CODING VARIATIONS

in the Discharge Abstract Database (DAD) Data

Canadian Institute
for Health Information

Institut canadien
d'information sur la santé

Coding Variations in the Discharge Abstract Database (DAD) Data

FY 1996–1997 to 2000–2001

May 2003

Contents of this publication may be reproduced in whole or in part provided the intended use is for non-commercial purposes and full acknowledgement is given to the Canadian Institute for Health Information.

Canadian Institute for Health Information
377 Dalhousie Street
Suite 200
Ottawa, Ontario
K1N 9N8

Telephone: (613) 241-7860
Fax: (613) 241-8120
www.cihi.ca

ISBN 1-55392-224-7 (PDF)

© 2003 Canadian Institute for Health Information

™ Registered Trade-mark of the Canadian Institute for Health Information

Cette publication est disponible en français sous le titre : « *Variations de codification dans la Base de données sur les congés des patients (DAD), exercices de 1996-1997 à 2000-2001* » ISBN 1-55392-225-5 (PDF)

Table of Contents

Acknowledgements

Coding Variations in the Discharge Abstract Database (DAD) was made possible by the project leadership of Chris Helyar, Hay Health Care Consulting Group and analysis by Bill Croson, associate consultant with the HayGroup.

Project support was provided from the Canadian Institute for Health Information (CIHI) under the direction of Nizar Ladak, and a project team comprising Frank Ivis, Sukanya Gopinath, Micheline Mistruzzi, Nicole DeGuia, Holly Bartoli, Craig Homan, Brenda Antliff, Andre Lalonde, Jason Sutherland, Greg Webster, Sheril Perry and Michael Cohen.

In February 2003, a draft of this report was circulated as background reading material for meetings that took place in February and March 2003 in selected provinces. This final version benefited from external reviewer comments and those discussions. In particular, CIHI acknowledges Andrée Martin Desjardins, Shirley Groenen, Gordon Kramer and Helen Whittome along with their respective teams, and the Executive staff of the Canadian Health Records Association (CHRA) for their detailed and thoughtful comments.

Introduction and Background

Introduction to the Project

Recent Research Identified Large Changes in CIHI Acute Care Data

Recent research conducted by CIHI, the Ontario Ministry of Health and Long-Term Care and the Ontario Joint Policy and Planning Committee (JPPC), identified unusual changes in reported acute care patient discharge abstract data for individual hospitals. The magnitude of some of these changes, particularly with respect to weighted cases, and the increasing use of Resource Intensity Weights or RIW™ weighted cases for hospital funding, has raised the question as to whether these changes reflect:

- changes in the clinical complexity[1] of patients seen in hospital, or
- changes in comprehensiveness and quality of clinical documentation, or
- changes in hospital health records coding and abstracting practices.

Report Presents Results of Broader Analysis of DAD Data

The Ontario experience has prompted CIHI to closely examine its coding standards and grouping methodologies and to conduct a broader investigation of the potential variations in the comprehensiveness and comparability of the data in the Discharge Abstract Database (DAD). The quality assurance processes applied to the DAD are described in a recent CIHI publication[2] and the results of the 2-year CIHI DAD re-abstraction study were recently published.[3,4] This report presents the results of the parallel investigation of variations in the DAD data.

[1] Complexity refers to diagnoses other than the most responsible that prolong length of stay and where most costly treatment is reasonably expected.

[2] CIHI, Quality Assurance Processes Applied to the Discharge Abstract and Hospital Morbidity Databases, August 2002.

[3] CIHI, Discharge Abstract Database Data Quality Re-Abstraction Study—Combined Findings for Fiscal Years 1999/2000 and 2000/2001, December 2002.

[4] Re-abstraction studies can identify whether the process of extraction of information from the medical record was done accurately and in compliance with CIHI guidelines. What they cannot do is assess whether the contents of the medical record are accurate. No retrospective analysis can definitively prove or disprove the accuracy of the contents of the medical record. This could only be done at the time a patient is in hospital and with the same assessment and investigation conducted by the clinicians that provide the documentation in the medical record.

Goals of Analyses

The initial goals of the analyses of the DAD, with a focus on the assignment of complexity, were to:

1. confirm and document overall changes in data submitted to DAD;
2. confirm and quantify apparent changes in Ontario data versus rest of Canada;
3. assess contributing factors to the changes in the Ontario DAD data; and
4. provide background data, analyses, and findings to support development and refinement of CIHI data quality methodologies and initiatives.

During the project the opportunity arose (through parallel JPPC activities) to more specifically assess data reporting practices of individual Ontario hospitals and to identify opportunities to create new measures to support this assessment. This activity is also documented in this report.

All of these analyses are intended to support ongoing CIHI efforts to maintain and enhance the quality of the data in all patient-specific databases, and to assess the potential impact of coding variation on data comparability in the DAD.

Coding Variation in the CIHI DAD

There has been increasing concern that variation in abstracting and coding practices across the CIHI DAD hospitals could compromise the comparability and utility of the DAD data. Whether coding variation results from initiatives designed to maximize RIW value or to optimize a hospital's relative position, is of no direct consequence to CIHI. Of concern to CIHI is the fact that variation in coding practices compromises comparability over time and within regions and provinces. Variation in coding practices could compromise the comparability of morbidity data, which could in turn call into question the validity of analysis and reporting efforts by CIHI, Statistics Canada, and others.

Definition of Upcoding

For the purposes of this document, we have used the term "upcoding" to refer to the recently observed changes in coding, since the variation found has typically resulted in an increase in the use of selected codes in defining patient complexity. Upcoding can be defined as:

> **Change in the apparent complexity and/or care requirements of the patients separated from a hospital, attributable to changes in the comprehensiveness or categorization of the data reported on the discharge abstract, and not attributable to actual changes in patient characteristics and/or care requirements.**

It should be noted here that "undercoding", referring to a lack of comprehensiveness in coding, is also of concern in maintaining comparability of data. However, our analysis found that it was increases in the reporting of codes that indicate patient complexity which were increasing variation and therefore warranted our attention. It should also be noted that there is no intended connotation of good or bad in the use of the term upcoding. Instead, upcoding simply refers to the uni-directional increase in the reporting of codes that help define patient complexity.

The analysis performed by CIHI focused on coding variation that compromised comparability of data. There are other techniques such as clinical audits involving chart re-abstraction that can be used to assess the reasons underlying change in coding practices. However, these techniques were not employed in this analysis and therefore any conclusions about the nature or intent that resulted in the coding variation could not be made.

Diagnosis Typing and the Complexity Overlay

To understand the purpose and results of the analyses presented in this report, it is necessary to understand the process of "diagnosis typing" and how the CIHI complexity overlay is used to identify patients with additional diagnoses that may lead to unusually long lengths of stay or high cost.

Diagnosis Typing

All diagnoses recorded on a DAD in-patient record must have a diagnosis type. The main diagnosis that can be described as having been most responsible for the patient's stay in the hospital is the Most Responsible Diagnosis (MRDx). The MRDx determines the assignment of a record to a Major Clinical Category (MCC) and in conjunction with the principle procedure (for surgical cases) determines the assignment to a Case Mix Groups or CMG™.

A Type 3 diagnosis (secondary) is a diagnosis for which a patient may or may not have received treatment, but does not satisfy the requirements to be considered a comorbidity. The two comorbidity types are defined as follows:[5]

- Pre-Admit Comorbidity—Type 1 Dx. A co-existing condition presents prior to admission that has a significant influence on the patient's length of stay or significantly influences the management/treatment of the patient while in hospital.
- Post-Admit Comorbidity—Type 2 Dx. A condition arising during the hospital observation or treatment that has a significant influence on the patient's length of stay or significantly influences the management/treatment of the patient while in hospital.

[5] The 2002 diagnosis typing standard was clarified in a CIHI bulletin published in January 2003. The definitions here reflect the guidelines in place prior to fiscal year 2002–2003.

Type 1 comorbidities are often used to support risk adjustment methodologies used with CIHI data grouped into CMG. Type 2 comorbidities have been used to measure complication rates for hospital quality measurement.

Complexity Methodology

The CIHI Complexity Methodology or Plx™ was introduced in response to the concern that CMG were not always sufficiently clinically and/or statistically homogeneous. Categories based on the original DRG concept (such as CMG), driven by single diagnosis, may not be sensitive to differences in the burden of illness, patient age, or severity of illness, a specific patient may have.

The CIHI Plx methodology (including segregation of cases into three age bands) was introduced for fiscal year 1997–1998 after a 3-year project to identify mechanisms to improve CMG clinical and statistical performance. The Plx methodology assigns a complexity level to each in-patient case:

- 1 – No complexity
- 2 – Complexity related to chronic condition(s)
- 3 – Complexity related to serious/important condition(s)
- 4 – Complexity related to potentially life-threatening condition(s)
- 9 – Complexity not assigned

Some types of patients do not have complexity assigned (e.g. 112 out of 472 CMG, in Obstetrics, Neonates, Mental Health, Trauma) and are given complexity level 9 by default.

The assignment of a complexity level to a patient record is dependent on the diagnoses (beyond the MRDx) recorded. Only Type 1 and 2 diagnoses are used to assign complexity levels. Any medical or surgical patient record with no Type 1 or 2 diagnoses will be assigned to complexity level 1.

Not all Type 1 and 2 diagnoses will impact the complexity assignment. During the development of the complexity methodology CIHI identified a list of selected diagnoses (the 440 "Grade List" diagnoses) with significant impact on the length of stay of a patient. A patient must have at least one Type 1 and/or 2 grade list diagnosis to be assigned a complexity level higher than 1.

Highest Volume Grade List Diagnoses in CIHI DAD (2000)

ICD-9 Code	Dx Name	Volume
4019	Essential Hypertension Unspec	76,264
4280	Congestive Heart Failure	53,390
4273	Atrial Fibrillation And Flutter	50,774
2859	Anemia Unspecified	45,395
5990	Urinary Tract Infect Site Nos	44,076
486	Pneumonia Organism Unspecified	32,419
411	Oth Ac/Subac Ischemic Heart Dis	23,846
2851	Acute Posthemorrhagic Anemia	22,901
410	Acute Myocardial Infarction	21,340
5119	Unspecified Pleural Effusion	20,682
2768	Hypopotassemia	19,535
7806	Pyrexia Of Unknown Origin	18,148

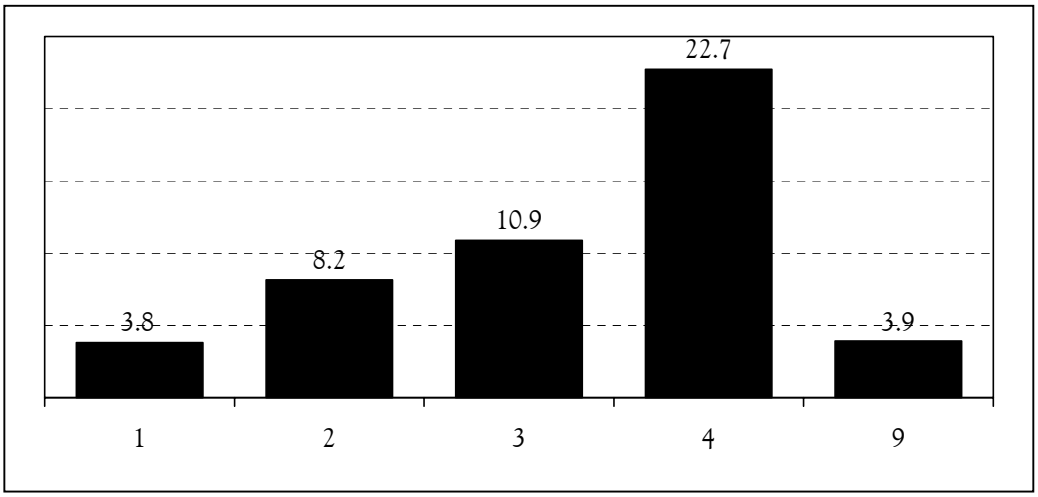
The impact of grade list diagnoses on the complexity assignment for an individual in-patient depends on:

- the "class" of diagnosis :
  - A [life threatening]
  - B [important LOS impact]
  - C [chronic disease]
  - D [debilitating condition]
  - P [psych dx];
- the diagnosis type (Type 1 versus Type 2);
- the number and mixture of class of diagnoses; and
- whether the grade list diagnoses are in same MCC as the MRDx.

Why Was Complexity Introduced?

The complexity overlay was introduced to respond to the concern that CMG were not sufficiently sensitive to differences in the burden of illness, patient age, or patient complexity. The grade list diagnoses were selected on the basis of their impact on the patient length of stay (and resource use). The following chart shows the average length of stay for Typical[6] patients discharged in fiscal year 1996–1997 by complexity level. As would be expected, the average in-patient length of stay increases as the assigned case complexity increases.

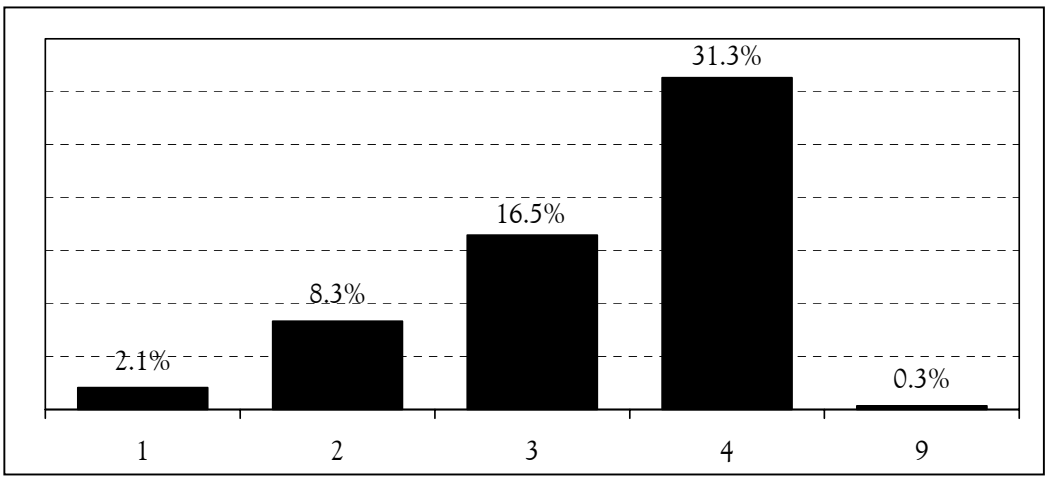
1996 Average Length of Stay for Typical Patients in the CIHI DAD by Assigned Case Complexity Level



It would also be expected that in-hospital mortality would be higher for patients with higher complexity levels (particularly for complexity level 4, patients with life-threatening illness). The following chart (which is based on 1996–1997 CIHI DAD data) shows that the percent of acute care in-patients that die in the hospital increases from 2.1% for complexity level 1 patients to 31.3% for complexity level 4 patients.

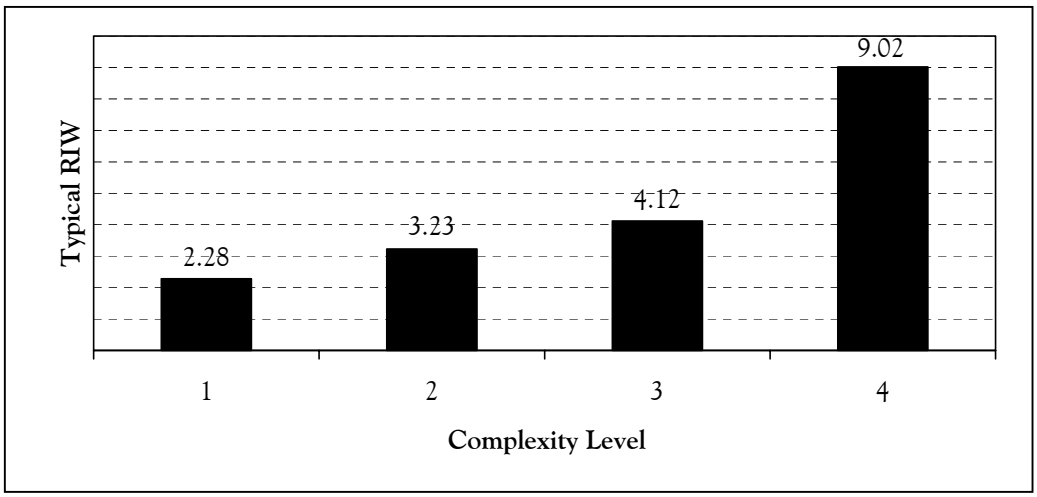
[6] A Typical patient is defined by CIHI as being an inpatient in an acute care hospital who has a full course of acute treatment and who is not a long-stay outlier, a transfer to or from another acute care hospital, and who does not die in the acute care hospital or sign themselves out against medical advice.

1996 Average Percent In-hospital Mortality in the CIHI DAD by Assigned Case Complexity Level



The longer length of stay for higher complexity patients is reflected in the RIW values assigned to these patients. The chart below shows the RIW values assigned to Typical patients, aged 18 to 69, in the Craniotomy CMG.

CMG/RIW 2000 Typical RIW for CMG 1 Craniotomy (age 18 to 69) by Complexity Level



Sensitivity of RIW Assignment to Complexity

A Typical craniotomy patient with no grade list comorbidities will be assigned an RIW of 2.28. Depending on the number and mixture of comorbid grade list diagnoses, the assigned weight can increase almost four-fold, to 9.02 weighted cases. As will be shown later in this report, the sensitivity of weighted case assignment to complexity level has generated a focus on understanding variation in rates of recording of grade list diagnoses and the impact of this variation on comparability of DAD data.

Baseline Comparisons 1996–1997

Choice of 1996–1997 as Baseline Year

The baseline for the review of changes in the CIHI DAD is the data for the 1996–1997 fiscal year.[7] The 1996–1997 fiscal year has been used as the baseline because:

- 1996–1997 is the earliest year of data available that has been re-grouped using the CMG 2000 grouper and the RIW 2000 case weighting methodology.[8]
- 1996–1997 was the last year of data submitted to the CIHI DAD before full introduction of the Complexity or Plx™ methodology. It has been argued that the introduction of Plx resulted in a change to coding practices as concepts of mandatory verses optional reporting of comorbidities emerged. However, the 1996–1997 data should reflect the state of the DAD prior to the introduction of these practice changes. The selection of this baseline is also consistent with the aim of this analysis which is to examine variations and the consistency of coding practices across hospitals and provinces.

The table on the following page shows summary statistics for the 1996–1997 DAD data by province.

Records Assigned to Province Based on Hospital Location

For purposes of all of the analyses in this report, patient records are assigned to a province or territory on the basis of the location of the acute care hospital. For example, the hospital record for a resident of Saskatchewan who was hospitalized in British Columbia is included in the British Columbia data. In most cases the vast majority of hospital care for the residents of a region is provided by a hospital located in that region. However, for the residents of the territories[9] most of their tertiary and quaternary hospital care is provided in southern hospitals. The shorter length of stay (LOS) and lower weighted cases for the territories will reflect only the hospital care provided within the territories.

[7] All references to a year in this report refer to the fiscal year beginning on April 1st. Where a single year is identified it refers to the fiscal year that began in that calendar year (e.g. 1996 refers to fiscal year 1996–1997 and 2000 refers to fiscal year 2000–2001.

[8] Unless otherwise stated, all data shown as been consistently grouped using CMG 2000.

[9] Data for the Yukon, the Northwest Territories, and Nunavut have been combined because of low volumes in each individual territory.

1996 CIHI DAD Data by Province

Province	IP Cases	IP Days	ALOS	% ALC	RIW per Case	RIW per Day	SDS Cases	SDS as % of Total	RIW per SDS Case
N.L.	72,827	539,431	7.41	4.3%	1.34	0.181	41,199	36.1%	0.192
P.E.I.	16,382	119,756	7.31	2.0%	1.24	0.169	9,147	35.8%	0.172
N.S.	120,147	874,700	7.28	3.2%	1.40	0.192	77,433	39.2%	0.177
N.B.	118,941	753,047	6.33	0.6%	1.15	0.182	46,446	28.1%	0.192
Ont.	1,222,354	7,459,992	6.10	9.6%	1.29	0.211	960,622	44.0%	0.178
Man.	87,659	834,072	9.51	14.5%	1.82	0.191	69,077	44.1%	0.189
Sask.	144,827	869,883	6.01	2.7%	1.18	0.197	67,148	31.7%	0.191
Alta.	332,165	1,860,276	5.60	3.9%	1.23	0.220	N/A	N/A	N/A
B.C.	453,165	2,747,185	6.06	6.9%	1.25	0.206	262,518	36.7%	0.198
Territories	11,832	46,599	3.94	1.8%	0.76	0.193	4,146	25.9%	0.192
Total	**2,580,299**	**16,104,941**	**6.24**	**7.4%**	**1.28**	**0.206**	**1,537,736**	**37.3%**	**0.183**

Case Volumes

In 1996, there were 2.6 million in-patient cases in the CIHI DAD and 1.5 million ambulatory procedure (SDS) cases. Almost half (47%) of the in-patient cases were from Ontario hospitals and 62% of the ambulatory procedure cases were from Ontario. Because ambulatory procedure cases were not consistently reported to CIHI by Alberta hospitals, all of the Alberta SDS records have been excluded.

For most provinces the DAD data reflects all of the acute care in-patient cases. Exceptions are Quebec (where hospital separation data is reported to MED-ÉCHO rather than CIHI) and Manitoba, where only the largest hospitals reported their data to CIHI. Ambulatory procedure activity is also less comprehensive for provinces such as Alberta and New Brunswick.

Length of Stay

In 1996, the longest average acute care hospital length of stay was in Manitoba (9.51 days) and the shortest was in the territories (3.94 days). However, both of these length of stay values do not reflect the average length of stay for hospitalizations of most of the residents of the region (since the Manitoba data is for the hospitals treating the most complex cases and the territory data excludes complex patients treated elsewhere). For the provinces where the data reflects patterns of care for most of the residents, the longest LOS was in Newfoundland and Labrador and the shortest LOS was in Alberta. Average acute care hospital length of stay tended to be shorter in the western provinces than in the east (a geographic pattern also seen in the United States).

ALC Days

In 1996, there was large variation in the percentage of total in-patient days reported as Alternate Level of Care (ALC), from a low of less than 1% of days in New Brunswick, to a high of 14.5% of days in Manitoba. This may reflect provincial variation in the capacity of post-acute placement options (e.g. home care or long-term care beds) and/or variation in the comprehensiveness of reporting of discharge placement delays. In other words, there is national variation in the comprehensiveness of reporting of ALC days and not all facilities in New Brunswick reported ALC days.

Resource Intensity Weights

The average RIW weighted cases per in-patient separation ranged from a low of 0.76 in the territories to a high of 1.82 in Manitoba. For the provinces for which the data shows the hospitalizations of most residents, the lowest average RIW per case was in New Brunswick (1.15) and the highest in Nova Scotia (1.40). The average RIW per case is a measure of the relative resource use per case.

A second measure of the relative resource use is the average RIW per day. Because RIW values for long-stay outliers are partially assigned on a per diem basis, the average RIW per case may be high because a hospital has long lengths of stay. The average RIW per day is a better measure of the relative daily intensity of in-patients. In 1996, Prince Edward Island had the lowest average RIW per day (0.169) and Alberta had the highest average RIW per day (0.220).

Percent Use of Ambulatory Procedures

A gross measure of the extent to which the hospitals in a province have replaced in-patient surgery with ambulatory procedures is the percent of total cases in the DAD that were reported through the ambulatory procedure reporting system.[10] The percent use of ambulatory procedures as it applies to the 1996–1997 baseline data year are being examined in that it may also reflect differences in data collection and reporting and therefore contribute to the variation found in this analysis. This is particularly relevant for provinces like New Brunswick and Ontario where some ambulatory procedures do not get reported to CIHI. In 1996, (for those provinces where the data reflect hospitalizations of most residents) the lowest ambulatory procedure rate was 28.1% of all (in-patient and ambulatory procedure) cases for the hospitals in New Brunswick. The highest ambulatory procedure rate was 44.0% for the hospitals in Ontario.

The average RIW value per ambulatory procedure (a measure of the relative cost intensity of the ambulatory procedures) ranged from a low of 0.172 in Prince Edward Island hospitals to a high of 0.198 in British Columbia hospitals.

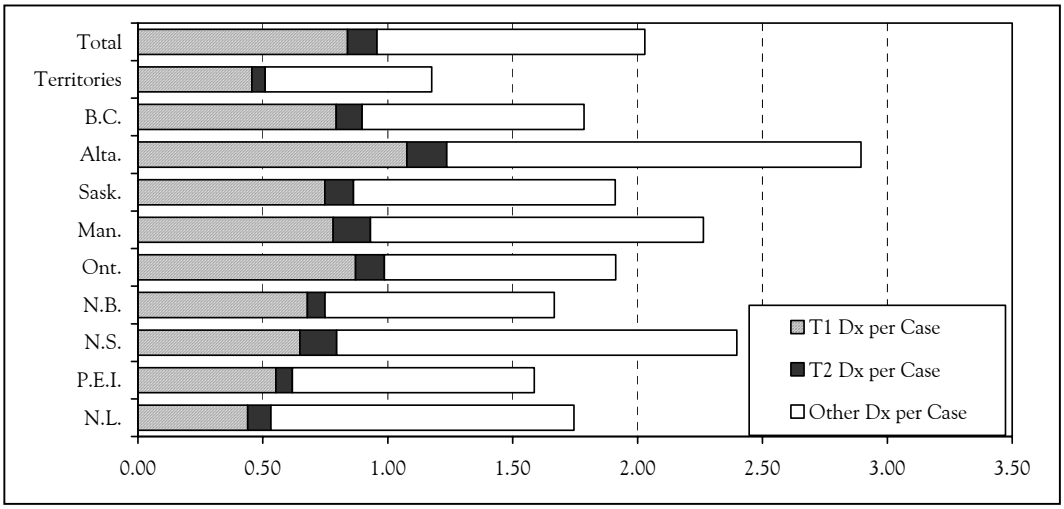
[10] Not all activity reported to CIHI as an ambulatory procedure is surgical in nature.

The differences in the measures shown above, derived from the CIHI DAD data, likely reflect a combination of differences in the structure, capacity, and role of acute care hospitals and the broader health system between provinces. However, as already stated, they may also reflect differences in data collection and reporting.

Diagnoses per In-patient Case

The following chart shows the variation across provinces in the average number of diagnoses, by type, reported to the CIHI DAD for in-patient separations. Every case must have a Most Responsible Diagnosis (MRDx) and the numbers in the chart exclude the MRDx. The diagnosis types shown are Type 1 (pre-admit comorbid condition), Type 2 (post-admit comorbid condition), and Other (mainly Type 3 or secondary diagnoses).

1996 Average Diagnoses per In-patient Case by Province



In 1996, Alberta hospitals reported almost three diagnoses per in-patient case, and more comorbid diagnoses per case than the hospitals in any other province. The actual values by diagnosis type by province are shown in the following table.

1996 Average Diagnoses per Case by Diagnosis Type by Province

Province	T1 Dx per Case	T2 Dx per Case	Other Dx per Case	Total Dx per Case
N.L.	0.44	0.09	1.21	1.75
P.E.I.	0.55	0.07	0.97	1.59
N.S.	0.65	0.15	1.60	2.40
N.B.	0.68	0.07	0.92	1.67
Ont.	0.87	0.11	0.93	1.91
Man.	0.78	0.15	1.33	2.26
Sask.	0.75	0.11	1.05	1.91
Alta.	1.08	0.16	1.66	2.89
B.C.	0.79	0.10	0.89	1.79
Territories	0.46	0.05	0.67	1.18
Total	**0.84**	**0.12**	**1.07**	**2.03**

In 1996, Newfoundland and Labrador hospitals reported the lowest number of pre-existing comorbidities (Type 1 diagnoses) per in-patient case and one of the lowest number of post-admit comorbidities (Type 2 diagnoses) per case. However, these same Newfoundland and Labrador hospitals had a relatively high reporting rate for other diagnoses per case.

Factors Influencing Diagnosis Reporting

The factors that might influence the reported diagnoses per in-patient case in the CIHI DAD include:

- Patient health and burden of disease. For those provinces where the data reflects the majority of the hospitalizations of the residents, we would not expect to see great variation in the population health status contributing to the variation in reported diagnoses.
- Incentive to comprehensively capture and report diagnostic information. Hospitals in jurisdictions where hospital funding uses discharge separation abstract data or where there is history of performance measurement using such data may have a greater incentive to report more diagnoses.
- Availability of health records resources. There is a cost to identifying and coding diagnoses and if health records resources are limited, diagnoses may be less comprehensively reported.
- Provincial variation in data capture and reporting guidelines (or variation in awareness and understanding of CIHI standards).

- Documentation practices that are either conducive to or detract from comprehensive data capture and reporting of diagnoses.

The variation in reporting of Type 1 and Type 2 diagnoses has the greatest potential impact on comparability of DAD data, since the comorbidity diagnosis data may be used to assign case weights, risk adjust for quality measurement, and to measure the incidence of complications.

Grade List Diagnoses

In 1996, only a small subset of reported diagnoses were grade list diagnoses that would lead to the assignment of higher complexity levels.[11] The average overall DAD ratio of non-grade list diagnoses to grade list diagnoses was 12.5.

1996 Ratio of Non-Grade List Diagnoses to Grade List Diagnoses*

Province	Grade List Dx per Case	Non-Grade List Dx per Case	Ratio of Non-Grade List to Grade List
N.L.	0.10	1.65	17.2
P.E.I.	0.09	1.50	16.6
N.S.	0.14	2.26	16.4
N.B.	0.10	1.57	15.5
Ont.	0.16	1.76	11.3
Man.	0.18	2.09	11.8
Sask.	0.12	1.79	14.8
Alta.	0.20	2.70	13.7
B.C.	0.14	1.65	11.8
Territories	0.04	1.14	31.0
Total	**0.15**	**1.88**	**12.5**

* Please note that numbers have been rounded-off for presentation purposes. Calculations were performed with 16 decimal places.

[11] The complexity methodology was not routinely applied to all DAD data until fiscal year 1997–1998, although the methodology was widely publicized and applied on an ad hoc basis prior to that year.

There was a two to one difference between Alberta, Newfoundland and Labrador, Prince Edward Island, and New Brunswick in grade list diagnoses per case. It is unlikely that this truly reflects differences in the incidence of the grade list conditions for hospital in-patients between the provinces. This is more likely the result of differences in comprehensiveness of reporting of grade list diagnoses. In 1996–1997, Alberta hospitals had already had years of experience with hospital funding based on discharge data,[12] and were developing discharge data based hospital system performance measures.

A primary use of the CIHI DAD by acute care hospitals is the establishment of length of stay targets and the monitoring of length of stay performance. CIHI uses the DAD to calculate an expected LOS for Typical patients, and CIHI reports routinely compare the actual LOS for a patient with the expected LOS (ELOS). The following table shows, for Typical patients, the 1996–1997 ratio of the actual LOS (ALOS) to the ELOS, by province. The ELOS is calculated after removal of the reported ALC days, so that ALOS used for comparison here also excludes the reported ALC days.

1996 Typical Case LOS Performance by Province

Province	IP Cases	IP Days	ALOS (incl. ALC)	ALOS (excl. ALC)	% ALC	ALOS as % of ELOS
N.L.	58,662	296,727	5.06	5.04	0.4%	123%
P.E.I.	13,272	69,838	5.26	5.23	0.6%	124%
N.S.	97,978	500,198	5.11	5.08	0.6%	116%
N.B.	99,230	479,914	4.84	4.83	0.1%	116%
Ont.	1,055,062	4,734,047	4.49	4.38	2.4%	100%
Man.	70,951	353,102	4.98	4.91	1.4%	111%
Sask.	117,826	519,424	4.41	4.39	0.5%	108%
Alta.	281,797	1,188,510	4.22	4.17	1.1%	96%
B.C.	375,948	1,672,660	4.45	4.39	1.4%	101%
Territories	10,415	33,354	3.20	3.18	0.5%	99%
Total	**2,181,141**	**9,847,774**	**4.51**	**4.44**	**1.7%**	**102%**

In 1996–1997, the overall actual length of stay for Typical in-patient cases in the DAD was 102% of the ELOS.[13] Only Alberta and territorial hospitals had actual Typical lengths of stay shorter than the DAD ELOS. Typical lengths of stay in hospitals in the Atlantic Provinces were all at least 16% longer than the expected LOS. The Ontario Typical LOS was equal to the ELOS.

[12] The Alberta Acute Care Funding system in the early 1990's used the U.S. refined DRG (RDRG) grouper and weights, rather than the CIHI (or HMRI, the predecessor to CIHI) CMG grouper and weights.
[13] The ELOS is based on CMG 2000.

When the LOS performance is broken down by broad program[14] (medicine, surgery, obstetrics/neonates, and psychiatry) in some cases it differs from the provincial average, particularly for Psychiatry.

1996 Typical Case LOS Performance (as % of Expected LOS) by Program by Province

Province	Medicine	Surgery	Obs/Neo	Psych
N.L.	119%	127%	127%	124%
P.E.I.	123%	129%	138%	109%
N.S.	119%	116%	115%	109%
N.B.	116%	117%	127%	108%
Ont.	99%	101%	101%	97%
Man.	108%	109%	112%	129%
Sask.	105%	108%	124%	102%
Alta.	98%	93%	92%	105%
B.C.	97%	104%	107%	100%
Territories	95%	107%	115%	83%
Total	**102%**	**103%**	**105%**	**101%**

While the Alberta LOS performance was below 100% for Medicine, Surgery, and Obstetrics/Neonates, it was 105% for Psychiatry. The Prince Edward Island LOS performance was 109% for psychiatry but above 120% for the other programs. These differences may reflect provincial difference in the structure of the mental health system (e.g. availability of tertiary mental health services, categorization of mental health beds as acute care, and community service capacity).

In 1996, 30% of in-patient cases submitted to the CIHI DAD were in CMG to which the complexity methodology did not apply. The distribution of the remaining cases, by complexity level, and by province, is shown in the following table.

[14] Cases were assigned to programs as follows: MCC 19 cases were assigned to Psychiatry; MCC 14/15 cases were assigned to Obstetrics/Neonates. Any of the remaining cases with an operative procedure were assigned to Surgery, and all other cases were assigned to Medicine.

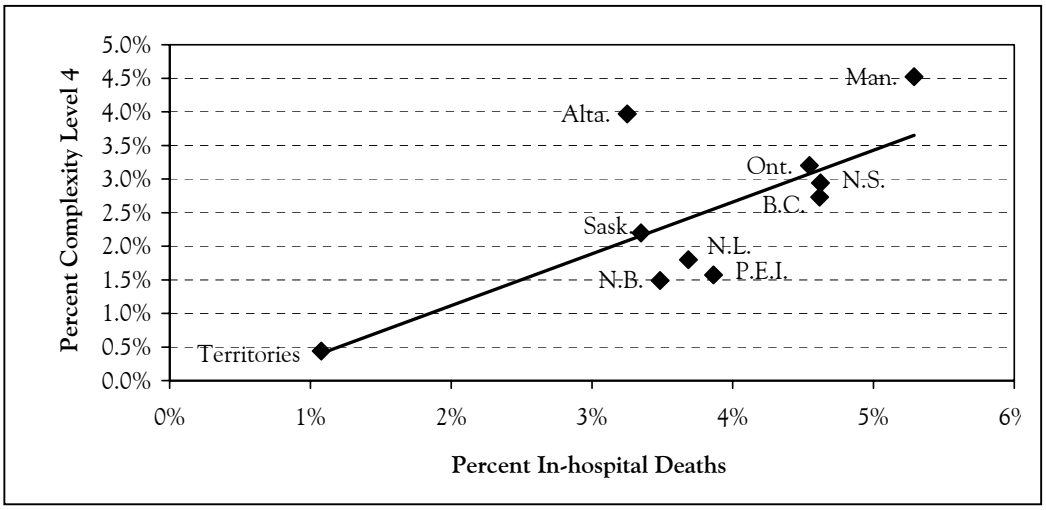
1996 Distribution of In-patient Cases by Complexity Level

Province	% of Total in Plx 9	Distribution of Cases by Plx (excl. Plx 9)			
		Plx 1	Plx 2	Plx 3	Plx 4
N.L.	23.5%	89.0%	6.3%	2.8%	1.8%
P.E.I.	28.9%	87.5%	8.0%	2.9%	1.6%
N.S.	26.4%	84.0%	8.9%	4.1%	2.9%
N.B.	21.6%	87.8%	7.6%	3.1%	1.5%
Ont.	31.4%	81.1%	10.7%	5.0%	3.2%
Man.	35.3%	78.6%	11.1%	5.7%	4.5%
Sask.	24.8%	85.7%	8.4%	3.6%	2.2%
Alta.	31.8%	79.5%	11.0%	5.5%	4.0%
B.C.	29.6%	83.6%	9.3%	4.3%	2.7%
Territories	40.4%	93.1%	5.1%	1.3%	0.4%
Total	**30.0%**	**82.4%**	**9.9%**	**4.7%**	**3.0%**

Overall in 1996, 82.4% of medical/surgical cases in the DAD were assigned a complexity level 1 (no complexity). Manitoba had the highest percent of medical/surgical cases in complexity level 4 (life threatening condition) at 4.5%, followed by Alberta at 4.0%.

We would expect that there would be some correlation between the percent of medical/surgical cases that are assigned to complexity level 4 and the actual percent of medical/surgical cases that die in hospital. The following graph compares the complexity 4 and in-hospital mortality rates. Generally, for those provinces where the percent of patients in complexity level is higher, the actual percent of in-hospital deaths is also higher. The exception is Alberta, which has the 2nd highest percent of medical/surgical patients in complexity level 4, but the 2nd lowest actual percent of in-hospital deaths.

1996 Percent of Medical/Surgical Cases in Plx 4 Versus Actual In-hospital Mortality for Medical/Surgical Cases



1996 Data Conclusions

For fiscal year 1996–1997, prior to the implementation of the CIHI complexity overlay, there were apparent differences between provinces in use of acute care facilities and in reporting of patient separation data to CIHI. Some of these differences were caused by differences in the role of acute care hospitals and the availability of other types of hospital beds and health services. Other differences were likely caused by measurement difference (e.g. comprehensiveness of diagnostic data, interpretation of coding guidelines). Some of this variation is inevitable. The goal of this analysis and assessment of the DAD data for the subsequent years (fiscal year 1997–1998 to 2000–2001) is not to determine whether there is any data reporting variation between provinces, but rather to determine whether the variation is significant enough to compromise the comparability of the data.

Changes from 1996–1997 to 2000–2001

In addition to the fiscal year 1996–1997 DAD data, DAD data were analyzed for the fiscal years from 1997–1998 through to 2000–2001. All of these data were grouped using CMG 2000 (the same grouper used with the 1996–1997 data). When the 1997–1998 through 2000–2001 data were collected, the complexity methodology was routinely applied to all acute care in-patient records, and all CIHI clients received reports showing their length of stay performance and RIW weighted cases based on complexity. The following table shows the percent change in key acute care activity measures from 1996–1997 to 2000–2001.

Percent Change from 1996 to 2000 in Overall DAD Activity Measures by Province

Province	IP Cases	IP Days	ALOS	% ALC	RIW per Case	RIW per Day	SDS Cases	SDS as % of Total	RIW per SDS Case
N.L.	-12%	-6%	7%	-7%	6%	-1%	12%	16%	-7%
P.E.I.	13%	20%	6%	114%	7%	0%	6%	-4%	-2%
N.S.	-11%	0%	12%	157%	14%	2%	25%	21%	8%
N.B.	-8%	1%	9%	105%	15%	6%	44%	35%	-8%
Ont.	-7%	-7%	0%	-5%	12%	11%	18%	14%	2%
Man.	-13%	-16%	-3%	-56%	-2%	1%	-7%	4%	6%
Sask.	1%	-2%	-4%	-4%	1%	4%	49%	28%	-5%
Alta.	1%	15%	13%	52%	11%	-2%	N/A	N/A	N/A
B.C.	-8%	2%	10%	118%	11%	1%	10%	11%	5%
Territories	-10%	-4%	7%	32%	9%	2%	23%	25%	-1%
Total	**-6%**	**-2%**	**4%**	**17%**	**10%**	**5%**	**18%**	**15%**	**2%**

From 1996–1997 to 2000–2001, there was a 6% decrease in in-patient cases in the DAD. All provinces exhibited a decrease except for Alberta and Saskatchewan, which had a 1% increase, and Prince Edward Island, which had a 13% increase.

LOS Changes

There was a 4% increase in the average length of stay of the patients represented in the DAD data. Some of this increased length of stay is accounted for by the 17% increase in the percent of days used by ALC patients. The very large increases in percent ALC days in some provinces (more than 100%) probably represents more complete reporting of ALC days.

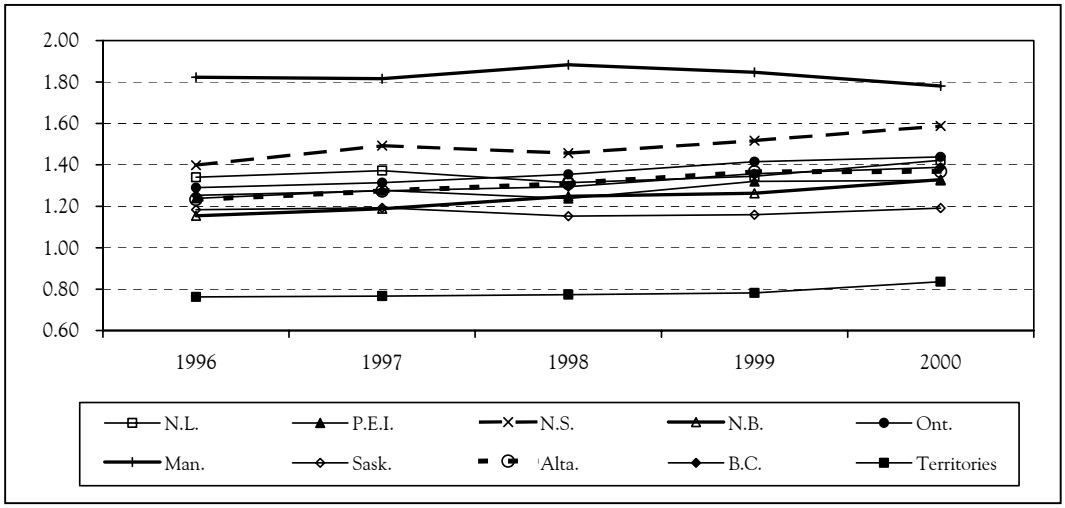
The average RIW per case increased in all provinces except Manitoba. The average RIW per in-patient day increased in all provinces except Newfoundland and Labrador and Alberta.

Ambulatory procedure volumes increased by 18% overall and in all provinces except Manitoba. The change in average RIW per ambulatory procedure was mixed, with some provinces higher and other lower.

The changes in the activity measures from 1996–1997 to 2000–2001 are consistent with an overall pattern of improved utilization of acute care beds, with fewer in-patient cases, more ambulatory procedures, and a longer residual LOS (and higher resource intensity) for the cases not shifted to ambulatory care.

The graph below shows the trend in average RIW per in-patient case.

Average RIW per In-patient Case Trend from 1996 to 2000 by Province

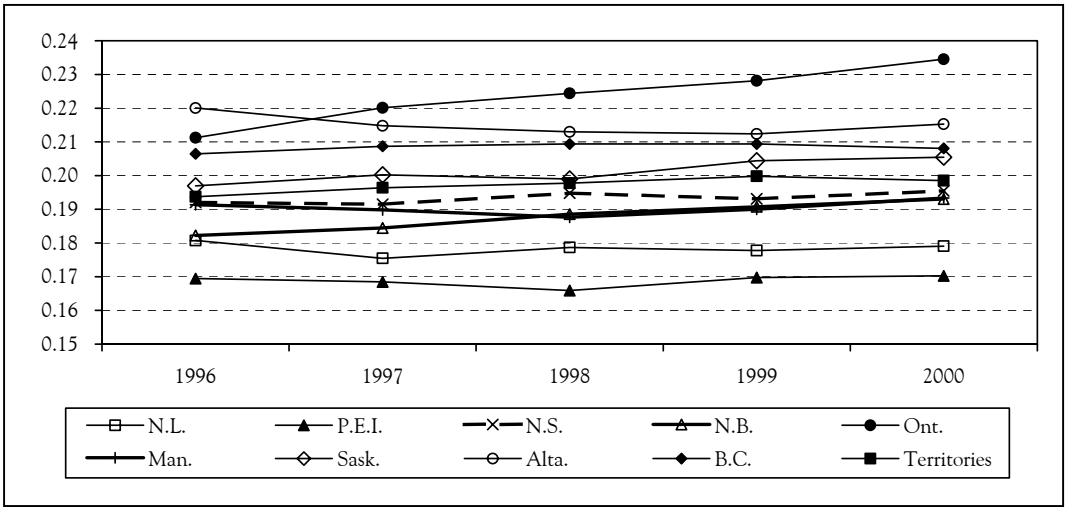


Most of the provinces show a steady increase in the average RIW per in-patient case over the 5-year period, except for Manitoba and Saskatchewan.

RIW per In-patient Day

The chart below shows the trend in average RIW per in-patient day. Here Ontario stands out, with a steady increase such that by 2000–2001 the Ontario RIW per in-patient day is clearly higher than that of the other provinces. New Brunswick also has a steady increase, but remains lower than most other provinces in 2000–2001. Hence a perspective resulting from the graph below is that the changes in New Brunswick reflect more comprehensive coding practices generally as opposed to practices that focused on improving RIW. This is discussed more fully later in the discussion section of the document.

Average RIW per In-patient Day Trend from 1996 to 2000 by Province



Increases in Reported Diagnoses

The changes in RIW per in-patient day over the 5-year period for Ontario and New Brunswick prompted an analysis of corresponding changes in the reporting rate for diagnoses.

Over the 5-year period there was a 13% increase in reported diagnoses in the DAD, but this increase was concentrated in the Type 1 diagnoses (26% increase) and the Type 2 diagnoses (46% increase). Other diagnoses (mainly Type 3 secondary) dropped by 2%.

Change in Reported Diagnoses for In-patient Cases by Diagnosis Type from 1996 to 2000 by Province

Province	Type 1	Type 2	Other	Total
N.L.	-7%	0%	-38%	**-28%**
P.E.I.	33%	59%	-17%	**3%**
N.S.	0%	-7%	-8%	**-6%**
N.B.	84%	114%	-8%	**34%**
Ont.	42%	92%	-5%	**22%**
Man.	-9%	-20%	-5%	**-7%**
Sask.	11%	-23%	3%	**5%**
Alta.	9%	11%	15%	**13%**
B.C.	2%	3%	-2%	**0%**
Territories	68%	13%	-17%	**18%**
Total	**26%**	**46%**	**-2%**	**13%**

Variation by Province

The change in reported diagnoses was not consistent across the provinces. Three provinces had a decrease in reported diagnoses (Newfoundland and Labrador, Nova Scotia, and Manitoba) while two provinces had increases in excess of 20% (New Brunswick and Ontario).

Type 1 Diagnoses

The differences are even greater when examined by diagnosis type. New Brunswick had an 84% increase in Type 1 (pre-existing comorbidity) diagnoses. The corresponding increase for the territories was 68% and 42% for Ontario. Newfoundland and Labrador and Manitoba had 7% and 9% respectively decreases in Type 1 diagnoses. The large increases in Type 1 diagnoses must reflect changes in coding practices since they are too large to be due to changes in the underlying health status of the acute care in-patients.

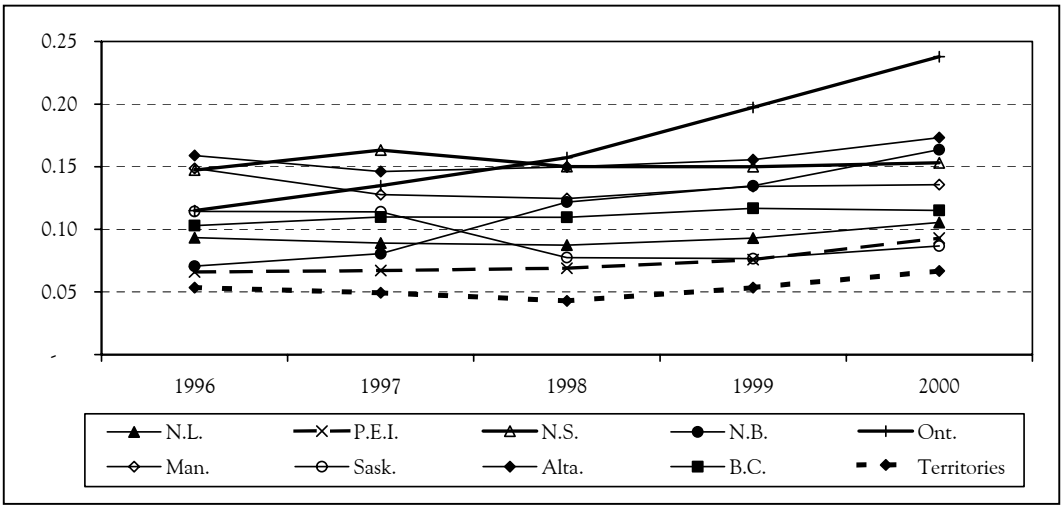
Type 2 Diagnoses

The increases in reported Type 2 (post-admit comorbidity) diagnoses vary from reductions in Nova Scotia, Manitoba, and Saskatchewan, to a 114% increase in New Brunswick and a 92% increase in Ontario. Thus, this variation remains a concern for CIHI.

Alberta is the only province where the change in reporting of diagnoses does not appear to be related to diagnosis type. In all other provinces and territories a greater proportion of the reported diagnoses were Type 1 or 2 in 2000–2001. In Alberta, the number of other (secondary) diagnoses grew at a faster rate than the rate for Type 1 or 2 diagnoses. This may be evidence of the residual impact in Alberta of prior use of the RDRG grouper, (rather than the CMG grouper) which did not rely on diagnosis typing to assign complications and comorbidities.

The change in reported Type 2 diagnoses per in-patient case over the 5-year period is shown in the graph below.

Change in Reported Type 2 Diagnoses per In-patient Case from 1996 to 2000 by Province

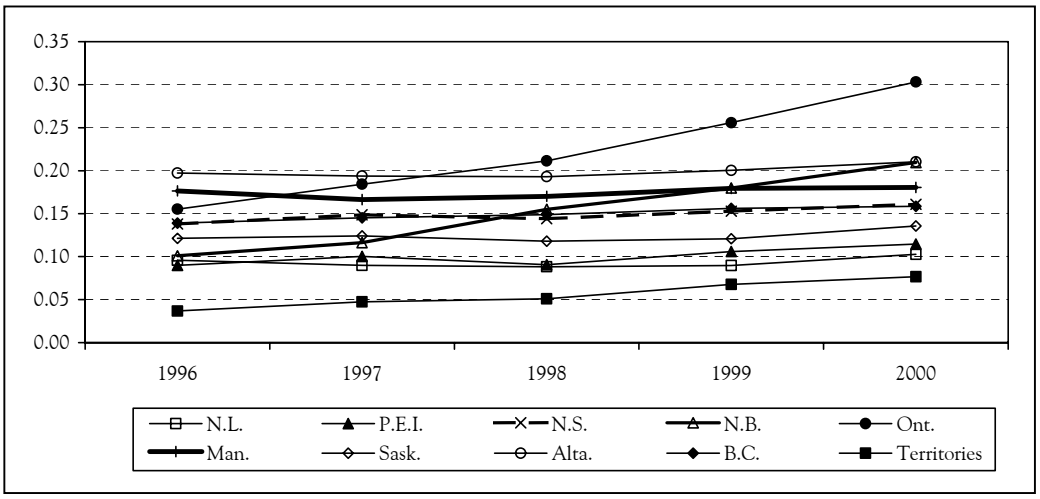


The graph shows that as a result of the increased reporting of Type 2 diagnoses in Ontario, the Ontario Type 2 diagnosis rate was substantially higher than the rate in the other provinces. While New Brunswick had the highest rate of increase, because it started with a low Type 2 diagnosis reporting rate, it remained lower than both Ontario and Alberta in 2000–2001.

Grade List Diagnoses

There are also differences between the provinces in the volumes of grade list diagnoses reported per case since the introduction of the complexity methodology. There has been a 55% increase in the reported grade list diagnoses per in-patient case in the DAD (versus a 17% increase for non-grade list diagnoses) from 1996–1997 to 2000–2001. Every province had an increase in grade list diagnoses. New Brunswick and the territories had a 108% increase in grade list diagnoses and Ontario had a 95% increase.

Change in Grade List Diagnoses Reported per In-patient Case



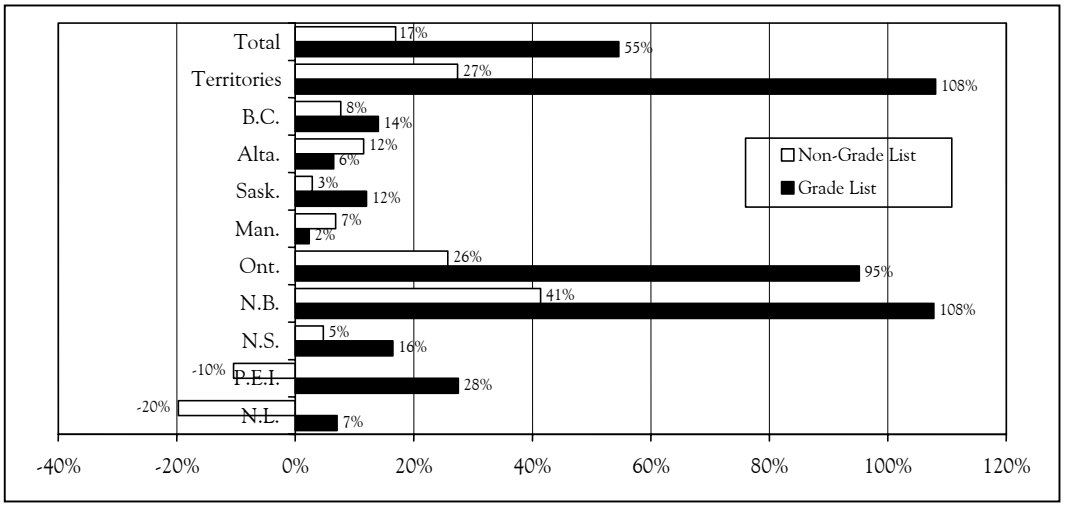
Once again, the increase in reported grade list diagnoses leaves Ontario with a much higher rate than everywhere else in 2000–2001, and New Brunswick with a rate similar to that of Alberta. In spite of the over 100% increase in grade list diagnoses in the territories, the 2000–2001 rate is still less than the rate in the other provinces.

The following table compares the increase in grade list diagnoses with the increase in non-grade list diagnoses. In every province except Alberta, the increase in grade list diagnoses is greater than the increase in non-grade list diagnoses. Non-grade list diagnosis reporting dropped in Prince Edward Island and Newfoundland and Labrador.

Focus of Health Records Professionals on Most Significant Diagnoses

These results support the anecdotal feedback from health records professionals that lack of availability of sufficient coding staff has caused health records departments to focus on coding and reporting those diagnoses that are the most significant and that impact RIW assignment (i.e. Type 1 and 2 grade list diagnoses).

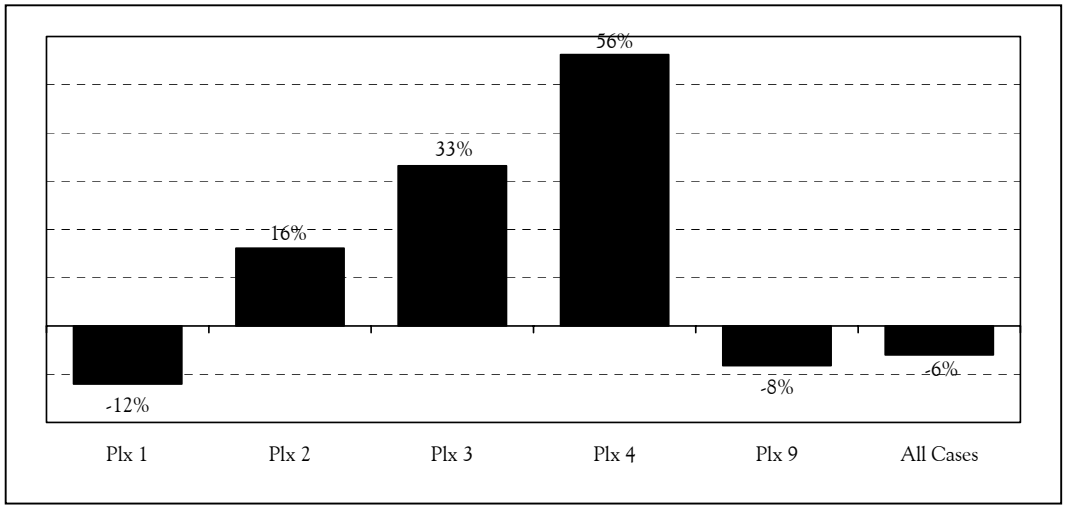
Change in Grade List and Non-Grade List Diagnoses per Case From 1996 to 2000



Distribution of Cases by Complexity

The emphasis on reporting of grade list diagnoses has had an impact on the distribution of cases by complexity level.

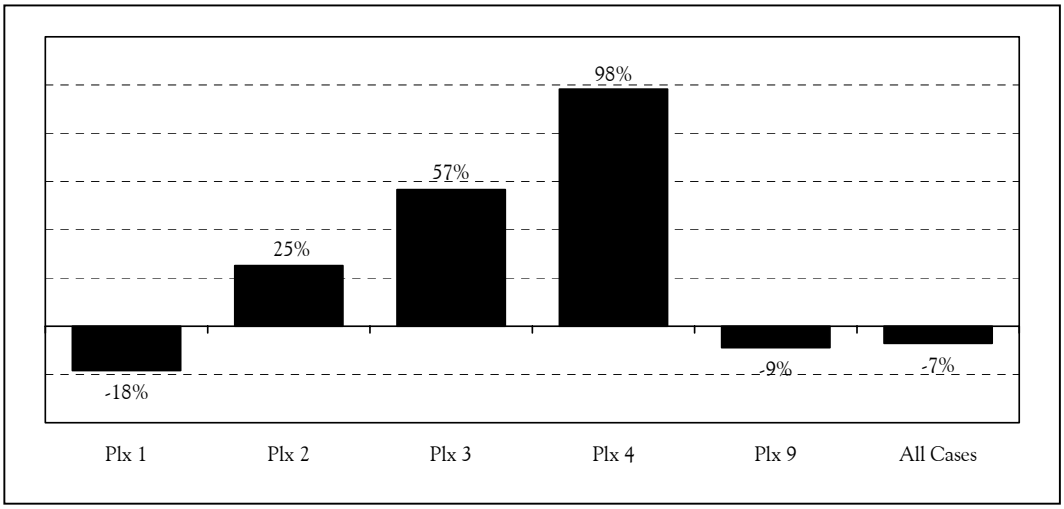
Percent Change in CIHI DAD In-patient Cases by Complexity from 1996 to 2000



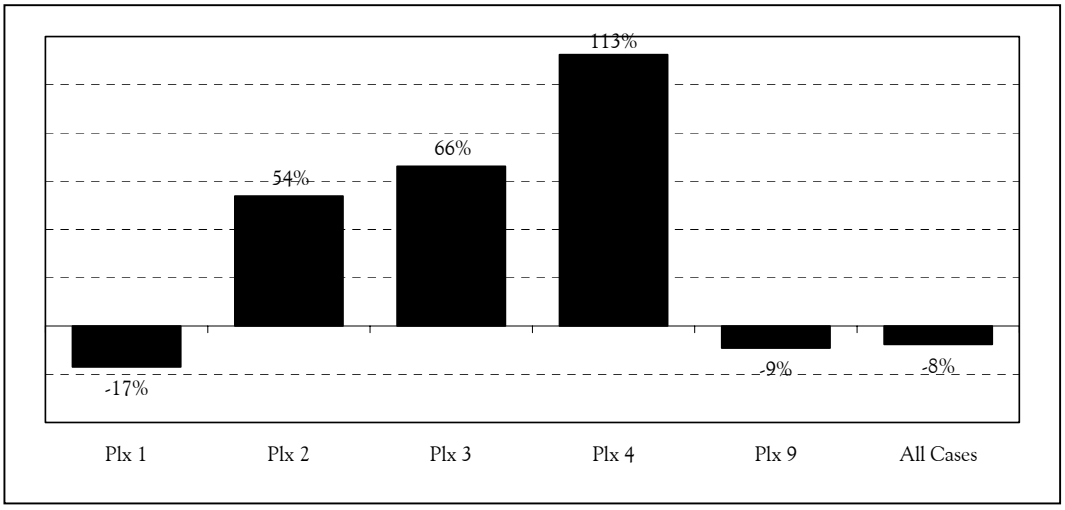
Across the DAD there was a 6% decrease from 1996–1997 to 2000–2001 in in-patient cases and an 8% decrease in complexity level 9 cases. Complexity level 1 cases decreased by 12%, while case volumes in the higher complexity levels increased.

For Ontario and New Brunswick, the overall DAD pattern is replicated but with l larger decreases in complexity level 1 cases and larger increases in complexity level 2, 3, and 4 cases.

Percent Change in Ontario In-patient Cases by Complexity from 1996 to 2000

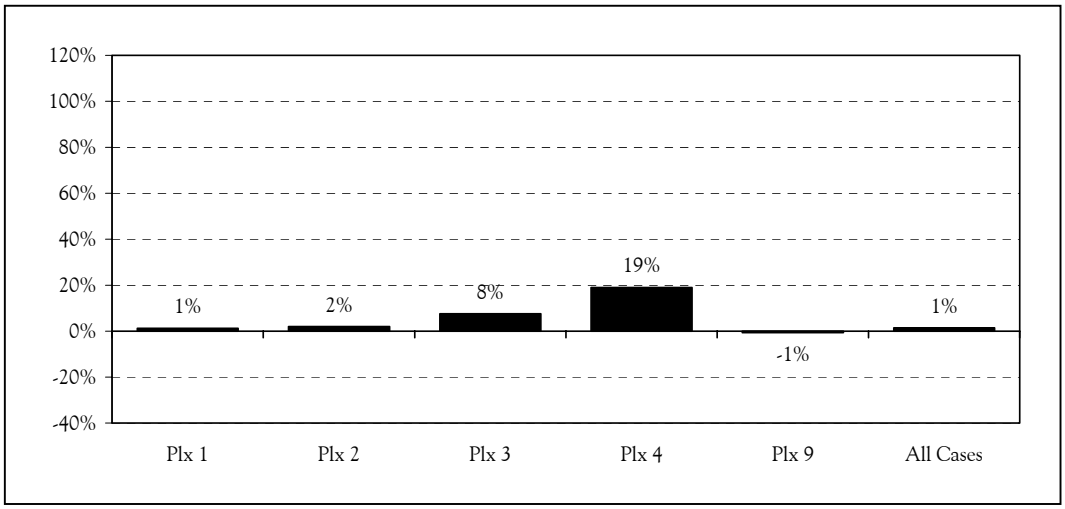


Percent Change in New Brunswick In-patient Cases by Complexity from 1996 to 2000



In contrast, Alberta had a slight increase in complexity 1 cases and small increases in complexity 2, 3, and 4 cases.

Percent Change in Alberta In-patient Cases by Complexity from 1996 to 2000



Correlation Between Level 4 and Mortality

If the 56% increase in complexity level 4 (life threatening illness) cases was purely due to increased patient complexity, we might expect to see a corresponding increase in actual in-hospital mortality.

Percent Change in In-hospital Deaths and Plx 4 Cases from 1996 to 2000 by Province

Province	In-hospital Deaths	Plx 4 Cases
N.L.	3%	-5%
P.E.I.	33%	36%
N.S.	1%	5%
N.B.	4%	113%
Ont.	-2%	98%
Man.	-10%	-4%
Sask.	11%	14%
Alta.	9%	19%
B.C.	1%	8%
Territories	58%	110%
Total	**1%**	**56%**

However, the 56% increase in complexity level 4 cases was accompanied by only 1% increase in-hospital deaths. In Ontario, for the same period where there was a 98% increase in complexity level 4 cases, there was a reduction of 2% in the actual number of in in-hospital deaths. In Newfoundland and Labrador, while there was a 5% decrease in complexity level 4 cases, there was a 3% increase in in-hospital deaths.

Percent Change in In-hospital Deaths and Plx 4 Cases from 1996 to 2000 by Patient Group by Province

Province	Medicine		Surgery		Other
	Deaths	Plx 4	Deaths	Plx 4	Deaths
N.L.	5%	4%	-5%	-10%	-16%
P.E.I.	39%	63%	-3%	7%	9%
N.S.	2%	12%	-1%	-1%	7%
N.B.	5%	154%	1%	69%	-10%
Ont.	-2%	124%	-2%	71%	-18%
Man.	-10%	4%	-11%	-10%	-39%
Sask.	13%	28%	0%	0%	-29%
Alta.	10%	29%	7%	10%	14%
B.C.	0%	12%	2%	4%	-2%
Territories	51%	219%	300%	-7%	-60%
Total	**1%**	**76%**	**0%**	**37%**	**-12%**

Particularly for Ontario, the change in complexity level 4 cases is not correlated with the actual change in in-hospital mortality. This suggests that the changes in the DAD data contributed by Ontario hospitals are more due to changes in coding and reporting practices than in changes in the acute care in-patient population in the province.

Comparisons for 2000–2001

This chapter of the report shows the resulting distribution of DAD data in fiscal year 2000–2001, and repeats many of the comparisons previously shown for fiscal year 1996–1997.

2000 CIHI DAD Data by Province

Province	IP Cases	IP Days	ALOS	% ALC	RIW per Case	RIW per Day	SDS Cases	SDS as % of Total	RIW per SDS Case
N.L.	64,142	509,608	7.94	4.0%	1.42	0.179	46,034	41.8%	0.179
P.E.I.	18,459	143,681	7.78	4.3%	1.32	0.170	9,674	34.4%	0.169
N.S.	107,228	870,763	8.12	8.1%	1.59	0.195	96,948	47.5%	0.191
N.B.	109,963	756,875	6.88	1.2%	1.33	0.193	67,003	37.9%	0.177
Ont.	1,136,183	6,966,650	6.13	9.1%	1.44	0.234	1,135,556	50.0%	0.181
Man.	76,389	702,643	9.20	6.4%	1.78	0.193	64,341	45.7%	0.201
Sask.	146,497	848,390	5.79	2.6%	1.19	0.205	100,345	40.7%	0.182
Alta.	336,916	2,140,956	6.35	6.0%	1.37	0.215	NA	NA	NA
B.C.	419,088	2,792,841	6.66	15.1%	1.39	0.208	287,476	40.7%	0.208
Territories	10,647	44,776	4.21	2.4%	0.83	0.198	5,099	32.4%	0.191
Total	**2,425,512**	**15,777,183**	**6.50**	**8.6%**	**1.41**	**0.217**	**1,812,476**	**42.8%**	**0.186**

In 2000–2001, Ontario hospitals still provided 47% of in-patient cases, and 63% of ambulatory procedure cases (Alberta ambulatory procedure cases have been excluded). Average lengths of stay remain longer in the Atlantic Provinces than in the rest of Canada (although inconsistent reporting in New Brunswick may partly explain this).

Newfoundland and Labrador and Prince Edward Island hospitals report the lowest RIW per day and Ontario the highest RIW per day.

New Brunswick and Ontario have the highest rates of Type 1 diagnoses per in-patient case, more than double the rates in Newfoundland and Prince Edward Island.

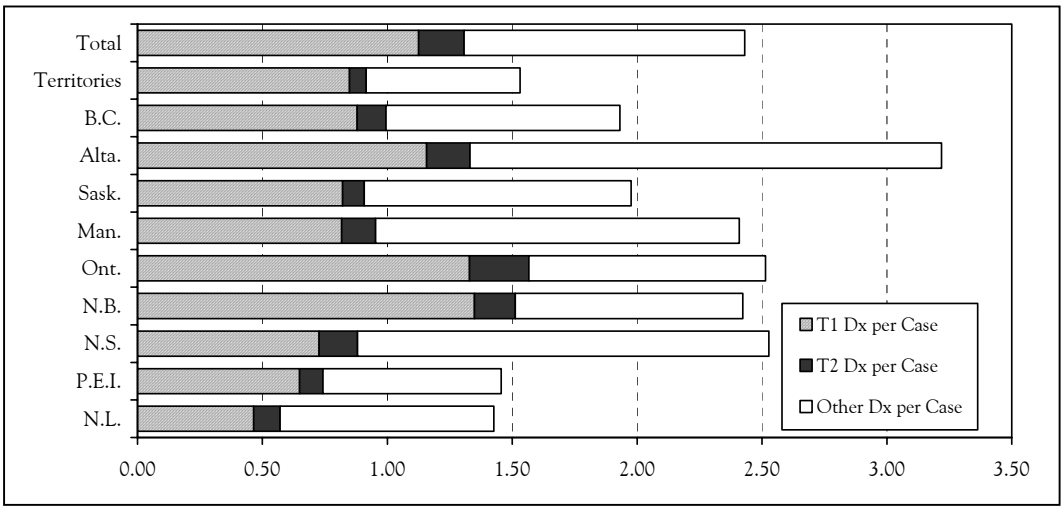
Ontario has the highest rate of Type 2 diagnoses per in-patient case, and Prince Edward Island and Saskatchewan the lowest.

Alberta has the highest rate of reporting of other (secondary) diagnoses, followed by Nova Scotia. The rates for other diagnoses are below the DAD average in New Brunswick and Ontario, and are the lowest in Newfoundland and Prince Edward Island. Inconsistent reporting and the propensity to record diagnosis types more so in one province verses another is a concern for CIHI. In our Provincial visits that took place in the spring, 2003, we identified these inconsistencies as an area for future focus as these practices contribute to variations in the data.

2000 Diagnoses per In-patient Case by Diagnosis Type by Province

Province	T1 Dx per Case	T2 Dx per Case	Other Dx per Case	Total Dx per Case
N.L.	0.46	0.11	0.86	1.43
P.E.I.	0.65	0.09	0.71	1.46
N.S.	0.73	0.15	1.65	2.53
N.B.	1.35	0.16	0.91	2.42
Ont.	1.33	0.24	0.95	2.51
Man.	0.82	0.14	1.46	2.41
Sask.	0.82	0.09	1.07	1.98
Alta.	1.16	0.17	1.89	3.22
B.C.	0.88	0.12	0.94	1.93
Territories	0.85	0.07	0.62	1.53
Total	**1.12**	**0.18**	**1.12**	**2.43**

2000 Average Diagnoses per In-patient Case by Province



Grade List Diagnoses

Ontario has the highest rate of grade list diagnoses per in-patient case, three times the Newfoundland and Labrador rate. The overall ratio of non-grade list diagnoses has decreased from 12.5 in 1996–1997 to 9.4 in 2000–2001.

2000 Ratio of Non-Grade List Diagnoses to Grade List Diagnoses*

Province	Grade List Dx per Case	Non-Grade List Dx per Case	Ratio of Non-Grade List to Grade List
N.L.	0.10	1.32	12.9
P.E.I.	0.11	1.34	11.7
N.S.	0.16	2.37	14.7
N.B.	0.21	2.21	10.6
Ont.	0.30	2.21	7.3
Man.	0.18	2.23	12.3
Sask.	0.14	1.84	13.6
Alta.	0.21	3.01	14.3
B.C.	0.16	1.77	11.2
Territories	0.08	1.45	19.0
Total	**0.23**	**2.20**	**9.4**

* Please note numbers have been rounded off for presentation purposes.

In 2000–2001 the actual DAD LOS was 96% of the ELOS.

2000 Typical Case LOS Performance by Province

Province	IP Cases	IP Days	ALOS (incl. ALC)	ALOS (excl. ALC)	% ALC	ALOS as % of ELOS
N.L.	51,974	275,852	5.31	5.27	0.6%	119%
P.E.I.	14,609	75,569	5.17	5.14	0.6%	118%
N.S.	85,608	434,238	5.07	5.02	1.0%	109%
N.B.	90,830	470,613	5.18	5.17	0.3%	110%
Ont.	985,014	4,625,022	4.70	4.53	3.5%	90%
Man.	63,318	349,968	5.53	5.44	1.6%	112%
Sask.	117,074	508,402	4.34	4.32	0.6%	101%
Alta.	277,741	1,229,088	4.43	4.35	1.6%	98%
B.C.	341,246	1,542,255	4.52	4.37	3.3%	95%
Territories	9,107	30,047	3.30	3.27	0.8%	95%
Total	**2,036,521**	**9,541,054**	**4.68**	**4.56**	**2.6%**	**96%**

The actual Ontario Typical LOS went from 100% of the ELOS in 1996–1997 to 90% of the ELOS in 2000–2001. The total LOS (based on all cases) for Ontario was lower than the LOS in all other provinces except Saskatchewan. When ALC days are removed, the average LOS for all cases in Ontario is the lowest (5.57 days), just below Saskatchewan (5.64 days) and B.C. (5.65 days). This suggests that the exceptional Ontario Typical LOS performance of 90% of ELOS is not just a result of higher rates of reporting grade list diagnoses (and correspondingly higher case complexity assignment and higher ELOS estimate), but truly does reflect shorter acute hospital lengths of stay in Ontario.

The Alberta and British Columbia actual lengths of stay were also below the DAD ELOS.

The Ontario actual lengths of stay for Medicine and Surgery (the programs to which the complexity methodology is applied) are less than 90% of the ELOS. The provinces of Newfoundland and Labrador and Prince Edward Island (which have the lowest grade list diagnosis reporting rates) have the poorest Typical case length of stay performance.

2000 Typical Case LOS Performance (as Percentage of Expected LOS) by Program by Province

Province	Medicine	Surgery	Obs/Neo	Psych
N.L.	113%	122%	123%	131%
P.E.I.	120%	119%	132%	100%
N.S.	113%	103%	114%	103%
N.B.	111%	108%	117%	100%
Ont.	89%	87%	99%	92%
Man.	113%	107%	108%	130%
Sask.	98%	104%	115%	95%
Alta.	98%	96%	91%	112%
B.C.	93%	96%	100%	97%
Territories	92%	98%	108%	84%
Total	**95%**	**93%**	**101%**	**99%**

As a result of the changes in reported rates for Type 1 and 2 grade list diagnoses in Ontario, Ontario has the lowest percent of medical/surgical in-patient cases in complexity level 1, and the highest percent in complexity level 4.

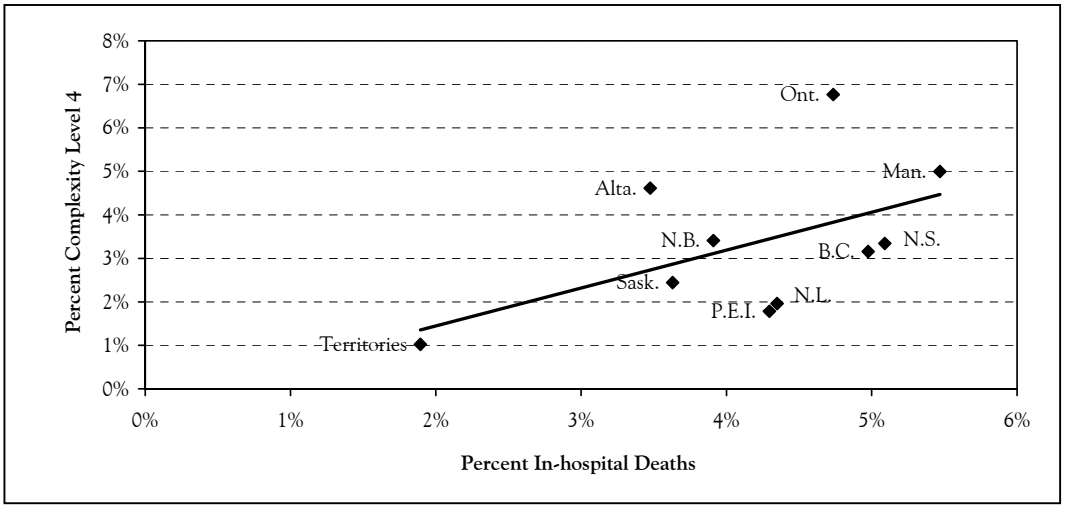
Newfoundland and Labrador has the highest percent of medical/surgical cases in complexity level 1 and the lowest percent in complexity level 4.

2000 Distribution of In-patient Cases by Complexity Level

Province	% of Total in Plx 9	Distribution of Cases by Plx (excl. Plx 9)			
		Plx 1	Plx 2	Plx 3	Plx 4
N.L.	24.0%	87.4%	7.5%	3.1%	2.0%
P.E.I.	24.7%	85.1%	9.4%	3.7%	1.8%
N.S.	24.0%	82.4%	9.7%	4.6%	3.3%
N.B.	21.2%	78.4%	12.5%	5.6%	3.4%
Ont.	30.8%	70.6%	14.2%	8.4%	6.8%
Man.	35.6%	77.3%	11.7%	6.0%	5.0%
Sask.	23.6%	84.2%	9.2%	4.1%	2.4%
Alta.	31.2%	78.6%	11.0%	5.8%	4.6%
B.C.	28.8%	81.8%	10.2%	4.8%	3.2%
Territories	40.5%	86.7%	9.3%	2.9%	1.0%
Total	**29.3%**	**76.3%**	**12.1%**	**6.5%**	**5.0%**

In 1996–1997 only the Alberta percent of cases in complexity level 4 was much higher than the actual percent of in-hospital deaths. In 2000–2001, Ontario also appears to be an outlier.

2000 Comparison of Percent of Medical/Surgical Cases in Plx 4 Versus Actual In-hospital Mortality for Medical/Surgical Cases



2000 Data Conclusions

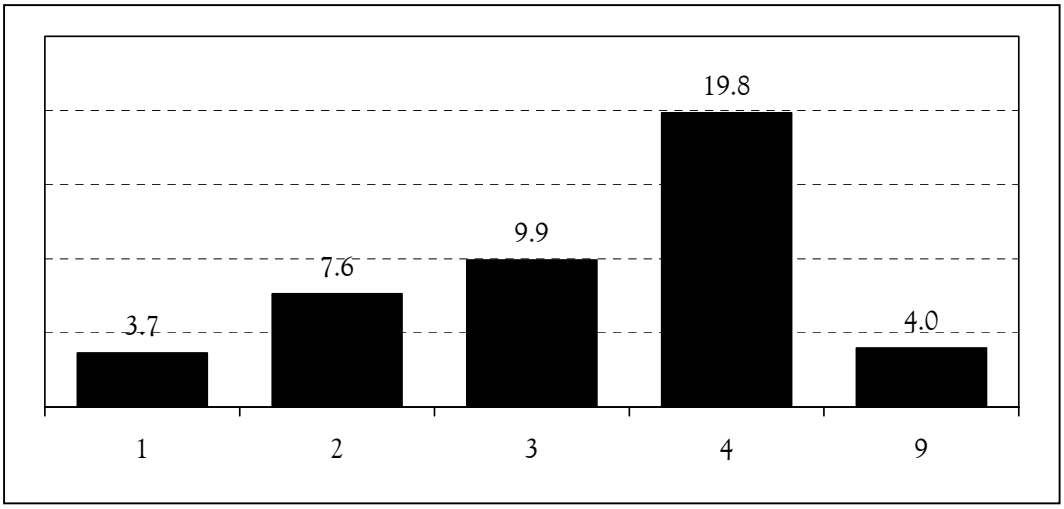
There have been large increases in the volume of grade list diagnoses reported by hospitals in Ontario and New Brunswick since 1996–1997. However, because the initial reporting rates in New Brunswick were relatively low, the 2000–2001 New Brunswick data remains comparable with data from other provinces represented in the DAD. This is an important point in that, while the nature of this analysis focused on increases over a specified time period, in the case of New Brunswick, this increase was magnified over that period highlighting the province in this analysis. While variation remains a concern for CIHI and must be addressed to maintain comparability, New Brunswick's increases for reporting have simply placed it at similar levels to other provinces.

Ontario Has Become Outlier

The same cannot be said for Ontario. The Ontario increases have caused Ontario to be an outlier, in terms of volumes of grade list diagnoses and the impact on case distribution by complexity, weighted cases, and LOS performance. The next section of this report examines the Ontario DAD data. Understanding the changes in the Ontario DAD data, and the factors that have caused the changes to occur, can help CIHI develop improved methodologies to ensure comparability of DAD data between provinces and between individual hospitals.

In spite of the changes in the DAD data, the complexity methodology still effectively differentiates in-patient cases by length of stay when applied across the database. However, the average LOS for complexity level 1 cases has increased by 0.1 days, decreased by 0.6 days for complexity level 2 cases, decreased by 1.0 days for complexity level 3 cases, and decreased by 2.9 days for complexity level 4 cases.

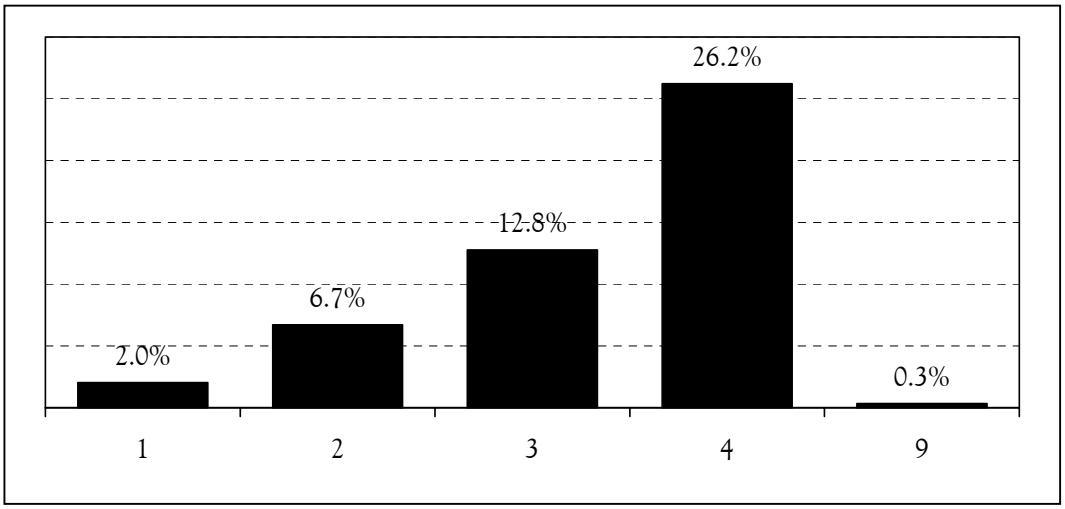
2000 Average Length of Stay for Typical Patients in the CIHI DAD by Assigned Case Complexity Level



While the different complexity levels still exhibit different length of stay patterns, the differences have been slightly compressed.

Similar patterns are seen when the 2000–2001 in-hospital mortality by complexity level is examined. The actual in-hospital mortality for complexity level 4 cases has decreased from 31.3% in 1996–1997 to 26.2% in 2000–2001.

2000 Average Percent In-hospital Mortality in the CIHI DAD by Assigned Case Complexity Level



Understanding Changes in Ontario

Focus on Ontario

Reasons for Focus on Ontario Data

Over the course of this project, much of the analysis has focused on the Ontario data in the DAD. Reasons for this Ontario focus include:

- The initial comparisons of changes in the DAD data showed the greatest changes in New Brunswick and Ontario. However, even with the changes, New Brunswick data could not be considered to be an outlier, while on many measures, Ontario had become an outlier.
- Ontario contributes almost half of the records to the DAD. Any better understanding of changes in the Ontario data will help assess the validity and comparability of the entire DAD.
- The results of the 2-year CIHI re-abstraction study showed higher than average rates of diagnosis discrepancies for some of the Ontario hospitals included in the sample.
- In parallel with this project, the Ontario Ministry of Health and Long-Term Care and the Ontario Joint Policy and Planning Committee, established a working group to assess the impact of variation in DAD data coding and reporting practices on comparability of weighted case measures for funding purposes. The Ontario Ministry of Health and Long-Term Care has previously expressed their commitment to increased use of CIHI data to support hospital funding allocation.

Ontario 6-Year Data Set

To support the detailed analysis of the Ontario DAD data we analyzed in-patient acute care data for individual Ontario hospitals for fiscal years 1996–1997 through 2001–2002 (6 years of data, one more than for the analyses shown in the previous chapters of this report). All of the data were assigned to a hospital organization on the basis of the site management and ownership in fiscal year 2001–2002.

The data were also available separated by major program (Medicine, Surgery, Psychiatry, Maternal, and Neonates).

The following table shows the change, over the 6-year period, for the Ontario DAD data.

Changes in Ontario DAD Activity Measures from 1996–1997 to 2001–2002 (6 years)

Activity Measure	Complexity Levels Assigned		Complexity Not Applicable			Total
	Medical	Surgery	Psych	Maternal	Neonate	
IP Cases	-6.7%	-6.3%	-3.1%	-8.0%	-4.9%	-6.5%
Average RIW per Case	14.2%	20.6%	0.6%	4.7%	3.7%	14.3%
RIW per Day	13.6%	19.2%	5.7%	4.3%	3.8%	14.1%
Plx 1 Cases	-24.2%	-22.0%				-23.4%
Plx 2 Cases	29.6%	50.9%				35.8%
Plx 3 Cases	84.2%	76.9%				81.7%
Plx 4 Cases	177.5%	102.9%				140.9%
Deaths	-1.6%	-3.7%	-8.1%	-50.0%	-4.0%	-2.3%
Plx 9 Cases			-3.1%	-8.0%	-4.9%	-6.2%
Total Dx per Case	40.8%	52.6%	29.0%	30.5%	36.5%	41.8%
Type 1 Dx per Case	78.2%	67.9%	54.4%	50.3%	46.4%	69.1%
Type 2 Dx per Case	163.7%	155.7%	89.6%	49.2%	110.6%	150.4%
Type 3 Dx per Case	-10.5%	-1.5%	-18.9%	8.1%	-22.6%	-6.5%
Grade List Dx per Case	66.0%	93.0%	38.5%	47.6%	43.0%	72.6%
Non-Grade List Dx/Case	25.8%	28.2%	26.3%	30.1%	35.7%	27.4%

Greatest Changes Relate to Complexity Methodology

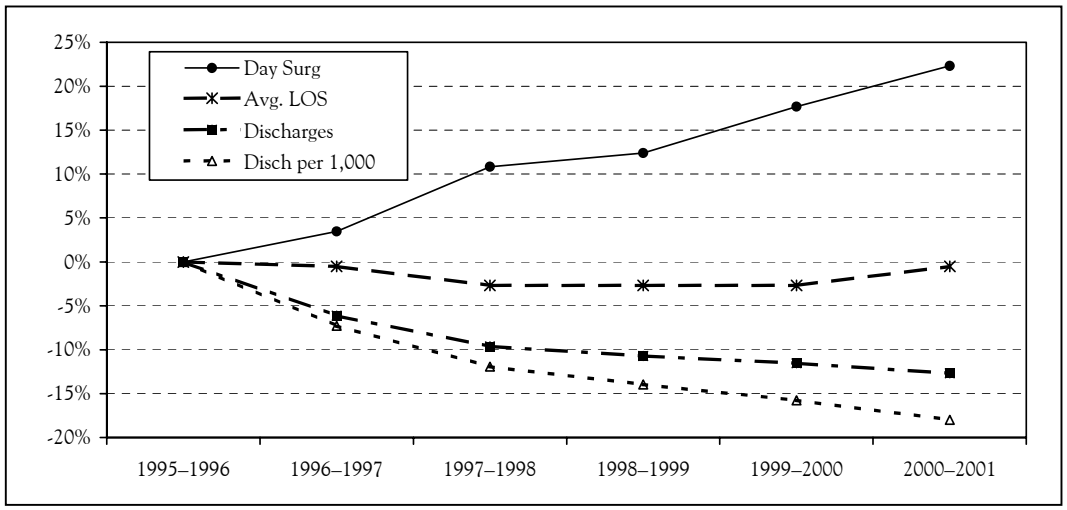
The 6-year comparisons of Ontario DAD data trends show that the changes in Ontario data have been greatest for the programs (Medicine and Surgery) where the complexity methodology is applied, and greatest for comorbidity and grade list diagnoses.

Ontario In-patient Complexity has Likely Increased

It is likely that the actual complexity of acute care in-patients in Ontario hospitals has increased since 1995–1996. Ontario hospitals had funding reductions in the mid-90's, followed by restructuring by the Health Services Restructuring Commission, which led to decreases in available beds. At the same time increases in ambulatory procedures have removed some of the least complex surgical patients from in-patient care, leaving higher average complexity of the patients remaining as in-patients.

The following graph shows the changes in Ontario acute care activity from 1995–1996 to 2000–2001.

Percent Change in Ontario Acute Care Activity from 1995–1996 to 2000–2001



The decrease in acute care discharges and discharges per 1,000 population and the increase in day surgery cases, and the recently increasing length of stay, all support the hypothesis that Ontario acute care hospital beds are increasingly used by more complex patients.

Actual Increased Patient Complexity Unlikely to Account Completely for Data Changes

However, the magnitude of the changes in the Ontario data (180% increase in Medicine patients with life threatening illness, 156% increase in post-admit comorbidities for Surgical patients, 23% reduction in in-patients with no complexity) are far too great to be explained purely by shifts from in-patient to ambulatory care.

Shift to Ambulatory Care Occurred in Other Provinces Too

The following table shows that the shift from in-patient care to ambulatory procedures was not confined to Ontario. On average, the other provinces included in the DAD data decreased their in-patient case volume and increased their ambulatory procedure volume at almost the same rates as in Ontario.

5-Year Change in In-patient and Ambulatory Procedure (SDS) Case Volumes for Ontario and Rest of Canada[15]

Province	Fiscal Year	Inpatient	SDS	Total	% SDS
Ontario	1996–1997	1,220,944	960,622	2,181,566	44.0%
	1997–1998	1,176,853	1,028,880	2,205,733	46.6%
	1998–1999	1,161,740	1,043,470	2,205,210	47.3%
	1999–2000	1,150,646	1,092,415	2,243,061	48.7%
	2000–2001	1,134,728	1,135,556	2,270,284	50.0%
	% Change	-7.1%	18.2%	4.1%	13.6%
Rest of Canada (excl. Alberta)	1996–1997	1,032,810	577,114	1,609,924	35.8%
	1997–1998	1,021,081	607,157	1,628,238	37.3%
	1998–1999	1,021,088	640,902	1,661,990	38.6%
	1999–2000	997,315	665,938	1,663,253	40.0%
	2000–2001	954,538	676,920	1,631,458	41.5%
	% Change	-7.6%	17.3%	1.3%	15.7%

We were unable to identify other hospital system or population health changes that would explain the changes in the Ontario (and New Brunswick) DAD data, but that would have much less impact in the other provinces. This left the hypothesis that the Ontario DAD data changes were more likely due to changes in coding and reporting practices and not changes in the acute care patient population.

Analysis of Individual Ontario Hospital Data

To test this hypothesis, a series of analyses were conducted using individual hospital data. If there was variation in the DAD data between Ontario hospitals, such that a subset were driving the large changes seen at the aggregate level, and there were no apparent sudden changes in program mix or population served for these hospitals, then the change could be attributed to upcoding.

Focus on Data Impacting Complexity

The analyses focused on the data elements with the greatest impact on complexity assignment (and the associated weighted cases): diagnosis typing (comorbid diagnoses) and grade list diagnoses.

[15] Alberta data were excluded because of the incomplete reporting of ambulatory procedure data in the CIHI DAD. Quebec discharge data is not included in the DAD.

Ontario Diagnosis Typing

The first set analyses of the 6-year Ontario hospital dataset examined diagnosis typing and the average number of diagnoses reported per case. The Ontario hospital data were separated by hospital type:

Hospital Peer Groups

- Small—less than 2,000 in-patient RIW weighted cases in 2001–2002
- Medium—more than 2,000 in-patient weighted cases but less than 15,000
- Large—more than 15,000 in-patient weighted cases
- Teaching—Member of the Ontario Council of Teaching Hospitals

Reporting of Type 1 and 2 Diagnoses

The following table shows that the increases in rates of reporting of Type 1 and 2 diagnoses were greatest for the teaching and large community hospitals.

Change from 1996–1997 to 2000–2001 in Ontario Diagnoses per In-patient Case by Diagnosis Type and Hospital Type

	Hospital Type	Small	Medium	Large	Teaching
Diagnoses per Case	Type 1	25%	44%	72%	91%
	Type 2	65%	98%	130%	195%
	Type 1 & 2	27%	49%	78%	107%
	Type 3	-6%	-2%	-9%	-5%
	Total	**14%**	**27%**	**40%**	**58%**

Increase May Reflect Greater Emphasis on Measurement Using DAD Data

The large urban hospitals in Ontario have, since the late 90's, been developing enhanced decision support functions and attempting to move to greater emphasis on data driven and performance based decision-making. These hospitals have also been more able to recruit health records coders and analysts than have hospitals in smaller, more rural communities. These may be contributing factors to their greater increase in comprehensiveness of diagnosis reporting in their DAD submissions.

Variation within Teaching Peer Group

However, even within a peer group the change in coding and reporting of comorbid diagnoses is not uniform. While the teaching hospital peer group had an average 195% increase in Type 2 diagnoses per in-patient case, there were three individual Ontario teaching hospitals with increases less than 30%, and four had increases more than 200%.

For Type 1 diagnoses per in-patient case, one teaching hospital had a drop of 4%, while at the other end of the spectrum one hospital had an increase of 164%.

Change from 1996–1997 to 2000–2001 in Type 1 and 2 Diagnoses per In-patient Case by Individual Ontario Teaching Hospital

Teaching Hospital	Type 1 Dx per Case	Type 2 Dx per Case
A	147%	373%
B	62%	109%
C	-4%	25%
D	164%	280%
E	92%	165%
F	10%	27%
G	36%	15%
H	83%	215%
I	46%	36%
J	106%	176%
K	91%	346%
Total	**91%**	**195%**

The different rates of increases in reporting of Type 1 and 2 diagnoses in the teaching hospitals haven't led to more comparable data for 2001–2002 (i.e. the increases haven't been greatest for hospitals that started with low reporting levels). For 2001–2002, there is a three-fold range, from lowest to highest, in the average number of Type 1 and 2 diagnoses per in-patient case for the Ontario teaching hospitals for medical and surgical patients. The coefficient of variation (C.V.)[16] for Type 1 and 2 diagnoses per case for the teaching hospitals is 40%. The following table summarizes the range (maximum minus minimum value) and coefficient of variation for Type 1 and 2 diagnoses per in-patient case for 1996–1997 and for 2001–2002 Ontario data.

[16] The coefficient of variation is a measure of relative variation calculated as standard deviation divided by mean, and then multiplied times 100 to generate a percentage.

1996 and 2001 Range and Coefficient of Variation for Type 1 and 2 Diagnoses per Case by Ontario Peer Group

Hospital Peer Group	1996/1997		2001/2002	
	Range	C.V.	Range	C.V.
Small	2.50	45%	1.47	48%
Medium	1.25	33%	1.38	39%
Large	0.79	19%	1.78	41%
Teaching	0.85	19%	1.96	40%

For all but the smallest hospitals[17] there was an increase in the range and coefficient of variation for Type 1 and 2 diagnoses per in-patient case from fiscal year 1996–1997 to 2001–2002. While in 1996–1997 the smallest ranges and lowest C.V. values were for the large and teaching hospitals, by 2001–2002 they had the largest ranges and the C.V. values had doubled.

The hospitals with the lowest rates are not necessarily the hospitals perceived to have the least complex patient population, and the hospitals with the highest rates are not necessarily the hospitals perceived to have the most complex patient population. The following table shows the Type 1 and 2 diagnoses per in-patient case for each of the medical and surgical programs for individual Ontario teaching hospitals in 2001–2002.

Conclusion that Variation Has Increased and Comparability Reduced

Our conclusion from the review of the comorbid diagnosis reporting in Ontario is that while there has been increased coding and reporting of Type 1 and 2 diagnoses in Ontario since 1996–1997, the variation in reporting rates between hospitals has increased, and the comparability of this data between hospitals has been reduced.

Review of this and similar Ontario data by the MOHLTC and the JPPC has heightened concern in Ontario about comparability of the DAD data and the reliability of performance measures based on the complexity measures contained in the data.

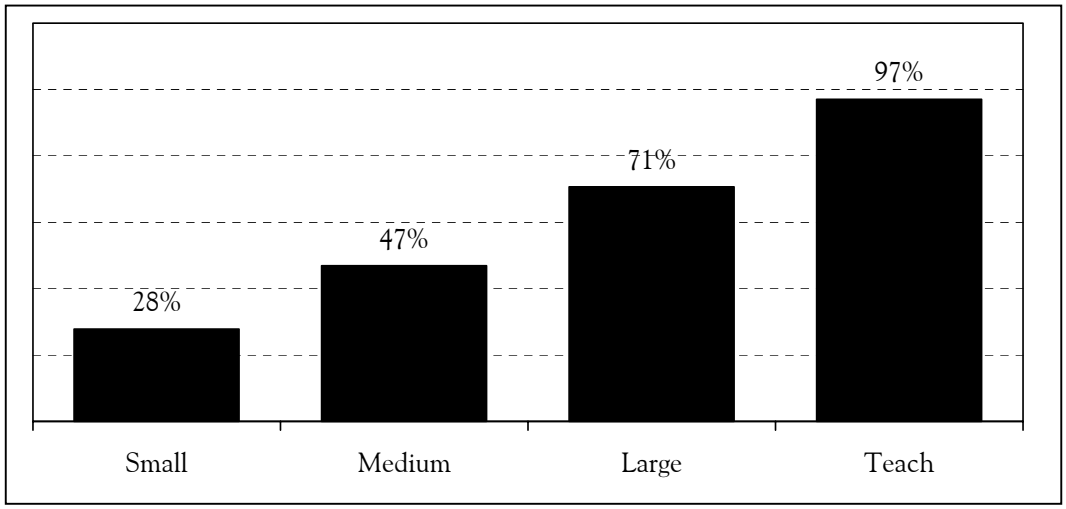
[17] The large range for small hospitals for 1996–1997 was because one small hospital reported virtually no Type 1 or 2 diagnoses.

Ontario Grade List Diagnosis Analyses

Increased Grade List Reporting will Increase Complexity

If the changes in the Ontario DAD data were at least partially a result of attempts by hospitals to maximize their RIW weighted cases for funding purposes, we would expect to see large increases in coding and reporting of grade list diagnoses, since only grade list diagnoses can impact complexity assignment. Previous tables have shown that the overall increase in grade list diagnoses per in-patient case in Ontario hospitals was 73% from 1996–1997 to 2001–2002. However, this increase was not uniform across the peer groups; it was much greater in teaching and large community hospitals.

Percent Change in Reported Grade List Diagnoses per In-patient Cases from 1996–1997 to 2000–2001 by Ontario Hospital Peer Group



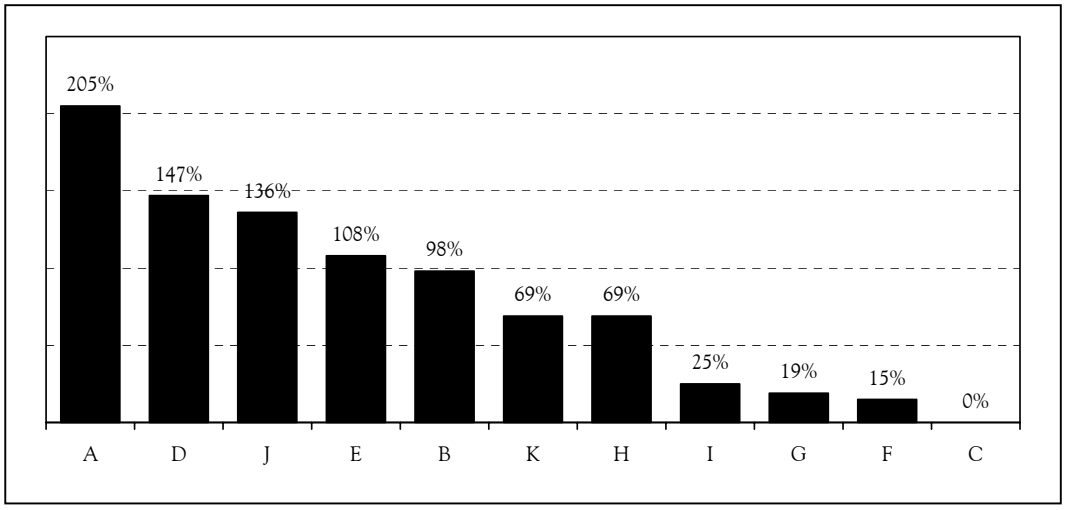
Within the peer groups, the range and C.V. for grade list diagnoses per in-patient case also increased from 1996–1997 to 2001–2002.

1996 and 2001 Range and Coefficient of Variation for Grade List Diagnoses per Case by Ontario Peer Group

Hospital Peer Group	1996–1997		2001–2002	
	Range	C.V.	Range	C.V.
Small	1.50	49%	1.47	50%
Medium	0.89	34%	1.38	33%
Large	0.75	26%	1.78	30%
Teaching	0.74	21%	1.96	39%

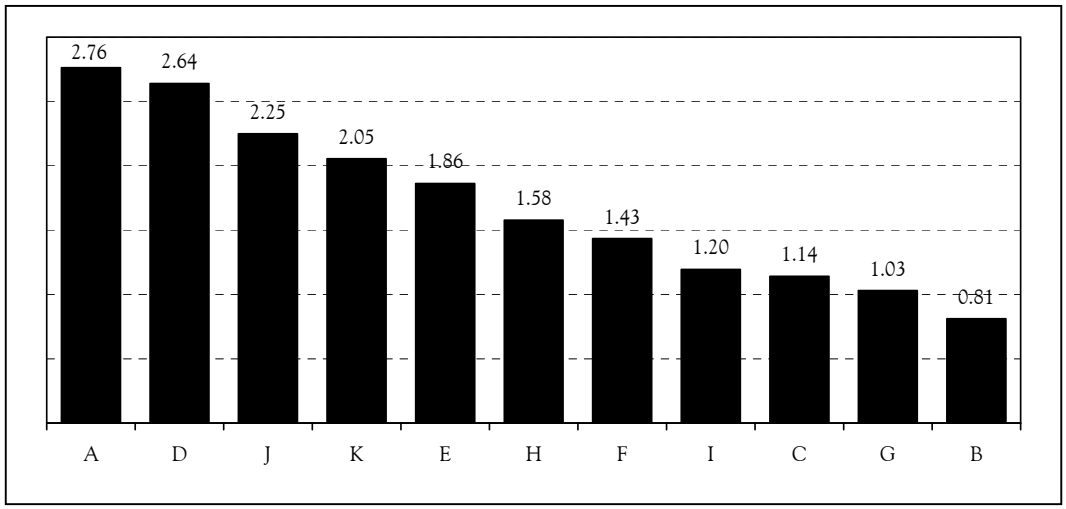
The change in grade list diagnosis reporting rates for individual Ontario teaching hospitals is shown in the following chart. Four hospitals had increases in grade list diagnoses of 25% or less, while four hospitals had increases of more than 100% (with one more than 200%).

Percent Change in Reported Grade List Dx per In-patient Case for Individual Ontario Teaching Hospitals from 1996 to 2001



As with the reporting of comorbidities, the varying rates of increase in reporting of grade list diagnoses have not resulted in greater consistency of rates across teaching hospitals. The range in rates is greater than would be expected for a set of hospitals with a focus on tertiary and quaternary care.

2001–2002 Grade List Diagnoses per Medical/Surgical In-patient Case for Individual Ontario Teaching Hospitals



While the overall increase in grade list diagnoses per in-patient case was 73%, the increase was much greater for some individual grade list diagnoses. The following table shows the grade list diagnoses with the greatest percent increase in volumes reported as Type 1 and 2 from 1996–1997 to 2001–2002 in Ontario.

Type 1 and 2 Grade List Diagnoses with Greatest Percent Increase in Reported Ontario Volume from 1996 to 2001[18]

ICD-9 Diagnosis Code and Description	Type 1 & 2 Grade List Diagnoses			
	1996	2001	Case Increase	% Increase
7197 Difficulty In Walking	135	2 468	2 333	1728%
2888 Other Diseases White Blood Cells	81	1 338	1 257	1552%
2867 Acquired Coagulation Fact Defic	165	2 051	1 886	1143%
2738 Oth Disorder Plasma Protein Met	493	6 031	5 538	1123%
7876 Incontinence of Feces	217	2 046	1 829	843%
2768 Hypopotassemia	2 774	21 770	18 996	685%
2869 Oth/Unspec Coagulation Defects	1 050	7 293	6 243	595%
2767 Hyperpotassemia	1 300	8 527	7 227	556%
2761 Hyposmolality/Hyponatremia	3 038	19 193	16 155	532%
7823 Edema	1 251	7 903	6 652	532%
2851 Acute Posthemorrhagic Anemia	3 919	23 998	20 079	512%
7990 Asphyxia	794	4 211	3 417	430%
5180 Pulmonary Collapse	2 743	14 444	11 701	427%
2760 Hyperosmolality/Hypernatremia	570	2 977	2 407	422%
2754 Disorders Of Calcium Metabolism	1 738	8 272	6 534	376%
2766 Fluid Overload	595	2 816	2 221	373%
2752 Disorders Magnesium Metabolism	368	1 588	1 220	332%
7883 Incontinence Of Urine	1 164	4 824	3 660	314%

Difficulty in Walking

Much of the 1,728% increase in reporting of the "Difficulty in Walking" grade list diagnosis was from three community general hospitals where the diagnosis was routinely used for many joint replacement and stroke patients. The number of cases in these three Ontario hospitals with this diagnosis exceeded the total number of cases with the diagnosis reported in all of the non-Ontario DAD hospitals combined.

[18] Only those diagnoses with at least 1,000 cases reported as Type 1 and 2 in 2001–2002 are shown in the table.

Grade List Diagnosis Change by ICD Chapter

The following table shows the change in the number of reported Type 1 and 2 grade list diagnoses by International Classification of Disease chapter.

Change in Reported Ontario Type 1 and 2 Grade List Diagnoses by ICD Chapter

ICD Chapter	1996	2001	Increase	% Increase
Circulatory	139,379	246,971	107,592	77%
Signs and Symptoms	48,890	119,190	70,300	144%
Endocrine	23,716	96,859	73,143	308%
Blood	25,783	86,459	60,676	235%
Respiratory	40,892	81,050	40,158	98%
Genitourinary	43,004	74,347	31,343	73%
Injury and Poisoning	44,826	67,649	22,823	51%
Digestive	42,075	61,976	19,901	47%
Mental	17,683	33,449	15,766	89%
Skin	9,498	16,724	7,226	76%
Infectious	11,575	16,337	4,762	41%
Nervous	8,620	16,040	7,420	86%
Neoplasms	9,114	12,636	3,522	39%
Musculoskeletal	3,266	7,373	4,107	126%
Congenital	1,641	2,253	612	37%
Perinatal Conditions	1,932	1,994	62	3%
V-Code	359	1,423	1,064	296%
Total	**472,253**	**942,730**	**470,477**	**100%**

Greatest Increases for Endocrine and Blood Diagnoses

In percentage terms, the greatest increases in reported grade list diagnoses were for Endocrine (308%) and Blood (235%). Many of the individual diagnoses previously identified as having the greatest percent increase fall in the Endocrine and Blood chapters of the ICD.

Requirement for "Significant Influence"

Most Endocrine and Blood diagnoses require laboratory test results to confirm their presence. However, an abnormal test result is not sufficient by itself to justify coding these diagnoses as a Type 1 or 2 diagnosis. To be a Type 1 or 2 diagnosis the diagnosis must have "a significant influence on the patient's length of stay or significantly influences the management/treatment of the patient while in hospital".[19]

Some Hospitals Identify Comorbidities Based on Lab Tests Only

During the CIHI re-abstraction project, some Ontario hospitals participating in the study were found to frequently have Type 1 and 2 diagnoses recorded, apparently based only on laboratory test results. There was no documentation on the medical record that the presence of the diagnosis had any impact on either the length of stay or the treatment of the patient. The fact that the greatest percent increase in grade list diagnoses in Ontario occurs for diagnoses that are based on laboratory test results suggests that some hospitals are reporting diagnoses as Type 1 or 2 without actually assessing the significance of impact on the patient stay.

Automatic Recoding of All Type 3 Diagnoses to Type 1

Non-application of the test of significance of impact was clearly the case for one Ontario hospital that re-submitted their DAD data at the end of the fiscal year. When the re-submitted data were compared to the originally submitted data, the only change was that every instance (12,632 cases) of a Type 3 diagnosis (secondary) for a patient to which the complexity methodology would apply had been changed to a Type 1 diagnosis. These changes were clearly made automatically, without any assessment of the validity of the diagnosis as a Type 1.

Analyses of Endocrine Diagnosis Reporting

We focused our next analyses on the Endocrine grade list diagnoses, to see whether the increases in reporting were consistent across all types of hospitals. Just as the overall increase in reported grade list diagnoses is much greater for the larger Ontario hospitals, we found that the increase in Endocrine grade list diagnoses was also greater in the largest hospitals. The table on the following page shows the results of the analysis by peer group. There was a 453% increase in Type 1 and 2 Endocrine grade list diagnoses reported by teaching hospitals, but only an 82% increase for the small hospitals.

Within the teaching hospitals, the increase from 1996–1997 to 2001–2002 in reported Endocrine grade list diagnoses ranged from 2% to 2,151%.

[19] In January 2003 the CIHI diagnosis typing guideline was modified to further reinforce these requirements.

Increase in Reported Type 1 and 2 Endocrine Grade List Diagnoses by Ontario Hospital Peer Group[20]

Hospital Peer Group	Type 1 and 2 Endocrine Grade List Diagnoses			
	1996–1997	2001–2002	Change	% Change
Small	999	1,818	819	82%
Medium	4,060	9,726	5,666	140%
Large	8,785	35,845	27,060	308%
Teaching	8,192	45,300	37,108	453%
Total	**22,036**	**92,689**	**70,653**	**321%**

Change in Reported Type 1 and 2 Endocrine Grade List Diagnoses from 1996–1997 to 2001–2002 for Individual Ontario Teaching Hospitals

Hospital	1996	2001	Change	% Change
A	781	17,578	16,797	2151%
B	120	451	331	276%
C	650	663	13	2%
D	893	7,188	6,295	705%
E	390	2,799	2,409	618%
F	897	1,353	456	51%
G	372	440	68	18%
H	754	1,646	892	118%
I	709	1,089	380	54%
J	1,343	6,426	5,083	378%
K	1,283	5,667	4,384	342%
Total	**8,192**	**45,300**	**37,108**	**453%**

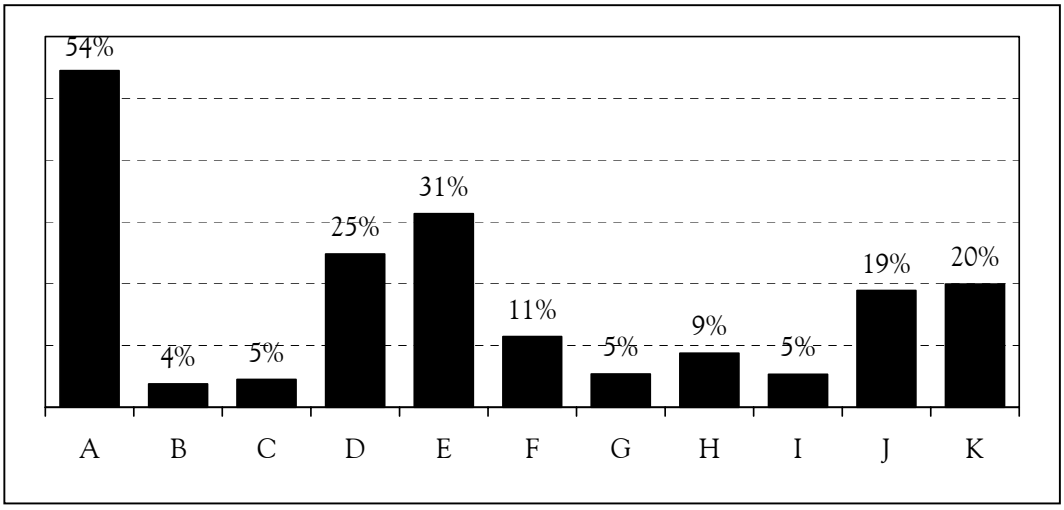
[20] The total Endocrine grade list diagnosis increase does not match the increase shown in the previous table because a small number of cases from hospitals not assigned to peer groups have been excluded here.

For the Ontario teaching hospital data for fiscal year 2001–2002, 21% of all medical/surgical in-patient cases had an Endocrine grade list diagnosis recorded as a Type 1 or Type 2 diagnosis. The rate for individual hospitals ranged from 4% (there were four hospitals at 5% or lower) to 54%. The reported 54% rate for one hospital would mean (if the data were accurately coded) that the majority of that hospital's in-patient medical and surgical in-patient cases had endocrine grade list diagnoses that either:

- significantly affected the treatment received, or
- required treatment beyond maintenance of the pre-existing condition, or
- increased the length of stay by at least 24 hours.

Although the accuracy of this hospital's data could only be confirmed through re-abstraction, the extremely high rate has resulted in considerable variation.

Percent of 2001–2002 Medical/Surgical In-patient Cases with Type 1 or 2 Endocrine Grade List Diagnosis for Individual Ontario Teaching Hospitals



Ontario Analysis Conclusions

The initial analysis of the Ontario DAD data suggested that Ontario acute care hospitals have faced larger increases in patient complexity and relative cost, and much improved LOS performance, compared to most hospitals in the other provinces and territories who submit data to the DAD. The result has been that on average, the Ontario DAD data describe an acute hospital patient population that looks significantly different from the patients admitted to hospital elsewhere in Canada.

There are no obvious hospital or health system differences that would explain the apparent differences in the patient populations. The differences between the Ontario patient population and patients in other provinces are greatest for medical and surgical patients (to whom the CIHI complexity methodology applies) and much less for mental health and birthing patients (to whom the complexity methodology is not applicable). It appears that the differences are much more likely due to differences in data coding and reporting practices (particularly as they relate to the complexity methodology) than to true difference in the patients admitted to acute care.

The review of the Ontario DAD data has shown that the large changes in rates of reporting for comorbidities and grade list diagnoses, and the resulting higher patient complexity, are not uniform across peer groups. Larger hospitals have reported greater changes in their DAD data.

Within peer groups, the DAD data changes have not been uniform. There is wide variation between apparently similar hospitals in rates of reporting of comorbidities. For some Ontario hospitals, the recent change in data has been very substantial resulting from coding practice rather than actual changes in patient characteristics and/or care requirements.

This coding variation contributed to by a small number of Ontario hospitals may have compromised the comparability of the DAD data at the individual hospital level. This was the reason behind the recent decision of the Ontario MOHLTC and JPPC not to use weighted cases based on CIHI complexity levels for hospital funding purposes.

While potentially compromised at the individual hospital level, the Ontario DAD data, even with the coding variation, still demonstrate the effectiveness of the complexity methodology in differentiating groups of patients. The following table shows the 2001–2002 average length of stay and percent in-hospital mortality for Ontario medical/surgical in-patient cases by complexity level. Both the average length of stay and the actual in-hospital mortality are still progressively greater for the higher complexity levels.

2001 Ontario Medical/Surgical Average LOS and In-hospital Mortality by Complexity Level

Complexity	Average LOS	Percentage In-hospital Mortality
1	4.2	1.7%
2	8.1	5.4%
3	10.7	9.7%
4	21.4	22.8%
All	6.8	4.8%

The current concern with lack of comparability of DAD data between hospitals, because of unwarranted variation in patient complexity levels, is not necessarily only because of flaws in the underlying complexity methodology, but also because of difficulty in monitoring adherence to, and enforcing compliance with, CIHI coding and reporting standards. In parallel to this analysis, CIHI perceived a need to clarify its Diagnosis Typing Coding Standards. In January 2003, a clarification of the diagnosis typing standards was circulated to Canadian hospitals. In addition, the continued relevance and utility of diagnosis typing, as a practice will be examined in the re-development scheduled for CMG, RIW and Complexity Overlay resulting from the national adoption of ICD-10-CA and CCI. In the meantime, hospitals and their coders have been advised to continue this practice using the clarified standard. This will allow data to be collected and used to validate whether diagnosis typing ought to continue as a practice in the re-developed CMG and RIW products.

Sensitivity to Complexity Methodology Changes

CIHI Developed Revised Grade List Grouper as Alternative to Ontario Abandonment of Plx

Concurrent with this project, the Ontario JPPC was considering whether to continue to use complexity-based RIW weighted cases as a hospital activity measure for acute care funding in Ontario, or to use weighted cases developed by the MOHLTC that did not depend on complexity assignment. The dataset prepared to support this project was also used by CIHI to assess the impact of revising the complexity diagnosis grade list. These revisions were performed as a means to retroactively minimize the impact of the significant increases in the reporting of selected grade list diagnoses affecting complexity assignment.

The hope was that a revised CMG grouper, using a complexity methodology based on a revised grade list, could be used by CIHI to generate RIW weighted case measurements that could in turn be used by the JPPC and MOHLTC for funding purposes. This would allow a modified complexity methodology to be maintained instead of completely abandoning the complexity methodology for funding purposes in Ontario.

Revised Grade List Grouper as Diagnostic Tool

While CIHI's revised grade list CMG grouper was not ultimately accepted for use for funding in Ontario, we can use it as a diagnostic tool to assess the degree of reliance of hospitals in Ontario and elsewhere on grade list diagnoses that are most subject to coding variations. The larger the reduction in RIW weighted cases for a hospital when the revised grade list grouper was used, the more that hospital's weighted cases had previously been driven by coding of these questionable diagnoses.

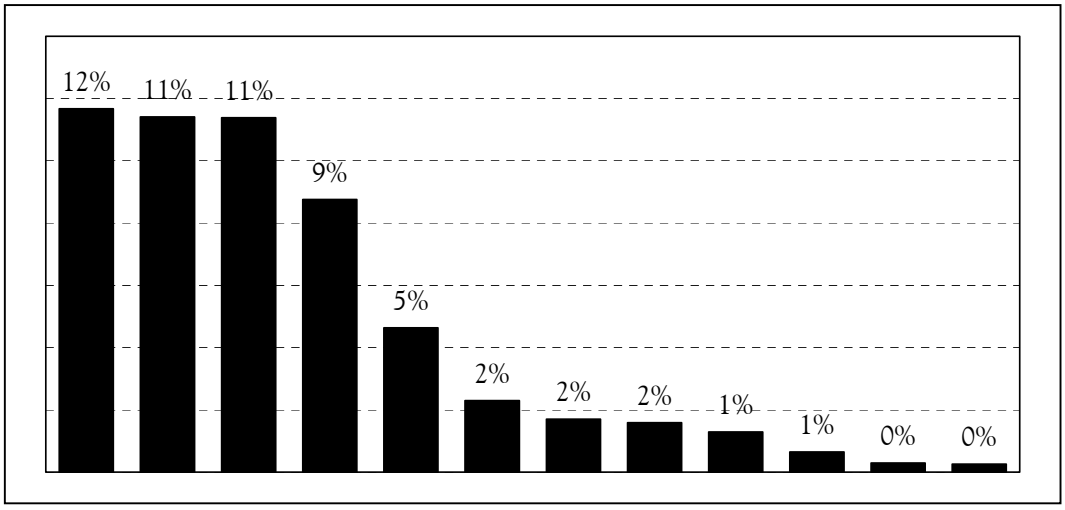
Grade List Revisions

CIHI fully acknowledges that this methodology described here to revise the grade list was crude. It was the best available method given the time constraints faced in CIHI's discussions with Ontario. However, conceptually the methodology has merit and is being examined more fully as an alternative to retain Complexity Overlay for use by other Canadian provinces. We emphasize strongly, that clinical review of grade list changes and statistical verification of the significance of comorbidities on length of stay **will** be considered as part of a more comprehensive approach used to retain Complexity Overlay. This method employing clinical review and statistical tests of significance will be examined as CIHI seeks to retaining Complexity Overlay for use until it can be re-developed using ICD-10-CA and CCI activity data.

The 440 grade list diagnoses were originally selected because they helped to differentiate between non-complex and complex patients in the same CMG. The grade list diagnoses were selected based on clinical review and statistical analyses conducted in the early 1990's. The intent of the grade list revision was to review the grade list diagnoses to assess whether they are still reliable to identify complex patients, and to remove the diagnoses no longer considered being reliable for that purpose.

For example, ICD code 276.8 Hypopotassemia is a grade list diagnosis that increased in reported volume by more than 600% in Ontario hospitals from 1996–1997 to 2001–2002. In some Ontario teaching hospitals more than 10% of patients have this diagnosis as a comorbidity, while in others it is less than 1%.

Percent of Medical/Surgical Patients with Hypopotassemia Coded as Type 1 or 2 Dx in Ontario Teaching Hospitals in 2001–2002

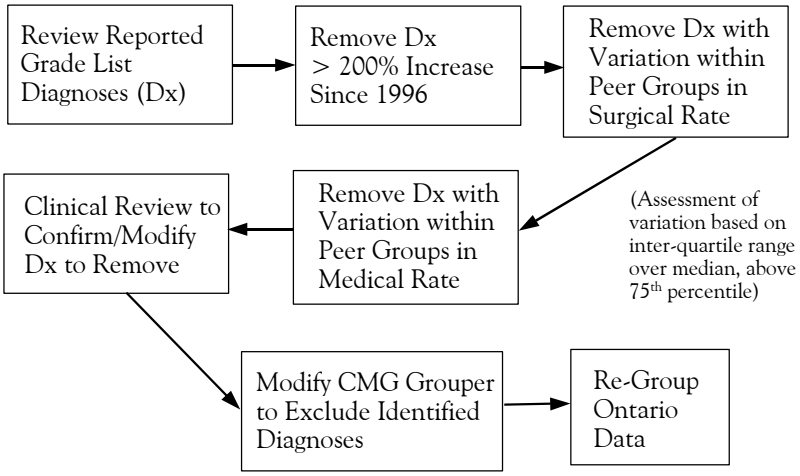


The review of the grade list diagnoses was intended to assess whether a diagnosis like Hypopotassemia should remain on the complexity grade list.

Grade List Review Process

The approach for the review is shown in the flow chart below.

Approach for Ontario Review of Grade List Diagnoses



Three initial criteria were used to flag grade list diagnoses to be considered for removal from the grade list:

1. Any diagnosis with an increase in reported volume (as a comorbidity) greater than 200% between 1996–1997 and 2001–2002. The diagnoses with the greatest percent increase tend to be the same diagnoses identified as often upcoded in the re-abstraction studies.
2. Any diagnosis with large variation in rate per surgical case across Ontario hospitals. Large variation was considered to be a ratio of the inter-quartile range to the median rate per surgical case above the 75th percentile ratio of all of the diagnoses.
3. Any diagnosis with large variation in rate per medical case across Ontario hospitals. Large variation was considered to be a ratio of the inter-quartile range to the median rate per medical case above the 75th percentile ratio of all of the diagnoses.

Review of Grade List by CIHI Classification Specialists

The grade list, with the flagged diagnoses, was then provided to CIHI classification specialists who confirmed or modified the flagged diagnoses based on their assessment of:

- appropriateness of reporting of the diagnosis in re-abstracted data;
- prior identification of the diagnosis as problematic by coders;
- certainty of clinical criteria for the diagnosis; and
- potential program differences across hospitals that would justify large inter-hospital variation (e.g. renal failure diagnoses concentrated in hospitals with large dialysis programs).

The classification specialists confirmed some of the grade list diagnoses marked for removal, rejected some of the flagged diagnoses (thereby retaining them on the grade list), and added flags for removal to some diagnoses not identified using the three statistical criteria.

The revised grade list was then used to re-group the data, generating a new dataset with fewer higher complexity cases and lower RIW weighted case volumes.

Impact on 2001–2002 Ontario Data

The approach to revising the grade list was applied to the 942,730 counts of the 440 grade list diagnoses in the Ontario 2001–2002 Ontario DAD in-patient database. Of the 440 grade list diagnoses:

- 44 diagnoses were flagged because of an increase in volume greater than 200%
- 57 diagnoses were flagged because of large surgical variation
- 45 diagnoses were flagged because of large medical variation
- 35 of the flagged diagnoses were retained on the grade list due to the clinical advice from the classification specialists
- 85 additional diagnoses were removed from the grade list solely due to clinical advice from the classification specialists

166 Diagnoses Removed from Grade List

The net impact was to eliminate 166 of the grade list diagnoses and to reduce the 2001–2002 Ontario grade list diagnosis count to 354,638 (38% of the original volume of grade list diagnoses). A CMG grouper was then modified to use only the remaining grade list diagnoses to identify complex cases, and a revised total RIW weighted case number calculated for each Ontario hospital.

The impact on RIW weighted cases of using the revised grade list grouper is shown in the following table.

Impact of Revised Grade List Grouper on Ontario Hospital 2000–2001 RIW Weighted Cases

Impact on RIW Weighted Cases	Medical/ Surgical RIW	Total RIW
Average Change	-8.9%	-7.2%
Median Change	-6.2%	-4.9%
Maximum Change	-19.1%	-15.5%
Minimum Change	0.8%	0.6%
# Hospitals > 10% Change	26	15
# Hospitals < 2% Change	14	18
Teaching Median Change	7.4%	-6.1%
Large Median Change	7.9%	-5.8%
Medium Median Change	5.7%	-4.7%
Small Median Change	5.2%	-4.6%

Average Reduction of 8.9% of Medical/Surgical Weighted Cases

The average reduction in medical and surgical weighted cases was 8.9%, but the range was from a reduction of 19.1% in medical and surgical weighted cases to an increase of 0.8%[21] in medical and surgical weighted cases. Because the complexity methodology is only applicable to medical and surgical activity the impact on the total hospital weighted cases (including mental health and birthing) is less.

Greatest Impact on Large and Teaching Hospitals

The teaching and large Ontario hospitals had the largest median reductions in RIW weighted cases from application of the revised grade list grouper.

[21] An increase in weighted cases can occur using the revised grade list where a case that was a Typical patient with the original grade list becomes an Outlier with the revised grade list and is then assigned a higher RIW.

Use of Revised Grade List Grouper to Assess All DAD Data

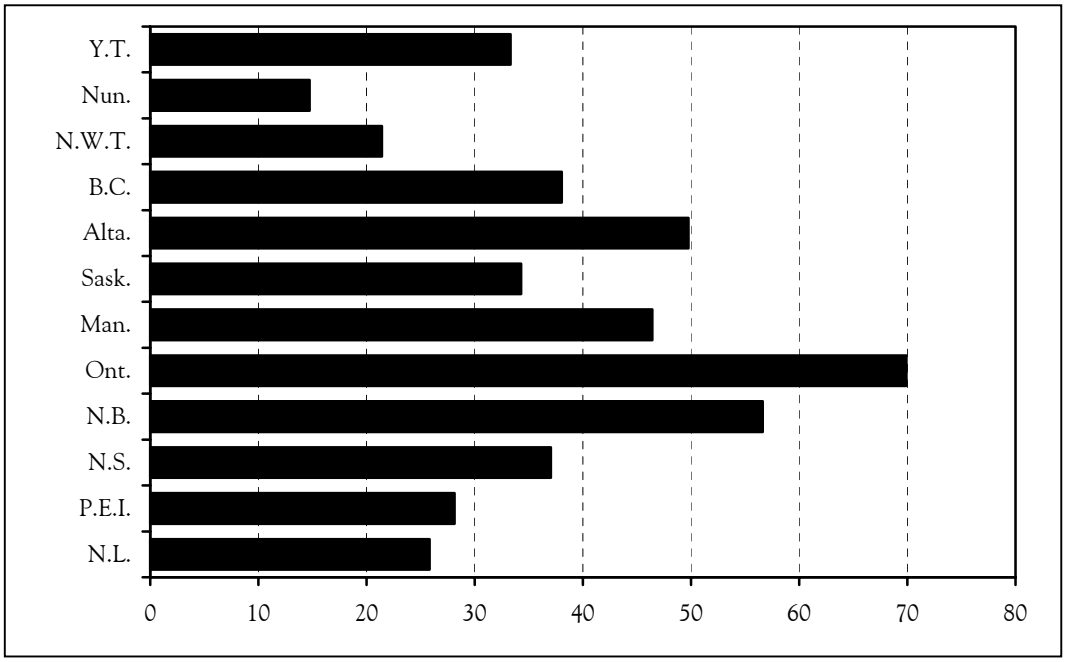
The next step was to re-group the remainder of the DAD data (the non-Ontario portion) and compare the impact on non-Ontario hospital RIW weighted cases with the results for the Ontario hospitals.

Change in RIW Weighted Cases as Surrogate Upcoding Measure

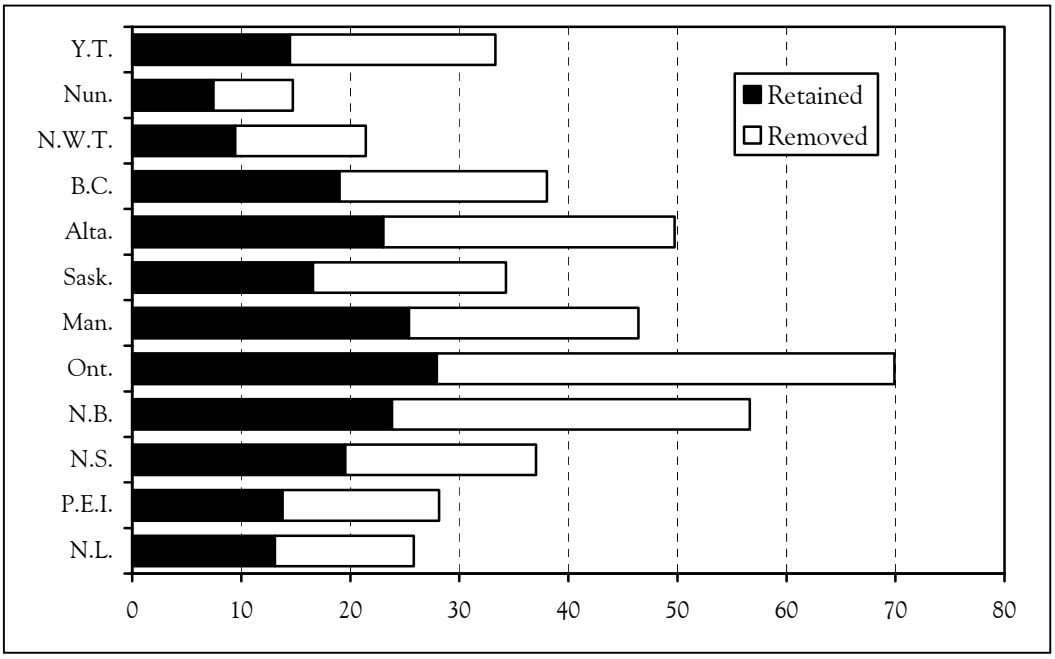
The assumption was that the change in medical/surgical RIW weighted cases from application of the revised grade list grouper was a valid measure of the degree of reliance of a hospital on questionable comorbidities. If some non-Ontario hospitals were also upcoding to the same extent as Ontario hospitals, we would expect to see large impacts on their medical and surgical RIW weighted cases by using the revised grade list grouper. The magnitude of the change in RIW weighted cases could considered a surrogate upcoding index.

The following graph shows the 2000–2001 average grade list diagnoses per 100 medical and surgical cases by province.

2000–2001 Grade List Diagnoses per 100 Medical/Surgical In-patient Cases

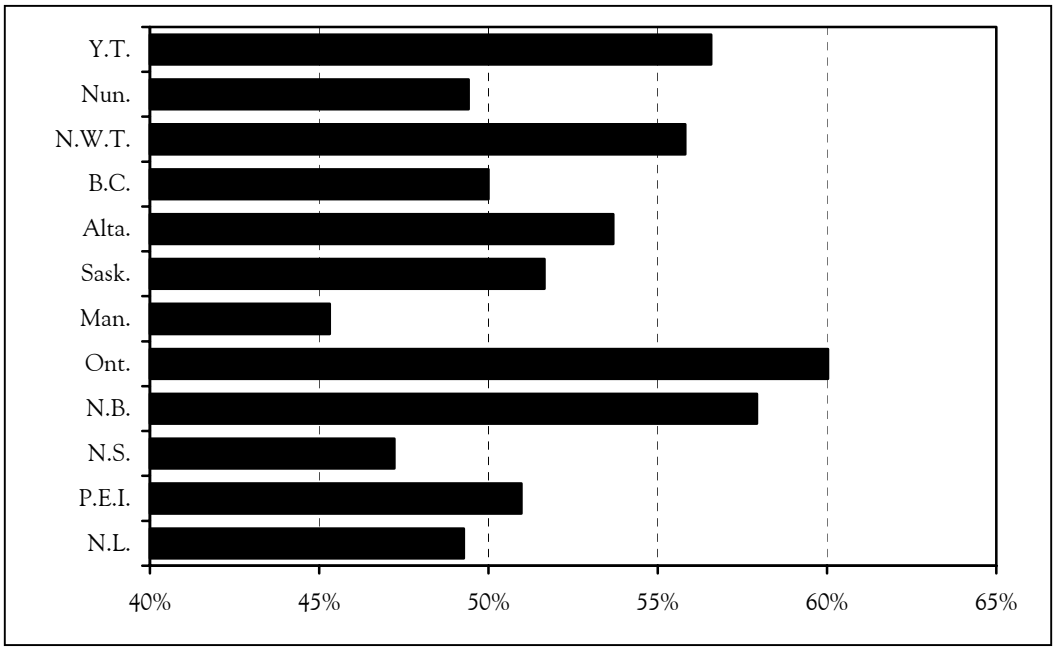


Impact of Revisions to Grade List on Diagnoses per 100 Medical/Surgical Patients by Province



The impact was greatest in Ontario, where more than 60% of the occurrences of grade list diagnoses were removed, and in New Brunswick, where 58% of the diagnoses were removed.

Impact of Revisions to Grade List on Volume of Grade List Diagnoses (percentage removed) by Province



The resulting impact on RIW weighted cases, by province is shown below.

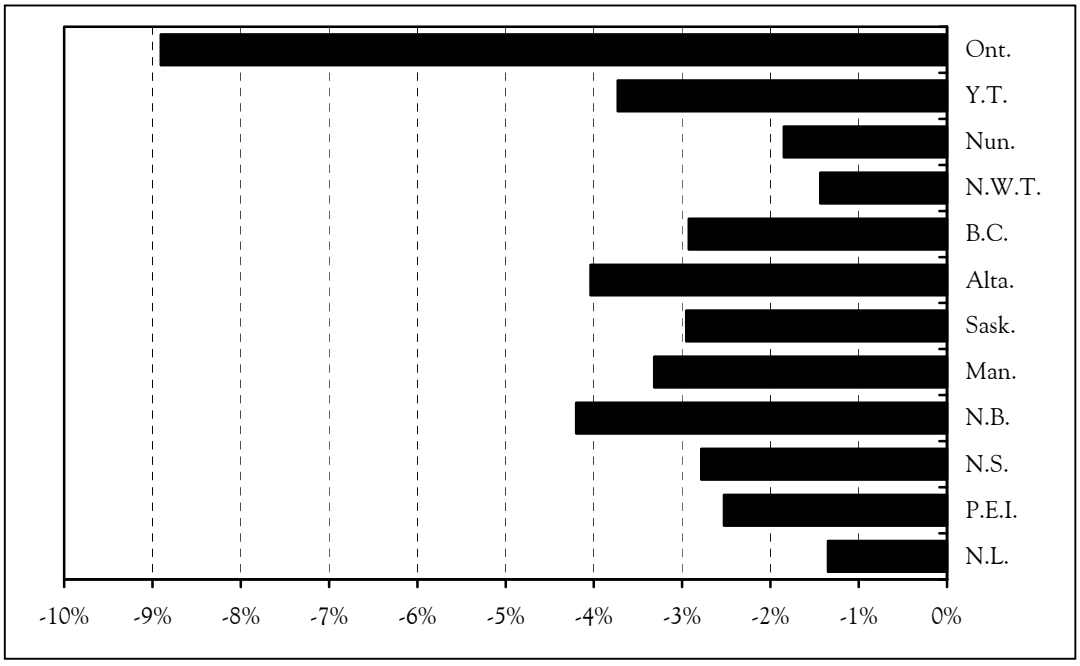
Reduction in 2000–2001 Weighted Cases Due to Revised Grade List, by Province

Province	% Chg. In Med/Surg RIW	% Chg. In Total RIW
N.L.	-1.3%	-1.1%
P.E.I.	-2.5%	-2.1%
N.S.	-2.8%	-2.3%
N.B.	-4.2%	-3.5%
Man.	-3.3%	-2.6%
Sask.	-3.0%	-2.5%
Alta.	-4.0%	-3.2%
B.C.	-2.9%	-2.3%
N.W.T.	-1.4%	-1.0%
Nun.	-1.8%	-1.1%
Y.T.	-3.7%	-2.9%
Ont.	-8.9%	-7.2%

Ontario Reduction More Than Double Any Other Province

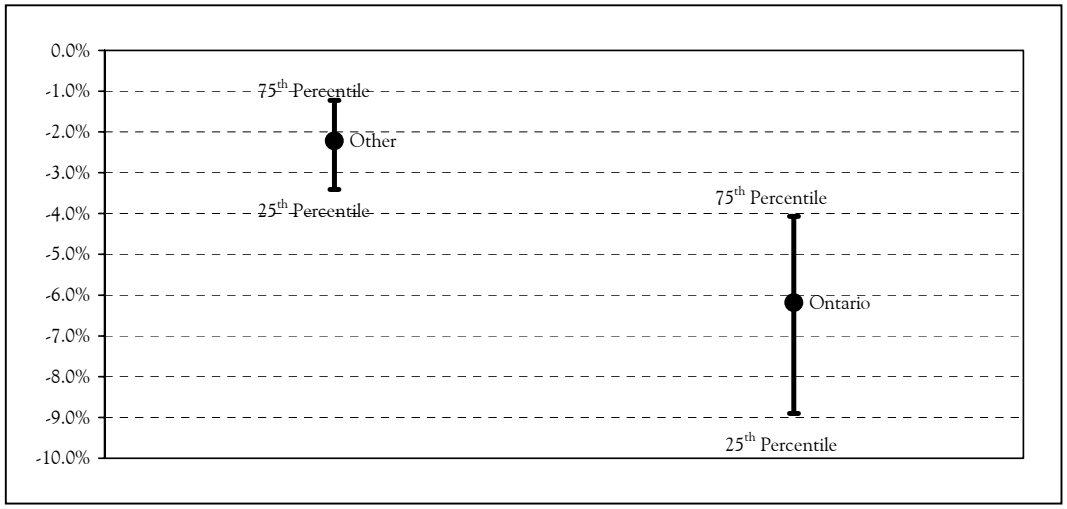
The average impact on Ontario is more than double the impact on any other province. The greatest impact outside Ontario is on New Brunswick and Alberta, and the least impact outside Ontario is on Newfoundland and Labrador. The relative impact on Ontario is clearly shown in the chart below.

Percent Reduction in Medical/Surgical Weighted Cases Due to Revised Grade List



The distribution of the impact on medical and surgical RIW weighted cases for individual hospitals in Ontario is greater than for the rest of the DAD.

Range of Reduction in Medical/Surgical Weighted Cases for Individual Hospitals, with Application of Revised Grade List



Only one quarter of non-Ontario hospitals have a reduction in medical and surgical RIW weighted cases of more than 3.5%. One quarter of Ontario hospitals have a reduction in medical and surgical RIW weighted cases of more than 8.9%.

Reduction in Non-Ontario Medical/Surgical Weighted Cases Due to Revised Grade List by CIHI Peer Group

Peer Group	% Chg. In Med/Surg RIW	% Chg. In Total RIW
0–49 beds	-2.7%	-2.4%
50–99 beds	-2.6%	-2.2%
100–199 beds	-2.7%	-2.2%
200–399 beds	-3.3%	-2.7%
400 + beds	-3.2%	-2.5%
Teaching	-3.8%	-3.0%
Paediatrics	-3.9%	-3.0%
Total	**-3.3%**	**-2.7%**

The greatest impacts on RIW weighted cases for the non-Ontario hospitals are in large and teaching hospitals. This result is similar to the Ontario result, but the magnitude of the impact is much less.

The distribution of individual hospitals by reduction in their medical and surgical RIW weighted cases is shown below.

Distribution of Reduction in Weighted Cases Due to Revised Grade List for Individual Hospitals by Province

Province	Range of Reduction in Med/Surg Weighted cases							% of Hospitals > 7%
	< 1 %	1 to 3%	3 to 5%	5 to 7%	7 to 10%	> 10%	Total	
Alta.	9	49	38	11	4	2	113	5%
B.C.	12	49	27	3	1		92	1%
Man.		3	4				7	0%
N.B.	2	9	7	7	1		26	4%
N.L.	19	15					34	0%
N.S.	10	19	6	1			36	0%
Nun.		1					1	0%
N.W.T.	1	2	1				4	0%
Ont.	4	19	23	38	27	26	137	39%
P.E.I.		4	3				7	0%
Sask.	18	32	10	5	3		68	4%
Y.T.			1				1	0%
Total	**75**	**202**	**120**	**65**	**36**	**28**	**526**	**12%**

In Ontario, 39% of hospitals have a greater than 7% reduction in medical and surgical RIW weighted cases when the revised grade list grouper is used. For all other provinces, no more than 5% of hospital have a reduction in excess of 7%.

The difference is even more striking when the size of the hospitals is taken into account. In Ontario, it is the larger hospitals that are impacted the most by the revised grade list grouper (and that have been most reliant on the eliminated diagnoses). 80% of the total RIW weighted cases in Ontario are in hospitals that have a reduction in medical and surgical weighted cases greater than 7%.

In all other provinces and territories except Saskatchewan, 1% or less of all weighted cases are in hospitals with a reduction in medical and surgical weighted cases greater than 7%. In Saskatchewan, only 3% of the total provincial weighted cases are in hospitals with a reduction greater than 7%.

Medical/Surgical Weighted Cases by Province by Range of Reduction in Weighted Cases for Individual Hospitals

Province	Range of Reduction in Med/Surg Weighted cases							% of Wtd. Cases in Hospitals > 7%
	< 1 %	1 to 3%	3 to 5%	5 to 7%	7 to 10%	> 10%	Total	
Alta.	6,658	65,656	234,724	50,111	2,267	3,137	362,552	1%
B.C.	9,285	195,742	215,671	1,483	1,978	-	424,157	0%
Man.	-	28,348	80,899	-	-	-	109,247	0%
N.B.	301	25,503	55,878	34,940	1,026	-	117,649	1%
N.L.	13,703	27,830	-	-	-	-	41,534	0%
N.S.	5,993	87,290	33,828	2,416	-	-	129,527	0%
Nun.	-	688	-	-	-	-	688	0%
N.W.T.	495	2,584	185	-	-	-	3,264	0%
Ont.	2,678	57,172	101,004	360,841	1,566,376	526,940	2,615,012	80%
P.E.I.	-	12,805	5,895	-	-	-	18,699	0%
Sask.	6,108	68,663	48,549	6,575	3,389	-	133,283	3%
Y.T.	-	-	2,010	-	-	-	2,010	0%
Total	**45,222**	**572,281**	**778,642**	**456,366**	**1,575,035**	**530,077**	**3,957,623**	**53%**

The distribution of DAD hospitals for which the revised grade list grouper would reduce medical and surgical weighted cases by more than 7% is:

- 53 hospitals in Ontario;
- 6 hospitals in Alberta;
- 3 hospitals in Saskatchewan;
- 1 hospital in British Columbia; and
- 1 hospital in New Brunswick.

The highly impacted hospitals in Ontario tend to be large, while the highly impacted hospitals elsewhere, tend to be small.

Coding Variation Largest in Ontario

The reliance on the diagnoses removed from the grade list to generate RIW weighted cases is far greater in Ontario hospitals than in the DAD hospitals from elsewhere in Canada. This result suggests that the potential upcoding identified in Ontario hospitals is confined to that province.

Conclusions from Analysis Results

Review of Results

The comparisons of DAD data by province for the 1996–1997 fiscal year show that prior to the introduction of the CIHI complexity methodology there was provincial variation in the data submitted by acute care hospitals to the DAD. This variation included:

- Differences in comprehensiveness of reporting of ALC days. Less than 1% of acute hospital days were reported as ALC in New Brunswick, while almost 10% were ALC in Ontario.
- Differences in number of comorbid diagnoses reported on in-patient records. Alberta hospitals reported more than twice as many comorbid diagnoses than hospitals in Newfoundland and Labrador and Prince Edward Island.
- Differences in number of grade list diagnoses reported on in-patient records. Alberta hospitals reported more than twice as many comorbid diagnoses than hospitals in Newfoundland and Labrador, Prince Edward Island, and New Brunswick.

These differences impacted the relative reported acute care patient complexity, length of stay performance, and in-hospital mortality, with the hospitals in the provinces with the lowest reporting rates appearing to be the worst performers.

There Has Always Been Variation in DAD Data

While the introduction of the complexity methodology, coupled with increased use of RIW weighted cases based on complexity for hospital funding, is associated with increased variation in DAD data, there was already variation in the data prior to that. Some of the variation likely reflects true differences in acute care hospital roles and funding, but some was also due to provincial differences in:

- interpretation of coding and reporting guidelines;
- availability of health records and decision support staff;
- presence of a data driven approach to hospital system planning and funding; and
- documentation practices that vary by facility within provinces.

Between 1996–1997 and 2000–2001 the Ontario RIW per in-patient day rose by 11%. Only New Brunswick (6%) and Saskatchewan (4%) rose by more than 2%.

Greatest Change in Diagnosis Reporting in New Brunswick and Ontario

The average number of comorbid diagnoses per in-patient case increased by 90% in New Brunswick and 60% in Ontario. The increase was less than 10% in most other provinces. A similar pattern was seen for reporting of grade list diagnoses, with an increase from 1996–1997 to 2000–2001 of approximately 100% in New Brunswick and Ontario, and an increase less than 20% in British Columbia, Alberta, Saskatchewan, Manitoba, Nova Scotia, and Newfoundland and Labrador.

As a result of the increased reporting of comorbid and grade list diagnoses, New Brunswick and Ontario hospitals had a 100% increase in complexity level 4 (life threatening illness) patients. In spite of the 100% increase in the number of patients reported as being at risk of death, New Brunswick hospitals had less than a 5% increase in actual in-hospital deaths, and Ontario hospitals had a decrease of 2%.

Ontario is a Data Outlier

In 2000–2001 Ontario hospitals had the best LOS performance compared to the CIHI expected LOS (which is adjusted to reflect reported patient complexity). The average number of grade list diagnoses per in-patient case in Ontario was three times the number in Newfoundland and Labrador, and 50% higher than the rates for any other provinces or territories. Despite similar rates of change in reported diagnoses in New Brunswick and Ontario, because New Brunswick started at a much lower level than Ontario, only the Ontario data were substantially different from the other DAD data in 2000–2001.

Ontario Changes Were Not Uniform Across Hospitals

When the changes in DAD data in Ontario were examined in more detail we found that the changes (particularly with respect to reporting comorbid diagnoses and grade list diagnoses) were not uniform across hospital types or individual hospitals. Large and teaching hospitals had the greatest changes, but even within these groups there was much variation between individual facilities. There were individual hospitals with such dramatic changes (e.g. 205% increase in reported grade list diagnoses per case, 2,151% increase in reported endocrine comorbidities per case) that the changes in data could not be reflective of true changes in their patient populations.

Focus Must Be Diagnosis Typing and Reporting of Comorbidities

Combining the results of the analyses of Ontario hospital-specific data with the findings of the re-abstraction studies points leads to a focus on diagnosis typing and variation in identification of diagnoses as comorbid conditions. Some Ontario hospitals appear to have reported diagnoses as comorbid conditions without assessing the significance of the presence of the diagnoses as required by CIHI diagnosis typing guidelines.

Although larger increases in capture and reporting of diagnostic data in hospitals in provinces that were previously under-reporting would improve the comparability of DAD data, this does not seem to be what has happened, with the possible exception of New Brunswick. The apparent gaps in rates of reporting of diagnostic data between provinces continue to exist, and in the case of Ontario, have been exacerbated.

"Undercoding" Will Also Compromise Utility of DAD Data

While the emphasis of this analysis has been on increases in reporting comorbidities and the resulting variation, "undercoding" should also be a concern. In provinces where there has not been a history of using DAD data for planning or funding, or where there are shortages of health records professionals, not all relevant diagnostic information may be captured in the DAD data. This compromises the comparability and utility of performance measurements based on DAD data as much as upcoding.

Lessons Learned

The value of the CIHI DAD is its utility to support comparisons of activity and performance between hospitals. This value is predicated on the assumption that the DAD data as collected, coded, and reported in a consistent manner by all of the participating hospitals. CIHI recognizes this and these analyses, the recent re-abstraction studies, and feedback from stakeholders have all helped CIHI identify steps that must be taken to address variation in coding practices. Some of the actions initiated by CIHI include:

- Established a national CMG re-development committee with an aggressive timetable for recommendations.
- Issued clarifications of the diagnosis typing standard to reduce variations in coding.
- Published review of CIHI Quality Assurance Practices (November 2002).
- Published results of the application of the Data Quality Framework to the DAD.

Some key lessons for CIHI from the findings of review of variation in the DAD are:

- Monitoring of adherence to CIHI diagnosis typing guidelines for DAD submissions must be enhanced.
- CIHI will evaluate and assess the relative benefits and risks of continuing to rely on a diagnosis typing approach that contains an element of subjective judgement as opposed to a pre-determined black and white, data driven diagnosis typing system (as is used to determine complications and comorbidities in the United States DRG system). This was a consistent message delivered in CIHI's Spring 2003 consultations nationally. Participants in these provincial meetings expressed a desire to re-examine the continued utility of this subjective coding practice.
- There should be regular reporting to hospitals of their level of adherence to CIHI DAD data reporting guidelines.
- There should be regular review of the CMG grouping methodology to ensure that variables previously identified as important to support differentiation of patient groups retain their value over time as coding and reporting practices change.
- Special attention should be paid to data elements and calculated variables used to support funding allocations.

Monitoring and Reporting Variation in the DAD

The analyses presented in this report provide examples of potential indicators that could be used to monitor variation between hospital in coding and reporting of DAD data. Most of these indicators have been used to compare year over year change in data or have been applied to large population-based datasets where differences between the populations would be expected to be small.

A greater challenge for CIHI is the identification and development of indicators that can be used to assess the data from individual hospitals and that might be implemented on a "real time" basis, so that potential upcoding or undercoding can be identified as it happens.

Variation as a Sentinel Event

Sentinel events are a type of adverse event that are indicative of underlying systemic concerns. In health care, sentinel events are unexpected occurrences involving death or serious physical or psychological injury, or risk thereof. Sentinel events signal the need for immediate investigation and response. For CIHI, any significant coding variation up or down is considered to be a sentinel event.

Sentinel Indicators

A sentinel indicator is very similar to a screening tool for use in data processing by CIHI. It can be an indicator that automatically triggers investigation and follow-up in response. Ideally CIHI could create indicators to identify individual abstracts submitted to CIHI DAD that indicate that the submitting organization is not following CIHI coding protocols. Additionally there could be indicators that would be applied to a pool of data (not individual records) and be based on an assessment of patterns in the data.

Indicators for Individual Records and for Pools of Data

An indicator that applies to an individual record could be used in real time to flag records that require correction or that should not be accepted into the DAD. Indicators based on assessing patterns in a pool of data could be used with periodic data submissions if the volume of records was sufficient, or could be retrospectively used with annual submissions.

No Black and White Indicators of Upcoding Applicable to Individual Records

CIHI experience with edit tests applied to individual patient records has been that unless the test generates a rejection of the record (and not just a warning) the offending record will not necessarily be corrected. For an edit test to flag a record for rejection there must be certainty that the record is incorrect. With the current diagnosis typing guidelines there are very few, if any, diagnoses that could never be coded as a Type 1 or 2 diagnosis. We were unable to identify any indicators that could be applied to individual records. Some combinations of diagnoses were considered to be very rare but not impossible.

Use of Indicators to Apply to Pools of Data

It is much more feasible for CIHI to develop and apply indicators that can be used to assess the likelihood of upcoding in a pool of data. The indicators could be used to:

- Provide a warning back to the submitting institution that their data appear unusual and show evidence of upcoding/undercoding. As well, a copy of any reports/findings sent to individual hospitals would need to be shared with provincial Ministries as well to allow follow-up at a provincial level.
- Support communication with Ministries of Health regarding the apparent quality and comparability of the data submitted by individual hospitals.
- Support development of a published comparison of data quality across hospitals. This could then be used by researchers and hospitals to assess the utility of the DAD data from individual hospitals for comparisons of performance and activity.
- Identify institutions where audit or re-abstraction of their data is recommended.
- Identify institutions whose data should be excluded from DAD for the purposes of calculating average values (e.g. expected LOS, Typical RIW).[22] However, hospitals would be given the prior opportunity to investigate, correct as required, and report on questionable data prior to their exclusion.

In all cases the indicators can only lead to suspicion of "upcoding/undercoding"; confirmation of upcoding or undercoding would require on-site chart review (i.e. re-abstraction).

In addition to facility-based indicators, extreme values for population-based indicators monitored and reported by CIHI may provide evidence of undercoding or upcoding by the hospitals that provide care to the population.

Potential Indicators

A potential indicator that can be used as was done in this analysis is changes in grade list diagnosis volumes or distribution of patients by complexity level. Additional indicators based on changes in data patterns compared with prior submissions from the same organization include:

- Percent change in weighted cases per in-patient day greater than 5%, with no addition or discontinuance of a major program.
- Percent change in volume of Type 1 or 2 diagnoses per medical or surgical in-patient case.
- Percent change in volume of Type 1 or 2 diagnoses per mental health in-patient case.
- Percent change in actual LOS versus ELOS performance.

[22] Exclusion of data from the DAD would be problematic for population-based analyses and indicators where comprehensive capture of the activity for a population is required.

Potential indicators based on comparisons with peer organizations include:

- Frequency of categorization of diagnosis as comorbid condition within specific CMG (e.g. "difficulty in walking" as comorbid condition for stroke or joint replacement CMG).
- Actual LOS less than 80% of ELOS.
- Type 1 diagnoses per in-patient medical case above 90th percentile for peer group.
- Type 1 diagnoses per in-patient surgical case above 90th percentile for peer group.
- Type 2 diagnoses per in-patient medical case above 90th percentile for peer group.
- Type 2 diagnoses per in-patient surgical case above 90th percentile for peer group.
- Ratio of case volume in non-complex vs. complex CMG significantly different from peers. Examples of potential CMG pairs to be assessed would include:
  - simple vs. complicated appendectomy;
  - c-section with complicating diagnosis vs. c-section with no complicating diagnosis;
  - VBAC with complicating diagnosis vs. VBAC with no complicating diagnosis;
  - vaginal delivery with complicating diagnosis vs. vaginal delivery with no complicating diagnosis;
  - neonates, with similar birth weight, with and without problem diagnoses; and
  - mental health CMG with Axis 3 diagnoses vs. without Axis 3.

More sophisticated tools to assess the comparability of CIHI data, referred to as "coding indices" have been developed[23] to compare the actual distribution of a hospital's cases by complexity with the expected distribution, taking into account variables such as:

- hospital size and teaching status;
- hospital case mix, procedure mix, and program mix;
- actual in-hospital mortality; and
- hospital location (e.g. urban vs. rural).

These coding indices were developed to be used with DAD data using the CIHI complexity overlay but the same principles could be used to develop a CIHI coding index. One advantage of a coding index is that it can be used to create a continuous measure showing the degree to which a hospital has reported more (or less) resource intensity than would be expected, rather than just a dichotomous upcoding measure.

[23] Examples are the Ontario Ministry of Health Hospital Coding Index and the Thiinc Consulting RIW Weighted Complexity Index.