Reporting hospital adverse events using The Alfred Hospital's morbidity data

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Abstract

Hospital morbidity data were analysed to determine their usefulness for reporting adverse events. The entire ICD-10-AM classification system was reviewed in conjunction with the Australian Coding Standards to identify external cause codes and code prefixes associated with adverse events.

For the 50,712 separations registered at The Alfred from July 2000-June 2001, 4,740 external cause codes were associated with adverse events. Place of occurrence code CY92.22 was considered the best indicator of the number of separations associated with adverse events. Approximately 4% of all separations were associated with adverse events occurring during an episode of care.

Results suggest that hospital morbidity data are useful for monitoring adverse events at hospital level. Reliable reporting across the health care industry requires consistent reporting requirements at state and national levels and the adoption of standard code prefixes nationally.

Reporting and using morbidity data

As part of The Alfred's strategy to improve patient adverse event reporting, the Coding and Casemix Services staff analysed the Hospital's morbidity data for the 2000-2001 financial year, to determine their usefulness for monitoring the hospital-wide incidence of adverse events.

Alfred staff replicated part of a national study, the findings of which suggested that routinely collected medical record data have a legitimate place in monitoring patient adverse events (Hargreaves 2000). Bayside Health and The Australian Council for Safety and Quality in Health Care funded the project, which is consistent with the Council's priority of "better using data to identify, learn from and prevent error and systems failure".

Victorian public hospitals first reported coded data to the Department of Human Services in the late 1970s using a clinical classification system. The current version is the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification - ICD-10-AM (National Centre for Classification in Health 2000). The system includes an extensive range of coded data fields based on the Australian Institute of Health and Welfare National Health Data Dictionary (2000), which defines and describes the codes. The data are reported via an electronic patient information reporting system.

From 1993, the data were used to support the Casemix Funding system, which determines and facilitates payment to health services. The State Government forwards this data to the Australian Department of Health and Aging for inclusion in its national database.

As with other health services, The Alfred records, codes and reports a wide range of data to the Department from patient medical records. These processes are well established and were originally intended to support health service research, education and administration. The morbidity data is accessed frequently by clinical units and

individual clinicians for patient safety, education, clinical review and quality monitoring purposes. However, the data remain a potential but relatively untapped source of information at hospital level.

Method

Routinely collected coded data from the Hospital's Patient Information Management database were analysed for the period July 2000-June 2001. The database contains a separate record for every occasion a patient was discharged, transferred or died, or when the care type changed. These occasions of care are referred to as "separations" or "episodes of care" and these terms are used interchangeably in this report. Patients admitted and discharged more than once during the review period had multiple database records.

For the purposes of this report, the definition of "adverse event" is that used by the Australian Council for Safety and Quality in Health Care (2000): "an incident in which harm resulted to a person receiving health care". The study complied with the Australian Coding Standards and Victorian Code Prefixes were used. Unless otherwise stated, definitions were derived from the Victorian Additions to the Australian Coding Standards.

External cause codes for adverse events

To determine the codes specifically associated with adverse events, the entire classification list of diseases in ICD-10-AM was reviewed in conjunction with the Australian Coding Standards (Victorian Department of Human Services 2000). The codes represent the environmental events, circumstances and conditions that caused an injury, poisoning and other adverse effects.

Code prefixes assigned to adverse events

The code prefixes assigned to these codes were also reviewed as they distinguish between conditions arising during an episode of care that was not present on admission (Prefix "C"); present on admission but not treated or investigated during an episode of care (Prefix "A"); and arising from previous episodes of care or other circumstances, and treated or investigated during the episode of care under review (Prefix "P").

The "C" code prefixes denoted conditions resulting from a misadventure, an abnormal reaction to, or later complication of care, or conditions arising during the episodes of care in the study period.

Place of occurrence codes

Place of occurrence codes were of particular importance in the study as they indicate where an adverse event occurred – in a health service, at home or elsewhere. The codes are assigned to all episodes of care in which injuries, misadventures, complications of treatment, adverse effects of drugs and accidental poisoning are treated or investigated in a health service. By analysing place of occurrence codes in conjunction with external cause codes and code prefixes, the study identified adverse events occurring at The Alfred during an episode of care that resulted in harm to patients.

Outcome measures

The study's main outcome measures included the percentage of separations with an adverse event recorded as a diagnosis; an external cause of injury or poisoning; and an adverse event coded as occurring in the hospital.

Limitations and considerations

The study considered the effects and implications of data reporting differences between the hospital and the Department of Human Services, the completeness of instructions for coding with ICD-10-AM, software and other limitations.

Data reporting differences

The morbidity data required by the Department of Human Services are restricted to the first twenty-five diagnosis and procedure codes in the string of codes. Subsequently, the data the Department forwards to the national database are restricted in the same manner.

The Alfred's Patient Information Management database allows an unlimited number of diagnosis and procedure codes to be assigned and, as the study drew information directly from the database, there were no restrictions on the number of codes assigned. The differences in the number of codes in the base data set should be considered in light of the study's findings and their applicability at state and national levels.

Software and data collection limitations

Software limitations affecting adverse event coding included insufficient edit prompts and coder instructions to ensure accurate and consistent coding, some codes with no requirement to include an external cause, and the need to assign additional codes and prefixes to some data to improve coding accuracy and consistency.

These limitations increased the potential for coding errors and required coders to identify solutions to overcome them. The study identified 322 occasions where a disease code was assigned but there was no "forced" requirement for coders to enter an external cause code. This meant that 322 potential adverse events were not assigned an external cause code and were therefore excluded from the study.

With the adoption of the ICD-10-AM classification, the number of codes required to describe external causes of adverse events increased, with additional codes being introduced to describe the place of occurrence and activity. For example, in this study, of 4,740 adverse events, approximately 13% had more than twenty-five diagnosis codes. This has implications for studies done at state and national levels because restrictions on data reporting may result in fewer adverse events being included in state and national databases compared to hospital databases.

Medical record entry content and quality

The usefulness of this study depends on the content and quality of medical record documentation. It is possible that clinical information is omitted from patients' medical records and as such, adverse events are under-reported in the medical record and under-represented in the study.

Patient characteristics and adverse event outcomes

This study was a "first cut" to determine whether adverse events by separation can be reported from the Hospital's morbidity data. It was beyond the brief of the study to report information such as age and gender, the outcome or extent of harm caused to a patient by an adverse event, analysis of systems problems or errors leading to adverse events, and the number of patients who sustained one or more adverse events during the study period. These data can be reported with further analysis and the appropriate software specifications.

Data coding performance

The study outcomes also depend on coder accuracy. The Alfred's Health Information staff regularly conduct coding accuracy audits to monitor and correct coding issues. An audit conducted by the Department of Human Services in 2000-2001 reported The Alfred's coding for hospital activity under Casemix Funding was the most accurate for all Group A hospitals across the state in the nine-year history of external audits. Other health services should review data coding accuracy before replicating this study.

Results

The Alfred registered 50,712 separations for the study period (see Figure 1). Among these, 4,740 external cause codes specific to adverse events were identified (in approximately 9% of separations). Approximately half of these were present on admission and the remainder occurred during the episode of care.

Place of occurrence codes

These codes are assigned to all external cause codes associated with adverse events. The "C" prefix is assigned if the adverse event occurred during the episode of care. Place of occurrence code CY92.22 is the best indicator of the number of episodes of care in which adverse events (in the broadest sense) occurred. Using this indicator, an adverse event occurred during the study period in 1,964 (approximately 4%) of all separations.

Figure 1: Separations with an adverse event by adverse event external cause

Separation date range: July 00-June 01					
Code description			**Separations**		
	'C' prefix.	**% total**	**'P' prefix**	**'A' prefix**	**All**
Misadventures (ICD-10-AM Codes Y60 - Y82)	110	0.22%	20	1	131
Complications (ICD-10-AM Codes Y83 - Y84)	1579	3.11%	1590	51	3220
Adverse drug effects (ICD-10-AM Codes Y40 - Y59)	613	1.21%	643	133	1389
Total by adverse event external cause code (40-Y84)	2302	4.54%	1285	185	4740
Separations with place of occurrence code Y92.22	1964	3.87%	1285	64	3313
Accidental poisoning (ICD-10-AM codes X40 - X49)	16	0.03%	486	4	506
Separations with disease code but no external cause code forced	137	0.27%	149	36	322
Coded separations in period					50712
Uncoded separations in period					0
Separations					50712

C prefix:
Indicates a complication – a condition resulting from misadventure, an abnormal reaction to, or later complication of care, or a condition arising during the episode, not present at the start of the episode.

P prefix:
Indicates conditions treated or investigated and not meeting the definitions for A or C prefixes.

A prefix:
Indicates a condition present on admission but not treated or investigated during this episode of care.

The study also identified the episodes of care in which patients required treatment and/or investigation for an adverse event that occurred during a previous admission (to The Alfred or elsewhere). For all separations during the study period, 1,285 separations had a "P" prefix assigned, indicating a pre-existing adverse event in 2.5% of all separations for the study period. Due to software and coding limitations, Alfred staff were unable to determine the percentage of the P-prefixed adverse events that arose from a previous Alfred admission or from elsewhere.

External causes of injury

The 4,740 external cause codes identified in the study included misadventures, complications and adverse effects of medications during therapy and medication errors. Each separation may have several external cause codes assigned to it, but if each event occurred in the same place, then only one place of occurrence code is assigned. Therefore the number of adverse events by external cause codes will exceed the number of adverse events by place of occurrence codes.

Misadventure external cause codes refer to adverse events occurring during a medical or surgical procedure. For all separations during the study period, 131 had misadventure external cause codes assigned and of these, 110 (0.2% of all separations) were assigned a "C" prefix indicating the adverse event occurred during the episode of

care. Eighty-nine misadventures assigned a "C" prefix (indicating they occurred during the episodes of care for the study period) were attributable to accidental cut, puncture, perforation or haemorrhage during medical or surgical care.

Complication external cause codes refer to a condition that was not present at the time the patient was admitted and may include a condition resulting from a misadventure during surgical or medical care or an abnormal reaction to or later complication of, surgical or medical care. The study included early complications (occurring less than twenty-nine days after the procedure) and late complications (occurring or persistent more than twenty-eight days after the procedure) in our analysis.

For all separations during the study period, we identified 3,220 complication codes. Of these, 2,587 (5% of all separations) had a "C" prefix assigned, indicating the complication occurred during the episode of care. These codes were categorised into "surgical procedures associated with complications" (1,008 separations) and "medical procedures associated with complications" (571 separations).

Adverse drug effects are adverse effects that occur when the correct drug is properly administered and include allergic reaction, hypersensitivity, idiosyncratic reaction and interaction of drugs (when each drug is the correct drug properly administered). This category excludes adverse events resulting from improper or incorrect use of drugs. For all separations during the study period, 1,389 adverse drug effects codes were identified. Of these, 613 (in approximately 1% of all separations) were assigned a "C" prefix indicating the adverse drug effect occurred during the episode of care. Of all drugs and other biological substances used during an episode of care, systemic antibiotics were most commonly associated with adverse drug effects.

Accidental poisoning refers to accidental overdose of a drug, wrong drug given or taken in error, and drug taken inadvertently, accidents using drugs, medicaments and biological substances in medical and surgical procedures. This definition excludes poisoning with suicidal or homicidal intent, intent to harm and undetermined intent. These occurrences are coded separately from adverse drug effects. For all separations in the study period, 506 separations (less than 1% of all separations) had accidental poisoning codes assigned. Of these, sixteen were coded with a "C" prefix, indicating accidental poisoning occurred during an episode of care. These may include drug errors that caused harm to a patient or poisoning due to a combination of prescription drugs and non-prescription drugs. The reasons for accidental poisoning can only be confirmed by further analysis. These codes were excluded from the count for external cause codes directly associated with adverse events due to definitional problems with the term "accidental poisoning".

Conclusions and recommendations

Despite the limitations noted, The Alfred study suggests that the Hospital's routinely collected morbidity data are useful for hospital-wide monitoring of adverse events as a proportion of separations in a given period. One of the clinical governance roles of organisational governance bodies (for example, hospital Boards and area health service Boards) is to maintain patient safety. Receipt of regular reports using this methodology provides high-level retrospective oversight of the crude incidence of adverse events occurring within a hospital. Use of such reports for governance and management purposes is likely to improve the quality and reliability of classification tools and coding, as well as providing a mechanism for tracking the effectiveness of management interventions.

Place of occurrence codes classified as occurring within the health service (CY92.22), when studied in conjunction with the specified external cause codes assigned a "C" prefix, provide the best indicator of the number of separations associated with the occurrence of hospital-based adverse events. The Alfred study suggests that approximately 4% of all separations during the study period were associated with adverse events occurring during a hospital stay and resulting in harm to patients.

Further refinement and enhancement of the ICD-10-AM classification system and changes to state and national-level reporting requirements will improve the usefulness of morbidity data for monitoring adverse events at hospital, state and national levels. It is possible to establish a regular hospital adverse event report incorporating additional data requirements including a range of patient characteristics, the nature of adverse events and patient outcomes. Health services and others considering replicating this study should consider the

limitations included in this report, in particular the quality of current coding and the state-level data reporting restrictions. We recommend these changes to the ICD-10-AM classification system, library files and state reporting requirements:

- include instructions to code external causes for all relevant codes;
- establish "forced" coding for external causes when applicable, or provide coding warnings;
- differentiate place of occurrence codes (those for the health service under review and those for elsewhere);
- adopt code prefixes nationally to standardise reporting of adverse events occurrence (P: present on admission and C: occurring during an episode of care); and
- remove the restrictions on the number of diagnosis and procedure codes reported to the State Government and the national database.

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