Clinical coding audits: an annotated bibliography

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Introduction
The accuracy of clinical morbidity coding is vitally important for all groups who use the resulting databases for the purposes of health services research, allocation of funding, evaluation of health services and clinical interventions, and health services planning (Cornes 1999; Roberts et al 2002). A variety of quality improvement techniques are used to assess the accuracy of clinical morbidity coding, and to introduce changes such as coder and clinician education, clinical documentation, software edits, and coding standards, all of which aim to address issues identified in the accuracy assessment process. Audits are performed by various organisations including health authorities and other funders (such as insurance companies, the Department of Veterans’ Affairs, Transport Accident Commissions), research groups, individual health services, and other agencies with a vested interest in coded data quality (such as the National Centre for Classification in Health, and the Australian Institute of Health and Welfare). These audits include statistical analysis of morbidity databases, using products such as Performance Indicators for Coding Quality, to identify compliance with coding standards, and medical record recoding audits which also assess code selection and sequencing based on medical record content (Reid et al 1999; O’Connell & Perry 2003).

The aim of this project was to identify literature relevant to recoding audits of clinical morbidity data which had been published since the annotated bibliography on data quality was prepared by Chicco in 1997.

Methodology
An extensive search for publications on coding quality was undertaken, searching combinations of the terms clinical, coding, ICD, morbidity, data, accuracy, quality, error, and audit. The search involved the online databases of Medline, CINAHL, and PubMed. Google (advanced search) and manual searches of 11 health care journals were also undertaken, in addition to checking the reference lists of identified articles and proceedings of relevant conferences. The search identified 129 published documents related to morbidity coding accuracy for the period January 1997 – April 2004.

Thirty-two of these publications, with a focus on audit methodology or results of morbidity recoding studies, were selected for inclusion in this annotated bibliography. All identified Australian reports have been included, together with a selection of general and condition-specific international recoding studies. Where the same study was reported in more than one publication, only one of these has been included in the annotated bibliography. The articles are presented in alphabetical order by authors’ name.

The common threads of the articles in this bibliography are the quantification of coding differences (or errors) through the process of medical record recoding, the identification of the causes of coding error, and the proposal of strategies for improving coding quality.

Discussion
Stated aims vary for each audit, but they generally include assessment of the reliability of coded data for the purposes of funding, evaluation and the planning of health services, in addition to monitoring the health of the population.

This article provides an overview of the methodologies and results of a variety of clinical coding audits, using a methodology that involved recoding medical records. The selection includes audits that have been conducted by auditors who were both internal and external to the organisation that performed the coding function. Some of the audits have sampled the full range of diagnoses and procedures; others focus on a specific specialty area. The terminology used to describe coding accuracy varies between articles, including terms such as inconsistency, error and variation.

The definition of coding inconsistency, and the calculation and description of error, varies between articles and is sometimes not clearly specified. Care should be taken in comparing the results of these audits because of the variations in audit methodology and classification systems, and the terminology, definition and measurement of coding difference.

Annotated Bibliography

A recoding audit, focusing on the coding of burns, was conducted in two New South Wales public acute hospitals in 1994 – 1996. A stratified random sample of 300 separations was selected. The aims of the research were to assess compliance with the Australian Coding Standards (ACS), assess the impact of clinical documentation on code allocation, and to identify the change in Diagnosis Related Group (DRG) allocation after recoding. Coding errors were identified in 89% of cases, although there was substantial compliance with ACS. After recoding, DRG allocation changed in 9% of cases. Several documentation issues were noted, including variation between multiple burns charts; variation between burns charts and narrative descriptions; and lack of specific documentation regarding site, thickness and extent. In 46% of cases with an error in the coding of site or thickness of burn the clinical
documentation was noted to be inconsistent or unclear. Other factors that may have impacted on the error rate were the clinical complexity and relative rarity of burns cases. In addition to recommendations on coding standards and coding practice, the authors suggested that documentation could be improved by the implementation of standardised burns charts and clinical terminology, and education of clinicians on the importance of detailed and consistent documentation.


The focus of the introduction of this article is the financial consequences of incorrect code, and therefore incorrect DRG, allocation. The author then describes an ideal coding compliance program, comprising five components, which enhances coding quality to avoid false claims. The detection component proposes computer software to audit 100% of cases for clinical consistency, compliance with data submission requirements, and unusual resource matches (such as short length of stay matched to acute myocardial infarction or assisted ventilation). The correction component involves recoding records with potential non-compliance identified by the detection software, with correction of codes as appropriate. The prevention component evolves from the reports of the detection software that provide a text description to explain the reason for the potential non-compliance. The verification component involves the development of a coding compliance database to track code-error detection and code amendments, providing both an audit trail and a basis for error analysis. Comparison is the final component of the proposed program and includes review of coding practice, using the coding compliance database, to monitor performance within the organisation and to be used as the basis of benchmarking with other agencies. The proposed program has the potential of being labour intensive, but would increase coding effectiveness and efficiency in the long term. The article also discusses the advantages and disadvantages of coder self-audit compared to audit by an independent auditor.


The author describes several programs that are designed to improve the quality of reported coded data. These include a state health authority system of computer edits, a hospital association recoding audit, and a concurrent coding project. The first program described is a set of software edits used by the State of California to check all coded data submitted by hospitals for completeness and compliance with published coding rules, conventions and guidelines. Errors are then provided to hospitals so that data can be checked and resubmitted to correct the identified errors. The second program, conducted by the New Jersey Hospital Association, has been reviewing coded data for 25 years. Results of a large 1996 audit involved the identification of coding errors using specialised software. The most common error types identified were omission of comorbidity and complication codes for recorded conditions, unclear or insufficient physician documentation, and incorrect selection or sequencing of principal diagnosis. The third program to be described involves daily review of current inpatient records by a health information manager to identify the potential DRG allocation, and inadequate documentation, such as conditions that have been treated but not formally documented. As a result, the Health Information Manager works closely with the case manager and clinicians during the inpatient stay to improve the content of the medical records and clinician understanding of the impact on DRG allocation.


This article describes key elements of a process for conducting internal coding audits and monitoring coding for potential non-compliance with coding standards. The author recommends that the audit process be formally documented and reported, and that it becomes a regular component of the function of the Health Information Service. Criteria for selection of auditors are specified as competence, experience, knowledge of reimbursement systems, and involvement in continuing education activities. A variety of record-sampling strategies are described. The article lists common coding errors and causes and makes recommendations for analysis, reporting, and corrective action.

A variety of activities were implemented in an Australian public metropolitan teaching hospital to demonstrate the application of a Continuous Quality Improvement Model (CQIM) to several aspects of the coding function. One of these activities involved an internal recoding audit, using a sample of 50 surgical discharges, to measure coding accuracy before and after the introduction of the CQIM. The number and source of coding errors was analysed to identify areas in which improvements could be achieved. Results indicated a substantial improvement in coding quality in the second audit, although the authors note that the sample size and other confounding factors may have had an impact on this outcome. The authors recommended that CQIM, including coding audit activities, could be an effective process for achieving improvements in the coding function.


This article reviews the published results of 21 recoding audits performed in England, Northern Ireland, Scotland and Wales during the period 1975-1998. Sample sizes varied from 19 to 9,416 records, and many of the audits were focused on specific conditions or procedures. The larger audits were conducted on Scottish Morbidity Record (SMR) data. Coding accuracy rates for diagnoses, using the *International Classification of Diseases* (ICD), and procedures, using the *Classification of Surgical Procedures and Operations* (OPCS), varied from 53% to 100%. Several confounding factors which make it difficult to compare accuracy measures and rates are identified, including auditors having access to additional information added to the record post-discharge changes in classification systems and changes in coder training and support systems. The authors suggest the need for additional and more extensive audits and research into methods of improving coding accuracy.


This American recoding audit focused on 40 randomly selected records of patients who had undergone spinal surgery. Although the accuracy of individual codes was identified as 95%, overall the researchers found that in 70% of cases lacking or inaccurate data were reported. One of the major causes of this inaccuracy was surgeon documentation where not all procedures performed had been recorded in the medical record, or procedures were recorded sequentially (ie, in order of completion) rather than in order of significance or severity. The availability of *International Classification of diseases, 9th revision, Clinical Modification* (ICD-9-CM) codes to adequately describe the procedures was also criticised. Although this was a small study, it clearly demonstrated the importance of clinical documentation. The authors concluded that education of physicians and coders was an essential factor in improving coding quality for purposes such as resource allocation.


This annotated bibliography comprises commentaries on 66 publications relating to the quality of coded clinical data, published during the period 1978-1997. Fourteen of the items contain information about recoding audits.


The study reported in this article highlighted the impact of clinical documentation on accurate code allocation. The research team recoded 100 records of trauma patients admitted over a two-month period in 2000 from the trauma centre of a metropolitan hospital. The recoding process included a review of the Trauma Case Manager Record for these patients, resulting in additional codes for 74% of records, based on the additional information from this source. Recoding changed the DRG allocation in 28% of cases. Involvement of nursing case managers to review documentation and coding, in addition to managing patients with complex conditions, is proposed as a method of improving coding accuracy, funding, and patient care.


This article reports the methodology and results of a recoding audit conducted at two large, acute health services in England where records had been coded using the ICD and OPCS. A stratified random sample of 1,607 episodes was selected for general conditions and four specific diagnosis groups (asthma, diabetes, fractured femur, and appendicitis with appendicectomy). Records were recoded, blind, by external auditors who were experienced clinical coders. Accuracy measures identified “exact” and “approximate” (to three-digit code level) matches for the principal diagnosis and procedure codes. Results were also analysed to assess difference in DRG allocation. The lowest rate of exact code match was with coding of diabetes as the principal condition. The agreement for exact match of principal diagnosis codes varied from 6% to 65%. Categories of disagreements over codes included difference in selection of principal diagnosis, coding of symptoms, specificity of code selection, incorrect diagnosis selection, and omitted codes for secondary codes and co-morbidities. The researchers queried the validity of code selection by the external auditors, and whether they may have accessed material added to the medical record after the original coding had been performed. The authors also commented on the impact of poor medical record documentation on code accuracy and the responsibility of clinicians in this re-
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Concurrent auditing, or checking coding accuracy prior to reporting for reimbursement purposes, is recommended as best practice by the author. This concurrent process may be achieved by use of editing software that identifies records that should be reviewed and recoded as appropriate. Trending is described as an important complementary retrospective coding audit process. This can be achieved by comparing activity at 6- or 12-month intervals to identify changes in diagnostic or coding practice. As an example, changes in code allocation over a 12-month period are presented for the diagnoses of transient ischaemic attack and cerebrovascular accident, with an analysis of number of patients and average length of stay. Retrospective review of cases coded to "other specified" codes is also recommended.


The American Office of the Inspector General (OIG) recommends that health care agencies perform regular internal coding audits; however, the author of this article claims that their guidelines do not provide adequate advice on methodology. This article attempts to meet this need by briefly discussing the methodological issues of sample size, sample selection, and audit frequency.


The author emphasises the potential financial impact of inaccurate DRG allocation; over-coding may result in penalties and fines in the US healthcare environment, and under-coding may result in less than optimal reimbursement. The process of assessing coding compliance is described, including policy development and implementation, medical record review, claims review, and staff interviews to review education and resource needs. Instructions for conducting coding audits, including sample worksheets, are provided. Feedback of results, staff training, and on-going monitoring processes are described as key components of the coding compliance program.


This paper describes the Australian Coding Benchmark Audit (ACBA) as a tool for uniformly undertaking re-coding audits and recording and analysing the results. ACBA classifies the type and cause of errors and distinguishes “coder errors” from “system errors” to facilitate the development of quality management activities to improve coding accuracy. Issues of auditor selection and frequency of coding audits are discussed. Tools for recording and analysing audit results, and reporting these for internal feedback and external benchmarking purposes, are described.


The importance of careful selection of external coding consultants and auditors is discussed in this article. The author presents an extensive list of criteria for the selection of auditing companies that could also be applied to individual coding consultants. Criteria relating to the auditors include auditor experience, appropriate education, involvement in continuing education activities, provision of references, and fee structure. Other auditor selection criteria are based on processes used by the auditor, such as use of appropriate standards; review of all coding errors, not only those which impact on DRG assignment; and providing documented justification for coding discrepancies by referring to published standards.


This article describes a process of developing a coding compliance program in 13 steps. Several of the steps relate to the planning, conduct and follow-up of coding audit procedures. Audit issues discussed by the author are determination of audit focus, timing of audit (concurrent or retrospective), sample selection, sample size, selection of auditor (internal or external), review of results by a committee, and development of strategies to improve identified coding problems.


The focus of this Tasmanian audit was at the District Hospital level, where the practice was for front sheets from medical records to be sent to a major acute care hospital for coding. Eight of the 16 District Hospitals were included in the audit of 172 episodes of care; the auditors recoded at these hospitals using the medical records. A change in principal diagnosis was noted in 29.65% of episodes, and a change of DRG allocation resulted in 29.91% of episodes. The most common types of errors were attributed to front sheet documentation issues, including principal diagnosis not in accordance with ACS, additional diagnoses and procedures not recorded, and less specific information than recorded elsewhere in the medical record. Issues with identification of qualified or unqualified newborns were also noted. As a result of the study it was recommended that qualified coders visit the District Hospitals to code, on site, from the entire medical record, and that a range of clinician education activities be introduced to increase awareness of documentation requirements.

gard. Recommendations were made for regular audits of medical record content, in addition to coding audits.


The focus of this review was the records of 1109 day-procedure patients treated in a urology department over a one–year period in 1999–2000. The study compared the content of the two databases maintained by the Urology Department and the English hospital in which it was located. In addition to coding variance and coding errors, the researchers identified a large discrepancy between the number of patients in the databases; 480 of the cases in the departmental database were not present in the hospital database. The cause of coding errors was identified as lack of coder knowledge of surgical procedures, coder reluctance to code more than one procedure, and poor clinical documentation. Interestingly, the recommendations to reduce future error include the suggestion that coders code from the discharge summary instead of reading the medical record.


The results of an American Association of Health Information Management (AHIMA) survey on productivity measures used in United States health care agencies are presented in this article. Survey respondents self-reported coding error rates based on performance measures of the number of claims for reimbursement returned (due to missing support documentation, coding errors, or wrong DRG assignment). 87% of respondents indicated that less than 5% of their records had significant coding error.


In this article the authors provide an extensive description of the compliance programs introduced for health care agencies in the United States to improve coding quality through reductions in false or excessive claims for reimbursement. The authors also report on a national survey of over 16,000 health information managers who identified the extent of external audits conducted by the Health Care Financing Administration (HCFA) or State authorities in the previous two-year period. 13.2% of respondents indicated an incidence of recent state audit or investigation, with medium-sized inpatient facilities most likely to be targeted. HCFA audits were reported by 16.1% of respondents, with medium– large-sized inpatient facilities most likely to be targeted. In conclusion, the authors emphasise the importance of internal compliance programs in relation to coding quality.


The authors conducted a secondary analysis of data collected in the process of a 1993-1994 recoding audit of 7,013 records from 63 Victorian hospitals. The purpose of the analysis was to identify the validity of data in the Victorian Inpatient Minimum Database (VIMD) for epidemiological studies, disease surveillance, and other research purposes. The analysis identified a change in DRG assignment in 13.6% of separations, and a change of principal diagnosis in 22% of separations. Higher rates of coding discrepancy were found in rarer DRGs, medical DRGs, complex cases with a large number of codes, and rural hospitals. In conclusion, the authors stated that the VIMD was a reliable and relatively accurate source of data for epidemiological studies, where researchers were aware of the strengths and limitations of the data.


This article reports the results of a coding validation study of 546 Victorian public hospital separations in 1994–1995 with a principal diagnosis code of 800–999 and a cause-of-injury code. Following the recoding process, error rates for both principal diagnosis and cause of injury were calculated, and grouped as omission of code, superfluous code, discrepancy of allocated code, and change in code sequence. 94% of code discrepancy in the principal diagnosis code related to different selection of codes within the same group of codes, and approximately half of these were minor changes at the level of the last two digits. The Victorian coding error rates for complications of medical and surgical care were noted to be low in compari-
son to previous studies. The authors described the overall discrepancy rate as "low" for principal diagnosis and cause-of-injury codes, but noted a higher rate for omission of other codes. The researchers concluded that the morbidity data collection is a feasible, comprehensive and reliable base for injury surveillance data.


This paper presents an overview of the objectives, methodology and results of audits conducted on data submitted to the VIMD for the period 1998–1999. The audit involved recoding a sample of 7,004 records from 50 hospitals, in addition to checking several administrative and demographic data items which may impact on DRG allocation. The auditors also reported on coding infrastructure issues which may impact on coding accuracy and timeliness of reporting to the Department of Human Services. Results were analysed to enable comparisons between Major Diagnostic Categories, hospital groups, and between metropolitan and rural locations. 13.05% of cases recoded resulted in a change of DRG. Reasons for differences in coding were identified, and the categories which had the highest rates of coding inconsistency were "incorrect code assigned for the condition/procedure", 24%; and "hospital's code not necessary or not justified by documentation", 20%. The paper concludes with an extensive list of recommendations.


The aim of this project was to identify the coding accuracy of patients treated for endophthalmitis in Western Australian hospitals for the extensive period 1980–1998. In addition to recoding cases from the Hospital Morbidity Data System (HMDS), other sources, including surgeons’ logbooks and microbiology and anaesthetic databases, were compared to the HMDS. These supplementary sources identified cases which had been omitted from the HMDS, or which were present but not coded as endophthalmitis. Incorrect coding was attributed to misunderstanding of eye infections, and the misleading structure and index of 1980s editions of coding books. Coding accuracy was noted as having improved since the 1980s, and this was attributed to coder education and improvements in classification systems.


This paper describes the Department of Health (Western Australia) program of recoding audits conducted at eight hospitals in the period 1998 to 2001. An initial random sample of 1,152 records was audited, followed by a targeted audit of 542 records focusing on DRGs identified as having high error rates in the random audit. Results of these audits indicated the four major types of error to be principal diagnosis, omissions (undercoding), failure to follow index (coding conventions), and overcoding of additional diagnosis. The author discusses problems with the coding of principal diagnosis and additional diagnoses, which were commonly related to misinterpretation of the relevant coding standards ACS0001 and ACS0002. Disparate diabetes coding practice prior to the introduction of the third edition changes is also noted. The value of targeted audits, and subsequent targeted coder educational activities, is discussed.


A three-stage coding audit program has been developed by Northwestern Health, a network of Victorian metropolitan public hospitals. Primary audits comprise several auditing techniques, including review of 100% of cases where there is a high financial risk to the hospital (eg, high-cost procedures, ventilation and outliers) and recoding of a sample of cases from a specialty for educational purposes, including "round table" comparisons. Secondary audits use the ACBA methodology, sampling 5% of separations for three months of the year. Tertiary audits are those conducted by external funding agencies, including private health insurance companies and the DHS. The process of reporting results and implementation of recommendations following each audit are discussed. The outcomes of this comprehensive auditing program are identified as improved data integrity, staffing flexibility across the network, support for coders previously isolated in smaller hospitals, and enhancement of the profile of the clinical coder.


This article describes five levels of activity that comprise the program used by an American hospital to optimise clinical coding accuracy. The fourth, review, level involves quarterly internal coding audits, conducted by senior coding staff, on a stratified sample of 10% of records for each coder. The audit checks for accuracy of abstraction, code selection, code sequencing, and DRG assignment. A weighted scoring system is used based on the type and impact of coding error. A higher weighting is applied where the coding error impacts on DRG allocation. Coders are expected to maintain a minimum of 93% accuracy. A review of coders with high error rates is conducted one month following discussion and coder education, and coders face disciplinary action, including dismissal, if minimum accuracy rates are not maintained.

The accuracy of coded data submitted to the Western Australian Hospital Morbidity Data System in 1996–1997 was measured in a recoding audit of two public and five private hospitals. A sample of 1,050 cases was selected randomly, although some cases of high complexity were also included. Records were recoded “blind” by external auditors and code differences were discussed with the original coders, and checked by the senior auditor. Coder characteristics, including scope and length of experience, were noted by the auditors.

Inaccurate coding was analysed to identify an overall 13.2% change of DRG assignment, with individual hospital accuracy results ranging from 82% to 94.5%. Four major types of coding problem were identified: incorrect abstraction, 36%; inaccurate code assignment, 33%; non-application of the ACS, 14%; and poor documentation, 7%. There is substantial discussion on the cause of the coding problems, including incomplete clinical documentation, and inadequate coder knowledge of ACS changes.


The authors describe the responsibilities of the position of Coding Quality Analyst at an American hospital. This includes the development, in conjunction with coding staff, of an annual plan of monthly coding audit activities. These audits are focused on cases which are either high risk (impact on reimbursement), high volume, and special interest (such as new procedures). A database of audit results includes individual coder performance and is used to identify education needs and other strategies for improving coding accuracy. In addition to monthly audits conducted by the Coding Quality Analyst, external auditors are used to validate the hospital’s review processes.


This paper provides an analysis of results of 47 ACBA audits conducted in 30 Australian hospitals over a 12-month period, and submitted to the NCCH for benchmarking purposes. The 12-month time period and the sample size (3,912 medical records) was noted to be too small for meaningful trend analysis of error rates; however, it is noted that this standardised audit method has significant potential for tracking improvements over time, and for individual hospitals to benchmark their performance to nationally reported results. Hospitals also provided useful feedback on the auditing process to NCCH for consideration in further development of the ACBA tool.

Additional references


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Additional references


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