

Coding and DRG relationships in stroke and transient ischaemic attack (TIA)

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Abstract

The selection of cohorts from national and state databases in Australia usually relies on patient diagnoses according to International Classification of Disease (ICD) codes and/or Diagnosis Related Groups (DRGs). The aim of this study was to select a specific cohort consisting of stroke and transient ischaemic attack (TIA) episodes, thereby allowing the researcher to examine current process of care using State level hospital admissions datasets. Difficulties in accurately selecting the specified cohort were encountered, due to various interpretations of ICD codes and DRGs as well as the placement of codes to DRGs and different classifications used. These difficulties highlighted several issues regarding the relationships between ICD coding and DRGs in stroke and TIA and are the focus of this paper.

Keywords (MeSH):

Cerebrovascular accident; ischemic attack, transient; International Classification of Diseases; Diagnosis-Related Groups; hospital records; medical records

Introduction

Routinely collected State-wide and national datasets of hospital admissions are increasingly being used for epidemiological, quality of care, benchmarking and cost studies (Roos, Menec & Currie 2004; Scott, Youlden & Coory 2004). The selection of cohorts from these datasets usually relies on Diagnosis Related Groups (DRGs) (Kugler et al. 2000; Evers et al. 2002) and/or the patient diagnoses as classified according to International Classification of Disease (ICD) codes (Ellekjaer et al. 1999; Lee, Somerford & Yau 2003).

DRGs are a means of classifying a variety of diagnoses and procedures ICD codes into groups. One of the three main criteria of a DRG classification system is that the episodes in each DRG are clinically meaningful – that is, the diagnostic cluster should be clinically significant. Therefore, it is not unreasonable to expect that, for instance, a selection of ‘stroke’ and ‘transient ischaemic attack’ (TIA) DRGs, and hence the codes contained within them, would provide all of the relevant admissions from the dataset.

This paper reports the problems encountered in the selection of the cohort for an analysis of stroke and TIA process of care in acute hospitals using multiple year, state-level, hospital admissions datasets. The issues discussed here include discrepancies in how ICD codes are classified to stroke and TIA DRGs; working with several DRG classifications with different axes; and coder variance in the selection of ICD codes and DRGs for stroke and TIA. The latest version of the DRG was checked for amendments that correct some of the reported inconsistencies.

Method

The Victorian Admitted Episodes Dataset (VAED) for the financial years 1999/2000, 2000/2001 and 2001/2002 was the source of the cohort of stroke and TIA for the study. For the purpose of this study stroke syndrome is defined as ‘a symptom complex caused by a disorder of the blood vessels serving the brain, with impaired blood supply and ischaemia...called also stroke, cerebral vascular accident, and cerebrovascular accident’ (O’Toole, 1992: p. 1424). A transient

ischaemic attack is defined as a temporary attack, often a precursor to a stroke (O’Toole 1992).

For this study, stroke and TIA ICD codes and DRGs were selected in consultation with clinicians and coders. As DRGs should represent clinically significant clusters, first the coders were asked to select the relevant ‘stroke’ and ‘TIA’ DRGs. Second, the ICD codes included within these DRGs were reviewed with clinicians for face validity. It was recognised that the first two steps did not provide a complete list and so step three was applied, whereby all relevant stroke and TIA ICD codes were selected in consultation with coders and clinicians. ICD-9-CM codes selected were also mapped to the equivalent ICD-10-AM code. A fourth step was required to determine the DRGs for the codes in step three.

Three DRG versions were used during the study timeframe, namely (v) 3.1 (Commonwealth Department of Health and Family Services 1996), 4.1 (Commonwealth Department of Health and Aged Care 1998) and 4.2 (Commonwealth Department of Health and Aged Care 2000). The AR-DRG v4.1 classifies stroke patients into four DRGs rather than the two found in v3.1 (namely DRG 37 and 38 ‘Cerebrovascular disorder except TIA’). Within version 4.1 the groups include B70A ‘Stroke with severe or complicating diagnosis/procedure’, B70B ‘Stroke with other complication or comorbidity’, B70C ‘Stroke without other complication or comorbidity’ and B70D ‘Stroke died or transferred < 5 days’. DRG 37 of v3.1 has been reclassified into B70A and B70B, and DRG 38 maps to B70C. TIA patients are classified to DRGs 67, 68 and 69 ‘TIA and precerebral

occlusion’ in AN-DRG v3.1; and adjacent DRG B69 ‘TIA and precerebral occlusion’ in AR-DRG v4.1 and v4.2.

The study years covered three coding classifications: the Official National Coding Centre (NCC) Australian version of ICD-9-CM, Second Edition (National Coding Centre 1996); ICD-10-AM, First Edition (National Centre for Classification in Health 1998) and Second Edition (National Centre for Classification in Health 2000).

To relate the ICD and DRG classifications with the datasets, the 1999/2000 dataset reflects ICD-9-CM and AN-DRG v.3.1; the 2000/2001 dataset reflects ICD-10-AM First Edition and AR-DRG v4.1; and the 2001/2002 dataset reflects ICD-10-AM Second Edition and AR-DRG v.4.2.

At the conclusion of the study, the latest version of the DRG (AR-DRG v5.0) was also checked for amendments that would correct some of the reported inconsistencies.

Results

The issues encountered when choosing stroke and TIA codes and the relevant DRGs are listed below.

Codes not representing ‘stroke’ found in AR-DRG v4 and v5.0 stroke DRGs

In the stroke DRGs there were ICD codes not describing stroke, such as ‘Encephalopathy’ (G93.4), ‘Other specified disorders of brain’ (G93.8) and ‘Disorders of brain, unspecified’ (G93.9). Table 1 (below) lists non-stroke codes in stroke DRGs.

Table 1: Non-stroke codes in AR-DRG v4 and v5.0 stroke DRGs

CODE DESCRIPTION (ICD-10-AM)	DRG VERSIONS		
	V4.1	V4.2	V5.0
Other systemic atrophy affecting CNS in neoplastic disease (G13.1)	B70 Stroke	B70 Stroke	B70 Stroke
Transient global amnesia (G45.4)	B70 Stroke	B70 Stroke	B70 Stroke
Encephalopathy unspecified (G93.4)			
Other specified disorders of brain (G93.8)			
Disorders of brain unspecified (G93.9)	B70 Stroke		
Other specified disorders of the CNS (G96.8)			
Diseases of the CNS NOS (G96.9)	B70 Stroke		
Other disorders of the nervous system, not elsewhere classified (G98)	B70 Stroke		
Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction (I66.x)	B70 Stroke	B70 Stroke	B70 Stroke
Cerebral aneurysm, non ruptured (I67.1)			
Cerebral atherosclerosis (I67.2)	B70 Stroke	B70 Stroke	B70 Stroke
Other specified cerebrovascular diseases (I67.8)			
Cerebrovascular disease, unspecified (I67.9)	B70 Stroke	B70 Stroke	B70 Stroke

Codes representing ‘stroke’ in non-stroke AN-DRG v3.1 DRGs

In AN-DRG v3.1, the category ‘Occlusion and stenosis of pre-cerebral arteries’ (433.xx) was classified to non-stroke DRGs (i.e. DRG 67/68/69 which is TIA & Pre-cerebral occlusion). The above code category includes occlusion and stenosis both with and without infarction. This distinction is determined by the 5th digits of ‘0 without mention of cerebral infarction’ or ‘1 with cerebral infarction’.

Stroke ICD code not in AR-DRG v4 stroke DRG

The stroke code ‘Cerebral infarction due to cerebral venous thrombosis, non-pyogenic’ (I63.6) is in a non-stroke DRG in v4 of the grouper.

Other anomalous ICD code placement

The ICD-10-AM code I67.0, ‘Dissection of cerebral arteries, non-ruptured’, whilst not considered to be a ‘stroke’, currently groups to ‘Coronary atherosclerosis’ (i.e. DRG F66).

Code concepts different between ICD-9-CM and ICD-10-AM

Aetiology/manifestation convention (also known as dagger/asterisk codes) did not exist as such in ICD-9-CM. This convention was modified to remove duplication and include, where possible, fifth digit codes in aetiology rubrics, i.e. both concepts were included in one code, rather than two. The aetiology/manifestation convention

was re-introduced in ICD-10-AM. Cerebral artery syndromes (G46.0/1/2) and stroke and lacunar syndromes (G46.3/4/5/6) are examples of such ICD-10-AM additions.

Another complication was that different axes between versions existed, such as the specification of the artery in a cerebral infarction due to occlusion and stenosis of pre-cerebral arteries in ICD-9-CM, but the specification in ICD-10-AM was the cause; see the example of thrombosis or embolism below.

Coding conventions not always reflected in grouper

It was found that several codes that were invalid as principal diagnosis according to coding convention grouped to valid DRGs. Examples are aetiology/manifestation combinations and sequela codes. See Table 2.

Coder groups selected different ICD code ranges

Different coders identified different ICD code ranges for ‘stroke’. Table 3 displays the different ICD code ranges selected by coder groups

Discussion

At first, DRGs were used in selecting ‘stroke’ and ‘TIA’ as DRGs are a patient classification scheme that is said to provide a clinically meaningful way of relating the number and types of patients treated in a hospital to the resources required by the hospital. AN-DRG v3.1 37/38 (‘Cerebrov-

Example of thrombosis or embolism

ICD-9-CM (NCC, 1996):

- 433.0x Occlusion and stenosis of pre-cerebral arteries, basilar artery
- 433.1x Occlusion and stenosis of pre-cerebral arteries, carotid artery
- 433.2x Occlusion and stenosis of pre-cerebral arteries, vertebral artery
- 433.3x Occlusion and stenosis of pre-cerebral arteries, multiple and bilateral artery
- 433.8x Occlusion and stenosis of pre-cerebral arteries, other specified pre-cerebral artery
- 433.9x Occlusion and stenosis of pre-cerebral arteries, unspecified pre-cerebral artery

5th digit:

- 0 without mention of cerebral infarction
- 1 with mention of cerebral infarction

ICD-10-AM (NCCH, 1998; NCCH, 2000):

- I63.0 Cerebral infarction due to thrombosis of pre-cerebral arteries
- I63.1 Cerebral infarction due to embolism of pre-cerebral arteries
- I63.2 Cerebral infarction due to unspecified occlusion or stenosis of pre-cerebral arteries

Table 2: Examples of where coding conventions are not reflected in grouper

CODE DESCRIPTION(ICD-10-AM, ICD-9-CM)	DRG VERSIONS			
	V3.1	V4.1	V4.2	V5.0
Other systemic atrophy affecting CNS in neoplastic disease (G13.1)		B70 Stroke	B70 Stroke	B70 Stroke
Middle cerebral artery syndrome (G46.0)		B69 TIA and precerebral occlusion	B69 TIA and precerebral occlusion	B69 TIA and precerebral occlusion
Anterior cerebral artery syndrome (G46.1)		B70 Stroke	B70 Stroke	B70 Stroke
Posterior cerebral artery syndrome (G46.2)				
Brain stem stroke syndrome (G46.3)				
Cerebellar stroke syndrome (G46.4)				
Pure motor lacunar syndrome (G46.5)				
Pure sensory lacunar syndrome (G46.6)				
Other lacunar syndromes (G46.7)		B70 Stroke	B70 Stroke	B70 Stroke
Other vascular syndromes of brain in cerebrovascular diseases (G46.8)				
Other disorders of the brain in disease classified elsewhere (G94.8)		B70 Stroke	B81 Other disorders of nervous system	B81 Other disorders of nervous system
Other specified disorders of nervous system in diseases classified elsewhere (G99.8)		B70 Stroke	B81 Other disorders of nervous system	B81 Other disorders of nervous system
Cerebral amyloid angiopathy (I68.0)		DRG I66 Other connective tissue disorders	DRG I66 Other connective tissue disorders	DRG I66 Inflammatory musculoskeletal disorders
Cerebral arteritis in infectious and parasitic diseases classified elsewhere (I68.1)		B76 Seizure	B76 Seizure	B76 Seizure
Cerebral arteritis in other diseases classified elsewhere (I68.2)				
Other cerebrovascular disorders in diseases classified elsewhere (I68.8)		B70 Stroke	B70 Stroke	B70 Stroke
Sequelae of cerebrovascular disease (I69.x)	56 Dementia and global disturbances of cerebral function	B63 Dementia & other chronic disturbances of cerebral function	B63 Dementia & other chronic disturbances of cerebral function	B63 Dementia & other chronic disturbances of cerebral function
Late effects of cerebrovascular disease (438)				

Table 3: Selection of ICD code ranges by coder groups

CODE DESCRIPTION(ICD-10-AM, ICD-9-CM)	CODER GROUPS		
	A	B	C
Subarachnoid haemorrhage (I60.x)			
Subarachnoid haemorrhage (430)	Not selected	Not selected	Selected
Other non-traumatic intracranial haemorrhage (I61.x)			
Intracerebral haemorrhage (431)	Not selected	Selected	Selected
Subdural haemorrhage (acute)(non-traumatic) (I62.0)	Not selected	Selected	Selected
Subdural haemorrhage (432.1)Non-traumatic extradural haemorrhage (I62.1)			
Non-traumatic extradural haemorrhage (432.0)			
Intracranial haemorrhage (non-traumatic), unspecified (I62.9)			
Unspecified intracranial haemorrhage (432.9)			
Stroke, not specified as haemorrhage or infarction (I64)	Not selected	Selected	Selected
Acute, but ill-defined, cerebrovascular disease (436)			
Sequelae of cerebrovascular disease (I69.x)	Selected	Selected	Not selected
Late effects of cerebrovascular disease (438)			

ascular disorder except TIA’) were selected as ‘stroke’ DRGs but, whilst most of the codes in these DRGs were in fact strokes, there were other codes which were not strokes. A reviewed article published last year also reports using the DRGs 37/38 as a surrogate for ‘stroke’ (Royle, Callen & Craig 2004). Although it is noted that the present study’s definition of ‘stroke’ is broader than that used by the above study, it is a misconception to believe that these two DRGs would encompass only ‘stroke’ cases. It is of course reasonable that

ICD codes describing cerebrovascular disorders other than stroke are found in DRGs 37/38 due to the title ‘Cerebrovascular disorder except TIA’. After the renaming of the adjacent DRGs to ‘stroke’ in v4.1, there is an expectation that there would be a matched revision of its content, that is, ‘non-stroke’ codes would not be found in a DRG named ‘stroke’. However, it was observed that there still remained several ‘non-stroke’ codes in stroke DRGs in v4.1 and v4.2 (see Table 1) and

this trend continues in v5, the recent version of the grouper.

Despite ICD distinguishing between precerebral occlusions with and without cerebral infarction, all precerebral occlusion codes grouped to AN-DRG v3.1 67/68/69 'TIA and precerebral occlusion'. There would appear to be a 'match' between DRG and code title, however, clinically those with a cerebral infarction are in fact more similar to 'stroke' patients than to those without a cerebral infarction. The classification of the 'with infarction' codes was rectified in AR-DRG v4.

Two other codes were identified which we believe are erroneously placed. First, a code believed to represent a stroke (namely 'Cerebral infarction due to cerebral venous thrombosis, non-pyogenic') is classified to a non-stroke DRG 'Other disorders of the nervous system' in v4. Other 'infarction' codes group to stroke DRGs. Secondly, 'Dissection of cerebral arteries, non-ruptured' groups to DRG F66 Coronary atherosclerosis in AR-DRG v4, that is, out of the nervous system classification. It appears that mapping between ICD editions have caused this anomaly. The ICD-10-AM code for 'Dissection of cerebral arteries, non-ruptured' (I67.0) was mapped back to ICD-9-CM code 459.9 ('Unspecified circulatory disorder') which was felt to be the best match for the purposes of historical mapping, but is by no means an equivalent code. The code 459.9 grouped to DRGs 255/256 Atherosclerosis in v3.1. The descriptor for these DRGs was changed to coronary atherosclerosis in v4 – DRGs F66A and F66B. Many of the anomalies that have arisen between versions 3 and 4 of the grouper have done so via the mapping process. Commonwealth publications, such as Development of the Australian Refined Diagnosis Related Groups (AR-DRG) Classification, Version 4, Volume 1, Summary of changes for the AR-DRG classification Version 4.0 (DHFS, 1998) recognise the difficulty of mapping between the ICD-9-CM and ICD-10-AM coding systems.

Another issue identified in this study was that there were different concepts between classifications which create difficulties for researchers to accurately select the same cohort of patients across both coding and grouping classifications. Whilst mapping tables are available to

assist researchers in understanding the changes between ICD-9-CM and ICD-10-AM, they do not contain an explanation of the reason for particular code choices. Explanatory notes accompanying the mapping tables assist in the general understanding of the process, that is, creating logical maps where the correct DRG outcome was not achieved through historical mapping, however, the mapping process itself can lead to poor code selection in the next ICD edition. It was found that where an ICD-9-CM code existed on one axis and the ICD-10-AM classification did not provide an equivalent code because the axis had changed, term mapping, rather than code mapping or reliance on mapping tables, provided a more correct cohort selection.

Whilst the grouper is not designed to perform as a coding verification system, the authors believe that reflecting basic coding conventions would reinforce good coding practice. Aetiology/manifestation combinations must have the codes assigned in that order, therefore a manifestation or asterisk code should never be sequenced as principal diagnosis, but yet there is provision for these codes as principal diagnosis to group to a valid DRG. Similarly a sequela code should never be sequenced as a principal diagnosis code – nonetheless it was found that the ICD-10-AM code for 'Sequelae of cerebrovascular disease' (I69.x) and the equivalent ICD-9-CM code 438 'Late effects of cerebrovascular disease' group to valid DRGs (see Table 2). Some coding verification is already seen in the grouper in the use of 'error' DRGs and edits such as 'unacceptable principal diagnosis', but expansion is needed to also capture all manifestation and sequelae codes.

The term 'Coders' used here includes those trained as Health Information Managers, those with nosology qualifications or those with 'clinical coder' qualifications, such as that provided by the Health Information Management Association of Australia. However, regardless of their initial qualifications, the selection of different code ranges by different coders may demonstrate the differences in clinical knowledge, training, experience in current and older ICD classifications, understanding of casemix classifications or simply the interpretation of the question raised by the researcher. These are all important issues for both researchers and coders to be aware of – ensuring

that the coder can provide the relevant codes with confidence and ensuring that the researcher has understood the use of the codes supplied.

In this project, the coders were requested to select the codes that describe 'TIA' and 'stroke'. In response, one coder selected all possible options including 'old stroke', as well as providing scenarios of when particular codes would be assigned. From the researcher's point of view, the coders choice just meant 'TIA' and 'stroke' and all codes selected were therefore included in subsequent data analyses. This caused the inclusion of many cases which were not current strokes in the current-stroke-episode cohort selection and hence producing erroneous results.

Similarly, assumptions were made by some coders that v3.1 DRGs such as 37 and 38 (i.e. 'Cerebrovascular disorder except TIA') only contained stroke codes. The subsequent comparison of codes contained in the above DRGs with complete stroke ICD code lists demonstrated that there were problems in DRG-based (i.e. 37 and 38) cohort selection.

In October 2003 during the early stages of the research, the anomalies, as they were discovered, were reported to the Department of Health and Ageing via the Victorian Department of Human Services. As a final step in this study, a review of the v5.0 grouping of many of the above mentioned codes was done. It was very satisfying to note that many of the anomalies had been corrected, presumably as a result of this notification.

As Roberts, Innes and Walker (1998) state, at the time of the release of the ICD-10-AM codes, considerable effort has always been devoted to coding diseases and procedures in hospitals. The accuracy of classification of diseases and procedures in turn determines the success of Casemix funding systems. Since the DRGs aim to represent patients who consume similar resources, are of a similar level of complexity and have a similar length of stay, it is important to have ongoing review of the placement of codes and concepts within the grouper.

Disease and procedure classification systems permits the systematic recording, analysis, interpretation and comparison of morbidity and procedural data collected from different hospitals, states and even countries. Increased accuracy

of the classification system will also increase its usability in multiple areas including health policy development, planning and research.

Conclusion

This study provided several lessons and raised issues of which both researchers and coders need to be aware. Foremost, any selection of cohorts from hospital datasets using ICD codes and/or DRGs, needs to be clearly and carefully defined with feedback from an experienced coder to guide the process. Additionally, it is necessary to consult both coders and clinicians as both perspectives should clarify and confirm the selection. All parties need to be aware of ongoing changes between classifications, as well as the need to examine the inclusions and exclusions of DRGs rather than make assumptions of their contents. The issues raised in this study strongly support the need for an experienced coder, who understands coding conventions, history and background, as well as DRGs, to assist researchers with selection of ICD codes and/or DRGs.

This study helped the authors gain a greater understanding of coding and its relationship to DRGs and their evolution, which would allow a more specific and meaningful cohort selection for future studies. The process that was undertaken to arrive at the final cohort selection highlights the need for ongoing review of the placement of codes and concepts within the grouper.

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