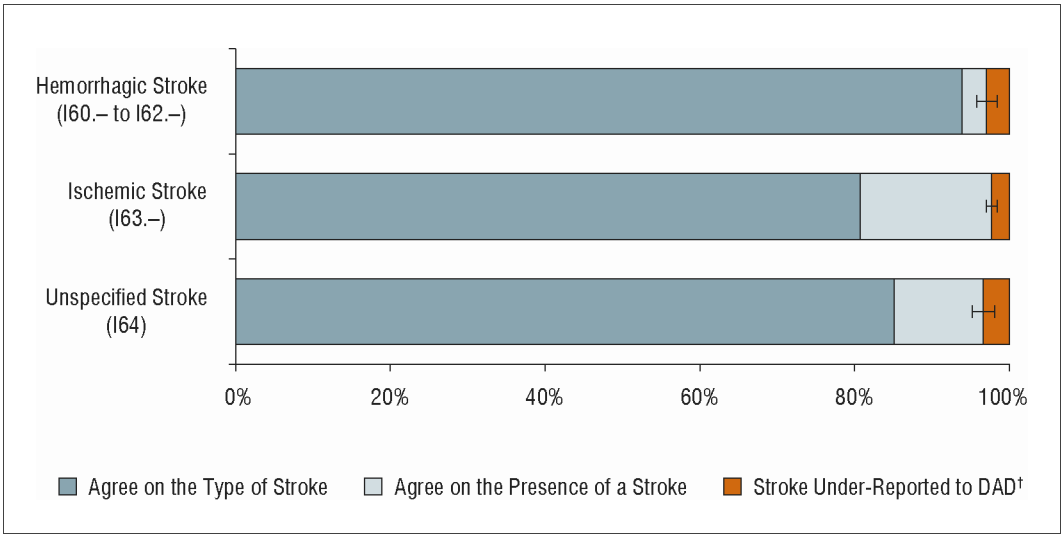
	DAD Data (in Thousands)		Total in Study Data (in Thousands)	Sensitivity (95% CI)
	Present	Under-Reported to DAD		
All Significant Strokes in Study Data *(Identified in the Chart by the CIHI Reabstractor)* *	23.1	0.6†	23.7	**97.4** (96.8–97.9)

Notes
CI: confidence interval.
* Includes codes between I60.– and I64 that are significant (type M, 1, 2, 6, W, X or Y).
† These diagnoses were either not present in the DAD, or were coded as not significantly impacting the patient's length of stay or resource use (that is, diagnosis type 3) or were assigned an ICD-10-CA code that was not between I60.– and I64.

iv. In precise terms, this is the potential under-reporting to the DAD by the facilities that belong to the study population.

When repeated for different types of stroke (hemorrhagic, ischemic and unspecified), this analysis found two key findings. First, all types of strokes were reported to the DAD with the same degree of completeness, as illustrated in Figure 1. The regions of interest in this figure are the orange bars, which show the degree of under-reporting of strokes to the DAD. The factors that contributed to under-reporting include not attributing significance to the stroke for the patient's hospital stay, identifying a different cerebral vascular disease and/or not identifying stroke at all. The second key finding is illustrated with the light blue regions of the figure, which present how often the stroke that was reported to the DAD was captured by the study coder as a different type of stroke. This second finding highlights that there are other coding issues, beyond coding completeness, that are particular to ischemic stroke and unspecified stroke.

Figure 1: Frequency With Which Significant Stroke Diagnoses Found During the Chart Review Were Also Present and Coded as Significant in the DAD*



Notes

* The bars represent the 95% confidence intervals.

† Includes all cases in which the DAD abstract did not include the stroke as affecting the patient's hospital stay.

Stroke reporting to the DAD was further analyzed to determine if the degree of coding completeness varied based on the type of patient or type of hospitalization. This analysis found no relationship between the completeness of stroke data and select patient demographics (gender, age group) or descriptors of the patient's hospital stay (discharge status, entry code, length of stay).[v] In other words, the sensitivity of strokes for each of these sub-populations was not significantly different from the overall sensitivity of 97%.

v. The categories analyzed for age group were 0 to 65 years, 66 to 79 years and 80+ years; the categories analyzed for length of stay were 1 to 7 days, 8 to 14 days, 15 to 21 days and 22 to 30 days.

3.2 Correctness of Reporting Strokes to the DAD

This section examines the *correctness*[3] of stroke data reported to the DAD by determining how often documentation in the patient charts supports the inclusion of stroke codes on the DAD abstract.

Of the stroke codes reported to the DAD that had a significant impact on the patient's length of stay or resource use, 94% had chart documentation that supported their inclusion as significant conditions. This percentage is known as the *positive predictive value* (Table 5). This result indicates possible over-reporting to the DAD[vi] of 6% of the significant strokes. This finding supports that the DAD data is very reliable in terms of the strokes abstracted.

Table 5: Strokes on the DAD Abstract Compared to Strokes Captured During the Chart Review

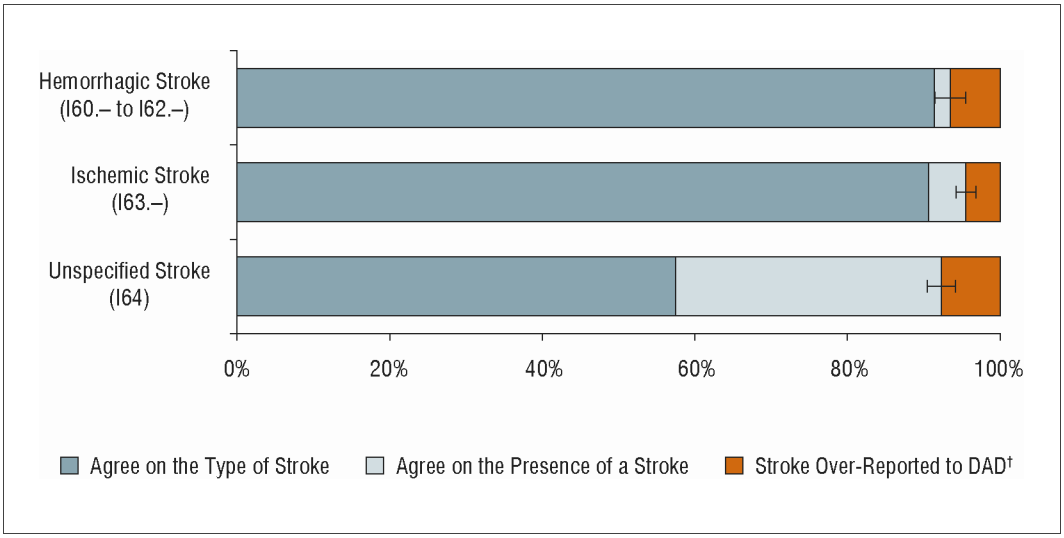
	Study Data (in Thousands)		Total in DAD (in Thousands)	Positive Predictive Value (95% CI)
	Present	Over-Reported to DAD		
All Significant Strokes in DAD*	23.1	1.4†	24.5	**94.2** (93.3–95.2)

Notes
CI: confidence interval.
* Includes codes between I60.– and I64 that are significant (type M, 1, 2, 6, W, X or Y).
† These diagnoses were either not reabstracted, or were reabstracted as not significantly impacting the patient's length of stay or resource use (that is, diagnosis type 3) or were reabstracted with an ICD-10-CA code that was not between I60.– and I64.

vi. In precise terms, this is the potential over-reporting to the DAD by the facilities that belong to the study population.

When repeated for different types of stroke, this analysis found two key observations. First, all types of strokes were reported to the DAD with a similar degree of correctness, as illustrated in Figure 2. The regions of interest in this figure are the orange bars, which show the degree of over-reporting of strokes to the DAD. Stroke data was over-reported when the study coder determined that the stroke did not significantly affect the patient's hospital stay, when the study coder captured a cerebral vascular disease other than a stroke and when no documentation was found in the patient chart that indicated any cerebral vascular incident. The second key finding is illustrated with the light blue regions of the figure, which present how often the type of stroke (that is, hemorrhagic, ischemic or unspecified) that was reported by the study coder differed from the type on the DAD abstract. The longer light blue bar for unspecified stroke indicates that there are more coding issues with respect to the coding of unspecified stroke in the DAD.

Figure 2: Frequency With Which Significant Strokes Found During the Chart Review Were Also Coded in the DAD as Significant*



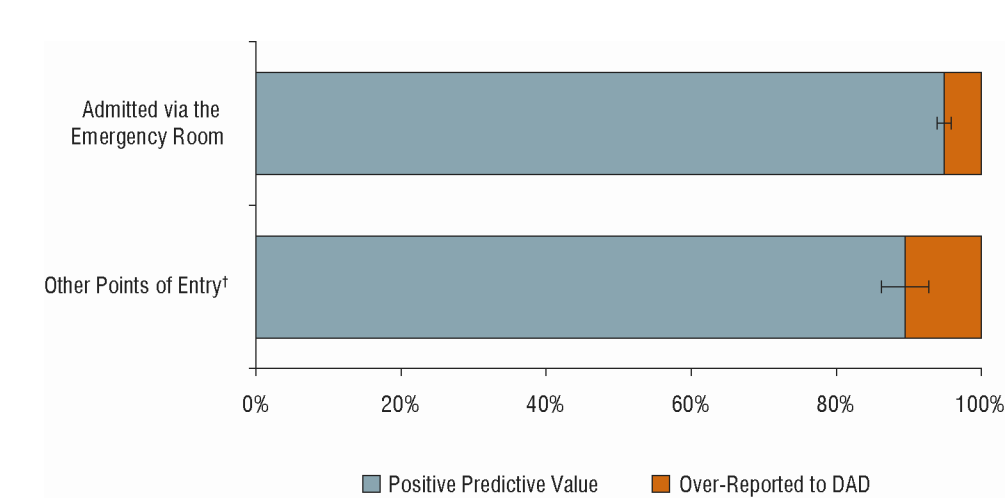
Notes

* The bars represent the 95% confidence intervals.

† Includes all cases in which the study data did not include the stroke as affecting the patient's hospital stay.

Stroke reporting to the DAD was further analyzed to determine if the degree of coding correctness varied based on the type of patient or type of hospitalization. This analysis found no relationship between the correctness of stroke data when considering gender, age group, discharge disposition or length of stay.[vii] However, differences were observed when comparing positive predictive values between hospitalizations based on the patient's point of entry to the health care facility (Figure 3). Strokes were more correctly reported to the DAD for patients who entered the health care facility via the emergency room.

Figure 3: Frequency With Which Significant Strokes Found During the Chart Review Were Also Coded in the DAD as Significant, by Entry Code Reported to the DAD*



Notes

* The bars represent the 95% confidence intervals.

† Other Points of Entry includes cases with Entry Codes of C (via clinic of the reporting facility), D (via admitting department or directly to the unit) and P (via the day surgery department of the reporting facility). While other Entry Codes are valid for reporting on the DAD abstract, only these three were represented in the study sample.

vii. The categories analyzed for age group were 0 to 65 years, 66 to 79 years and 80+ years; the categories analyzed for length of stay were 1 to 7 days, 8 to 14 days, 15 to 21 days and 22 to 30 days.

3.3 Special-Focus Topics on Strokes

The reliability of certain analyses of strokes using DAD data requires specific attributes to be coded with high quality. For example, some require the consistent capture of diagnosis types, while others require precision in the specificity of the ICD-10-CA codes that are selected. This section analyzes the coding quality of stroke data for different information needs.

Unspecified Stroke

The Canadian Coding Standards require that the most specific ICD-10-CA code be reported to the DAD. As a consequence, it is incorrect to capture stroke as I64– *Unspecified Stroke* if there is documentation in the chart that supports a more specific code; for example, ischemic or hemorrhagic stroke.

Table 6 presents analysis of all stroke diagnoses that were coded as significant in the DAD and compares these to data collected during the chart review. The cells shaded in blue mark the cases in which strokes were captured by the study coder in the same way that they were reported to the DAD. The cells shaded in dark orange indicate cases in which unspecified stroke was reported to the DAD whereas the study coder was able to capture a more specific stroke. This analysis shows that there is a tendency to report I64– *Unspecified Stroke* to the DAD when the chart documentation indicates that the stroke was ischemic. Table 6 also offers more detail on the over-reporting of stroke as a significant condition, which is represented in the rightmost two columns.

Table 6: Strokes Identified During the Chart Review as Significant Compared to Conditions on the DAD Abstract

			Study Data				
		Volume in DAD (in Thousands)	Hemorrhagic Stroke	Ischemic Stroke	Unspecified Stroke	Different Code*	No Significant Code†
DAD Data	Hemorrhagic Stroke	5.1	**91%**	2%	0%	2%	4%
	Ischemic Stroke	12.6	1%	**91%**	4%	1%	4%
	Unspecified Stroke	6.8	1%	34%	**57%**	2%	5%

Notes

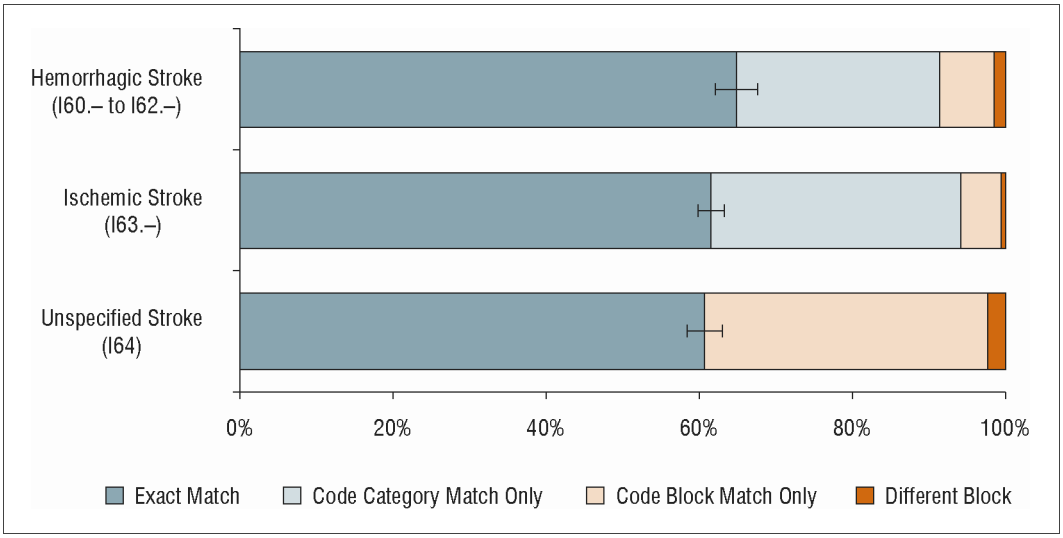
* These represent health conditions captured with a diagnosis code that is not within the ICD-10-CA code category range I60.– to I64.

† Includes diagnoses assigned a type 3 and cases where there was no diagnosis captured.

Specificity of Codes for Strokes

This section examines the coding consistency of ICD-10-CA codes assigned to strokes and focuses on only those strokes reported to the DAD that were confirmed as present after the chart review. Figure 4 illustrates this analysis, showing that there are exact matches for two-thirds of the stroke codes; this finding is consistent among the three categories of strokes. Non-matches in ICD-10-CA codes assigned to strokes are represented with the subsequent portions of the bar chart. Most coding inconsistencies for ischemic and hemorrhagic stroke did not result in a change in the type of stroke but, rather, consisted of differences in the code specificity that describes the cause of the ischemic event or the place in the brain where the hemorrhage had occurred. Differences of this nature are illustrated with the statistics labelled "Code Category Match Only." Most coding differences for code I64– *Unspecified Stroke* were the result of the study coder determining that the stroke was ischemic, which is illustrated in the figure with the statistics labelled "Code Block Match Only."

Figure 4: Consistency of ICD-10-CA Codes Assigned to Strokes*



Notes

The bars represent 95% confidence intervals.

* The scope of analysis is limited to strokes in the DAD that were typed as significant (type M, 1, 2, 6, W, X or Y) that were also reabstracted as a significant diagnosis type.

Post-Admission Stroke

The ability to monitor strokes that occur after a patient's admission to the hospital is of particular interest for various research purposes, for example, in examining the quality and safety of patient care.[5]

The study found slightly lower sensitivity and positive predictive values for post-admission strokes (Table 7). Most of the discrepancies were not due to whether the stroke had occurred but were due to whether the stroke had occurred after the patient was admitted, which explains why these coding accuracy results are lower than the findings presented earlier.

Table 7: Analysis of the Coding Quality of Post-Admission Strokes

	Volume (in Thousands)		Sensitivity (95% CI)	Positive Predictive Value (95% CI)
	DAD Data	Study Data		
Post-Admission Stroke*	1.8	2.0	**78.5** (72.5–84.5)	**86.6** (81.6–91.7)

Notes
CI: confidence interval.
* Includes codes between I60.– and I64 that are post-admission (type 2).

Transient Ischemic Attacks

The Canadian Coding Standards advise that when any stroke code is recorded on an abstract, the code G45.9– *Transient Cerebral Ischemic Attack, Unspecified* is typically not recorded on the same abstract—unless the two occur as separate events. Table 8 examines the volume of abstracts with a code G45.9 and illustrates the proportion from which a separate stroke event was coded; this analysis found that the proportion of hospitalizations with an unspecified transient ischemic attack and a separate stroke event was similar between the DAD data and the study data.

Table 8: Proportion of Hospitalizations for Transient Ischemic Attack That Also Have a Stroke Coded as a Separate Event*

	DAD Data	Study Data
Volume of Hospitalizations in Which the Patient Suffered From a Transient Ischemic Attack	4,985	4,736
Proportion of Patients Who Also Suffered From a Separate Stroke Event*	0.8%	0.9%

Note
* This analysis considers only diagnoses captured as significant diagnosis types.

3.4 Coding Quality of Other Health Conditions for Stroke Patients

This section reviews the coding quality of other health conditions captured on the DAD abstract that are important to researchers and policy-makers in understanding the population of stroke patients. The statistics presented in this section are at the hospitalization level and only consider whether a health condition was present, regardless of the number of times it was coded on the abstract.

Specific health conditions that are potential risk factors or side effects of a stroke were first reviewed for coding quality. This analysis, included in Table 9, shows that the prevalence of most health conditions for stroke hospitalizations is similar whether these were calculated using DAD data or study data; however, health conditions with lower sensitivity and positive predictive values indicate that different hospitalizations are included in these prevalence counts. These results highlight that this detailed information on stroke patients is less accurate than whether the stroke had occurred; potential coding quality issues were found for stroke patients with arrhythmia and hypertriglyceridemia/dyslipidemia (shaded in orange).

Table 9: Coding Quality of Other Health Conditions for Stroke Patients, at the Hospitalization Level*

Health Condition	Method of Classification†	Prevalence in Stroke Population (DAD)	Prevalence in Stroke Population (Study)	Sensitivity‡ (95% CI)	Positive Predictive Value‡ (95% CI)
Atrial Fibrillation	I48.0	1,996	2,104	**79** (72–85)	**83** (78–88)
Pre-Admission Aphasia, Dysphagia	Type 1 R47.0	1,084	1,090	**75** (68–83)	**77** (68–85)
Myocardial Infarction	I21.–	790	795	**83** (74–92)	**93** (87–99)
Arrhythmia	I47.–, I48.1, I49.–, R00	406	443	**66** (51–82)	**78** (65–92)
Hypertriglyceridemia, Dyslipidemia	E78.–	281	245	**63** (43–83)	**62** (42–83)
Drug Use	F10.– to F19.–	265	--	--	**78** (57–98)

Notes

CI: confidence interval.

* Health condition volumes had to have at least 30 abstracts in the study sample in order to be included in this table. Cells populated with -- indicate that the statistics are suppressed due to insufficient sample.

† The method of classification considered all diagnoses that were significant (type M, 1, 2, 6, W, X or Y), unless otherwise noted.

‡ To be interpreted as follows: Sensitivity: of the stroke patients identified by the study coder with a health condition, this is the percentage that had the health condition in the DAD; Positive predictive value: of the stroke patients in the DAD with a health condition, this is the percentage that had the health condition reabstracted.

When grouping hospitalizations based on the presence or absence of a health condition within each ICD-10-CA code block, a more exhaustive review of the coding quality of diagnoses was performed, as summarized in Table 10. Cells with a sensitivity or positive predictive value less than 70% are shaded in orange; these mark ICD-10-CA code blocks that are potentially under- and/or over-reported to the DAD. Coding issues for stroke hospitalizations were most common for ICD-10-CA blocks related to symptoms and signs.

Table 10: Coding Quality of Other Diagnoses for Stroke Patients, by ICD-10-CA Code Block at the Hospitalization Level*

ICD-10-CA Code Block and Description†	Prevalence (DAD)	Prevalence (Study)	Sensitivity‡ (95% CI)	Positive Predictive Value‡ (95% CI)
D60–D64 Aplastic and Other Anaemias	--	416	**70** (56–84)	--
E10–E14 Diabetes Mellitus	2,824	2,923	**81** (76–86)	**87** (82–91)
E70–E90 Metabolic Disorders	1,522	1,770	**72** (65–79)	**86** (80–92)
F00–F09 Organic Mental Disorders	410	494	**57** (43–71)	**70** (58–83)
G40–G47 Episodic and Paroxysmal Disorders	--	374	**59** (41–76)	--
G80–G83 Cerebral Palsy and Other Paralytic Syndromes	2,414	2,257	**77** (71–83)	**72** (66–77)
G90–G99 Other Disorders of the Nervous System	817	802	**89** (81–97)	**89** (82–96)
I10–I15 Hypertensive Diseases	3,261	3,995	**66** (61–70)	**81** (76–85)
I20–I25 Ischaemic Heart Diseases	1,222	1,169	**89** (84–95)	**90** (85–96)
I30–I52 Other Forms of Heart Disease	3,106	3,307	**80** (75–85)	**87** (83–90)
I70–I79 Diseases of Arteries, Arterioles and Capillaries	374	--	--	**65** (50–81)
I95–I99 Other and Unspecified Disorders of the Circulatory System	421	398	**79** (68–91)	**78** (63–92)
J09–J18 Influenza and Pneumonia	572	567	**75** (64–86)	**78** (66–89)
J40–J47 Chronic Lower Respiratory Diseases	--	333	**78** (65–91)	--
J60–J70 Lung Diseases Due to External Agents	887	945	**84** (76–92)	**92** (85–99)
J95–J99 Other Diseases of the Respiratory System	665	662	**83** (73–94)	**86** (77–96)
N17–N19 Renal Failure	805	875	**74** (63–84)	**83** (73–93)
N30–N39 Other Diseases of Urinary System	1,424	1,745	**70** (62–77)	**90** (85–94)
R00–R09 Symptoms and Signs Involving the Circulatory and Respiratory Systems	544	455	**67** (51–82)	**60** (45–74)
R10–R19 Symptoms and Signs Involving the Digestive System and Abdomen	867	1,162	**53** (43–63)	**72** (62–83)
R25–R29 Symptoms and Signs Involving the Nervous and Musculoskeletal Systems	730	--	--	**67** (54–80)
R40–R46 Symptoms and Signs Involving Cognition, Perception, Emotional State	689	439	**71** (56–86)	**48** (34–61)
R47–R49 Symptoms and Signs Involving Speech and Voice	1,911	1,763	**76** (69–83)	**72** (66–79)
R50–R69 General Symptoms and Signs	1,166	1,051	**65** (57–74)	**68** (59–78)
T80–T88 Complications of Surgical and Medical Care	531	592	**65** (51–78)	**79** (67–91)
Z40–Z54 Persons Encountering Health Services for Specific Procedures and Health Care	3,213	3,977	**76** (72–80)	**96** (93–98)
Z70–Z76 Persons Encountering Health Services in Other Circumstances	1,846	1,840	**95** (92–97)	**95** (93–98)

Notes

CI: confidence interval.

* At least 50 abstracts in the study sample had to contain one of the codes within the ICD-10-CA code blocks of significant diagnosis type (type M, 1, 2, 6, W, X or Y) in order to be included in this table.

† Some code block descriptions have been abbreviated and do not match those in ICD-10-CA. Block I60–I69 has been omitted from this table since it includes the stroke codes used to create the subset of data for analysis.

‡ To be interpreted as follows: Sensitivity: of the stroke patients identified by the study coder with a health condition, this is the percentage that had the health condition in the DAD; Positive predictive value: of the stroke patients in the DAD with a health condition, this is the percentage that had the health condition reabstracted.

3.5 Quality of Case Mix Grouping Variables

Case mix grouping methodologies categorize patients into clinically and statistically homogeneous groups based on various 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 resource indicators include expected length of stay (ELOS) and Resource Intensity Weight (RIW).

This analysis focuses on the CMG+ 2009 grouping methodology.[6]

Given the study focus on stroke coding, the reliability of certain Case Mix Groups, specifically those that describe stroke hospitalizations, was reviewed. This analysis, presented in Table 11, found that changes in Case Mix Group mapped closely to the diagnosis coding discrepancies identified with stroke data. That is, DAD hospitalizations grouped to Case Mix Group 28—Unspecified Stroke were commonly regrouped to the more descriptive Case Mix Group 26—Ischemic Event of Central Nervous System when using diagnosis and intervention information resulting from the study (shaded in dark orange). Also, some hospitalizations were regrouped to a group that did not describe a stroke, as represented in the last column of the table. This latter observation is a corollary to the other coding issues on the abstract, such as other diagnoses on the abstract that are under- and over-reported.

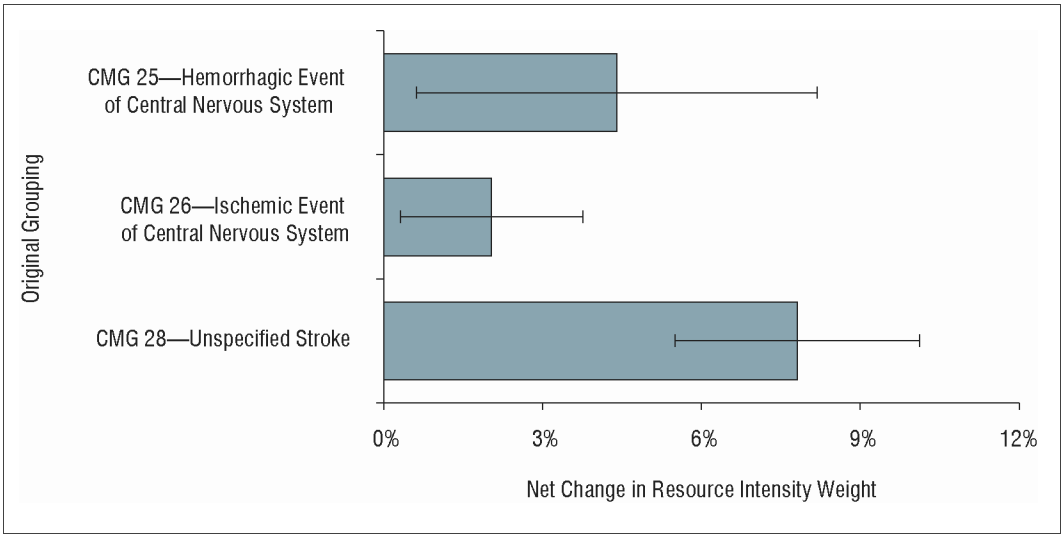
Table 11: Changes to Case Mix Group as a Result of Coding Quality Issues

		Volume in DAD (in Thousands)	Study Data			
			CMG 25—Hemorrhagic Event of Central Nervous System	CMG 26—Ischemic Event of Central Nervous System	CMG 28—Unspecified Stroke	All Other CMGs
DAD Data	CMG 25—Hemorrhagic Event of Central Nervous System	2.9	**91%**	3%	0%	6%
	CMG 26—Ischemic Event of Central Nervous System	9.8	1%	**92%**	4%	3%
	CMG 28—Unspecified Stroke	5.2	1%	35%	**57%**	8%

Notes
CMG: Case Mix Group; cells shaded in blue represent cases where there was agreement in Case Mix Group.

The reliability of Resource Intensity Weight was also investigated for hospitalizations that were grouped to one of these three stroke Case Mix Groups. When the data was regrouped using the study data, the changes observed in Resource Intensity Weight resulted in a net increase in value for each of these Case Mix Groups (Figure 5). The greatest percentage net increase was for cases originally assigned to Case Mix Group 28—Unspecified Stroke. The overall trend of increases in Resource Intensity Weight is a result of coding quality issues identified with comorbidities and the specificity of coding strokes.

Figure 5: Net Change of Resource Intensity Weight in Three Stroke Case Mix Groups



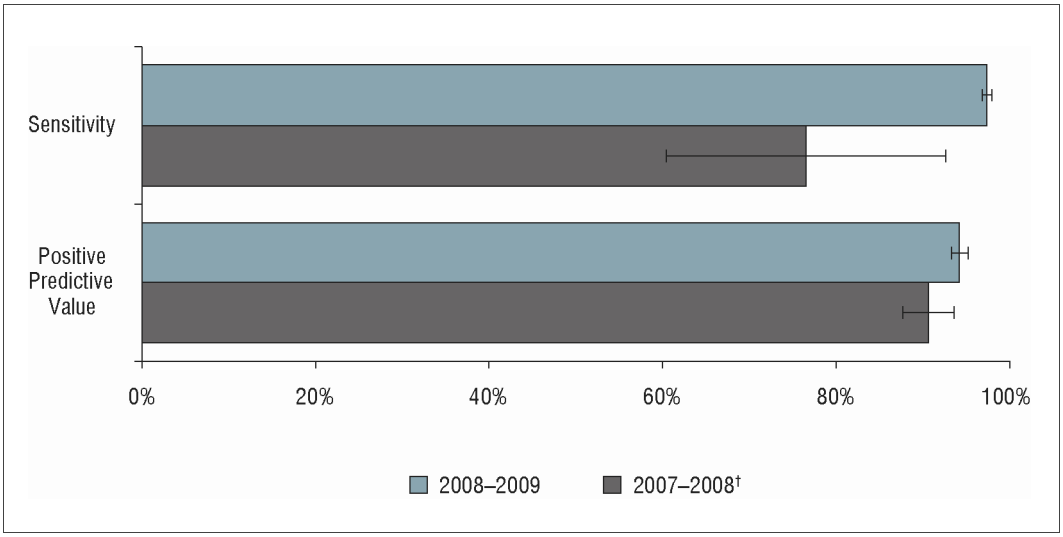
Notes
CMG: Case Mix Group; the bars represent 95% confidence intervals.

3.6 Coding Quality of Strokes Over Time

The coding quality of strokes reported to the DAD in 2008–2009 was compared to the coding quality of strokes reported to the DAD in the previous fiscal year. To allow the most meaningful comparisons, the data compared from the 2007–2008 reabstraction study was limited to a population that shared the same inclusion criteria in terms of sampling. Specifically, this restricted the 2007–2008 estimates to include data from only those facilities that had CT and/or MRI scan technology *and* that had reported a minimum of 1,000 abstracts in that fiscal year.

Figure 6 illustrates the results of this comparison, which suggests that the coding quality of strokes has improved since 2007–2008, although the wide confidence intervals reveal that the true net change may be much smaller.

Figure 6: Coding Quality of Strokes* in 2007–2008 and 2008–2009



Notes

The bars represent 95% confidence intervals.

* See the notes under Table 4 for the diagnoses that are included in this analysis.

† The 2007–2008 estimates are based on a subset of the reabstraction study results; the subset includes data from only those facilities that had CT and/or MRI scan technology *and* that had reported a minimum of 1,000 abstracts.

3.7 Consistency of Data for Stroke Patients in the DAD and NACRS

This analysis considers the consistency of information captured in the DAD and the National Ambulatory Care Reporting System (NACRS), with focus on inpatient hospitalizations for stroke patients admitted via the emergency department. The scope of this analysis is restricted to inpatient discharges between April 1, 2008, and March 31, 2009, from Ontario facilities only.[viii] For this population, a corresponding NACRS emergency department abstract was identified by applying a deterministic linkage algorithm to join the two data sets. The linkage algorithm considered the patient's Health Care Number, Disposition Date/Time From Emergency Department, Acute Care Admission Date/Time, Date/Time Patient Left the Emergency Department, Acute Institution Number and the Emergency Department Visit Disposition.

Based on this methodology, the consistency analysis presented in this section represents 15,899 of the 18,920 (84.0%) inpatient stroke hospitalizations in the DAD from Ontario.

Table 12 presents the analysis for non-clinical data. Many of these data elements are consistently reported between the two data sets; however, inconsistencies are notable for data elements that record the date and time of certain events. Some inconsistencies with dates and times are for hospitalizations in which the patient was admitted as an inpatient but waited in an emergency room before acquiring an inpatient bed; this situation appears to cause confusion with determining the correct times for admission and leaving the emergency department. Up to 6% of inpatient stroke hospitalizations had inconsistencies with date and time due to this particular situation; most differences are the result of a coding error on the emergency department abstract.

viii. The study population was restricted to inpatient acute cases in the DAD that were admitted through the emergency department of the admitting facility (Entry Code = E) and that had a significant stroke diagnosis (type M, 1, 2, W, X or Y). For this reference period, Ontario was the only jurisdiction that mandated the collection of emergency department visits to NACRS. Strokes reported on the NACRS abstract that were not reported on a subsequent DAD abstract were not included in the analysis, nor were strokes originating in an acute care facility or the emergency department of a different facility as indicated on the DAD abstract.

Table 12: Coding Consistency of Non-Clinical Data Elements* Between the DAD Abstract and the Emergency Department Abstract

	Agreement Rate
Gender	**99.9**
Birthdate	**99.7**
Postal Code	**98.1**
Emergency Department Visit Disposition	**99.1**
Acute Care Institution Code	**97.4**
Emergency Department Disposition Date and Acute Care Admission Date	**98.7**
Emergency Department Disposition Time and Acute Care Admission Time†	*77.4*
Date Patient Left the Emergency Department	**94.3**
Time Patient Left the Emergency Department†	*69.6*

Notes

* Only comparable data elements according to the definitions specified in the DAD manual and NACRS manual were evaluated.

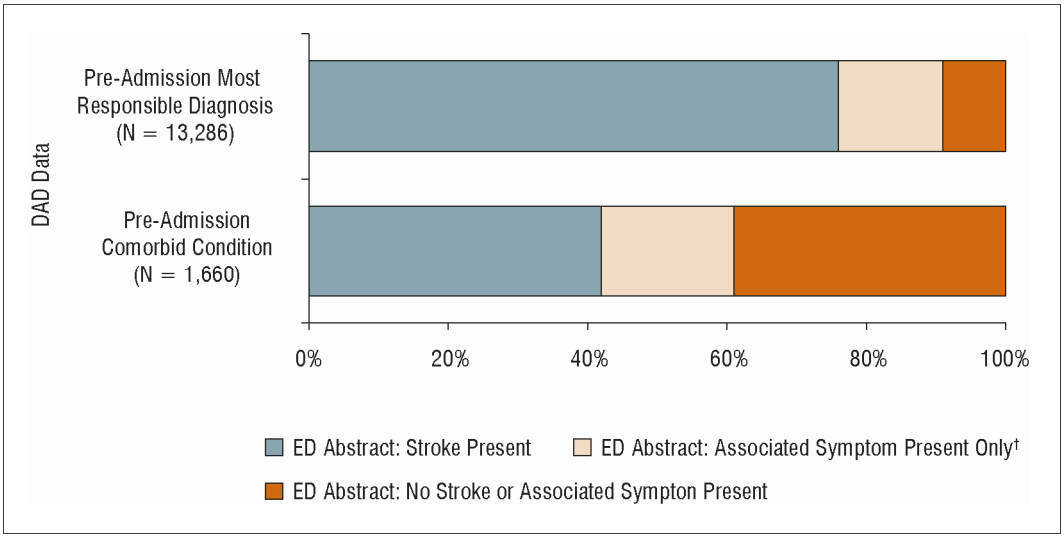
† Consistency in time data elements was evaluated only when the respective date data element was found to be consistent.

Diagnosis data was also reviewed for coding consistency for pre-admission strokes in the DAD, which account for more than 90% of all significant strokes. Pre-admission strokes can be captured as either the patient's most responsible diagnosis (type M) or a pre-admit comorbidity (type 1), as described in the Canadian Coding Standards.[8]

Figure 7 compares the DAD data on pre-admission stroke to the diagnoses on the emergency department abstract. This analysis found that the emergency department abstract included a stroke diagnosis for 76% of the DAD abstracts that reported stroke as the most responsible diagnosis, whereas this percentage was much lower, at 42%, for the pre-admission comorbid conditions in the DAD. For the remainder of cases, the emergency department abstract either indicated an associated stroke symptom (Appendix A) or did not contain any diagnoses that had an obvious relationship to a stroke. In addition to this analysis, Table 13 provides more detail by comparing the type of stroke between the two data holdings.

The inconsistencies identified from this analysis show expected trends from a clinical perspective; hemorrhagic and ischemic strokes in the DAD were commonly classified as having unspecified stroke or stroke symptoms in the emergency department. Such patients who present to the emergency department are later admitted to the inpatient setting, where they are provided with a CT and/or MRI scan that confirms or rejects the presence of the stroke and, if present, often determines the type of stroke.

Figure 7: Consistency of the Presence of Stroke Between the DAD Abstract* and the Emergency Department Abstract



Notes

N: number in population; ED: emergency department.

* Pre-admission comorbidity (type 1) or pre-admission most responsible diagnosis (type M) strokes from the DAD only.

† See Appendix A for associated symptom codes and descriptions.

Table 13: Coding Consistency of Strokes Between the DAD Abstract* and the Emergency Department Abstract

			Emergency Department Abstract				
		DAD Volume (in Thousands)	Hemorrhagic Stroke	Ischemic Stroke	Unspecified Stroke	Associated Symptom Only†	No Stroke or Associated Symptom
DAD Data	Hemorrhagic Stroke	3.4	**66%**	2%	10%	9%	15%
	Ischemic Stroke	7.2	1%	**19%**	53%	16%	11%
	Unspecified Stroke	4.3	1%	3%	**65%**	18%	14%

Notes

* Pre-admission comorbidity (type 1) or pre-admission most responsible diagnosis (type M) strokes from the DAD only.

† See Appendix A for associated symptom codes and descriptions.

3.8 Summary of Findings for the Coding Quality of Strokes

Strokes are completely and correctly captured on the DAD abstract. However, the strokes captured on the DAD abstracts sometimes missed specificity through misclassification of the stroke as unspecified rather than ischemic. The inconsistencies in classifying the type of stroke, along with under- and over-reporting issues that were identified for other health conditions, resulted in some abstracts being assigned to a different Case Mix Group and to higher Resource Intensity Weights when using the study data.

Chapter 4—Coding Quality of Thrombolytic Therapy

This chapter focuses on the study's second objective: to assess the coding quality of thrombolytic therapy for stroke patients in the DAD.

Thrombolytic therapy can reverse the effects of a stroke caused by a blood clot by breaking up the clot; it is given to patients who are having an ischemic stroke and, to be effective, must be administered within three hours of the onset of stroke symptoms. That is, when a patient presents with stroke symptoms, the doctor has a short period of time to determine whether the stroke is ischemic and to administer thrombolytic therapy.[7]

Limitation! Due to how thrombolytic therapy was reported to the DAD in 2008–2009, it is possible to analyze only the completeness with which it was reported.

4.1 Completeness of Reporting Thrombolytic Therapy to the DAD

Of the instances in which the chart documentation showed that thrombolytic therapy was administered to a stroke patient, only 81% of these had thrombolytic therapy reported on the DAD abstract. This percentage is known as *sensitivity* (Table 14). This sensitivity result indicates potential under-reporting to the DAD of 19% of thrombolytic therapies that are administered in the inpatient setting to stroke patients.

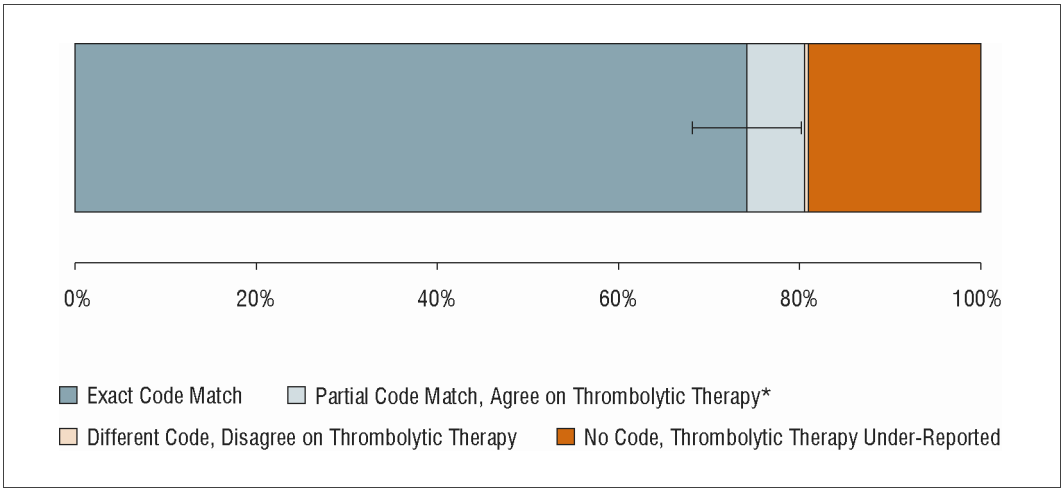
Table 14: Interventions for Thrombolytic Therapy Captured During the Chart Review Compared With Interventions on the DAD Abstract

	DAD Data (in Thousands)		Total in Study Data (in Thousands)	Sensitivity (95% CI)
	Present	Under-Reported to DAD		
All Interventions for Thrombolytic Therapy for Stroke Patients in Study Data*	1.3	0.3	1.6	**80.5** (74.3–86.7)

Notes
CI: confidence interval.
* The CCI code for thrombolytic therapy is 1.^ ^.35.H^-C1 and has been mandatory to capture in the DAD since April 1, 2006, as per the Canadian Coding Standards.[8]

To understand the situations that contributed to the under-reporting of thrombolytic therapy, a review of the information on the DAD abstract was done when thrombolytic therapy was captured by the study coder. This analysis, presented in Figure 8, found that inconsistencies in selecting CCI codes were rarely a factor that contributed to the under-reporting of this agent. Rather, the under-reporting of the thrombolytic therapy was mostly observed when the DAD abstract did not contain any pharmacotherapy codes.

Figure 8: Comparisons of Interventions for Thrombolytic Therapy That Were Found During the Chart Review to Information Coded on the DAD Abstract



Notes

The bar represents the 95% confidence interval for "Agree on CCI Code for Thrombolytic Therapy."

* Additional cases in which the CCI code did not match exactly but the CCI code on the DAD abstract also described thrombolytic therapy (e.g. 1.^ ^.35.H^-C1).

The reporting of thrombolytic therapy was further analyzed to determine if the degree of coding completeness varied based on the type of patient or the type of patient hospitalization. This analysis found no relationship between the completeness of thrombolytic therapy data and select patient demographics (gender, age group) or descriptors of the patient's hospital stay (discharge status, entry code, length of stay).[ix] In other words, the sensitivity of thrombolytic therapy for each of these domains was not significantly different from the overall sensitivity of 81%.

ix. The categories analyzed for age group were 0 to 65 years, 66 to 79 years and 80+ years; the categories analyzed for length of stay were 1 to 7 days, 8 to 14 days, 15 to 21 days and 22 to 30 days.

4.2 Special-Focus Topics on Thrombolytic Therapy

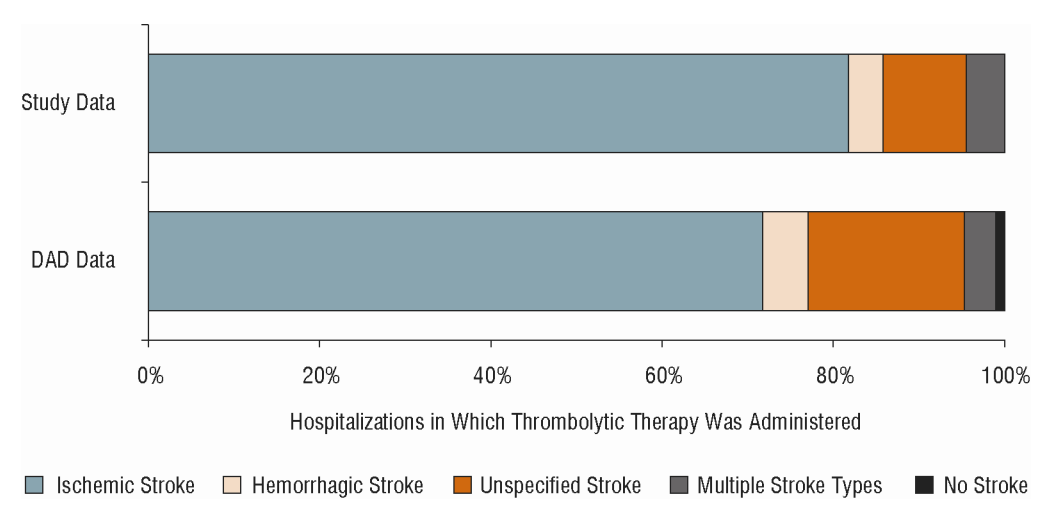
The reliability of certain analyses of thrombolytic therapy requires specific attributes to be coded with high quality. This section analyzes the coding quality for specific points of interest. Due to the analytical limitations with identifying thrombolytic therapy in 2008–2009, *the analysis presented in this section is restricted to the subset of data in which thrombolytic therapy was captured by the study coder and was present on the DAD abstract*.

Appropriateness of Coding Thrombolytic Therapy

It was previously described that thrombolytic therapy is appropriate to administer to patients who are suffering from ischemic stroke. Consequently, it is expected that when an abstract shows that this agent was administered, it should also show that the patient was suffering from ischemic stroke (or some other health-related problem for which administration of this agent is appropriate). To assess the appropriateness of coding thrombolytic therapy on the abstract, this section describes the characteristics of the patients who receive this therapy.

Of all the abstracts in which there was agreement that thrombolytic therapy was administered, 72% indicated that the patient suffered from an ischemic stroke on the DAD abstract, whereas 82% indicated that the patient suffered from an ischemic stroke based on the data collected by the study coder. The study findings suggest that the practice of administering thrombolytic therapy to stroke patients is better than the DAD data suggests. Figure 9 illustrates these observations with the portion of the bars shaded in blue. Note also that in both the study data and the DAD data, the remainder of abstracts was mostly for patients who suffered from stroke, albeit non-ischemic stroke.

Figure 9: Appropriateness of Coding Thrombolytic Therapy Based on Stroke Type*



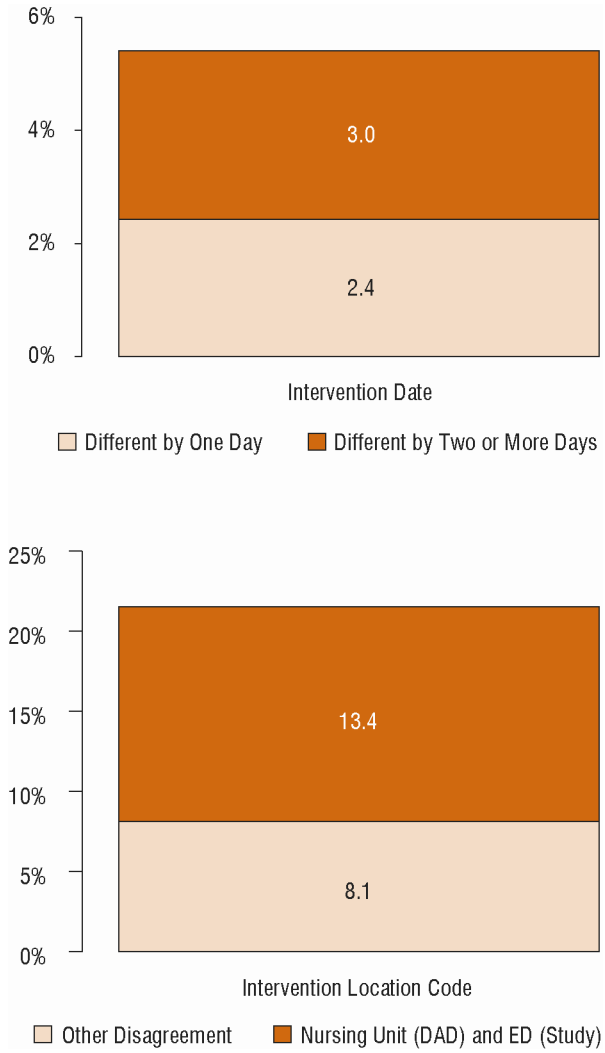
Note

* This analysis is restricted to the subset of data in which thrombolytic therapy was captured by the study coder and was present on the DAD abstract.

Intervention Time and Intervention Location Code

For the subset of patients with agreement on the presence of thrombolytic therapy, analysis was done to examine the reliability of data that describes when and where within the health care facility the agent was administered. For this subset, 5.4% had discrepancies concerning *when* the agent was administered, with most differences in intervention date of two or more days. Also, 21.5% had discrepancies concerning *where* it was administered in the health care facility, with most differences observed between the nursing unit in the DAD and the emergency room in the study data. Figure 10 summarizes these findings, and Table 15 provides more details on the changes in intervention location code.

Figure 10: Discrepancies in the Date and Location* for Thrombolytic Therapy



Notes

ED: emergency department.

* Intervention Location Code is not mandatory to capture in all provinces.[9] This analysis is restricted to the subset of data in which the Intervention Location Code for thrombolytic therapy was captured by the study coder and was present on the DAD abstract.

Table 15: Changes to Intervention Location Code*

		Study Data				
		Main Operating Room	Nursing Unit	Diagnostic Imaging Department	Emergency Department	Other†
DAD Data	Main Operating Room	**17**	0	0	0	0
	Nursing Unit	4	**230**	3	**141**	0
	Diagnostic Imaging Department	2	4	**62**	12	0
	Emergency Department	2	17	0	**480**	0
	Other†	0	2	0	39	**34**

Notes

* Intervention Location Code is not mandatory to capture in all provinces.[9] Consequently, this analysis is restricted to the subset of data in which the Intervention Location Code for thrombolytic therapy was captured by the study coder and was present on the DAD abstract.

† Represents only Intervention Location Code = 11 (Other). See the *DAD Abstracting Manual* for details.

4.3 Coding Quality of Other Health Interventions for Treating Stroke Patients

This section reviews the coding quality of other health interventions that are captured on the DAD abstract that may be important to researchers and policy-makers in understanding the treatments provided to stroke patients. The statistics presented in this section are at the hospitalization level and consider only whether a health intervention was present, regardless of the number of times it was coded on the abstract.

Specific health interventions associated with treating stroke were reviewed for coding quality. This analysis, included in Table 16, shows that the prevalence of intubation/ventilation for stroke hospitalizations is similar whether these were calculated using DAD data or study data; however, possible over-reporting issues for CT scans and under-reporting of MRI scans were identified for Ontario data (shaded in orange).

Table 16: Coding Quality of Health Interventions at the Hospitalization Level for Stroke Patients*

Health Intervention	Method of Classification	Prevalence in Stroke Population (DAD)	Prevalence in Stroke Population (Study)	Sensitivity† (95% CI)	Positive Predictive Value† (95% CI)
Intubation/ Ventilation	1.GZ.31. ^ ^	2,331	2,465	**92** (88–95)	**100** (99–100)
CT Scan (Ontario Only)‡	3.ER.20. ^ ^ or 3.ER.40. ^ ^	3,843	3,065	**83** (80–87)	**68** (63–73)
MRI Scan (Ontario Only)‡	3.AN.20. ^ ^ or 3.AN.40. ^ ^	4,760	5,871	**77** (73–80)	**97** (95–98)

Notes

CI: confidence interval; CT: computerized tomography; MRI: magnetic resonance imaging.

* Intervention volumes had to have at least 30 abstracts in the study sample in order to be included in this table.

† To be interpreted as follows: Sensitivity: of the stroke patients identified by the study coder with a health intervention, this is the percentage that had the health intervention in the DAD; Positive predictive value: of the stroke patients in the DAD with a health intervention, this is the percentage that had the health intervention reabstracted.

‡ Data abstraction to the DAD of CT and MRI scans is mandatory in Ontario only.

4.4 Summary of Findings for the Coding Quality of Thrombolytic Therapy

Thrombolytic therapy for stroke patients appears to be under-reported to the DAD (19.5%). Under-reporting was rarely caused by CCI code selection but was mostly the result of no pharmacotherapy code being present on the DAD abstract. The documentation related to the administration of thrombolytic therapy to stroke patients is better than the DAD suggests. There was minimal disagreement (5.4%) regarding *when* the agent was administered; however, about one in five cases disagreed on *where* it was administered.

Chapter 5—Coding Data for the Stroke Improvement Project

This chapter focuses on the study's third objective: to evaluate whether the information required for the Canadian Stroke Strategy Performance Improvement Project was readily available in the chart.

The Canadian Stroke Strategy Performance Improvement Project, or Stroke Project 340, was initiated in the DAD starting April 1, 2009. Stroke Project 340 allows the capture of additional data fields for key process and outcome information, based on stroke best practices, and supports stroke surveillance, quality improvement, benchmarking and the new Accreditation Canada Stroke Program Distinction Initiative.

Important! The reference period for this study was the fiscal year prior to the launch of this special project. Therefore, the findings in this chapter provide a baseline of the chart documentation that was available for specific stroke attributes and treatments prior to the launch of Stroke Project 340.

5.1 Availability of Information for Stroke Project 340

This analysis focuses on all hospitalizations for ischemic and hemorrhagic stroke and transient ischemic attack, which is the population of interest for Stroke Project 340.[x]

Table 17 summarizes the extent to which documentation in the patient chart contained the information required to capture data for Stroke Project 340. Note that the statistics presented in the column "Not Applicable" indicate the proportion of abstracts in which the capture of the data element was not appropriate given other characteristics of the patient's hospitalization. For example, it would not be applicable to capture whether the physician prescribed antithrombotic medication at discharge should the patient die during his or her hospital stay. Hence, the statistics of interest for this study objective are presented in the column "Not Available in the Chart"; these identify hospitalizations in which it is appropriate to collect the information but the documentation does not offer the details needed for data abstraction.

x. Type M or 1 diagnosis of I60.–, I61.–, I63.– (excluding I63.6), I64, H34.1 or G45.– (excluding G45.4).

Table 17: Availability of Information in the Patient Chart for Stroke Project 340

	Availability of Information in the Patient Chart (Percentage)		
	Available in the Chart	Not Applicable*	Not Available in the Chart
CT/MRI Scan Completed Within 24 Hours	100.0	0.0	0.0
Admission to a Stroke Unit	47.2	52.8†	0.0
Administration of Acute Thrombolysis	78.8	21.2	0.0
Prescription of Antithrombotic Medication at Discharge	70.8	26.2	3.0
Stroke Symptom Onset Date	72.8	16.4	10.8
Stroke Symptom Onset Time	46.6	16.5	36.9

Notes

* Certain data elements are not applicable to all hospitalizations. For example, patients who died in hospital would not be prescribed medication at discharge. Also, thrombolysis would not be administered to patients who suffered from a hemorrhagic stroke.

† In this case, not applicable applies to hospitalizations from facilities that do not have a designated stroke unit.

The study found that chart documentation was frequently unavailable for Stroke Symptom Onset Date and Time, which is defined as the date and time that the patient first started to experience stroke symptoms, regardless of location of the patient at the time of symptom onset. This information, when known, should be available on the ambulance record, the emergency department admission record, the triage nurse assessment and/or the physician notes in the emergency department or on admission to the facility. Otherwise, in cases in which the stroke is not witnessed or is so severe that the patient is unable to speak or self-report, the date and time the patient was last seen well needs to be located in the patient chart and reported for Stroke Project 340.[10] The study found that in over one-third (36.9%) of the charts reviewed, the time when the patient started to exhibit stroke symptoms was not recorded in the patient chart. In 10.8% of the charts reviewed, the date was also unavailable.

Furthermore, clinical notes did not include details on the Prescription of Antithrombotic Medication at Discharge for 3% of the charts. This is an important field since it has been shown to significantly reduce the risk of recurrent stroke for patients who have had an initial ischemic stroke or transient ischemic attack. Clinical best-practice guidelines state that all ischemic stroke and transient ischemic attack patients should be discharged on antithrombotic therapy.[10]

Table 18 provides details on two data elements that are captured for hospitalizations in which thrombolytic therapy was administered. Roughly 4% of these charts lacked documentation on the Time of Acute Thrombolysis Administration, which is important as it is a well-accepted evidence-based therapy for acute ischemic stroke and has a significant impact on patient outcomes when it is administered within three hours of the onset of stroke symptoms.[10]

Table 18: Availability of Information in the Patient Chart for Abstracting the Date and Time of Administration of Acute Thrombolysis, for Patients Who Had This Agent Administered

	Availability of Information in the Patient Chart (Percentage)		
	Available in the Chart	Not Applicable	Not Available in the Chart
Hospitalizations in Which Thrombolytic Therapy Was Administered			
Date of Acute Thrombolysis Administration	99.6	0.0	0.4
Time of Acute Thrombolysis Administration	95.7	0.0	4.3

Additional analysis on the availability of information in the chart was reviewed for different types of stroke patients (Table 19). The rates in which information was not available in the chart were similar among the hospitalizations for ischemic stroke, unspecified stroke, and central retinal artery occlusion or transient cerebral ischemic attacks.

Table 19: Availability of Information in the Patient Chart for Select Data Elements in Stroke Project 340, by Stroke Type

	Availability of Information in the Patient Chart (Percentage)		
	Available in the Chart	Not Applicable	Not Available in the Chart
Prescription of Antithrombotic Medication at Discharge			
Subarachnoid or Intracerebral Hemorrhage	0.0	100.0	0.0
Ischemic Stroke	81.3	15.3	3.4
Unspecified Stroke	79.5	15.3	5.2
Central Retinal Artery Occlusion or Transient Cerebral Ischemic Attacks and Related Syndromes	96.1	1.2	2.6
Stroke Symptom Onset Date			
Subarachnoid or Intracerebral Hemorrhage	0.0	100.0	0.0
Ischemic Stroke	86.0	0.5	13.6
Unspecified Stroke	86.0	0.2	13.8
Central Retinal Artery Occlusion or Transient Cerebral Ischemic Attacks and Related Syndromes	89.2	0.5	10.4
Stroke Symptom Onset Time			
Subarachnoid or Intracerebral Hemorrhage	0.0	100.0	0.0
Ischemic Stroke	56.1	0.6	43.3
Unspecified Stroke	51.2	0.2	48.6
Central Retinal Artery Occlusion or Transient Cerebral Ischemic Attacks and Related Syndromes	57.6	0.5	41.9

5.2 Summary of Findings for Stroke Project 340

The study found that chart documentation was frequently unavailable for Stroke Symptom Onset Date and Time, which is defined as the date and time that the patient first started to experience stroke symptoms, regardless of location of the patient at the time of symptom onset. Chart documentation sometimes did not include details on the Prescription of Antithrombotic Medication at Discharge or the Time of Acute Thrombolysis Administration.

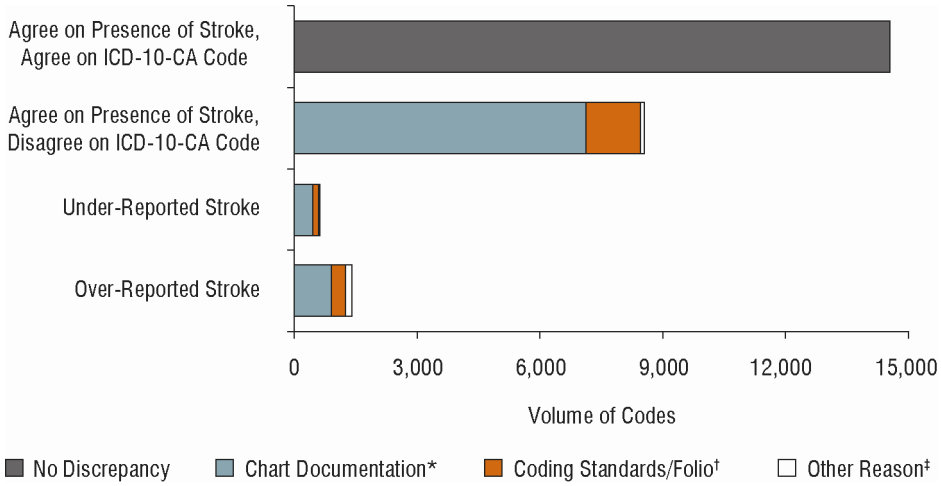
Chapter 6—Discussion of Coding Issues

This chapter focuses on identifying the sources of the coding issues that arose as a result of any observed coding variation.

6.1 Coding Issues for Strokes

Strokes generally had few coding issues with respect to their inclusion on the patient chart or in assigning significance. Most differences were with the ICD-10-CA code selected; the study coder interpreted the chart documentation differently than the hospital coder. The coders also reported that the lack of quality documentation led to the coding differences (Figure 11).

Figure 11: Analysis of Coding Issues for Strokes Reported to the DAD



Notes

ICD-10-CA: International Classification of Diseases and Related Health Problems, 10th Revision, Canada.

* Chart Documentation: conflicting documentation for the same health condition or different interpretation of the chart between coders.

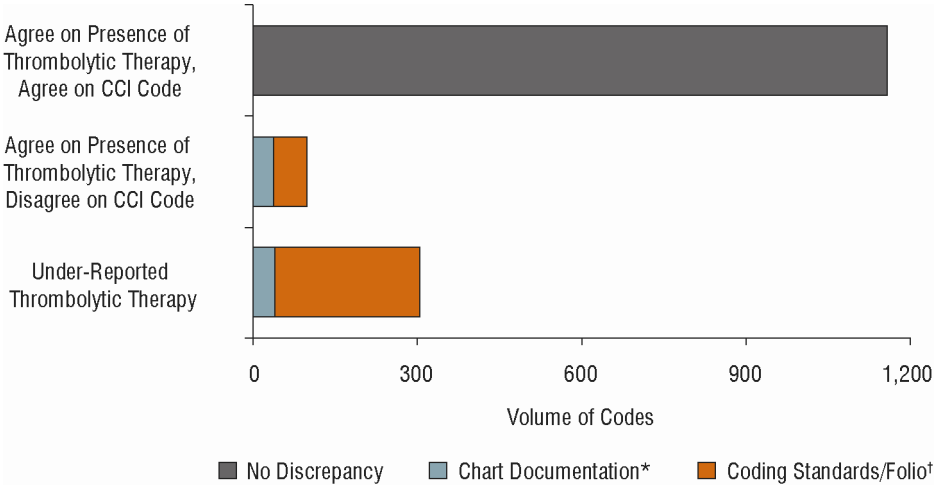
† Coding Standards/Folio: non-compliance with coding standards or codebook directives.

‡ Other Reason: incomplete documentation in the chart or a technical issue with the coding application.

6.2 Coding Issues for Thrombolytic Therapy

Most coding issues for thrombolytic therapy were related to its under-reporting; the study coder found that the coding standards for capturing these agents were not always followed in the abstract from the hospital (Figure 12).

Figure 12: Analysis of Coding Issues for Thrombolytic Therapy Reported to the DAD



Notes

CCI: Canadian Classification of Health Interventions.

* Chart Documentation: conflicting documentation for the same intervention or different interpretations of the chart between coders.

† Coding Standards/Folio: non-compliance with coding standards or codebook directives.

Chapter 7—Conclusion

7.1 Summary of Findings

This report presents the results of a reabstraction study carried out on the data from 2008–2009 that was submitted to the DAD. *Note that the results for this study are not representative of the DAD; rather, they are representative of a targeted population of certain stroke patients.*

Coding Quality of Strokes

- There is a tendency to report I64– *Unspecified Stroke* to the DAD when chart documentation indicates that the stroke was ischemic. The Canadian Coding Standards require that the most specific ICD-10-CA code be reported to the DAD. As a consequence, it is incorrect to capture stroke as I64– *Unspecified Stroke* if there is documentation in the chart that supports a more specific code; for example, ischemic or hemorrhagic stroke.
- Most coding inconsistencies for ischemic and hemorrhagic stroke did not result in a change in the type of stroke but, rather, consisted of differences in the code specificity that describes the cause of the ischemic event or the place in the brain where the hemorrhage had occurred. The study coder interpreted the chart documentation differently than the hospital coder. The lack of quality documentation led to some of these coding differences.
- Of the stroke codes reported to the DAD that had a significant impact on the patient's length of stay or resource use, 94% had chart documentation that supported their inclusion as significant conditions. That is, there is possible over-reporting to the DAD of 6% of the significant strokes. Strokes were more often over-reported to the DAD for patients who were admitted via the admitting department.
- Of all the significant stroke diagnoses found during the chart review, 97% were reported on the DAD abstract as significant diagnoses. That is, there is potential under-reporting to the DAD of 3% of strokes that can affect the patient's length of stay or resource utilization.
- The inconsistencies in classifying the type of stroke, along with under- and over-reporting issues that were identified for other health conditions, resulted in some abstracts being assigned to different Case Mix Groups and to higher Resource Intensity Weights when using the study data.

Coding Quality of Thrombolytic Therapy

- In relation to the coding quality of strokes, more under-reporting issues were identified with thrombolytic therapy. Of the instances in which chart documentation showed that thrombolytic therapy was administered to a stroke patient, 81% had thrombolytic therapy reported on the DAD abstract. This indicates potential under-reporting to the DAD of 19% of thrombolytic therapies that are administered in the inpatient setting to stroke patients. The study coder found that the coding standards for capturing these agents were not always followed in the abstract from the hospital.
- Of all the abstracts in which there was agreement that thrombolytic therapy was administered, only 72% indicated that the patient suffered from an ischemic stroke on the DAD abstract. The study data showed slightly higher consistency between the stroke reporting and the coding of thrombolytic therapy.
- Few discrepancies were found with the CCI code assigned to thrombolytic therapy; however, more discrepancies were found concerning *when* the agent was administered (5% discrepancy rate for intervention date) and *where* it was administered in the health care facility (22% discrepancy rate for Intervention Location Code).

Availability of Documentation for Stroke Project 340[xi]

- Chart documentation was frequently unavailable for Stroke Symptom Onset Date and Time, which is defined as the date and time that the patient first started to experience stroke symptoms, regardless of location of the patient at the time of symptom onset. The study found that for 37% of the charts reviewed, the time when the patient started to exhibit stroke symptoms was not recorded in the patient chart. In 11% of the charts reviewed, the date was unavailable.
- Clinical notes did not include details on the Prescription of Antithrombotic Medication at Discharge for 3% of the charts. This is an important field since this practice has been shown to significantly reduce the risk of recurrent stroke for patients who have had an initial ischemic stroke or transient ischemic attack.
- For hospitalizations in which thrombolytic therapy was administered, 4% lacked documentation on the Time of Acute Thrombolysis Administration.

xi. The reference period for this study was the fiscal year prior to the launch of this special project. Consequently, the study results provide a baseline of the chart documentation that was available for specific stroke attributes and treatments prior to the launch of Stroke Project 340.

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, coders who extract patient information and record data on the DAD abstract and those who maintain the DAD and develop national coding directives.

Where coding issues were identified, the findings from this study will be used to improve CIHI products, such as the Canadian Coding Standards for ICD-10-CA and CCI. Administrators, physicians and health records staff at the study facilities can review the findings from the study with the information provided in their facility-specific report to identify areas where improvements are needed to promote high-quality DAD data.

Appendix A: Associated Symptom Codes for Stroke Patients

Table 20: Associated Symptom Codes for Stroke Patients

ICD-10-CA Code	Code Description
G45.–	Transient Cerebral Ischaemic Attacks and Related Syndromes
G51.–	Facial Nerve Disorders
G81.–	Hemiplegia
H34.0	Transient Retinal Artery Occlusion
H34.1	Central Retinal Artery Occlusion
H53.–	Visual Disturbances
R25.–	Abnormal Involuntary Movements
R26.–	Abnormalities of Gait and Mobility
R27.–	Other Lack of Coordination
R29.–	Other Symptoms and Signs Involving the Nervous and Musculoskeletal Systems
R40.–	Somnolence, Stupor and Coma
R41.–	Other Symptoms and Signs Involving Cognitive Functions and Awareness
R42	Dizziness and Giddiness
R43.–	Disturbances of Smell and Taste
R44.–	Other Symptoms and Signs Involving General Sensations and Perceptions
R45.–	Symptoms and Signs Involving Emotional State
R46.–	Symptoms and Signs Involving Appearance and Behaviour
R47.–	Speech Disturbances, Not Elsewhere Classified
R48.–	Dyslexia and Other Symbolic Dysfunctions, Not Elsewhere Classified
R49.–	Voice Disturbances
R51	Headache
R53	Malaise and Fatigue
R55	Syncope and Collapse
R56.–	Convulsions, Not Elsewhere Classified

References

1. Canadian Institute for Health Information, *Executive Summary: Data Quality Documentation: Discharge Abstract Database, 2007–2008* (Ottawa, Ont.: CIHI, 2008).

2. Canadian Institute for Health Information, *CIHI Data Quality Study of the 2005–2006 Discharge Abstract Database* (Ottawa, Ont.: CIHI, 2009).

3. Heart and Stroke Foundation, *What Is a Stroke?*, accessed on December 17, 2009, from <http://www.heartandstroke.com/site/c.ikIQLcMWJtE/b.3483935/k.A279/What_is_Stroke.htm>.

4. K. Jordan, M. Porcheret and P. Croft, "Quality of Morbidity Coding in General Practice Computerized Medical Records: A Systematic Review," *Family Practice* 21, 4 (2004): pp. 396–410.

5. Canadian Institute for Health Information, *Health Indicators 2008* (Ottawa, Ont.: CIHI, 2008).

6. Canadian Institute for Health Information, *CMG+ Directory 2009* (Ottawa, Ont.: CIHI, 2009).

7. Heart and Stroke Foundation, *Stroke Medications*, accessed on June 2, 2010, from <http://www.heartandstroke.bc.ca/site/c.kpIPKXOyFmG/b.3644659/k.246/Stroke__Medications.htm>.

8. Canadian Institute for Health Information, *Canadian Coding Standards for ICD-10-CA and CCI, 2008* (Ottawa, Ont.: CIHI, 2008).

9. Canadian Institute for Health Information, *DAD Abstracting Manual, 2008–2009 Edition: All Provinces Information* (Ottawa, Ont.: CIHI, 2009).

10. Canadian Institute for Health Information, *Errata—Canadian Stroke Strategy Performance Improvement Project #340*, accessed July 20, 2010, from <http://secure.cihi.ca/cihiweb/en/downloads/bl_dad_errata_20091201_e.pdf>.

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.

Canadian Institute for Health Information
495 Richmond Road, Suite 600
Ottawa, Ontario K2A 4H6

Phone: 613-241-7860
Fax: 613-241-8120
www.cihi.ca
copyright@cihi.ca

ISBN 978-1-55465-849-7 (PDF)

How to cite this document:
Canadian Institute for Health Information, *CIHI Data Quality Study of the 2008–2009 Discharge Abstract Database* (Ottawa, Ont.: CIHI, 2010).

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 2008-2009.*
ISBN 978-1-55465-850-3 (PDF)

Talk to Us

CIHI Ottawa
495 Richmond Road, Suite 600
Ottawa, Ontario K2A 4H6
Phone: 613-241-7860

CIHI Toronto
4110 Yonge Street, Suite 300
Toronto, Ontario M2P 2B7
Phone: 416-481-2002

CIHI Victoria
880 Douglas Street, Suite 600
Victoria, British Columbia V8W 2B7
Phone: 250-220-4100

CIHI Montréal
1010 Sherbrooke Street West, Suite 300
Montréal, Quebec H3A 2R7
Phone: 514-842-2226

CIHI St. John's
140 Water Street, Suite 701
St. John's, Newfoundland and Labrador A1C 6H6
Phone: 709-576-7006

www.cihi.ca

Canadian Institute
for Health Information

Institut canadien
d'information sur la santé