

Health Information Workforce Report

October 2013



An Australian Government Initiative

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Executive summary

Health Workforce Australia (HWA) received requests from the National e-health Transition Authority (NeHTA) and the Australian Health Informatics Education Council (AHIEC) to undertake a study of the health information workforce. Following release of a discussion paper which proposed a methodology for conducting the study, a detailed workforce analysis was carried out. The stated objectives of the study were to:

- Define the health information workforce including its composition.
- Provide an analysis of the workforce.

Human Capital Alliance (HCA) were engaged to carry out the initial study. Following this, HWA built upon HCA's work and conducted its own stakeholder consultations on the future strategic direction of the health information workforce.

Finding 1

The health information workforce encompasses several potentially related occupations which work in all areas of health and there is little consensus on its boundaries. HWA adopted the AHIEC approach to the health information workforce, which distinguishes three separate levels within the health information workforce (see below). Using that model, the specific focus of the study was determined to be on the Level 1 workforce.

- Level 1: Workers who self-identify as part of the health information workforce and work full-time with health information systems.
- Level 2: Healthcare professionals and administrators/managers who develop or help develop health information systems and use health information systems heavily in their work.
- Level 3: All healthcare professionals who must be able to properly input data to and extract information from health information systems.

Consultation and survey results were then used to identify the following five roles as comprising the Level 1 specialist health information workforce.

1. Health information managers.
2. Clinical coders.
3. Data analysts.
4. Costing experts.
5. Health information technology specialists.

Recommendation 1: Delineate the workforce

- Build on initial work conducted by HWA and develop consensus amongst key professional associations and other peak bodies in which defined occupations are included within the health information workforce (Level 1 workforce).
- Define and agree upon the essential functions of health information work, and align existing competencies with the agreed functions.
- For counting purposes, draft standardised role descriptions for a range of classes of the Level 1 workforce, based on the agreed functions and associated competencies.
- There be will new and emerging roles within the future Level 1 workforce, so this work will require ongoing assessment and updates.

Finding 2

Successful progress in the areas of workforce delineation and data collection would support further workforce planning of the health information workforce. The implications for data collection need to be conveyed to those bodies that currently collect workforce data.

Recommendation 2: Improve data collection

Prepare advice for and consult with the Australian Bureau of Statistics (ABS), Australian Workforce and Productivity Agency (Skills Australia), the Department of Immigration and Citizenship (DIAC) (with respect to the General Skilled Migration Program), Department of Health and Ageing (DoHA), and the Australian Institute of Health and Welfare (AIHW), to improve data collection processes for health information occupations.

Finding 3

Stakeholder groups (for example, Health Information Management Association of Australia (HIMAA), Health Informatics Society of Australia (HISA), AHIEC, Australian Health Information Council (AHIC)) need to maintain or strengthen strategic relationships with bodies that significantly influence workforce demand (including NeHTA, state and territory health authorities, DoHA) for informed discussion and development of a coordinated workforce response. For example, all proposed new health information projects and initiatives should include workforce impact statements.

Recommendation 3: Form strategic relationships

- Support a single body that represents and advocates for all health information stakeholders in relation to workforce issues.
- Establish a close working relationship with employer representatives and NeHTA in order to identify and influence opportunities to collect data that furthers an understanding of employer workforce needs and recruitment and skills development behaviour.
- Improve the relationship with education providers to ensure a better fit of the education solutions with the industry requirements of the workforce in the future.
- Approach the ABS to consider re-classification or more appropriate classification of the occupations listed under the Australian and New Zealand Standard Classification of Occupations (ANZSCO) codes.

Finding 4

Stakeholder feedback identified an ideal future health informatics leadership structure. This encompassed current Level 1 staff, including a Chief Information Officer (with a strong clinical background) to lead technological development and implementation, and a Chief Clinical/Medical/Nursing Information Officer to lead clinical engagement. In addition to this leadership structure (as part of the Level 1 workforce), other workforce components required are: a core clinical informatics-focused team (Level 1 and 2 workforces), clinical educators/trainers (Level 2 workforce) and clinicians with an appropriate level of health informatics skills (Level 3 workforce).

Recommendation 4: Consider future configuration of workforce

- Focus on future workforce investment in the clinical informatics workforce structure by teams (Level 1 and 2 workforce) whose purpose is to help answer critically important questions during the design, content development and implementation of e-health tools that relate to workflow, ease and speed of use. This may be achieved through organisational initiatives and team formation, and whose skills are obtained through undergraduate, postgraduate or workplace-based training.
- Consider future workforce structures that include clinical educators/trainers (Level 2 workforce), whose role is to train clinicians to use new systems. Their skills may be obtained through workplace-based training conducted by the Level 1 workforce, or through external continuing educational programs (such as workshops, online training modules).
- Determine whether the configuration of these workforces is optimal in productivity and training terms.

Finding 5

There are existing workforce shortages in the clinical coding workforce (as a component of the Level 1 workforce). This is currently being addressed to various extents in some states and territories and within some local health networks. Given the strong links between the clinical coding and health information management (HIM) workforces, shortages of HIMs must also be addressed, as they are critical to the quality of clinical classification work and to support health information innovation and change. Shortfalls for these workforces are likely to be exacerbated in the short and medium term by the national adoption of activity based funding under the National Health Reform Agenda.

Stakeholder feedback suggests that there are other health information workforce shortages that are less well understood. For example, senior data analysts with skill sets in the development of policy, evaluation and information strategies are a highly valuable and scarce resource. These skills are not readily gained through traditional education courses but most often through a mix of structured education and direct exposure in the workplace to a variety of information projects and programs.

Furthermore, shortages of higher order skills in decision-making roles (Level 1 workforce) may constrain the adoption of eHealth initiatives or investment in its infrastructure. Additionally, shortages in two intermediary groups - a clinical informatics-focused team (Level 1 and 2 workforces) and clinical informatics educators/trainers (Level 2 workforce) – will limit the adoption of eHealth initiatives in hospital settings. These groups provide an essential link between the Level 1 workforce and all healthcare professionals whose primary role is patient care (Level 3 workforce), and will foster clinicians' training and confidence in using new systems and protocols.

Recommendation 5: Address known health information workforce shortfalls

- Increase the national supply of clinical coders. In addition to supporting existing course options, it is recommended that the number of clinical coders can be increased through 'in situ' workplace-based training; supported by an increased capacity of the vocational education and training (VET) sector. Efforts to identify and appropriately re-skill health professionals leaving the clinical workforce could improve the supply of clinical coders. Stakeholder feedback has suggested that the issue of remuneration for clinical coders needs to be addressed because the current rate of pay for their work is a significant disincentive to retention and recognition of this workforce.
- Address the shortage of HIMs, in the short-term by addressing the drop in enrolments in appropriate courses and in the longer-term by increasing the broader appeal of the HIM profession.

Finding 6

Enrolments in appropriate undergraduate courses are declining. In order to enhance attractiveness of health information careers (Level 1 workforce), and enhance health informatics competencies of clinicians (Level 2 and 3 workforces), a number of measures are recommended.

Recommendation 6: Promote health information training and careers

- Raise the profile and status of the health informatics discipline, and as such, raise the profile of the health information workforce occupations (Level 1 workforce) to attract more employees and prospective students.
- Develop the three different types of future education in health informatics identified in the study:
 1. Training specialists (Level 1 workforce) in biomedical informatics through postgraduate programs such as masters, PhDs, and residencies.
 2. Training clinicians in knowledge of biomedical informatics (Levels 2 and 3 workforces) needs to spread and be included in medical and other health careers undergraduate curricula.
 3. Continuing education of all professionals (Levels 1, 2 and 3 workforces) which could be done by adapting the American Medical Informatics Association (AMIA) 10x10 program model, or similar.
- Review current course curricula and use resources produced by the *Coordinated interprofessional curriculum renewal for e-health capability in clinical health professional degrees* project to include e-health (or clinical informatics) curriculum in undergraduate and postgraduate coursework where it is not yet in place, and to engage in collaborative continuing improvement where it is.

1. Introduction

Health Workforce Australia (HWA) was established in 2010 as the national health workforce agency through the Council of Australian Governments' (COAG) National Partnership Agreement (NPA) on Hospital and Health Workforce Reform. HWA was established to address the challenges of proving a skilled, flexible and innovative health workforce that meets the healthcare needs of the Australian community, now and into the future.

Purpose of the report

HWA received requests from both NeHTA and AHIEC to undertake a study of the health information workforce. Following the release of a discussion paper in 2011 which proposed a methodology for conducting the study, a detailed workforce analysis was carried out. The stated objectives of the study were to:

- Define the health information workforce including its current composition in terms of:
 - Functions, roles and job titles.
 - Skills and competencies.
 - Education and training pathways.
- Provide an analysis of the workforce, in particular:
 - Quantify the existing size of the workforce by gender, age, competencies, types of training undertaken, current deployment within the health system and geographic locations.
 - Identify, discuss and quantify (where possible): current demand for the workforce, including drivers of demand and their impact on the workforce; and current supply sources of the workforce, including current education and career pathways.
 - Identify and analyse any estimated shortfall between current supply and demand.

The study initially comprised the following components:

- Literature review: to identify and analyse relevant literature in the health information field including national and international research findings as to what constitutes the health information workforce.
- Key informant interviews: to provide insight into current factors influencing the health information workforce, particularly in relation to workforce demand.
- Case studies: consultations with health information managers and other stakeholders were conducted at three sites to examine current workforce practices, work requirements, adequacy of workforce for work, and future influences on demand and strategies for supply.
- Employee survey: a survey was conducted of health information workers (who had been identified by their managers) at the case study sites to describe the characteristics of the workforce at the sites, identify job roles and functions performed and competencies possessed.
- Secondary data analysis: to quantify where possible the existing size, supply and demand for the health information workforce.
- Search conference: to explore and assess likely future scenarios that will influence and impact on the supply and demand for the health information workforce in Australia.

Human Capital Alliance (HCA) were engaged to carry out the initial study. Following this, HWA built upon HCA's work and conducted its own stakeholder consultations on the future strategic direction of the health information workforce in light of anticipated increasing demand for the workforce from factors including e-health initiatives, moves towards digitalised hospitals and national Activity Based Funding (ABF).

A draft report containing results of the initial study and subsequent HWA work was distributed to stakeholders for comment in 2012. This final report incorporates the work of the initial study, further HWA investigations and comments from stakeholders.

The report has a particular emphasis on identifying and discussing strategic directions for the future workforce, including future demand, future supply and changes required to education and career pathways.

This report is presented in the following sections:

- Health information workforce defined: outlining functional approaches to defining the health information workforce.
- HWA's approach for the study: outlining the approach HWA took in relation to the definition of the health information workforce.
- The existing health information workforce: providing quantitative information on the health information workforce.
- Considerations for the future health information workforce: examining factors influencing the demand for, and composition of, the health information workforce.
- What competencies are required for the future health information workforce: outlining stakeholder views on the future competencies of the health information workforce.
- Demand versus supply of the health information workforce: highlighting information available on whether supply of the health information workforce is sufficient to meet demand.
- Supply of the health information workforce: highlighting current and future sources of supply, and factors influencing workforce supply.

2. Health information workforce defined

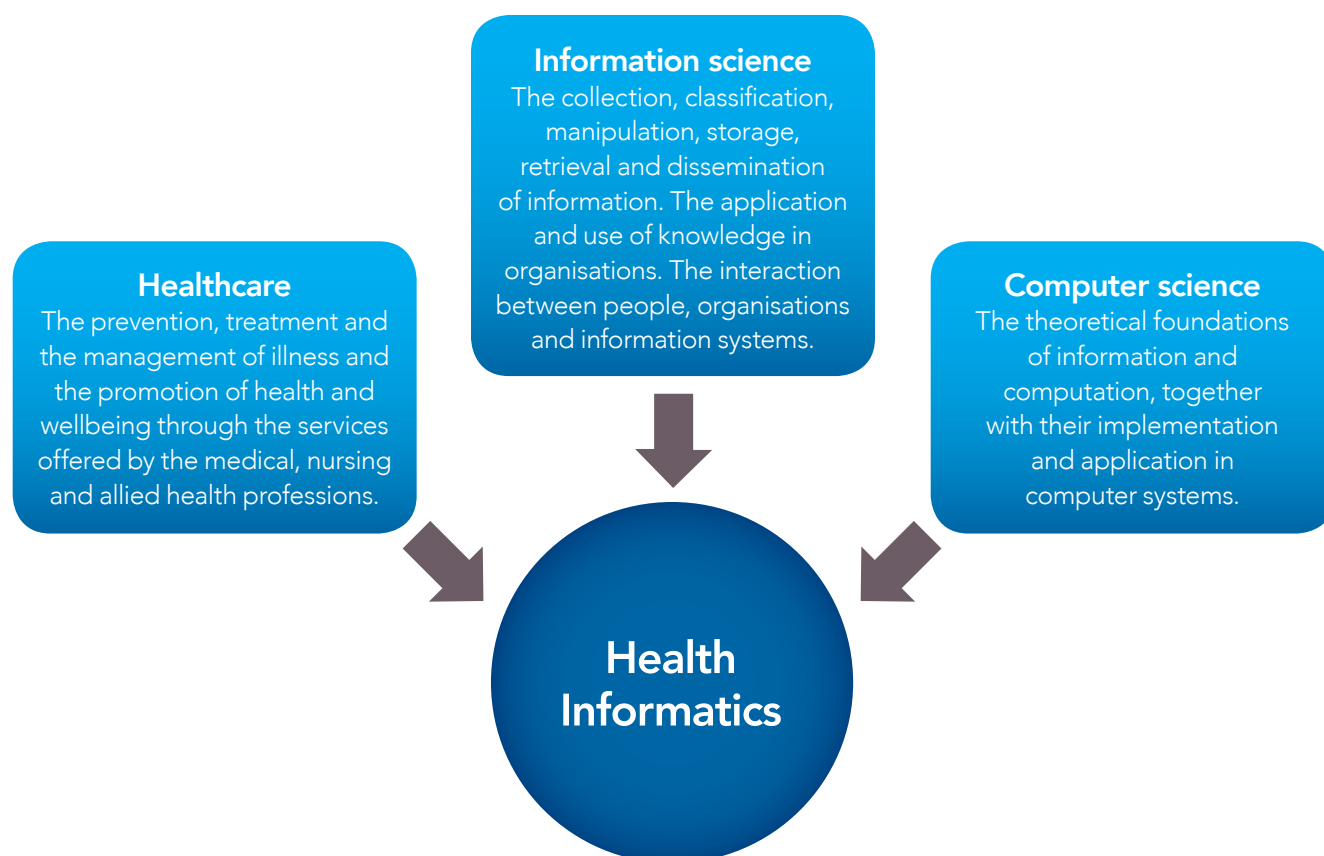
The health information workforce is a relatively new and rapidly developing workforce. One of the most difficult tasks with such workforces is establishing workforce boundaries. This difficulty was reflected in the research and consultations in this study, with no fully agreed definition of the health information workforce developed, and consequently, imprecise workforce boundaries.

Many descriptions exist of the health information workforce and the work it performs, with the name of the workforce itself in dispute. For example, the workforce can be referred to as the health information workforce, the health information management workforce (normally this terminology is inclusive of clinical coders)¹, the health information technology workforce², and more recently, the term health informatics has become the most frequently used³. Overseas, the term health information technology workforce is widely used, especially in the United States of America and Canada. This term received little support from stakeholder consultations, with the word technology proving to be particularly provocative.

Both reflecting and contributing to the imprecise workforce boundaries is the fact the health information workforce is composed of multiple occupational titles and discipline areas. Workers are drawn from at least three main discipline areas, namely healthcare, information science and computer science. There is no single recognised means of entry into the workforce, and no restrictions on entry beyond what an employer may specifically require, which was considered an asset throughout consultation.

Figure 1 shows health information at the intersection of three distinct foundations: healthcare, information science and computer science.

Figure 1: Foundations of the health information/informatics workforce



Given the lack of an agreed clear definition of the health information workforce and workforce boundaries, functions of the health information workforce were examined.

2.1 Health information workforce functions

Consistent with the existence of many descriptions of the health information workforce, there are various views on the functions performed by the health information workforce. Approaches that encompass the majority of views identified are presented here.

Health Information Society of Australia

HISA conducted a review of the *Health Informatics Workforce*³, which used the number and type of functions performed as a way of drawing boundaries around the health information workforce. Using this categorisation, this workforce could be defined by the proportion of time spent on health informatics functions compared with time spent on other functions. HISA identified a number of recognisable work functions and broadly classified them into two groups: work on or work in health information systems.

Queensland Health

Queensland Health made available their description of the health information workforce functions to this study. They identify 16 functions that are performed by the health information workforce, summarised in Table 1.

Most stakeholders endorsed the list of health information functions in Table 1. However they also recognised that:

- Sufficient proficiency to perform all these functions is unlikely to reside in a single worker.
- Health information work is multi or inter-disciplinary in nature.
- Health information work requires the collaborative effort of a number of workers with somewhat idiosyncratic skills and knowledge.

Table 1: Work performed by the health information workforce

Function	Description
Planning and administration	Planning and administration of the business of healthcare, including strategic planning, logistics, human resources and finance.
Systems and enterprise architecture	Developing, implementing and managing of information and organisational systems and technologies.
Technologies	Developing hardware and software solutions that facilitate and optimise the capture and use of electronic data and health information.
Health information/informatics education	Contributing to and influencing professional competencies, course development and professional network forums.
Workplace training	Direct training of the workforce for purposes such as changing work practices.
Reporting	Monitoring and ensuring compliance with ethical, legal, regulatory and best practice standards, and informing ongoing business requirements.
Policy and practice standards	Developing and promoting best practice standards for healthcare information and ensuring the state is aligned with Australian healthcare standards.
Infostructure	Supporting system interoperability and architecture.
Decision support and knowledge management	Accessing knowledge to inform point-of-care decision making and streamline clinical workflow.
Analysis and research	Retrieving and analysing information to identify trends and benchmarks and promote best practice.
Classification and coding	Capturing and classifying primary data to inform patient care and public health.
Terminology and knowledge engineering	Delivering source of evidence-based knowledge within the context of workflow and helping create new evidence through delivery outcomes.
Change management	Managing the impact of change on the workforce due to information system implementation.
Information exchange and communication	Supporting information exchange between clinical and non-clinical staff, and between clinical and non-clinical health systems.
Data management and records	Capturing information about a consumer and their interactions with the healthcare system and managing that information.
Clinical practice	Using information science and technology in the provision of patient care.

Source: Queensland Health, 2012

Australian Health Informatics Education Council

Some stakeholders suggested the entire health workforce is part of the health information workforce, because in the coming five to ten years, all clinicians will need to understand the importance of data entry and the use of information to improve patient care. Stakeholders also argued that a negative outcome of specialising (or narrowly defining) the health information workforce was to distance clinicians from the planning and design of e-health interventions. This in turn is seen to considerably reduce the likelihood of successfully implementing e-health projects.

AHIEC adopts the whole of health workforce approach, but distinguishes three separate levels within the health information workforce. Each level has clearly differentiated competency requirements⁴, illustrated in Figure 2.

Figure 2: The broad segments or levels of the health information workforce



3. HWA's approach for the study

Considering the different functional approaches and stakeholder consultation, HWA used AHIEC's model as the basis for this health information study. This model was determined to provide a comprehensive yet simple representation of the health information workforce, and a solid basis for the study.

Using this model, the specific focus of the study was determined to be on the Level 1 workforce: workers who self-identify as part of the health information workforce and work full-time with health information systems.

Stakeholders were strong advocates of the view the whole healthcare workforce should be equipped with a minimum level of informatics skills given technological advances and changing healthcare settings. For the purpose of this study, the Level 2 and 3 workforces in the AHIEC model were considered of secondary interest, although there is some discussion of the requirements of teams that include these workforce levels later in this report. Level 3 stakeholders argued this conceptualisation does little to clearly articulate what the health information workforce represents, and would also reduce the visibility of health information professions.

It was also recognised boundaries between the three levels can become blurred, between Levels 2 and 3 when individual health practitioners begin to build on their core competencies by making health information a special interest, as well as between Levels 1 and 2.

From a workforce planning perspective, these views suggest a more sophisticated and knowledgeable clinical workforce (Levels 2 and 3) will influence demand for the specialist health information workforce (Level 1), and raise questions such as when should a person from Level 2 be considered part of the specialist health information workforce (Level 1) and when should they be considered supplemental?

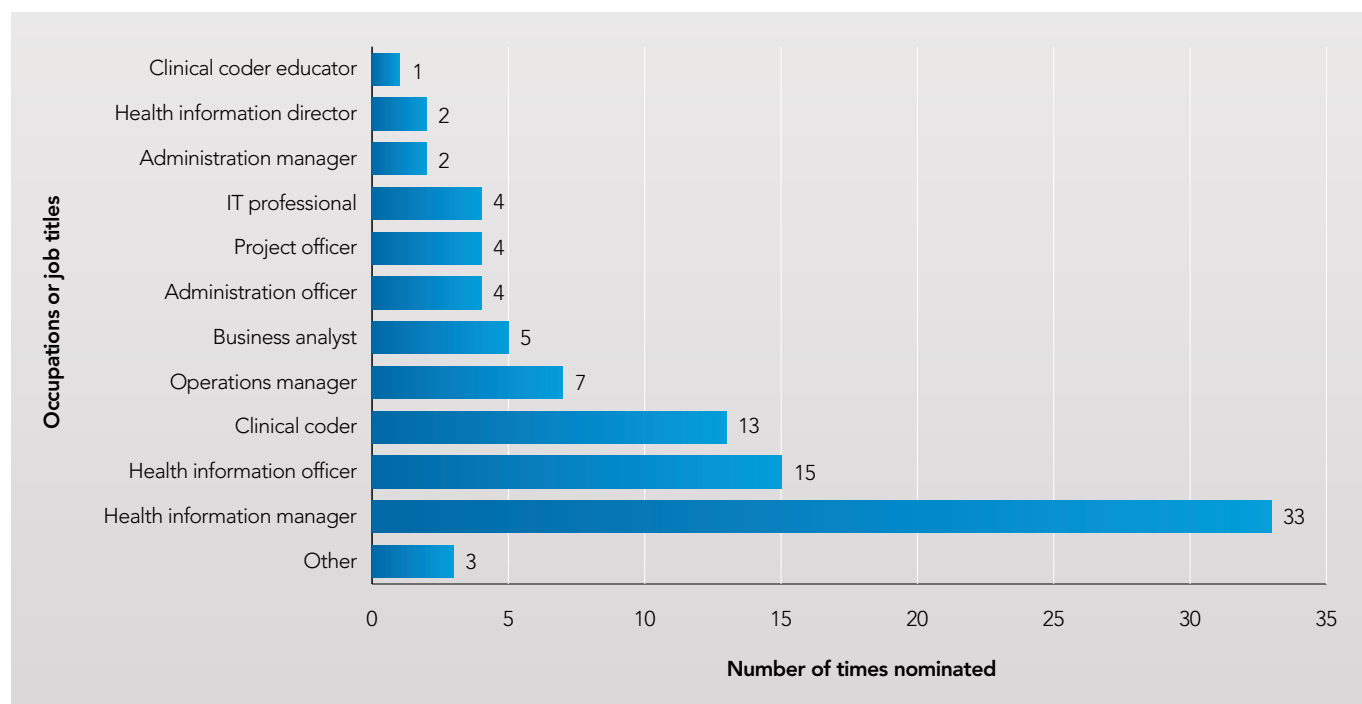
3.1 Workforce composition identified from case studies and survey

Having adopted the view that the health information workforce are primarily those Level 1 workers who self-identify as part of the health information workforce and work full-time with health information systems, the consultants performing the initial component of this study conducted consultations at three case study sites and an employee survey (of almost 100 health information workers) to understand the composition of the specialist (Level 1) health information workforce.

The consultation and survey results identified that the specialist health information workforce is comprised of multiple occupations bearing a range of recognisable (and varying) job titles such as health information manager, clinical coder, data manager, chief information officer, systems analyst, and biomedical engineer. In total, 14 separate occupational titles¹ were identified which stakeholders considered part of the Level 1 workforce (Figure 3).

¹ Within some of these occupational areas several job titles were deemed to be equivalent.

Figure 3: Job titles of the health information workforce (Level 1)



Source: HCA survey 2011

Stakeholders also noted that there will be new and emerging occupations within the future Level 1 workforce in Australia, and that this list should not be considered exhaustive. For example, in the USA some of the fastest growing positions are clinical documentation improvement specialists, health information management business analysts and health information data analysts, with additional positions developing.

From an analysis of the functions performed within the 14 separate occupation titles from the case study site consultations and survey results, five key roles were identified as comprising the Level 1 specialist health information workforce:

1. Health information managers.
2. Clinical coders.
3. Data analysts.
4. Costing experts.
5. Health IT specialists.

It should be noted a key difference between the theory on health information occupational titles and work functions (identified through literature review) and real world experience (identified through the case study sites and survey results) was the literature focuses on the professional workforce, yet in most practical settings the workforce is still composed of a mix of professional and non-professional staff.

A more detailed description of the five key roles and functions they perform (developed from the case study consultations and survey results) is provided on page 16.

Health information workforce role descriptions

Health information managers

Across all case study sites, the HIM role was viewed as providing an umbrella service to all parts of the health service, supporting clinical services and business analysis. This included data analysis for length of stay, profit and loss, morbidity statistics, differences of costs and procedures. HIMs were also viewed as playing a major role in change management of health information systems within each health service.

Differences also existed between sites in the HIM role. At one site, HIMs worked principally in clinical coding, with a small but growing number carrying out a fuller range of functions including data collection for research purposes, designing data collection processes, data analysis, change management, technical/system improvements and working with clinicians for decision support. At other sites, the importance of the HIM role in relation to information systems was highlighted. This included the HIM acting as the interface between information systems and clinicians to make information systems work efficiently. Examples include data collection quality for coding; and in the planning, implementation and use of information systems.

Clinical coders

The approach to clinical coders varied across the case study sites. At one site, the majority of the workforce performing coding functions were qualified HIMs. This may be a result of that site being located in Victoria, which has a longer history of coding due to the introduction of ABF nearly 20 years ago, and a long history of employing qualified HIMs in coding roles. In the other case study sites, the majority of clinical coders had been trained on-the-job through a HIMAA course. They were brought into training from a variety of backgrounds, but mostly from clerical or administration roles. Most stakeholders believed clinical coders could be developed to competent levels in an average twelve-month timeframe. The more complex elements of coding (advanced practice) were believed possible after a few years on-the-job or by undertaking the more advanced HIMAA course.

Most managers of coders from the case study sites observed that when a HIM is only coding, their full skillset is under-utilised. A number of HIMs had returned to the workforce after an absence and were working as coders only. Their feedback was that they appreciate the control they can maintain over their work hours in this form of employment. All case study sites used contract coders to supplement their employed clinical coding workforce, although there was considerable variation between sites in the ratio of salaried to contract coding workforce numbers.

One site had a strong reliance on non-professional coders working in a team usually managed by a HIM. The HIM performs some of the complex coding, auditing and data analysis.

Data analysts

Across all case study sites a small number of individuals had roles that essentially produced reports full-time. Some of these reports were routine, such as monthly reports to the responsible health department on certain types of cost items or service activity. The remainder of these reports were custom-developed in response to specific requests, for example in response to concerns raised about seemingly higher incidence of a certain procedure, or cost over-runs in a particular diagnosis related group (DRG) item. In some case study sites these workers were referred to as decision support. It should be noted that this was not in support of clinical, but rather administrative or policy decisions.

Data analysts came from a variety of backgrounds (including HIMs), but all had professional statistical and mathematical competencies.

Costing experts

Another workforce role performed across the sites was costing, with costing experts estimating the costs associated with particular clinical work categories (specific procedures, DRGs). This is a specialised role performed by a small number of individuals who had developed within the workforce over a long period of time from varied backgrounds including engineering, mathematics, statistics and software development. At the case study sites, most other staff had a limited understanding of what was being done by costing experts. It was noted that costing experts were in short supply and will continue to be in high demand over time. Costing experts were placed within different areas of a health service depending on organisational structure. They were often observed to sit within the finance area, but could also be considered part of the specialist health information workforce.

Health IT specialists

Three types of IT skilled people were identified across all case study sites:

1. Those who could work in any industry.
2. Those who specialised in the health industry.
3. Those who were highly-integrated (multi-skilled) within the health system, including HIMs, smart systems analysts and business analysts who had picked up skills from other work areas.

The role of the health IT specialist was seen to be different to that of the HIM, and is focused on developing and supporting the IT systems used by the health information workforce and the rest of the health service.

Finding 1

The health information workforce encompasses several potentially related occupations which work in all areas of health and there is little consensus on its boundaries. HWA adopted the AHIEC approach to the health information workforce, which distinguishes three separate levels within the health information workforce (below). Using that model, the specific focus of the study was determined to be on the Level 1 workforce.

- Level 1: Workers who self-identify as part of the health information workforce and work full-time with health information systems.
- Level 2: Healthcare professionals and administrators/managers who develop or help develop health information systems and use health information systems heavily in their work.
- Level 3: All healthcare professionals who must be able to properly input data to and extract information from health information systems.

Consultation and survey results were then used to identify the following five roles as comprising the Level 1 specialist health information workforce.

1. Health information managers.
2. Clinical coders.
3. Data analysts.
4. Costing experts.
5. Health IT specialists.

Recommendation 1: Delineate the workforce

- Build on initial work conducted by HWA and develop consensus amongst key professional associations and other peak bodies in which defined occupations are included within the health information workforce (Level 1 workforce).
- Define and agree upon the essential functions of health information work, and align existing competencies with the agreed functions.
- For counting purposes, draft standardised role descriptions for a range of classes of the Level 1 workforce, based on the agreed functions and associated competencies.
- There be will new and emerging roles within the future Level 1 workforce, so this work will require ongoing assessment and updates.

4. The existing health information workforce

The sections above highlight the complexities of defining the health information workforce. Through the use of the AHIEC model, the case study site consultations and employee surveys, HWA identified five key roles as comprising the Level 1 specialist health information workforce.

Ideally, information would be available on these five roles to measure the number and characteristics of this workforce nationally. However, as the roles are comprised of multiple occupation titles, and do not necessarily align with classifications used by national data collections (such as the ANZSCO, used by the ABS), there is no single source of information that exists to describe the workforce. Therefore a summary of relevant information available from various sources is presented in this section to provide an indication of the size and characteristics of Australia's health information workforce. It should be noted most existing studies have focused on the HIM or clinical coder workforce^{1,27}. Further information can be accessed from the listed sources.

Australian Institute of Health and Welfare

AIHW conducted a study of the national HIM/clinical coder workforce in 2010²⁷. This study estimated the combined national HIM/clinical coder workforce to be just fewer than 3,500 in number, but acknowledges this is only a portion of the larger health information workforce.

Health Information Society of Australia's Review of the Australian Health Informatics Workforce

In 2009 HISA surveyed almost 1,300 workers from the health information workforce, and from this, extrapolated the survey data to provide low and high total health informatics workforce estimates of 10,919 and 11,806.

Survey results characterised the health information workforce as female, aged 45 years old or more (70 percent) and possessing postgraduate qualifications.

The study also indicated the health information workforce was comprised as follows:

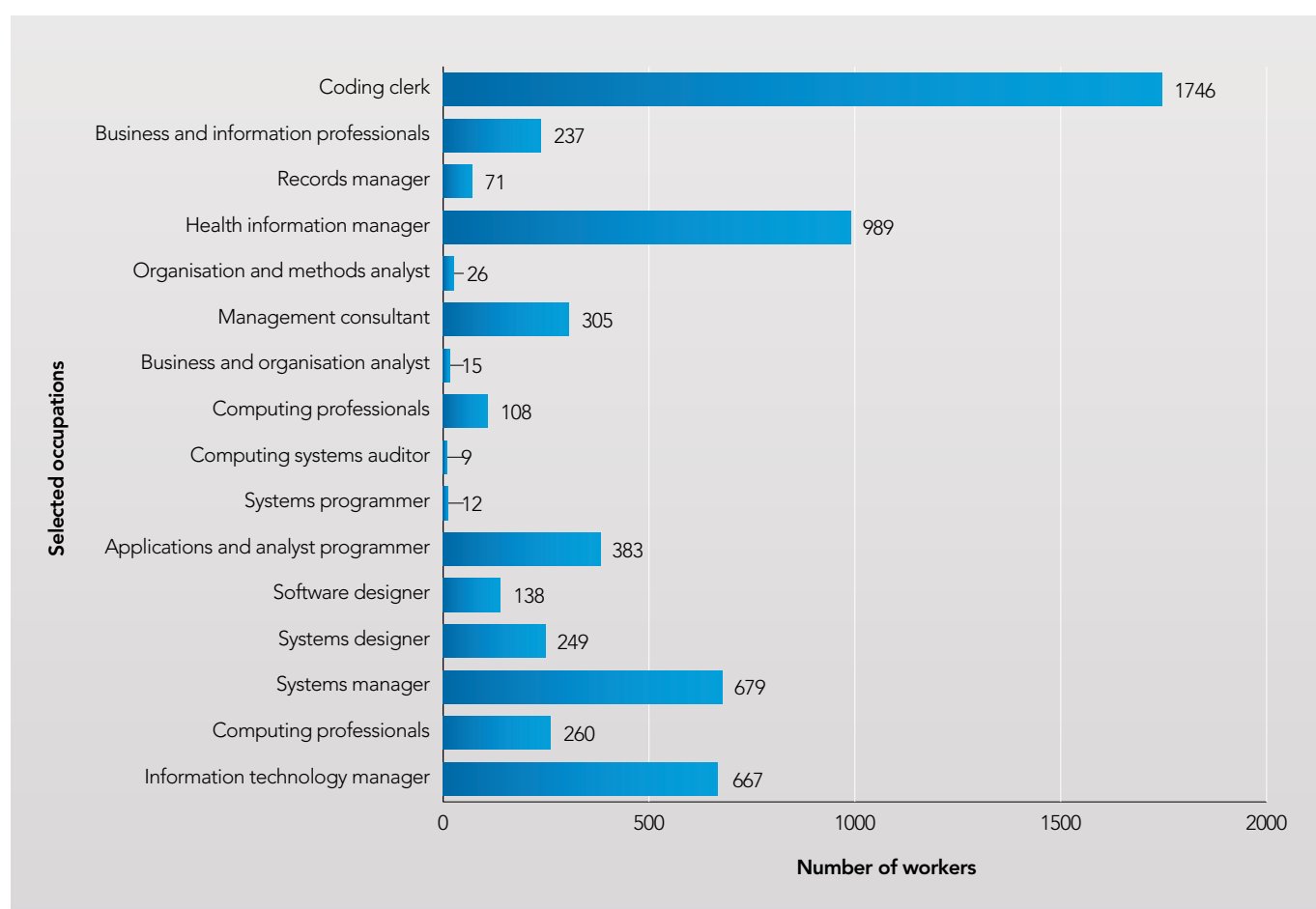
- Health information management professions: 25 per cent.
- Clinical informatics professionals (nurse, medical practitioner, allied health): 22 per cent.
- Information and Communications Technology (ICT) professionals: 19 per cent.
- Health informatics professionals: 18 per cent.
- Management: 17 per cent.

Australian Bureau of Statistics (ABS) Census of Population and Housing

Occupations within the ANZSCO that align to the Level 1 specialist health information workforce roles were identified (refer Appendix D), and used to generate an estimate of the health information workforce from the Census of Population and Housing. In addition to relevant occupations, census data was also refined by industry (refer Appendix D), to restrict the information to those people working in relevant occupations within health settings.

Census data showed there were 5,894 people working in the health information workforce in 2006. Figure 4 shows their distribution across the selected occupation categories.

Figure 4: Distribution of the health information workforce by selected occupations, 2006

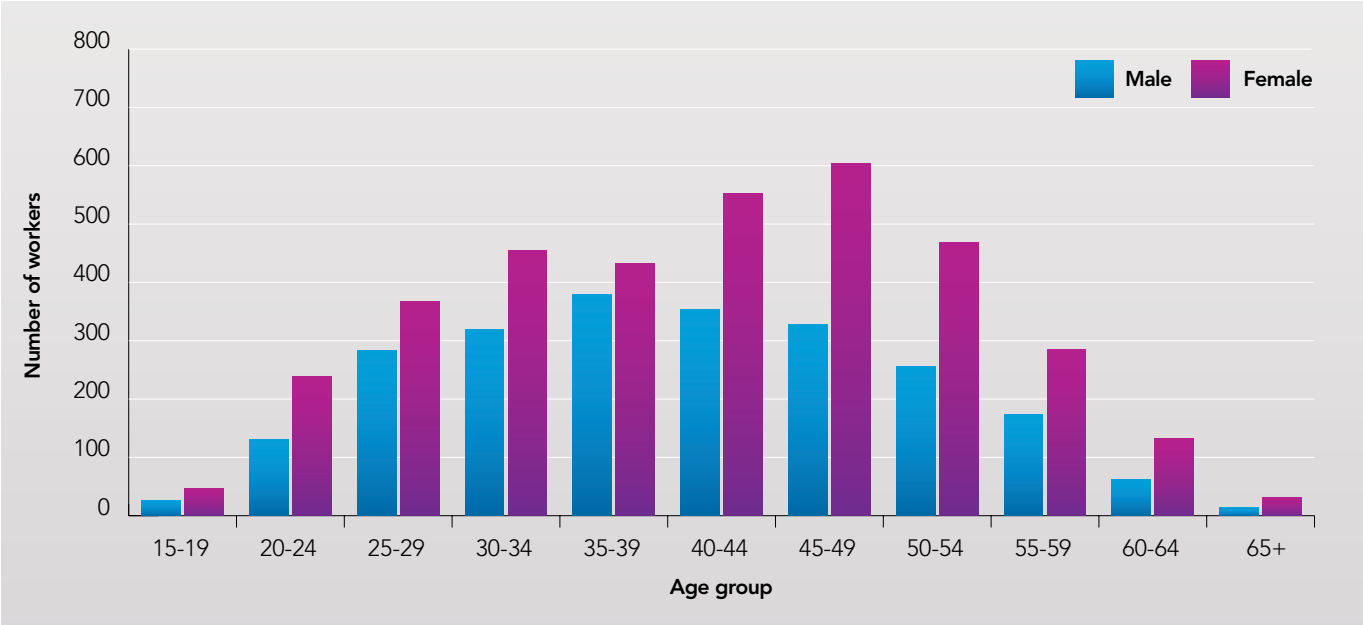


Source: ABS Census of Population and Housing, 2006

Census information contained in Figure 5 indicated:

- There are more female workers than males.
- 42 per cent of all female workers are aged over 45 years.
- Approximately one-third of male workers (35 percent) are aged over 45 years.

Figure 5: Age and gender distribution of the health information workforce, 2006

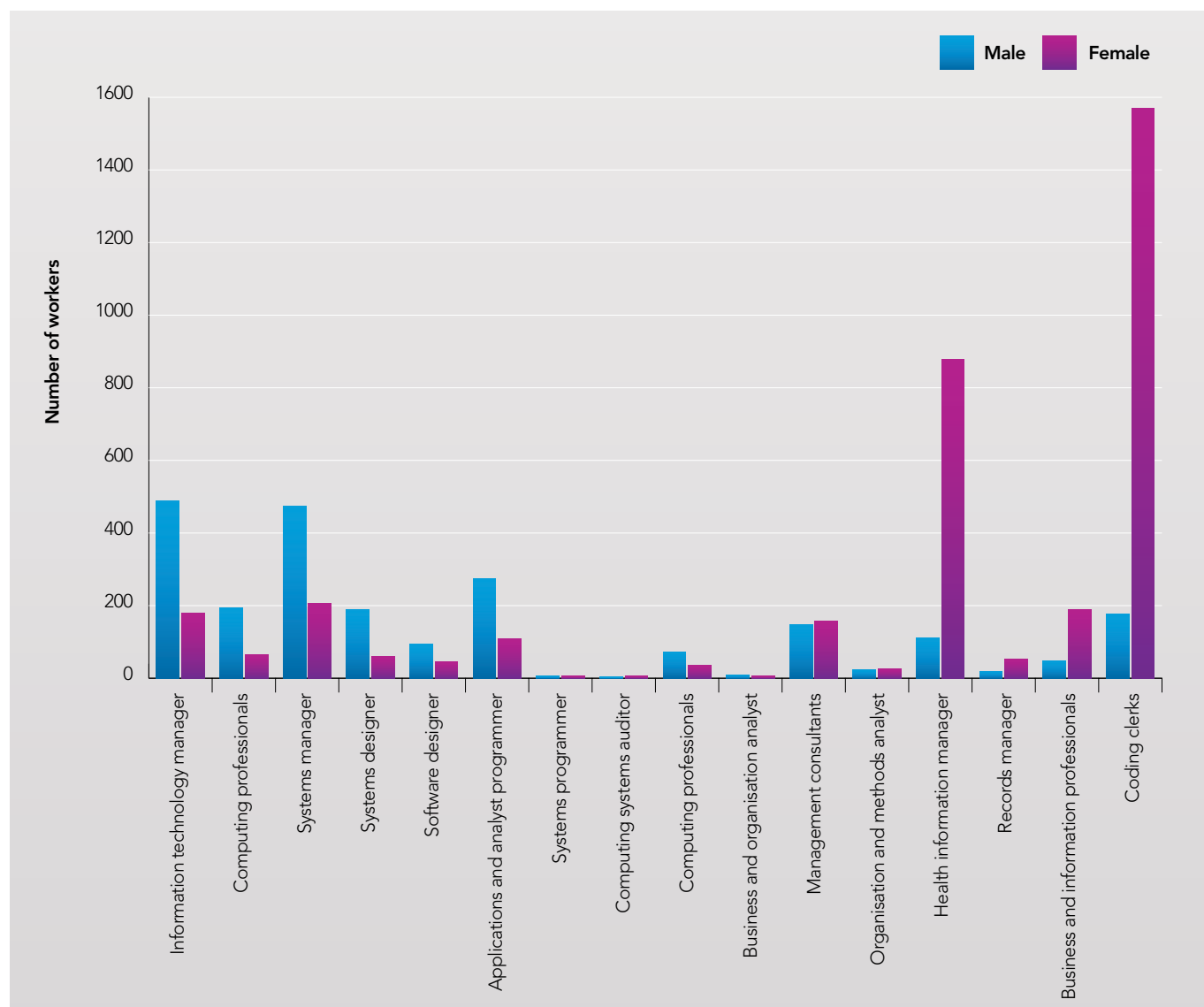


Source: ABS Census of Population and Housing, 2006

Figure 6 shows the distribution of male and female workers across the selected ANZSCO occupations in 2006. Females predominately worked as coding clerks and HIMs, while more males worked in IT roles.

This distribution is reflected in the gender and age profile. Coding and HIM roles are often second career choices, so a higher female age profile can be expected, while IT is more commonly a first career choice, reflected in more males aged less than 45 years.

Figure 6: Gender distribution of the health information workforce by main occupation, 2006



Source: ABS Census of Population and Housing, 2006

Differences between information sources

Substantial differences exist between the health information workforce size estimates from the different data sources. This reflects the different scope and methodologies of the data sources. The AIHW report clearly focuses on only a component of the health information workforce compared with the other two sources. HISA used a survey approach to estimate the size of the whole workforce, while census data limitations include the occupation categories not specifically aligning with health information roles, and a potential undercount from limiting the information to those people working in a health industry. For example, some HIMs and coders may work for companies supplying contract services to the health industry. If those companies are classified in a non-health industry, these people will not be counted in the census information presented in this report.

Finding 2

Successful progress in the areas of workforce delineation and data collection would support further workforce planning of the health information workforce. The implications for data collection need to be conveyed to those bodies that currently collect workforce data.

Recommendation 2: Improve data collection

Prepare advice for and consult with ABS, Skills Australia, DIAC (with respect to the General Skilled Migration Program), DoHA, AIHW, to improve data collection processes for health information occupations.

5. Considerations for the future health information workforce

The sections above highlight the complexities that exist in defining and quantifying the existing health information workforce. While recognising these limitations, there is clear agreement this is an important existing and emerging workforce. One of the aims of the study was to consider the future strategic direction of the health information workforce. To do this, it is important to understand the factors that will influence future demand for, and the likely future composition of, the health information workforce.

5.1 Factors influencing demand for the health information workforce

Over the last 20 years demand for the health information workforce has grown as the collection and storage of health-related data in health information systems has grown, especially in hospital services and even more so in those state and territories where activity based funding arrangements have been introduced. Looking to the future, key factors that will influence demand for the future health information workforce are:

- E-health initiatives.
- Broader national health reform, particularly the adoption of ABF nationally.
- The increasing complexity and comprehensive nature of data collections.
- Advances in technology.
- Demand for critical competencies.

E-health

E-health is the electronic management of health information to deliver safer, more efficient and better quality healthcare. DOHA has been facilitating the transition of paper-based clinical record keeping to electronic means for better information exchange, through a variety of e-health project roll-outs across the states and territories²⁵. E-health projects include:

- The continued implementation of electronic medical records across acute and primary health care settings.
- The personally controlled electronic health record (PCEHR).
- The digitalisation of hospital settings according to the Global Electronic Medical Record Adoption Model.

Appendix C details the present funding commitments for e-health initiatives from both federal, state and territory budgets.

In its briefing paper to HWA, AHIEC highlighted the significant federal and state government investment in e-health information systems, and identified the following key drivers underpinning these investments:

1. To reduce medical errors and duplication of tests through improved communication and computer based decision support for clinicians (estimated cost of more than \$3 billion yearly).
2. To improve the ability of the healthcare system to cope with a reduced workforce and increasing demand by using technology to gain efficiencies of information processing, availability and management and increase patient partnership in healthcare.
3. To improve the quality of state and national data collections to support clinical, administrative, policy and public health decision making.

One of the most significant e-health initiatives that will influence demand for the health information workforce is the concept of digital hospitals, and EMR adoption.

The concept of digital hospitals is based on the need to provide better quality healthcare while controlling costs, leading to a push for hospitals to deploy high-performance information and communication systems. Digital hospitals are designed to:

- Guarantee continuity in the provision of care services between hospitals and non-hospital practices.
- Improve medical practices and governance in both public and private healthcare facilities².

The extent to which a hospital is digitised will influence the demand for the health information workforce. The potential impact on health information workforce composition as a result of the move towards digital hospitals and EMR is highlighted in section 5.2.

Activity Based Funding

ABF is the system by which state and territory governments can calculate their contribution to public hospital services. ABF is used to monitor, manage and administer the funding of healthcare provided by public hospitals. The introduction of a nationally consistent approach to ABF for health services was first agreed by COAG in 2008, with updated implementation milestones agreed as part of the National Health Reform Agreement in 2011.

Implementation of a nationally consistent approach to ABF for acute admitted services, emergency department services and non-admitted patient services began on 1 July 2012, with implementation for remaining non-admitted services, mental health and sub-acute services due to begin on 1 July 2013.

From the literature review and case study site consultations, it was highlighted ABF is likely to increase demand for the health information workforce through:

- Increased requirements for coding of inpatient and outpatient activity^{1,27}, with one stakeholder suggesting the national introduction of ABF would increase demand for workforce tenfold over a period of 10–15 years.
- Increased demand for other roles that are pivotal to the ongoing operation of ABF, including professionals skilled in the area of hospital data development, classification systems, collections and costings, and
- The need to develop interoperable health information systems to capture all non-admitted health services.

Data collections

Separate to e-health and ABF requirements, there is an ongoing and increasing demand for high-quality and high-volume data reported from health information systems to support clinical, administrative, policy and public health decision-making. The Level 1 health information workforce is integral in all aspects of this data collection, from systems development and maintenance, to coding of data, and the extraction and analysis of data.

Advances in technology

While the factors listed are all expected to increase the demand for the health information workforce, some stakeholders suggested technology advances may reduce the need for some components of the current Level 1 health information workforce. For example, advances in auto-coding may substantially reduce demand for clinical coders, with one stakeholder suggesting the reported shortage of clinical coders was over-stated and was significantly based on the over-engineering of the coding task.

Demand for critical competencies

A number of stakeholder suggested that demand for the health information workforce may not be large, but that demand will exist for critical competencies that are difficult (and time-consuming) to develop, for example a high-order informatician (engineering/technological base with 10–15 years of health background) compared with coders, who can be created along clear pathways in 12 months.

Increasing competencies of the whole healthcare workforce in using information systems could also reduce demand for the Level 1 workforce.

5.2 Factors influencing composition of the future health information workforce

Section 5.1 outlines factors that will influence demand for the future health information workforce. Earlier sections in this report highlight difficulties in defining the health information workforce, as well as the five key roles HWA identifies as currently comprising the Level 1 specialist health information workforce.

Whether the composition of the future health information workforce can be expected to reflect the current composition, or not, is of importance for workforce planning. Through the search conference conducted by the consultant, and HWA's own analysis and stakeholder consultation, this question was examined, in particular the composition of the future health information workforce was explored in relation to the following factors:

- The impact of EMR adoption.
- The impact of new clinicians who are more familiar with technology.
- Key roles within the future health information workforce.
- The composition of a health information team.
- Competencies required by the health information workforce (regardless of occupation title or job roles).

Impact of EMR adoption

The globally accepted model of EMR adoption was developed by HIMSS Analytics, a subsidiary of the Healthcare Information and Management Systems Society (HIMSS). Their EMR adoption model identifies eight stages towards achieving a paperless environment and improving the quality of healthcare through the use of technology. At the final stage (stage 7), a hospital will maintain complete electronic records with full interoperability.

Regional variations of the EMR adoption model were created to reflect realities of the adoption sequence in different markets²⁶. Table 2 illustrates the Asia Pacific EMR adoption, which is applicable to Australian hospitals and other health services (where appropriate).

Table 2: HIMMS Analytics – Asia Pacific EMR Adoption Model

Stage of adoption	Cumulative capabilities
Stage 7	Complete EMR; continuity of care document transactions to share data; data warehousing; data continuity with emergency department, ambulatory, outpatient
Stage 6	Physician documentation (structured templates), full clinical decision support system (variance and compliance), closed loop medication administration
Stage 5	Full complement of radiology picture archiving and communications system
Stage 4	Computerised physician order entry, clinical decision support (clinical protocols)
Stage 3	Nursing/clinical documentation (flow sheets), clinical decision support system (error checking), picture archiving and communications system available outside radiology
Stage 2	Clinical data repository, controlled medical vocabulary, clinical decision support, may have document imaging; health information exchange capable
Stage 1	Ancillaries: lab, radiology, pharmacy; all Installed
Stage 0	All three ancillaries not installed

Source: <http://www.himssanalyticsasia.org/>

Each stage of EMR adoption has different requirements of the health information workforce. Therefore, where an organisation sits in relation to EMR adoption influences its health information workforce composition. Global EMR adoption scores are available (Table 4), which indicate approximately half of Australian hospitals sampled were at stage 2 (CDR, CMV, CDS, may have document imaging; HIE capable) of EMR adoption, and over one-third were at the very beginning of the adoption scale (stage 0).

Table 3: HIMMS Analytics – Hospitals' EMRAM Scores (December quarter, 2012)

Stage of adoption	Australia	Other Asia Pacific	USA	Canada	Europe	Middle East
Stage 7	0.00%	0.20%	1.90%	0.00%	0.10%	0.00%
Stage 6	0.00%	2.60%	8.20%	0.50%	1.60%	6.90%
Stage 5	3.70%	4.10%	14.00%	0.30%	15.00%	15.70%
Stage 4	0.90%	3.00%	14.20%	2.30%	3.80%	4.90%
Stage 3	0.50%	0.40%	38.30%	33.80%	4.30%	21.60%
Stage 2	51.60%	27.50%	10.70%	25.30%	24.60%	17.60%
Stage 1	4.60%	3.60%	4.30%	14.80%	18.10%	14.70%
Stage 0	38.70%	58.40%	8.40%	23.00%	32.50%	18.60%
Sample size	N = 217	N = 469	N = 5,458	N = 640	N = 1,439	N = 102

Source: Current State of Global EMR Adoption, HIMMS Analytics 2012

Stakeholder consultations and case study site visits conducted as part of the study provided some insight into what the above adoption ratings mean for the health information workforce.

Stakeholders involved in overseeing the rollout of e-health services within hospital settings (with one hospital at stage 2 of the EMR Adoption Model, and the second further progressed) both highlighted the need for a larger integration layer or integration specialists within the Level 1 health information workforce when progressing along the EMR adoption pathway.

Each of the case study sites visited as part of the study were at different stages of the EMR adoption process. One site self-assessed as being between stages 3 and 4 on the EMR adoption scale (as they had a near-paperless record system, where any paper data input was scanned and attached to a centrally stored medical record, and through the integration of the patient information management and clinical medical systems, a range of health information workers and clinicians could directly access patient data). At this site the major impact of EMR adoption had not been on the health information workforce, but on clerical staff (non-professional) whose work changed from paper-based to scanning and appending documentation to EMRs.

However this site also noted the move to interoperable systems was being strategically pursued and supported with considerable change management processes, and the health information workforce impact was being experienced in other organisations (not specifically their own). For example, in the Medicare Local associated with this site, there are eight to ten people working on e-health projects focusing on systems interoperability supported by NeHTA funding. This included linking pharmacists' systems to general practitioners' (GPs) systems; linking GPs' systems to hospital systems; and linking allied health systems to both pharmacists' and GPs' systems.

Another site noted their services were still essentially paper-based, so EMR adoption was low (self-assessed at stages 2-3 on the EMR adoption scale). They highlighted their health information workforce priority was on building the coding workforce to meet the needs of change to ABF.

While the last site had commenced electronic records for their emergency department and inpatients, records were printed off (to be inserted in a paper record) after data entry, and outpatient and specialist services were still fully paper-based. They did not advise of any impact on their health information workforce.

Clinicians support requirements

Most stakeholders advised of a distinct difference between new graduates entering the clinical workforce (more tech savvy and better equipped with existing technological skills) and existing clinicians. Feedback from stakeholders was that the existing workforce have more trouble using data and are not as open to technological change. Part of this problem is a lack of understanding that the purpose of new systems is not to change the way in which they practice, but rather to enhance their services.

With the gradual adoption of EMR, it was considered there will be an increase in demand for technological support for clinicians (help working with mobile devices, beside computers and other components of IT infrastructure) as well as an increased demand for a transient workforce to take on support roles (for example, physician or clinical champions).

Key roles identified for the future health information workforce

In considering the full implementation of EMR in hospitals and other healthcare settings in the coming five to ten years, stakeholders highlighted the roles of the Chief Information Officer (CIO), the Chief Medical Information Officer (CMIO), Chief Nursing Information Officer (CNIO), and Chief Clinical Information Officer (CCIO) as essential within the health information workforce. A detailed description of these roles is provided on the following pages.

Chief Information Officer

The role of the CIO has rapidly changed over recent years. Stakeholders viewed the future role of the CIO as providing technological leadership in the development and implementation of hospitals' e-health programs. The CIO would lead the hospital in planning and implementing information systems to support both distributed and centralised clinical and business operations to achieve more effective and cost-beneficial IT operations and in turn, more effective healthcare services. A combination of literature suggests other tasks of the CIO will be to:

- Provide strategic and tactical planning, development, evaluation, and coordination of the information and technology systems for the hospital.
- Facilitate communication between clinicians and other technology resources.
- Oversee the back office computer operations of any affiliate management information system, including local area networks and wide-area networks.
- Take responsibility for the management of multiple information and communications systems and projects, including voice, data and imaging.
- Design, implement, and evaluate the systems that support end users in the productive use of computer hardware and software.
- Develop and implement user-training programs.
- Oversee and evaluate systems' security and back-up procedures.

During consultation, one stakeholder (whose hospital is at stage 2 of EMR implementation), noted rather than have a CIO, the role was split into two directors:

1. Director of Health and Information Technology who oversees the department dedicated to the day-to-day running of health information systems within the hospital. The departments that report to this director are in charge of data support for the hospital IT and communications, front desk, telephones and decision support.
2. Director of Clinical Operations to whom the CMIO and EMR Project Director report. The CMIO plays an advocate and advisory role at this hospital and is focussed on clinical engagement. The EMR Project Director focuses on the hospital's clinical information strategy. The hospital views the EMR project as a clinical project enabled by technology. That is, the project is implementing new clinical systems that all clinicians must be proficient in using.

Chief Medical Information Officer

The CMIO essentially serves as the bridge between medical and IT departments. Typically, the CMIO is a physician with some degree of formal health information training or a working equivalent, who often works in conjunction with or helps to manage other physicians, nurses, pharmacists, and general informaticians. In many cases, CMIOs continue to see patients on a part-time basis⁵. Some CMIOs however are technology professionals who have been trained in health informatics.

Due to rapid technological advances, the job description of the CMIO is still being defined and varies from one organisation to another. Stakeholders suggested some common responsibilities would be to:

- Design and integrate IT systems in medical departments.
- Analyse the use of technology such as EMR, DMR and CPOE systems to determine its effect on patient care.
- Set standards for the use of medical terminology.
- Train physicians on the use of software, studying how the software is used and using that knowledge to influence future deployments.
- Work with senior leadership to create a strategic plan for IT.

Chief Nursing Information Officer

Recognising that implementation of EMR greatly impacts nursing practice, organisations are realising they need a leader who would be able to⁶:

- Define and implement the strategy for innovative technology and processes to support the delivery of quality patient care and enhance nursing practice.
- Understand the impact of EMR on nursing that will improve patient care delivery, efficiency, quality and safety and outcomes.
- Recognise that the enhanced technology can maximise nursing productivity and maximise investments.

Duties of the CNIO would include:

- Using the knowledge and skills of clinical practice to develop and oversee the implementation of evidence based information systems that enable the delivery of efficient, effective nursing care.
- Acting as the primary liaison between IT and nursing and be the translator of application functionality to the nursing division.
- Facilitating the development of nursing automation standards, developing procedures and guidelines for the implementation and use of nursing applications.
- Establishing nursing system competency requirements.
- Articulating and educating the nursing staff and others on the importance of technology to clinical care.
- Defining and implementing nursing strategy for aligning people, processes and technology to transform the practice of nursing through information technology.

Chief Clinical Information Officer

A CCIO would provide leadership and management of ICT and information development activity to support the safe and efficient design, implementation and use of informatics solutions to deliver improvements in the quality and outcomes of care. Some organisations combine the role of CMIO and CNIO into a CCIO, so as not to silo clinical staff. CCIO duties include:

- Providing expert clinical informatics advice and guidance.
- Working collaboratively with others to ensure patient and clinical involvement in the planning, development, delivery and evaluation of systems and services.
- Championing the use of informatics as an enabler of change and quality improvement.

In 2011, e-health Insider UK, launched a CCIO campaign to encourage the National Health Service (NHS) to develop the role of a dedicated CCIO within NHS services⁷. The campaign, which is backed by the Royal College of Physicians and other clinical professional bodies, calls for every NHS provider organisation to consider appointing a clinician to act as their clinical informatics champion.

Integration specialist

Stakeholders suggested another rapidly developing role for the future health workforce in Australia is the integration specialist. The role can be described as working with computer systems to facilitate clear communication between software, applications and hardware over a variety of networks, allowing for systems interoperability (between internal systems and external healthcare providers). These professionals install and update programs and applications to make sure that communication across systems is smooth. Integration specialists also work with numerous types of computer systems and mobile devices to get them all to work together. This can include desktops, laptops, personal digital assistants, smart phones, tablets etc. The integration specialist must make sure that this is possible while also protecting the security of the system⁸.

Composition of a health information team

By identifying the potential impact various factors may have on the future health information workforce, in combination with recognising future key roles and the fact that the health information workforce is comprised of many roles, stakeholders discussed the possible composition of a future health information workforce team.

In relation to leadership, stakeholders noted the ideal future health information leadership team would include a CIO with a strong clinical background (finding a good balance between clinical and technological skills), as well as a CMIO or CCIO to guide clinicians and lead clinical engagement. Stakeholders envisaged that in the future the CMIO or CCIO would take a seat next to the CIO, because this role was rapidly gaining importance. It was suggested the composition of the future health information team could be as follows.

(Level 1) The CMIO/CCIO and CIO work best as a team.

The CMIO or CCIO is involved in all facets of clinical implementations and best practice, while the CIO is focused on budget and IT infrastructure, including security and regulations. The CMIO or CCIO is key to facilitating collaboration between IT and the clinical community and is considered highly strategic to achieving the clinical objectives of the health system.

(Level 1 and 2) A core, clinical informatics-focused team.

A team focused on informatics will play a large part in defining and creating tools that can be successfully implemented and used in a meaningful way. The purpose of this team will be to help answer critically important questions during design, content development and implementation of tools that relate to workflow, ease and speed of use. The team should synthesise broad information, which medical staff advisors should review.

(Level 2 to train Level 3) Physician champions, superusers and clinical representatives.

Achieving successful systems implementation will require well-planned and regularly scheduled meetings with physician champions and clinical representatives in all key areas. These should come from a range of disciplines. By working together, the CIO, CMIO, CCIO, and the informatics and clinical representative teams should achieve consensus across the system through communication that encourages involvement. This view accords with another stakeholder who said the future workforce needs to be comprised of technical support for new systems, as well as those who can teach clinicians to use the systems.

Stakeholders noted that jurisdictions currently use different service models, such as the shared services arrangements in WA. The suitability of implementing this suggested structure will vary between jurisdictions.

5.3 Summary of considerations for the future health information workforce

In summary, demand for the Level 1 health information workforce can be expected to increase with the implementation of e-health initiatives, ABF and the continued requirement for data collections and reporting. However as demand factors change, stakeholders expect the composition of the health information workforce to change. In particular:

- In the short to medium-term, there appears to be strong demand for clinical coding as a result of ABF implementation, however advances in technology and improvements in auto-coding may see this change long-term.
- As e-health initiatives are developed and ABF is implemented, there is a strong focus on health systems development, interoperability and implementation.
- Throughout the implementation of ABF in the short-term and e-health in the medium to long-term, there is a need for roles to train clinicians in the use of new systems.
- In the long-term, as systems are bedded in, IT focus will change from implementation to maintenance and support.

Changing demand drivers need to be considered in the planning for, and education of, the future health information workforce to ensure the skills and abilities required are generated.

Finding 3

Stakeholder groups (for example, HIMAA, HISA, AHIEC, AHIC) need to maintain or strengthen strategic relationships with bodies that significantly influence workforce demand (including NeHTA, state and territory health authorities, DoHA) for informed discussion and development of a coordinated workforce response. For example, all proposed new health information projects and initiatives should include workforce impact statements.

Recommendation 3: Form strategic relationships

- Support a single body that represents and advocates for all health information stakeholders in relation to workforce issues.
- Establish a close working relationship with employer representatives and NeHTA in order to identify and influence opportunities to collect data that furthers an understanding of employer workforce needs and recruitment and skills development behaviour.
- Improve the relationship with education providers to ensure a better fit of the education solutions with the industry requirements of the workforce in the future.
- Approach the ABS to consider re-classification or more appropriate classification of the occupations listed under the ANZSCO codes.

Finding 4

Stakeholder feedback identified an ideal future health informatics leadership structure. This encompassed current Level 1 staff, including a CIO (with a strong clinical background) to lead technological development and implementation, and a CCIO/CMIO/CNIO to lead clinical engagement. In addition to this leadership structure (as part of the Level 1 workforce), other workforce components required are: a core clinical informatics-focused team (Level 1 and 2 workforces), clinical educators/trainers (Level 2 workforce) and clinicians with an appropriate level of health informatics skills (Level 3 workforce).

Recommendation 4: Consider future configuration of workforce

- Focus on future workforce investment in the clinical informatics workforce structure by teams (Level 1 and 2 workforce) whose purpose is to help answer critically important questions during the design, content development and implementation of e-health tools that relate to workflow, ease and speed of use. This may be achieved through organisational initiatives and team formation, and whose skills are obtained through undergraduate, postgraduate or workplace-based training.
- Consider future workforce structures that include clinical educators/trainers (Level 2 workforce), whose role is to train clinicians to use new systems. Their skills may be obtained through workplace-based training conducted by the Level 1 workforce, or through external continuing educational programs (such as workshops, online training modules).

Determine whether the configuration of these workforces is optimal in productivity and training terms.

6. What competencies are required for the future health information workforce

The majority of stakeholders suggested that demand for the future health information workforce may be expressed as demand for competencies rather than demand for individual workers. This is particularly relevant given the future health information workforce will not necessarily match that of today with factors such as ABF implementation in the short-term, and EMR adoption in the long-term, likely to affect health information workforce composition.

With this context, stakeholders considered what competencies would be required for developing the future health information workforce.

A variety of opinions exist about the health information competencies required by the future technical and clinical workforces, however most stakeholders highlighted the following competencies as integral to the Level 1 health information workforce:

- Health Level Seven International (HL7) literacy: the HL7 protocol creates a common language that allows healthcare applications to share clinical data with each another. Over time the HL7 interoperability protocol has become internationally accepted and accredited standard. HL7 creates international standards for inter-system and inter-organisation messaging, for decision support, clinical text document mark-up, user interface integration as well as a health data model and message development methodology.
- Conceptual grasp of core IT and informatics tools e.g. databases, presentation layer, networks/communications, web technologies, cloud/service environments.
- Awareness of ethical and legal requirements regarding information privacy, security and quality.
- Competence in standards associated with health informatics (eg terminologies, messaging).
- Information management as IT people do not have these skills and they are not always understood and recognised by hospitals.
- Business process analysis to enable those who use information to create better business processes.
- Ability to generate reports.
- System life cycle development.
- Project management.

The above list is not exhaustive, and the required competency standards may vary between roles and employment selection criteria.

There was stakeholder consensus that future health information training will need to be competencies-based. This will allow for the continued design of stand-alone courses, and also enable health information competency-based training to be integrated within general medical and health science degrees.

Current competency frameworks

As highlighted above, stakeholders identified the importance of competencies in looking to the health information workforce of the future. A number of competency-based approaches already exist in relation to health information workforce, summarised below.

Australian Health Informatics Education Council

In 2011, AHIEC conducted a detailed review⁹ of the required competencies of Australia's health information workforce. The outcome of the review was a list of competencies based on the International Medical Informatics Association (IMIA) recommendations published in 2010¹⁰, with modifications to align them with the Australian healthcare environment. A list of these competencies is found in Appendix B².

The IMIA produced its recommendations to provide a framework for individual curriculum development. In the development of Australia's modified competencies, AHIEC noted that education and training providers need to make use of these competencies for program/course design, delivery and assessment purposes.

The scope of AHIEC's competency sets include healthcare professionals, providers and software professionals across three groups:

1. Health informatics related competencies used by the whole healthcare workforce (Levels 2 and 3 workforces).
2. Health informatics professionals (Level 1 workforce).
3. Specialisations within the health informatics professional workforce (Level 1 workforce).

AHIEC organised these competencies into three main areas:

1. Knowledge (including knowledge management).
2. Medicine, health and biosciences, health system organisation.
3. Informatics/computer sciences, mathematics, biometry.

Australian Health Training Package

In Australia, there are well-developed competencies for clinical coders and HIMs as these areas of the workforce are well circumscribed. In the Australian Health Training Package there are three units of competency that underpin the VET training qualifications for workers in health information, normally those undertaking clinical coding within health services. Table 4 identifies the units of competency and their elements.

² The competencies were informed by the International Medical Informatics Association recommendations (IMIA Working Group on Health and Medical Informatics Education, 2009), the competency statements of many of the health and information technology professional groups and the competency based requirements of the Department of Education, Employment and Workplace Relations (Department of Education Employment and Workplace Relations, 2007, Health Information Management Association of Australia, 2001, Australian Nursing Federation, 2010, HIMAA Education Services, 2010, Royal Australian College of General Practitioners, 2007, SFIA Foundation, 2008).

Table 4: Relevant units of competency in Australian Health Training Package

Unit of competency code	Unit of competency title	Elements
HLTCC301A	Produce coded clinical data	1. Identify and evaluate clinical data from simple medical records.
		2. Assign codes to clinical data.
HLTCC402A	Complete highly complex clinical coding	1. Abstract clinical data from highly complex medical records.
		2. Assign codes relating to highly complex medical records.
		3. Provide clinical coding expertise in the workplace.
		4. Maintain currency of data collection and coding.
HLTCC401A	Undertake complex clinical coding	1. Abstract clinical data from moderately complex medical records.
		2. Assign codes relating to moderately complex medical records.
		3. Maintain clinical coding records.

Source: adapted from Australian Health Training Package

Health Information Management Association of Australia Limited competency standards

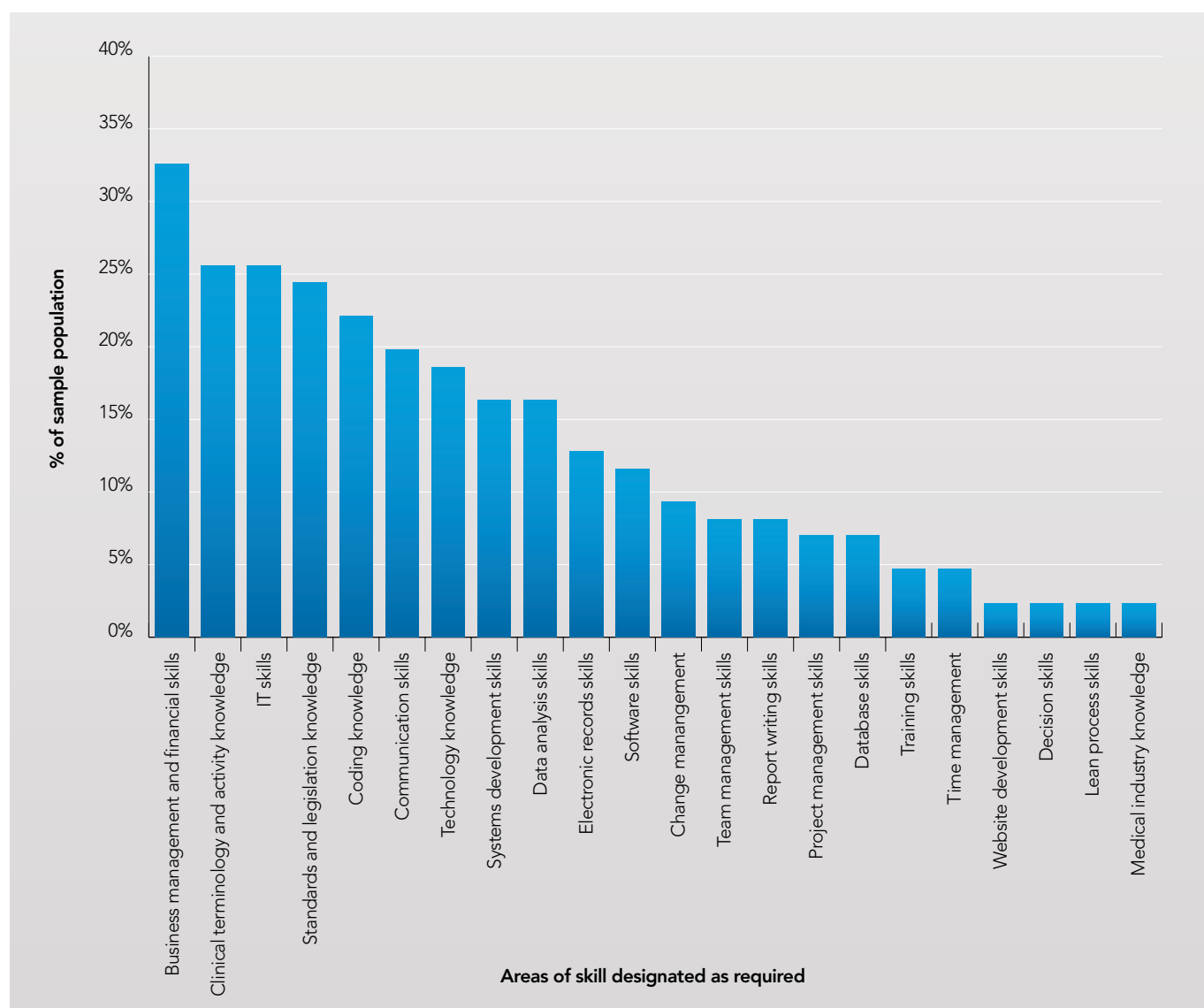
In 2013, HIMAA published new entry level competency standards required by HIMs across Australia¹¹, aligned with the competencies published by AHIEC in 2009. The standards describe the responsibilities of HIMs including the collection, storage, analysis and release of health information, ensuring information is available for patient care and decision making. The standards are described across the following domains:

- Generic professional skills.
- Health data management.
- Health statistics, biomedical research and quality management.
- Health services organisation and delivery.
- Information technology and systems/health informatics.
- Organisation and management.
- Continuing professional development.

Competencies identified through this study

In the survey of a sample of the health information workforce population undertaken for this study (86 respondents), respondents were asked to nominate the three most important skills they felt they must develop to continue to be effective in their jobs. The open-ended responses were categorised into broad skill/knowledge areas and ranked by percentage of respondents identifying the skill. The areas most nominated were business management and financial skills, clinical terminology and activity knowledge, and IT skills (Figure 7).

Figure 7: Skills identified as required for effective jobs in order of priority



Source: HCA survey 2011

International competency frameworks

The Centre for Disease Control and Prevention (CDC) in the USA, the Canadian Health Informatics Association (COACH) and the NHS in the UK have all published competency frameworks for health informaticians. The Public Health Informatics Competencies (USA) represents a broad set of core competencies for public health informaticians¹². It recognises that all informaticians are not expected to be equally competent in every area, rather, informaticians' competencies depend on seniority, position, focus and location (e.g. health department, academia, federal government). COACH's Health Informatics Professional Core Competencies are aimed at health informatics professionals only, and reflect advances in e-health and the practice of health informatics since it was originally published in 2007¹³. The NHS Health Informatics National Occupational Standards (HINOS) are primarily for specialists¹⁴. However, in their development it was recognised that all health staff need some informatics skills at an appropriate level, therefore the standards were developed to address all healthcare workers needs.

7. Demand and supply of the health information workforce

While Chapters 5 and 6 of this report focus on strategic issues that will impact the health information workforce, including the future composition of the workforce and competencies required, a more immediate question is whether there is (and will continue to be) sufficient workforce to meet demand.

Current situation

There is no single quantitative measure available to determine whether supply and demand for a particular workforce is in balance or not. The existing health information workforce also cannot be nationally defined or reliably measured at this point in time (refer Chapters 2 to 4). Despite these limitations, the literature review highlighted many commentators claiming the health information workforce is currently in shortage and there is insufficient supply to satisfy demand.

NeHTA response to a review of its operations noted³:

"NeHTA's organisational development to date has been characterised by intense recruitment activity and a rapid build-up of staff numbers. Despite this growth, recruitment difficulties reflect capacity constraints in the Australian market... The constraints have inevitably driven up salaries and made it harder to attract suitable candidates. Recruitment agencies report that there are more jobs than there are candidates in the market."

Similar anecdotal evidence was noted in the Australian Health Review⁸:

"Anecdotal data supports the lack of skilled and qualified clinical informaticians in the Australian private health sector: one private hospital's Applied Medical Intelligence Research facility took 19 months in 2008 to fill three informatics positions (Clinical Data Manager, Clinical Information System Manager, Clinical Data Analyst) with suitable staff."

AIHW's report *The Coding Workforce Shortfall* makes claims that²⁷:

"There is a recognised shortfall in the [clinical] coding workforce in Australia, as has been articulated in two previous national surveys ..."

AIHW's report goes on to provide evidence of both a current and future shortage in the supply of coders, in particular the existence of a number of vacancies at the time of the report. Similarly, the Health Information Management Journal published a report which found that 63 per cent of health services in Victoria had unfilled vacancies for clinical coding positions¹.

Despite the apparent weight of evidence in support of claims there is inadequate supply to satisfy demand, there remains questions as to the spread of shortages both geographically and across different segments of the health information workforce. At this time, strong evidence seems to support difficulties in employing clinical coders, and to a lesser extent, HIMs.

This observation was generally supported by stakeholder consultations. Many stakeholders interviewed reflected on a disconnect between an assessed need for the health information workforce and the employment decisions of individual employers. They noted that employers are not necessarily creating the roles/positions that the literature suggests are needed.

Types of shortages

If a workforce shortage exists, the question is then raised about what type of shortage it is. The National Institute of Labour Studies offers the following taxonomy for categorising workforce shortages²⁹.

Type 1 shortage

- There is a shortage of trained workers.
- There is a long training time to develop the skills.
- There are limits to the capacity of training organisations.

Type 2 shortage

- There is a shortage of trained workers.
- There is a short training time to develop the skills.
- The capacity of training organisations can be readily expanded.

Type 3 shortage: skills mismatch

There are a sufficient number of trained workers who are not already employed, but they are not willing to apply for the vacancies under current conditions.

Type 4 shortage: quality gap

There are a sufficient number of trained workers who are not already employed, but who lack some qualities that employers think are important.

On the evidence available, any current shortage in relation to the clinical coding workforce is more likely to be classified as a type 2 shortage, given this workforce can be up-skilled relatively rapidly. However, some literature suggests that the health information workforce shortage is more a type 4³⁰. It should be noted the type of shortage will depend on the workforce segment being considered, and may vary significantly between, and even within, jurisdictions.

Future situation

With information available, it is not possible to project the future workforce position of the health information workforce – whether there will be sufficient supply into the future to satisfy demand or not. However information gained through the study highlighted key factors that will influence demand for the future health workforce, namely the impact of EMR adoption, the ongoing and increasing demand for high quality and high volume data reported from health information systems, advances in technology, and the impact of new clinicians who are more familiar with technology.

Stakeholders considered the influence of these demand drivers on the future composition of the health information workforce, and suggested:

- Key roles for the future included:
 - The CIO, CCIO, CMIO, CNIO e.g. roles with higher order skills in decision-making, that work together and provide technological leadership in the development and implementation of hospitals' e-health programs.
 - Integration specialist who works with computer systems to facilitate clear communication between software, applications and hardware over a variety of networks, allowing for systems interoperability between internal systems and external healthcare providers.
- The demand for clinical coders may substantially reduce as a result of advances in auto-coding.

It can also be expected there will continue to be an ongoing need for an information brokerage role that works across the clinical and IT disciplines to ensure the usability and integration of the health information system.

While it is not possible to project the future workforce position of the health information workforce, with the information gained on key roles within the future health information, we can focus on understanding the competencies required in performing the identified roles, and ensure pathways are in place that allow those competencies to be developed.

Finding 5

There are existing workforce shortages in the clinical coding workforce (as a component of the Level 1 workforce). This is currently being addressed to various extents in some states and territories and within some local health networks. Given the strong links between the clinical coding and health information management (HIM) workforces, shortages of HIMs must also be addressed, as they are critical to the quality of clinical classification work and to support health information innovation and change. Shortfalls for these workforces are likely to be exacerbated in the short and medium term by the national adoption of activity based funding under the National Health Reform Agenda.

Stakeholder feedback suggests that there are other health information workforce shortages that are less well understood. For example, senior data analysts with skill sets in the development of policy, evaluation and information strategies are a highly valuable and scarce resource. These skills are not readily gained through traditional education courses but most often through a mix of structured education and direct exposure in the workplace to a variety of information projects and programs.

Furthermore, shortages of higher order skills in decision-making roles (Level 1 workforce) may constrain the adoption of eHealth initiatives or investment in its infrastructure. Additionally, shortages in two intermediary groups - a clinical informatics-focused team (Level 1 and 2 workforces) and clinical informatics educators/trainers (Level 2 workforce) – will limit the adoption of eHealth initiatives in hospital settings. These groups provide an essential link between the Level 1 workforce and all healthcare professionals whose primary role is patient care (Level 3 workforce), and will foster clinicians' training and confidence in using new systems and protocols.

Recommendation 5: Address known health information workforce shortfalls

- Increase the national supply of clinical coders. In addition to supporting existing course options, it is recommended that the number of clinical coders can be increased through 'in situ' workplace-based training; supported by an increased capacity of the vocational education and training (VET) sector. Efforts to identify and appropriately re-skill health professionals leaving the clinical workforce could improve the supply of clinical coders. Stakeholder feedback has suggested that the issue of remuneration for clinical coders needs to be addressed because the current rate of pay for their work is a significant disincentive to retention and recognition of this workforce.
- Address the shortage of HIMs, in the short-term by addressing the drop in enrolments in appropriate courses and in the longer-term by increasing the broader appeal of the HIM profession.

8. Supply of the health information workforce

Knowing the type of workforce shortage informs the most appropriate mechanism to address that shortage. Given the lack of definitive information on the type and extent of any workforce shortage, this chapter presents research and stakeholder views outlining key current supply streams (and trends where available) for the health information workforce, rather than providing specific suggestions on how a current workforce shortage could be addressed. Views on future supply and factors affecting future supply are also presented.

³ This is a subtle distinction between courses that prepare graduates specifically for work in the health industry, for instance a Bachelor of Nurse Informatics, versus courses that prepare students for a broad range of industry options, one of which might be health, for instance a Bachelor of Informatics.

8.1 Current sources of supply

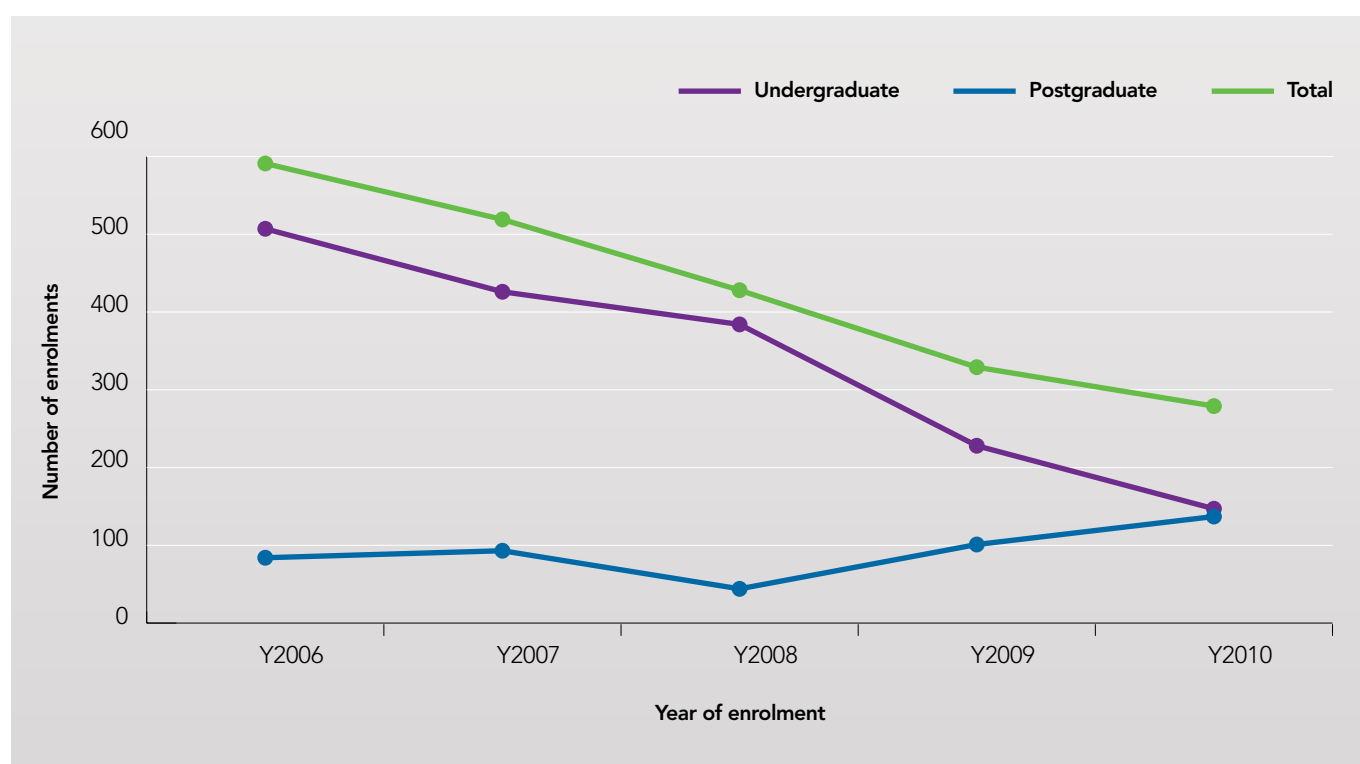
Graduates

A number of courses currently exist at the tertiary level that specifically train health information workers. Information was obtained from the then Department of Employment, Education and Workplace Relations (DEEWR) on enrolments and completions in these health information workforce-related courses.³

While this report highlights a number of factors that will contribute to increasing demand for the health information workforce, Figure 8 shows overall enrolments in health information workforce-related courses have substantially reduced from 2006 (591) to 2010 (279). This was the result of a fall in undergraduate course enrolments (from 507 to 142), with a contributing factor to this the recent closures of long-standing relevant health information undergraduate courses (which were preceded by a gradual decline in course enrolments).

While undergraduate enrolments reduced over the period 2006 to 2010, post-graduate health information workforce-related enrolments increased from 2008 to 2010. Stakeholders indicated one reason for this might be that many universities are trying to convert undergraduate courses into postgraduate courses for financial reasons.

Figure 8: Student enrolments in health information workforce related courses in Australia distributed according to post and undergraduate courses



Source: DEEWR, 2010

Table 5 shows enrolments and completions by institution and course for 2006 and 2010. In almost all instances (for courses where enrolment and completion information was not confidentialised to <10) enrolments and completions reduced from 2006 to 2010.

Academic stakeholders consulted suggested the current demise of health information courses was more a result of prospective student lack of interest rather than decisions made by the education sector. Most stakeholders believe courses are poorly sold to prospective students, and that demand for the health information workforce is not well articulated by employers, hence market intelligence (small numbers of advertised positions) indicates to prospective students that there are no jobs available.

Table 5: Enrolments and completions relevant courses for health information work offered by Australian universities, 2006 and 2010

Institution	Course	Enrolments		Completions	
		2006	2010	2006	2010
Central Queensland University	Bachelor of Nursing Informatics	15	0	<10	<10
	Graduate Certificate, Graduate Diploma and Master of Health Informatics	24	<10	<10	0
Curtin University of Technology	Bachelor of Science (Health Information Management)	102	46	<10	16
La Trobe University	Bachelor of Health Information Management/Health Sciences/Information systems/Honours	177	70	22	21
	Master of Health Information Management	0	95	0	0
Monash University	Graduate Certificate/Diploma in Health Informatics	18	0	40	0
Queensland University of Technology	Bachelor of Health Science (Health Information Management)	49	17	16	0
The University of New South Wales	Bachelor of Health Informatics	<10	0	0	0
The University of Sydney	Bachelor of Applied Science (Health Information Management)/Health Sciences (Health Informatics Pathway)	159	<10	65	0
	Doctor of Philosophy	16	29	<10	<10
	Master of Applied Science				
	Master of Health Informatics				
	Master of Health Information/Master of Health Science (Health Information Management)				
University of Tasmania	Graduate Certificate/ Graduate Diploma in E-Health (Health Informatics) (H5E) and (H6E)	18	0	<10	0
University of Wollongong	Master of Health Informatics	<10	<10	<10	<10

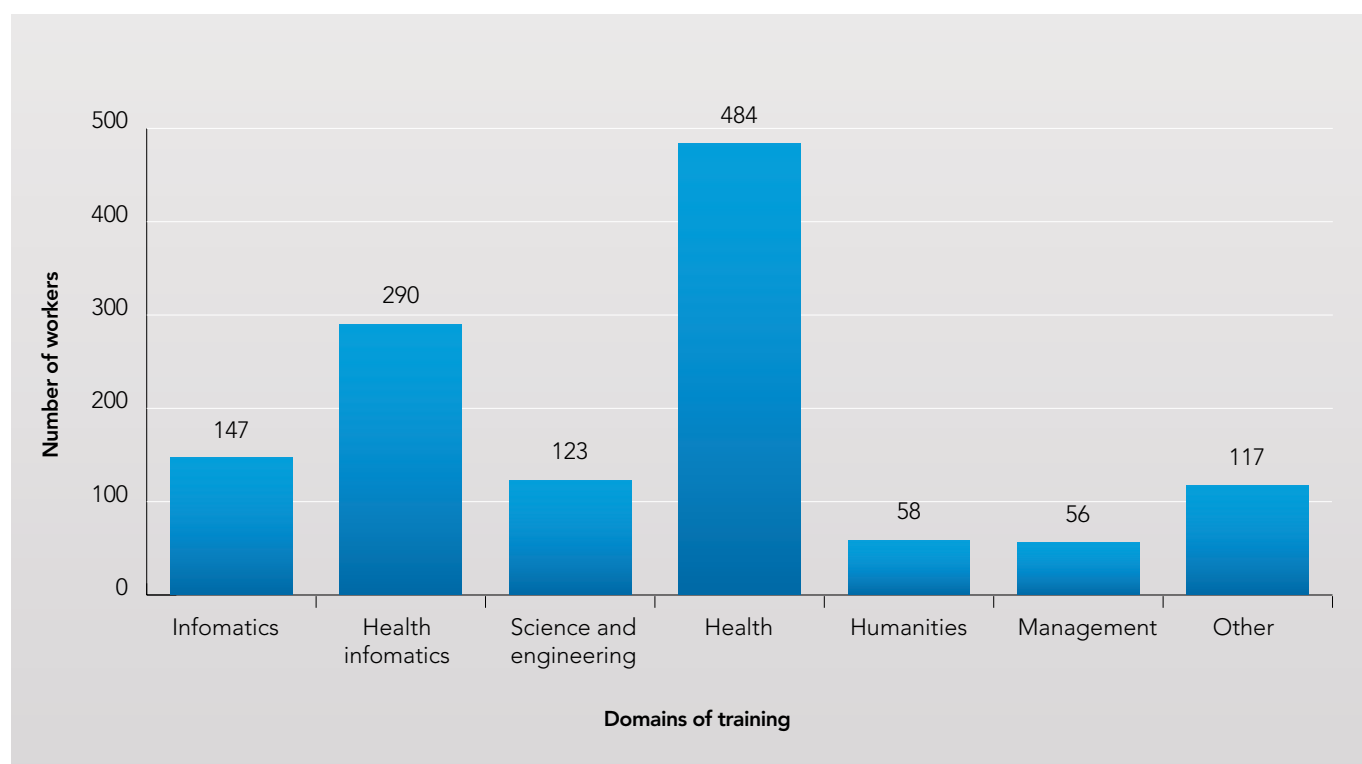
Cell <10 have been confidentialised.
Source: DEEWR, 2010

Second career options

A significant amount of literature discusses first career and second career graduate entrants into the health information workforce³¹. First career graduates refers to graduates entering the relevant workforce straight out of their initial degree, while second career graduates refers to people who have returned to study after an initial career, and are then entering the workforce relevant to that second field of study.

The survey conducted by HISA in 2009 found that the first training obtained by approximately 40 per cent (484) of the health information workers surveyed was in a health profession, for example nursing, medicine or allied health. Almost one-quarter (23 per cent or 290) had obtained their first training in health informatics, while approximately 44 per cent had obtained training immediately relevant to health information work (including health informatics, informatics, information science, computer science, systems design/engineering) (Figure 9). These results demonstrate more than half of the health information workforce surveyed did not enter the workforce as first career graduates.

Figure 9: Distribution of the health information workforce by first domain of training



Source: HISA, 2009

The HISA survey results also showed almost four in five people surveyed had a second qualification. Second qualifications were primarily in the areas of informatics, health informatics or health information management.

These results demonstrate the importance of second career graduates to the supply of the current health information workforce.

The Australian Health Review's report, *Clinical informatics: a workforce priority for 21st century health care*, calls the second career graduate process 're-tooling' through post-vocational and postgraduate training, and argued it is invaluable for the development of appropriate levels of capacity within both the technical and clinical workforces⁸. This view is supported by the HISA survey results, which showed a substantial percentage of the health information workforce with second qualifications.

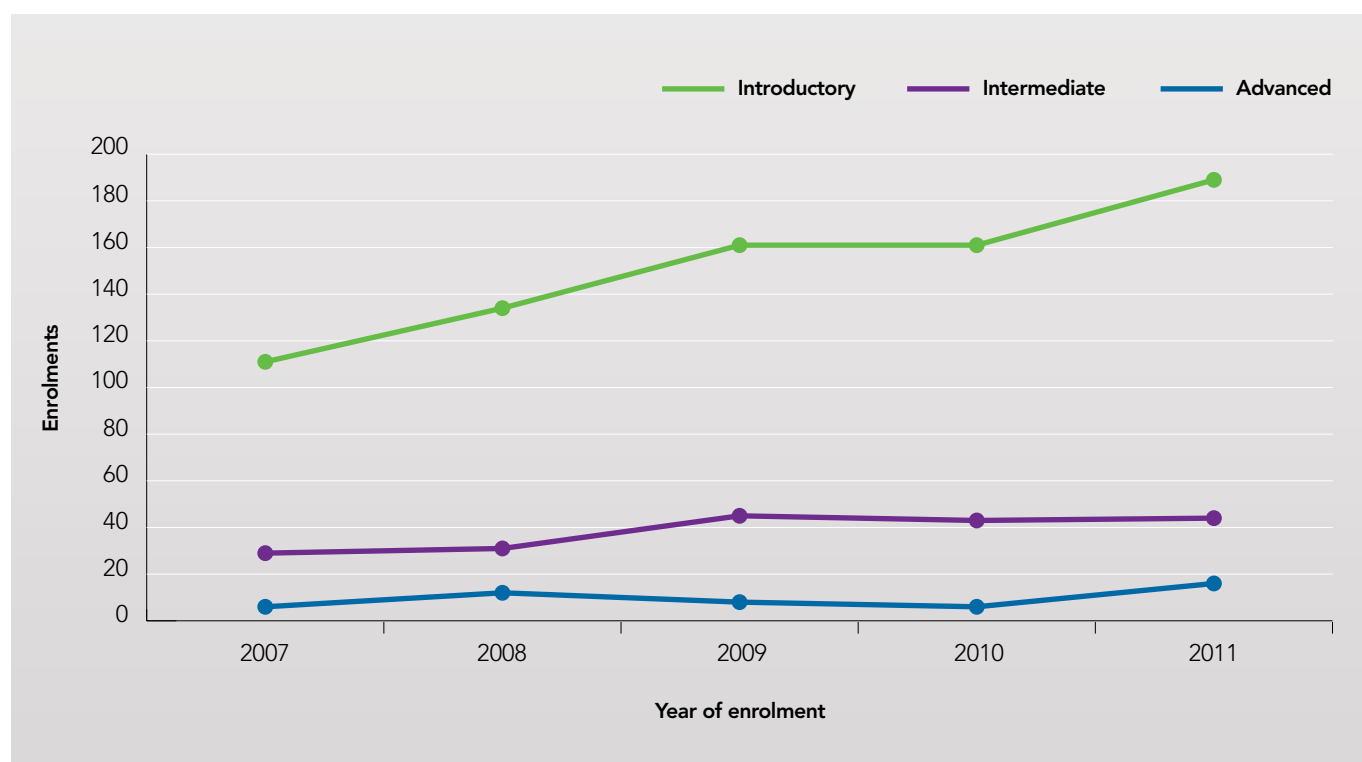
The IMIA also recognises that students undertaking health informatics postgraduate education have either completed an undergraduate degree in one of the health professions or in informatics (for example computer science, information and communication technology, information management, information science, bioinformatics) or they have previously graduated with a degree in a wide variety of knowledge domains³⁰.

Clinical coding preparation

The second career terminology is particularly apt for many entering the clinical coding workforce. While it was highlighted previously in this report that many use a health information management qualification to enter the coding workforce (especially in Victoria), an increasing number are entering through a relevant HIMAA course. Following the introduction of coding competencies in the Australian Health training package (refer Chapter 6), HIMAA courses have been based on the relevant units of competency.

Figure 10 shows HIMAA course enrolments have increased from 2007 to 2011, particularly introductory course enrolments (from 111 to 189 enrolments). Increases in course enrolments may be a reaction to the perceived shortage in the clinical coding workforce or increased demand through the implementation of ABF. This is also consistent with information gained throughout the study, which suggested that new clinical coders are often graduates from clerical or medical records administration roles in health information departments.

Figure 10: Enrolments in HIMAA courses by course type, 2007 to 2011



Source: HIMAA, 2011

8.2 Future sources of supply

Information presented in section 8.1 highlights some of the current sources of supply to the health information workforce. During the course of this study, desktop research and key informants highlighted alternative education pathways for the future health information workforce, which are outlined in this section.

Upskilling the existing workforce

In the short-term, upskilling of the existing workforce (from outside of the existing health information pool) was highlighted as an effective means of improving short-term supply problems where particular skills or competencies are required.

One stakeholder noted that many enter the health information workforce by simply adding on skills or up-skilling, including clinicians who pick up IT skills or IT people who pick up health knowledge. Several stakeholders noted that clinical coding skills are comparatively easy to generate, especially if the development and deployment is independent of HIM skills. One stakeholder identified many coders were formerly administrative staff. As well, coding can provide an opportunity to retain nursing/clinical skills within an organisation by offering an alternative role to people who have become dissatisfied with either the work or conditions such as shift-work associated with clinical roles.

Alternative training pathways

Longer-term, while stakeholders considered competency-based training appropriate for the future health information workforce, other research conducted has identified three different types of future education in health informatics:

1. Training specialists.
2. Training clinicians in knowledge of biomedical informatics.
3. Continuing development of all professionals.

These aim to initiate efforts to better prepare current and future health information workforce professionals¹⁵.

Training specialists (Level 1 workforce)

The academic stakeholders consulted noted that training specialists will be at a postgraduate level, due to diminishing undergraduate courses. One stakeholder suggested that Australia adopt the approach of the USA, where after an initial medical, health, information technology or computer science degree, graduates can enter a health information specialty via programs such as a masters, PhD program or residency (where applicable).

Stakeholders also expressed the need for executive level courses that address the needs of clinicians who will eventually transfer to senior positions within the health information workforce, such as the CIO or CCIO. It was noted that special attention should be paid to innovative teaching methods being applied successfully both overseas and in Australia already, such as workshops, summer schools, online resources, multi-disciplinary groups and problem-solving oriented training¹⁶.

Training clinicians (Level 2 and 3 workforces)

Coordinated interprofessional curriculum renewal for e-health capability in clinical health professional degrees

Future clinical health professionals will need to be able to work competently in an e-health enabled healthcare sector, and the argument for increasing clinicians' knowledge about e-health and health informatics is advancing quickly¹⁷. New initiatives in professional education, training, learning and development are required to build the knowledge and skills the Australian health workforce needs to work in a national e-health system. In Australia, few educational providers in the health professions have developed a systematic approach to teach, assess, accredit or audit this aspect of professional education, and such curriculum initiatives are not widely known¹⁷.

To make significant improvements to the e-health education of future clinicians in Australia, considerable efforts are needed to develop e-health expertise among academic teaching staff and to develop resources for teaching and assessing e-health competence.

One project contributing to this is the Coordinated Interprofessional Curriculum Renewal for e-health Capability in Clinical Health Professional Degrees¹⁸⁻²² project. This project is running from 2011 to 2013, and aims to encourage and support program coordinators of all Australian undergraduate and postgraduate programs in all allied health, nursing and medical professions to include e-health (or clinical informatics) curriculum where it is not yet in place, and to engage in collaborative continuing improvement where it is. It is being led by the University of Melbourne in partnership with the University of Western Sydney, the University of Queensland and Curtin University in Western Australia.

Other academic views

All academic stakeholders consulted supported the notion of embedding competencies across undergraduate health curricula (as topics within units), rather than the notion of single health informatics subjects or units. One stakeholder outlined the following critical competencies as common across many health professions, and suggested they should be incorporated into undergraduate units:

- How to retrieve information and manage knowledge including competent use of health engines and specialist resources (such as the Cochrane Library).
- Use of electronic records as a platform for patient data which allows for health information exchange between healthcare providers, leading to a coordinated approach to healthcare.
- Working in partnership with specialists and at a minimum level, being able to understand the importance of their work, while building skills which allow for working partnership with the specialist health information workforce (Level 1), such as and the ability to critically appraise data.
- Patient engagement including how to use the PCEHR in clinical care and encourage patient autonomy. This will challenge the role of the traditional clinician.
- Improving the role of clinical researchers and how to understand clinical studies and longitudinal data.

Stakeholders also noted that in their view, medical degrees could take two actions to equip students with health information competencies prior to graduation:

1. Offer scholarly selected projects such research projects on topics related to health informatics.
2. Incorporate health information competencies into the existing final year unit '*Transition to Practice*'.

Continuing education of all workforce levels

Virtual learning

Some stakeholder views were that Australia should adopt the AMIA 10x10 program model for the continuing education of both specialists and clinicians in health information.

AMIA's 10x10 virtual programs aim to realise the goal of training 10,000 healthcare professionals in applied health and medical informatics within 10 years²³. The programs use curricular content from existing informatics training programs, with a special emphasis on those programs with a proven record in distance learning²³.

AMIA's 10x10 courses currently cover the following topics in the field of informatics:

- Clinical or health informatics.
- Clinical research informatics.
- Translational bioinformatics.
- Nursing informatics.
- Public health informatics.

On-the-job training

In relation to on-the-job training, the UK's NHS provides a strong benchmark that could be followed.

The NHS Health Informatics Quality Scheme for Learning and Development (NHS HIQS) ran from 2007 to 2009 as a recognition scheme for certified on-the-job training. As part of this, the scheme produced a framework within which health informatics courses could be evaluated. The framework incorporated the NHS's health informatics national occupational standards²⁴.

A central element of the scheme's value was that to be recognised, the course had to deliver and assess the concepts and knowledge underpinning one or more of the NHS's health informatics national occupation standards, with delivery and assessment occurring in a healthcare context.

Recognition under the scheme enabled, and continues to enable, learning providers and employers to use the NHS logo and NHS HIQS descriptor line on course documentation and certificates, including marketing materials and web pages, which can act as a workforce attraction strategy.

Finding 6

Enrolments in appropriate undergraduate courses are declining. In order to enhance attractiveness of health information careers (Level 1 workforce), and enhance health informatics competencies of clinicians (Level 2 and 3 workforces), a number of measures are recommended.

Recommendation 6: Promote health information training and careers

- Raise the profile and status of the health informatics discipline, and as such, raise the profile of the health information workforce occupations (Level 1 workforce) to attract more employees and prospective students.
- Develop the three different types of future education in health informatics identified in the study:
 1. Training specialists (Level 1 workforce) in biomedical informatics through postgraduate programs such as masters, PhDs, and residencies.
 2. Training clinicians in knowledge of biomedical informatics (Levels 2 and 3 workforces) needs to spread and be included in medical and other health careers undergraduate curricula.
 3. Continuing education of all professionals (Levels 1, 2 and 3 workforces) - which could be done by adapting the AMIA 10x10 program model, or similar.
- Review current course curricula and use resources produced by the *Coordinated interprofessional curriculum renewal for e-health capability in clinical health professional degrees* project to include e-health (or clinical informatics) curriculum in undergraduate and postgraduate coursework where it is not yet in place, and to engage in collaborative continuing improvement where it is.

8.3 Factors influencing future workforce supply

When considering supply steams, both current and future, is important for the health information workforce, potential workers need to be attracted to the workforce. Throughout the study, stakeholders consistently mentioned the lack of career pathways as a primary limiting factor for the attraction of people to the health information workforce.

Career pathways

Presently, there is an adhoc approach to the way the Australian health information workforce is structured, organised and allocated. This was reflected throughout the course of the study, and is highlighted in Chapter 1 which outlines there is no nationally agreed definition of the health information workforce, and consequently, imprecise workforce boundaries.

Stakeholders generally commented that no genuine career structures can be identified in the health information workforce. At the coal face career progression is not clear and is left up to the individual employers as to how they contract roles. There are multiple entry points, different awards and pay structures, which results in people being paid differently for equivalent work.

Along with the issue this raises for attracting people to the workforce, some stakeholders suggested the lack of a career structure, along with other visibility problems, is pushing the morale of health information workers below that of most other health workforces. This has potential implications for the existing workforce if people choose to pursue other career options on this basis.

It was commented that the small size of the health information workforce in Australia undermines attempts to create a career pathway. This is exacerbated when limited workforce resources are spread thinly over a number of health service facilities or health districts, or even within facilities across a range of departments. One exception to this was highlighted by Queensland Health, who noted within their Information Division there is an evolving career structure. They suggested this may be due to the centralisation of some of Queensland Health's e-health initiatives creating enough critical mass to allow for a career structure to develop.

The lack of a clear career pathway reinforces the need for the first recommendation of this report to be achieved, to delineate the workforce, in particular to:

- Develop consensus among key professional associations and other peak bodies on which defined occupations are included within the health information workforce (Level 1 workforce).
- Define and agree upon the essential functions of health information work, and align existing competencies with the agreed functions.

It is only by having a clear understanding of what the health information workforce is, that career pathways can then be developed.

ACHI, HISA and HIMAA, have commenced work in creating an Australian career pathway, by introducing a certification program for health informatics. The Certified Health Informatician Australasia certification program was launched in July 2013. The program seeks to address the lack of formal recognition for health informatics skills in the Australian health workforce. Participation in the program will be via directed self-learning, successful completion of the program will require the applicant to pass an exam.

The core competencies for health informatics that are tested in the exam have been developed with reference to similar programs by the International Medical Informatics Association and COACH, Canada's Health Informatics Association, and builds on the previous work done by the Australian Health Informatics Education Council.

International career pathway frameworks

Overseas, even in countries with larger health information workforces, the problem of poor career structures has been noted. In the UK, prior to developing its Health Informatics Quality Scheme and Career Frameworks^{24,32}, the NHS recognised that the lack of a clear career pathway was a barrier to developing a workforce with a recognised identity and measurable competencies.

The UK's broader workforce reform policies attempts have been made to both broaden and deepen career opportunities for health information workers. The NHS has developed a Health Informatics Career Framework (HICF) based on nine career framework levels and the following seven disciplines³²:

1. Information management.
2. Knowledge management.
3. ICT staff.
4. Health records and patient administration.
5. Clinical informatics staff.
6. Health information educators and trainers.
7. Project and programme management.

The HICF matrix (Figure 11) is designed to provide a structure for careers within health informatics. It demonstrates the breadth of what can be considered health information, with the HICF adopting the view that the health information workforce is about the effective use of data, information, knowledge and technology to support and improve health and healthcare delivery.

While such a framework may not be immediately adaptable for the Australian environment of multiple employers and jurisdictions (compared with the UK), it again demonstrates the need for an agreed definition of what the health information workforce is, to have a starting point for a career pathway framework. The breadth of the HICF, with seven disciplines and nine career framework levels, also demonstrates the complexity of defining clear career pathways for a workforce comprised of multiple levels, roles and competencies.

Figure 11: Health Informatics Career Framework matrix (UK)

Career framework levels	Knowledge management	Information management	ICT staff	Health records and patient administration	Clinical informatics staff	HI educators and trainers	Project and programme management
CF9 More senior staff		Director of informatics	Director of IT		Clinical director lead		Programme director
CF8 Consultant practitioners		Head of information Head of clinical coding services	Head of IT Head of systems development Technical architect	Head of health records	Clinical engagement lead Clinical informaticist	ETD lead Senior lecturer Head of professional development	Benefits lead Programme lead Project lead
CF7 Advanced practitioners	Library services manager Research and evaluation manager	Information development manager Clinical coding manager Information governance manager	IT service manager Information security manager Systems development manager	Health records manager	Clinical quality manager Clinical risk manager	Professional development manager Training manager Lecturer	Benefits manager Business analyst Programme manager
CF6 Senior practitioners	Librarian Clinical librarian	Senior information analyst Data quality manager Information governance manager	Senior systems developer Service desk manager Senior ICT support technician	Health records officer	Clinical trials officer Senior clinical audit facilitator Patient safety facilitator	Senior trainer	Business change facilitator Project manager
CF5 Practitioners	Assistant librarian	Information analyst Clinical coder	ICT test analyst Systems developer Network manager	Health records team leader Patient administration officer	Clinical audit facilitator	Trainer	Senior programme/project support officer
CF4 Assistant practitioners	Library assistant	Assistant information analyst Information governance assistant	IT telecoms support officer Server support technician	Health records clerk Medical secretary Waiting list coordinator	Assistant clinical audit facilitator Care pathway coordinator	Assistant trainer	Programme/project support officer
CF3 Senior assistants/technicians	Patient information officer	Information assistant	Service desk operator IT team administrator	Clinic coordinator Ward clerk Medical summariser	Clinical assurance administrator Patient safety assistant	Training administrator	Project administrator
CF2 Support workers		Clinical coding support worker	Assistant service desk operator	Health records assistant			
CF1 Initial level entry jobs		Apprentice (Information management)	Apprentice (ICT)	Apprentice (Health records and patient administration)			

Another career framework was developed in Canada and is displayed in Table 6. The breadth, depth and diversity of health informatics is captured on the matrix, featuring 65 jobs in seven competency areas over five levels of mastery:

1. Emerging professional.
2. Competent.
3. Proficient.
4. Expert.
5. Master³³.

Table 6: COACH's Health Informatics Professional Career matrix (Canada)

	Level				
Profession	5 Master	4 Expert	3 Proficient	2 Competent	1 Emerging professional
Clinical and health sciences	Chief medical information officer	Clinical informatics director	Clinical informatics specialist, clinical informatics manager	Clinical analyst	Clinical coordinator
Canadian health system	Chief information officer	Lead policy strategist	Business development analyst, risk manager, senior business analyst	Business analyst, policy analyst, risk analyst	Junior business analyst
Project management	–	Program management office director	Project director, program management office manager	Project manager	Project coordinator, program coordinator
Organisational and behavioural management	Practice director	Change and evaluation services director	Engagement manager, program manager, service manager	Product specialist, trainer, transition and change management lead	Product support analyst, training coordinator
Analysis and evaluation	Research and analysis vic president	Senior methodologist	Outcomes specialist, senior researcher	Benefits and evaluation analyst, business intelligence analyst, information analyst	Research analyst
Information management	Chief privacy officer	Chief quality officer, im director, standards director	Privacy specialist, registry manager, standards manager, standards specialist	Data integrity analyst, privacy and data access lead	Operations coordinator, privacy analyst, standards analyst
Information technology	Chief technology officer	Architecture director, it director	Data architect, security specialist, solution architecture lead	Data modeller, integration architect, senior testing analyst, solutions architect technical lead	Service desk coordinator, testing analyst

Glossary of abbreviations

ABF	Activity based funding
ABS	Australian Bureau of Statistics
AHIC	Australian Health Information Council
AHIEC	Australian Health Informatics Education Council
AMIA	American Medical Informatics Association
ANZSCO	Australian and New Zealand Standard Classification of Occupation
ANZSIC	Australia and New Zealand Standard Industrial Classification
CDSS	Clinical Decision Support System
COAG	Council of Australian Governments
CPE	Continuing Professional Education
DEEWR	Department of Education, Employment and Workplace Relations
DoHA	Department of Health and Ageing
DMR	Digital Medical Records
DRG	Diagnosis Related Group
EHIS	Electronic Health Information Systems
EMR	Electronic Medical Record
ERG	Expert Reference Group
HCA	Human Capital Alliance
HIM	Health Information Manager
HIMAA	Health Information Management Association of Australia Limited
HIMSS	Healthcare Information and Management Systems Society
HISA	Health Informatics Society of Australia
HWA	Health Workforce Australia
ICT	Information and Communication Technology
IMIA	International Medical Informatics Association
NeHTA	National e-health Transition Authority
PCEHR	Personally Controlled Electronic Health Records
VET	Vocational Education and Training

Appendix A: Methodology

Literature review

The literature reviewed was most helpful in informing discussion on what constitutes the health information workforce and what are the major influences on health information workforce supply and demand. Close to 50 separate relevant documents were gathered and considered for the review, including a mixture of Australian and international (United Kingdom, United States of America, Canada) reports. The collected literature was mostly opinion based and included published and unpublished documents sourced from key stakeholder organisations, an Expert Reference Group (ERG) and an electronic search.

Key informant interviews

Eleven stakeholders able to provide an insight into current factors influencing the health information workforce (particularly on the demand side) were identified and interviewed. Discussions were also held with a number of the ERG members (Table 7).

A further six key stakeholders were identified and interviewed about the future strategic direction of the health information workforce. They were asked to supply their views and evidence about technological changes to health settings, and the impact of these on the future health workforce (both the demand and supply). One of these stakeholders provided information about the change in undergraduate health curricula to equip graduates with the competences required by the changing workforce. The list of stakeholders interviewed (beyond the ERG) is contained in Table 8.

HWA acknowledges the contributions of these stakeholders and especially the Expert Advisory Group established for this project for contributing documentation, knowledge and advice. HWA also wished to acknowledge the work of the Department of Health Information Management (Faculty of Health Sciences, La Trobe University) for the focus group discussions prior to the project commencing.

Table 7: Expert Reference Group

Name	Organisation
David Rowlands	Health Informatics Society of Australia (HISA)
Sallyanne Wissman	Health Information Managers Association of Australia (HIMAA)
Phillipa Olrick	Department of Health and Ageing (DOHA)
Ellen Cumberland	Queensland Health
Klaus Veil	Australasian College of Health Informatics (ACHI) / AHIEC
Vicki Bennett / David Braddock	Australian Institute of Health and Welfare (AIHW)
Sonya Hilberts	National eHealth Transition Authority (NeHTA)

Table 8: Stakeholders interviewed for Health Information Workforce Study

Nominated stakeholder	Position and organisation
Liz Foreman	Department of Health and Ageing
Karen Gibson	Program Director, Queensland Health
Vikki Tierney	Manager Primary Health Care Information Support, Queensland Health
Glynda Summers	District Executive Director of Nursing (DEDON), Cairns and Hinterland Health Service District (CHHSD), Queensland Health DEDON Informatics - CHHSD Senior Clinical Advisor e-health, Queensland Health
Evelyn Hovenga	Director, Chief Executive Officer and Trainer, e-health Education Pty Ltd, Rockhampton
Professor Michael Kidd	Dean, Executive Dean, Faculty of Health Sciences, Flinders University
Robert Steele	Head, Discipline of Health Informatics, Sydney University
Jennie Shephard	Principal Health Information and Classification Advisor, Department of Health Victoria
Kathy Eagar	Director, National Coding and Classification Centre
Beth Reid	Private practice research consultant in the area of case-mix
Andrew Howard	Global e-health Director, Orion Health
Peter Williams	Principal Advisor e-health Police, Office of the Chief Information Officer, Department of Health Victoria President, Australasian College of Health Informatics
Libby Owen-Jones	Clinical Systems Project Director, Austin Hospital
Jackie McLeod	Project Director, The Royal Children's Hospital Melbourne
Professor Fernando Martin-Sanchez	Professor and Chair of Health Informatics, Melbourne Medical School Adjunct Professor, Computing and Information Systems, Melbourne School of Engineering
Professor Colin Carati	Executive Director (ICT Strategy and Integration), Office of the Pro Vice Chancellor (Information Services) and CIO Professor, School of Medicine Associate Head of Faculty (ICT), Faculty of Health Sciences Flinders University
Professor Anthony Maeder	Professor in Health Informatics, School of Computing and Mathematics, College of Health and Science, University of Western Sydney

Case studies

In order to understand important workforce demand drivers and supply strategies the project methodology included three case studies. The case studies specifically aimed to examine and identify:

1. Current workforce practices.
2. Work requirements (within and between care sectors).
3. Adequacy of workforce for estimated work.
4. Future influences on demand.
5. Future strategies for supply.

The case study sites were chosen across three jurisdictions as follows:

1. Barwon Health, Victoria (Barwon) as a larger regional/provincial district with significant rural outreach includes a major public hospital and many smaller public and private acute care facilities, primary healthcare and community services. Victorian health services have been funded by ABF for approximately ten years.
2. Metro South Health Service District, Brisbane, Qld (Metro South) as a major metropolitan health district with several large public teaching hospitals and private hospitals, sophisticated primary care services and a range of articulated community and public health services. This health district is part of the first wave of e-health initiatives.
3. Far West Local Health Network, NSW (Far West) as a remote area district with most services isolated with less sophisticated health information systems.

The chosen case study sites covered a wide range of possible health information work circumstances and particularly different levels of progress along a health information innovation adoption pathway however they are not claimed to be representative of the entire health system.

Data was collected from interviews within each region of stakeholders, managers and a survey of health information workforce employees.

Employee survey

A survey was conducted in order to quantify and describe the characteristics of the current workforce, job roles and functions performed, competencies possessed and applied and possible career pathways.

The survey sample population was developed by collecting employee lists from managers interviewed throughout the case study process. Just under 100 survey responses were analysed.

As the survey subjects were selected from the case study sites rather than the workforce population they may not be representative of the health information workforce as a whole.

Secondary data collection and analysis

In order to explore supply and demand data for the health information workforce, secondary data from ABS and DEEWR was collected and analysed. HIMMA and National Centre for Vocational Education Research (NCVER) also provided explanation and descriptions of relevant Technical and Further Education (TAFE) courses available including:

1. Course content.
2. Training providers.
3. Registration and recognition of training.
4. Current and past enrolment rates.

Analysis of the data allowed a quantitative picture to be drawn of the existing size, supply, composition and distribution of the workforce as well as providing a measure of historical data allowing for trend analysis.

Search conference

A search conference was conducted on 27 February 2012 and attended by 25 health information managers.

The objectives of the search conference were to:

1. Identify and discuss a range of possible drivers of demand, their likely impact and implications for the health information workforce.
2. Identify and assign some level of importance to the main drivers of demand for health information workforce now and in the future.
3. Examine and quantify (to the extent that it is possible) the future (5-10 years) demand for health information workforce in Australia based on predictions of the future health system.

After an initial briefing on the project scope and its findings to date, search conference participants were grouped into small working subgroups to brainstorm, discuss and gain consensus on each of the objectives. Teams for the first objective addressed and identified issues from natural, social and cultural, technology, political and economic factor perspectives. Working teams then addressed the second objective by identifying impacting factors and considerations from five alternative scenarios. Each of the teams presented their findings and identified impacting factors to the full participant audience, after an informed discussion was held and recommendations made.

Appendix B: AHIEC competencies

The competencies are listed in tables which show for each competency, the level of skills expected for each different generalist or specialist area at an entry or graduation based level. It is acknowledged that individuals may have higher levels and broader competencies that cross into multiple specialist areas or other professional domains than what is depicted in the table.

Table 9: Competency levels

Level	Category	Definition
1	Remembering	Recalling previous learned information.
2	Understanding	Comprehending the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.
3	Applying	Using a concept in a new situation or unprompted use of an abstraction. Applying what was learned in the classroom into novel situations in the work place.
4	Analysing	Separating material or concepts into component parts so that it's organisational structure may be understood. Distinguishing between facts and inferences.
5	Evaluating	Making judgments about the value of ideas or materials.
6	Creating	Building a structure or pattern from diverse elements. Putting parts together to form a whole, with emphasis on creating a new meaning or structure.

The competency tables can be read by reading the competency description and the verb from the list above related to the number shown following roles:

1. Healthcare professional.
2. Health informatician.
3. Health informatics information technologist (HIIT).
4. Health informatics information system specialist (HIIS).
5. Clinical informatician (CI).
6. Health information manager (HIM).
7. Health informatics administrator (HIA).

Table 10: Competency Area 1 – Knowledge

ID	Competency description	Healthcare professional	Health informatician	HIIT	HIIS	CI	HIM	HIA
1.1	Evolution of informatics as a discipline and as a profession.	2	2	3	2	2	3	2
1.2	Need for systematic information processing in healthcare, benefits and constraints of information technology in healthcare.	2	4	5	4	5	4	4
1.3	Efficient and responsible use of information processing tools, to support health care practice and decision making.	3	3	5	5	5	3	3
1.4	Use of personal application software for documentation and communication including internet for access to publications and basic statistics.	3	3	3	3	3	3	3
1.5	Characteristics, functionalities and examples of information systems in healthcare (eg clinical information systems, primary care information systems)	3	3	4	6	6	3	3
1.6	Architectures of information systems in healthcare: approaches and standards for communication and cooperation and for interfacing and integration of component, architectural paradigms (eg service oriented architectures).	1	2	6	6	2	2	2
1.7	Characteristics, functionalities and examples of information systems to support patients and the public (eg patient-oriented information system architectures and applications, personal health records, sensor-enhanced information systems.	2	2	3	3	6	5	3
1.8	Methods and approaches to regional networking and shared care (e-health, health telematic applications and interorganisational information exchange).	2	2	4	4	6	4	2
1.9	Appropriate documentation and health data management principles including ability to use health and medical coding systems, construction of health and medical coding systems.	1	2	2	3	3	5	2
1.10	Structure, design and analysis principles of the health record including notions of data quality, minimum data sets, architecture and general applications of the electronic health record (all types).	1	2	4	4	5	6	2
1.11	Socio-material and socio-technical issues, including workflow/process modelling and re-organisation.	1	3	4	6	6	4	3

ID	Competency description	Healthcare professional	Health informatician	HIIT	HIIS	CI	HIM	HIA
1.12	Principles of data representation and data analysis using primary and secondary data sources, principles of data mining, data warehouses, knowledge management.	1	3	4	4	3	3	3
1.13	Biomedical modelling and simulation. Biometry and epidemiology including study design.	1	1	1	1	3	1	1
1.14	Ethical and security issues including accountability of healthcare providers and managers and health informatics specialists and the privacy, and security of patient data.	3	3	5	5	5	6	3
1.15a	Nomenclatures, vocabularies, terminologies, ontologies and taxonomies in healthcare.	1	2	3	2	3	4	2
1.15b	Classification and casemix.	1	1	1	1	3	5	2
1.16	Informatics methods and tools to support education (including flexible and distance learning), use of relevant educational technologies, including internet and world wide web.	2	2	3	3	2	3	2
1.17	Evaluation and assessment of information systems, including study design, selection and triangulation of quantitative and qualitative methods, outcome and impact evolution, economic evaluation, unintended consequences, systematic reviews and meta-analysis.	1	2	4	5	5	3	3

Table 11: Competency Area 2 - Medicine, Health and Biosciences, Health System Organisation

ID	Competency description	Healthcare professional	Health informatician	HIIT	HIIS	CI	HIM	HIA
2.1	Fundamentals of human functioning and biosciences (anatomy, physiology, microbiology, genomics, and clinical disciplines such as medicine, nursing, allied health).	3	2	2	2	6	3	2
2.2	Fundamentals of what constitutes health, from physiological, sociological, psychological, nutritional, emotional, environmental, cultural, spiritual perspectives and its assessment.	3	2	2	2	6	3	2
2.3	Principles of clinical decision making and diagnostic and therapeutic strategies.	3	2	2	3	6	3	2
2.4	The Australian health system, inter-organisational aspects and shared care.	3	2	2	2	5	3	4
2.5	Policy and regulatory frameworks for information handling in healthcare.	3	2	2	2	5	5	4
2.6	Principles of evidence-based clinical practice.	3	2	2	4	6	3	2
2.7	Health administration, health economics, health quality management and resource management, patient safety initiatives, public health services and outcome measurement.	2	2	2	3	2	5	5
2.8	Quality assessment and performance in healthcare, supporting direct patient care and safe clinical practice.	1	2	2	2	5	5	2
2.9	Accreditation and Standards.	2	3	5	5	5	5	4
2.10	Health Vocabulary.	3	1	2	2	3	4	2
2.11	Health Terminology (including terminology systems such as SNOMEDCT and LOINC).	2	2	2	2	3	4	2
2.12	Health Terminology development.	1	1	1	1	1	1	1
2.13	Clinical terminology QA, management and governance.	1	2	2	2	2	2	1
2.14	Advanced clinical terminology mapping, including building, and assessing maps and term sets.	1	1	1	1	1	1	2
2.15	Identity management in healthcare, including collection and data quality management for identifiers in a shared healthcare environment.	3	3	3	3	3	6	2

Table 12: Competency Area 3 - Informatics/Computer Sciences, Mathematics, Biometry

ID	Competency description	Healthcare professional	Health informatician	HIIT	HIIS	CI	HIM	HIA
3.1	Basic informatics terminology, including data, information, knowledge, hardware, software, computer networks, information systems, information systems management.	2	3	4	4	4	4	2
3.2	Ability to use personal computers, text processing and spreadsheet software, easy to use database management systems.	3	3	4	4	3	4	3
3.3	Ability to communicate electronically, including electronic data exchange, with other healthcare professionals, internet/intranet use.	3	3	6	5	3	5	3
3.4	Methods of practical informatics/computer science, including programming languages, software engineering, data structures, database management systems, information and system modelling tools, information systems theory and practice, knowledge engineering, concept representation and acquisition, software architectures.	1	3	5	5	4	3	2
3.5	Methods of theoretical informatics/computer science e.g. complexity theory, encryption/security.	1	2	3	3	2	3	2
3.6	Methods of technical informatics/computer science, eg network architectures and topologies, telecommunications, wireless technology, virtual reality, multimedia.	1	2	3	3	2	3	2
3.7	Methods of interfacing and integration of information system components in healthcare, interfacing standards, dealing with multiple patient identifiers, including HL7.	1	2	5	4	2	3	2

ID	Competency description	Healthcare professional	Health informatician	HIIT	HIIS	CI	HIM	HIA
3.8	Information system life cycle: analysis, requirement specification, implementation and selection of information systems, risk management, user training.	2	4	4	6	4	4	3
3.9	Methods of project management and change management ie project planning, resource management, team management, conflict management, collaboration and motivation, change theories, change strategies.	1	4	4	5	4	4	5
3.10	Mathematics: algebra, analysis, logic, numerical mathematics, probability theory and statistics, cryptography.	2	2	3	2	2	2	1
3.11	Methods for decision support and their application to patient management, acquisition, representation and engineering of medical knowledge; construction and use of clinical pathways and guidelines.	2	3	4	4	5	3	3
3.12	Basic concepts and applications of ubiquitous computing eg pervasive, sensor-based and ambient technologies in healthcare, health enabling technologies, ubiquitous health systems and ambient assisted-living.	1	2	3	3	2	2	2
3.13	Usability engineering, human-computer interaction, usability evaluation, cognitive aspects of information processing.	1	2	2	3	4	4	2

Appendix C – Federal and state funding for e-health initiatives

Federal Government

PCEHR as part of e-health

In the 2012-2013 budget, the federal government committed \$233.7 million over three years to implement the PCEHR. This follows on from the \$466 million invested over two years from the 2010-2011 budget to create the PCEHR. Spending in the 2012-13 budget comprises:

1. \$161.6 million to operate the PCEHR system for the next two years, including registration and customer support, adoption support and benefits monitoring and evaluation.
2. \$4.6 million to maintain safeguards for privacy-related aspects of the PCHER system. This will mean that people can be confident that the privacy of their personal health information is fully protected.
3. \$67.4 million as the Commonwealth's share of joint funding with the states and territories for the NEHTA work program for the next two years. This is to operate and maintain critical services and standards for the secure electronic exchange of health information, including healthcare identifiers, authentication services and e-health standards.

Investing in regional hospitals and health care

The federal government is investing \$475 million through the Health and Hospitals Fund (HHF) as part of the \$5 billion investment in health infrastructure to improve access to health care services across Australia including:

1. \$35 million to the Regional Queensland e-health project *E-Health to support integrated care in Regional Queensland*.

Tasmanian public hospitals

The federal government has committed \$36.8 million over four years to accelerate access to the PCEHR for Tasmania's public hospitals; support the adoption of electronic pathology requesting and reporting in Tasmania; and support e-health readiness and connection to PCEHR for allied health practitioners.

Digital hospitals

St Stephen's is a new hospital to be built at Hervey Bay on Queensland's Fraser Coast by UnitingCare Queensland. The project is underway with the support of Commonwealth funding through the HHF which has provided \$47 million towards the estimated \$87.5 million construction and e-health costs for the state of the art hospital of the future.

State

South Australia

As part of the South Australia (SA) government's health reform agenda, SA Health is developing Australia's first fully integrated state-wide electronic health record (EHR) system. The EHR will improve communications for patients, doctors, nurses, midwives, allied health professionals and other healthcare professionals within the public health system by streamlining and interconnecting information systems. The key enablers of e-health in South Australia are:

1. Enterprise Patient Administration System (EPAS).
2. Beside computers.

The implementation of EPAS is SA Health's most significant e-health reform program by its scale and impact, with an investment of \$408 million over the next 10 years.

The EPAS program will form the foundation for the EHR by connecting a patient's health record across all public hospitals and health services. As part of the implementation of the EPAS, SA Health will be creating a unique identifier number for each patient. This will be an interim measure until the national unique health identifiers are complete.

The installation of bedside computers in public hospitals commenced in late 2011.

Bedside computers have now been installed and are fully operational for patient entertainment in 12 hospitals state-wide. The bedside computers will provide staff with another access point to EPAS, at the point of care.

Victoria

From the Victorian 2012-2013 state budget:

1. The government has allocated \$100 million over the next four financial years to the Victorian Innovation, E-Health and Communications Technology Fund. This will support health IT projects, including system and software upgrades and installations, according to budget documents.
2. The government has also dedicated \$8.3 million per year in funding over the next two years as part of the state's contribution to NEHTA core operations.

New South Wales

From NSW 2012-2013 state budget \$6.1 million in infrastructure funding has been allocated for the Ambulance Service of NSW, including ambulance radio network and new medical and IT equipment to improve emergency response capacity.

Australian Capital Territory

No current state funding for e-health initiatives documented.

Queensland

From the Queensland 2011-2012 state budget, over \$11 billion committed to invest in better health services including two personally controlled electronic health record initiatives. This includes the early rollout National Broadband Network sites at Brisbane, Springfield Lakes, Toowoomba and Townsville.

Northern Territory

From the Northern Territory 2011-12 state budget \$6.6 million allocated toward tele-health services at 17 remote towns in the territory. The allocation formed part of a \$16.4 million funding package over three years to establish video conferencing sites. The funding will also help to further establish the territory's shared e-health record project, which handles records for close to 40,000 Aboriginal and Torres Strait Islander consumers, as well as improvements to fibre optic bandwidth at the earmarked towns.

Western Australia

From the Western Australian 2011-12 state budget \$89.6 million committed to the continued implementation of WA's ten-year e-health program, which commenced in 2006.

Tasmania

No current state funding for e-health initiatives documented.

Appendix D – ANZSCO codes

The ANZSCO categories included the following:

- 122411 Information Technology Manager
- 223100 Computing Professionals, nfd
- 223111 Systems Manager
- 223113 Systems Designer
- 223115 Software Designer
- 223117 Applications and Analyst Programmer
- 223119 Systems Programmer
- 223121 Computer Systems Auditor
- 223179 Computing Professionals, nec
- 229400 Business and Organisation Analysts, nfd
- 229411 Management Consultant
- 229413 Organisation and Methods Analyst
- 229911 Health Information Manager
- 229913 Records Manager
- 229979 Business and Information Professionals, nec
- 619921 Coding Clerk

The ANZSIC categories attempted to limit the workforce data extraction to the health sector.

The following codes were included in the filter:

- 8610 Hospitals and nursing homes (undefined)
- 8611 Hospitals (except psychiatric)
- 8612 Psychiatric hospital
- 8613 Nursing homes
- 8620 Medical and dental services
- 8621 General practice medical services
- 8622 Specialist medical services
- 8623 Dental services
- 8630 Other health services (undefined)
- 8631 Pathology services
- 8632 Optometry and optical dispensing
- 8633 Ambulance services
- 8634 Community health
- 8635 Physiotherapy
- 8636 Chiropractic
- 8639 Health services (not further defined)
- 8721 Accommodation for aged
- 8722 Residential care services

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