

**Queensland
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Impact of changes in diabetes coding on Queensland hospital principal diagnosis morbidity data

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Key Findings

Over time, changes in coding have the potential to influence the trends observed within hospital morbidity data with diabetes as a principal diagnosis.

Second edition ICD-10-AM (July 2000 onwards) changes potentially increased the scope for diabetes surveillance. Seventh edition ICD-10-AM (July 2010 onwards) changes potentially decreased the scope for diabetes surveillance.

Hospital morbidity data for diabetes as a principal diagnosis from the third to the sixth editions of the ICD-10-AM (July 2002 - June 2010) represents a period of relative coding consistency. Over this period it is unlikely that the increase in the prevalence of diabetes in the community, directly accounts for all of the increase in episodes with diabetes as a principal diagnosis.

1.0 Background and purpose of the report

Morbidity data is collected on all admitted patients in Queensland hospitals as per the requirements of the Queensland Hospital Admitted Patient Data Collection (QHAPDC).¹ This data is represented by codes sourced from the International Classification of Diseases and Related Health Problems, Tenth Revision, Australian modification (ICD-10-AM).²⁻⁸ The process by which the ICD-10-AM codes are assigned is governed by the Australian Coding Standards. The ICD-10-AM has been revised every two years since it was introduced in some jurisdictions in 1998, with each new edition updating the classification.

The coding of diabetes mellitus (diabetes) and associated conditions has been affected by these ICD-10-AM revisions (editions) including changes in: Australian Coding Standards, national coding directives, clinical terminology and disease classification.^{9, 10} In this context the changes influencing diabetes data from the first edition ICD-10-AM (implemented from July 1999 in QLD) through to seventh edition ICD-10-AM (implemented July 2010 onwards) are summarised and the impact of these changes over time on principal diagnosis (PD) reported.

2.0 Methodology and exclusions

QHAPDC data for diabetes related episodes of care (financial year reporting) were extracted from July 1999 (first edition) to December 2010 (seventh edition); with a projected estimate for the remaining six months of 2010/11. Corresponding coding and classification changes for this period were mapped. Results are shown for the broad diabetes groupings of Type I diabetes (E10) and Type II diabetes (E11) with Queensland age specific diabetes rates standardised per 100,000 to the Australian population 2001. The following exclusions were applied: organ donors, unqualified neonates, boarders, sex coded as missing or indeterminate, public psychiatric hospitals and a usual place of residence other than Queensland. These exclusions were applied to be consistent with typical definitions used for chronic disease reporting and in the calculation of age standardised rates e.g. the Queensland Health Chief Health Officer Report 2010.

3.0 Mapping changes in coding and classification influencing episodes with diabetes from the first to the seventh edition ICD-10-AM

First Edition ICD-10-AM

From the first edition ICD-10-AM the following *Australian Coding Standard 0001 – Principal Diagnosis (ACS 0001)* definition applied to diabetes as a principal diagnosis:

*The diagnosis established after study to be chiefly responsible for occasioning the patient's episode of care in hospital (or attendance at the healthcare facility)*¹¹

The definition for principal diagnosis has remained consistent over time, as described in ACS 0001. However a coding standard which influences the coding of diabetes, *ACS 0401 – Diabetes mellitus (and impaired glucose regulation)*, has been revised multiple times.^{9, 10} These ICD-10-AM edition changes are summarised in Table 3.1.

In the first edition of ICD-10-AM, *ACS 0401 – Diabetes mellitus* instructed that the 'diabetes with complication' code be sequenced above the related condition. For example, a diagnosis of 'diabetic cataract' could have a principal diagnosis of '*E10.30 Diabetes with ophthalmic complication*' and an additional code of '*H28.0 Diabetic cataract*' to describe the related condition. There was a requirement for this coding to reflect a documented cause and effect relationship between the diabetes and its related complication/condition.^{2, 9}

Second Edition ICD-10-AM

The second edition ICD-10-AM introduced several key conceptual changes in the classification principles.

- An expanded set of diabetes with complication codes were introduced to better reflect the clinical complexity of diabetes and associated conditions.^{3, 9}
- The implied causality between diabetes and the condition was restricted to terms and conditions specified via the complication codes.
- The previous requirement to establish a cause and effect relationship between the diabetes and the complication/condition was reduced from an explicit to an implied relationship. i.e. a diabetes with complication grouped code could represent a causal relationship or a co-existing condition.^{3, 9}

Many more diabetes with complication codes became available to better capture the clinical complexity of diabetes and associated conditions.^{3, 9} One example of the improved specificity of the diabetes with complication codes is demonstrated for '*Diabetes with ophthalmic complication*'. E10.30 (controlled) and E10.31 (uncontrolled) were replaced with eight new codes. '*E10.3x Type 1 diabetes mellitus with...*'

- E10.30 – Ophthalmic complication unspecified;
- E10.31 – Background retinopathy;
- E10.32 – Proliferative retinopathy;
- E10.33 – Proliferative retinopathy;
- E10.34 – Other retinopathy;
- E10.35 – Advanced ophthalmic disease;
- E10.36 – Diabetic cataract; and
- E10.39 – Other specified ophthalmic complication.

The expected impact of the second edition ICD-10-AM changes was to allow some scope for surveillance of diabetes and commonly co-existing conditions.^{9, 10} Therefore during the first to second edition transition of the ICD-10-AM, some of the observed increase in hospital episodes with diabetes as a principal diagnosis may simply reflect:

- an increased availability of 'diabetes with complication' codes,
- the potential amalgamation of co-existing and causality information and
- the potential relocation of some information about diabetes associated conditions to the principal diagnosis data field.

Third to Sixth Edition ICD-10-AM

Between the second and sixth editions of ICD-10-AM finer level changes occurred to the coding process that reflected progress in the clinical understanding of diabetes. These changes in diabetes classification may have changed the level of available information in QHAPDC for certain conditions associated with diabetes. Finer level changes may have corresponded to:

- a) information gain (new codes added)
- b) information loss (codes deleted and not replaced)
- c) a change in the level of information (merging or splitting codes or changes in definition)
- d) no information change (no change in definition but change in code)

Seventh Edition ICD-10-AM

In the seventh edition of ICD-10-AM^{8, 10} *ACS 0401 – Diabetes mellitus* was extensively revised, directing that diabetes with complication/s codes be applied only when complication/s were documented as 'due to' or 'secondary to' diabetes⁷. Where there was no cause and effect relationship, the diabetes was required to meet additional criteria before a diabetes code should be assigned.

For example, a patient who had a history of Type 2 diabetes admitted for treatment of a cataract, would have a principal diagnosis of *H26.9 Cataract, unspecified* recorded. The diabetes would not be coded if it was not treated or did not meet additional ACS coding criteria. If a similar patient also saw the diabetes educator during the episode of care, that is, the diabetes itself was also treated, then the principal diagnosis would be *H26.9, Cataract, unspecified* with an other diagnosis (OD) of *E11.39 Type 2 diabetes mellitus with other specified ophthalmic complication*. If there was no visit by the educator but the clinical notes documented the cataract as being 'due to' diabetes, then the episode would be assigned a principal diagnosis of *H26.8 Other specified cataract* with and other diagnosis of *E11.36 Type 2 diabetes mellitus with diabetic cataract* to identify the underlying causal condition.

The rationale for this seventh edition change in coding practice would be for collected diabetes data to more accurately reflect documented diabetic cause and effect relationships rather than co-existing conditions; or for conditions recorded during an episode of care to reflect treatment during the episode of care.^{8, 10} However, the impact of this directive on the assignment of diabetes with complication codes as a principal diagnosis is substantial, with a drop in the episode with diabetes counts and potential relocation of some information from the principal diagnosis field to the other diagnosis field.

Summary

In summary, these coding changes may have potentially influenced both the absolute counts for episodes with diabetes and/or the clinical meaning of the collected diabetes data over time. Time series analyses require consideration of the potential impact of these coding changes on capturing a consistent level of detail and clinical meaning over time, for example, when describing trends for specific complication/s or between diabetes types.

Table 3.1 Summary of changes in diabetes coding on principal diagnosis episodes

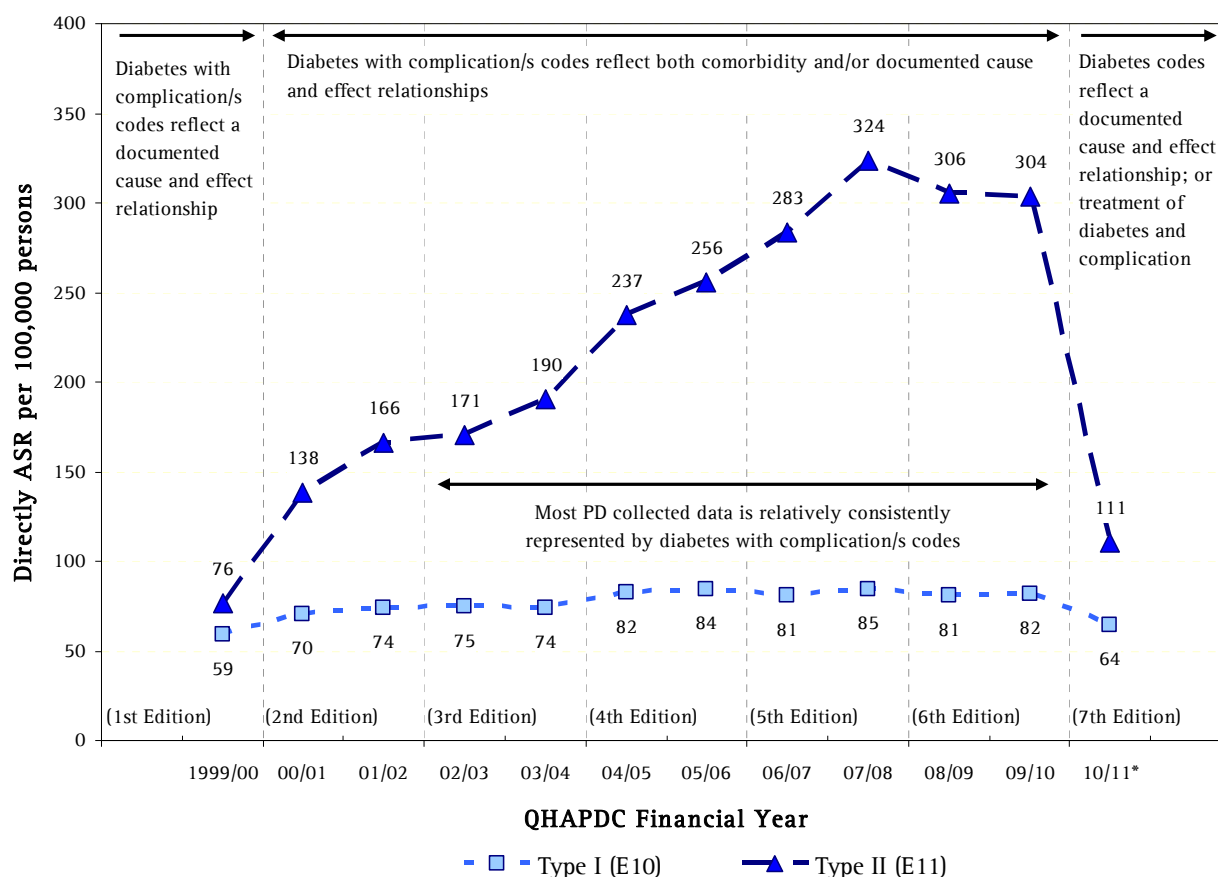
Time period (ICD-10-AM Edition)	Changes in coding for diabetes as a PD meeting ACS 0001 coding criteria	The potential impact of changes coding and or directives on the location and/or meaning of diabetes as a PD collected data
July 1999 - June 2000 ^{*2} (1st Edition)	Diabetes as a PD with or without complication/s is recorded following ACS 0401.	a) The PD field contains aggregate data on diabetes with complication/s. The OD field contains further detail if necessary about the complication/s caused by diabetes b) The PD field contains data of diabetes without complication/s. The OD field contains further detail if necessary on co-existing conditions.
July 2000 - June 2002 ³ (2nd Edition)	Diabetes as a PD with or without complication/s is recorded following a revised ACS 0401.	The PD field may contain amalgamated information on: a) diabetes with co-existing conditions and b) diabetes with diabetes specific complication/s. If required the OD field may contain further detail about the complication/s.
	In the 2nd edition ICD-10-AM, more diabetes with complication/s codes become available to better reflect the clinical complexity of diabetes.	Fine mapping may be required to capture the equivalent level information between the 1st and 2nd editions of the ICD-10-AM for diabetes as a PD.
	Changes in the breadth of available diabetes codes and in ACS 0401 coding instruction in the second edition ICD-10-AM.	Some increased scope for diabetes surveillance, particularly conditions commonly co-existing with diabetes. Some decreased scope for determining whether the co-existing condition has been specifically caused by the diabetes.
July 2002 - June 2004 ⁴ (3rd Edition)	In the 3rd edition ICD-10-AM some new diabetes with complication codes are created and some are inactivated.	Fine mapping may be required to capture the equivalent level information between this and previous ICD-10-AM versions.
July 2004 - June 2006 ⁵ (4th Edition)	In the 4th edition ICD-10-AM NCCH introduces minor changes to reflect updated diabetes terminology in code descriptions.	Fine mapping may be required to capture the equivalent level information between this and previous ICD-10-AM versions.
July 2006 - June 2008 ⁶ (5th Edition)	No changes	No changes
July 2008 - June 2010 ⁷ (6th Edition)	In the 6th edition ICD-10-AM some new diabetes with complication codes are created and some are inactivated.	Fine mapping may be required to capture the equivalent level information between this and previous ICD-10-AM versions.
July 2010 - June 2012 ⁸ (7th Edition)	The revised ACS 0401 instructs the use of diabetes with complication codes for: a) complication/s 'due to' / 'secondary to' diabetes or b) describing treatment of both diabetes and the complication in the episode of care. ^{8, 10}	Decreased scope for diabetes surveillance as diabetes with complication/s codes now reflect documented cause and effect relationships between diabetes and co-existing condition/s; or the treatment of both diabetes and an associated complication during the hospital episode.

* Queensland began applying first edition ICD-10-AM coding in July 1999. This is noted as there is inconsistency when each Australian state began using ICD-10-AM first edition coding.¹²

4.0 Trends in episodes with diabetes as a principal diagnosis from the first to the seventh edition ICD-10-AM

Figure 4.1 shows the trends in episodes with diabetes (Type I and Type II) as a principal diagnosis in QHAPDC over time. In Queensland Type II diabetes represents the most common diabetes type¹³ and is more sensitive to diabetes coding change impact.

Figure 4-1 Episodes with diabetes as a principal diagnosis in QHAPDC as direct age standardised rates (ASRs) from 1999/2000 to 2010/11*



During the transition from first edition through to the end of the second edition ICD-10-AM (July 1999¹² - June 2002) in Queensland there was an increasing trend in the direct age standardised rates of episodes with diabetes Type I and Type II. The more pronounced increase for Type II diabetes was likely to have been partially influenced by the second edition ICD-10-AM coding changes.^{3, 10} The expected impact of second edition changes was for diabetes with complication/s coding to reflect both co-existing and documented cause and effect relationships. A secondary change with the second edition was an underlying shift to using diabetes with complication/s codes rather than diabetes without complication codes. This coincided with the increased availability of diabetes with complication codes in the second edition ICD-10-AM to better reflect clinical complexity. This coding shift had stabilised by the beginning of third edition ICD-10-AM data collection (July 2002).

* 2010/11 is a projected estimate based on preliminary QHAPDC data extracted July 29 2011. The following calculation is used: (July to December 2010 diabetes PD separations x 2) / QLD 2009 population and then age standardised to the Australian population 2001.

The period of data collection from the third through to the sixth edition ICD-10-AM is a period with relative coding consistency for episodes with diabetes as a principal diagnosis, because second edition conceptual changes had become established.⁴⁻⁷ Over this period there were far fewer changes in the number and/or meaning of available diabetes with complication codes.⁴⁻⁷ Despite the coding consistency there is a steady and marked increase in the number of episodes with diabetes as a principal diagnosis and accordingly the age standardised rate. The increase over this period should not be fully attributed to an increasing prevalence of diabetes within the community¹⁴. An increasing awareness of diabetes as a disease, and a potentially increasing surveillance of diabetes through the morbidity data may have also had a significant effect on the number of episodes with diabetes.

The first half of 2010/11 (July to December 2010) covers the start of seventh edition ICD-10-AM data collection. Half year counts of episodes with diabetes type II as a principal diagnosis were crudely projected to calculate an annual direct age standardised rate of 111 per 100,000 for 2010/11. This was markedly down from 304 per 100,000 in 2009/10 (Figure 4.1) and this decrease is consistent with the influence of the seventh edition ACS 0401 changes to the meaning of diabetes with complication data to:

- a) better reflect cause and effect relationships rather than co-existing conditions and
- b) to better reflect the actual conditions treated during the hospital episode.^{10, 14}

5.0 Reporting trends in episodes with diabetes as a principal diagnosis over time using hospital morbidity data from QHAPDC

Utilising hospital morbidity data to report on trends in diabetes related episodes will have constraints in the data interpretation. The changes in coding have impacted:

- a) the number and/or location of episodes with diabetes; and
- b) the clinical meaning of these episodes with diabetes.^{9, 10}

Additionally hospital morbidity data represents diabetes hospitalisation trends based on episodes of care and is limited in interpreting patient level trends or prevalence.^{9, 14}

From the second edition ICD-10-AM onwards recording co-existing conditions with diabetes (where there was no cause and effect requirement) may have had the effect of allowing some scope for disease surveillance.^{9, 10} This effect has been reversed following major changes to diabetes coding in the seventh edition ICD-10-AM. The subsequent expectation is to decrease the extent of diabetes surveillance.

Collected QHAPDC diabetes and condition/s data from the third to the sixth edition ICD-10-AM (July 2002 - June 2010) represents a period of relative consistency in ICD coding standards. Care should be taken in how the increase in episodes with diabetes is attributed as it is unlikely that the increase in the prevalence of diabetes in the community directly accounts for all of the increase in episodes with diabetes as a principal diagnosis.

6.0 References

1. Data Collections Unit. 2009-2010 Queensland Hospital Admitted Patient Data Collection (QHAPDC): Manual of instructions and procedures for the reporting of QHAPDC data [manual online]. Queensland: Queensland Health; 2009. Available from: www.health.qld.gov.au/hic
2. National Centre for Classification in Health (NCCH). Australian Coding Standards First Edition – 1 July 1998. In: The International Statistical Classification of Diseases and Health Related Problems, Tenth Revision, Australian Modification (ICD-10-AM). Sydney: NCCH; 1998.
3. National Centre for Classification in Health (NCCH). Australian Coding Standards Second Edition – 1 July 2000. In: The International Statistical Classification of Diseases and Health Related Problems, Tenth Revision, Australian Modification (ICD-10-AM). Sydney: NCCH; 2000.
4. National Centre for Classification in Health (NCCH). Australian Coding Standards Third Edition – 1 July 2002. In: The International Statistical Classification of Diseases and Health Related Problems, Tenth Revision, Australian Modification (ICD-10-AM). Sydney: NCCH; 2002.
5. National Centre for Classification in Health (NCCH). Australian Coding Standards Fourth Edition – 1 July 2004. In: The International Statistical Classification of Diseases and Health Related Problems, Tenth Revision, Australian Modification (ICD-10-AM). Sydney: NCCH; 2004.
6. National Centre for Classification in Health (NCCH). Australian Coding Standards Fifth Edition – 1 July 2006. In: The International Statistical Classification of Diseases and Health Related Problems, Tenth Revision, Australian Modification (ICD-10-AM). Sydney: NCCH; 2006.
7. National Centre for Classification in Health (NCCH). Australian Coding Standards Sixth Edition – 1 July 2008. In: The International Statistical Classification of Diseases and Health Related Problems, Tenth Revision, Australian Modification (ICD-10-AM). Sydney: NCCH; 2008.
8. National Centre for Classification in Health (NCCH). Australian Coding Standards Seventh Edition – 1 July 2010. In: The International Statistical Classification of Diseases and Health Related Problems, Tenth Revision, Australian Modification (ICD-10-AM). Sydney: NCCH; 2010.
9. Phillips G. The Impact of ICD coding standard changes for diabetes hospital morbidity data. Canberra: AIHW; 2003.
10. Knight L, Halech R, Mortimer L. Changes in diabetes coding from the fifth to the sixth and seventh editions of ICD-10-AM. Technical Report #8. Brisbane: Queensland Health; 2011.
11. Health Data Standards Committee. National Health Data Dictionary. Version 12 supplement. Canberra: AIHW; 2004.
12. Innes K, Peasley K, Roberts R. The Development of an Australian Modification of ICD-10-AM. Sydney: NCCH; 2000. ICD Coded Data Fact Sheet. [cited 2011, March 21]. Available from: <http://www.aihw.gov.au/national-hospital-morbidity-database/>
13. Queensland Health. The Health of Queenslanders 2010. Third Report of the Chief Health Officer of Queensland. Brisbane: Queensland Health; 2010.
14. Population Health Division. The Health of the people of New South Wales – Report of the Chief Health Officer. Sydney: NSW Department of Health. Diabetes hospitalisations and persons hospitalised. [cited 2011, March 21]. Available from: http://www.health.nsw.gov.au/publichealth/chorep/dia/dia_pcohosl.asp