Predicting the influence of the electronic health record on clinical coding practice in hospitals

Kerin Robinson and Jennie Shepheard

Abstract

The key drivers of change to clinical coding practice are identified and examined, and a major shift is predicted. The traditional purposes of the coding function have been the provision of data for research and epidemiology, in morbidity data reporting and, latterly, for casemix-based funding. It is contended that, as the development of electronic health records progresses, the need for an embedded nomenclature will force major change in clinical coding practice. Clinical coders must become expert in information technology and analysis, change their work practices, and become an integral part of the clinical team.

Keywords: *electronic health records; clinical coding; health information management; nomenclature; clinical terminologies; health classification*

Introduction

This paper explores the shift in the functions and responsibilities of clinical coders over a period in time, starting with a review of the last two decades of the 20th century and moving forward to identify drivers and to predict key changes that are likely to occur during the first two decades of the 21st century, within the context of the emerging electronic health record.

The boundaries in health care are shifting and the electronic health record will facilitate linkage between primary, secondary and tertiary health care services unlike anything experienced so far, bringing vast opportunities for clinical coders as they map and code clinical diagnoses and events in the extended continuum of care. To date, clinical coders have operated primarily in hospitals, with some notable exceptions (including, for example, mortality coding, pathology coding, and general practice coding). The following discussion focuses, by way of example, on hospital-based clinical coding; however, the effects of the electronic health record will be similar for clinical coders and coding practice across all areas of the health sector.

Historically, the primary purposes of the clinical coding function were twofold, namely to

- provide current and comprehensive disease and operation indices for use in research by individual clinicians, for example within the treating healthcare facility or practice, and by epidemiologists and other researchers external to the treating facility; and
- meet reporting accountabilities, for instance to health departments, especially for morbidity data collections.

There is no reason why these will not continue to be important in the foreseeable future.

A third purpose, to use coded data as the clinical information foundation of casemix-based funding, emerged in the 1990s, driven by the imperatives of healthcare payment reforms, especially in some states.

The importance of these functions will continue, and clinical coders will face additional challenges, such as learning to operate competently and confidently in the information technology (IT) environment, to undertake analysis of coded data, and to become an acknowledged and legitimate part of the clinical team.

Problems for coding and coders

In many Australian hospitals in the 1980s, neither the quality nor the continuity of the coded data was questioned closely. There was an implied assumption, on the part of the individuals who performed the clinical coding function, that those who used coded data in clinical or epidemiological research in monitoring of disease status at state and national levels, as well as in health service planning, knew and accounted for any inherent peculiarities and inconsistencies.

One of the most problematic issues with respect to the continuity and consistency of retrievable data arose in the frequently imposed changes from one classification system to another.

Another key problem was the lack of uniformity of coding in the private hospital sector; this was due in part to the fact that, up until the time when various state departments of health mandated the regular reporting of coded hospital episode data, little coding was done in the private sector and, where it was attempted, it was undertaken generally by untrained personnel.

Poor medical record documentation

There are differences in the casemix of private and public hospitals in Australia and this becomes evident when the 20 most frequent Diagnosis Related Groups (DRGs) in both sectors are compared (Bloom 2002). Private hospitals account for 48.1% of all surgical procedures and the majority of services provided in specific sub-specialties, such as rehabilitation, some branches of orthopaedics, same-day colonoscopies, and alcohol and sleep disorders (Bloom 2002). Whether or not this makes any meaningful difference to the level and type of technical coding is beyond the scope of this paper; however, a different casemix in itself can neither compensate for nor justify the problem of poor clinical documentation faced by private sector coders.

One of the impediments to coding in this sector is a paucity of clinical information entered by doctors in inpatient medical records. This means that coders in many hospitals cannot abstract effectively from the full record and would not expect to find much clinical documentation of substance to support the final diagnosis (or diagnoses) recorded on the front sheet. The

impact on clinical coding of poor documentation practices has been reported elsewhere and is evident also in the public sector (Donoghue 1992; Chisholm et al 1994; HIMAA 1995; Callen et al 1997; McKenzie et al 2003; Cameron & Robinson 2004). The public sector, however, has the advantage of junior medical staff who have clearly defined clinical documentation responsibilities.

The initial Australian Coder Workforce Study of 1994 (HIMAA 1995) and the recent Australian Coder Workforce Study of 2002 (McKenzie et al 2003) revealed a pattern of deficiencies. Whilst the findings of the 2002 study indicated an improvement on those of the earlier study, the former revealed that approximately three-quarters of health information managers and coders identified incomplete medical record content as being the factor that exerted the most negative impact on their ability to cod. This was followed closely by related deficiencies, specifically principal diagnosis not identified, complications and comorbidities not identified, and illegible medical record content (HIMAA 1995; McKenzie et al 2003). Cameron and Robinson (2004) reported that Victorian clinical coders identified several impediments to accurate coding, including identification of principal diagnosis, identification of complications and associated conditions, incomplete medical record content, and illegibility and ambiguity of medical record entries.

Other studies have identified similar problems faced by clinical coders, such as in the identification of principal and associated diagnoses, inconsistent or unclear documentation, and ambiguity of medical record content (Chisholm et al 1994; Donoghue 1992; Callen et al 1997).

One of the arguments in support of the electronic medical record is that it has the potential to reduce or eliminate at least some of these problems, the first and most obvious being illegibility and ambiguity of medical record entries.

Drivers of change in clinical coding practice

In the 1980s, the term *clinical coder* was not used in Australasia, nor was there a high demand for the services of specialist coders. Health information managers undertook coding as part of their professional role. In many small, remote public hospitals, and in private hospitals, untrained clerks coded at a basic level. Whilst there was a clear responsibility for completion of the coding, there was little real accountability for the quality of the coded data other than via the application of edits in the indexing software, which identified gross errors.

There are several identifiable changes in the Australian health care system that affected clinical coding directly and indirectly in the latter decades of the 20th century. Some of these are discussed below.

Health system payment reform

The introduction of health system reforms, such as the improvement of technical efficiency in hospitals through payment reform, has been responsible for key changes. This was effected through the introduction of casemix-based funding systems for public hospitals in some states in the early to mid-1990s (Duckett, in Bloom 2000). Casemix data, underpinned by clinical coding, are also used increasingly to plan and purchase health care, to compare the relative efficiency of health services, to project workforce demand, and to predict patterns of health service utilisation (Eagar, Garrett & Lin 2001).

Casemix-based funding has been an important driver of change in clinical coding and has raised the profile of coders whilst simultaneously creating a high degree of accountability for coding accuracy, and increased levels of coder productivity and efficiency not seen previously. In one pre-casemix study, workforce demand for health information managers and nosologists (as coders were known then) was predicted to increase, based on the projected importance and volume of coding once it became linked to funding (Robinson et al 1994).

A national focus on classification

Australia's National Centre for Classification in Health (NCCH) was established in 1997. Its predecessors, the National Coding Centre and the National Reference Centre for Classification in Health, were established in 1994 and 1992, respectively (Roberts, Robinson & Williamson, in Gardner & Barraclough 2002). The NCCH has played a pivotal role in the development and regular updating and refinement of the Australian modification of the World Health Organization's *International Classification of Diseases: The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM), third edition* (NCCH 2002).

The NCCH is responsible also for the standardisation of coding practice and rules at a national level. This has driven what might be seen as a professional–cultural change in coders' practice, knowledge, and currency. Previously, coders updated only when a new classification system or version was introduced. In order to code correctly, they are now required to keep up to date not only with new clinical developments and technologies, but also with the incremental changes to the classification and to the Australian Coding Standards that reflect these developments.

Hospital accreditation

In the past two decades, there has been an increasing nationwide focus on hospital accreditation, which, ostensibly through requirements for audits and other quality management practices, has contributed to an improvement in the quantity and quality of clinical documentation in hospital medical records. Logically, this would be expected to have the effect of supporting improved coding practice.

Quality management in healthcare

The application of industrial total quality management to the healthcare sector during the 1990s contributed to improved health information systems and documentation which have supported more sophisticated and reliable coding and an associated focus on quality-

related activities in the field of clinical coding. This has been effected through the impetus of accreditation as well as via sporadic efforts of senior staff in hospitals to improve the quality of care and service provision.

The establishment in 2000 of the Australian Council for Quality and Safety in Healthcare saw the development, as a key national priority, of the better use of data to identify, learn from, and prevent error and system failure. Coded data are necessary to identify the incidence and pattern of adverse events at hospital level and, through the state administrative (coded) datasets, at state and national levels (Duckett 2003). The added value of an accurate, coded hospital dataset for use in statistical comparison of mortality rates, at hospital and national levels, is evident when the operative mortality experience at the Bristol Royal Infirmary is considered (Bolsin 2003). This is reinforced in the recommendations of the subsequent British National Health Service Inquiry (Sweeting 2003).

Acuity of private hospital casemix

There was an increase in the complexity and acuity of private hospital casemix during the late 1980s and into the 1990s. This was supported by changes in private insurance payment systems; for example, the introduction of graded theatre fees, differential bed-day charges for advanced surgery, and fees for intensive care allowed for differential payments between hospitals according to their level of infrastructure and case complexity (Foley, in Bloom 2000). The net effect, over time, has been that private hospitals have been required to produce coded data, which has demanded increasingly more rigorous standards of clinical coding in order to meet the documentation and substantiation requirements of the health insurance funds.

Evidence-based medicine

There has been an increasing emphasis on evidence-based medicine in particular and, to a lesser extent, on evidence-based health care in general. This requires, among other things, sound information and good access to comparative morbidity and mortality data starting at the level of the clinician–patient interaction and finishing in the conduct and reporting of clinical trials (Frommer & Rubin, in Bloom 2000), and in the development and use of evidence-based clinical practice guidelines.

The development of practice guidelines by expert bodies is supported by the National Health and Medical Research Council (NHMRC) under the National Health and Medical Research Council Act 1992 through an approval process and the application of specific requirements and standards (NHMRC 2003).

The *new public health*

There has been a focus on *the new public health*, one of the three main components of which is known as *public health intelligence*. This has been described as the *gathering and analysis of information about health, the causes of ill health, and the patterns and trends of health and ill health in populations* (Lin & King, in Bloom 2000: 252).

Coding that is accurate and longitudinally consistent is needed for population-based health information, which, in turn, supports decision-making in public health policy, planning and practice.

Drivers of future change

Some reforms and changes are inevitable. Other changes that will impact upon clinical coding will mirror shifts in health policy driven by political, structural and economic influences; some of these will reflect international trends and it would be reckless to predict them far ahead. However, it is feasible to forecast some likely drivers of change that will affect clinical coding and the role of the coder.

The electronic health record

The development of an electronic health record (EHR) is a prerequisite to the use of an appropriate, electronically based nomenclature. The electronic health record infrastructure needs to support the nomenclature.

The Australian government has an ambitious strategic plan for the development of a summary electronic health record, which will afford clinicians and patients significant benefits, including improved accessibility of health information. It is likely that developments will be incremental and erratic rather than evenly paced. This is because of the complexity of clinical medicine and the resultant difficulty in developing and implementing a suitable architecture and associated prerequisites for robust and reliable electronic health information systems. Allocative decisions for health information IT development will become more important because of the massive costs involved in the development and implementation of a workable electronic health record system that can be applied across the health sector.

There is a disturbing history of failure of large-scale information technology projects and, anecdotally, this includes the health sector. These failures are not well documented, because the embarrassment of substantial cost over-runs is highly sensitive in an environment in which competing interests vie for a share of the health budget. Contributing factors include evidence of inadequate or inappropriate specification of requirements; the exclusion of the real experts (including health information managers) and users from the feasibility and planning stages; and inadequate understanding amongst non-clinicians of the immense complexity of clinical medicine and hospital systems, especially in acute care.

It is important, therefore, for the future of clinical coding and clinical coders that key players establish and maintain an active input. At hospital level, managers of Health Information Services and of coding units must become active leaders and participants in the development of these systems. Clinical coders also need to maintain an interest and input by virtue of their expert knowledge and status. Expert organisations, such as the NCCH, the University Departments or Schools of Health Information Management, and

others, must become involved in researching and planning for electronically embedded coding systems, and in informing national-level policy.

It can be reasonably assumed that there will be a continuing trend to improve the quality of health care because of the influence of the consumer movement and because of Australian government policy supporting the Australian Council for Quality and Safety in Healthcare. It is likely that progress will be uneven and fraught with difficulties as hospitals and states come to terms with the patterns of adverse events and how to minimise or prevent them.

It can also be assumed that there will continue to be a greater emphasis on the new public health. There is therefore likely to be a greater demand for improved accuracy and quality of coded data not only in those states where casemix-based funding demands highly accurate coding, but also nationally for use by epidemiologists, public health planners, researchers and policy makers.

An appropriate nomenclature for Australia

The adoption of a suitable and robust nomenclature, which incorporates the rich and complex language of clinical medicine, is necessary to fit an electronic environment. The choice of nomenclature, or reference terminology, will be critical to the utility of coded data and the role of the coder.

The implementation of this national policy decision needs to be informed by experts in coding and health information management. The National Health Information Standards Plan includes provision for expert advice in this regard by health classification experts and others (National Health Information Standards Advisory Committee 2001).

The likely candidate as reference terminology for the Australian electronic health record appears to be the American College of Pathologists' *Systematized Nomenclature of Medicine – Clinical Terms* (SNOMED-CT). SNOMED-CT has a capability for providing *a common language for capturing, sharing and aggregating health data across specialties and sites of care* (National Health Information Management Group & Australian Health Information Council 2004: 79). It has been designed as a controlled clinical vocabulary suitable for use in an electronic health record environment. It is the result of a merger of the sophisticated pathology classification the *Systematized Nomenclature of Medicine – Reference Terminology* (SNOMED-RT) and *Clinical Terms Version 3*, the United Kingdom system known formerly as the *Read Clinical Codes*. The functionality of SNOMED-CT has been reported previously in this journal (Aschman 2002).

SNOMED-CT, however, has limitations, including the fact that it does not relate to the World Health Organization (WHO) - endorsed classifications, which include the *International Classification of Diseases* (ICD) and the *International Classification of Functioning, Disability and Health* (ICF); nor does it support other classifications, such as the *International Classification of Primary Care* (ICPC). If selected for use in the Australian EHR environment, it will need to be adapted as an Australian Modified (AM) version for Australian clinical practice and conditions, as occurs with the ICD classification (National Health Information Management Group & Australian Health Information Council 2004).

Critical factors that will influence the direction of the change

Adopting a new role

Coders' perceptions of their expanded advisory and analytical role and their collective ability to adapt their skills to a new way of doing things will be of critical importance.

The coding will be done within the system. The role of the coder will be to verify accuracy, application of standards, and mapping, and to analyse and report the coded data. This will require skills in data analysis and IT, as well as high-level competence in clinical coding.

Change management

The collective ability of clinical coders to prepare for and manage their workplace and role change will be critical to their long-term professional credibility and survival.

Working as a skilled member of the clinical team

Coding is a complex set of processes. It is dependent upon a core body of knowledge and improves with increased practical experience. Coders' expertise and knowledge is special, and unique to them.

In order that clinical coders survive and thrive professionally in the future, there must be increasing and sustained recognition of their higher-level practical and analytical skills. This recognition needs to be promoted initially by the coders themselves. This does not apply to simple coding, specifically the ability to read a front sheet, consult an index, apply codes, and interpret and apply coding standards. It means that coders should participate as active and informed members of the clinical team.

Educating clinicians

Coders have a responsibility to lead the new coding process. It is therefore they who should educate the clinicians who are the first point of contact in the continuum of clinical data from point of care through to the highest levels of health policy development, funding allocation, epidemiology and research.

The *Good Clinical Documentation Guide*, developed by the classification experts at the National Centre for Classification in Health at the request of the Clinical Casemix Committee of Australia, is indicative of a recognition of the need to assist clinicians to understand the connection between their clinical documentation, the coding process, and reliable coded data (National Centre for Classification in Health 2003; Roberts and Hanson 2003).

Managing the coding function

Proper management of the coding system is necessary for the development of coders' career paths. Coding unit managers need to be excellent leaders. They have

to motivate their staff members and be innovative managers. Where managers take a structuralist approach and apply Taylorism (Taylor 1947) as their preferred management practice, for example, and have their coders sitting in a back room or basement, coding all day in a mechanistic manner, then not only are they poor managers, but their organisations will suffer and their coders will not be prepared for the coding role of the future. Managers should encourage their coders to interact routinely with clinical staff, for example via unit meetings and ward rounds, to attend grand rounds, and generally to operate at a highly visible level, regardless of whether the coders are physically located on the wards or in the Health Information Service. This conferring and teamwork, along with regular quality-focused reviews by way of internal audits, are equally important parts of the coding function as the practical coding.

The capacity of the embedded coding system to accommodate the needs of the multiple users of coded data will become increasingly important for the credibility of the system and the integrity and utility of the coded data. This includes, for example, the need to anticipate and control potential effects on continuity and consistency of reported coded data for epidemiological research. In the next couple of decades, changes in classification systems have to be planned carefully and implemented in such a way as to exert minimal impact on the usefulness of coded data for research. It is incumbent upon coders and those who make decisions to change from one classification system to another, or to update to another version of an existing classification, or to create or change coding standards, to do so in full and open consultation with the multiplicity of users of coded data, and to factor, in the potential adverse data-utility and financial effects.

The degree to which the embedded coding system can apply standards will be pivotal to the future role of clinical coders. One scenario is a mapping process whereby clinical data coded to a nomenclature will be mapped into a statistical classification. In today's context, it is useful to consider the example of using a mapping table to convert codes in SNOMED-CT to ICD-10-AM, which the National Centre for Classification in Health is developing at the time of writing. If there is to be mapping from one classification to another, then the concept of mapping prompts the question: What happens to the coding standards? If standards are retained because they are considered to be essential for high quality coded data that accurately reflect Australian clinical practice, they will need to be applied at some point in the coding process. Some standards will be more amenable than others to functioning in an electronic medium. For example, where the standards involve decision-making based on the documentation in the record, such as sequencing of diagnoses, it is feasible that this level of application could be embedded into the electronic health record and applied as the next step in the process of conversion of free-text clinical information into coded data.

It can be assumed that, by 2020, many standards will be applied automatically within an electronic system. Inevitably, in order that some standards are applied correctly, an informed decision will be required that can be made only by a person with specialised knowledge. Therefore, some decisions in the coding process will have to be made by highly skilled human beings who are experts in clinical coding rather than via the application of artificial intelligence. An analogy might be drawn with decision-making in clinical medicine: whilst electronic systems can present an array of potential diagnoses, the particular level of knowledge, logic and intuitiveness of the individual clinician (in other words, the human element in clinical decision-making) will never be replaced. Decision-support systems in medicine are not new. It is important to acknowledge that they are for *decision-support,* and are not in themselves *decision-making* systems. Similarly, other types of *decision support* systems can be established and used in clinical coding.

Critical issues

There is a need for active research and debate to identify solutions to the following questions. When coding becomes automatic:

- Who will monitor the assignment of nomenclature codes to cases in hospitals?
- What is the role for clinical coders in this context? This needs to be identified and role ownership established.
- Will coding standards be used?
  It may be assumed that a set of rules is necessary to ensure consistency of data for end users, including funders.
- How, by whom, and at what point in the coding process will coding standards be applied in an electronic health record environment? One school of thought is that automatically allocated codes in a rich nomenclature (such as SNOMED-CT) will be mapped to ICD-10 or its successor for subsequent grouping for financial purposes. It is argued that clinical coders should apply the coding standards post-mapping and monitor, analyse and report on coded data; in doing this, they will be working with electronic health records.
- Who will be responsible for ensuring that the nomenclature is translated accurately, mapped to ICD-10-AM codes for subsequent translation into DRGs (ie,)?
- Who will be accountable for the quality of the grouped data, and hence for levels of reimbursement?
- If this continues to be health information managers/clinical coders in their business analysis role, what are they doing to plan and develop systems that ensure integrity and utility of the coded data?

Factors that militate against a secure future for coders

Those who do the coding, especially in hospitals with a high casemix complexity, are accountable for several critical functions that are fundamental to the financial viability of the organisation. These include:

- meeting externally imposed reporting deadlines;
- coding comprehensively and accurately;
- maintaining currency with the coding standards;

- applying an ethical and legal framework to their work; and
- coding with consistency to ensure that the data are useable longitudinally as well as for prospective comparative analyses, nationally and internationally.

These requirements, singly and in combination, constitute a particular challenge for coders in states with well-developed casemix-based funding systems. It is this set of pressures that sometimes leads coders to focus only on the *here and now* (ie, on maintaining their output). In these situations, the big picture can be lost.

The expectation for increased productivity means that coders have to work harder and faster. There is little room for poor judgement or error. The coders' professional and technical skills (ie, their background clinical knowledge, practical coding skills, professional judgment, and ability to communicate with medical staff who document in the record) are all crucial to their being able to achieve the increasingly higher levels of accountability expected of them professionally.

Predicted skill and knowledge requirements

It is unlikely, unless the complexity of coding and coding standards is dramatically reduced, that the higher-level decision-making processes undertaken by skilled coders will be replaced throughout the nation in the medium term. There will be a need for coders to implement and maintain automated coding and related decision support systems, in data interpretation and in other evolving areas that will be dependent upon health care data (Fenton, in La Tour & Eichenwald 2002; Beinborn 1999). This fits neatly into the role of the future *clinical data specialist* predicted by the American Health Information Management Association (2000).

In addition to maintaining competency and currency in their practical coding skills, the coder of the future will need to have a high level of knowledge of both clinical medicine and information technology. A strong IT literacy will be needed to operate effectively in the new coding environment. The clinical coder will need to be an active, albeit clinically peripheral, member of the clinical team via their professional consultation with clinicians. The coder will have to become the recognised and respected coding expert at the micro level in the ward, and at the macro level in the organisation. It will be essential to keep up to date with developments in classification systems and related developments.

The role of the coder should include monitoring, analysing and managing the coded data with the interests of the following stakeholders in mind:

- the organisation, for casemix and casemix-related financial reimbursement, where relevant;
- internal users of coded data, and researchers; and
- external (non-hospital) users of coded data.

Conclusion

The coding focus has shifted in recent years to include a strong financial imperative. However, the pressure to perform at maximum level to facilitate appropriate funding has detracted from some of the more traditionally key functions and applications of coded data. The public health profile of the community has suffered from poor quality coding systems in the past; this can occur, for example, through misinterpretation of trends due to inconsistencies and changes in classification systems over time. It is important when developing future policy, IT supporting systems and coding practices that the needs of the public and population health researchers are also recognised.

The nexus between good clinical care, well-written medical records, high-quality and consistent health classification systems and practice, and reliable morbidity data will become more important as electronic health record technology is developed further. The challenge for clinical coders is to be prepared for the inevitable changes in their role.

References

American Health Information Management Association (AHIMA) (2000). *Evolving HIM careers: Seven roles for the future*. Chicago, AHIMA.

Aschman D (2002). SNOMED-CT: The fit with classification in health. *Health Information Management* 31(1). Retrieved from WWW 18/06/04] <*http://www.himaa.org.au*>.

Beinborn J (1999). Automated coding: The next step. *Journal of the American Health Information Management Association* 70(7): 38-42.

Bloom A (2002). The funding of private hospitals in Australia. *Australian Health Review* 25(1): 19-39.

Bolsin S (2003). Personal professional monitoring and coding – synergy for the future. *Proceedings of the 8th Biennial Conference of the National Centre for Classification in Health. Melbourne, 26-28 March.* Sydney, National Centre for Classification in Health.

Callen J, Meehan J and Tomornsak S (1997). A new continuous quality improvement model for the coding process. *Journal of Health Information Management* 27(2): 69-73.

Cameron M and Robinson K (2004). The effects on clinical coding of the critical pathway recording methodology. *Health Information Management* 32(2). Retrieved from WWW 18/06/04 <http://www.himaa.org.au>.

Chisholm K, Chu YC, Szeto K and Fung H (1994). Data quality: Monitoring the accuracy of clinical information. *Health Information Management* 24(2): 135-136.

Donoghue M (1992). The prevalence and cost of documentation and coding errors. *Australian Medical Record Journal* 22(3): 97-97.

Duckett S (2000). The evolution of the purchaser role for acute inpatient services in Australia. In: *Health care reform in Australia and New Zealand*, (A. Bloom, ed). South Melbourne, Oxford University Press: 147-160.

Duckett S (2003). Coders and governance. *Proceedings of the 8th Biennial Conference of the National Centre for Classification in Health, Melbourne, 26-28 March*. Sydney, National Centre for Classification in Health.

Eagar K, Garrett P and Lin V (2001). *Health planning: Australian perspectives*. Crows Nest, Allen & Unwin.

Fenton S (2002). Clinical classifications and terminologies. In: *Health information management: Concepts, principles, and practice* (La Tours and Eichenwald S, eds). Chicago, American Health Information Management Association.

Foley M (2000). The changing public-private balance. In *Health care reform in Australia and New Zealand* (Bloom A, ed). South Melbourne, Oxford University Press: 99-114.

Frommer MS and Rubin GL (2000). Evidence-based health care. In: *Health care reform in Australia and New Zealand*, (Bloom A, ed). South Melbourne, Oxford University Press: 307-324.

Health Information Management Association of Australia (1995). *The Australian coder workforce.* National Coder Workforce Issues Project. Brisbane, HIMAA.

Lin V and King C (2000). Intergovernmental reforms in public health. In: *Health care reform in Australia and New Zealand,* (Bloom A, ed). South Melbourne, Oxford University Press: 251-263.

McKenzie K, Walker S, Klisanin A and Spallek M (2003). The Australian coder workforce survey 2002: Coders' responses. *Coding Matters* 10(1): 14-17.

National Centre for Classification in Health (2002). *International statistical classification of diseases and related health problems, tenth revision, Australian modification (ICD-10-AM),* 3rd edition. Sydney, National Centre for Classification in Health.

National Centre for Classification in Health (2003). *The good clinical documentation guide.* Sydney, National Centre for Classification in Health.

National Health Information Group (NHIG) and Australian Health Information Council (AHIC) (2004). *National health information management and information and communications technology strategy*. Final report prepared by the Boston Consulting Group. Canberra NHIG and AHIC. Retrieved from: WWW 18/06/04 <http://www.health.gov.au/-healthonline/docs/bcg.pdf>.

National Health Information Standards Advisory Committee (2001). *Setting the standards: A national health information standards plan for Australia*. Canberra, Commonwealth Department of Health and Aged Care.

National Health and Medical Research Council (NHMRC) (updated Feb 2004). NHMRC standards and procedures for externally developed Clinical Practice Guidelines. Canberra, NHMRC. Retrieved from WWW 18/06/04 <http://-www.health.gov.au/nhmrc/>.

Roberts R and Hanson RM (2003). Medical records and population health. *Medical Journal of Australia* 179(6): 277-278.

Roberts R, Robinson K and Williamson D (2002). Health information policy. In: *Health policy in Australia*, 2nd edition, (Gardner H and Barraclough S, eds). South Melbourne, Oxford University Press: 100-121.

Robinson K, Ell M, Raw J and Simpson D (1994). Health workforce planning: An analysis of employer demand pertaining to the Victorian medical record administration and diagnostic coding workforces. *Health Information Management* 24(2): 42-51.

Sweeting C (2003). The Bristol Royal Infirmary Inquiry – the next steps. *Proceedings of the 8th Biennial Conference of the National Centre for Classification in Health*. *Melbourne, 26-28 March.* Sydney, National Centre for Classification in Health.

Taylor FW (1947). Scientific management*,* comprising Shop Management, The Principles of Scientific Management [and] Testimony before the special House committee. With a foreword by Harlow S. Person. New York: Harper & Row.

Kerin Robinson, BHA, BAppSc(MRA), MHP

Head, Department of Health Information Management
School of Public Health
Faculty of Health Sciences
La Trobe University
Bundoora, VIC 3086
Email: K.Robinson@latrobe.edu.au

Jennie Shepheard, RMRL, GDipHthAdmin, GCertHthEcon

Coding Auditor and Consultant, and Sessional Lecturer,
Department of Health Information Management
School of Public Health
Faculty of Health Sciences
La Trobe University
Bundoora, VIC 3086