An evaluation of the quality of obstetric morbidity coding using an objective assessment tool, the Performance Indicators for Coding Quality (PICQ)

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Abstract

The Performance Indicators for Coding Quality (PICQ) is a data quality assessment tool developed by Australia's National Centre for Classification in Health (NCCH). PICQ consists of a number of indicators covering all ICD-10-AM disease chapters, some procedure chapters from the *Australian Classification of Health Intervention* (ACHI) and some *Australian Coding Standards* (ACS). The indicators can be used to assess the coding quality of hospital morbidity data by monitoring compliance of coding conventions and ACS; this enables the identification of particular records that may be incorrectly coded, thus providing a measure of data quality. There are 31 obstetric indicators available for the ICD-10-AM Fourth Edition. Twenty of these 31 indicators were classified as Fatal, nine as Warning and two Relative. These indicators were used to examine coding quality of obstetric records in the 2004-2005 financial year Australian national hospital morbidity dataset. Records with obstetric disease or procedure codes listed anywhere in the code string were extracted and exported from the SPSS source file. Data were then imported into a Microsoft Access database table as per PICQ instructions, and run against all Fatal and Warning and Relative (*N*=31) obstetric PICQ 2006 Fourth Edition Indicators v.5 for the ICD-10-AM Fourth Edition. There were 689,905 gynaecological and obstetric records in the 2004-2005 financial year, of which 1.14% were found to have triggered Fatal degree errors, 3.78% Warning degree errors and 8.35% Relative degree errors. The types of errors include completeness, redundancy, specificity and sequencing problems. It was found that PICQ is a useful initial screening tool for the assessment of ICD-10-AM/ACHI coding quality. The overall quality of codes assigned to obstetric records in the 2004-2005 Australian national morbidity dataset is of fair quality.

Key Words (MeSH):

Computerised Medical Records Sytems; Quality Control; Coding; Obstetrics; Morbidity; International Classification of Diseases; ICD-10-AM

* *Note:* For simplicity, the term Obstetrics has been used to describe the dataset that was studied although it included records selected because they include codes from the Gynaecology chapters.

Introduction

The last decade has seen an increase in the number of routine data collections at the population level. Datasets that result from these collections are a good source of information for health services administration and management, monitoring of population health and disease trends, strategic health planning and policy development, as well as for research purposes (Cande 2005; McKenzie et al. 2006a, Taylor et al. 2005). However, many researchers have raised questions regarding the quality of data contained

in these datasets (Cande 2005, Lu et al. 2007; Yasmeen et al. 2006), one of these being the hospital morbidity dataset (McKenzie et al. 2005; McKenzie et al. 2006b). Issues of concern have included data reliability and accuracy (Cande 2005; Lydon-Rochelle et al. 2005; Romano et al. 2005), and the specificity of assigned codes (McKenzie et al. 2006b).

In order to ensure that the ICD-10-AM coded data collected by hospitals in Australia is of a high quality, the National Centre for Classification in Health (NCCH) has developed a set of coding quality indicators. The Performance Indicators for Coding Quality (PICQ) was developed for the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification* (ICD-10-AM) and the *Australian Classification of Health Intervention* (ACHI) – collectively known as ICD-10-AM. These indicators function as a tool to assess the coding quality of hospital morbidity data, and provide an objective measure of data accuracy. At the end of each analysis, reports are generated on the overall error rate of the dataset, as well as individual error separations. This provides a measure of data accuracy and means to identify specific records that may be incorrectly coded and requiring corrections.

PICQ

PICQ indicators are developed based on the *Australian Coding Standards* (ACS) and coding conventions. As codes and coding standards can change between different editions of the ICD-10-AM, indicators are often added or modified accordingly. PICQ indicators for the Fourth and Fifth Editions of ICD-10-AM cover all 21 ICD-10-AM diagnosis chapters and most procedure (ACHI) chapters with varying numbers. Currently, there are 223 and 247 indicators available for the Fourth and Fifth Editions of ICD-10-AM, respectively. Depending on the complexity of the coding area as well as the focus priority of certain health conditions and procedures, the numbers of indicators available differ for different diagnosis and procedure chapters (Tables 1 and 2).

Table 1: Number of PICQ 2006 Fourth Edition v.5 Indicators by ICD-10-AM disease chapters

DISEASE CHAPTERS	DESCRIPTIONS	NO. OF INDICATORS 4TH EDITION	NO. OF INDICATORS 5TH EDITION
1	Certain infectious and parasitic diseases	6	9
2	Neoplasms	10	10
3	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	3	3
4	Endocrine, nutritional and metabolic diseases	15	22
5	Mental and behavioural disorders	8	8
6	Diseases of the nervous system	2	2
7	Disease of the eye and adnexa	5	5
8	Disease of the ear and mastoid process	2	2
9	Disease of the circulatory system	10	11
10	Disease of the respiratory system	7	9
11	Disease of the digestive system	11	12
12	Disease of the skin and subcutaneous tissue	5	5
13	Disease of the musculoskeletal system and connective tissue	2	3
14	Disease of the genitourinary system	7	7
15	Pregnancy, childbirth and the puerperium	31	31
16	Certain conditions originating in the perinatal period	5	5
17	Congenital malformations, deformations and chromosomal abnormalities	2	2
18	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	4	4
19	Injury, poisoning and certain other consequences of external causes	21	21
20	External causes of morbidity and mortality	11	11
21	Factor influencing health status and contact with health services	14	22
	Total	**181**	**204**

Table 2: Number of PICQ 2006 Fourth Edition v.5 Indicators by ACHI chapters

PROCEDURE CHAPTERS	DESCRIPTIONS	NO. OF INDICATORS 4TH EDITION *	NO. OF INDICATORS 5TH EDITION *
1	Procedures on nervous system	0	0
2	Procedures on endocrine system	0	0
3	Procedures on eye and adnexa	1	1
4	Procedure on ear and mastoid process	0	0
5	Procedure on nose, mouth, and pharynx	1	1
6	Dental services	0	0
7	Procedures on respiratory system	2	2
8	Procedures on cardiovascular system	6	7
9	Procedures on blood and blood-forming organs	0	0
10	Procedures on digestive system	3	4
11	Procedures on urinary system	3	3
12	Procedures on male genital organs	1	1
13	Gynaecological procedures	1	1
14	Obstetric procedures	11	11
15	Procedures on musculoskeletal system	1	1
16	Dermatological and plastic procedures	4	4
17	Procedures on breast	0	0
18	Radiation oncology procedures	1	1
19	Noninvasive, cognitive and other interventions, not elsewhere classified	13	13
20	Imaging services	0	0
	Total	**48**	**50**

* Some indicators found in the procedure chapters overlap with indicators already defined in the disease chapter, therefore the total number of indicators reported in this is larger than 223 (for 4th Edition) and 247 (for 5th Edition).

PICQ Indicators

PICQ indicators are categorised according to the type and degree of problem the indicator seeks to identify, and are given the attribute descriptions of indicator type and indicator degree (National Centre for Classification in Health 2006). There are five indicator types and three indicator degrees. The five indicator types function to identify edit, code completeness, data redundancy, specificity and code sequencing problems. Edit problem indicators identify errors due to codes or code combinations that should have been prevented by basic editing; completeness problem indicators identify records with potentially missing codes; redundancy problem indicators identify records with unnecessary codes; specificity problem indicators identify records with codes that lack specificity or may be incorrectly assigned; sequencing problem indicators identify records with codes that are incorrectly sequenced (National Centre for Classification in Health 2006)[1]. The three indicator degrees are Fatal, Warning and Relative. Fatal degree indicators identify records that are incorrectly coded according to ICD-10-AM standards and conventions. Warning degree indicators identify records with individual codes or a combination of codes that may be incorrect. Some Warning degree indicators are given a nominated threshold to indicate the probability that the record may be incorrect; a Warning degree indicator with 1% threshold suggests that the record has a high probability of being incorrect. Relative degree indicators function to assess the overall quality of the coded data rather than to identify individual problem records and are expressed as a ratio of a larger group of episodes (National Centre for Classification in Health 2006).

1 Detailed examples of each type of problem can be found in the NCCH website (http://nis-web.fhs.usyd.edu.au/7.3.1.htm).

PICQ obstetric indicators

All PICQ indicators are assigned a unique identifying number and grouped according to the indicator degree and indicator type, as well as the diagnosis and procedure chapters they serve to test. This allows users the freedom to choose either the entire suite of indicators or specific indicators for analysis. The codes for gynaecological and obstetric hospital admissions are listed in diagnosis chapter 15 of ICD-10-AM and chapters 13 and 14 of ACHI. There are 31 indicators associated with these chapters. The 31 obstetric indicators consist of 11 indicators which measure the coding accuracy of obstetric procedures, and 20 indicators which test the correct assignment of obstetric diagnosis codes. Twenty of these 31 indicators belong to the Fatal degree category, nine to the Warning degree category and two to the Relative degree category.

Quality of obstetric coding

The coding quality of obstetric data found in the admitted patient morbidity data collection has been a concern for clinicians and researchers; it has been argued that this has led to reluctance to use these data for monitoring, continuation of care, and research purposes (Main et al. 2006; Taylor et al. 2005; Yasmeen et al. 2006). Areas of concern include the coding of co-morbidity and the under-reporting and under-coding of complications with ambiguous coding rules (Romano et al. 2005).

Aim

The aim of this study was to use the 31 PICQ obstetric indicators as a data quality screening tool to assess the overall quality of gynaecological and obstetric codes assigned in the 2004-2005 Australian national hospital morbidity dataset.

Methods

The national hospital morbidity dataset for the 2004-2005 financial year for all Australian States was provided to the researchers by the Australian Institute of Health and Welfare (AIHW). The dataset consisted of seven million separations (i.e. discharges). Records with an obstetric diagnosis or procedure listed anywhere in the code string were extracted for analysis. A data extraction program was written, using SPSS, to analysis all 50 diagnosis and procedure fields found in the Australian national morbidity dataset, in order to identify and extract records beginning with an 'O' code, or containing any code from the range Z37.0 to Z37.9, or containing any code from Chapters 13 and 14 of the ACHI. The PICQ 2006 Fourth Edition Indicators version 5 (National Centre for Classification in Health 2006) was used for the analysis. All selected obstetric records were exported from the SPSS source file and imported into a Microsoft Access database table as per PICQ instructions. These extracted records were then run through an SQL query developed for PICQ 2006 Fourth Edition Indicators v.5 which compares all coded records with selected indicators to identify any possible coding errors.

The percentage error was then calculated using the following formulae:

$$\frac{\text{Total numerator records}}{\text{Total denominator records}} \times 100$$

Where:

Numerator records = records the indicator is seeking to identify (potential problem records)

Denominator records = records in the dataset under analysis in which the numerator records could occur (National Centre for Classification in Health 2006).

Results

There were 689,907 obstetric records found in the 2004-2005 Australian national morbidity dataset. Of these, two records from the public hospital sector were found to contain obstetric procedure codes but no disease code entries. Currently, the PICQ algorithm requires an entry in at least one of the diagnosis fields, thus these two records were excluded from the PICQ analysis, resulting in 689,905 usable records. Sixty percent (n = 417,104, 60.5%) were from public hospitals, 30.7% (n = 212,003) private hospitals, and 8.8% (n = 60,798) 'other' hospitals. These coded records were run against all 31 PICQ 2006 Fourth Edition v.5 obstetric indicators.

Indicator degree

Overall, there were 1.14% Fatal degree, 3.78% Warning degree, and 8.35% Relative degree errors found in the dataset. Table 3 presents a detailed breakdown of the percentages of error found for each PICQ 2006 Fourth Edition v.5

Table 3: PICQ 2006 Fourth Edition v.5 indicator errors for obstetric coding

INDICATORS	DESCRIPTIONS	DEGREE *	TYPE **	*N*	%
100262	Single spontaneous vaginal delivery code with procedure code other than those permitted	A	4	27	0.09
100694	Forceps and caesarean section codes used together for single newborn delivery	A	3	31	0.04
100854	Abortion, threatened abortion, threatened premature labour or pre-term delivery code without duration of pregnancy code	A	2	834	0.70
100888	Single spontaneous delivery code with pregnancy, childbirth or puerperium abnormality/complication code	A	3	120	0.40
101385	Obstetric perineal laceration/tear, first/second degree, without first/second degree suture/ repair or episiotomy	A	2	2464	3.61
101386	Obstetric laceration third/fourth degree without third/fourth degree repair	A	2	250	6.42
101407	Delivery without outcome of delivery code	A	2	541	0.35
101432	Delivery of twins without code for outcome of twin delivery	A	4	61	1.78
101433	Delivery of multiple babies (other than twins) without code for outcome of multiple (other than twin) delivery	A	4	5	6.25
101503	Hyperemesis gravidarum (mild) with dehydration code	A	3	74	1.51
101510	Tuberculosis complicating pregnancy, childbirth and puerperium code without code for condition	A	2	4	22.22
101514	Viral hepatitis complicating pregnancy, childbirth and puerperium code without code for condition	A	2	92	29.68
101516	Protozoal diseases complicating pregnancy, childbirth and puerperium code without code for condition	A	2	3	30.00
101519	Endocrine, nutritional, metabolic diseases complicating pregnancy, childbirth and puerperium code without code for condition	A	2	63	1.89
101595	Termination of pregnancy procedure code without medical abortion code	A	4	1068	1.43
101636	Single delivery by caesarean section (no condition classifiable) code without caesarean section procedure code	A	2	5	0.21
101641	Single delivery code with outcome of delivery code other than single birth	A	4	19	0.06
101642	Single delivery by forceps/vacuum extractor (no condition classifiable) code without forceps or vacuum extractor procedure code	A	2	55	17.97
101646	Vaginal delivery following previous caesarean section diagnosis code with caesarean section code and single newborn outcome code	A	4	26	0.70
101952	Curettage of non-gravid uterus code with a diagnosis code indicating an abortion or delivery	A	4	2052	2.60
100253	Delivery, possible, without outcome of delivery code	B	2	11797	5.51
100265***	Pregnant state incidental code with code from chapter 15	B	3	66	0.01
100856	Sterilisation code as principal diagnosis before medical abortion code	B	5	26	4.85
101387***	Obstetric rupture or laceration of uterus without repair	B	2	129	67.19
101388	Obstetric laceration of 'high vaginal wall alone' without repair	B	2	276	9.63
101389	Obstetric laceration of cervix without repair	B	2	53	22.18
101409	Postpartum episode without either 'care and examination immediately following delivery' code or 'outcome of delivery code'	B	2	1997	13.04
101424	Premature rupture of membranes without duration of pregnancy code	B	2	19738	72.97
101425	Unspecified reason for delivery procedure	B	4	2645	1.03
101925	Use 'Other' diagnosis code in chapter 15 as principal diagnosis	C	4	48138	10.67
101926	Use 'Unspecified' diagnosis code in chapter 15 as principal diagnosis	C	4	27160	6.02

* Degree of Fatality: A – Fatal; B – Warning; C - Relative

** Type of problems: 2 – completeness; 3 – redundancy; 4 – specificity; 5 – sequencing

*** Warning Degree Errors with 1% threshold

obstetric indicator. Fatal degree indicators 101510 (*Tuberculosis complicating pregnancy, childbirth, and puerperium code without code for condition*), 101541 (*Viral hepatitis complicating pregnancy, childbirth, and puerperium code without code for condition*), 101516 (*Protozoal diseases complicating pregnancy, childbirth, and puerperium code without code for condition*) had the highest error rates among other Fatal degree indicators. The error rates were 22.22%, 29.68% and 30.00% respectively. Two Warning degree indicators had an associated threshold of 1%; these two indicators were 100265 (*Pregnant state incidental code with code from chapter 15*) and 101387 (*Obstetric rupture or laceration of uterus without repair*). Indicator 100265 had a low error rate of 0.01%, while indicator 101387 had a comparatively high error rate of 67.19%.

Indicators 101925 (*Use 'Other' diagnosis code in chapter 15 as principal diagnosis*) and 101926 (*Use 'Unspecified' diagnosis code in chapter 15 as principal diagnosis*) tested the specificity of codes assigned as principal diagnosis. For these two indicators, PICQ 2006 Fourth Edition v.5 examined the ratio of 'other' or 'unspecified' obstetric codes assigned as principal diagnosis for all records with an obstetric code ranging from O00.0 to O99.9 as the principal diagnosis. In 2004-2005, there were 451,139 records with an obstetric code assigned as the principal diagnosis, with 48,138 (10.67%) assigned an 'other' code, and 27,160 (6.02%) assigned an 'unspecified' code. Tables 4 and 5 present a detailed break-down of the frequencies and percentages of 'other' and 'unspecified' codes assigned as principal diagnosis. There is no evidence to suggest a lack of specificity in codes assigned; the only exception is code O99.8 (*Other specified diseases and conditions complicating pregnancy, childbirth and the puerperium*), accounting for 3.36% of records with an obstetric code assigned as the principal diagnosis.

Indicator type

The analysis also identified four indicator type problems (Table 3): completeness problems,

Table 4: Frequency counts of the 'other' code assigned as principal diagnosis

CODES	DESCRIPTIONS	FREQUENCY (%) *	% OF ALL OBSTETRIC PDx
O99.8	Other specified diseases and conditions complicating pregnancy, childbirth and the puerperium	15168 (31.51)	3.36
O69.2	Labour and delivery complicated by other cord entanglement	4534 (9.42)	1.01
O72.1	Other immediate postpartum haemorrhage	3535 (7.34)	0.78
O68.8	Labour and delivery complicated by other evidence of fetal stress	3427 (7.12)	0.76
O62.2	Other uterine inertia	2818 (5.85)	0.62
O64.8	Labour and delivery affected by other malposition and malpresentation	2145 (4.46)	0.48
O92.20	Other and unspecified disorders of breast associated with childbirth, without mention of attachment difficulty	1759 (3.65)	0.39
O75.8	Other specified complications of labour and delivery	1735 (3.60)	0.38
O92.21	Other and unspecified disorders of breast associated with childbirth, with mention of attachment difficulty	1570 (3.26)	0.35
O26.88	Other specified pregnancy-related conditions	1376 (2.86)	0.31
O71.8	Other specified obstetric trauma	860 (1.79)	0.19
O36.8	Maternal care for other specified fetal problems	818 (1.70)	0.18
O92.71	Other and unspecified disorders of lactation, with mention of attachment difficulty	782 (1.62)	0.17
O46.8	Other antepartum haemorrhage	677 (1.41)	0.15
O99.1	Other diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism complicating pregnancy, childbirth and the puerperium	489 (1.02)	0.11
Other	Remaining 'Other' codes with less than 1% frequency	6445 (13.39)	1.43
	Total	**48138 (100.00)**	**10.67**

* Percentage of total

Table 5: Frequency counts of the 'unspecified' code assigned as principal diagnosis

CODES	DESCRIPTIONS	FREQUENCY (%) *	% OF ALL OBSTETRIC PDx
O46.9	Antepartum haemorrhage, unspecified	5680 (20.91)	1.26
O14.9	Pre-eclampsia, unspecified	4212 (15.51)	0.93
O42.9	Premature rupture of membranes, unspecified	2456 (9.04)	0.54
O23.4	Unspecified infection of urinary tract in pregnancy	2018 (7.43)	0.45
O16	Unspecified maternal hypertension	1867 (6.87)	0.41
O65.4	Labour and delivery affected by fetopelvic disproportion, unspecified	1614 (5.94)	0.36
O33.9	Maternal care for disproportion, unspecified	1060 (3.90)	0.23
O20.9	Haemorrhage in early pregnancy, unspecified	950 (3.50)	0.21
O66.9	Labour and delivery affected by dystocia, unspecified	877 (3.23)	0.19
O45.9	Premature separation of placenta, unspecified	851 (3.13)	0.19
O00.9	Ectopic pregnancy, unspecified	689 (2.54)	0.15
O68.9	Labour and delivery complicated by fetal stress, unspecified	669 (2.46)	0.15
O24.49	Diabetes mellitus arising at or after 24 weeks gestation, unspecified	536 (1.97)	0.12
O66.5	Failed application of vacuum extractor and forceps, unspecified	400 (1.47)	0.09
O47.9	False labour, unspecified	336 (1.24)	0.07
O67.9	Intrapartum haemorrhage, unspecified	295 (1.09)	0.07
O21.9	Vomiting of pregnancy, unspecified	275 (1.01)	0.06
Other	Remaining 'unspecified' codes with less than 1% frequency	2375 (8.74)	0.53
	Total	**27160 (99.98)**	**6.01**

* Percentage of total. Total percentage does not add up to 100% due to rounding error.

redundancy problems, specificity problems and sequencing problems. For records with Fatal degree errors, 1.23% were related to completeness problems, 0.21% were related to redundancy problems, and 1.46% to specificity problems. For records with Warning degree errors, 13.08% were related to completeness problems, 0.01% to redundancy problems, 1.03% to specificity problems, and 4.85% to sequencing problems. All Relative degree errors were related to specificity problems (8.35%).

Discussion

Fatal degree indicators

Indicators 101510, 101514, and 101516 had the highest error rate when compared to other Fatal degree indicators. These three indicators are related to O98 (*Maternal infectious and parasitic diseases classifiable elsewhere but complicating pregnancy, childbirth and the puerperium*) and are associated with ACS 1521. According to ACS 1521 'Conditions complicating pregnancy', the assignment of any codes ranging from O98.0 to O98.9 should be accompanied by an additional code from the other chapters of ICD-10-AM to identify the specific condition (NCCH 2004). The frequency of these conditions complicating pregnancy for 2004-2005 was very low: 18 counts of tuberculosis complicated pregnancy, childbirth and puerperium (O98.0), 310 counts of viral hepatitis complicated pregnancy, childbirth and puerperium (O98.4), and 10 counts of protozoal diseases complicated pregnancy, childbirth and puerperium (O98.6). The high error rates may be due to the infrequent assignment of these codes, with clinical coders possibly unfamiliar with the coding standard associated with the use of this range of codes. An examination of the error rate for indicator 101519 (*Endocrine, nutritional, metabolic diseases complicating pregnancy, childbirth, and puerperium code without code for condition*) lends support to this speculation. Indicator 101519 is also associated with ACS 1521, and identifies records with the assignment of code O99.2 (*Endocrine, nutritional and metabolic diseases complicating pregnancy, childbirth and puerperium*) without the associated code from the 'Endocrine, nutritional and metabolic diseases' chapter (E00.0 to E98.9). The frequency

of the condition associated with code O99.2 is relatively high, with 3339 records reported over the 2004-2005 financial year. The error rate of indicator 101519 was relatively low (1.89%) when compared to other indicators associated with ACS 1521 (indicators 101510, 101514, and 101516). A possible explanation for this low error rate may be that coders are more familiar with the rules for coding conditions associated with code O99.2, so do not make similar errors that have resulted in the high error rate for indicators 101510, 101514, and 101516. Refresher training provided to clinical coders may help to improve the quality of coding of these conditions.

Warning degree indicators

Indicators 100265 and 101387 are Warning degree errors with a 1% threshold. According to the PICQ 2006 User Guide (NCCH 2006), Warning degree indicators with a 1% threshold indicate that the probability of the record being incorrect is very high and they therefore should be considered similar to Fatal degree indicators (NCCH 2006). Indicator 101387 has a high error rate of 67.19%. This indicator identifies records containing a rupture of uterus before onset of labour code (O71.0) or a rupture of uterus during labour code (O71.1) but without a suture of ruptured uterus code (90478-00 [1344]), or any procedure codes from the abdominal hysterectomy block ([1268]), and the patient was not transferred, did not leave against medical advice, or died (NCCH 2006). Currently the O71.1 code is also assigned to records where there is a uterine laceration during a caesarean section. Under such circumstances the record is correct without the assignment of a repair code. The removal of records with a caesarean section code (16520-00 to 16520-03 [1340]) in any of the procedure code strings from the list of error records resulted in 18 error records for indicator 101387 and a substantial decrease in the error rate (67.19% to 9.38%). A revision or addition of ICD-10-AM codes may serve to reduce the error rate of this indicator. A set of fifth character codes has been created by the NCCH in category O71 (*Other obstetric trauma*) to differentiate a laceration of uterus from a ruptured uterus. This change will be incorporated into the ICD-10-AM/ACHI Sixth Edition, which will be implemented in Australia in July 2008.

Completeness problems

Completeness problem indicator types seek to identify records with codes that are potentially missing. Completeness of the code(s) assigned is important for data extraction for research and reporting, and for casemix-based funding purposes.

Indicators 101407 (*Delivery without outcome of delivery code*), 100253 (*Delivery, possible, without outcome of delivery code*) identified records with a delivery code ranging from O80 to O82 and/or delivery procedure codes from blocks 1336 to 1340 without a code from the range Z37.0 to Z37.9 (*Outcome of delivery*). The error rates for these two indicators were relatively low: 0.35% for indicator 101407 and 5.51% for indicator 100253. Apart from their effect on DRG assignment, the range of codes from Z37.0 to Z37.9 is used as a flag for the selection of delivery records for research and reporting purposes (AIHW 2006). If any codes from the range Z37.0 to Z37.9 are missing, it will result in some birth records not being identified for analysis. In the 2004-2005 dataset, there were 77671 caesarean deliveries, but only 77370 records were given a code from the range Z37.0 to Z37.9, resulting in 301 (0.4%) caesarean delivery records not extracted for analysis. Data checks using PICQ allow these error records to be identified, thus enabling corrections to be made to specific records before submission to the national morbidity collection.

Some procedure codes are important for the calculation of a DRG. Missing procedure codes could lead to the assignment of an incorrect DRG, which could subsequently impact on the casemix-based funding received by the organisation. For example, the assignment of the single delivery by caesarean section (O82) code without a caesarean code from the block 1340 (*Caesarean section*) resulted in DRG O60B (*Vaginal Delivery W/O Catastrophic or Severe CC*) while the same delivery code with a caesarean procedure code resulted in DRG O01C (*Caesarean Delivery W/O Catastrophic or Severe CC*) (NCCH 2003). Currently, the PICQ 2006 Fourth Edition v.5 has seven indicators that check for missing procedure

codes. These seven indicators are Fatal degree indicators 101385, 101386, 101636, 101642, and Warning degree indicators 101387, 101388, 101389. These indicators serve to identify coded records that require closer examination and possible subsequent correction.

Specificity problems

Apart from the two Relative degree indicators that test the overall level of specificity, in terms of the use of 'other' and 'unspecified' codes, there are eight other indicators that test for the specificity of a particular combination of codes. A lack of specificity in code assignment may suggest a lack of understanding of coding standards on the part of the clinical coders or a lack of appropriate medical record documentation. The overall level of specificity of the obstetric coded records found in the 2004-2005 national morbidity dataset was relatively good. However, in other coding areas where there are problems of specificity, such as the injury area, PICQ results served to identify areas where further research and education is needed. PICQ can be used to determine reasons for the lack of detail and coding specificity. Results obtained can also be used to facilitate discussions between clinical coders and clinicians on the importance of providing detailed information in the medical record, so that more specific codes can be assigned (McKenzie et al. 2006b).

Sequencing problems

The assignment of the correct codes in the correct order is important for many chapters in ICD-10-AM and for the interpretation of the codes. These include the obstetric chapter (Ch 15), the injury chapter (Ch 19), and health services contact chapter (Ch 21). PICQ 2006 Fourth Edition Indicators v.5 currently has seven sequencing problem indicators for Chapters 19 and 10 for Chapter 21; however there is currently only one indicator (100856) for the obstetric chapter. This indicator examines the sequencing of sterilisation and medical abortion codes, and does not provide enough coverage for all issues relating to sequencing for this chapter. According to ACS 1521 and instructions given in ICD-10-AM Chapter 15, an additional diagnosis code from other chapters of ICD-10-AM should be assigned to identify the specific condition if a code from the range O98.0 to O98.6 (*Maternal infectious and parasitic diseases classifiable elsewhere but complicating pregnancy, childbirth and the puerperium*) or the range O99.0 to O99.8 (*Other maternal diseases classifiable elsewhere but complicating pregnancy, childbirth and the puerperium*) is assigned. The additional code should follow immediately after the O98 or O99 codes to reflect the association. Recent analysis of sequencing issues related to the O99 block by the authors demonstrated that this sequencing rule is not followed very closely, thus reducing the usefulness of some of the coded data for research and reporting purposes (manuscript in preparation). The addition of indicators which test for such sequencing would greatly enhance the quality and usefulness of these coded data in the future.

Comparison with another study

A group of researchers at the Victorian Department of Human Services has carried out a similar data quality analysis using PICQ 2006 Fourth Edition Indicators v.5 on their state morbidity dataset for the financial year 2004-2005[2]. The overall Fatal degree and Warning degree error rates were found to be 0.31% and 0.86% respectively. In the current study, while using the national obstetric dataset for the same time period, we have found a higher error rate (1.14% Fatal degree error and 3.78% Warning degree error). This may be due to the fact that our study utilised the national dataset, a much larger dataset which included the Victorian data. In Australia, the national dataset is derived from an accumulation of collected data from the states, thus the higher national error rate could due to the fact that not all states perform checks on their coded data before submission to the national data collection body, the AIHW. In Victoria, PICQ has been used since 2001 at various levels of the data collection and transmission process to monitor and improve the quality of coded data prior to data submission to AIHW (Perry & Shepheard 2007), thus resulting in the relatively low level of overall Fatal degree errors and Warning degree errors. Recent uptake of PICQ by other states, such as the Australian Capital Territory, Queensland, South Australia,

2 Results published at http://www.health.vic.gov.au/hdss/picq/results.htm

Tasmania and Western Australia may lead to an overall improvement of the quality of coded morbidity data. Another point to be noted is that the current study only focused on the obstetric subset of the national dataset, whereas the Victorian study included all diagnoses. Hence, any comparison has to be made with caution.

Conclusions

An evidence-based approach to the issue of data quality is needed as more population-based administrative datasets become available for analysis. PICQ functions as an initial screening tool for the identification of issues relating to ICD-10-AM coding problems. Results generated from the analysis provide an objective measure of the overall quality of data. These can be used at hospitals and health services as well as for research purposes to identify potentially incorrect or inadequately coded records. These results form the baseline for future data quality checks, and can complement hospital coding audit activities. Classification revision and further coder training can also be designed, based on the results from these analyses. The overall data quality of gynaecological and obstetric data found in the 2004-2005 Australian nation morbidity data is of fair quality, given the low level of Fatal degree and Warning degree errors with a 1% threshold.

Acknowledgement:

Data for this project were provided by the Australian Institute of Health and Welfare (AIHW) as part of the work program under the AIHW and NCCH collaboration agreement.

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