

Advancing Ehealth education for the clinical health professions

Final Report 2014

The University of Melbourne (Lead institution)

Dr Kathleen Gray (Project leader)

Dr Ambica Dattakumar (Project manager)

University of Western Sydney

Professor Anthony Maeder

Curtin University

Ms Kerryn Butler-Henderson

The University of Queensland

Professor Helen Chenery

clinicalinformaticseducation.pbworks.com

Support for the production of this report has been provided by the Australian Government Office for Learning and Teaching. The views expressed in this report do not necessarily reflect the views of the Australian Government Office for Learning and Teaching.



With the exception of the Commonwealth Coat of Arms, and where otherwise noted, all material presented in this document is provided under Creative Commons Attribution-ShareAlike 3.0 Unported License <http://creativecommons.org/licenses/by-sa/3.0/>.

The details of the relevant licence conditions are available on the Creative Commons website (accessible using the links provided) as is the full legal code for the Creative Commons Attribution-ShareAlike 3.0 Unported License <http://creativecommons.org/licenses/by-sa/3.0/legalcode>.

Requests and inquiries concerning these rights should be addressed to:

Office for Learning and Teaching
Department of Education
GPO Box 9880,
Location code N255EL10
Sydney NSW 2001
<learningandteaching@deewr.gov.au>

2014

ISBN 978-1-74361-340-5 [PDF]
ISBN 978-1-74361-341-2 [DOCX]
ISBN 978-1-74361-342-9 [PRINT]

Acknowledgements

The project team gratefully acknowledges contributions to the success of this project made by:

- the project funding body, the Commonwealth Government Office of Learning and Teaching;
- the four partner universities which provided in-kind support and clinical champions for this project;
- the health profession degree coordinators and directors from over 30 universities who participated in this project;
- the 21 educational experts in the health professions and in health informatics who served as a reference group for this project;
- numerous other stakeholders from educational institutions, government, industry and the professions who contributed to workshops and provided guidance to this project.

Executive summary

This is the final report of a project that aimed to encourage and support program coordinators and directors of Australian undergraduate and postgraduate coursework programs in all allied health, nursing and medical professions to address the need for ehealth education for entry-level clinical health professionals.

The rationale for this project was that new initiatives in professional education, training, learning and development are required to build the capabilities that the Australian health workforce needs to work in a national ehealth system. In Australia, very few educational providers in the health professions had developed a systematic approach to teach, assess, evaluate or audit this aspect of professional education, and relevant curriculum initiatives were not widely known.

Between 2010 and 2013, this project took a nationally coordinated approach to researching, workshoping and resourcing curriculum renewal, to facilitate theoretical and practical understanding of the rapidly developing field of ehealth and its implications for the education of future clinicians. It promoted the sharing of core principles and pedagogies and internationally recognised knowledge and skill domains in order to build ehealth capability across the health professions.

This report begins with an introduction to ehealth and ehealth education for clinicians and an outline of the project methodology, followed by a review of the international literature on university learning, teaching, assessment and evaluation of ehealth education for clinicians.

The report then presents project investigations and contributions of three types:

- support for academic development, through exploration of current practices and perspectives and through workshop discussions;
- materials for teaching and learning, including an inventory of resource documents and a set of clinical scenarios;
- influences on curriculum renewal, including accreditation requirements and employer expectations.

The report ends with five recommendations for further work to develop ehealth education for the health professions in Australia:

1. New learning, teaching and assessment resources are needed to explain and explore ehealth and clinical informatics in current and future healthcare contexts.
2. Up-to-date professional development in ehealth and clinical informatics needs to be made accessible to teachers, tutors and student supervisors in the health professions.
3. Revised accreditation and certification frameworks for the clinical health professions need to include clear specifications of ehealth and clinical informatics competencies.
4. Human resources management of professional staff in healthcare organisations needs to recognise and reward ehealth and clinical informatics competencies.
5. Systematic planning and development of professional practice in the health professions needs to integrate long-term ehealth and clinical informatics goals.

This report includes an extensive list of references and an appendix with findings of an independent evaluation of the project.

Additional materials related to project activities and outcomes are available from the project website: clinicalinformaticseducation.pbworks.com

Table of Contents

Acknowledgements.....	3
Executive summary.....	4
Tables	6
Chapter 1. Introducing ehealth and ehealth education for the clinical health professions	7
Chapter 2. Teaching and assessing ehealth in clinical professions: a literature review	11
Chapter 3. Australian ehealth education practices and perspectives: a national study.....	20
Chapter 4. Interprofessional directions for ehealth education: a national workshop.....	30
Chapter 5. Resources available for ehealth education: an inventory	37
Chapter 6. Ehealth scenarios in clinical practice	53
Chapter 7. Ehealth in health profession degree accreditation requirements.....	65
Chapter 8. Ehealth knowledge and skills required in clinical jobs.....	90
Chapter 9. A strategic approach to advance ehealth education	96
References	101
Appendix A. Method used to select papers for literature review.....	109
Appendix B. Survey and interview questions and respondent characteristics	110
Appendix C. Workshop program, panellist and participant details.....	114
Appendix D. Job advertisement search criteria and analysis flowchart.....	116
Appendix E. Independent evaluation report summary	117

Tables

Table 1. An approach to ehealth education in medicine.....	12
Table 2. An approach to ehealth education in nursing	13
Table 3. An approach to ehealth education in dentistry	14
Table 4. An approach to ehealth education in allied health	15
Table 5. An approach to ehealth education in complementary medicine	16
Table 6. An interprofessional approach to ehealth education.....	17
Table 7. Common ehealth competencies for clinical health professions, nominated by Australian workshop groups	34
Table 8. A selection of resources available to support teaching and learning of ehealth to future clinicians.....	37
Table 9. An ehealth scenario involving a Chinese medicine practitioner.....	53
Table 10. An ehealth scenario involving a chiropractor	54
Table 11. An ehealth scenario involving a dentist	55
Table 12. An ehealth scenario involving a dietician	56
Table 13. An ehealth scenario involving a general practitioner	56
Table 14. An ehealth scenario involving a midwife	57
Table 15. An ehealth scenario involving a nurse	58
Table 16. An ehealth scenario involving an occupational therapist.....	59
Table 17. An ehealth scenario involving a paramedic	60
Table 18. An ehealth scenario involving a pharmacist	61
Table 19. An ehealth scenario involving a physiotherapist	62
Table 20. An ehealth scenario involving a psychologist	63
Table 21. An ehealth scenario involving a social worker.....	63
Table 22. Ehealth related knowledge and skills in selection criteria for Australian clinical jobs	91

Chapter 1. Introducing ehealth and ehealth education for the clinical health professions

The scope of ehealth

Ehealth is “the use of information and communication technologies (ICT) for health. Examples include treating patients, conducting research, educating the health workforce, tracking diseases and monitoring public health” according to the World Health Organization, which has been working to advance ehealth for the past decade (WHO, 2013).

ICT is an increasingly influential part of the working environment and work practices of all clinical health professionals, in medicine, nursing, dentistry, allied health and complementary therapies. Over the past decade this change has been driven by the universal move towards electronic health record systems for patients as well as widening availability of sophisticated tools and technologies for clinical decision support and the rise of online information accessible to patients and consumers of health services. A key factor in ICT influence within the health sector is the emergence of system-wide government-led approaches to healthcare reform that focus on ‘health information technology’ (e.g. the Office of the National Coordinator for Health Information Technology in the US; Canada Health Infoway), ‘national IT infrastructure’ (e.g. the National Health Service Connecting for Health in the UK) and ‘national ehealth strategy’ (e.g. Australian National eHealth Transition Authority).

Ehealth has been a major focus of Australian health strategy and policy in recent years, for example these excerpts from the National Health and Hospitals Reform Commission (NHHRC, 2009):

- E-health is the combined use of electronic communication and information technology in the health sector. The widespread adoption of e-health is vital to driving safety and quality in health care. However, health information and communications technology (ICT) alone will not dramatically improve care and reduce costs. Even when information is electronic it is not always freely shared across organisational boundaries due to multiple constraints and barriers.
- To realise the benefits of health ICT we must enhance the free flow of health information and communications among patients and health professionals throughout the country, and act now to realise the vision of a patient-centred health system. We believe that taking action to put in place the architecture and environment to enable individuals to have, hold and control their own electronic record is a critical step, as has already been discussed.
- Achieving a ‘liquid’ flow of essential health information among health professionals and between health professionals and their patients is complex. In Australia, attempts have been fragmented and fraught with difficulty. Much like the state and private railways of the 19th century, Australia runs the risk of unlinked electronic health infrastructure. There are already significant pockets of investment in electronic health data and information exchange across Australia. From remote communities to metropolitan hospitals, governments, private companies and clinicians have implemented dozens of innovative e-health projects. But much more can be gained by taking advantage of synergies and committing to a truly national effort to optimise the system.

and from the goals of the National E-Health Transition Authority (NEHTA, 2009):

- improving the quality of healthcare services, by enabling authorised clinicians to access a patient's integrated healthcare information and history, directly sourced from clinical notes, test results and prescriptions using standardised clinical data formats and terminologies.
- streamlining multi-disciplinary care management, enabling seamless handovers of care by ensuring efficient electronic referrals; authorised access to up-to-date clinical opinions and patient healthcare histories via shared patient health records; and fast, secure mechanisms for directly exchanging important notifications between healthcare providers.
- improving clinical and administrative efficiency, by standardising certain types of healthcare information to be recorded in e-health systems; uniquely identifying patients, healthcare providers and medical products; and reforming the purchasing process for medical products.
- maintaining high standards of patient privacy and information security.

Ehealth is not a new academic discipline nor one that stands alone. Ehealth is an aspect of health and biomedical informatics, a field of knowledge over fifty years old which brings together computer science, information science, information management and knowledge management in healthcare. Usage of the term 'ehealth' varies but basically it extends previous conceptions of informatics through its emphasis on internet and web connectivity, and its inclusion of stakeholders ranging from consumers and patients through clinicians and researchers to government and industry planners.

The need to educate clinicians about ehealth

The recent rise of comprehensive national approaches to ehealth around the world suggests that new knowledge, skills and attributes are called for in the clinical health workforce, and thus new initiatives in education, training, learning and development in the health professions (Pate & Turner-Ferrier, 2010). Educational planning and curriculum frameworks for this aspect of health professional education have received attention nationally and internationally (AHIEC, 2009; Liaw & Gray, 2010; Hilberts & Gray, 2013).

However, at the outset of this project there was no concerted effort to bring these national and international perspectives to bear on health professional education in Australia. Some Australian peak professional bodies had recognised the need for curriculum reform. In a few instances, working groups had specified the relevant types of knowledge and skills that clinicians ought to have, for example nursing (Foster & Bryce, 2009) and general practice (Tse & O'Shea, 2008). Many other health professions in Australia and internationally seemed old for this rapidly developing field, and appeared to show professions still at early stages in this work, for example dentistry (Schleyer, 2003) and social work (Parker-Oliver & Demiris, 2008).

No educational providers in Australia were known to have a systematic approach to design, teach, assess or accredit relevant ehealth curriculum. It seemed that this aspect of curriculum was underdeveloped in most professional degrees, including degrees in dentistry, dietetics, medicine, midwifery, nursing, occupational therapy, optometry, paramedics, pharmacy, physiotherapy, psychology, radiography, social work and complementary therapies (Gray & Sim, 2007; 2010).

Unlike many other aspects of education for health professions in Australia, subject matter expertise in ehealth was scarce and not easy to identify (HISA, 2009). It was clear that many educators had acquired their own clinical expertise in low-technology work settings, and thus found it difficult to contribute to this aspect of curriculum renewal within their profession, not only in Australia but internationally (Buckeridge & Goel, 2002; Nagle, 2007).

An approach to curriculum renewal

This project concentrated on educating the future clinical workforce, that is, on entry level degrees that prepare students to enter clinical practice. It thus excluded advanced training and continuing professional development, although some of its outcomes could be useful in these quarters. It sought to focus attention on one clear message:

“Future clinicians will be expected to be more effective than is now the case in acquiring, managing, and utilising information for clinical decision making.” (UK National Health Service, 2009)

and one direct question:

How does tertiary education in Australia need to respond, so that it produces a generation of clinicians with the knowledge, skills and attributes to use ICTs effectively in healthcare?

Australian higher education institutions which offer health profession degrees had a key role to play. It appeared that curriculum renewal steps and tasks, such as mapping and benchmarking, could benefit from a shared effort. There was rising interest in such an approach: senior academics affiliated with a variety of health profession degrees in ten Australian universities engaged in an invitation-only forum on this theme in 2009 (University of Melbourne, 2009).

Accordingly, this project took a coordinated interprofessional approach to curriculum renewal for ehealth capability in clinical health profession degrees. Research was conducted as an intrinsic part of this project with human research ethics approval from the University of Melbourne (HRE #1135611).

A coordinated approach meant taking account of related work being done elsewhere, in Australia and internationally. Australian organisations consulted during this project included:

- Australasian Telehealth Society <aths.org.au>
- Australian Council of Pro-Vice Chancellors and Deans of Health Sciences <www.universitiesaustralia.edu.au/page/467/about-us/committees---contacts/key-contacts/deans-groups/>
- Australian Health Informatics Education Council and its auspicing organisations (Australasian College of Health Informatics, Australian Computer Society, Health Information Management Association of Australia, Health Informatics Society of Australia, Health Level 7 Australia) <www.ahiec.org.au>
- Australian Interprofessional Practice and Education Network <www.aippen.net>
- Health Workforce Australia <www.hwa.gov.au>
- National EHealth Transition Authority <www.nehta.gov.au>

International organisations' education programs consulted during this project included:

- Canada, COACH: Canada's Health Informatics Association, Clinician Forum <www.coachorg.com/en/communities/COACHClinicianForum.asp>
- International Medical Informatics Association, Health and Medical Informatics Education Working Group <www.imia-medinfo.org/new2/node/139>
- United Kingdom, National Health Service, Embedding Informatics in Clinical Education <www.cln.nhs.uk/eice/>
- United States of America, Office of the National Coordinator for Health Information Technology, Workforce Development Program <www.healthit.gov/policy-researchers-implementers/workforce-development-program>

An interprofessional approach was important, not only to make best use of limited expertise and resources. Expectations of effective interprofessional practice underpin ehealth. Ehealth tools and technologies enable clinicians to communicate and share patient and

client information across professional boundaries (Kuziemsky & Varpio, 2011). Even the process of making the transition to working with ehealth demands interprofessional negotiation and communication (Syvajarvi et al., 2005).

An interprofessional approach meant including all Australian tertiary degrees for entry into clinical practice, based on the Australian and New Zealand Standard Classification of Occupations in medicine, nursing and other health professions. It meant considering degrees offered at levels 7 through 10 of the Australian Qualifications Framework, i.e. Bachelor to Doctorate degrees. While these are mainly offered by universities, there are a small number of Vocational Education and Training (also known as Technical and Further Education) providers of degrees at level 7 as well.

The project rests on the principle that a formal, comprehensive approach to building clinicians' ehealth capability relies on health informatics education. It is more than just training in how to use particular tools or technologies. It cannot be achieved through curricula based on evidence-based practice, information literacy or computing skills, each of which has partial relevance only (Hersh, 2009). It needs to build the more integrated, resilient form of knowledge, skill and attitude expected of a graduate professional:

Competency is the (individual) ability to make deliberate choices from a repertoire of behaviours for handling situations and tasks in specific contexts of professional practice, by using and integrating knowledge, skills, judgement, attitudes and personal values, in accordance with professional role and responsibilities. Competency is to be inferred from task behaviour, outcomes and the justification of choices that have been made, as well as from reflection on performance and performance effects. (Govaerts, 2008, p. 235)

The knowledge and skills required have both theoretical and applied elements, entailing not only classroom teaching but also simulated and actual placement education. As with many other aspects of education for professions (in health and outside of health), there are diverse educational approaches that may be appropriate for curriculum renewal in various specialities. Options include, for example: a block of lectures and tutorials within a professional practice subject; a stand-alone unit of study; or a theme developed in several subjects over a period of years. Some elements of a clinical informatics curriculum may be most suited to workplace-based learning or project-based learning, and some may be supported by purposeful elearning innovations.

Taking account of these considerations, the project sought to make a difference through three kinds of contributions:

- support for academic development
- materials for teaching and learning
- influences on curriculum renewal

The methodologies and the results of these project activities are presented in detail in the next sections of this report.

Chapter 2. Teaching and assessing ehealth in clinical professions: a literature review

Introduction

This review seeks insights from international peer-reviewed reports of ehealth education for future clinicians, to give direction to its teaching and assessment in Australian health profession degrees.

The literature offers a variety of recommendations on what to teach to students who are qualifying in a health profession and why to teach it. The most authoritative of these draw upon the framework provided by the International Medical Informatics Association (Mantas et al., 2010). However, there is a paucity of literature to take educators beyond defining learning needs, specifying desired competencies and outlining curriculum content. This gap in the literature has been identified as an issue for informatics education broadly (Van Veen et al., 2004), and it appears that there has not been much further curriculum research in ehealth education, despite advances elsewhere in the field of informatics.

The literature of health professional education generally recognises that curriculum is both an entity and a process. As an entity it comprises not only the expected competencies and roles; but also the learners at the centre of the enterprise; assessment linking competencies and learners; the conditions and resources for learning; and the social, political and cultural context in which the learning occurs. As a process it comprises design, implementation, evaluation and renewal (Bordage and Harris, 2011).

Given this more extensive view of curriculum, new ehealth education initiatives need to be able to refer to rich descriptions and critical discussions of teaching and learning strategies and methods; of the alignment of assessment with objectives and standards; of approaches to quality management and continuous improvement. Ehealth education should be evidence-based (as in Patel et al., 2009). It should derive good practice from theories, for instance Kaufman's (2004) seven principles to guide teaching practice. Those who design and implement it should be scholarly, producing "work upon which other scholars can build and equally important that other scholars can review, assess and critique"(Shulman, 2011, p. 3).

These ideas form the basis for the following selective review of the literature on implementation and evaluation of ehealth education to prepare students for entry into the clinical workforce.

Methods

This review examines literature that is self-described as either ehealth education or as clinical informatics education, an association supported by theorists (Rohm and Rohm, 2007) and practitioners (Clark et al., 2009). For the purpose of this review, relevance was defined as peer-reviewed journal and conference literature published in English between 2000 and 2011, on the subject of university teaching of ehealth or (bio-) medical / clinical / health informatics to future clinicians in any health profession. Appendix A gives details of the five-step method used to select papers.

This review excludes papers focusing on continuing professional development for qualified health professionals, or on training for advanced clinical specialties (such as psychiatry, oncology nursing, etc.) or on ehealth as a specialist degree in its own right. It also excludes non-peer-reviewed literature, which should not be overlooked by those interested in this aspect of health professional education. However such literature tends to make recommendations and provide high-level summaries rather than to give details of actual educational implementation or evaluation, and so does not fit the aims of this review.

Findings and discussion

We selected six papers to summarise. These papers give a balance of professions and of pedagogical approaches over the decade and around the world. We recognise that none of these papers can tell the full story about any instance of ehealth education. Further, so as not to endorse one approach at the expense of those omitted, each summary includes citations for all other papers shortlisted in that health profession.

The summaries are presented in six tables:

- Medicine (Table 1)
- Nursing (Table 2)
- Dentistry (Table 3)
- Allied Health (Table 4)
- Complementary Medicine (Table 5)
- Interprofessional (Table 6)

Table 1. An approach to ehealth education in medicine (from McGlade et al., 2001)

Learners / learning need	Elective course for first-year medical students Doctors need to be equipped with the attitude and tools to deal with and exploit advances in computing and the Internet.
Competencies / outcomes	Appropriate knowledge, skills and attitudes to ICT To access information from databases About information flows and information systems
Content	Managing data and information Knowledge engineering and decision support Communication and the Internet Data security and confidentiality Evaluating software and systems Using PowerPoint for presentations Searching online information sources and databases
Standards / accreditation	Benchmarked against UK, US and Australian report and journal literature on medical IT literacy.
Teaching methods / mode	Taught in second semester of first year, in 3 two-hour sessions per week for 12 weeks, including lectures, hands-on computer work, and field trips to see clinical computing systems in situ.
Assessment	Individuals used online resources to research a medical topic, then shared findings and comments online with peers.

	Groups wrote reports about a working clinical system and a patient survey and presented findings in class.
Evaluation	Students were surveyed before and after the course: its impact on their IT skills was not significant, but student feedback was consistently positive in all areas.
Related case	Lungeanu et al. (2009); Zelnick and Nelson (2002)

Table 2. An approach to ehealth education in nursing (from Desjardins et al., 2005)

Learners / learning need	<p>Non-nurses with a Bachelor's degree, enrolled in a 3-year program leading to a Master's degree and professional practice as advanced practice nurses.</p> <p>Informatics competence is a prerequisite for professionals to optimally use information technology to promote patient safety and to enable evidence-base practice.</p>
Competencies / outcomes	<p>(2003 iteration)</p> <p>Analyse clinical case studies using diagnostic decision support tools</p> <p>Critically analyse a clinical decision rule for validity and utility in nursing practice</p> <p>Assess the strengths and weaknesses of selected decision support programs for application in nursing practice</p> <p>Create, solve and interpret a simple decision tree using software that supports expected value decision making methods</p> <p>Apply clinical and theoretical expertise to the review of interactive health communication resources</p> <p>Critically analyse web-based health content for literacy level and accuracy of information for clinical populations</p> <p>Select appropriate materials for a target population's health information and education needs related to a specific topic</p> <p>Develop a user-friendly health information and education web page on a chosen topic</p>
Content	<p>Decision-making and decision support</p> <p>Web-based health information for consumers</p>
Standards / accreditation	Benchmarked against US report and journal literature on nursing informatics competencies.
Teaching methods / mode	(2003 iteration)

	<p>Two year-long 1-credit informatics intensives, with didactic and laboratory classes</p> <p>PDA based clinical log using Home Health Care Classification terminology</p> <p>Mainstreaming of some competencies into core or specialty curriculum</p>
Assessment	<p>Students used their PDA to document a standard set of data elements related to patient demographics, medical and nursing diagnoses and nursing interventions, and to access evidence-based practice resources, and synchronized their data to a central repository every two weeks.</p> <p>Students critically evaluated health education sites on the Internet.</p>
Evaluation	<p>Student learning was evaluated using in-class pre-and post-tests of self-reported competency in documentation, decision support, data, privacy/security and evidence-based practice.</p> <p>Results were mixed, and it appears that educational strategies were not closely enough integrated with tested competencies to show substantial positive effects.</p>
Related cases	Gassert and Sward (2007); Jacobs et al. (2003); Shorten et al. (2001); Sokolow and Bowles (2008)

Table 3. An approach to ehealth education in dentistry (from Levine et al., 2008)

Learners / learning need	<p>Required course for first-year dental students</p> <p>Dentists must be knowledgeable about and keep up with the latest developments to make informed choices to improve patient care.</p>
Competencies /outcomes	<p>Use critical thinking and problem solving related to comprehensive care of patients</p> <p>Use information technology resources in contemporary dental practice</p>
Content	<p>Evidence-based dentistry</p> <p>Information databases and search strategies</p> <p>Structure and evaluation of scientific information</p> <p>Dental Informatics</p>
Standards / accreditation	The degree accrediting body required that graduates have expertise in information management and critical thinking.
Teaching methods / mode	The course ran in the first half of the first semester.

	It consisted of 5 lectures, 1 hour of practical training on database searching and 1 hour of class discussion on clinical search topics chosen by the students.
Assessment	Students had to complete two online questionnaires, email the results of their search completed in the practical session to the librarian, and do an individual written assignment that evaluated one of the resources that was used to get an answer to the clinical question. In the final session, students had to work in small groups and discuss their individual assignment. They then presented it to the class as a whole.
Evaluation	Students completed an online evaluation at the end of the course: feedback was positive overall.
Related case	Ford and Hibberd (2010)

Table 4. An approach to ehealth education in allied health (from Van Moorsel, 2005)

Learners / learning need	Required course for first-year students in occupational, physical and respiratory therapy Health care professionals must contend with the growth of biomedical knowledge and advances in information technology and exercise sophisticated information management skills in clinical education.
Competencies / outcomes	Appraise and evaluate the quality of information Appreciate ethical, legal, and socioeconomic aspects of information and its technologies Develop an appreciate for information literacy and lifelong learning Exercise best practices for integrating information into clinical decision making Organize and communicate information effectively Recognize the need for information Understand how to access information from appropriate sources
Content	Information searching on MEDLINE, CINAHL, PubMed, Web of Science, and using text book and journal resources Evidence based practice and tools – using the ‘PICO’ model to form clinical questions to search databases, appraising the information based on the quality of the information and judging the applicability of the article to a clinical scenario

	<p>Presentation tools such as MS PowerPoint, MS Publisher and Adobe Photoshop</p> <p>Use of statistical analysis and data management tools such as MS Excel and SPSS</p> <p>Relational databases – normalization, table and query formation, relationship design, MS Access</p>
Standards / accreditation	<p>Benchmarked against the University Library’s information literacy competencies.</p> <p>Accreditation of occupational, physical and respiratory therapy degree programs by their professional associations required inclusion of informatics training in the curriculum.</p>
Teaching methods / mode	<p>Taught as a combination of lectures and labs, 3 hours per week over 7 weeks.</p> <p>Separate classes for students in each allied health degree.</p>
Assessment	<p>Group and individual assignments and group presentations of research.</p>
Evaluation	<p>Pre-test / post-test / post-test and self assessment instruments were used to measure whether the course objectives had been achieved: instruction had a positive effect on student learning, confidence and satisfaction.</p>
Related cases	<p>Harrison and Stewart (2003); Hersh et al. (2002)</p>

Table 5. An approach to ehealth education in complementary medicine (from Schwartz, 2011)

Learners / learning need	<p>Required course for first year osteopathy students</p> <p>How to access and evaluate information that is required to resolve a clinical situation needs to be taught at a university level rather than clinicians entering the workplace and then learning the skills.</p>
Competencies /outcomes	<p>Answer basic questions about information, information systems and the role of information literacy and informatics in health care</p> <p>Design and deliver an informed presentation of a clinical case</p> <p>Develop effective search strategies and apply them to selected databases</p> <p>Evaluate and synthesise information retrieved in a search</p> <p>Recognise the need for case-specific information and articulate a well-formed question</p>
Content	<p>Classification of information and where it is located.</p>

	<p>How to verify the quality, accuracy of the information</p> <p>Presenting information to different audiences and using PowerPoint</p>
Standards / accreditation	Course design was benchmarked against US medical schools.
Teaching methods / mode	<p>1-year, for-credit course.</p> <p>The first 9 contact hours consisted of 3 lectures.</p>
Assessment	<p>A Student Grand Rounds presentation was the major assessment. Students worked in groups of 9 on a case allocated to them depending on the physiological system that they were studying at the time. They had to research the case, write a report and present it to hospital faculty and students.</p> <p>There were also quizzes in the lectures, two reflective pieces of writing about research, and self- and peer evaluation.</p> <p>The course was graded Pass or Fail.</p>
Evaluation	<p>Analysis of student self- and peer evaluation</p> <p>Course team of librarians, clinical teaching staff and lab researchers met regularly.</p>
Related cases	[None found]

Table 6. An interprofessional approach to ehealth education (from Brock and Smith, 2007)

Learners / learning need	<p>Elective course for third-year pharmacy students plus students from public health, nursing, and Information and library science at a similar stage in their degree</p> <p>Innovations in technology mean that health care providers have to become proficient at appropriately using technology to deliver high quality health care services.</p>
Competencies /	<p>Appreciate the perspectives and roles of patients and providers when using technology in care</p> <p>Make decisions about the value and ethical applications of specific technologies</p> <p>Understand how to incorporate technology into the provision of safe, effective and evidence-based health care</p>
Content	<p>Clinical decision support systems and patient safety</p> <p>Consumer health</p> <p>Electronic health records and computerised order entry</p> <p>Health care terminologies and coding</p> <p>Information management and evaluation</p>

	Patient care management and monitoring Public health informatics Security, privacy and ethics Telehealth
Standards / accreditation	Benchmarked using a workshop of practicing pharmacists, a literature review and curriculum committee review
Teaching methods / mode	Initial orientation meeting, then taught online via a 20 minute lecture each week provided as PowerPoint slides with voiceovers and ancillary learning resources, in a Blackboard learning management system. Students had to complete weekly activities, then do a feedback exercise before moving onto the next set of slides.
Assessment	Self-assessment quizzes and weekly activities. Each student did an informatics project of their choice and presented it, using voice-annotated PowerPoint slides accessible via the Blackboard page, for peer and instructor review.
Evaluation	Online survey about each week's module and comprehensive online survey at the end of the course: generally positive. Analysis of student work: consistently met or exceeded the course expectations. Substantial increase in enrolments the following year.
Related cases	Hart et al. (2010); Masic (2008); Murray et al. (2010)

Discussion

Educators looking for the evidence base on how to teach ehealth effectively will find very few accounts of educational implementation or evaluation from any health profession. At present nursing cases are the most abundant source in the literature from a specific profession, and they may serve as useful models for other health professions. More contributions to the scholarship of teaching and learning in this field are needed from educators in other health professions.

Also abundant are accounts of interprofessional teaching. Across the health professions, the general aims and outcomes of these units of study are not radically different from one to another. In educational settings where future clinicians are enrolled and trained for more than one profession, there are obvious logistical arguments for sharing elements of ehealth education among health professions. Comparison of curriculum aims and outcomes across specific professions, combined with the evidence from the interprofessional cases themselves, suggests that there are pedagogical reasons for interprofessional learning as well.

A number of relevant cases used the language and standards of information literacy or evidence-based medicine to describe an essentially informatics-oriented unit of study. It is interesting to note that interdisciplinary teaching teams are often involved, which may include clinical educators, biomedical scientists, biomedical librarians and, perhaps not often enough, expert health informaticians.

Recommendations of the International Medical Informatics Association for 19 essential elements of core biomedical and health informatics knowledge and 14 essential elements of informatics / computer science (Mantas et al., 2010, p. 112) were available during the period these cases represent, in their first iteration. It is concerning that these recommendations do not seem to have influenced formulation of the desired competencies and course content in the cases we reviewed. Future curriculum development needs to close the gap between each clinical profession and the discipline of health informatics.

Choice of compulsory or elective study for ehealth curriculum is a notable point of difference across these cases. Explicit ehealth education requirements by an external accrediting body are not always in evidence, nor requirements to meet expectations from employers of graduates.

A related decision is when in a multi-year degree program to introduce ehealth and how much emphasis to give to this content, with options ranging from a short, sharp first-semester-of-first-year learning experience to a later-year or capstone experience. Teaching and assessment methods may be as important as timing in influencing the way that future clinicians are able to consolidate and extend their initial development of knowledge, skills and attributes. The option of integrating the content into many subjects in every year of the degree is infrequently described. The nursing case we summarised suggests that this is more challenging to achieve than a stand-alone subject, but potentially more effective too.

There is scope for creativity in selecting methods and modes of instruction; lectures and computer lab sessions can be supplemented by field studies and field work with a strong applied focus. The possibilities for using elearning, simulations and personal or mobile technologies do not appear to be fully exploited in most cases. Innovations of this kind appear in the literature, but often are written up in a way that explicates technical design decontextualised from the pedagogical themes on which this paper focuses.

The alignment between intended learning outcomes and methods used to assess student learning is not well described in many case reports. The ability to develop competence to practice underlies many of the needs analyses, yet the design and conduct of assessment to demonstrate such competence is relatively underdeveloped, with no apparent use of externally validated instruments or processes. This is an area where ehealth education seems to fall outside what is considered good practice in other areas of clinical knowledge and skill.

Conclusion

Many of the papers discovered during this review focused strongly on the rationale or argument for teaching ehealth to clinicians. This is an indicator the long and complex journey toward recognition of informatics as a core competency for all future health professionals.

In the current international climate of system-wide implementation of ehealth, it is important for educators to take the theory and the practice of ehealth education to a more sophisticated level, in a scholarly and supportive community of practice within and across the health professions.

No picture of Australian ehealth education emerged from this review. The identification of this gap in the evidence sets the scene for empirical study of Australian academics' practices and perspectives on ehealth education for future clinicians. This forms the basis of the next two chapters of this report.

Chapter 3. Australian ehealth education practices and perspectives: a national study

Introduction

This chapter reports on the status of ehealth education in degree programs preparing Australia's future clinicians. It is the first study of this kind to be undertaken in Australia and provides an important set of reference data for benchmarking curriculum renewal in future.

Method

Data were collected in 2011 from an online survey that targeted every academic coordinator or director of an Australian health profession degree (approximately 400 people). The survey response rate was around 25% for individuals and 75% for universities, with participation by 102 people based in more than 30 universities and responsible for degrees across the professional spectrum. Following the survey, additional data were collected from structured telephone interviews lasting 30 minutes or longer, with 34 of the survey participants. Appendix B shows survey and interview questions and respondents' characteristics (i.e. States and Territories, professions and educational institution types).

Results

The main findings are presented under four headings that represent important constituents of educational quality:

- Academic knowledge and access to information
- Curriculum, teaching and assessment practices
- Profession, employer and subject matter expert influences
- Student technology uses and educational preferences

Example quotes from study participants illustrate various viewpoints from a range of professions, with the actual participant identified as "SPNN".

Academic knowledge and access to information

Participants were asked open-ended questions about **their own understanding of ehealth and the understanding in their teaching team**. These data were analysed thematically, and the responses are categorized and exemplified here:

Clear personal understanding of ehealth:

"Ehealth is the use of technology to facilitate medical interventions. So it can be anything from video conferencing to ehealth, to diagnosing online. So it is very broad". Social Worker, SP45

"The first thing it means is the delivery of services to clients, electronically. And the other aspect to me, is the management of electronic medical records, and management of patient data". Psychologist, SP20

"It is an electronic way of communicating a person's health; between health practitioners, and between health organisations (hospital to hospital)". Dietitian, SP55

Confusion between ehealth and elearning:

"I come to this really with very little background apart from what I have done externally to the university and what I have picked up here. So I equate the 'e' to e-learning which I equate with flexible learning methods, essentially using the internet and electronic medium. This could be streaming audio-visual material, contributing to a blog online, chat rooms or sending material for people to read and do at home via the internet. For us this is done through our portal, which is known as 'Blackboard'. So e-learning in terms of ehealth, with a focus in the health area I presume can be a big 'H' or a little 'h' because a lot of my background had been in public health, health promotion". Social worker, SP47

"That is a tricky question. The difference between ehealth and elearning in a context where students are learning about health creates a blur. Because all our teaching is about learning about health and preparing students for work in the healthcare domain. As I understand it, ehealth is about patient access via e-sources; about connections between patients and health care workers and that ability to communicate and access health care from a distance. So, for example, online patient records. I can't give you a clear definition". Physiotherapist, SP96

"As I understand it, ehealth is the provision of online resources, and other sorts of information, as well as studying online". Midwife, SP38

Variable knowledge and perceptions in the teaching team:

"I think there are two main camps. I think among one camp there is a view that ehealth is an opportunity, and that we have to grab it with both hands; the view is that we are thinking that this will enable people who wouldn't otherwise access health facilities or resources to do so- it's a social justice issue. And then there's the other group who feel that the capacity for ehealth to develop good health outcomes is limited. So there are two camps. Some people think there are really good opportunities here; and for social justice reasons. And there is the other group who feel there's no way you can get the same health outcomes with electronic health as you can with face-to-face health". Psychologist, SP20

"There is probably a wide spectrum of opinion. We have our technophobes who don't want to know anything about it whatsoever, and then there are others who are possibly too enthusiastic about it, and are trying to do too much about it. They all understand that it is the future and that it allows for a more flexible delivery of learning". Chiropractor, SP19

"Here they are all very enthusiastic as they have been involved in this project. Out there in the real world though, it depends on the discipline. General Practitioners are totally comfortable with this, because they have been doing it for years, and they are familiar with it because they were paid to do it by the government. But in the hospitals I think you would find varying views; with some enthusiasm and some scepticism". Medical Practitioner, SP91

Ehealth knowledge in the teaching team not known:

"We haven't really discussed it, so I'm not entirely sure". Psychologist, SP3

"I think some of them might have a better understanding of it than I do, but I'm not entirely sure about that". Traditional Chinese Medicine Practitioner, SP71

“It is hard to comment here, because we haven’t had a specific conversation about it. There is however a general agreement among staff that we need to do more in our course with ehealth. We have had meetings with other faculties about how to best approach ehealth in the course, so there is general agreement about the need to include ehealth in the learning and teaching of the program, so there certainly is more work to be done”. Nurse, SP61

Participants were asked **where, when and how they access ehealth information resources**. These data were analysed thematically, and the responses are categorised and exemplified here:

Appropriate access to ehealth information resources:

“We come across it on a daily basis, through the information we get via our computers, through our involvement in the national Health Workforce Australia, when we liaise with students. I guess it is all mostly through our networks. We are aware of it on a daily basis. To be successful in our field you need to have an ongoing commitment with liaising and engaging with a clinical environment”. Radiographer/Sonographer, SP26

“Mostly through the Dietitians Association. They send out updates and they call for people to be involved in various things. I sometimes represent the Association in National meetings [about this]”. Dietitian, SP100

“Personally, I belong to both national and international online forums. So for example, I belong to one that has only just recently been set up, called HISA [Health Informatics Society of Australia]. It is a real gateway for information as it tells you about what is around, and what you can access, that kind of thing. Because I am midwifery lecturer, I also belong to an international one concerned specifically with midwifery. And that looks at both research and clinical practice”. Midwife, SP38

Lack of access to ehealth information resources:

“I really haven’t come across much. Having said that though, I haven’t searched for it, but I know there would probably be information on it out there somewhere”. Nurse, SP76

“By accident usually”. Psychologist, SP3

“I haven’t come across a thing. You are my first contact that I have had with it.” Social Worker, SP47

Participants were asked **what advice they would give to a colleague who was about to start teaching ehealth**. These data were analysed thematically, and the responses are categorized and exemplified here:

Clear professional direction:

“The best advice I would give, would be to get really up to date information. Using the NEHTA [National Ehealth Transition Authority] website is really useful, and

finding out what is happening with them is also a good starting point about where our profession is heading”. Dietitian, SP100

“My advice would be what I outlined just before, in that the PACS [picture archiving and communication system] is a smaller version of what ehealth is all about. However, it is a closed system, limited to that particular site or facility, but it is a micro-model of what ehealth is all about. So I guess that would be my interpretation of a way that students could gain a more hands-on experience”. Medical Imaging Professional, SP46

“The first thing would be to define what ehealth means, and then go away and figure out how it relates to occupational therapy. Once you have figured that out, you have the basis for a search of the literature and then going and talking to other people about what content you need to include”. Occupational Therapist, SP2

Unsure of direction:

“I would tell them to speak to someone who has more expertise and knowledge in the field”. Nurse, SP76

“I would tell them to ask around and find out what is available. I would direct them to a research centre that do work in this area, or to other programs in this area that use ehealth resources”. Exercise Physiologist, SP52

“To try and find someone in the faculty who understands it, because I can’t identify any specific form of expertise on our campus (we are only a small campus mind you), but I assume there would be experts in the faculty that we could tap into to better develop the use and understanding of ehealth”. Paramedic, SP92

Curriculum, teaching and assessment

Participants were asked **whether the curriculum content of the degree program addresses at least some aspects of ehealth**. 6% of respondents answered neutrally, did not know or did not respond.

84% of respondents agreed that their program addresses at least some aspects of ehealth, for example:

“The curriculum has a strong emphasis on Research Enriched Learning and Teaching (RELT). The curriculum containing individual subjects on evidence based practice in addition to discipline specific EBP [evidence-based practice] content dispersed throughout the curriculum”. Physiotherapist, SP13

“Evidence-based practice, Communication, Clinical decision support systems, Professional Experiences in actual health care agencies”. Nurse, SP61

“Several lectures include content relating to electronic patient records, how they are accessed and how they relate to the hospital environment and private practice”. Exercise/ Sports Scientist/ Physiotherapist, SP32

10% of respondents disagreed, for example:

“This is not specifically taught as a topic within the current degree program but electronic record keeping is used throughout most clinics and students are expected to conform to current practices of reporting”. Audiologist, SP22

“We cover evidence-based learning of psychological skills, knowledge & research, but nothing is specifically related to "ehealth". Psychologist, SP4

“Only limited specific discussion of evidence based practice however would not include this as part of ehealth or informatics”. Nurse, SP81

Participants were asked **whether teaching methods address at least some aspects of ehealth**. 20% of respondents answered neutrally, did not know or did not respond.

51% of respondents agreed that their teaching methods address at least some aspects of ehealth, for example:

“Students have access to remotely located guest lecturers who present using teleconferencing”. Nurse, SP15

“Guest speaker from the State Government Perinatal Data Collection Unit”. Midwife, SP80

“The fact that the subject notes must be down loaded by students provides a basis for this type of learning environment. However, there is no designated aspect of the course in which this sort of information is presented”. Massage/ Musculoskeletal/ Myotherapist, SP69

29% of respondents disagreed, for example:

“Some staff are more e-savvy and use technologies such as Skype & Adobe Connect but there is no requirement. We have guest lectures at residential schools”. Psychologist, SP4

“The teaching methods to date do not use telehealth or other methods”. Dietitian/ Nutritionist, SP90

“Not at this stage, again as above it’s a new program and we are looking towards doing this”. Dietitian, SP55

Participants were asked **whether the assessment strategies in their degree program address at least some aspects of ehealth**. 25% of respondents answered neutrally, did not know or did not respond.

31% of respondents agreed that their program address at least some aspects of ehealth, for example:

“Our assessment strategies are always aligned with our learning objectives and so yes some of our strategies will address some aspects of ehealth”. Medical Imaging Professional/Radiographer, SP88

“Have introduced a lecture that will expand to incorporate International Dietetic Terminology which will link into using electronic case notes in the future”. Dietitian/ Nutritionist, SP53

“Not a subject of an assessment item. Some components of public health essays may touch upon ehealth as a component of a question or as part of an answer”. Medical Practitioner, SP89

44% of respondents disagreed, for example:

“There are no assessment strategies in this degree program which include this area”. Massage/Musculoskeletal/Myotherapist, SP6

“Our assessment strategies do not address anything related to ehealth”. Psychologist, SP4

“Our students use electronic records in our clinic however they are not assessed on them”. Chiropractor, SP102

Profession, employer and subject matter expert influences

Participants were asked **whether the profession or industry body that accredits their degree program required that at least some aspects of ehealth be included in learning, teaching and assessment**. 30% of respondents answered neutrally, did not know or did not respond.

32% of respondents agreed that accrediting bodies required at least some aspects of ehealth be included in learning, teaching and assessment, for example:

“It is required that students demonstrate an awareness of electronic record storage - in the competency based outcome standards”. Speech Pathologist, SP104

“The Bachelor of Nursing has been accredited against the draft Standards and Criteria for the Accreditation of Nursing and Midwifery Courses Leading to Registration, Enrolment, Endorsement and Authorisation in Australia for Registered Nurses (ANMC, 2009). Standard 4 - Curriculum Content requires us to report against the criteria of Information Technology for Health Care”. Nurse, SP61

“Guidelines for curriculum content and accreditation requirements contain specific statements about the inclusion of ehealth”. [Multiple responsibilities for] Exercise/ Sports Scientist/ Health Informatician/ Occupational Therapist/ Orthoptist/ Physiotherapist/ Radiation Therapist/ Radiographer/ Sonographer/ Speech Pathologist, SP16

38% of respondents disagreed, for example:

“There is no explicit statement in the list of Standards and Elements on ehealth in the Australian Physiotherapy Council accreditation requirements, however, ehealth may be seen as embedded within some of the standards, e.g. operate effectively across a range of settings; participate in quality improvement processes”. Physiotherapist, SP96

“This is not stated specifically by the accrediting body”. Occupational Therapist, SP8
“Not one of their criteria, but it is expressed in discussion”. Medical Practitioner, SP24

Participants were asked **whether the major employers of their graduates expected some aspects of ehealth to be included in their degree**. 16% of respondents answered neutrally, did not know or did not respond.

62% of respondents agreed that major employers expected some aspects of ehealth to be included in their degree, for example:

“Graduates would be expected to be able to access all forms of electronic information regarding patient records and care”. Medical Practitioner, SP89

“Employers expect our graduates to be able to use computed radiographic imaging systems including CT and the PACS interface that communicates with the hospital departments and wards remote from the radiology department”. Medical Imaging Professional/ Radiographer, SP88

“Our students would be required to know how to use patient records, how to access and undertake reviews of the literature”. Dietitian/ Nutritionist, SP29

22% of respondents disagreed, for example:

“Major employers require content and skill knowledge but not necessarily ehealth capability. However, by the time our distance students graduate they have good e-technology skills”. Clinical Psychologist, SP2

“Very little technology, apart from those who go into health placements and employment pathways, is required of social workers when compared with other disciplines. Ehealth notes and statistics would be the major requirement for hospital-based students. Child protection requires knowledge and use of client information systems”. Social Worker, SP95

“Ambulance service does not expect graduates to be able to conduct research to any great degree, and do not wish for us to teach them electronic patient care records as this is done once they are in their grad year”. Paramedic, SP77

Participants were asked **whether they use independent expertise to support decision-making about learning, teaching and assessing ehealth in the degree**. 29% of respondents answered neutrally, did not know or did not respond.

21% of respondents agreed that they use independent expertise to support decision-making about learning, teaching and assessing ehealth in the degree, for example:

“We use info from NEHTA [National EHealth Transition Authority]”. Dietitian, SP100

“E-technology consultant employed within the school”. Nurse, SP79

“We are discussing content with other ehealth academics”. Public Health professional, SP94

50% of respondents disagreed, for example:

“We have not yet included specific aspects in curriculum design”. Occupational Therapist, SP84

“Curriculum design and implementation is always a balance between the needs of the program overall and the apparent needs of a discipline. It is generally not possible to access, assess and implement all external curricula in our curricula. We do however use them (at times) to bench mark our curriculum”. Medical Practitioner, SP91

“No external expertise has been called upon at this point in time”. Social Worker, SP95

Student technology uses and educational preferences

Participants were asked **whether students’ use of technology outside of study influenced the approach the degree took to their ehealth learning needs and leaning outcomes**. 14% of respondents answered neutrally, did not know or did not respond.

68% of respondents agreed that students’ use of technology outside of study influenced the approach the degree took to their ehealth learning needs and learning outcomes, for example:

“We assume that students can access the web and use smart phones. We provide profession-specific training in the use of relevant research databases and electronic resources, and general direction about access to health apps for smart phones and tablet computers. Once pointed in the right direction, students are able to develop their own lines of information and resource gathering”. Speech Pathologist, SP23

“Absolutely - the majority of resources we direct our students to are online - either through the library or through our online learning management system (Moodle). Students are also encouraged to use PebblePad - a self directed reflective space to record learning experiences and progression through the degree, including a skills diary -video performance of themselves that is uploaded onto PebblePad and reviewed for reflective learning”. Physiotherapist, SP67

“We teach students to access information, including oral health information online. Many students access health apps but this is not a requirement of the program”. Dental Hygienist, SP12

18% of respondents disagreed, for example:

“We assume not all students are at the same level of technology use, nor do they all have the same access outside of study, so the approach we take is that we teach them what they need to know for our profession”. Exercise/Sports Scientist, SP5

“A variety of students - ages and backgrounds - we don't assume everyone knows

how to use the technology or has access”. Pharmacist, SP6

“The curriculum has more specific drivers focused on clinical competency”. Medical Practitioner, SP89

Participants were asked **whether the educational preferences of students in the degree influenced the approach the degree took to their ehealth learning needs and outcomes**. 19% of respondents answered neutrally, did not know or did not respond.

64% of respondents agreed that the educational preferences of students in the degree influenced the approach the degree took to their ehealth learning needs and outcomes, for example:

“We cater for students who are engaged in clinical placement and have limited available time during the day to physically attend university. Therefore, we have designed online subjects in professional practice, as well as Advanced Workplace Injury Management that students do online through the university elearning system”. Exercise/ Sports Scientist, SP5

“Database access abilities are valued [by students] as a critical component of clinical skills”. Physiotherapist, SP1

“We have included student feedback in the planning of the course. We have attempted to cater to a range of learning styles by providing students with the option of face-to-face lectures or accessing these lectures online”. Nurse, SP15

17% of respondents disagreed, for example:

“We cater for the necessary clinical skills not primarily student preferences as the driver for problem-based hands-on learning”. Exercise Physiologist, SP52

“We provide a standard program for all students to ensure that they are meeting the core knowledge and competencies provided by the professional body”. Audiologist, SP22

“The delivery of the curriculum is based on what gives the best outcomes not student preferences”. Medical Practitioner, SP89

Discussion and conclusions

Despite extensive and intensive recruitment efforts, only one-quarter of degree directors and coordinators in Australian health profession degrees provided any information about ehealth education in their programs of study. Those who did respond represent faculties, schools and departments of health sciences in three-quarters of Australia’s approximately 40 universities. The Vocational Education and Training sector, a recent entrant to providing health profession degrees, is also represented in the findings.

Between one-quarter and three-quarters of those who participated were unable to confirm that important constituents of educational quality were in place – the academic knowledge base; curriculum, teaching and assessment practices; external advice and review; student-centred learning. There are pockets of good practice which are important to be able to share through this study, for example, understanding ehealth comprehensively (SP45);

contextualising teaching about electronic patient records (SP32); referencing external guidelines for curriculum content (SP16). However, there are also inadequate conceptions of the breadth and depth of ehealth education, such as the idea that it can be equated with evidence-based practice (SP54), or that it can be achieved by elearning (SP47), and assessment practices generally are weak.

Taking a broad view across professions and degrees, the evidence suggests that Australia does not yet have a consistent, disciplined approach to educating the future clinical workforce to work effectively with ehealth. The results of this study indicate that considerable efforts are needed to develop ehealth knowledge among academic teaching staff, to develop resources for teaching and assessing ehealth competence and to develop processes for strengthening ehealth curriculum review.

The next chapter of this report describes the workshop activity that was initiated as part of this project, to begin to address the need for widespread academic development.

Chapter 4. Interprofessional directions for ehealth education: a national workshop

Introduction

This project ran a half-day invitation-only academic staff development workshop targeting academic coordinators and directors of entry level degrees in all clinical health professions. The workshop was offered in February 2012 at four different times in four cities - Brisbane, Melbourne, Sydney and Perth. The aim of the workshops was to share and improve the level of ehealth knowledge and curriculum planning around Australia. The workshop was also designed to explore the scope for interprofessional work toward this goal, for both pedagogical and strategic reasons: since ehealth facilitates interprofessional practice, so should its teaching; and given the Australian government's interest in innovation and reform across the health workforce, efforts to build ehealth capability should follow suit.

Method

The workshop focused on five topics:

1. why clinicians need to be competent in ehealth
2. what it means for a clinician to be competent in ehealth
3. strategies for learning, teaching and assessing ehealth competence
4. elements of ehealth capability common to all health professions
5. requirements to facilitate further curriculum renewal for ehealth education

Documentary resources provided to workshop participants were:

- a discussion paper (based on material reported in Chapter 3 of this report)
- a literature review (based on material reported in Chapter 2 of this report)
- an abridged list of competencies developed by the Australian Health Informatics Education Council (AHIEC, 2011)

Presentations by variety of panellists from industry and government were a key part of the workshop program in each location. They provided authoritative perspectives on why it is important for health professionals to be competent in ehealth.

The National EHealth Transition Authority (NEHTA) had a major presence at the workshops. In every location, the NEHTA education officer was not only part of the panel but also hosted an extra post-workshop information session on the Personally Controlled Electronic Health Record (PCEHR), a key component of Australia's national ehealth strategy.

In response to documentary resources and panel presentations, each workshop participant was asked to undertake specific activities, individually and in small groups. A standard worksheet was used to record individual and group responses during workshop activities. Participants were allocated to small groups (13 groups in total across the four workshop venues) so as to ensure that each group comprised a mix of health professions.

In all, 52 people from the target group participated in these workshops. Details of the workshop program and participants are in Appendix C.

Results

This report summarises consolidated participant responses to the workshop activities, based on collation and analysis of worksheets. Workshop participants' ideas about the five workshop topics are presented as commonly occurring themes, followed by quotes selected to illustrate multiple viewpoints and a range of professions. The participant quoted is shown as WPNN.

Why clinicians need to be competent in ehealth

Overall workshop participants' views about the rationale for ehealth education reflected a sense of its importance. Commonly occurring themes were: challenging, critical, essential, necessary, patient-centred, vital; for example:

“Challenging but exciting, because of the explosion in technology and the tyranny of isolation.” Nursing, WP44

“Critical for 21st century healthcare, because there is a need to promote better health info across disciplines to ensure patient safety quality and care.” Medicine, WP19

“Vital and inevitable, because ehealth should be ultimately for the benefit of patients, and clinicians should be actively involved in to make sure this happens.” Clinical Psychology, WP4

Notably some participants initially lacked basic knowledge about the nature and scope of ehealth, for example:

“Vital, because as the world enters the ‘paper-less’ working environment, we must be prepared to embrace this trend or get left behind.” Pharmacy, WP8

“Unsure, because there is a lot of confusion about the term; information / communication applied to clinical practice / decision making.” Health Sciences, WP13

“As yet, unclear to me – a tool for / in healthcare? electronic records only? I need to clarify my understanding of the scope of ehealth / additional ideas relevant to our practice.” Physiotherapy, WP41

What it means for a clinician to be competent in ehealth

Overall workshop participants felt that a competent clinician in their own profession should understand the importance of ehealth in improving the healthcare system. Commonly occurring themes were: adaptability, attitude, awareness, ethical practice, evidence-based practice; for example:

“Attitude that ehealth is an effective tool. Ability to use all aspects of ehealth effectively to manage clients.” Dental Therapy, WP5

“Aware of resources and technologies; able to use ehealth in an interprofessional framework; able to critically evaluate quality of ehealth.” Allied Health and Nursing, WP20

“Ethical (accurate use of information in records); informed which sources of information is evidence-based and certified; can accurately interpret information and records; can accurately access and enter information into records; can accurately convey information to assist healthcare outcomes; respects privacy when using technology; computer literate. Pharmacy, WP26

“See ehealth as a necessary tool in providing care. Be vigilant and competent in safe,

appropriate use of ehealth. Still focused on providing best patient care and willing to use any resource to do so.” Nurse, [P6]

“Know about tools, web based systems. Can use / demonstrate use of tools / equipment, including iPad /new formats and web based ‘systems’ such as Skype, Facebook and electronic databases for health care delivery. Embrace new technologies and systems as early adopters.” Occupational Therapy, WP18

“Curiosity – to search out information to emphasise healthcare; capability – to ensure they can find that information; context – will be embedded in an integrated ehealth system.” Medicine, Nursing and Allied Health, WP43

Ehealth learning, teaching and assessment strategies

Participants’ descriptions of a key ehealth learning outcome for students in their health profession degrees strongly featured ethical practice; for example:

“Apply ethical and security issues including accountability... privacy and security of patient data and risk management.” Nursing, WP10

“Apply efficient and ethical responsible use of info process tools to support practice and decision-making.” Physiotherapy, WP17

“Ethics associated with the use of ehealth records.” Pharmacy, WP26

Other themes in proposed learning outcomes included workflow improvement, decision support and data integration; for example:

“Understand the clinician workflow and how ehealth may improve workflow and patient care.” Exercise Physiology/Exercise Science, WP9

“Apply the principles of clinical decision making and diagnosis.” Pharmacy, WP24

“Ability to integrate digital, audio and video into standard client files.” Speech Pathology, WP34

Participants’ suggestions for teaching strategies highlighted case studies and activities that simulate the use of real health information systems, for example:

“Simulated ehealth records.” Physiotherapy, WP1

“EBP [evidence based practice] simulation dynamically applying PICO [problem, intervention, outcome, comparison] at the patient level.” Paramedic, WP37

“Use of case studies, scenarios, and simulations.” Nursing, WP21

“Use of an ‘app’ example to monitor exercise, with records of practice.” Occupational Therapy, WP18

“Best practice suggestion made by an ehealth system, being interrogated by students.” Chiropractic, WP40

Participants' assessment strategy suggestions echoed teaching strategies in highlighting the utility of case studies and simulated activities, for example:

"Case studies for my specific course, although we are using it for other courses."
Epidemiology, WP7

"Patient mapping activity and case study with critical reflection." Social Work, WP16

"Simulated ehealth tools used concurrently in a case based scenario to use interviews/charts/tests to make decisions and support / justify answers." Pharmacy, WP32

Notably more than one in five workshop participants was unable to make any suggestions for learning, teaching and assessment strategies. 14 participants did not specify any key learning outcomes. 11 participants did not advance any new teaching methods. 12 did not generate any ideas for appropriate assessment tasks.

Interprofessional elements of ehealth education

Almost all workshop participants agreed that there was merit in developing ehealth capability in clinical health professionals through interprofessional education, citing interprofessional communication and patient care themes; for example:

"Health is about interprofessional communication, so should be modelled in this environment." Medical Imaging, WP3

"Health should not be a single profession's responsibility. Patients see multiple professionals and these professionals should be able to work together." Pharmacy, WP8

"Engaging professionals together enables progress toward the goal of patient safety." Social Work, WP16

However support for interprofessional approaches to ehealth education was not universal, for example:

"Neutral – interprofessional education requires further development and I wonder about fusing two fields that are still emerging in themselves." Nursing, WP35

"Neutral – not sure it is a separate capability; rather embedded in the other teaching." Physiotherapy, WP38

"Strongly disagree – pan professional knowledge is very important, but we all have an area of use... a perspective is fine, but we don't just want different flavours of the same thing." Chiropractic, WP40

In a small group activity designed to distil 45 competencies specified by the Australian Health Informatics Education Council, participants were asked to nominate up to five common competencies, that is, necessary for ehealth competence across all clinical health professions. For each one they nominated, they were asked to give concrete examples of

important and demonstrable learning outcomes, feasible and effective teaching methods, and relevant and meaningful assessment activities. Six competencies were nominated by four or more small groups, as shown in Table 7.

Table 7. Common ehealth competencies for clinical health professions, nominated by Australian workshop groups

AHIEC Competency	Learning Outcomes	Teaching Methods	Assessment Activities
<p>1.14: Apply ethical and security issues including accountability of healthcare providers and managers and health informatics specialists and the privacy and security of patient data.</p> <p>Nominated by 9 groups</p>	<p>demonstration and understanding of ethical and security issues and principles</p> <p>being able to access and interpret information in an ethical manner</p>	<p>case studies</p> <p>teaching with case based scenarios</p> <p>debating ethical issues</p>	<p>critiquing a complex case to identify the issues and suggesting the next steps</p> <p>observing and assessing debates</p>
<p>2.3: Apply principles of clinical decision making and diagnostic and therapeutic strategies.</p> <p>Nominated by 5 groups</p>	<p>being able to understand the process of information gathering</p> <p>understanding the potential of IT but also being aware of its limitations</p>	<p>problem based learning</p> <p>simulated cases</p> <p>exposure to electronic tools in computer labs</p>	<p>multiple choice questions with negative marking</p> <p>actual simulations to demonstrate clinical skills, using telemedicine for instance to support this</p>
<p>3.3: Apply ability to communicate electronically, including electronic data exchange, with other healthcare professionals, internet/intranet use.</p> <p>Nominated by 5 groups</p>	<p>being able to collaborate with other health professionals using electronic methods</p> <p>being aware of issues of confidentiality, security and privacy</p>	<p>using personal stories from patients in the form of videos,</p> <p>comparing, contrasting and critiquing different modes of communication</p> <p>role playing online</p>	<p>developing a referral pathway plan including the tool</p> <p>debating two different views of one situation</p> <p>assessing the completeness and accuracy on an online document</p> <p>creating an eportfolio</p>
<p>1.3: Apply efficient responsible use of information process tools, to support healthcare practice and decision-making.</p>	<p>being able to apply or evaluate IT in an effective way</p> <p>application of simulated ehealth</p>	<p>making entries into patient records during clinical placements and searching information and</p>	<p>case based assessments with questions regarding the decision path and what tools can be used</p>

Nominated by 4 groups	information drawing on past records to make decisions	producing reports based on this. problem based learning and simulated cases	test the ability to generate an appropriate report based on an online patient record
2.6: Apply principles of evidence-based clinical practice. Nominated by 4 groups	demonstrating the effective use of electronic media to find the relevant evidence discussing the scope of ehealth to patient health	reviewing literature using electronic resources using simulated information tools case based scenarios	testing, either oral or paper-based report based on a literature review
3.11: Understand 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. Nominated by 4 groups	demonstrating the use of database management tools being able to apply decision making principles	analysing a data management system using case studies and examples of adverse scenarios from practice	assessing a report discussing case pathways, diagnostic output and actions

Requirements to support further work

Participants were asked what their faculty / school / department would most need in order to undertake further work on curriculum renewal for ehealth capability. A key theme in their responses was the need for ehealth tools and resources that could be used for educational purposes, for example:

“Patient records system for simulated practice or access to such a system.”
Occupation Therapy, WP2

“Different IT support to help with development – Infrastructure is missing or minimal.” Physiotherapy, WP47

“1) A simulated ehealth info tool. 2) A standard national therapeutic guideline that is considered the starting point for all decisions.” Pharmacy, WP32

Another theme highlighted curriculum renewal process issues, such as planning cycles and mandates from the professions, for example:

“Devoted time to plan and clearly list resources and possibilities.” Social Work, WP16

“Program and curriculum development not complete. Content has to include effective program planning design.” Medicine, WP19

“Support from professional bodies to include ehealth as core curriculum.” Health Sciences, WP13

10 participants did not answer this question.

Discussion and conclusions

This workshop model proved effective in bringing together senior educators across disciplinary, institutional and geographic boundaries to advance ehealth education in all clinical degrees. Participants engaged constructively and creatively in workshop activities and contributed to thoughtful critical discussion of the issues. While interprofessional learning and teaching of ehealth was not universally endorsed in the workshops, meaningful perspectives and practices were shared and sound bases for further collaborative initiatives were established in every workshop.

An unforeseen outcome of the workshops was to give the expert panellists insights into the need to provide greater encouragement and support for ehealth education for future clinicians. Many panellists did not initially appreciate the need for such support, assuming that education in the health professions was keeping pace with ehealth technologies and strategies. Workshop interactions between panellists and educators were illuminating on this point.

In terms of their impact across the sector these workshops were just a start. They made clear how many more academic development activities and resources are required to help educators upgrade their ehealth knowledge to the point where they are able to integrate this into the teaching and assessment of future clinicians.

Although further workshops were out of scope, this project undertook the identification and creation of ehealth learning resources that could be used in a variety of settings for academic development as well as student learning. These resources are described in the next two sections of this report.

Chapter 5. Resources available for ehealth education: an inventory

Introduction

The project sought to facilitate curriculum renewal for ehealth education by providing an inventory of resources that could be used for teaching ehealth to entry level health profession students.

This inventory is intended to enable teaching staff to tailor the inclusion of ehealth education in their degrees, based on their interpretation of a wide variety of sources of knowledge and practice from Australia and around the world. It is intended as an indication of the range of resources that are available, and as a prelude to broader and deeper curriculum research and development in any degree program.

Method

The resources were found by performing a Google search, using general and specific terms related to ehealth. A university teacher with doctoral qualifications and teaching experience in ehealth reviewed each resource retrieved. Only resources which were judged to be useful for teaching or curriculum planning, and were accessible online, authoritative, current and relevant were selected for inclusion in the inventory. A draft inventory was circulated to expert educators for feedback and comments. The discovery process was stopped when 100 resources had been reviewed and accepted for inclusion.

There are caveats on this inventory. It is neither exhaustive nor comprehensive; although every effort was made to produce a balanced selection, it is possible that worthwhile resources were omitted. It was completed in September 2012, so it does not reflect changes to the content and availability of resources since that date. All the resources listed can be located online, however not all of them offer access free of charge to the entire text, tool or product. The educational effectiveness of the resources listed has not been tested or evaluated within this project.

Results

This inventory is arranged in order by the type information about each resource as follows:

- provider category – for example, government, professional organization, etc.
- content owner – for example, author, publisher, etc.
- media type – for example, Powerpoint presentation, video etc.
- location and description – a precis of the resource and the web address.

The items included in this inventory are not duplicated in the collected list of References for this report.

Table 8. A selection of resources available to support teaching and learning of ehealth to future clinicians

Provider category	Content owner	Media type	Location and description
Consulting company	Accenture	Website	http://www.accenture.com/au-en/Landing-Pages/health-public-service/Pages/healthps-au-electronic-health-records.aspx?c=con_auglohpspsgs_1210&n=g_electronic_health_records_(ehr)/a_0

			/ehr&KW_ID=sKAyat4EH pcriid 14830932476 Accenture also provides healthcare hardware and software solutions. The site above is a resource that can be browsed by topics, and has a link to a survey on the international Electronic Medical/Health Record Market.
Consulting company	Deloitte	Website	http://www.deloitte.com/view/en_AU/au/industries/Lifesciencesandhealth/c892fceb60cb8310VgnVCM2000001b56f00aRCRD.htm# This link provides access to a report by Deloitte on Digital hospitals: debunking the myths surrounding the technology journey.
Consulting company	KPMG	Reports	http://www.kpmg.com/africa/en/issuesandinsights/articles-publications/pages/accelerating-innovation.aspx The link above is to a recent report by KPMG on lessons learnt from eHealth implementations around the world.
Consulting company	McKinsey & Company	Website	http://www.mckinsey.com/client_service/initiatives/mhealth This link provides information on mhealth (mobile health) and links to podcasts and articles in the McKinsey Quarterly.
Consulting company	PriceWaterhouseCoopers	Website	http://www.pwc.com.au/industry/healthcare/webcasts/index.htm The link above provides access to webcasts on healthcare, including mhealth and eHealth.
Government department / agency	National Health Service, Scotland	Toolkit	http://www.knowledge.scot.nhs.uk/eHealth/eHealth-toolkit.aspx The National Health Service, Scotland has provided a clinical eHealth toolkit online. This toolkit supports clinical champions in progressing local eHealth programs. The resources are available free of charge.
Government department / agency	National Health Service, UK	Competency Framework	http://www.connectingforhealth.nhs.uk/systemsandservices/icd/informspec/careerplan/phi/personal/learningweb/professional/competence (general information on competency frameworks) http://www.hicf.org.uk/ (Health Informatics Framework) http://www.cln.nhs.uk/eice/about-eice/about-eice (Embedding Informatics in Clinical Education) The NHS has developed a Health Informatics Career Framework that links competencies to job roles and then relating these to career pathways for health informatics. The eICE website provides free access to online learning and teaching tools, which support the

			learning, teaching and assessment of clinical informatics.
Government department / agency	National Institutes of Health, USA	Website	http://vsearch.nlm.nih.gov/vivisimo/cgi-bin/query-meta?v%3Aproject=medlineplus&query=electronic+health+records MedlinePlus is the National Institutes of Health's website for patients. It has been produced by the National library of medicine, and provides up to date information on medical research, clinical trials and treatments. This resource contains a variety of information on health and e-health related topics.
Government department / agency	Centers for Disease Control and Prevention, USA	Competency Framework	http://www.cdc.gov/InformaticsCompetencies/ The CDC, in partnership with the Association of Schools of Public Health and the University of Washington Center for Public Health Informatics, have developed a competency framework for public health informaticians. The framework defines the field of public health informatics, describes the skills and provides a framework for training of public health informaticians.
Government department / agency	Commonwealth Scientific and Industrial Research Organisation, Australia	Powerpoint presentation	http://www.slideshare.net/CeBITAustralia/hansen-eHealth-conference-cebit-2012 Delivering health services remotely using broadband technologies This is a presentation by David Hansen, CEO of the CSIRO e-health research centre on delivering health services remotely using broadband technologies.
Government department / agency	Department of Health and Ageing, Australia	Website	http://www.ehealth.gov.au and http://www.yourhealth.gov.au/internet/yourhealth/publishing.nsf/Content/theme-ehealth#.UeXrsY2LCS0 These DoHA websites contain information on ehealth, telehealth and personally controlled ehealth records (PCEHR).
Government department / agency	eGovernment resource centre, Victoria, Australia	News	http://feeds.feedburner.com/EgovernmentResourceCentre-E-healthDigest This site provides a digest of national and international eHealth news collated by the Victorian State Government online resource centre.
Government department / agency	European Commission	Website	http://ec.europa.eu/information_society/activities/health/index_en.htm The European Commission has developed the Europe Information Society Thematic Portal that contains information on the latest developments in Information and Communication Technologies, including e-health. This part of the portal contains information on eHealth, policies and studies.

Government department / agency	Agency for Healthcare Research and Quality, USA	Website	http://healthit.ahrq.gov/portal/server.pt?open=512&objID=653&PageID=5583&cached=false&mode=2 http://healthit.ahrq.gov/portal/server.pt/community/health it tools and resources/919 The Agency for Healthcare Research and Quality is within the US Department of Health and Human Services. This agency is dedicated to improving the quality, safety efficiency of healthcare services. The first link above is to and the search results for the term eHealth generated from the Knowledge library. The second link is to the health IT tools and resources. This contains toolkits, databases, bibliographies relating to Health IT in general.
Government department / agency	National EHealth Transition Authority, Australia	Website	http://www.nehta.gov.au This NEHTA website has webpages, downloadable documents and videos on e-health.
Government department / agency	Office of the National Coordinator of Health Information Technology, USA	Website	http://www.healthit.gov/newsroom ONCHIT is part of the U.S. Department of Health and Human Services (HHS). They support the adoption of Health IT and promotes nationwide exchange of health information. The link above contains resources such as video presentations, news, and events.
Government department / agency	Global Observatory for eHealth, World Health Organisation, United Nations	Website	http://www.who.int/goe/mobile health/en/ The World Health Organisation has established the Global Observatory for eHealth. The mission of the observatory is to provide strategic information and guidance to Member States on effective practices and standards in eHealth. The link above contains reports on eHealth and mHealth and their use around the world. The site above contains reports that are relevant to eHealth as well as mHealth.
Health insurer	BUPA health insurance	Website	http://www.bupa.com.au/staticfiles/Bupa/HealthAndWellness/MediaFiles/PDF/LSE_Report Online Health.pdf This link provides access to a report on Online Health: Untangling the Web. This report is published by BUPA's Health Pulse in 2011. 13,000 people in twelve markets were surveyed and the results are provided in this report.
Hospital	Palomar West Medical Centre	Video	http://www.youtube.com/watch?v=kDdiEbxgcWA This video created in Second Life, illustrates the hospital of the future.

			Palomar West Medical Centre has the vision of creating such as hospital space.
Individual expert	Jennifer Zelmer, CEO, International Health Terminology Standards Development Organisation	Powerpoint presentation	http://www.slideshare.net/ICEGOV/icegov2009-tutorial-4-eHealth-standards-in-practice-challenges-and-opportunities This is a presentation on e-health standards in practice: challenges and opportunities.
Individual expert	Maged Boulous, Associate Professor of Health Informatics, University of Plymouth	Powerpoint presentation	http://www.slideshare.net/sl.medic/eHealth-and-web-20the-3d-web-looking-to-the-future-with-sociable-technologies-and-social-software-121698 This is a presentation on eHealth and Web 2.0: looking to the future with sociable technologies and social software
Individual expert	Regina Holliday, patient advocate	Powerpoint presentation	http://www.slideshare.net/ReginaHolliday/73-cents-21-days This is a presentation on the need for and importance of electronic medical records.
Industry organisation	eHealth Space	Online community	http://eHealthspace.org/ eHealthspace is an online community for health professionals who are advocates for clinical reform and 'its enablers, including health technologies'. The website provides timely news, analysis and private forums. The site is sponsored by General Electric, Telstra, NEHTA, DLA Piper, CSC and CHIK services.
Industry organisation	GSMA	Videos, news, discussions	http://www.mobileHealthlive.org/ GSMA, a representative of the interests of mobile operators worldwide, has a website entitled Mobile Health Live (address above) that contains news, videos, publications and discussion on eHealth and mHealth.
Industry organisation	Health Informatics Forum	Online community	http://www.healthinformaticsforum.com/ This online community group contains the latest news and developments in eHealth as well as a list of events related to health informatics and a free MOOC.
Not-for-profit organisation	Australian Medicare Local Alliance	Website	http://amlalliance.com.au/medicare-local-support/eHealth/eHealth-resources The AML Alliance is a national, government funded not-for-profit organisation whose mission is to promote the importance of primary health care nationally and support a unified primary health care system. The link above is to a few resources on eHealth. There are 2 support packs, that provide an overview of eHealth, contain learning modules and events and are primarily created around the themes of awareness, readiness and adoption.
Not-for-	Health Beyond	Website	http://healthbeyond.org.au/

profit organisation			HealthBeyond is an exhibition that showcases the latest technologies and innovations in healthcare. The website above provides information on HealthBeyond, and offers opportunities to participate in the exhibition.
Not-for-profit organisation	National Prescribing Service	Website	http://www.nps.org.au/topics/electronic_transfer_of_prescriptions_etp The website above aims to raise awareness of the electronic transfer of prescriptions in Australia. The website above also contains additional links to other related websites on eHealth.
Not-for-profit organisation	Patient Centered Primary Care Collaborative	Website	http://www.pcpcc.net/ehealth This not-for-profit association provides contains webinars, publications and other key resources on eHealth. It also contains data that can be used by primary care clinicians.
Professional association	Aboriginal Medical Services Alliance of NT	News	http://www.amsant.org.au/index.php?option=com_content&view=article&id=141&Itemid=220 The link above provides news and information on the eHealth systems implemented for the indigenous community.
Professional association	Alliance for Nursing Informatics	Competency Framework	http://www.tigersummit.com/Home_Page.php http://tigercompetencies.pbworks.com/w/page/22247296/Recommendations The Technology Informatics Guiding Education Reform (TIGER) initiative is aimed at practicing nurses and nursing students. TIGER's goal is to develop action plans that can be used within the nursing profession as well as multidisciplinary training and workplace settings.
Professional association	American Board of Pathology	Study guide and examination outline	http://www.abpath.org/2013StudyGuide.pdf Outline of Clinical Informatics content; approximate percentage distributions of test items; lists of books, journals, and other materials found to be useful to practitioners; designed for Board certification in the medical subspecialty of clinical informatics.
Professional association	American Health Information Management Association	Simulated eHealth Applications	http://www.ahima.org/schools/vlab/apps.aspx AHIMA has developed simulated versions of commercially available software for education purposes. Although AHIMA is American, their applications can be customised and configured.
Professional association	Australian Dental Association	Website	http://www.ada.org.au/Australian_Dentist/December_2010/eHealtharticle.aspx The Australian Dental Association has a short article on eHealth and its impact on

			health services.
Professional association	Australian Health and Hospital Association	Website	http://ahha.asn.au/health-media-centre The Australian Health and Hospital Association website, which is a collaboration between the Australian Council of Healthcare Standards, the Australian Healthcare and Hospitals Association and the Women's and Children's Hospital Australasia has some information on eHealth (mainly in media releases).
Professional association	Australian Health Informatics Education Council	Competency Framework	http://www.ahiec.org.au/Documents.htm AHIEC has developed a competency framework for the health informatics in Australia. It supports the development of competencies 'within speciality groups' and can be used to inform curriculum development to include health informatics competencies in health profession degrees.
Professional association	Australian Medical Association	Website	http://ama.com.au/draft-ama-guide-using-pcehr This website contains a draft of a guide to using the Personally Controlled Electronic Health Record (PCEHR). This document contains the basic facts of the PCEHR and how to work with the system.
Professional association	Australian Psychology Society	Website	http://www.psychology.org.au/practitioner/eHealth/ The Australian Psychology Society has a link to information on eHealth for practitioners. The APS with the support of NEHTA has developed training modules for psychologists (can register via this website).
Professional association	COACH Canada's Health Informatics Association	Competency Framework	http://coachorg.com/en/publications/corecompetencies.asp Canada's Health Informatics Association provides access to information, credentials, and programs required for health informatics in Canada. The association has developed the health informatics professional core competencies.
Professional association	Health Informatics Society of Australia	Website	http://www.hisa.org.au/?page=hisa_resources HISA is the professional association for health informaticians in Australia. The link above provides resources containing HISA resources. There is also a link to blogs, news and press via this page.
Professional association	Health Information and Management Systems Society	Presentations / whitepapers	http://www.himssasiapac.org/topics/corpResources.aspx The Health Information and Management Systems Society (HIMSS) focuses on providing leadership on the use of healthcare information technology. The

			website above contains whitepapers and presentations on health IT.
Professional association	Health Information Management Association Australia	Website	http://www.himaa2.org.au/ HIMAA is the formal accrediting body for all Health Information Management courses in Australia. The site also contains an archive of articles publishes in the Health Information Management Journal and links to other government and professional bodies involved in work on eHealth and health informatics.
Professional association	International Federation of Health Information Management Associations	Course Content	http://www.ifhima.org/learning.aspx IFHIMA is an international association that has brought together national organisations that improve the use of health records around the world. The link above is to the learning centre web page. This page contains modules and educational material on health records.
Professional association	Registered Nurses' Association of Ontario	Toolkit	http://rnao.ca/eHealth/toolkit This website contains a toolkit that is designed for nurses and other healthcare professionals that would like to implement eHealth into their workplace. The toolkit is available upon registration or can be ordered via the website above.
Professional college	Academy of Medical Royal Colleges	Competency Framework	http://www.physio-pedia.com/images/f/f0/EHealth_Competa_ncy_Framework.pdf The Academy of Medical Royal Colleges and the Scottish Government have developed an eHealth competency framework that defines the knowledge and skills required by practising clinicians and covers a broad range of domains.
Professional college	Australasian College of Health Informatics	Website	http://www.achi.org.au/ ACHI is the professional body for health informatics in the Asia-Pacific region. The members of ACHI are national and international leaders and experts in health informatics.
Professional college	Australian College of Rural and Remote Medicine	Website	http://www.eHealth.acrrm.org.au/ The ACRRM website has an eHealth website that places emphasis on teleHealth. This is due to the benefits offered by teleHealth to patients and clinicians based in rural and regional Australia. The website contains useful news and information on teleHealth.
Professional college	Royal Australasian College of Surgeons	Website	http://www.surgeons.org/member-services/interest-groups-sections/e-health/ The RACS website has established an eHealth reference group. The link above contains videos of different stakeholders discussing teleHealth and eHealth. The site also contains links to presentations

			and articles related to eHealth.
Professional college	Royal Australian and New Zealand College for Radiologists	Website	http://www.ranzcr.edu.au/quality-a-safety/eHealth The RANZCR website contains some information on eHealth and radiology as well as relevant external links.
Professional college	Royal Australian and New Zealand College of Ophthalmologists	Website	http://www.ranzco.edu/index.php/component/content/article/28-news/214-teleHealth The RANZCO website contains two powerpoint presentations on eHealth and teleHealth. Although limited, this is an additional resource that may be useful across different professions.
Professional college	Royal Australian and New Zealand College of Psychiatrists	Website	http://www.ranzcp.org/Policy-and-advocacy/eHealth-and-information-management.aspx The RANZCP website contains information relating to eHealth and information management. Specifically, it contains submissions and reports, guidelines, policies and projects.
Professional college	Royal Australian College of General Practitioners	Website	http://www.racgp.org.au/eHealth/pcehr/resources The Royal Australian College for Australian General Practitioners has developed substantial amount of information on these initiatives. This link also contains information that has been published by the Department resources relating to e-health and teleHealth and contains a of Health and Ageing.
Professional college	Royal Australian College of Physicians	Website	http://www.racp.edu.au/index.cfm?objectid=CFE246CC-A239-840F-A29D34D3C74862AB The RACP website contains information on e-prescribing and teleHealth. This includes submissions, news and surveys on eHealth and teleHealth as well as links to external resources.
Professional college	Royal College of Nursing	Website	http://www.rcna.org.au/WCM/RCNA/Policy/Resources/rcna/policy/resources.aspx?hkey=bd04f3c6-4d0e-4e49-9c03-2daf2b9bc7db The RCNA website has a resources page which also contains information on eHealth.
Publisher / broadcaster	Australian Broadcasting Association	News, video, audio	http://search.abc.net.au/search/search.cgi?form=simple&num_ranks=20&collection=abcall&query=eHealth The Australian Broadcasting Association contains the latest news and information on eHealth development in Australia. The link above is the results of a search done in the site on eHealth.
Publisher / broadcaster	B. Blobel, R. Engelbrecht,	Book	http://www.iospress.nl/book/large-scale-projects-in-eHealth/

	M.A.Shifrin (Editors), Large Scale Projects in eHealth		This book covers the proceedings of the EFMI Special Topic Conference that was held in Russia in April 2012. It provides information on the use of ICT in different countries and can also has a section on education in health informatics.
Publisher / broadcaster	C. George, D. Whitehouse, P. Duquenoy, eHealth: Legal, Ethical and Governance Challenges	Book	http://www.amazon.com/eHealth-Legal-Ethical-Governance-Challenges/dp/3642224733/ref=sr_1_2?s=books&ie=UTF8&qid=1346401490&sr=1-2&keywords=eHealth+2012 This book identifies and discussed the challenges affecting eHealth in the European Union and the US in three main areas – legal, ethics and governance. The book also covers recommendations for good practice and ways forward.
Publisher / broadcaster	D.J. Rotham, D. Blumenthal, Medical Professionalism in the new information age	Book	http://www.amazon.com/Medical-Professionalism-Information-Critical-Medicine/dp/081354808X This book explores how Health IT may change the relationship between patients and physicians, physicians and other providers, physicians and their home institutions. The book outlines the challenges and opportunities that HIT presents to the medical profession.
Publisher / broadcaster	eHealthNews	News, reports	http://www.eHealthnews.eu/ eHealthNews.eu is considered the first European eHealth news portal. The site provides the latest developments in eHealth and also has links to conferences and events, and some videos.
Publisher / broadcaster	Electronic Journal of Health Informatics	Journal	http://www.ejhi.net/ojs/index.php/ejhi This journal contains articles that cover the advancements in Health IT, and cover eHealth in some detail.
Publisher / broadcaster	Health Technology Magazine	Magazine	http://healthcaretechnologymagazine.com/ The American Telemedicine Association is one of the main sponsors of this magazine. This magazine is available online and contains the latest news on developments in healthcare technology.
Publisher / broadcaster	International Journal of Electronic Healthcare	Journal	http://www.inderscience.com/jhome.php?jcode=IJEH This journal contains articles on current practice and research in eHealth.
Publisher / broadcaster	J.J.P.C. Rodrigues, I.d.I.Torre Diez, B.S.de Abajo, Telemedicine and E-Health Services, Policies and Applications:	Book	http://www.amazon.com/Telemedicine-E-Health-Services-Policies-Applications/dp/1466608889 This book contains a collection of e-health experiences and applications and explores development and trends in Medical Informatics.

	Advancements and Developments		
Publisher / broadcaster	Journal of Medical Internet Research	Journal	http://www.jmir.org/ This journal is dedicated to articles on eHealth and mhealth.
Publisher / broadcaster	Journal of Telemedicine and Telecare	Journal	http://jtt.rsmjournals.com/site/misc/about.html This journal covers articles in the field of telemedicine as well as eHealth.
Publisher / broadcaster	N. Wickramasingh e. R. Bali. R. Suomi. S. Kirn (Editors), Critical Issues for the Development of Sustainable E-health Solutions (Healthcare Delivery in the Information Age)	Book	http://www.amazon.com/Development-Sustainable-Solutions-Healthcare-Information/dp/1461415357 This book focuses on pervasive healthcare and the support that can be offered by e-health solutions.
Publisher / broadcaster	Pinterest	News, videos	http://pinterest.com/search/?q=eHealth Pinterest is a social media website that is used as a 'pin board' to highlight the latest news and information on various topics, one of which is eHealth (link above).
Publisher / broadcaster	Pulse + IT	News	http://www.pulseitmagazine.com.au/ PulseIT is an Australian ehealth and health IT magazine.
Publisher / broadcaster	R. Biswas, C.M. Martin, User-Driven Healthcare and Narrative Medicine: Utilizing Collaborative Social Networks and Technologies	Book	http://www.amazon.com/User-Driven-Healthcare-Narrative-Medicine-Collaborative/dp/1609600975 This book discussed eHealth and Health 2.0 and the wealth of information available on the Internet that is created by individual healthcare users. The authors use real life examples, experiences and observations to explore this issue.
Publisher / broadcaster	S.M. Noar, N.G. Harrington (Editors), eHealth Applications: Promising Strategies for Behavior Change	Book	http://www.amazon.com/eHealth-Applications-Promising-Strategies-Communication/dp/0415888182/ref=sr_1_fkmr1_1?s=books&ie=UTF8&qid=1346401490&sr=1-1-fkmr1&keywords=eHealth+2012 This book explores the history and current use of eHealth applications for disease prevention and management. The chapters present research that examines a variety of technology-based applications.

Publisher / broadcaster	T. Jones, Developing an E-Health Strategy: A Commonwealth Workbook of Methodologies, Content and Models	Book	http://www.amazon.com/Developing-E-Health-Strategy-Commonwealth-Methodologies/dp/1849290326 This book outlined some of the key policy issues that need to be considered when developing an e-health strategy.
Publisher / broadcaster	Technology, Entertainment, Design	Video	http://www.ted.com/talks/tags/name/health/page/1 TED is a not for profit organisation that has the mission of spreading new ideas. They do this by organising conferences all over the world where speakers are given 15 minutes to present their ideas. The link above contains presentations on various aspects of healthcare, including the future of healthcare.
Publisher / broadcaster	Telemedicine and e-Health Journal	Journal	http://www.liebertpub.com/TMJ/ This journal contains articles on telemedicine and management of electronic health records.
Publisher / broadcaster	The Australian	News	http://search.news.com.au/search?us=ndmtheaustralian&as=TAUS&filter-site=TheAustralian&q=eHealth The link above connects to the search results for the term eHealth, from the online version of The Australian newspaper.
Publisher / broadcaster	W. Bonnel, K. Smith , Teaching Technologies in Nursing & the Health Professions Beyond Simulation and Online Courses	Book	http://www.springerpub.com/product/9780826118479#.UA4r8LI_i9w (can be viewed through Google Books) This book is a guide that can help faculties make informed decisions on how to integrate technology into learning environments and how specific technologies can promote student learning.
Publisher / broadcaster	ZDNet	News	http://www.zdnet.com/topic-health/ This website contains news, whitepapers, newsletters on the latest developments on the topic of healthcare.
Research institute	Australian EHealth Research Centre	Website	http://aeirc.com/ The Australian e-Health Research Centre is a joint venture between the Queensland Government and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The website contains information on upcoming eHealth related events as well as references to publications by the center.
Research institute	RAND Corporation	Journal articles, reports	http://www.rand.org/topics/electronic-medical-records.html RAND is a globally located, not-for-profit

			organisation whose research is commissioned by government agencies, foundations and the private sector. The link above is to journal articles, commentary and reports on eHealth.
Software / systems provider	All Scripts	Blogs, videos	http://www.allscripts.com/ Allscripts provides solutions for a range of healthcare needs such as ambulatory, acute, post-acute care. This website site has access to blogs and videos.
Software / systems provider	Cerner	White papers	http://www.cerner.com/solutions/WhitePapers/ Cerner develops information systems and health information technology. Apart from descriptions of their services, Cerner has published white papers on Health Insurance Portability and Accountability Act (HIPAA), Centers for Medicare and Medicaid Services (CMS) and device connectivity.
Software / systems provider	Docucare	Simulated eHealth Applications	http://thepoint.lww.com/lwwdocucare This simulated EHR system has been designed to teach students to think critically about documentation and enables teachers to track and measure progress.
Software / systems provider	Elsevier Advantage Simulations	Simulated eHealth Applications	http://www.elsevieradvantage.com/article.jsp?pageid=10702 http://www.elsevieradvantage.com/simulations/sls/guided_tour_files/EMR/EMR.html Elsevier, which is one of the leading publishers of scientific products and services, has acquired Nurse Squared which is a simulated Electronic Health System that has been used to teach students how to develop proper documentation electronically.
Software / systems provider	FreeMed	Simulated eHealth Applications	http://freemedsoftware.org/# FreeMed is one example of free, open source electronic medical record software.
Software / systems provider	General Electric	Website	http://eHealth.geHealthcare.com/ General Electric (GE) develops eHealth record systems that are built on a secure, standard-based infrastructure. This website above also contains resources such as webinars, whitepapers and case studies on eHealth.
Software / systems provider	Geonetric	Website	http://www.geonetric.com/resources/Webinars/#2012-Webinars Geonetric provides e-health record software, but the link above is to Webinars on this topic. Webinars can be watched, listened and downloaded as PDF.
Software /	IBM	Website	http://www-

systems provider			935.ibm.com/services/au/gbs/bus/html/healthcare/eHealth_collaboration/ IBM, like the other companies provides hardware and software solutions for eHealth. The link above contains presentations, case studies and interviews.
Software / systems provider	Microsoft	Website	http://www.microsoft.com/health/ww/Pages/index.aspx http://www.youtube.com/watch?v=SWiuBK-WYO Microsoft offers solutions to support e-health, for examples, Microsoft Lync which is a software used for teleconsultations. Microsoft HealthVault is the electronic health record system. The link above contains blogs, case studies and videos. Microsoft has developed a video highlighting the future of the healthcare system and patient car (second link).
Software / systems provider	Online Practice Management Studio	Website	http://intracore.com.au/intracore/index.html?gclid=CPmDt9jklbECFQEzpQodfyULgw OPMS, which is supported by Medicare Australia, is a Mac application that enabled administration of patient records, financial data, claiming of Medicare online and communication between clinicians and patients. A free trial is available upon registration.
Software / systems provider	Philips	Website	http://www.healthcare.philips.com/main/products/healthcare_informatics/education_support/hi_education.wpd General healthcare education and specialized training on Philips Healthcare technology, including online education courses and downloadable publications.
Software / systems provider	CISCO	Website	http://www.cisco.com/en/US/products/p_s7060/index.html CISCO has played a key role in the area of teleHealth. They have developed system that offer high-quality videos that support communication at a distance. CISCO also has case studies and research in eHealth available via its site.
Training provider	eHealth Education	Website	http://www.eHealtheducation.net/course_list.php EHE is a privately owned company that provides eHealth education and also provide advice on health informatics curriculum, developing and delivering individual courses at universities.
Training provider	ThinkGP – eHealth for practice staff	Website	http://thinkgp.com.au/education/content/10364 This is an online portal that is aimed at GPs. It outlines the role of practice staff in eHealth, the Personally Controlled

			Electronic Health Record (PCEHR) systems and the tools that can aid in data cleansing and ensuring the quality of data.
Training provider	Webicina	Course content	http://thecourse.webicina.com/ This website links to a course on social media in medicine. The course is open source and free to access and contains information on different topics such as medical blogging, Wikipedia, e-patients.
University	Columbia University, USA in collaboration with others	Course content	http://www.onc-ntdc.info/ This is based on the US Columbia University, Duke University, Johns Hopkins University, Oregon Health and Science University and the University of Alabama at Birmingham online content, developed through a \$10 million grant from the ONC.
University	Imperial College, London, UK Institute of Global Health Innovation	Reports	http://www.globalhealthpolicyforum.org/docs/GHPS_Digital_Innovation_Report.pdf The Global Health Policy Summit was initiated to address the common challenges of health policy and to develop innovative methods to deliver healthcare around the world. The link above is to a report on the digital dimensions of healthcare and how it needs to adopt social media and other aspects of the digitised world.
University	Sheffield Hallam University, UK	Course content	http://www.shu.ac.uk/business/how-we-can-help/commercial-opportunities/systems-of-ecare Sheffield Hallam University has developed on-line modules on eCare for university nursing degrees. A sample of the content can be viewed in the site above on signing in. Some content can be viewed free of charge whilst others require payment.
University	University of Kansas, USA	Simulated eHealth Applications	http://www2.kumc.edu/healthinformatics/SEEDS.htm This website contains information on a simulated e-health delivery system (SEEDS) that has been developed by the University of Kansas Medical Center and Cerner Corporation.
University	University of Melbourne, Australia	News	http://www.scoop.it/t/health-and-biomedical-informatics An online news aggregation service.
University	University of South Florida, USA College of Public Health	Course content	http://openonlinecourses.com/ehr/AboutTheCourse.asp?E=#Weekly%20Syllabus This website provides resources such as lecture notes and assessments. One of the lectures is on the EHR. Each topic has an outline, the lecture slides and assignment information. This is a good guide to implement eHealth education into the curriculum.

University	University of Washington, USA Center for Health Science Interprofessional Education, Research and Practice	Course content	http://collaborate.uw.edu/faculty-development/clinical-informatics.html This centre is dedicated to developing interprofessional education. As part of faculty development, the center has developed free, open access modules on clinical informatics. Users can register for free to gain access to the modules.
------------	--	----------------	---

Chapter 6. Ehealth scenarios in clinical practice

Introduction

The project developed thirteen scenarios of ehealth in clinical practice that could serve as a learning and teaching resource for future health professionals. Each scenario sets out a practice context and challenge, an ehealth solution, knowledge and skills for good practice, ehealth trends and selected references.

These scenarios describe specific health professions but some are interchangeable for learning and teaching in more than one profession, and taken together, all of these scenarios can contribute to understanding how ehealth may support interprofessional practice in multidisciplinary care teams.

These scenarios draw upon lessons learned from the range of other studies included in this project report. They are designed to be succinct and selective rather than complete and comprehensive. They are intended for use as a preliminary to broader and deeper educational activities.

These scenarios may be used in many areas of curriculum, for example as discussion triggers, as a basis for role plays, in setting the stage for extended assignments or research projects.

Scenarios are provided in Tables 9-21. In overview, the particular health professions and ehealth focus issues included in the scenarios are:

- Chinese Medicine – Drug interaction database
- Chiropractic – Medical image sharing
- Dentistry – Tele-diagnosis
- Dietetics – Online support groups for health
- General Practice – Shared electronic health record
- Midwifery – Patient flow management
- Nursing – Tablet computers for mobile health
- Occupational Therapy – Games for health
- Paramedics – Disaster management system
- Pharmacy – Prescriptions exchange system
- Physiotherapy – Tele-rehabilitation
- Psychology – Virtual environments for therapy
- Social Work – Health data linkage

Table 9. An ehealth scenario involving a Chinese medicine practitioner

The context	Chuanli has been practicing traditional Chinese herbal medicine for ten years in a comprehensive cancer clinic.
The challenge	Chuanli’s patients typically combine his treatments with drug therapies prescribed by their Western medicine practitioners, and also with off-the-shelf vitamins and minerals. Chuanli needs to make carefully researched recommendations to his patients about these combinations, in order to be sure that his treatments will be safe and efficacious for them, and he needs to monitor them for short-term and long-term adverse effects.
An ehealth solution	Curated online databases of drug-drug interactions offer Chuanli clinical decision support for combined therapies. Chuanli can look up known interactions quickly; he can receive automatic updates based on recent research findings; if he registers for professional access he can contribute new clinical observations.

	Examples: www.nlm.nih.gov/services/drug.html
Ehealth knowledge	Chuanli needs to know the authoritative databases for his practice, and how to find and interpret the contents that are relevant to each patient he sees. Chuanli needs to understand how to summarise the evidence base for the therapy for each patient, in an electronic medical record system. Chuanli needs to know how he can “mine” his accumulated medical records for new insights into his specialised field of practice.
Ehealth trends	New natural language processing tools are emerging that can help to unlock the contents of medical records, not only the structured coded data in them but also the free text notes. These will make it simpler for Chuanli to investigate his own practice and potentially to contribute to scientific research, with consent from patients whose records are used.
Selected readings	Wu, Z., Chen, H., & Jiang, X. (2012). Overview of knowledge discovery in traditional Chinese medicine. Pp.1-26 in Z. Wu, H. Chen & X. Jiang. Modern Computational Approaches to Traditional Chinese Medicine. Elsevier, London. Yap, K.Y.-L., Kuo, E.Y., Lee, J.J.J., Chui, W.K., & Chan, A. (2010). An onco-informatics database for anticancer drug interactions with complementary and alternative medicines used in cancer treatment and supportive care: An overview of the oncorx project. Supportive Care in Cancer, 18(7), 883-891.

Table 10. An ehealth scenario involving a chiropractor

The context	Carl is the sole proprietor in a private chiropractic practice.
The challenge	Carl sees many walk-in clients who are seeking chiropractic treatment for low back pain when they believe that they have exhausted their other therapeutic options. Sometimes clients make repeat visits, sometimes months or years apart, after they have pursued intervening diagnoses and treatments with other types of clinicians. They expect immediate help from Carl: “My back is killing me.” Usually, clients forget to bring with them any medical images ordered by other clinical consultants, such as X-rays, CT scans or MRIs, and often they cannot remember or explain diagnoses given by other consultants they have seen. This means that Carl has to take many more X-rays than necessary.
An ehealth solution	Digital imaging technologies are commonplace in many medical imaging practices. Carl can set up an account with a web-based service that provides secure storage and sharing of medical images in digital formats. He can advise each new client about this service and suggest that clients ask their medical imaging provider to upload images to this or a similar service (or ask for their own digital copies to upload for themselves). When they visit him next, they can give him access rights on the spot to view the relevant images on his internet-connected office computer. Over time this will reduce the need for him to X-ray repeat clients, and it will educate his clients about how to get the most from their chiropractic visit. An example: www.xrayshare.com
Ehealth knowledge	Carl needs to understand different digital imaging formats, such as DICOM and JPEG, and the implications for storing and viewing images. Carl needs to know how to select a web-based service that is stable and secure and suitable for his and his clients’ clinical needs. Carl needs to be able to explain the choices his clients have in taking ownership of their own medical image files and sharing them with clinicians.
Ehealth trends	It is increasingly possible to link web-based digital image storage and sharing with records from self-monitoring of daily physical activity, to help clients and their therapists understand causal factors and outcomes from changing

	daily habits. This will allow Carl to focus his treatments more effectively and help his clients further with preventive strategies.
Selected readings	Filip, M., Linzer, P, Samal, F., Tesar, J., Herzig, R., & Skoloudik, D. (2012). Medical consultations and sharing of medical images involving spinal injury over mobile phone networks. <i>American Journal of Emergency Medicine</i> , 30(6), 961-965. Marceau, L., Link, C., Smith, L., Carolan, S., & Jamison, R. (2010). In-clinic use of electronic pain diaries: Barriers of implementation among pain physicians. <i>Journal of Pain and Symptom Management</i> , 43(3), 391-404.

Table 11. An ehealth scenario involving a dentist

The context	Donna works in a private dental practice.
The challenge	Over many years Donna has built up a number of long-term patients. Some of her patients are now elderly and frail, and have moved into a large residential aged care facility in the locality. Even if they are feeling strong enough to go out, they rely on others to transport them to appointments, making it hard for them to attend regular dental check-ups with Donna. Donna’s schedule makes it impossible for her to visit them in their residence. Even if this were possible, she would not have the facilities to do a proper examination on the site.
An ehealth solution	Tele-dentistry technologies have been shown to be effective for routine screening. Donna can work with the aged care facility to set up a tele-dentistry service on their premises to which she can connect from her office. By appointment a residential care staffer will wheel a computer cart into her patients’ rooms in the residence and operate a small webcam that will allow her to inspect her patients’ oral health in real time. This way she can “see” each of her patients routinely while they are seated comfortably in their own rooms. She can also discuss issues with each patient and their care staff, and recommend more detailed treatment in her office if this is needed. An example: www.youtube.com/watch?v=mFP3u_UBgKQ
Ehealth knowledge	Donna needs to be certain that the internet connection between the aged care residence and her office will support the real-time video quality that she must have to conduct her examination. Donna needs to be familiar with clinical guidelines for tele-dentistry so that she follows professional protocols for determining when she needs to see her patients in person. Donna needs to know that with her patients’ consent she can use the extensive video records that she is logging of her elderly patients’ oral health and her examination techniques, for teaching and research that may improve dental care in this age group.
Ehealth trends	Within a few years, the dental practice where Donna works will be using tele-dentistry to provide routine dental check-ups to their patients who are travelling or relocating elsewhere, and it will be submitting tenders to offer services to rural and remote patient groups, such as in mining communities.
Selected readings	Blomstrand, L., Sand, L., Gullbrandsson, L., Eklund, B., Kildal, M., & Hirsch, J. (2012). Telemedicine—A complement to traditional referrals in oral medicine. <i>Telemedicine and e-Health</i> , 18(7), 549-553. Glassman, P., Helgeson, M., & Kattlove, J. (2012). Using telehealth technologies to improve oral health for vulnerable and underserved populations. <i>Journal of the California Dental Association</i> , 40(7), 579-585.

Table 12. An ehealth scenario involving a dietician

The context	Di runs her own part-time practice specialising in weight management, within a large 24-hour medical and allied health clinic.
The challenge	Di wants to be more flexible in the way she makes herself available outside of normal office hours, to fit in with the way the clinic operates. Some days, she has no appointments booked during her office hours, or booked-in clients cancel. Other days, her clients want to see her immediately before or after they attend other appointments in the clinic, but these are outside of her hours. Some of her clients would benefit from being in a support group, or from a joint consultation with her and her psychologist colleague - but it can be hard to arrange these at mutually agreeable times.
An ehealth solution	Building an online dietician service blending chat, web-based meetings, self-help resources and online support groups could address some of Di's and her clients' needs. She can reduce unproductive hours in her office and potentially work from home at other times. Web links will encourage her patients to use the existing online weight-loss education sites and tools that she prefers them to work with. She can moderate a password-protected online community in which patients in the clinic can learn from and add to a discussion forum about weight management with her, her clinical colleagues and each other, at times that suit them, without having to attend the clinic in person. An example: www.dietitianonline.com.au
Ehealth knowledge	Di needs to be aware of the evidence about what works and doesn't work in online weight management and about benefits and risks of using social media in healthcare. Di needs to be knowledgeable about the weight-loss education sites and tools on the internet, of criteria for recommending their use and of the implications of such recommendations for her professional relationship with her patients. Di needs to understand techniques for professional moderation of online support groups.
Ehealth trends	Smart sensors sending data wirelessly over the internet may help Di and her patients to monitor their eating habits. In her clinical consultations Di may soon be able to refer to data not only about a patient's weight and body mass index but also what has been in their supermarket trolley and refrigerator.
Selected readings	Brandt, V., Pedersen, M., Glintborg, D., Brandt, C., Brandt, K., Toubro, S., & Arendal, C. (2011). Sustained weight loss during 20 months using a personalized interactive internet based dietician advice program in a general practice setting. <i>International Journal on Advances in Life Sciences</i> , 3(1 & 2), 23-28. Das, A., Faxvaag, A., & Swanaes, D. (2011). Management of weight-loss: Patients' and health professionals' requirements for an e-health system for patients. <i>Human Centered Design: Lecture Notes in Computer Science</i> , 6776, 285-294.

Table 13. An ehealth scenario involving a general practitioner

The context	Gopal works in a walk-in medical clinic in a major holiday resort town.
The challenge	Gopal sees many patients who are regular seasonal visitors in the town and others who are just passing through. Their reasons for visiting the doctor during their holiday are varied, but a significant number of them have

	<p>chronic medical conditions which are managed routinely by their regular doctor in their home town. Sometimes the problem they present with is connected with their chronic condition. At other times there is no direct connection but while he is taking routine observations Gopal notices things about their health status that are concerning given their chronic condition. Gopal has no information about the current management of his patient's chronic condition apart from the medical history pro forma that the clinic receptionist asks them complete when they walk in, and any patient records on file in the clinic from their previous visits. If he is sufficiently concerned, he may tell his patient that he needs to contact their regular doctor, then he may manage to make the contact well after the consultation is over, then he may need to contact his patient to return for another appointment to finalise a prescription or order further tests.</p>
An ehealth solution	<p>Shareable electronic health records can overcome the information gap for the general practitioner who sees a patient occasionally or once only, save time fact-checking and improve the specificity of the medical advice given. Gopal's medical clinic and encourages all patients to register for Australia's national personally controlled electronic health records (PCEHR) system and activate sharing with their healthcare professionals. Patients with chronic conditions who have created an electronic health record are able to share their up-to-date history with Gopal, which allows him to make a clearer decision about their care. In turn, Gopal is able to record in their electronic health record, his notes on the examination and treatment he has given, so he can be confident that he has communicated matters of importance to their regular doctor.</p> <p>Refer to: www.ehealthinfo.gov.au/personally-controlled-electronic-health-records</p>
Ehealth knowledge	<p>Gopal needs to be aware of the privacy and permissions processes in the PCEHR system, and be able to explain these to patients if necessary. Gopal needs to understand how his access to a patient's electronic health records provides important information for his clinical decision-making. Gopal needs to know how the notes he writes for his office medical records will appear in the PCEHR to a range of other clinicians with whom he otherwise may never work.</p>
Ehealth trends	<p>Gopal will soon find that shareable electronic health records are becoming a repository not only for clinicians' notes but also for automated data from patient' self-monitoring devices (for example for blood pressure or blood glucose) and for patient reported outcomes of treatment.</p>
Selected readings	<p>Han, H., & Lopp, L. (2013) Writing and reading in the electronic health record: An entirely new world. Medical Education Online, 18. doi:10.3402/meo.v18i0.18634 E-publication 5 February.</p> <p>Lehnbom, E., McLachlan, S., & Brien, J. (2012). A qualitative study of Australians' opinions about personally controlled electronic health records. Pp.105-110. In A. Maeder & F. Martin Sanchez (Eds.) Health Informatics: Building a Healthcare Future through Trusted Information. IOS Press, Amsterdam.</p>

Table 14. An ehealth scenario involving a midwife

The context	May is the director of the maternity unit in a general hospital.
The challenge	Work is varied and unpredictable from one day to the next in the maternity unit. Staff may be booking in patients early in their pregnancy; running antenatal classes; conducting routine check-ups; referring patients for specialist attention; caring for patients in labour; assisting normal deliveries and complicated ones; accompanying a transfer to another unit; providing

	<p>one-to-one postnatal advice; discharging a patient; making a home visit. Several midwives, one or more GPs, an obstetrician and a paediatrician, all working at different times, may be involved in deciding on a patient's need for admission, transfer or discharge. Last week was very bust, and as a result of uncoordinated decision-making, a patient had to give birth on a trolley in the emergency department.</p> <p>May has been asked to ensure that in future the maternity unit can handle the flow of patients in and out, especially at periods of peak activity.</p>
An ehealth solution	<p>Tools for managing patient flow may be bundled with enterprise ehealth solutions, and there are also customised tools for specific settings such as maternity.</p> <p>Such tools allow May to integrate data from many separate hospital record systems and, using probabilistic models, streamline processes and plan the allocation of staff and beds so that clinical care and resource management are optimised.</p> <p>Example: www.microsoft.com/health/en-us/solutions/Pages/patient-flow-management.aspx</p>
Ehealth knowledge	<p>May needs to have a basic understanding of the assumptions that underlie patient flow modelling.</p> <p>May needs to understand the strengths and weaknesses of various patient flow management tools.</p> <p>May needs to know about access to the organisational data needed for modelling, and about data quality and its influence on the results.</p>
Ehealth trends	<p>Technologies to “mine” routinely collected data about hospital processes are becoming more sophisticated and the findings more public. May expects that in the near future constantly updated and aggregated information about the positive and negative aspects of the patient journey in her maternity unit will be available on her desktop and also on the hospital website for prospective patients to see.</p>
Selected readings	<p>Griffin, J., Xia, S., Peng, S., & Keskinocak, P. (2012). Improving patient flow in an obstetric unit. <i>Health Care Management Science</i>, 15, 1-14.</p> <p>Isken, M.W., Ward, T.J. & Littig, S.J., (2011) An open source software project for obstetrical procedure scheduling and occupancy analysis. <i>Health Care Management Science</i>, 14, 56-73.</p>

Table 15. An ehealth scenario involving a nurse

The context	<p>Nhu has worked for the Royal District Nursing Service (RDNS) for over 30 years. She provides nursing care to people in their homes across a large rural region.</p>
The challenge	<p>On a typical working day Nhu will leave home by herself and spend six hours in her car in order to see six patients with disparate needs such as cystic fibrosis, dementia, infectious conditions, palliative care, post-acute care and wound management. From one month to the next about half of her visits will be to patients she has not seen before.</p> <p>For each patient she needs to be able to review the medical record that is shared by other RDNS nurses and other clinicians who are part of the care team, and she needs to update these records as she goes from house to house.</p> <p>Also, although she regularly does professional development courses, it is impossible for her to remember the latest advances in all the procedures she is called upon to do – depending on the condition of her patient today she may need to look up many different things.</p>
An ehealth	<p>The development of lightweight tablet computers, synchronised nightly with</p>

solution	the RDNS database over its wide area network, has transformed Nhu's work. She can access her roster, her records, reference materials and resource people without carrying bulky files and photocopies. It is a simple matter to keep records up to date, to add photos and videos to the files, and to share health information material with patients. Example: ehealthspace.org/casestudy/mobile-nursing-takes-tablet
Ehealth knowledge	Nhu needs to be computer literate and to understand the capabilities and limitations of her tablet. Nhu needs to understand what is in the RDNS database and what happens when she synchronises her tablet with it over the network. Nhu needs to understand the privacy and security measures that are required to safeguard the patient records she carries around on her tablet.
Ehealth trends	The expansion of high-capacity broadband networks in regional and rural areas means that, with her patient's permission, Nhu will be able to share detailed health status observations immediately with others in the care team – for example, to send a photo of a leg ulcer to a wound management consultant for on-the-spot advice, or to complete the documentation for a specialist referral or hospital admission then and there if needed.
Selected readings	Bennett, V., & Nicholson, W. (2013). Care in local communities: A vision and service model for district nursing. <i>British Journal of Community Nursing</i> , 18(2), 74-76. Breitschwerdt, R., Iedema, R., Robert, S., Bosse, Al. & Thomas, O. ((2012), Mobile IT solutions for home health care. Pp.171-187 in N. Menachemi, & S. Singh (Eds). <i>Health Information Technology in the International Context (Advances in Health Care Management, Volume 12)</i> . Emerald Group Publishing Limited. doi 10.1108/S1474-8231(2012)0000012012

Table 16. An ehealth scenario involving an occupational therapist

The context	Olivia works in a large aged care facility which has a range of programs for in-home, day centre, respite and residential geriatric care.
The challenge	Olivia has a number of clients who are experiencing increasing social isolation and physical frailty as they and their elderly family and friends stop driving cars and thus find it harder to participate in regular activities outside of the home. Interactive online technologies could help, but many of her clients are not comfortable with computers or the internet.
An ehealth solution	New handheld devices developed for gaming and simulation can be used successfully for social wellbeing among older people. Olivia matches each patient's needs and interests with a selection of virtual bowling, music-making, strategy games and brainpower puzzles that they can do using Wii and Kinect interfaces to an easy-to-use console connected to the internet. She sets up group activities online and in the day centre using these games. She assists some of her clients set up games with grandchildren and with friends who do not live nearby, and also to find and join games with other people on the world wide web. Examples: occupational-therapy.advanceweb.com/multimedia/videos/health-gamers.aspx
Ehealth knowledge	Olivia needs to be able to educate her clients about how to set up and use gaming consoles in their homes, including costs and environmental health and safety issues that can arise from using gaming consoles and services. Olivia needs to understand and explain the privacy and security considerations for clients who are communicating socially on the web. Olivia needs to know how to capture meaningful clinical data about health

	outcomes from such therapies, for her clients' medical records.
Ehealth trends	As interfaces for play and socialising become more advanced, Olivia will be able to offer her clients more choices of table tops, garden features and other surfaces in their homes for creative online interaction. She will also be able to collect data about their physical and cognitive function, mood and other clinical observations directly from the device they are using for gaming (with her clients' permission).
Selected readings	Allaire, J., McLaughlin, A., Trujillo, A., Whitlock, L., LaPorte, L., & Gandy, M. (2013). Successful aging through digital games: Socioemotional differences between older adult gamers and non-gamers. <i>Computers in Human Behavior</i> , 29(4), 1302–1306. Wiemeyer, J., & Kliem, A. (2012). Serious games in prevention and rehabilitation – A new panacea for elderly people? <i>European Journal of Aging and Physical Activity</i> , 9, 41-50.

Table 17. An ehealth scenario involving a paramedic

The context	Pete works for a metropolitan ambulance service driving a mobile intensive care vehicle, stabilising patients who are seriously ill or injured and transporting them to hospital accident and emergency departments.
The challenge	Pete has been called to the scene of a major accident caused by a storm which has disrupted power, telephone lines and roadways. He needs to use the safest and quickest route to attend the accident scene. When he arrives he needs to determine who is in control of the scene and where to focus his attention among the many injured people. Then he needs to know which hospitals are best positioned to admit patients and how to make the transfers most efficiently.
An ehealth solution	The Ambulance Service operates a complex logistics system for disaster management, linking a central coordinator, vehicles and personnel in the field and patient reception centres. Pete's ambulance has facilities that can receive and transmit information en route and at the scene of a disaster between the vehicle and the incident control centre, using one or more of satellite, radio, computer networking, fax, closed circuit television and microwave communications. His personal protective clothing has built-in monitoring devices that keep the control centre abreast of his exposure to hazardous materials as well as his cognitive function and fatigue levels so that his safety is managed as well as the situation allows. His vehicle's movements are tracked using geolocation technologies and he receives continuous feedback on travel and site conditions. As he uploads data on accident victims, an automated decision support system at the control centre allocates each case to a patient reception facility. When he is finished at the scene, the system issues a route map for him to follow for the most orderly transfer of his patients. Example: www.excelerate-group.com/en/ambulanceservices
Ehealth knowledge	Pete needs to understand the interoperability of different information and communication systems. Pete needs to know how to work with a variety of technology interfaces and devices depending on the circumstances. Pete needs to understand the principles on which the automated decision support system is based.
Ehealth trends	Wireless sensing technologies connecting an "internet of things" will mean that the equipment lockers in Pete's vehicle continuously log his stocks of oxygen, bandages, fuel, drugs, etc. and signal for replenishments as needed.

	Likewise, his personal protective clothing will incorporate voice recognition receptors, biometric identifiers and augmented reality viewers so that his routine activities at the scene are captured without him having to touch a keypad.
Selected readings	Lang, M. (2012). Supporting the 'chain of survival': How ICT can facilitate rapid response for out-of-hospital cardiac emergencies. <i>International Journal of Business Continuity and Risk Management</i> , 3(4), 327-338. Soderholm, H.M., & Sonnenwald, D.H. (2010). Visioning future emergency healthcare collaboration: Perspectives from large and small medical centers. <i>Journal of the American Society for Information Science and Technology</i> , 61(9), 1808-1823.

Table 18. An ehealth scenario involving a pharmacist

The context	Phee runs a large pharmacy employing four other pharmacists in a suburban shopping centre.
The challenge	Even if Phee and her staff knew each client and their medical practitioner very well and spoke personally with each client about their scripts, she still wouldn't know whether since their last visit to her, a client had filled prescriptions at other pharmacies, perhaps written up by other doctors. So it is likely that Phee cannot give her best advice to clients, for instance about dosages, timing, substitutions, side effects and allergies, etc. Furthermore, Phee wishes she had a better basis for communication with every doctor who writes the prescriptions she fills. Sometimes their handwritten prescriptions are illegible, so her staff have to retype them and occasional transcription errors slip in. Even more, Phee would like to be able to let doctors know for sure when their patients have had their prescriptions dispensed.
An ehealth solution	MedView is a national repository of prescribed and dispensed medications records. With a patient's consent It provides a combined list over time of all the scripts written and / or filled for them, that can be seen any doctor or pharmacist who is registered with this service. An electronic version of each prescription can be uploaded to national prescriptions exchange database from any primary and community medical practice as well as hospitals and aged care facilities that a patient attends. When a client brings their paper copy of the script to Phee's pharmacy to be filled, her staff can download the electronic copy, annotate it as "dispensed" and upload it again. Phee's participation in Medview means that medication management is safer for her clients, more efficient and professional for her pharmacy, and part of a good partnership with doctors. Example: erx.com.au/eprescribing/videos/
Ehealth knowledge	Phee needs to understand the difference between the two major prescription exchange services, eRX and Medisecure. Phee needs to know how the prescriptions exchange service integrates with her pharmacy management software. Phee needs to understand what happens with client data, how this appears to her clients, and how to explain this to them.
Ehealth trends	As the pharmaceutical industry continues to develop drugs that target the specific genetic traits of individual patients, e-prescribing will involve more advanced matching of personal genomic records with best-fit medications, and medication records will be able to be linked with medical records for research to deepen our understanding of drug effects on individuals.
Selected	Goundrey-Smith, S. (2013). <i>Information Technology in Pharmacy: An</i>

readings	<p>Integrated Approach. Springer. Chapter 5: Electronic medicines management in primary care. Pp. 121-150.</p> <p>Motulsky, A., Lamothe, L., & Sicotte, C. (2013). Impacts of second-generation electronic prescriptions on the medication management process in primary care: A systematic review. International Journal of Medical Informatics. dx.doi.org.ezp.lib.unimelb.edu.au/10.1016/j.ijmedinf.2013.01.012</p>
----------	--

Table 19. An ehealth scenario involving a physiotherapist

The context	Paul works in a sports medicine clinic.
The challenge	<p>Paul sees many patients who have sustained knee and ankle injuries from active lifestyles, and wants to help them to resume their sporting activities as soon as they can.</p> <p>As part of their initial treatment Paul recommends and demonstrates exercises to strengthen the muscles around their joints. He asks them to come back in a week, and at that follow-up appointment he relies to some extent on their self-reports of compliance with their exercise program and signs of recovery.</p> <p>This information can be imprecise or inaccurate. Also, if patients have misunderstood his instructions they may have spent a week doing exercises that aggravate their injury, drawing out the duration of their physiotherapy.</p>
An ehealth solution	<p>Tele-rehabilitation software coupled with wearable motion sensing devices are advancing rapidly to help physiotherapists provide fine-tuned management of their patients' therapies.</p> <p>Paul gives his patients a lightweight motion sensor in a cuff that they can fit over the injured joint when they are performing their exercises at home. He can log into a web site, review diagnostic metrics collected by the sensor, observe as his patient goes through a routine, and advise on adjustments as needed.</p> <p>Example: www.meditouch.co.il/en/Tele-Rehabilitation</p>
Ehealth knowledge	<p>Paul needs to keep up to date with innovations in tele-rehabilitation systems.</p> <p>Paul needs to understand the algorithms underlying the data-processing mechanisms that are translating motion into metrics.</p> <p>Paul needs to be able to define his professional role and responsibilities when his patients are using tele-rehabilitation systems.</p>
Ehealth trends	Robotic technologies built into the wearable sensor can give not only monitor but also give feedback on the patient's performance and guide the patient to correct or change their movement for best rehabilitation outcomes, without Paul's intervention. This results in error reduction and time savings for Paul and his clinic, while directly aiding patient recovery.
Selected readings	<p>Briere, S., Corriveau, H., Grant, A., Lauria, M., & Michaud, F. (2011). Usability testing of a mobile robotic system for in-home telerehabilitation. Engineering in Medicine and Biology Society, EMBC, 2011 Annual International Conference of the IEEE, Boston, USA.</p> <p>Piqueras, M., Marco, E., Coll, M., Escalada, F., Ballester, A., Cinca, C., Belmonte, R., & Muniesa, J. (2013). Effectiveness of an interactive virtual telerehabilitation system in patients after total knee arthroplasty: A randomized controlled trial. Journal of Rehabilitation Medicine, 45, 392–396.</p>

Table 20. An ehealth scenario involving a psychologist

The context	Paloma’s private practice is attached to a community health centre. She is a recognised expert in the treatment of social anxiety disorders. Nevertheless she receives referrals from general practitioners and self-referrals to treat a wide range of mental health problems.
The challenge	Paloma is sought out by many people who suffer from anxiety disorders and who would benefit from long-term cognitive behavioural therapy. She wishes that she could focus her attention on this group but clinical psychologists are in short supply in her community and she has many demands on her time from people with other serious psychological disorders. For her clients with anxiety disorders it is a major problem to attend appointments regularly, because of the very nature of their condition. Another problem is that government and private health insurance subsidise only a small number of psychological consultations per person per year, and many of her clients are unable to afford to pay privately for the additional CBT sessions with her.
An ehealth solution	Specially designed online virtual worlds are showing positive results in the treatment of various psychological disorders. Clients can take part in individual or group based therapeutic interactions from home, in their own time. They can take part using avatars, which mask their identity but can be customised to reflect their psychosocial state. They can feel relatively safe as they work through scenarios that cause anxiety. Paloma can direct her clients to an existing virtual world that meets their needs or she can collaborate with other clinicians and researchers to develop and trial a virtual world for this purpose. Example: www.vrphobia.eu
Ehealth knowledge	Paloma needs to be familiar with the skills required of therapists, with the therapeutic experiences offered to clients, and with the quality of the evidence for their efficacy in existing virtual worlds. Paloma needs to understand and explain the privacy and security considerations and the internet literacy requirements, for clients who are interested to participate in existing virtual worlds. Paloma needs to understand how her professional code of ethics applies in therapeutic virtual worlds, and also how human research ethics apply in trialling a new intervention of this kind.
Ehealth trends	Advances in artificial intelligence and machine learning mean that virtual worlds can include therapists and other participants who are not actual humans but rather computer programs designed to appear human and respond appropriately as a human. For Paloma, it will be very important to give informed input to professional organisations as they work out clinical protocols for these extensions to current modes of practice.
Selected readings	Repetto, C., & Riva, G. (2011). From virtual reality to interreality in the treatment of anxiety disorders. <i>Neuropsychiatry</i> , 1(1), 31-43. Yuen, E., Herbert, J., Forman, E., Goetter, E., Comer, R., & Bradley, J.-C. (2013). Treatment of social anxiety disorder using online virtual environments in Second Life. <i>Behavior Therapy</i> , 44(1), 51-61.

Table 21. An ehealth scenario involving a social worker

The context	Samson manages a unit in a non-government organisation which provides preventive health programs in remote indigenous communities, including
-------------	--

	early childhood education, screening and immunisation programs, health literacy training, sanitation and nutrition initiatives.
The challenge	<p>Samson’s organisation depends on government grants, philanthropic funding and charitable donations to run these programs, and to tackle the enormous need for services with scant resources. On a daily basis Samson has to review the performance of these programs, improve participation rates, demonstrate health outcomes, evaluate new methods of service delivery, respond to feedback from clients and staff, and communicate about this work with funders and the public.</p> <p>To do his job, Samson routinely has to analyse a range of data to produce information for a range of audiences. Some of the data he needs are captured in personal health or social welfare records, for example, chronic and infectious diseases, addiction and mental illness, education and employment participation. Overall the population health data he needs come from diverse record systems that are maintained by many organisations besides his own. His budget for tools and resources to do this work must be kept to a minimum.</p>
An ehealth solution	<p>Health data linkage services can streamline Samson’s work and improve the quality of the information he generates.</p> <p>Using these services lets him gain permission to use data maintained by various organisations. He can connect large volumes of individuals’ records accurately with consent and in a de-identified form. He can access data analysis and reporting tools and services to meet his needs – all online.</p> <p>Reference: www.phrn.org.au/about-us/what-is-data-linkage</p>
Ehealth knowledge	<p>Samson needs to understand where and how public health related data are collected and stored.</p> <p>Samson needs to be familiar with federated data processing and information management services.</p> <p>Samson needs to understand his responsibilities in specifying what he plans to do with linked data, in adhering to confidentiality agreements related to some data sets, and in disseminating some findings publicly.</p>
Ehealth trends	<p>Crowdsourcing is the term given to advances in social media that are giving individuals and groups more ability to contribute data and directions to monitoring and research programs in health care. For Samson, this means that members of the communities served by his organisation are able to share their observations and have their say about the reports he produces.</p>
Selected readings	<p>Bardsley, M. (2012). Understanding patterns of complex care: Putting the pieces together. <i>Journal of Health Services Research & Policy</i>, 17(4), 195-196.</p> <p>Brownell, M., & Jutte, D. (2013). Administrative data linkage as a tool for child maltreatment research. <i>Child Abuse & Neglect</i>, 37(2–3), 120–124.</p>

Chapter 7. Ehealth in health profession degree accreditation requirements

Introduction

The project reviewed degree accreditation guidelines in 21 Australian health professions, to determine how they might be used to influence curriculum renewal for ehealth capability. The design and renewal of curriculum in the health professions is governed by such requirements. It is fundamental to quality assurance that a degree must be accredited and reaccredited by the authorised professional organisation (Forum of Australian Health Professions Councils, 2011).

Findings about universities' provision of ehealth education for clinical health professions, from the project's 2011 survey and 2012 workshop series, suggested that such education was not supported clearly by degree accreditation guidelines. An empirical review of these guidelines was needed to identify requirements for ehealth capability. As well this review would compare these requirements from one profession to another, and establish what scope there was for interprofessional benchmarking and modelling of guidelines.

Method

Degree accreditation documents current in mid-2012 were sourced by web searching or by contacting the responsible organisation, for the following health professions: Ambulance Paramedics, Chinese Medicine, Chiropractic, Dietetics, Dentistry, Exercise and Sports Science, Medicine, Midwifery, Nursing, Occupational Therapy, Optometry, Osteopathy, Pharmacy, Physiotherapy, Podiatry, Psychology, Public Health, Radiography, Social Work, Sonography and Speech Pathology. (Audiologist and medical scientist degree accreditation documents were unavailable.)

For each document the table of contents and all sections pertaining to curriculum, teaching, assessment and learning were read word-by-word. Adobe Acrobat and Microsoft Word document search tools were used as well.

Researchers noted any occurrences in the entire document of directly and indirectly relevant terms that might pertain to ehealth specifications in curriculum; the selection of terms was guided in part by the literature review reported in section 2.1 of this report. Search terms included communication, computer, data, document, ehealth, electronic, evidence, informatics, information, internet, online, record, technology, as well as associated truncations, permutations and acronyms. For instance, this strategy would find database under 'data'; e-health and tele-health under 'ehealth'; electronic health records under 'electronic' and 'record'; ICTs under 'information', 'communication' and 'technology'.

Each occurrence that was found was re-read in context, and if its relevance was established, the occurrence in context, the document section, and the page number were recorded as a finding. Draft findings were circulated widely to health profession educators and their feedback was incorporated in the final report.

Results

Detailed findings for each profession are listed here, in alphabetical order by the name of the responsible organisation and within each alphabetically by key term. A search term is not listed if did not occur in the document, also if it occurred only in relation to the accreditation process, but without reference to education about informatics, information management or technology.

Australian Acupuncture & Chinese Medicine Association

Computer "9. Seek out and utilise resources such as libraries, databases and computer resources to enable independent learning, especially in relation to improving theoretical understanding and clinical practice." 3. Characteristics of graduates, 3.1. Knowledge, page 7.

Data 'Database' appears in document; refer to search term 'computer'.

Evidence Evidence-based practice appears as "8. Critically evaluate relevant literature that will inform and modify current clinical practice and benefits future client/patient health-care management." 3. Characteristics of graduates, 3.1. Knowledge, page 7.

Technology "Whether it be titled 'flexibly delivered education', 'distance education' or 'correspondence' at its most basic level distance education takes place where a teacher and students are separated by physical differences, and technology be it by voice, video, data or print are used to bridge the physical gap." Appendix A.5, Record of dissenting views, page 56.

Australian Association of Social Work

Communication "Telecommunications and video conferences may be used to supplement site visits but will not entirely replace them." 4.3, Learning for practice in field education, 4.3.3 Roles and responsibilities, b., Social work program responsibilities, point 7, page 15

Computer "Universities will liaise with host organizations so that the student has access to appropriate learning opportunities, and an educational environment that enables a student to meet the requirements for social work education. This includes arrangements for: adequate space and resources for the student as required, including use of desks, office space, computers, telephones and cars." 4.3, Learning for practice in field education, 4.3.3 Roles and responsibilities, b., Social work program responsibilities, point 13, page 15

Evidence The term evidence is mainly used to describe the evidence that has to be provided to the accrediting body. It is also used in the context of knowledge on current evidence on protective and risk factors relating to a child's well being. Evidence-based practice appears as: "A beginning appreciation of how research and evaluation applies to social work practice with people with mental health problems, especially in relation to evidence-based practice and program evaluation." Specific mental health curriculum content, B., Knowledge for social work practice, 3. relevant services, policy and legislation, point 3.5, page 54.

Online "Where a social work program is offered via flexible delivery and/or off campus modes, students will be given a range of opportunities by which to engage in interaction with their peers and with experienced practitioners so that they can develop the appropriate knowledge, skills and practice standards for professional practice. These opportunities could include face-to-face interactions, use of on-line technologies, and other innovative strategies that replicate as closely as possible the range of practice contexts in contemporary society." 5.0, Structure of programs of social work education, 5.4, flexible delivery and off campus programs, page 19.

Australian and New Zealand Osteopathic Council

Communication "The clinical skills of diagnosis, oral and written communication and counselling and the development of clinical judgment in deciding appropriate treatment and/or referral." Section 2 - Standards for accreditation of osteopathic courses, The curriculum, Standard 9, The curriculum is designed to achieve the competencies expected of entry level graduates by the professional registration body (*). Emphasis is placed upon these competencies rather than defining a prescribed content however it would be expected that the course would include instruction in, page 19.

Computer "The ability to use computers for learning, literature searches and other applications in osteopathic practice". Appendix 1: Model Course Objectives, Goals and objectives of an entry level osteopathic course, 2. Objectives relating to skills, Graduates completing basic osteopathic education should have the following skills, page 28.

Evidence "The ability to arrive at an appropriate diagnosis based on the objective evaluation of all available evidence". Appendix 1: Model Course Objectives, Goals and objectives of an entry level osteopathic course, 2. Objectives relating to skills, Graduates completing basic osteopathic education should have the following skills, page 28.

The term evidence-based practice is not used in the document but there are related statements: "the ability to interpret relevant literature in a critical and scientific manner and apply these skills to ongoing learning and patient management"; "the ability to use the resources of an appropriate reference library to pursue independent inquiry relating to clinical problems". Appendix 1: Model Course Objectives, Goals and objectives of an entry level osteopathic course, 2. Objectives relating to skills, Graduates completing basic osteopathic education should have the following skills, page 28.

Information "(k).the ability to communicate clearly, considerately and sensitively with patients, relatives, carers, professional colleagues, other health professionals and the general public. This should include the ability to counsel sensitively and effectively and to provide information in a manner which ensures patients and families / carers can be truly informed when consenting to any clinical procedure. It also includes the ability to write referral letters, progress reports and medico-legal reports that are clear, effective and in proper form." Appendix 1: Model Course Objectives, Goals and objectives of an entry level osteopathic course, 2. Objectives relating to skills, page 28.

Internet "A statement about how students are made aware of the philosophy and objectives of the course and how staff are reminded of them, including a list of the official publications, student guides and Internet sites in which it appears." Section 2 - Standards for accreditation of osteopathic courses, the context within which the course is provided, Standard 3, The philosophy and objectives of the course are clearly stated and are consistent with those the ANZOC believe should guide and underpin a course intended to provide the necessary knowledge and skills for the safe and effective practice of osteopathy, page 16.

Online "Briefly describe any interactive and/or online learning, or distance learning opportunities. Provide some examples of these." Section 2 - Standards for accreditation of osteopathic courses, The curriculum, Standard 10, Each subject/unit has specific learning objectives/outcomes and a detailed teaching plan that is made available to students at the commencement of each subject/unit, page 20.

Record "(a). the ability to gather and record an accurate, organised and problem-focused patient history, including psycho-social factors, using appropriate perspective, tact and judgement [...] (s). The ability to maintain patient records and other documentation according to legal requirements and accepted procedures and standards for comprehensiveness, legibility, accuracy and confidentiality." Appendix 1: Model Course Objectives, Goals and objectives of an entry level osteopathic course, 2. Objectives relating to skills, page 28.

Technology "Provide information to show that students have adequate exposure to, and experience of new technology being used in healthcare settings in general, and in the osteopathic field in particular". Section 2 - Standards for accreditation of osteopathic courses, Physical Resources, Standard 17, There is sufficient equipment for effective teaching and the equipment is well maintained, page 24.

Australian and New Zealand Podiatry Accreditation Council

Communication "Communication (verbal, non-verbal, written)." C. Curriculum and assessment, accreditation standard: *Pre-clinical and Clinical Studies (clinical practice, clinical systems & procedures, patient safety and quality of health care) Other issues, page 14. The term communication is used to describe communication skills and abilities in the podiatric curriculum.

Computer "Facilities documentation and staff/student interviews and on-site evidence including library and computer facilities, lecture theatres, tutorial rooms, orthoses manufacture laboratories, clinical gait analysis laboratory, and radiographic activities, also noting areas for improvement." D. Standards for Educational Resources, D2 Physical/Learning Resource and ICT facilities, accreditation standards: The school has sufficient Occupational Health & Safety-compliant physical/ICT/Learning Resource facilities for staff and students to meet program objectives and ensure competencies are developed, page 17.

Electronic Refer to search term 'database'.

Evidence "The teaching and learning activities are consistent with the mission/vision and appropriate for developing the competency standards and evidence-based practice, with a range of pedagogies utilised including didactic, technological, clinical and inquiry based approaches and developing student responsibility in the preparation for lifelong learning." C Curriculum and assessment, C4 teaching and learning activities, accreditation standards, page 16. "Curriculum mapping of research, evidence-based practice and inquiry-based learning across overall podiatry program from undergraduate to post-graduate levels." C. Curriculum and assessment, C5 Research in the curriculum, accreditation standard, page 16. Information The majority of the text contains the term information in the context of accreditation standards; for instance, with regard to the student standards, the term student information handbook occurs very often. Also, there is reference to "Educational resources including buildings, clinical sites, library, Information & Communication Technologies facilities." D. Educational Resources, page 17. There is a reference to IT capabilities; refer to 'Record'.

Record "Curriculum mapping program handbook and detailed course outlines for: *Clinical systems & procedures: medical records/documentation, IT, stocking, storage, maintenance. " C. Curriculum and assessment, standards for curriculum and assessment, Accreditation standard: *Pre-clinical and Clinical Studies (clinical practice, clinical systems & procedures, patient safety and quality of health care), page 14

Technology "Clinical experience - range of diagnostic and management presentations including access to relevant equipment and technology". C. Curriculum and assessment, standards for curriculum and assessment, C3 Clinical experience, accreditation standard: *Appropriately-supervised clinical experiences progressively providing an increasingly wide range of patients in various internal clinic and external placement situations to develop their skills, professional dispositions and understandings such that they achieve course outcomes and develop the required competencies and safe practice, page 15. There is also a reference to IT capabilities; refer to 'Record'.

Australian Dental Council & Dental Council of New Zealand

The Australian Dental Council & Dental Council of New Zealand have two endorsed documents that are to be used for accreditation purposes. The first document (henceforth referred to as Document 1) entitled 'ADC/DCNZ Accreditation standards: Education programs for dentists' is the main document that outlines the processes and standards. The second document (henceforth referred to as Document 2) is entitled 'Professional attributes and competencies of the newly qualified dentist'. It is stated within this document that it is anticipated that educational institutions will use this document to help in the self-

assessment stage of the accreditation process.

Document 1

Communication "Where possible, dental students should have an opportunity to interact with students in other health education programs to foster effective communication between disciplines." Standard 13, Relationships with other allied dental and health education programs, page 16

Computer "Describe library and computer facilities." Standard 5, Physical facilities and resources, Evidence requirements, page 9.

Electronic "The design, size and general state of buildings and classrooms, library, laboratories, clinics including outplacement clinics or placements, hospital and education provider/university facilities and their relevant equipment must allow the Dental School to achieve its clinical and educational objectives. Modern audio-visual and electronic material and methods of information retrieval must be available." Standard 5, Physical facilities and resources, page 9.

Document 2

Evidence

Quote 1: "the process of assimilating and analysing information, encompassing an interesting finding new solutions, a professional curiosity with an ability to admit to and lack of understanding, a willingness to examine beliefs and assumptions and to search for evidence that supports the acceptance, rejection or suspension of those beliefs and assumptions, and the ability to distinguish between fact and opinion."

The first quote is from B. Terminology, critical thinking, page 6.

Quote 2: "on graduation a dentist should be able to: understand and apply knowledge of the scientific basis of dentistry, including the relevant biomedical and psychosocial sciences, the mechanisms of knowledge acquisition, scientific method and evaluation of evidence." The second quote is from C. The competencies statements, 5. scientific and clinical knowledge, point 1, page 11.

Evidence-based practice

Quote 1: "an approach to oral health care that requires judicious integration of systematic assessments of clinically relevant scientific evidence relating to the patient's oral and medical condition and history and oral health literacy, and integrated with the practitioner's clinical expertise and the patient's treatment needs and preferences." The first quote is from B. Terminology, evidence-based dentistry, page 6.

Quote 2: "practise evidence-based dentistry". The second quote is from C. The competencies statements, 1. professionalism, point 4, page 8.

Quote 3: "educate patients at all stages in their life, or patients' family, carers or guardians, about the aetiology and prevention of oral disease using effective and evidence-based education and communication strategies." The third quote is from C. The competencies statements, 4. health promotion, point 9, page 11.

Information "Select treatment options based on the best available information and the least invasive therapy necessary to achieve the appropriate and favourable outcome for the patient." C. The competencies statements, 5. scientific and clinical knowledge, point 4, page 11. The term information is mainly used to describe the provision, collection of information from patients.

Information technology

Quote 1: "use contemporary information technology for documentation, continuing education, communication, management of information and applications related to health care." The first quote is from C. The competencies statement, 1.

professionalism, point 10, page 8.

Quote 2: "locate and evaluate evidence in a critical and scientific manner to support professional practice and use information technology appropriately as an essential resource for modern dental practice." The second quote is from C. The competencies statement, 3. critical thinking, point 5, page 8.

Technology Refer to 'information'.

Australian Institute of Radiography Professional Accreditation and Education Board

Communication "The curriculum develops knowledge and understanding of the humanities and behavioural science including models of behaviour and behavioural development, ethics, communication and patient care." Accreditation review criteria, programme curriculum, page 8.

Australian Medical Council

Communication "Communication skills – to listen, reflect understanding, provide information and advice and give feedback – are of key importance in medical practice. Health care environments are complex communication environments, involving a wide range of health professionals and administrators, and patients who will have their own social, emotional and cultural communication needs. The beginning doctor must be able to negotiate these environments and communicate effectively." 3. The medical curriculum, 3.2, Curriculum structure, composition and duration, 3.2.6, behavioural and social sciences and medical law and ethics, notes, page 19. See also under 'Information'.

Computer

Quote 1: "In hospitals, students should have facilities for quiet study and for relaxation. If the hospital is geographically separate from the university campus, library and computer-based literature search facilities should be provided. Library facilities available to staff and students include access to computer-based reference systems, supportive staff and a reference collection adequate to meet curriculum and research needs." from 8 Implementing the curriculum - educational resources, 8.1 physical facilities, page 32

Quote 2: "Many schools are developing, often in partnership with hospitals, sophisticated clinical skills laboratories in which students and hospital staff are able to develop basic and advanced clinical skills using a range of simulation techniques. Computer simulation of patient care scenarios is an exciting area, with educational potential." from same section, but 8.3 Clinical teaching resources, page 33.

Data Database is used in the context of curriculum evaluation research: "Schools are encouraged to participate in long term outcome evaluation projects, such as the Medical Schools Outcomes Database project sponsored by the Committee of Deans of Australian Medical Schools." 6. The curriculum - monitoring and evaluation, 6.2, outcome evaluation, notes, page 26.

Evidence Evidence-based practice occurs as follows.

Quote 1: "The curriculum is based upon principles of scientific method and evidence-based practice, and inculcates analytical and critical thinking". Curriculum structure, composition and duration, 3.2.2 scientific method, standard and notes page 13 - 14.

Quote 2: "The curriculum should include instruction in the principles of evidence-based practice and should foster critical thinking and analytical problem-solving by students. There are a variety of ways in which these aims may be achieved, including clinical problem-solving tasks, problem-based tutorials and exercises in evidence-based practice, as well as research projects and assignments". Curriculum structure, composition and duration, 3.2.2 scientific method, standard and notes page 13 - 14.

Information

Quote 1: "The ability to use information technology appropriately as an essential resource for modern medical practice." from Accreditation standards and their program of study, attributes of medical graduates, skills, number 25, page 3.

Quote 2: "The rapid improvement in multimedia information technology has vastly expanded the potential for integrated learning throughout basic science and clinical medicine. Information technology has an accepted role in medical practice and there is evidence that routine use of information and communication technologies contributes to improved health care. Students must be ready to use technology and communication tools as they are used in practice and flexible enough to incorporate changing technology." from 4. The curriculum, 4.1, teaching and learning methods, accreditation standards, notes, page 21.

Quote 3: "The use of information and communication technologies is an increasingly important part of medical practice, and facilities need to be adequate to accommodate staff and student needs, and acquaint students to the information and communication technologies environments in which they will work." from 8 Implementing the curriculum - educational resources, 8.2 information technology, page 32.

Quote 4: "The school has sufficient information technology resources and expertise for the staff and student population to ensure the curriculum can be delivered adequately." from 8, implementing the curriculum - educational resources, 8.2, information technology, standards, page 32.

Technology

"Teaching hospitals are the venues where technology-intensive services requiring special expertise, equipment and staff are provided. Medical students benefit from access to patients and teachers within institutions administered through State governments." from 1. The context of the medical school, 1.6, interaction with health sector, notes, page 7.

"Indeed, the new technologies provide excellent possibilities for simulated clinical practice in low-risk environments, and medical schools should explore available information that might advise on the balance of simulated- and real-patient experience that could be utilised with effective outcomes". from 8 Implementing the curriculum - educational resources, 8.3 Clinical teaching resources, page 33. See also 'Information'.

Australian Network of Academic Public Health Institutes

There is no professional accreditation for the Master of Public Health degree, but there is a document that contains the competencies that must be met by graduates.

Communication Communication is used often to describe communicating of surveillance findings, developing communication strategies and plans, communication approaches, and communicating with the public, with emphasis placed on effective communication with Indigenous Australians. See also 'information'.

Data

Quote 1: "Demographic information/data sources." The first quote is from area of practice: monitoring and surveillance, practice goal: assess, analyse and communicate population health information, underpinning knowledge – monitoring and surveillance, page 9.

Quote 2: "Epidemiological measures/data sources." The second quote is from area of practice: monitoring and surveillance, practice goal: assess, analyse and communicate population health information, underpinning knowledge – monitoring and surveillance, page 9.

Quote 3: "Environmental standards and use of data warehouse." The third quote is from area of practice: health protection, practice goal: promote, develop and support physical interventions which ensure a safe and healthy environment,

underpinning knowledge – health protection, page 13.

Quote 4: “15.3 Analyse population health activities (collection, management, dissemination and use of data and information) with regard to the public health code of ethics.” The fourth quote is from area of practice: evidence-based professional population health practice, practice goal: engage professionally across population health with generic knowledge and skills of systematic research, ethical practice, teamwork, stakeholder analysis, health communication and cultural safety, Unit of competency number 15, page 18.

Evidence Evidence-based practice appears.

Quote 1: “Evidence-based data collection.” The first quote is from area of practice: monitoring and surveillance, practice goal: assess, analyse and communicate population health information, underpinning knowledge – monitoring and surveillance, page 9. This quote also appears under underpinning knowledge – disease prevention and control, page 11.

Quote 2: “9.2 Critically appraise potential evidence-based health promotion initiatives to address effectively a health problem within a specific population/community.” The second quote is from area of practice: health promotion, practice goal: promote population and community health by both changing social, economic, cultural and physical environments through consultation, engagement and empowerment, and strengthening the skills and understanding of individuals to achieve and maintain their health, unit of competency number 9, page 14.

Quote 3: “14.2 Assess peer-reviewed and evidence-based information (including systematic reviews) relevant to study in population health.” The third quote is from area of practice: evidence-based professional population health practice, practice goal: engage professionally across population health with generic knowledge and skills of systematic research, ethical practice, teamwork, stakeholder analysis, health communication and cultural safety, unit of competency number 14, page 18.

Quote 4: “Location of peer-reviewed evidence based information (including Cochrane, Campbell etc)”. The fourth quote is from area of practice: evidence-based professional population health practice, practice goal: engage professionally across population health with generic knowledge and skills of systematic research, ethical practice, teamwork, stakeholder analysis, health communication and cultural safety, underpinning knowledge- for public practitioners, page 19.

Quote 5: “Translate broad policy into evidence-based strategies”. The fifth quote is from Appendix 1: Australia public health training context, public health workforce training in Australia, the new prevention goals, page 22.

Information Information is used often to describe the collection, analysis and evaluation of health information on a particular population or community. Information and Communication Technology appears as “Social marketing theory, new communication technologies as applied to health promotion communication and learning theories.” Area of practice: health promotion, practice goal: promote population and community health by both changing social, economic, cultural and physical environments through consultation, engagement and empowerment, and strengthening the skills and understanding of individuals to achieve and maintain their health, underpinning knowledge – health promotion, page 15.

Technology Refer to ‘Information’.

Australian Nursing and Midwifery Council

The Australian Nursing and Midwifery Council has four separate documents outlining the accreditation process for registered nurses, enrolled nurses, nurse practitioners and midwives. Registered nurses and midwives are considered entry level professions and these documents were analysed separately below.

1 Accreditation of Midwifery Degrees

Communication Refer to search term 'information'.

Data The term data is used once in the main document to discuss the need for future clinicians to collect or implement research data. Data and database are otherwise used in the reference section of the document.

Evidence Evidence-based practice appears.

Quote 1: "The course provider is required to demonstrate that: 5) evidence-based approaches are applied to theory and practice." The first quote is from Domain 2: Curriculum, Standard 5: Curriculum Content, page 14, 15).

Quote 2: "Identification of content focused on or related to evidence-based practice across the course (M)[Mandatory]. Benchmarking against selected examples of national and international best practice. Examples of research and evidence-led curriculum." The second quote is from Domain 2: Curriculum, Standard 5: Curriculum Content, page 15.

Quote 3: "The course provider is required to demonstrate that midwifery academics: 3) encourage and support midwifery students to develop skills in midwifery inquiry, which includes evidence-based practice." The third quote from Standard 9: Research, Criteria, page 22.

Quote 4: "The International Confederation of Midwives has made a statement on the role of the midwife in research which recommends that 'midwifery education include the theory and practical application of research so that midwives are able to appraise, interpret and critically apply valid research findings'.... The literature reviewed for this project highlights that research and evidence-based practice is a recurring theme in international education standards." The fourth quote from Discussion, Standard 9, page 37.

Quote 5: "The N3ET conducted a study in 2006—Priorities for Nursing and Midwifery Research.... found that pre- and post-registration educational programs that reflect and harness the value of research (e.g., where research and evidence-based practice are integrated and/or embedded into the program) are important in fostering the skills and positive attitudes to research needed by nurses and midwives." The fifth quote from Discussion, Standard 9, page 37.

Information

"A partnership can be considered 'good' where communication and information-sharing systems between the education and health sectors are established, where there is a shared vision of professional experience, where respect is demonstrated across the two sectors, and where approaches to care incorporate the community." Discussion, Standard 1, page 23.

"Course handbook or equivalent with details of mode(s) of delivery of courses, including professional experience requirements and information technology requirements (M)[Mandatory]." Standard 3: students, evidence guide, criterion, page 12.

Online The term online is used to mainly describe the provision of online courses.

Technology Refer to 'information'.

2 Accreditation of Registered Nursing Degrees

Evidence The term evidence is used to refer to evidence that has to be presented by institution seeking accreditation. Evidence-based practice appears as "The importance of research and evidence-based practice is central to nursing and is supported by statements by professional bodies in Australia and internationally. The Royal College of Nursing, Australia (RCNA) and the ANF have made a joint position statement on the importance of nursing research.³⁰ The ICN has a position statement on nursing research which supports

efforts to improve access to 'education which prepares nurses to conduct research, critically evaluate research outcomes, and promote appropriate application of research findings to nursing practice.'" Discussion, Standard 9, page 27.

Informatics is specified:

Quote 1: "The criterion that technology, including IT and information management to support health care, is integral to the curriculum reflects the contemporary demands and opportunities of nursing and healthcare delivery. This is supported by a project conducted by the Australian Nursing Federation (ANF): Nurses and Information Technology Final Report (2007) which speaks of the need for national competency standards in IT and information management for nurses and a national competency program in pre-registration and pre-enrolment nursing courses based on such standards. A subsequent ANF project that aims to establish a set of IT competency standards for nurses is in progress. The criterion captures the concept of instruction in the use of technology in the service of healthcare delivery as well as in communication and information management in relation to healthcare. It encompasses the idea of nursing and healthcare informatics. The ICN, following the National Council of State Boards of Nursing, defines 'informatics' as 'information technology that can be used to communicate, manage knowledge, mitigate error, and support decision making'". The first quote is from Discussion, Standard 5, pages 24-25.

Quote 2: "6) List of content focused on / related to health / nursing informatics across the course." The second quote is from Standard 5: Curriculum content, page 13.

Information In addition to occurrences under 'informatics', it appears as follows:

"8) Course handbook or equivalent with details of mode(s) of delivery of courses, including professional experience requirements and information technology (IT) requirements (M)[Mandatory]." Standard Three: Students, evidence guide, criterion, page 11.

"5) technology, including information technology and information management, to support health care is integral to the course." Standard Five: Course Content, page 13.

Online The term online is used in the document mainly to refer to online courses.

Technology Refer to 'information'.

Australian Pharmacy Council

Communication "Must have access to remedial support particularly with regards to learning and communication difficulties or technology illiteracy etc." Standard 7: The students, page 9

Computer

Quote 1: "A pharmacy program must be supported by sufficient human resources, accommodation, library, computer systems, laboratory equipment and other infrastructure to ensure effective delivery". Standard 3: resources and facilities, page 5.

Quote 2: "The curriculum should: provide teaching and learning that is varied which may include some or all of the following: lectures, practical classes, tutorials, clinical placements, computer-assisted learning, self-directed learning, interactive small-group teaching, problem based learning, contemporary tools such as the use of 'virtual patients' and distance learning technology." Standard 5: The curriculum, page 7.

Data "Contingency plans should be developed and documented that would cover deficiencies in infrastructure, IT and/or personnel (e.g. disaster recovery plans – damage,

infection control, data loss, power outages etc)." Standard 3: resources and facilities, page 6

Information

Quote 1: "For pharmacy graduates to be able to practice effectively, efficiently and confidently they need to know about, understand and have some of the skills to operate within health care systems, alongside and together with other health professionals and other scientists: Use of information technology in pharmacy and more widely in health care.". The first quote is from Appendix 1: Indicative Curriculum, Health care systems and the roles of professionals, page 14.

Quote 2: "information literacy: an understanding of information literacy and specific skills in acquiring, organizing and presenting information, including computer-based activity." The second quote is from Standard 8, the graduates, 8.1, p.10.

Quote 3: "research: the ability to conduct research by recognising when information is needed and locating, retrieving, evaluating and using it effectively". The third quote is from Standard 8, the graduates, 8.1, p.10.

Quote 4: "Ability to apply in a clear and correct manner generic skills in communication, critical thinking, information literacy and research to pharmaceutical, clinical and laboratory information." The fourth quote is from Standard 8, the graduates, 8.2, page 11.

Technology

Quote 1: "Use of information technology in pharmacy and more widely in health care". The first quote is from Appendix 1: Indicative curriculum, healthcare systems and the roles of professionals, p. 14.

Quote 2: "The school should ensure that IT infrastructure and library resources are sufficient to meet teaching and learning and research objectives". The second quote is from Standard 3: resources and facilities, page 6.

Quote 3: "The school should have sufficient staffing resources to support faculty operations and academics (administration assistants, lab techs, IT and library staff etc)". The third quote is from Standard 3: resources and facilities, page 5.

Quote 4: "Schools that plan to develop distance education based curriculum components need to demonstrate that they are adequately resourced and funded and that students are motivated, committed and competent in the use of distance learning tools and technology." The fourth quote is from Standard 5, the curriculum, page 8.

Australian Physiotherapy Council

Communication Refer to 'evidence-based practice'.

Computer Refer to 'data'.

Data "Interactive computer based questioning and computer based clinical problem solving can also be used to evaluate integration of knowledge and decision making abilities. This method of assessment may include: patient or skill simulation using technology / on-line quizzes / multimedia for clinical reasoning scenarios / use of electronic data recording systems / on-line discussion groups / web casts / development of web-based materials." 2.1, Assessment principles, 2.2.2 technology based assessment, page 73.

Electronic This will include: understanding basic concepts of clinical informatics, including electronic health records, electronic image storage and retrieval and decision support". Element 2: Apply contemporary forms of information management to relevant areas of practice, page 31.

Evidence "The assessment of generic skills, such as communication skills, use of technology and evidence-based practice, can be acquired through activity based experiences." 2.1, Assessment principles, 2.2.6 workplace observation, page 74. Evidence-based practice appears:

Quote 1: "This will include:

- the application of principles and practices of evidence-based practice
 - an understanding of research methodologies used to inform physiotherapy practice
 - basic research skills including
 - critical reading and understanding research reports
 - critical appraisal of literature
 - identifying aspects of physiotherapy practice where convincing evidence is lacking
 - accessing and deriving information from relevant health statistics
 - data interpretation
 - rational, critical, logical, conceptual and independent thinking."
- The first quote is from Standard 3, access, interpret and apply information to continuously improve practice, Examples of evidence standard 3, Element 3: Apply an evidence-based approach to own practice, page 33.

Quote 2: "Evidence-based practice is the integration of individual clinical expertise with the best available external clinical evidence and client values. The best available external evidence is not restricted to randomised controlled trials and meta-analyses (Australian Physiotherapy Association, 2005). Activities that support and promote evidence-based practice include:

- engaging in discussion of issues relevant to evidence-based practice
 - critically evaluating practice that has insufficient supporting evidence
 - participating in and undertaking research
 - collecting and recording client data
 - cooperating with others who are undertaking clinical research programs
 - volunteering assistance to others in their research endeavours
 - quality improvement activities."
- The second quote is from Glossary, page 79.

Informatics Clinical informatics is specified. Refer to search term 'electronic'.

Information

Quote 1: "3.3.2 Information from a range of sources is critically evaluated for the impact on own work." The first quote is from Standard 3, access, interpret and apply information to continuously improve practice, 3.3 Apply an evidence-based approach to own practice; 3.3.2, page 32.

Quote 2: "3.4.1 Knowledge and information needs are identified". The rest of the quotes where the term information is used refer to information to be collected from the patient and its accuracy. The second quote is from the same standard, that is standard 3, 3.4 Acquire and apply new knowledge to continuously improve own practice, 3.4.1, page 32.

Information and Communication Technology "Relevant information and communication technology is used efficiently to record, store, convey and retrieve client information". 3.2 Apply contemporary forms of information management to relevant areas of practice, 3.2.1, page 30.

Online Refer to search term 'data'.

Record Refer to search term 'information'.

Technology Refer to search term 'electronic'.

Australian Psychology Council

Communication "The capacity to convey, appraise and interpret information in both oral and written formats and to interact on a professional level with a wide range of client groups and other professionals, including: the ability to establish and maintain constructive working relationships and in clinical settings therapeutic alliances with clients; the ability to communicate, interact and liaise for a range of purposes (e.g., discussing research with

other professionals; discussing relevant psychological services with clients, potential clients); the ability to develop knowledge of theories and empirical data on professional relationships high level oral communication and interpersonal skills in communicating effectively with clients, other psychologists, other professionals, the community; individuals, small groups and agencies from varied cultural, ethnic, religious, social and political backgrounds; excellent written communication, including the ability to write, in an organised fashion, reports and other documents excellent written communication, including the ability to write, in an organised fashion, reports and other documents." Section 5, Postgraduate professional courses, 5.1.12, core capabilities and attributes, 5.1.12(f) communication and interpersonal relationships, page 52.

Computer "All students in each course should have access to computers with a range of software for word-processing and data analysis and presentation, as well as access to the Internet." Section 5, Postgraduate professional courses, Resources, 5.1.8, page 49.

Data "The Psychology AOU must provide access for staff and students to a range of software including packages for statistical analysis, spreadsheets, data presentation and word processing." Section 2, General accreditation standards, 2.5, Resources, 2.5.7, page 39.

Database appears:

Quote 1: "The Psychology AOU must have access to a computer network which has full electronic mail facilities and is linked to the Internet and on-line databases." The first quote is from Section 2, General accreditation standards, 2.5, Resources, 2.5.8, page 39.

Quote 2: "The Institutional library or libraries must provide ready access to a comprehensive and up-to-date range of psychology texts, monographs, journals and databases." The second quote is from same section, that is section 2, 2.5, Resources but point 2.5.11.

Quote 3: "The Institutional library should have substantial holdings of, or electronic access to, journals, monographs and relevant peer-reviewed international journal databases in each area of course specialisation offered by the AOU". The third quote is from Section 5, Postgraduate professional courses, Resources, 5.1.7, page 49.

Quote 4: "The Psychology AOU must have access to a computer network which has full electronic mail facilities and is linked to the Internet and on-line databases." The fourth quote is from Section 2, General accreditation standards, 2.5, Resources, 2.5.8, page 39.

Electronic

Quote 1: "All units should provide the opportunity for formative assessment aimed primarily at facilitating learning as distinct from contributing to the final assessment e.g., electronic quizzes, comments on essays and peer assessment, and marked according to the same criteria and standards as those applying to on-campus assessments." The first quote is from Section 2, General accreditation standards, 2.6, teaching materials and methods: managing the learning process, 2.6.10, page 39.

Quote 2: "The Institutional library should have substantial holdings of, or electronic access to, journals, monographs and relevant peer-reviewed international journal databases in each area of course specialisation offered by the AOU." The second quote from Section 5, Postgraduate Professional Courses, Resources, 5.1.7, page 49.

Quote 3: "...While casework with clients by means of other electronic media or use of simulation is permissible, face-to-face casework must never be less than 66% of the total casework undertaken as part of the course. There must be at least three different practical placements in different settings, with at least two of these being external to the AOU offering the course." The third quote from 5.3, Fifth and sixth year masters courses of professional education, practical placements, 5.3.19, page 59.

Quote 4: "Supervision of all placements must involve one hour of direct contact for each full day of placement (7.5 hrs). Direct contact supervision may include telephone, video conference or other electronic forms of real-time interaction, as

long as the total percentage of supervision conducted by such electronic means across all casework units is never greater than 40% for any given student." The fourth quote from same section, that is 5.3, but is point 5.3.25, page 59.

Evidence

Quote 1: "Knowledge of the theoretical and empirical bases underpinning evidence-based approaches to psychological intervention". The first quote is from Section 4, Undergraduate 4th year and four year courses, course content, 4.1.4 (second bullet point), page 45.

Quote 2: "The content of the lectures, tutorials and laboratories in the course must be supported by relevant and up-to-date evidence-based scientific reference material. This material should include peer-reviewed empirical articles in the best international scientific journals, preferably at all year levels and certainly at all levels beyond first year." The second quote from Section 3, undergraduate 3-year sequence courses, 3.1 three year courses, course content, 3.1.9, page 42.

Quote 3: "Fourth year topics must include education in the theoretical and empirical bases underpinning the construction, implementation, and interpretation of some of the more widely used cognitive and personality assessments, and evidence-based approaches to psychological intervention". "All work in these professional courses should adhere to the scientist-practitioner model and always direct students to the relevant scientific empirical evidence base for each and every aspect of the course." The third quote is from Section 4, undergraduate 4th year and four year courses, 4.1, fourth year courses, page 43.

Internet "The Psychology AOU must have access to a computer network which has full electronic mail facilities and is linked to the Internet and on-line databases." Section 2, general accreditation standards, 2.5, resources, 2.5.8, page 39.

Online "The Psychology AOU must have access to lecture theatres, tutorial rooms and computer facilities that meet all of its teaching requirements. Specifically: Lecture rooms must be equipped with appropriate audiovisual facilities. Some rooms used for professional skills training must have video recording facilities. Units taught by distance or in mixed mode must be supported by an online learning management system". Section 2, general accreditation standards, 2.5, resources, 2.5.2, page 39.

Record "Administrative and record keeping procedures (including adequate clarification of any financial arrangements); record keeping, including demonstrated knowledge of the ethical and legal implications of administrative and record keeping procedures including confidentiality" Section 5, Postgraduate Professional Courses, core capabilities and attributes, 5.1.12 (b), ethical, legal and professional matters, page 51.

Technology "Practical placements must provide students with experience and skill development in a range of settings. Placements must include casework which involves face-to-face work with clients (individuals, groups or organisations as appropriate to the course). Face-to face work is defined as real time verbal communication in the presence of client(s) in the room with the trainee or interacting with the trainee by means of videoconference technology where there is a real time image of the each of the parties, including a clear view of facial expressions". 5.3, Fifth and sixth year masters courses of professional education, practical placements, 5.3.19, page 58

Australian Sonographer Accreditation Registry

Communication The term communication is used once to describe teaching and learning approaches that promote communication.

Evidence-based practice

Quote 1: "The course provider demonstrates that contemporary, relevant and varied approaches to teaching and learning underpin the course and that the teaching and

learning approaches provide Australian and international evidence based best practice perspectives on sonography." The first quote from The Standards, standard five: teaching and learning, page 14.

Quote 2: Locate, analyse and synthesise information to support evidence based practice. The second quote is from Appendix, Appendix 1: Required graduate competency outcomes for general sonography and discipline specific sonography courses, general sonography course, page 18.

Quote 3: "An appropriate use of evidence based simulated learning in relevant areas of the curricula." The third quote is from The Standards, standard five: teaching and learning, 5.10, page 14.

Information "That technology, including information technology and information management, to support patient management is integral to the course." Standard three: Course Content, criteria, point 3.4, page 12.

Record "Learning in the clinical environment is supervised in order to ensure that acceptable standards of patient care are maintained including accurate and complete record keeping is undertaken." Standard five: teaching and learning, criteria, 5.7, page 14.

Technology Refer to 'information'.

Council of Ambulance Authorities

Communication The term communication is used to describe communication strategies, open and timely communication and communication and information exchange.

Data Database appears: "Library facilities available to staff and students should include access to electronic databases, supportive staff and a reference collection adequate to meet curriculum and research needs." 3.4, curriculum implementation, 3.4.7, educational resources, standards, page 24.

Electronic Refer to 'database'.

Evidence Evidence-based practice appears:

Quote 1: "The interaction between research and teaching influences teaching and learning and prepares students to engage in paramedic research and evidence-based practice." The first quote is from 3.1, the context of entry-level paramedic education programs, 3.1.7, teaching-research nexus, notes, page 13.

Quote 2: "The curriculum must be structured to include classroom, clinical experiences as well as an understanding of research methodology, that are carefully sequenced and integrated to ensure effective learning at the appropriate point on the paramedic pathway. The curriculum would include but not limited to: evidence-based practice...." The second quote is from 3.3, the paramedic curriculum, 3.3.2, curriculum structure, page 18.

Information ICT appears; refer to 'internet'.

Internet "Physical facilities required for program delivery include auditoriums, tutorial rooms, laboratories, laboratory equipment, clinical skills laboratories, libraries, ICT facilities and Internet access, multimedia equipment. Facilities for student study and recreation should also be provided." 3.4, curriculum implementation, 3.4.7, educational resources, notes, page 24.

Technology "The key drivers of change include operating environment/demography; new technologies and healthcare; empowered consumers and resources and capability." 1. the guidelines, 1.1, background, page 5.

Council on Chiropractic Education Australasia

Communication Refer to 'Information and Communication Technology'.

Computer

Quote 1: "Notes: Access to computer-based reference systems must also be provided". The first quote is from 3. Educational resources, 3.6 Learning resources centre, page 11.

Quote 2: "The evolution of curricula in health sciences in recent years has resulted in innovative teaching strategies and greater emphasis on small group and self-directed learning. Thus, complete dissection of the human body is no longer considered essential and may be replaced by study of prepared specimens and computer-based learning modules, which integrate structure and function. Similarly, some practical classes may be better replaced with interactive computer-based simulations for individual students. The rapid improvement in multimedia information technology has vastly expanded the potential for integrated learning throughout the basic and clinical sciences. Increasingly, computer-assisted learning may be an integral part of the chiropractic curriculum." The second quote is from 4.2 Curriculum models and instructional methods, page 14

Evidence "The principles of scientific method and evidence based health care, including analytical and critical thinking must be taught throughout the curriculum." 4.4 Program content, 4.4.2, basic sciences, page 15. Evidence-based practice appears: "The use of information and communication technology may be part of education for evidence based health care and in preparing the students for continuing education and professional development." 3.7, Information Technology, Notes, page 12.

Information Information technology and information and communication technology appear:

Quote 1: "Notes: Determination of institutional/unit policy includes the design, management and evaluation of the curriculum, and other matters relevant to students such as library acquisitions, information technology support, matters relating to the clinical facilities, etc." from 2. Students, 2.4 Student representation, notes, page 10.

Quote 2: "Notes: Physical facilities include lecture halls, tutorial rooms, laboratories, learning resource centres, information technology facilities, clinical facilities, recreational facilities etc." 3. Educational resources, 3.3 Physical facilities, notes, page 10.

Quote 3: "Each institution must have a policy which addresses the evaluation and effective use of information and communication technology in the educational program." 3.7, Information Technology, Basic standard, page 12.

Quote 4: "Quality Development; Teachers and students should be enabled to use information and communication technology for self-learning, accessing information, managing patients and working in health care systems". 3.7 Information Technology, Basic standard, page 12.

Quote 5: "A policy regarding the use of computers, internal and external networks and other means of information and communication technology would include coordination with the library services of the institution." 3.7 Information Technology, Basic standard, page 12.

Quote 6: "The rapid improvement in multimedia information technology has vastly expanded the potential for integrated learning throughout the basic and clinical sciences". 4.2 Curriculum models and instructional methods, page 14.

Record "An ongoing review of a representative sample of patients and patient records to assess the appropriateness, necessity and quality of the care provided". Governance, structure, administration, 3.9, patient services, page 12

Technology Refer to 'information'.

Dietitians Association of Australia

Communication The term communication is used in the document to mainly describe communication between the doctor and the patient.

Data The term data is used to describe the collection and analysis of data relating to the individuals nutrition, demographics etc. Database appears: "Library facilities available to staff and students. Key nutrition texts, e-journals and databases must be available under the following knowledge areas: – human nutrition, – food habits and behaviour, – food science, – food service, – communication, – nutrition education, – organisation and management, – public health/health promotion." Section 3, Requirements for dietetic programs seeking accreditation, 3.8, university facilities and resources, page 15.

Evidence-based practice

Quote 1: "Evidence-based practice: – Published evidence based practice guidelines related to nutrition, dietetics, medicine and health, including those available in national and international agencies". The first quote is from Section 5, Guidelines for curriculum development - core fields of study, 5.1, unit 1: underlying knowledge, content area: theory of nutrition and dietetics, page 29.

Quote 2: "Elements: 1.11 Conducts or uses nutrition research methodology, research principles and evidence based practice including qualitative and quantitative research methods / Knowledge } Research ethics and principles for conducting clinical trials / } Knowledge of quantitative and qualitative research methods / } Principles of research design, including data management and statistical analysis / } Principles of evidence based practice, including critical appraisal of the literature / } Principles of epidemiology and sampling methodology". The second quote is from Section 5, Guidelines for curriculum development - core fields of study, 5.1, unit 1: underlying knowledge, content area: Research and evidence based practice, page 32.

Quote 3: "DAA strives towards best practice and evidence-based education for students. The third quote is from Section 1, DAA's role in dietetic education, page 3.

Quote 4: Fundamental skills are taught within an evidence-based paradigm to ensure all graduates meet and maintain core competency standards in all areas of dietetics, nutrition communication and advocacy, management and research, which can then be expanded with continuing professional education and work experience." The fourth quote is from Section 1 (same as second quote), 1.3, DAA's philosophy of continuous quality improvement, page 5.

Information IT appears; refer to 'technology'

Record The term record is used in the document to mainly describe the recording of patient information without specifying electronically.

Technology

Quote 1: "IT facilities that provide access to terminals and dietary analysis, statistics and word processing software." Section 3, requirements for dietetic programs seeking accreditation, 3.8, university facilities and resources, page 15.

Quote 2: "Where universities offer offshore placements, the following requirements apply: 1. The placement sites must provide an environment equivalent to Australian sites, in consideration of the following issues: – case mix – sites should reflect in general the typical case mix found in the Australian health setting / – technology – sites should provide access to technologies found commonly in the Australian health setting / – protocols of medical and dietetic practice – sites should reflect protocols in the Australian health care system, including the multidisciplinary approach, evidenced-based practice and clarity of role of the allied health practitioner and, where relevant, community/public health nutrition practice." The second quote is from Section 3, requirements for dietetic programs seeking accreditation, 3.6, clinical placement program, 3.6.11 Offshore placements, page 14.

Exercise and Sports Science Australia

Communication The term communication is used in the document to mainly describe communication skills between the health practitioner and patient.

Computer "AS2.21 Please detail the computer facilities available to support the research and teaching needs of students, beyond those required for formal laboratory and tutorial sessions. AS2.23 Do staff and students have access to computer networks for emailing and internet purposes?" Application 2: General Criteria, A2.3.3, Computers and software, page 34.

Data The term data is used mainly in the following ways: kinematic data, clinical data, data analysis and data collection. Database appears: "AS2.27 Please list the information databases available to both staff and students." Application 2: General Criteria, A2.4.3, Exercise and sports science information databases and additional resources, page 38.

Electronic "(b) Communication (verbal, written, electronic) using brief and concise language, and in appropriate syntax (subjective, objective, assessment, plan — SOAP, lay, medical) for other AEPs, medical practitioners, other health professionals, compensable authorities/agents (eg insurers), and clients". Application Section 4: Exercise physiology criteria, 4.2.18, communication, application, page 75.

Evidence-based practice

Quote 1: "(b) Understanding of evidence-based practice models of clinical decision making." The first quote is from Application Section 4: Exercise physiology criteria, 4.2.19, evidence-based practice, knowledge, page 75.

Quote 2: "• Other related activities as outlined in the AEP evidence-based criteria." The second quote is from A 5.2: Information for EP accreditation only, page 90.

Quote 3: "– Research to prepare for a client service; e.g. research of evidence-based practice for the particular case." The third quote is from A 5.2: Information for EP accreditation only, 2. Preparation for exercise service delivery, observation and other clinical activities related to the scope of practice (≤ 35%);, page 92.

Information

Information technology appears:

Quote 1: "For example, a regionally located academic unit may have developed innovative solutions using information technology to address limitations in appropriately qualified supervisors for the practicum program." The first quote is from 2.2, specific considerations, 2.2.1 consideration of special circumstances, page 18.

Quote 2: "The academic unit must be able to demonstrate that it has the necessary level of support staff (administrative, technical and information technology) to ensure the opportunity for excellence in the training of exercise and sports science students." The second quote is from A2.2, Support Staff, page 31.

Quote 3: "Does the academic unit believe that access to administrative, technical and information technology support staff is sufficient? If no, please explain." The third quote is from A 2.2, Support Staff, A2.2.1, Details of support staff involved in the course, AS 2.13 Support staff details, page 32.

Internet Refer to 'computer'.

Record The term record is used in the document to mainly describe record keeping (not specified as electronically).

Technology Refer to 'information'.

Occupational Therapy Australia

Communication Used to describe appropriate communication between doctors and

patients.

Quote 1: "Whilst dissemination and communication of information is critical, principles of confidentiality and privacy must always be upheld." Unit 5: Occupational therapy professional communication, page 40.

Quote 2: "Communication may take a range of forms, including verbal, written, non-verbal and electronic means." Unit 5: Occupational therapy professional communication, page 46.

Data Database appears: "5.2.6 All client information is secured and maintained according to workplace and legal requirements of privacy and confidentiality. Cues: Workplace database is password-protected." Unit 5: Occupational therapy professional communication, 5.2, adopts a communication approach appropriate to the working environment, 5.2.6, page 43

Electronic Refer to 'communication'.

Evidence "In their everyday work, competent professionals will recall and apply facts and skills, evaluate evidence, create explanations from available facts, formulate and test hypotheses, and synthesise information from a rich and highly organised knowledge base." Accreditation and registration process, professional competence, page 4. Evidence-based practice appears:

Quote 1: "Many approaches can be taken to performing evaluation activities, and occupational therapists must be able to undertake and understand such activities, and occupational therapists must be able to undertake and understand such activities as part of evidence-based practice and quality improvement". The first quote is from Unit 4: Occupational therapy service evaluation, page 36.

Quote 2: "... Occupational therapists should seek to utilise opportunities to disseminate professional information which is evidence-based and reflects the importance of occupation, the occupational therapy process and occupational therapy services." The second quote is from Occupational therapy professional communication, page 40.

Information The term information is used in the document to mainly describe the information to provide to and collect from patients. Information technology and information and communication technology appear:

Quote1 "Information and Communication Technology (ICT) and other electronic communication tools (e.g., mobile phones, internet, social networking sites, paging systems) are used responsibly in accordance with privacy and confidentiality, and workplace and legislative requirements, to support occupational therapy practice." Unit 5: Occupational therapy professional communication, element 5.2, adopts a communication approach appropriate to the working environment, page 42.

Quote 2 "Australian occupational therapy practice is dynamic and continues to evolve in response to changes in national priorities and legislation, population demographics, health and information technology, and work environments". Scope of Occupational Therapy Practice, page 2.

Internet "7.1.7 Resources within the workplace are used efficiently, safely, appropriately and responsibly to support practice. In accordance with the expectations of the practice setting, occupational therapists assume responsibility for development, management and maintenance of resources within financial constraints. Cues: Content downloaded from Internet relates directly to work tasks and responsibilities." Element 7.1: Adopts and efficient, effective and systematic approach to daily workload management, p.48 See also 'information'.

Online "Information that supports evidence-based practice and enhances the occupational therapy profession is disseminated. Cues: Online interest groups are accessed and engaged with...." Unit 5: Occupational therapy professional communication, element 5.4, page 43

Record "All client information is secured and maintained according to workplace and legal requirements of privacy and confidentiality. Cues: Client records are stored to ensure restricted access." Unit 5: Occupational therapy professional communication, element 5.2, adopts a communication approach appropriate to the working environment, page 42.

Technology Refer to 'information'.

Optometry Council of Australia and New Zealand

The accreditation document for optometry contains a journal article (Kiely, 2009) within which competency standards are outlined.

Communication The term communication is used to describe doctor-patient communication skills.

Computer

Quote 1: "Problem-based learning, computer assisted learning and other student-centred learning strategies are encouraged. Some of these strategies include: essays / extended responses, problem sheets / case studies / computer aided activities...." The first quote is from Guideline 5, Teaching and learning methods, interpretation, a. Requirements for varied and innovative teaching methods, page 28.

Quote 2: "Where the school is unable to provide a sufficient number of student/patient contacts, it must be able to demonstrate that effective clinical teaching is provided during those encounters and that the clinical experience is extensively supplemented by: computer aided case exercises". The second quote is from guideline 6, clinical training and setting, interpretation, b. Requirements when clinical exposure is limited, page 26.

Quote 3: "review the different methods of teaching used (lectures, practical classes, clinical experience, assignments, computer aided instruction etc). The third quote is from guideline 6 (same guideline as above), site visit/focus of assessment team, page 33.

Quote 4: "Library staff and access to computer-based reference systems and the Internet should also be available to help students and staff." The fourth quote is from guideline 10, physical resources, interpretation, c. library.

Quote 5: "Description of:computer facilities, including Internet and email access, any computer-based reference systems and learning packages." The fifth quote is from the same guideline (guideline 10), evidence for a. facilities, optometry library and information systems, page 47.

Quote 6: "Ability to assess the suitability of aids such as closed circuit television, computer software for low vision, mobility aids, independent living aids, telescopes." The sixth quote is from the journal paper, Unit 5: patient management, element 5.4, performance criteria 5.4.1, suggested indicator number 2, page 381.

Quote 7: "Recognition of the need to use appropriate firewall, virus protection and back-up systems to safeguard computer records." The seventh quote is from the journal paper, unit 6: recording of clinical data, element 6.1, performance criteria 6.1.2, suggested indicator number 3, page 386.

Data The term data is used to describe analysis of data and recording of clinical data without specifying electronically. Database appears: "Ability to research information about demography and epidemiology through suitable methods such as database analysis, questionnaires and other means." This quote is from the journal paper, Unit 1: Professional responsibilities, element 1.11, performance criteria 1.11.1, suggested indicator number 2, page 370.

Electronic

Quote 1: "Ability to access material such as recent publications, journal articles, library materials (including textbooks and electronic media, seminar and conference proceedings, internet and computer materials, online databases)". The first quote is

from Unit 1: Professional responsibilities, Element 1.1, performance criteria 1.1.1, suggested indicator number 2, page 366.

Quote 2: "Understanding that information should be provided to the patient in a manner suitable to the abilities of the patient, e.g. written/oral instructions/information; CDs or electronic records of ocular photographs". The second quote is from the same unit, element 1.4, performance criteria 1.4.1, suggested indicator number 2, page 367.

Quote 3: "Understanding of the need to create a separate, distinct record for each patient either in paper form or electronically". The third quote is from Unit 6: Recording of clinical data, element 6.1, performance criteria 6.1.1, suggested indicator number 1, page 385.

Quote 4: "Recognition of the need to provide an electronic method to show corrections and modifications to electronic records." The fourth quote is from unit 6, element 6.1, performance criteria 6.1.3, number 2, page 386.

Quote 5: "Understanding of privacy and security requirements when patient information is communicated to others through electronic transfer, facsimile transmission or via telephone communication." The fifth quote is from the same unit, performance criteria 6.2.4, suggested indicator number 1, page 386.

Evidence "The ability to interpret biomedical evidence in a critical and scientific manner, and to use libraries and other information resources to pursue independent inquiry relating to optometric problems." Appendix 1, Objectives of basic optometric education, objectives relating to skills, point 11, page 51. N.B.

Information Used to describe information that needs to be communicated to the patient, collected from the patient and stored, without specifying electronically.

Internet "Copy of school/university policies relating to Internet and email access. Statement on the proportion of students who have Internet and email access through the school or the university." Guideline 10: Physical resources, evidence for a. facilities, optometry library and information systems, page 47.

Online Refer to search term 'electronic'.

Record "Understanding of the legal requirements related to confidentiality and privacy and health records." Unit 6: Recording of clinical data, element 6.2, suggested indicator number 4, page 386 (journal paper).

Technology

Quote 1: "The school should demonstrate that it has mechanisms that recognise and initiate responses to emerging issues, especially those that cross disciplinary boundaries. Topics of emerging interest may include those arising from recent or imminent legislation changing the scope of practice of optometry or changes in methods of practice arising from new knowledge or technology." The first quote is from Guideline 3, Course development and management, interpretation, b. Emergent topics requiring special emphasis, page 20.

Quote 2: "Developments in clinical theory, optometric techniques and technology are critically appraised and evaluated for their efficacy and relevance to clinical practice." The second quote is from Unit 1: Professional responsibilities, Element 1.1., performance criteria 1.1.2.

Speech Pathology Australia

Communication The term communication is used extensively in the document as speech pathologists take care of people with communication problems or swallowing issues. See under 'information' for its use in the context of ehealth education.

Data The term data is used in the document to mainly indicate 'assessment data'. Database

appears:

Quote 1: "client information databases are maintained." The first quote is from Unit 5: Planning, providing and managing speech pathology services, element 5.2, Use and maintain an efficient information management system, cues for this element, page 29.

Quote 2: "accessing through library the electronic databases relevant to speech pathology work practices." The second quote is from Unit 5: Planning, providing and managing speech pathology services, element 5.6, adhere to professionally accepted scientific principle in work practices, cues for this element, page 32.

Ehealth The term tele-health appears as follows:

Quote 1: "With the advent of new technologies, entry-level speech pathologists will have competencies with, for example, video conferencing, social networking platforms, and tele-health applications". The first quote is from defining 'speech pathology practice', clinical services, page 3.

Quote 2: "updating skills with the latest technology (e.g. tele-health applications)." The second quote is from Unit 7: Lifelong learning and reflective practice, element 7.2, participate in professional development and continually reflect on practice, cues for this element, page 37.

Electronic

Quote 1: "electronic alternative and/or augmentative communication." The first quote is from Unit 1: assessment, element 1.2, Identify the communication and/or swallowing conditions requiring investigation and use the best available scientific and clinical evidence to determine the most suitable assessment procedures in partnership with the client, cues for this element, page 13.

Quote 2: Show ability to comply with workplace requirements for electronic record keeping, data collection and video conferencing. Demonstrate a capacity to use or learn other relevant programs as required. Information management system education must be provided by the employer in a timely manner to ensure ethical delivery of services. The second quote is from Element 5: planning, providing and managing speech pathology services, Element 5.2, use and maintain an efficient information management system, point 3.

Quote 3: training is provided for electronic information management systems. The third quote from Element 5.2 (same as second quote), cues for this element, page 30.

Evidence

Quote 1: "best available evidence from the current literature." The first quote appears in two different places: - Element 3.1, cues for this element, a rationale for decisions made with reference to, point 3, page 20 - Element 3.4, cues for this element, methods for measuring outcomes, point 2, page 22. As well as Element 4.2, cues for this element, a rationale for decisions made with reference to, point 3, page 25. - Element 4.3, cues for this element, evaluation of intervention that considers, point 1, page 26.

Quote 2: the best available evidence from the current literature and research (for further information refer speechBITE™). The second quote is from element 3.5, performance criteria, point 3, page 22.

Quote 3: best available evidence from the current literature and research. The third quote is from Unit 4: Implementation of speech pathology practice, point 1, page 24.

Quote 4: Be able to justify decisions made about the speech pathology intervention program with reference to the client's case history and background and critical appraisal of the evidence in current literature and research. The fourth quote is from element 4.2, performance criteria, point 8, page 25.

Quote 5: critical appraisal of individual client's progress with evidence from the research literature. The fifth quote is from Element 4.3, cues for this element, evaluation of intervention that considers, point 2, page 26.

Quote 6: best available evidence from the current research literature. The sixth

quote is from element 5.3, cues for this element, rationale for choice of delivery model makes reference to, page 30.

Quote 7: Critically evaluate evidence from literature and research using knowledge of research methods and statistics. The seventh quote is from Element 5.6, performance criteria, point 2, page 32.

Quote 8: Know current research trends, concepts and theories in speech pathology practice as reported in the literature. Understand the extent and limitations of the evidence base. Actively seek information and analyse new research for implications for practice. The eighth quote is from element 7.2, performance criteria, point 1, page 37.

Evidence-based practice

Quote 1: "Speech Pathology Australia's position is that evidence-based practice is the combination of clinical expertise, research evidence and resources and contextually appropriate decision making in order to make informed choices and decisions about clinical best practice. When a clinician engages in evidence-based practice, they approach their clinical practice from the perspective of a researcher. They critically analyse their practice and formulate focused and structured questions or hypotheses about the likely outcomes of their planned management. speechBITE™ sponsored by Speech Pathology Australia, is one of a number of evidence-based practice resources available to speech pathologists. Where appropriate reference to speechBITE™ is made in this document, however, this is not to the exclusion of other resources (e.g. The Cochrane Library) or the integration of systematic research with clinical expertise." The first quote is from Defining 'evidence-based practice', page 4.,

Quote 2: "Identify the communication and/or swallowing conditions requiring investigation and use the best available scientific and clinical evidence to determine the most suitable assessment procedures in partnership with the client." The second quote is from competency-based occupational standards: entry level, 2011, unit 1: assessment, element 1.2, page 10.

Quote 3: "3.1 Use integrated and interpreted information (outlined in Unit 2) relevant to the communication and/or swallowing condition, and/or the service provider's policies and priorities to plan evidence-based speech pathology practice. 3.2 Seek additional information required to plan evidence-based speech pathology practice. 3.5 Select an evidence-based speech pathology approach or intervention in collaboration with the client and significant others". The third quote is from the same section as the first quote, but unit 3: planning evidence-based speech pathology practices, elements 3.1, 3.2, 3.5, page 10.

Quote 4: "4.2 Implement an evidence-based speech pathology intervention according to the information obtained from speech pathology assessment, interpretation and planning (see Units 1, 2, and 3)". The fourth quote is from the same section as the first 3 quotes, but from unit 4: implementation of speech pathology practice, element 4.2, page 10.

Quote 5: "Integrate information obtained from assessment using knowledge, clinical reasoning (COMPASS®), decision-making and evidence-based practice to develop an interpretation of the data". The fifth quote is from unit 1: assessment, element 1.1, investigate and document the client's communication and/or swallowing condition and explore the primary concerns of the client, point 8, page 11.

Quote 6: "The interpretation and analysis of clients' communication and/or swallowing condition must demonstrate current clinical reasoning approaches (refer to COMPASS®) and relevant evidence-based analysis." The sixth quote is from unit 2: analysis and interpretation, page 16.

Quote 7: "Analyse assessment data and collate, record and interpret results in the light of normative or test guidelines or using other evidence-based procedures." Quote 6: Be able to justify the choice of assessment procedures and tools with reference to: • best available evidence available from current literature and research...". The seventh quote is from unit 2: analysis and interpretation, element 2.1, analyse and interpret speech pathology assessment data, performance

criteria, point 1, page 16.

Quote 8: "In particular, the speech pathologist's clinical reasoning abilities and use of evidence-based practices are critical to competence in Unit 3 – the planning of speech pathology practice. Speech pathology practice is always informed by the best available evidence (refer to speechBITE™). Evidence-based speech pathology practice is designed to include the components of the International Classification of Functioning, Disability and Health...." The eighth quote is from unit 3: planning evidence-based speech pathology practices, page 19.

Quote 9: Consider a variety of evidence-based speech pathology approaches using clinical and theoretical knowledge to decide on the most suitable intervention. The ninth quote is from Element 3.5, select and evidence-based speech pathology approach or intervention in collaboration with the client and significant others, performance criteria, point 1, page 22.

Quote 10: "...Evidence-based speech pathology programs may involve one-to-one intervention, group intervention, classroom based intervention, training others, consultation and/or education, depending on each unique set of clinical circumstances." The tenth quote is from Element 4.2, implement an evidence-based speech pathology intervention according to the information obtained from speech pathology assessment, interpretation and planning (see units 1,2,3), point 1, page 25.

Quote 11: "Show an appreciation of the different workplace contexts in the choice of the most appropriate and evidence-based speech pathology intervention. " The eleventh quote is from Element 4.5, identify the scope and nature of speech pathology practice in a range of community and work place contexts, performance criteria, point 3, page 27.

Quote 12: Integrate current information about client needs (as obtained in accordance with Units 1, 2, 3 and 4)the speech pathology service, and evidence-based practice (refer to Evidence-Based Practice in Speech Pathology Position Statement) with the knowledge of the objectives and context of the speech pathology service. The twelfth quote is from element 5.3, manage own provision of speech pathology services and workload, performance criteria, point 1, page 30.

Quote 13: "using available evidence-based practice resources to determine efficacy of work practices (e.g. speechBITE™ or The Cochrane Library)". The thirteenth quote is from element 5.6, adhere to professionally accepted scientific principles in work practices, cues for this element, knowledge of scientific principles, point 1, page 32.

Information The term information is used widely in the document to describe the learning about collection of information, interpretation of the information and analysis of the information. See also 'electronic'. Information and Communication Technology appears: "Design projects or programs taking into account a variety of strategies, media, information and communication technologies and materials, and the requirements of the target population. (In such projects or programs the 'client' is often the general public and/or professional groups)." Element 4.6, Undertake preventative, educational and/or promotional projects or programs on speech pathology and other related topics as part of a team with other professionals, performance criteria, page 28

Internet "Relevant policies and procedures: policies on internet use." Unit 5: Planning, providing and managing speech pathology services, element 5.1, respond to service provider's policies, cues for this element, page 31

Record See also 'electronic'.

Quote 1: procedures for dealing with medical and/or educational records. The first quote is from Unit 5: Planning, providing and managing speech pathology services, element 5.1, respond to service provider's policies, cues for this element, page 31.

Quote 2: Maintain efficient systems of records, consistent with organisational requirements, for the purposes of service delivery, planning, accountability, monitoring client status and ensuring a high quality of service. The second quote is from Element 5.2, use and maintain an efficient information management system,

point 1.

Quote 3: digital recordings-audio & visual. The third quote is from Unit 1: Assessment, element 1.2, identify the communication and/or swallowing conditions requiring investigation and use the best available scientific and clinical evidence to determine the most suitable assessment procedures in partnership with the client, cues for this element, page 13. NB: the term record is also used to describe the recording of information accurately.

Technology "Assistive technology." Range of practice for the entry-level speech pathologist, Range of practice, 6. multi-modal communication, examples (include but not limited to), page 9.

Discussion and conclusions

No degree accreditation documents required that degree providers teach or assess ehealth as such. Two documents (nursing and physiotherapy) made explicit reference to education in 'informatics'.

Comparing these documents in terms of references to two key components of Australia's national ehealth agenda, namely the personally controlled electronic health record and telehealth, results show that one (physiotherapy) mentioned 'electronic health records' and one (speech pathology) mentioned 'tele-health' in as many words.

In some documents, aspects of ehealth could be inferred clearly from related concepts, particularly 'evidence', 'information' and 'technology'. In this category, speech pathology was most comprehensive. In other documents, related concepts were used unevenly and did not reflect systematic approaches. Some documents mentioned very few related concepts, notably radiography.

There was wide but not obviously justified variation in the usage of these related concepts from one document to another, for example, the disjointed appearances of the terms 'data' and 'databases', indisputably important concepts in ehealth and clinical informatics (Collen, 2012). If such variation proves to be essential to reflect distinctions in the ehealth knowledge, skill and attributes of each clinical profession, it appears that there could be major challenges in developing interprofessional approaches to learning.

In some documents, occurrence of related concepts, particularly 'information' and 'technology', signified an emphasis on elearning. While developing the ability to use information and communication technologies for learning is a sub-field within the health informatics discipline, its inclusion in these documents does not represent a comprehensive approach to ehealth education for clinical professions.

The results of this study confirmed prior survey and workshop findings. Most health professions were found to have no degree curriculum standards, and thus no formal curriculum review processes, to support the systematic and comprehensive development of ehealth capability or clinical informatics foundation knowledge and skills.

This study further found that current documents were dated between 2001 and 2012; the long cycles for updating and revising accreditation standards in some professions indicate that these professions might not be prepared to consider or describe the place of ehealth in their degree programs for many years to come.

Chapter 8. Ehealth knowledge and skills required in clinical jobs

Introduction

The project investigated what health service provider organisations expect, in terms of ehealth capability, in the clinical health professionals they employ. Curriculum renewal of degrees in the health professions is influenced in part by the views about work-readiness, fitness for practice and graduate attributes that are held by major employers of graduates (Walker et al., 2013).

The specific requirement to build ehealth related capabilities in the Australian clinical workforce has been expressed clearly in the scholarly and report literature (for example, Iliffe, 2005; HISA, 2009; Smith et al., 2011). However, the prior national study and workshop series in this project gave mixed signals about how this requirement was being manifested in actual employment practices.

Therefore this study looked for evidence of the ehealth knowledge, skills and attributes that are sought by Australian employers, using current clinical job advertisements as indicators.

Method

After consultation with key employers and recruiters of clinical professionals, a specific job search engine <mycareer.com.au> was used as the source of jobs advertised in healthcare, across different jurisdictions, professions and sectors nationally.

All job advertisements were searched for ehealth related terms: communication, computer, data, document, ehealth, electronic, evidence, informatics, information, internet, online, record, technology, as well as associated truncations, permutations and acronyms. For instance, this strategy would find database under 'data'; e-health and tele-health under 'ehealth'; electronic health records under 'electronic' and 'record'; ICTs under 'information', 'communication' and 'technology'.

To be included in the study, job advertisements had to:

- be based in a health service provider organisation or associated public agency
- stipulate that the candidate had to possess a tertiary degree in a clinical health profession
- be recently advertised and unique (that is, not the same advertisement for same role within the same organisation, differentiated only by state or recruiting agency)
- include a detailed description of the role and selection criteria (re-advertised newspaper job ads that did not contain sufficient detail about the potential applicants or the skills required were excluded)
- contain one or more search terms in the selection criteria to be addressed by applicants (that is, not simply in the description of the employer organisation)

Searching was conducted at least two to three times a week across a three-month period in mid-2012, until saturation was reached in the ehealth-related selection criteria that were being found in job descriptions across the range of professions and jurisdictions. Job ads examined were initially limited to entry level positions; when this yielded few or no results in some professions, the search was broadened to include more senior positions.

After close reading of the position descriptions and selection criteria in approximately 800 ads, approximately 70 job ads were included in the findings. Appendix D sets out the flowchart used to arrive at this selection.

Results

Findings are set out in Table 22, arranged by the clinical professional degree qualification required for the role. The position title is then given, along with the State where the position is based. This is followed by an excerpt containing the ehealth-related terms in the selection criteria of the job ad.

Table 22. Ehealth related knowledge and skills in selection criteria for Australian clinical jobs

Degree	Role	State	Description
Audiology	Audiologist	WA	Basic computer skills; some experience in using NOAH and familiarity with hearing aid software preferred.
Dentistry	Dental Assistant	VIC	Basic computer skills.
Dentistry	Dental Nurse	VIC	Prepared to develop basic IT skills, possessing basic computer skills would be an advantage.
Dentistry	Dental Nurse	NSW	Intermediate computer skills.
Dentistry	Dental Receptionist/Nurse	ACT	Computer literate.
Dietetics	Manager Nutrition Services	VIC	Computer/Word processing skills.
Medicine	General Practitioner	NSW	Excellent computer skills.
Medicine	General Practitioner	QLD	Computer literacy.
Midwifery	Registered Midwife	NSW	“Information management: Has appropriate IT/computer skills for the role; has an email address and routinely accesses/utilises email for communication; obtains access and develops competence using all the relevant software applications e.g. Birthing Outcomes Systems (BOS), the BOSS Digital Medical Record (DMR) and results management systems, iSoft Patient Management System (iPM), Cordis, RiskMan; understands data collection requirements; maintains record management to accepted standards; adheres to medico legal requirement of documentation and recording; maintains appropriate documentation requirements.” “Demonstrated high level of verbal, written and electronic communication skills”.
Midwifery	Aboriginal Maternal Infant Health Strategy –	NSW	Demonstrated high level oral, written and interpersonal skills, including

	Midwife		knowledge and skills in effective utilisation of computer based information systems and Microsoft applications.
Midwifery	Maternal and Child Health Coordinator	VIC	Experience in budget preparation and information technology is highly desirable.
Nursing	ACFI Coordinator	VIC	Excellent computer skills (Word, Outlook, Excel, Powerpoint and Internet).
Nursing	ACFI Project Manager	VIC	Exceptional communication skills and computer literacy are a must.
Nursing	Care Manager, Aged Care	NSW	Sound computer literacy skills.
Nursing	Clinical Manager	NSW	Computer literacy.
Nursing	Clinical Manager – Aged Care	NSW	Well developed management and communication skills, a thorough understanding of ACFI and strong computer literacy.
Nursing	Clinical Nurse Consultant – Infection Control	VIC	Excellent communication and analytical skills, initiative and personal drive and computer skills in Word and Excel.
Nursing	Community Care Manager	QLD	Proven ability to use, or willingness to learn, computer software in the delivery of care services.
Nursing	Director of Care	NSW	Tech savvy - able to operate various computer systems.
Nursing	EN/RN Nursing	NSW	Excellent organisational and computer literacy skills.
Nursing	Gastroenterology Clinical Nurse Consultant	VIC	Computer literacy and competence.
Nursing	Hepatitis Clinical Nurse Advisor	VIC	Excellent computer skills.
Nursing	Hepatology Clinical Nurse Consultant	VIC	Computer literacy and competence.
Nursing	Mental Health CNS, RN and EEN Roles	NSW	Sound computer skills.
Nursing	Mental Health RN	WA	Clear and concise written and computer skills.
Nursing	Nurse Unit Manager	NSW	Proficient computer skills.
Nursing	Practice Nurse/Enrolled	WA	Good computer skills.

	Nurse		
Nursing	Registered Nurse	NSW	Basic computer skills.
Nursing	Registered Nurse	NSW	Recent clinical experience, proficient computer skills, effective communication and time management skills and be able to work within a team environment.
Nursing	Registered Nurse	NSW	Computer literacy.
Nursing	Registered Nurse	VIC	Computer literacy.
Nursing	Registered Nurse/Quality Assurance	NSW	Sound computer literacy skills.
Nursing	Health Promotion Officer	VIC	Computer literacy.
Nursing	Surgical Liaison Nurse	VIC	Advanced computer skills.
Nursing	Project Officer – Home Dialysis	VIC	Computer literacy.
Nursing	Health Promotion Officer	VIC	Computer literacy.
Nursing	Child and Family Health Nurse	NSW	Computer literacy, word processing and data entry skills with a demonstrated ability to maintain concise and contemporaneous clinical documentation.
Nursing	Practice Nurse	WA	Comprehensive understanding of Medicare systems and computer systems would be advantageous.
Nursing	Director of Nursing	NSW	Sound computer literacy skills.
Nursing	General Practice Nurse	VIC	Computer literate.
Nursing	Nurse Manager Rehabilitation Unit	VIC	Computer literacy and word processing skills.
Nursing	Theatre Clinical Nurse Manager	VIC	Advanced computer literacy.
Nursing	Renal Vascular Access Coordinator	VIC	Basic computer literacy.
Nursing	Quality Manager – Aged Care	WA	High computer literacy, especially in Microsoft packages.
Nursing	Care Coordinator (Aged Care)	NSW	Good computer skills.
Occupational Therapy	Occupational Therapist	VIC	Excellent interpersonal skills, including computer literacy and the ability to

			produce well written reports.
Occupational Therapy	Occupational Therapist	VIC	Excellent interpersonal, written and verbal communication skills, including computer literacy and the ability to produce well written reports.
Occupational Therapy	Occupational Therapist – Seating/Equipment Specialist	NSW	Computer literate.
Paramedics	Paramedic	NSW	Intermediate/strong clerical and computer skills.
Pharmacy	Graduate Pharmacist	NSW	Computer literacy and demonstrated experience in working with FRED dispense system.
Pharmacy	Pharmacy Assistant	NSW	Computer literate with sound product knowledge.
Pharmacy	Pharmacist	NSW	Excellent computer skills.
Pharmacy	Clinical Pharmacist Grade 1	VIC	Interpersonal and information technology skills, well-developed computer skills, proficiency in word processing, spreadsheet and dispensing software applications.
Pharmacy	Clinical Pharmacist	VIC	Strong computer literacy and experience in specialist pharmacy software.
Physiotherapy	Physiotherapist	NSW	Computer skills, social media awareness.
Physiotherapy	Physiotherapist	NT	Proficient computer skills in Microsoft Office Suite.
Psychology	Autism Spectrum Disorder – Case Consultant Practitioner	VIC	Competent in the use of computers.
Psychology	Psychologist – Mental Health	NSW	Sound computer skills.
Psychology	Mental Health Support Worker	NSW	Computer literate in Windows Office programs.
Psychology/Social Work	Neurofeedback Counsellor	WA	Demonstrated high level verbal and written communication skills including computer literacy.
Psychology/Social Work	Senior Intake Officer/Counsellor	NSW	Well developed oral and written communication skills including computer literacy, and use of Microsoft packages.

Public Health	Population Health Manager	NSW	Advanced knowledge of research and statistical methodology, including extensive experience in the use of computer packages for data analysis.
Social Work	Psychiatric Triage Clinician	VIC	Utilise advanced computer based technology.
Social Work	Diabetes Social Worker	VIC	High level computer literacy.
Social Work/ Psychology / Nursing	Aboriginal Sexual Assault Worker	NSW	Demonstrated written and oral communication skills and experience in using computer programmes such as Microsoft Office.
Social Work / Occupational Therapy	Bilingual Counsellor	NSW	Computer literacy.
Speech Pathology	Speech Pathologist Grade 2	VIC	Computer literacy, "by ensuring that clinical and non-clinical activity using IBA software are entered within a fortnight of the activity, consistent with departmental protocols."
Speech Pathology	Speech Pathologist (Adult) Grade 2	VIC	Good computer skills.
Speech Pathology	Speech Pathologist Level 3	VIC	Excellent written and verbal communication skills, computer literacy and time management.

Discussion and conclusions

Ehealth related knowledge and skills scarcely rated a mention in job advertisements in most clinical health professions. The word 'ehealth' never appeared. Fewer than 10% of job advertisements overall included a term that could be construed as relevant ('computer literate' was most common) and the competence was often described narrowly or vaguely. Related knowledge and skills were specified as desirable more often than essential.

One exceptional case, in midwifery, gave a detailed list of information management and technology competencies required generally and in relation to specific software. In a small number of other cases, in audiology, pharmacy and speech pathology, competence with particular software packages was specified. There were occasional advertisements where the term 'technology' appeared in descriptions of the employing organisation's purpose and culture, but not in the selection criteria for the advertised position.

These findings demonstrate that most employers of health graduates into clinical positions do not require they have ehealth knowledge, skills or attributes to carry out the tasks of that role. In the rare instances where they do seek to recruit ehealth competent staff, the requirement or competency is neither clearly nor strongly expressed.

Along with the findings about degree accreditation requirements reported in Chapter 7, these findings on the absence of expectations formally expressed by employers of degree graduates indicate that very weak influences on curriculum renewal for ehealth education

are being exerted by the professions and the healthcare industry at present.

Chapter 9. A strategic approach to advance ehealth education

Project outcomes and impacts

Between 2010 and 2013, this project took a nationally coordinated approach to researching, workshopping and resourcing university curriculum renewal for ehealth education in entry level health profession degrees. Reports and related materials disseminated progressively during the project, via project activities, the project website and an email list of approximately 550 names, included:

- eight quarterly newsletters
- re-usable workshop materials
- a bibliography of peer-reviewed resources
- professional profiles and contact details for ehealth experts among the project team, the reference group and workshop panellists
- six curriculum development resource papers
- ten journal and conference papers and presentations (included in the list of References)

All these items are publicly accessible at <www.clinicalinformaticseducation.pbworks.com>

An independent evaluation of this project in 2013 established that it was successful in making an impact in universities and on other stakeholders. A summary of the evaluation report is provided as Appendix E. In summary, this evaluation found that the project:

- raised awareness of the need for ehealth education among academic coordinators and directors of entry level health profession degrees in Australian universities.
- engaged academic coordinators and directors in interprofessional dialogue, learning and planning for ehealth education.
- facilitated collaborations among academics and between this group and stakeholders from the government, healthcare organisations and the healthcare industry.
- created planning resources to support curriculum development and renewal of entry level health profession degree programs.

In addition, the project produced an array of data which will continue to be analysed and disseminated in peer-reviewed forums, beyond the life of the present project.

The two key factors contributing to the achievements of this project were:

- a respected, committed and collaborative national interdisciplinary project team;
- nationally active and respected academic and clinical champions.

However, this project identified many areas of need and concern regarding continuing curriculum reform. Factors that impeded greater progress in this project and beyond it must be addressed in order to advance the development of an ehealth capable clinical workforce in degree programs. These factors include:

- Students do not have access to contextually appropriate and intellectually challenging resources for learning, particularly opportunities to work with a variety of software and systems in simulated settings.
- Academic teaching staff and clinical educators do not have adequate theoretical and practical knowledge of ehealth or health informatics.
- Major employers of graduates of entry level degrees do not reinforce the importance of ehealth capability, in their approaches to recruitment.
- The professions do not provide a rigorous, systematic basis for quality assurance of educational curriculum in ehealth, in their degree accreditation processes.

- Health and education policy-makers do not take a national approach to planning, oversight and evaluation of professional education for ehealth capability in the clinical professions.

A review of international strategic perspectives on ehealth education of the health workforce is presented next, to provide a basis for the development of a strategic framework to address these factors in advancing the ehealth education of future clinicians.

Strategic perspectives on ehealth education

Education is often invisible in accounts of ehealth infrastructure. It may be implied but is rarely described within strategic plans. For example, a recent detailed comparison of three nations' national electronic health record system implementations is entirely silent about education (Morrison et al., 2011). A structured review to extract ehealth policy issues and solutions from sixty articles in both peer-reviewed and grey literature from 1998 to 2008 identified the following themes: networked care, interjurisdictional practice, diffusion of ehealth / digital divide, ehealth integration with existing systems, response to new initiatives, goal-setting for ehealth policy, evaluation and research, investment, and ethics. (Khoja et al., 2012). If we assume that education is blended into or integrated throughout such themes, we take much for granted and derive little insight.

One can find a number of idiosyncratic accounts of ehealth education; various tertiary education institutions, professional associations and private training providers offer ehealth education at least for some groups (indicative examples are Clark et al., 2009 and Edirippulige et al., 2012). However these do not offer a strategic perspective, because such education is not usually connected with large-scale ehealth implementations in a transparent or accountable way. While the decision to offer or to pursue these kinds of ehealth education may be influenced by the status of ehealth strategy in the local healthcare context, there is no assurance that such education will have curriculum appropriately aligned to the strategy (for example, will it equip participants to work with the particular tools and standards that are used in the national system or is it more generic?), or that it will be accessible to the people who are most directly affected by implementation of new systems (for example, will it be provided for widely dispersed community and primary care providers as well as for the hospital-based workforce?) , or that it will be taken up by a critical mass of stakeholders (for example, will it reach patients and carers in sufficient numbers to make a real impact in aged care and chronic disease management?).

For noting and setting aside likewise are the longstanding views of the specialised health and biomedical informatics community, championing education's critical role in the success of ehealth strategy implementation. For example, advocates for an international qualification scheme for this purpose wrote:

Though often a surprise to many, [a] picture of end-user poor compliance is well documented over a period of time, and thus should be anticipated. Health professionals have in round terms a professional lifespan of approximately forty years. In nearly every country those practicing for more than ten years will have undertaken their basic professional education and early practice in an environment based on paper-based records. In many countries of the world electronic systems will only have been brought in even more recently. Furthermore, the most senior and experienced health practitioners – usually the professional champions and leaders – will certainly have been educated ahead of the e-health revolution. It is into this workforce environment that governments, health policy makers, and health informatics system advocates are seeking to introduce radical and comprehensive electronic systems. (Rigby et al., 2007)

However such views have failed to engage the mainstream of ehealth strategists and stakeholders, and thus the educational research literature offers no substantial body of

theory or evidence about when, why and how to use education as infrastructure in implementing large-scale ehealth strategies.

A close reading of the literature for a strategic view of the role of ehealth education in implementing national strategies yields a small number which made substantial observations relevant to the topic. From consideration of key themes in these articles, it emerges that the prevalent concern is whether and why the health workforce or indeed any other stakeholder group needs ehealth education. Within this are three distinct theoretical perspectives on the role of education in implementing large-scale innovations in healthcare:

- **Education is not necessary:**
A view persists that designing health information technology innovations to be intuitive and enticing means that little or no education will be required for successful implementation (Ovretveit et al., 2007; Wen and Tan, 2005). However, based on the extant evidence, in the context of a national ehealth strategy it seems that this approach to education would be at best optimistic and at worst negligent: Healthcare workers may self-report of lack of competence in using an ehealth innovation at a surprisingly high level (Makela et al., 2010); or they may reject it as not being a priority for their work (Al-Qirim, 2005). Overlooking end users' training and support needs has been linked directly to implementation problems in some studies (Greenhalgh et al., 2010; Sheik et al., 2011).
- **Education is for workforce change:**
Another view is that the introduction of ehealth challenges the workforce to perform more or better or differently. From this perspective, an enlightened manager would frame ehealth as a learning challenge – rather than as a performance challenge – so as to encourage the workforce to be less averse to risk, to experiment more, persist longer, learn more and ultimately perform better (Nembhard et al., 2009). This view supports a functional argument for considering workforce education as an essential part of ehealth implementation, and makes it a priority to analyse scopes of practices and training demands among healthcare workers (Buntin et al., 2010). Proponents of this view suggest that workforce education needs to be sustained over time, practical, pitched at different levels, incorporated into mainstream activities, and supplemented with agreed clinical protocols and consistent reference documents (Brebner et al., 2005).
- **Education is for everyone:**
Yet another view is that understanding ehealth innovation as a whole system entails taking an inclusive and nuanced approach to the learning needs of a wide range of distinct stakeholder groups. Education target groups variously identified include not only clinicians but also the general public, patients, carers, administrators, researchers, IT industry manufacturers and suppliers, or groupings based on geography (Ackerman et al., 2010; Brock Martin et al., 2012; May et al., 2012; Wiljer et al., 2008). All may differ in their 'awareness', 'principles' and 'how-to' kinds of learning requirements (Kyratsis et al., 2012) This view encourages attention to ehealth system end-users beyond those in the healthcare workforce, and alignment between education for these groups and the broadest social and economic goals of ehealth strategies.

Even if one rejects the first of these three views based on the evidence against it, still there is scarce evidence to support the other two – that is, evidence about what makes for the effective design of education programs in order to achieve desired outcomes within large-scale ehealth implementations (Carlfjord et al., 2010). One systematic review identified four broad types of educational interventions for this purpose – meetings, materials, outreach and audit – but also noted the absence of impact evaluation research (Gagnon et al., 2009). There is no peer-reviewed research that offers substantial evidence of the impact of education in this context, or even enough pedagogical detail to inform the educational design of a strategic program. Nor is there any peer-reviewed research into other pertinent aspects of ehealth education at a nationally strategic level, such as quality assurance and resourcing.

Recommendations

A recommended program of the work to be done to advance ehealth education for the clinical professions is outlined next. Beyond the scope of the present project, it needs wider collaborations and additional resources to go forward. It has an Australian focus, and international relevance, for the health professions, teachers and learners, healthcare organisations and policy-makers.

Five work packages are involved:

1. Focus on learners: New learning, teaching and assessment resources need to explain and explore ehealth and clinical informatics in current and future healthcare contexts.

Actions: Design a suite of modularised, shareable materials, tools and online environments for education and training that are adaptable for use by individuals and groups at various levels.

Outcomes: Relevant knowledge: Utilisation of educational resources by learners in all major health profession education and training programs.

Preliminary work completed in this project: Inventory of educational resources and development of clinical ehealth scenarios.

2. Focus on educators: Up-to-date professional development in ehealth and clinical informatics needs to be accessible to teachers, trainers and student supervisors in health professions.

Actions: Develop a flexible program of interprofessional learning and development opportunities in ehealth and clinical informatics, with potential pathways into advanced qualifications.

Outcomes: Wide expertise: Completion of a minimum set of continuing professional development activities by educators in all major health profession education and training settings.

Preliminary work completed in this project: Workshops for degree program coordinators.

3. Focus on profession /industry bodies that accredit university degrees: Revised accreditation and certification frameworks for the health professions need to include clear specifications of ehealth and clinical informatics competencies.

Actions: Define, describe and promote relevant competencies for all major health professions that accredit degrees and / or certify practitioners.

Outcomes: Comprehensive coverage: Implementation of revised frameworks in accreditation and / or registration in all major health professions.

Preliminary work completed in this project: Review of accreditation guidelines.

4. Focus on employers: Human resources management of professional staff in healthcare organisations needs to recognise and reward ehealth and clinical informatics competencies.

Actions: Coordinate recruitment, orientation, promotion, supervision and other human

resources protocols and programs to reflect relevant values and practices in all major healthcare organisations.

Outcomes: Clear expectations: Implementation of revised human resources protocols and programs in all major health professions.

Preliminary work completed in this project: Review of employer requirements.

5. Focus on policy-makers: Integrated systematic planning and development of professional practice in the health professions needs to reflect long-term ehealth and clinical informatics goals.

Actions: Review established programs and strategic directions for health profession workforce, and integrate and strengthen actions to support and evaluate items (1) through (4).

Outcomes: Sustained capacity: Integration and continuous quality improvement of ehealth and clinical informatics capacity building at all levels in the health system.

Preliminary work completed in this project: Invited input by project team members to Health Workforce Australia's National Common Health Competency Resource Technical Working Group and to its Clinical Ehealth Competency Project.

Conclusion

It is certain that future clinical health professionals will need to be able to work increasingly with networked information and communication technologies in healthcare systems around the world. At present Australia's clinical workforce is not able to work optimally with ehealth, either as defined by current health reform policies or beyond them, for a number of reasons. A serious limitation on the ehealth capabilities of current and future clinicians is their lack of access to high-quality, widespread formal education in ehealth and the underlying discipline of health informatics.

Further curriculum research and development across the healthcare system is needed before the education of future clinical health professionals will be able to keep abreast or ahead of the changes that ehealth is bringing. No single stakeholder group can meet this challenge; university educators, professional accrediting bodies, employer organisations and the ehealth industry must work together.

This project did not explore patient, carer, consumer and citizen expectations about clinical ehealth competencies, for reasons of scope. Still, of all the stakeholders in ehealth, this group has the least ability to influence curriculum renewal for ehealth education and the most to gain or lose from the levels of competence that clinicians demonstrate. Thus it is important to acknowledge here that this group is the ultimate reason why education systems need to ensure that all clinicians are educated for ehealth capability.

References

- Ackerman M., Fliart R., Burgess L., & Poropatich R. (2010). Developing next-generation telehealth tools and technologies: patients, systems, and data perspectives. *Telemedicine and e-Health*, 16, 93-95.
- AHIEC Australian Health Informatics Education Council. (2009). Strategic Work Plan 2009-10 and beyond. Glen Iris, VIC: Australian College of Health Informatics. Retrieved 9 May, 2010, from <http://www.ahiec.org.au/docs/AHIEC%20Workplan%20%272009-10%20and%20Beyond%27.pdf>
- AHIEC Australian Health Informatics Education Council. (2011). Health Informatics Scope, Careers and Competencies. Glen Iris, VIC: Australian College of Health Informatics. Retrieved 1 July, 2012, from http://www.ahiec.org.au/docs/AHIEC_HI_Scope_Careers_and_Competencies_V1-9.pdf
- Allaire, J., McLaughlin, A., Trujillo, A., Whitlock, L., LaPorte, L., & Gandy, M. (2013). Successful aging through digital games: Socioemotional differences between older adult gamers and non-gamers. *Computers in Human Behavior*, 29(4), 1302–1306.
- Al-Qirim N. (2005). Critical success factors for strategic telemedicine planning in New Zealand. *Telemedicine and e-Health*, 11, 600-607.
- Australian Acupuncture & Chinese Medicine Association. (2001). Traditional Chinese Medicine Education. http://www.acupuncture.org.au/Publications/Education_Guidelines.aspx, date last accessed: 24th April 2012
- Australian and New Zealand Osteopathic Council. (2010). Standards and Procedures for the Accreditation of Osteopathic Courses in Australia. <http://anzoc.org.au/pdf/apnz.pdf?phpMyAdmin=c59ffb7e59b6bb5b540b7e1b6586926e>, date last accessed: 24th April 2012.
- Australian and New Zealand Podiatry Accreditation Council. (2009). Accreditation Standards and Procedures for Podiatry Programs for Australia and New Zealand. <http://www.podiatryboard.gov.au/Accreditation.aspx>, date last accessed: 24th April 2012
- Australian Association of Social Workers. (2010). Australia social work education and accreditation standards. <http://www.aasw.asn.au/document/item/100>, date last accessed: 4th May 2012
- Australian Bureau of Statistics. (2009). Australian and New Zealand Standard Classification of Occupations. Available from <http://www.abs.gov.au/ausstats/abs@.nsf/mf/1220.0>
- Australian Dental Council & Dental Council of New Zealand, (2010), ADC/DCNZ Accreditation Standards: Education Program for Dentists, <http://www.adc.org.au/asd.pdf>, date last accessed: 24th April 2012
- Australian Dental Council & Dental Council of New Zealand. (2010). Professional attributes and competencies of the newly qualified dentist. <http://www.adc.org.au/pacd.pdf>, date last accessed: 6th of June 2012
- Australian Institute of Radiography Professional Accreditation and Education Board. (2010). Accreditation of Professional-Entry Programmes in Medical Imaging and Radiation Therapy. http://www.air.asn.au/cms_files/05_Accreditation/Accreditation_ProEntry_Guidelines.pdf, date last accessed: 24th April 2012.
- Australian Medical Council. (2010). Standards for Assessment and Accreditation of Medical Schools by the Australian Medical Council 2010. <http://www.amc.org.au/images/Medschool/accreditation-standards-medical-schools-2010.pdf>, date last accessed: 24th April 2012.
- Australian Network of Academic Public Health Institutions. (2009). Foundation Competencies for Master of Public Health Graduates in Australia. <http://caphia.com.au/documents/Competencies-MPH-Graduates-Australia-ANAPHI-2009.pdf>, date last accessed: 26th July 2012.
- Australian Nursing and Midwifery Accreditation Council. (2009). Midwives, Standards and Criteria for the Accreditation of Nursing and Midwifery Courses Leading to Registration,

- Enrolment, Endorsement and Authorisation in Australia – with Evidence Guide. <http://www.anmc.org.au/userfiles/file/Accreditation%20Documents%20for%20the%20Website/15110%20ANMC%20Accreditation%20Standards%20-%20Midwives%20-%20Revised%20November%202010.pdf>, date last accessed: 24th April 2012.
- Australian Nursing and Midwifery Accreditation Council. (2009). Registered Nurse: Standards and Criteria for the Accreditation of Nursing and Midwifery Courses Leading to Registration, Enrolment, Endorsement and Authorisation in Australia – with Evidence Guide. http://www.anmc.org.au/userfiles/file/ANMC_Registered_Nurse%281%29.pdf, date last accessed: 24th April 2012.
- Australian Pharmacy Council. (2009). Accreditation Standards. <http://pharmacycouncil.org.au/PDF/Undergraduate%20and%20Graduate%20Accreditation%20Standards.pdf>, date last accessed: 24th April 2012.
- Australian Physiotherapy Council. (2006). Australian Standards for Physiotherapy. <http://www.physiocouncil.com.au/standards>, date last accessed: 24th April 2012
- Australian Psychology Accreditation Council. (2010). APAC Rules for Accreditation and Accreditation Standards for Psychology Courses – 10 June 2010. <http://www.psychologyboard.gov.au/Accreditation.aspx>, date last accessed: 24th April 2012.
- Australian Sonographer Accreditation Registry. (2011). http://www.asar.com.au/resources/ASAR_Accreditation_Standards.pdf, date last accessed: 15th May 2012.
- Bardsley, M. (2012). Understanding patterns of complex care: Putting the pieces together. *Journal of Health Services Research & Policy*, 17(4), 195-196.
- Bennett, V., & Nicholson, W. (2013). Care in local communities: A vision and service model for district nursing. *British Journal of Community Nursing*, 18(2), 74-76.
- Blomstrand, L., Sand, L., Gullbrandsson, L., Eklund, B., Kildal, M., & Hirsch, J. (2012). Telemedicine—A complement to traditional referrals in oral medicine. *Telemedicine and e-Health*, 18(7), 549-553.
- Bordage, G., & Harris, I. (2011). Making a difference in curriculum reform and decision-making processes. *Medical Education*, 45, 87-94. doi:10.1111/j.1365-2923.2010.03727.x
- Brandt, V., Pedersen, M., Glintborg, D., Brandt, C., Brandt, K., Toubro, S., & Arendal, C. (2011). Sustained weight loss during 20 months using a personalized interactive internet based dietician advice program in a general practice setting. *International Journal on Advances in Life Sciences*, 3(1 & 2), 23-28.
- Brebner J., Brebner E., & Ruddick-Bracken H. (2005). Experience-based guidelines for the implementation of telemedicine services. *Journal of Telemedicine and Telecare*, 11 (Suppl. 1), 3-5.
- Breitschwerdt, R., Iedema, R., Robert, S., Bosse, Al. & Thomas, O. ((2012), Mobile IT solutions for home health care. Pp.171-187 in N. Menachemi, & S. Singh (Eds). *Health Information Technology in the International Context (Advances in Health Care Management, Volume 12)*. Emerald Group Publishing Limited. doi 10.1108/S1474-8231(2012)0000012012
- Briere, S., Corriveau, H., Grant, A., Lauria, M., & Michaud, F. (2011). Usability testing of a mobile robotic system for in-home telerehabilitation. *Engineering in Medicine and Biology Society, EMBC, 2011 Annual International Conference of the IEEE, Boston, USA*.
- Brock Martin A., Probst J., Shah K., Chen Z., & Garr D. (2012). Differences in readiness between rural hospitals and primary care providers for telemedicine adoptions and implementation: Findings from a statewide telemedicine survey. *Journal of Rural Health*, 28, 8-15.
- Brock, T., & Smith, S. (2007). An interdisciplinary online course in health care informatics. *American Journal of Pharmaceutical Education*, 71(3), Article 43. Retrieved July 4, 2011, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1913289/>
- Brownell, M., & Jutte, D. (2013). Administrative data linkage as a tool for child maltreatment research. *Child Abuse & Neglect*, 37(2-3), 120-124.
- Buckeridge D., & Goel V. (2002). Medical informatics in an undergraduate curriculum: A qualitative study. *BioMedCentral Medical Informatics and Decision Making*, 2, 6.
- Buntin M., Jain S., & Blumenthal D. (2010). Health information technology: Laying the infrastructure for national health reform. *Health Affairs*, 29, 1214-1219.

- Butler-Henderson, K., Dattakumar, A., Gray, K., Chenery, H., & Maeder, A. (2012). And the top 10 are... The top ehealth competencies taught in Australian health professionals curriculum. Paper presented at the Health Information Management Association Australia (HIMAA) conference 2012, Gold Coast, 29-31 October 2012.
- Butler-Henderson, K., Gray, K., Dattakumar, A., Maeder, A., & Chenery, H. (2013). A study into the level of health informatics syllabus in Australian tertiary clinical degree curriculum. Paper presented at the International Federation of Health Information Management Associations (IFHIMA) 2013 Education Day, Montreal, Quebec, Canada, 11th May 2013.
- Canada Health Infoway. (2013). [Website]. Retrieved July 1, 2013, from <https://www.infoway-inforoute.ca/>
- Carlifjord S., Lindberg M., Bendtsen P., Nilsen P., & Andersson, A. (2010). Key factors influencing adoption of an innovation in primary health care: a qualitative study based on implementation theory. *BMC Family Practice*, 11, 60.
- Clark, J., Baker, B., & Baker, D. (2009). Getting ehealth into basic nursing education: Report of the RCN Information in Nursing Project. *Studies in Health Technology and Informatics*, 146, 534-539.
- Collen, M. (2012). *Computer Medical Databases: The First Six Decades (1950-2012)*. Springer, London.
- Council of Ambulance Authorities, (2010), *Guidelines for the assessment and accreditation of entry-level paramedic education programs*, http://caa.net.au/downloads/PEPAP_Guidelines_Reviewed_MAY_2010.pdf, date last accessed: 16th May 2012.
- Council on Chiropractic Education Australasia Inc.. (2009). *Educational Standards for First Professional Award Program in Chiropractic*. <http://www.ccea.com.au/Documents/Accreditation/Standards%20-%20First%20Professional%20-%20December%202009.pdf>, date last accessed: 24th April 2012.
- Das, A., Faxvaag, A., & Swanaes, D. (2011). Management of weight-loss: Patients' and health professionals' requirements for an e-health system for patients. *Human Centered Design: Lecture Notes in Computer Science*, 6776, 285-294.
- Dattakumar, A. (2012). Are We Educating the Future Clinical Health Professional Workforce Adequately for eHealth Competence? Current Australian Context and Data. Invited presentation to EHealth Meets Oral Health Symposium 2012, University of Melbourne, 9 November, 2012.
- Dattakumar, A. (2013). Are We Educating the Future Clinical Health Professional Workforce Adequately for eHealth Competence? Current Australian Context and Data. Invited presentation to Health Informatics Society of Australia Queensland Committee, Brisbane, 4 June, 2013.
- Dattakumar, A., Gray, K., Butler-Henderson, K., Maeder, A. & Chenery, H. (2012). We are not educating the future clinical health professional workforce adequately for ehealth competence: Findings of an Australian study. In Maeder, A.J. and Martin-Sanchez, F.J. *Health informatics: Building a healthcare future through trusted information*, IOS Press BV, Amsterdam, Netherlands, pp. 33-39.
- Dattakumar, A., Gray, K., Maeder, A., Butler-Henderson, K. (2013 forthcoming). Ehealth education for future clinical health professionals: an integrated analysis of Australian expectations and challenges. Poster presentation at Medinfo: World Congress on Medical and Health Informatics, August, Copenhagen.
- Desjardins, K., Cook, S., Jenkins, M., & Bakken, S. (2005). Effect of an informatics for evidence-based practice curriculum on nursing informatics competencies. *International Journal of Medical Informatics*, 74, 1012-1020. doi:10.1016/j.ijmedinf.2005.07.001
- Dietitians Association of Australia. (2011). *Manual for Accreditation of Dietetic Education Programs, Version 1.2*. http://daa.asn.au/wp-content/uploads/2011/03/DAA-accreditation-manual_v1.2_Oct-2011.pdf, date last accessed: 26th July 2012.
- Edirippulige S., Smith A., Armfield N., Bensinck M., & Wootton R. (2012). Student perceptions of a hands-on practicum to supplement an online ehealth course. *Journal of Medical Internet Research*, 14, e182.
- Exercise and Sports Science Australia, National University Course Accreditation Program

- (NUCAP). (2011). Guidelines and application form for academic units applying for full accreditation of a course with exercise and sports science Australia (ESSA). <http://www.essa.org.au/wp/wp-content/uploads/NUCAP-guidelines-and-application-Full-accreditation-v-Jan-2011.pdf>, date last accessed: 16th May 2012.
- Filip, M., Linzer, P., Samal, F., Tesar, J., Herzig, R., & Skoloudik, D. (2012). Medical consultations and sharing of medical images involving spinal injury over mobile phone networks. *American Journal of Emergency Medicine*, 30(6), 961-965.
- Ford, P., & Hibberd, K. (2010). Creating effective and engaging information literacy programmes for the dental curriculum. *European Journal of Dental Education*, 15, 1-6.
- Forum of Australian Health Professions Councils. (2011). Submission on the Tertiary Education Quality and Standards Agency Bill 2011, 10 March 2011. Accessed 1 July 2013 from http://www.healthprofessionscouncils.org.au/Submission_-_TEQSABill2011_100311_&_Attachment_RTF.pdf
- Foster, J., & Bryce, J. (2009). Australian nursing informatics competency project. In: *Proceedings of the 10th International Congress on Nursing Informatics: Connecting Health and Humans*, 28 June - 1 July 2009, Helsinki. Retrieved 9 May, 2010, from <http://eprints.qut.edu.au/31927/1/c31927a.pdf>
- Gagnon M., Legare F., Labrecque M., Fremont P., Pluye P., Gagnon J., Car J., Pagliazi C., Desmartis M., Turcot L., & Gravel K. (2009). Interventions for promoting information and communication technologies adoption in healthcare professionals. *Cochrane Database of Systematic Reviews*, 1.
- Gassert, C., & Sward, K. (2007). Phase I implementation of an academic medical record for integrating information management competencies into a nursing curriculum. In K. Kuhn, (Ed.). *MEDINFO 2007*. Amsterdam: IOS Press, 2007, pp. 1392-1395.
- Glassman, P., Helgeson, M., & Kattlove, J. (2012). Using telehealth technologies to improve oral health for vulnerable and underserved populations. *Journal of the California Dental Association*, 40(7), 579-585.
- Goundrey-Smith, S. (2013). *Information Technology in Pharmacy: An Integrated Approach*. Springer. Chapter 5: Electronic medicines management in primary care. Pp. 121-150.
- Govaerts, M. (2008). Educational competencies or education for professional competence? *Medical Education*, 42(3), 234-236.
- Gray, K., & Sim, J. (2007). Building ICT skills for clinical work in a sustainable healthcare system: Approaches to bridging the higher education learning and teaching gap. In K. Kuhn, J. Warren, & T.-Y. Leong (Eds.), *Studies in Health Technology and Informatics: Vol. 129. MEDINFO 2007: Proceedings of the 12th World Congress on Health (Medical) Informatics: Building Sustainable Health Systems* (pp. 1428-1431). (Amsterdam: IOS Press.)
- Gray, K., & Sim, J. (2010). Factors in the development of clinical informatics competence in early career health sciences professionals in Australia: A qualitative study. *Advances in Health Sciences Education*. doi:10.1007/s10459-010-9238-3
- Gray, K., Dattakumar, A., Maeder, A., & Chenery, H. (2011). Educating future clinicians about clinical informatics: A review of implementation and evaluation cases, *European Journal of Biomedical Informatics*, 7(2), 48-57.
- Gray, K., Shortliffe, E., Ho, K., Taylor, P., Mars, M., Maeder, A., Dattakumar, A., Butler-Henderson, K., & Chenery, H. (2013 forthcoming). *Health Informatics Education for the Clinical Workforce*. Panel presentation at Medinfo: World Congress on Medical and Health Informatics, August, Copenhagen.
- Gray, K. (2012). *Educating the Future Clinical Workforce for eHealth Competence*. Invited presentation to Connecting for Health Conference, Melbourne, 23 February 2012.
- Greenhalgh T., Hinder S., Stramer K., Bratan R., & Russell J. (2010). Adoption, non-adoption, and abandonment of a personal electronic health record: case study of HealthSpace. *British Medical Journal*, 341, c5184.
- Griffin, J., Xia, S., Peng, S., & Keskinocak, P. (2012). Improving patient flow in an obstetric unit. *Health Care Management Science*, 15, 1-14.
- Han, H., & Lopp, L. (2013) Writing and reading in the electronic health record: An entirely new world. *Medical Education Online*, 18. doi:10.3402/meo.v18i0.18634 E-publication 5 February.
- Harrison, J., & Stewart, J. (2003). Training in pathology informatics: implementation at the

- University of Pittsburgh. *Archives of Pathology and Laboratory Medicine*, 127, 1019-1025.
- Hart, J., Newton, B., & Boone, S. (2010). University of Arkansas for Medical Sciences electronic health record and medical informatics training for undergraduate health professionals. *Journal of the Medical Library Association*, 98(3), 212-216. doi:10.3163/1536-5050.98.3.007
- Hersh, W. (2009). A stimulus to define informatics and health information technology. *BMC Medical Informatics and Decision-Making*, 9(24), [6pp.] doi:10.1186/1472-6947-9-24
- Hersh, W., Gorman, P., Ruback, T., & Kenney-Moore, P. (2002). Medical informatics and evidence-based medicine for physician assistants: implementation and evaluation of curriculum. *Perspective on Physician Assistant Education*, 13(1), 7-10.
- Hightower, C., & Caldwell, C. (2010). Shifting sands: science researchers on Google Scholar, Web of Science, and Pubmed, with implications for library collections budgets. *Issues in Science and Technology Librarianship*, 63, Article 3. Retrieved September 29, 2011, from <http://www.istl.org/10-fall/refereed3.html>
- Hilberts, S., & Gray, K. (2013). Education as ehealth infrastructure: considerations in advancing a national agenda for ehealth. *Advances in Health Sciences Education*, [13pp.] doi:10.1007/s10459-013-9442-z
- HISA Health Informatics Society of Australia. (2009). A review of the Australian health informatics workforce. Retrieved 9 May, 2010, from http://www.hisa.org.au/system/files/u2233/_Informatics_Workforce_Review_v1_1_-_SUMMARY.pdf
- Iliffe, J. (2005). Building the IM & ICT capacity of the health workforce. In *Proceedings of the National Health Information Summit: Transforming Australia's health system*. (pp. 121-123).
- Isken, M.W., Ward, T.J. & Littig, S.J., (2011) An open source software project for obstetrical procedure scheduling and occupancy analysis. *Health Care Management Science*, 14, 56-73.
- Jacobs, S., Rosenfeld, P., & Haber, J. (2003). Information literacy as the foundation for evidence-based practice in graduate nursing education: a curriculum-integrated approach. *Journal of Professional Nursing*, 19(5), 320-328.
- Kaufman, D. (2004). Applying educational theory in practice. In D. Cantillon, L. Hutchinson, & D. Wood (Eds.). *ABC of Learning and Teaching in Medicine*. London, BMJ Books, pp. 1-4.
- Khoja S., Durrani H., Nayani P., & Fahim A. (2012). Scope of policy issues in ehealth: Results from a structured literature review. *Journal of Medical Internet Research*, 14, e34.
- Kiely, P.M. (2009). Optometrists Association Australia Universal (entry-level) and Therapeutic Competency Standards for Optometry 2008. *Clinical and Experimental Optometry*, 92(4), 362-386.
- King, S., Murray, H., & MacDonald, K. (2010). Evolving a collaborative matrix for teaching informatics online to health sciences students at the Massachusetts College of Pharmacy and Health Sciences. *Journal of the Canadian Health Libraries Association*, 31(3), 109-114. doi:10.5596/c10-029
- Kuziemsky, C., & Varpio, L. (2011). A model of awareness to enhance our understanding of interprofessional collaborative care delivery and health information system design to support it. *International Journal of Medical Informatics*, 80(8), e150-e160.
- Kyratsis Y., Ahamd R., Holmes A. (2012). Technology adoption and implementation in organisations: Comparative case studies of 12 English NHS Trusts. *British Medical Journal Open*, 2, e00872.
- Lang, M. (2012). Supporting the 'chain of survival': How ICT can facilitate rapid response for out-of-hospital cardiac emergencies. *International Journal of Business Continuity and Risk Management*, 3(4), 327-338.
- Lehnbom, E., McLachlan, S., & Brien, J. (2012). A qualitative study of Australians' opinions about personally controlled electronic health records. Pp.105-110. In A. Maeder & F. Martin Sanchez (Eds.) *Health Informatics: Building a Healthcare Future through Trusted Information*. IOS Press, Amsterdam.
- Levine, A., Bebermeyer, R., Chen, J.-W., Davis, D., & Harty, C. (2008). Development of an interdisciplinary course in information resources and evidence-based dentistry. *Journal of Dental Education*, 72(9), 1067-1076.
- Liaw, S. T., & Gray, K. (2010). Clinical health informatics education for a 21st century world.

- pp. 479-491. In E. Hovenga, M. Kidd, S. Garde, & C. Cossio (Eds.). *Health Informatics: An Overview*. (Studies in Health Technology and Informatics, vol. 151). Amsterdam, Netherlands: IOS Press.
- Lungeanu, D., Tractenberg, R., Bersan, O., & Mihalas, G. (2009). Towards the integration of medical informatics education for clinicians into the medical curriculum. In K.-P. Adlassnig et al. (Eds.). *Medical Informatics in a United and Healthy Europe*. European Federation for Medical Informatics / IOS Press. pp.936-940. doi:10.3233/978-1-60750-044-5-936
- Makela K., Virjo I., Aho J., Kalliola P., Kurunmaki H., Uusitalo L., Valli M., & Ylinen S. (2010). Management of electronic patient record systems in primary healthcare in a Finnish county. *Telemedicine and e-Health*, 16, 1017-1023.
- Mantas, J., Ammenwerth, E., Demiris, G., Hasman, A., Haux, R., Hersh, W., Hovenga, E., Lun, K., Marin, H., Martin-Sanchez, F., & Wright, G. (2010). Recommendations of the International Medical Informatics Association (IMIA) on Education in Biomedical and Health Informatics. First Revision (IMIA Recommendations on Education Task Force). *Methods of Information in Medicine*, 49(2), 105-120. doi: 10.3414/ME5119
- Marceau, L., Link, C., Smith, L., Carolan, S., & Jamison, R. (2010). In-clinic use of electronic pain diaries: Barriers of implementation among pain physicians. *Journal of Pain and Symptom Management*, 43(3), 391-404.
- Masic, I. (2008). Medical informatics education at medical faculty of Sarajevo University – 15 years experience. *Acta Informatica Medica*, 16(1), 4-9.
- May, C., Finch, T., Cornford, J., Exley, C., Gately, C., Kirk, S., Jenkins, K., Osbourne, J., Robinson, A., Roger, A., Wilson, R., & Mair, F. (2011). Integrating telecare for chronic disease management in the community: What needs to be done? *BMC Health Services Research*, 11, 131.
- McGlade, K., McKeveney, C., Crawford, V., & Brannigan, P. (2001). Preparing tomorrow's doctors: the impact of a special study module in medical informatics. *Medical Education*, 35, 62-67.
- Morrison, A., Robertson, A., Cresswell, K., Crowe, S., & Sheik, A. (2011). Understanding contrasting approaches to nationwide implementation of electronic health record systems: England, the USA and Australia. *Journal of Healthcare Engineering*, 2, 25-41.
- Motulsky, A., Lamothe, L., & Sicotte, C. (2013). Impacts of second-generation electronic prescriptions on the medication management process in primary care: A systematic review. *International Journal of Medical Informatics*.
<http://dx.doi.org.ezp.lib.unimelb.edu.au/10.1016/j.ijmedinf.2013.01.012>
- Nagle, L. (2007). Everything I know about informatics, I didn't learn in nursing school. *Nursing Leadership*, 20, 22-25.
- National Health Service Connecting for Health [UK]. (2013). [Website]. Retrieved July 1, 2013, from <http://www.connectingforhealth.nhs.uk/>
- NEHTA National E-Health Transition Authority (2009). [Website]. Retrieved July 19, 2010, from <http://www.nehta.gov.au/aboutus>
- Nembhard, I., Alexander, J., Hoff, T., & Ramanujam, R. (2009). Why does the quality of health care continue to lag? Insights from management research. *Academy of Management Perspectives*, 23, 24-42.
- NHHRC National Health and Hospitals Reform Commission. (2009, June). *A healthier future for all Australians: Final report to the Minister for Health and Ageing*. Retrieved July 19, 2010, from <http://www.nhhrc.org.au/>
- Occupational Therapy Australia. (2010). *Australian Minimum Competency Standards for New Graduate Occupational Therapists*. <http://www.otaus.com.au/about/entry-level-program-accreditation>, date last accessed: 24th April 2012.
- Office of the National Coordinator for Health Information Technology [USA]. (2013). [Website]. Retrieved July 1, 2013, from <http://www.healthit.gov/>
- Optometry Council of Australia and New Zealand. (2006). *Accreditation Manual for Optometry Courses in Australia and New Zealand*.
http://www.ocanz.org/component/docman/doc_download/6-ocanz-accreditation-manual-part-2, date last accessed: 24th April 2012.
- Ovretveit, J., Scott, R., Rundall, T., Shortell, S., & Brommels, M. (2007). Improving quality through effective implementation of information technology in healthcare. *International*

- Journal of Quality in Health Care, 19, 259-266.
- Parker-Oliver, D., & Demiris, G. (2008). Social work informatics: A new speciality. *Social Work, 51*(2), 127-134.
- Pate, C., & Turner-Ferrier, J. (2010). Exploring linkages between quality, e-health and healthcare education. *International Journal of Healthcare Delivery Reform Initiatives, 2*(4), 66-81. doi:10.4018/978-1-61692-843-8.ch013
- Patel, V., Yoskowitz, N., Arocha, J., & Shortliffe, E. (2009). Cognitive and learning sciences in biomedical and health instructional design: a review with lessons for biomedical informatics education. *Journal of Biomedical Informatics, 42*(1), 176-197. doi:10.1016/j.jbi.2008.12.002
- Piqueras, M., Marco, E., Coll, M., Escalada, F., Ballester, A., Cinca, C., Belmonte, R., & Muniesa, J. (2013). Effectiveness of an interactive virtual telerehabilitation system in patients after total knee arthroplasty: A randomized controlled trial. *Journal of Rehabilitation Medicine, 45*, 392–396.
- Repetto, C., & Riva, G. (2011). From virtual reality to interreality in the treatment of anxiety disorders. *Neuropsychiatry, 1*(1), 31-43.
- Rigby, M., Hulm, C., Detmer, D., & Buccoliero, L. (2007). Enabling the safe and effective implementation of health informatics systems - validating and rolling out the ECDL/ICDL Health Supplement [online]. In: Kuhn K (Editor); Warren J (Editor); Leong T-Y (Editor). *Medinfo 2007: Proceedings of the 12th World Congress on Health (Medical) Informatics; Building Sustainable Health Systems*. Amsterdam: IOS Press, pp.1347-1351. *Studies in health technology and informatics, ISSN 0926-9630, v. 129*.
- Rohm, B.W.T., & Rohm Jr., C.E.T. (2007). Clinical informatics: a new paradigm for advances in biomedical informatics. *Communications of the International Information Management Association (IIMA), 7*(3), 101-108.
- Schleyer, T. (2003). Dental informatics: A work in progress. *Advances in Dental Research, 17*, 9-15.
- Schwartz, B. (2011). The introduction of a medical informatics course into a medical school curriculum. *Medical Reference Services Quarterly, 30*(1), 74-82.
- Sheik, A., Cornford, T., Barber, N., Avery, A., Takian, A., Lichtner, V., Petrakaki, D., Crowe, S., Marsden, K., Robertson, A., Morrison, Z., Klecun, E., Prescott, R., Quinn, C., Jani, Y., Ficociello, M., Voutsina, K., Paton, J., Fernando, B., Jacklin, A., & Cresswell K. (2011). Implementation and adoption of nationwide electronic health records in secondary care in England: Final qualitative results from prospective national evaluation in “early adopter” hospitals. *British Medical Journal, 343*, d6054.
- Shorten, A., Wallace, M., & Crookes, P. (2001). Developing information literacy: a key to evidence-based nursing. *International Nursing Review, 48*, 86-92.
- Shulman, L. (2011). The scholarship of teaching and learning: a personal account and reflection. *International Journal for the Scholarship of Teaching and Learning, 5*(1), [7pp.]. Retrieved July 4, 2011, from http://academics.georgiasouthern.edu/ijsotl/v5n1/featured_essay/PDFs/_Shulman.pdf
- Smith, S.E., Drake, L.E., Harris, J.G., Watson, K., & Pohlner, P.G. (2011). Clinical informatics: A workforce priority for 21st century healthcare. *Australian Health Review, 35*, 130-135.
- Sokolow, P., & Bowles, K. (2008). Including information technology project management in the nursing informatics curriculum. *CIN: Computers, Informatics, Nursing, 26*(1), 14-20.
- Soderholm, H.M., & Sonnenwald, D.H. (2010). Visioning future emergency healthcare collaboration: Perspectives from large and small medical centers. *Journal of the American Society for Information Science and Technology, 61*(9), 1808-1823.
- Speech Pathology Australia. (2011). Competency-based occupational standards for speech pathologists - entry level. http://www.speechpathologyaustralia.org.au/library/Core_Assoc_Doc/CBOS_for_Speech_Pathologists_2011.pdf, date last accessed: 16th May 2012.
- Syvajarvi, A., Stenvall, J., Harisalo, R., & Juvansuu, H. (2005). The impact of information technology on human capacity, interprofessional practice and management. *Problems and Perspectives in Management, 1*(4), 82-95.
- Tse, J., & O'Shea, C. (2008). Getting runs on the scoreboard - development of a formal health informatics curriculum statement for the RACGP. In H. Grain, (Ed). *HIC 2008 Conference: Australia's Health Informatics Conference; The Person in the Centre*, August

- 31 - September 2, 2008 Melbourne Convention Centre. Brunswick East, Vic.: Health Informatics Society of Australia, 210-213.
- University of Melbourne. (2009). Developing the e-health competence of the Australian health workforce: How can education, training and CPD build the knowledge and skills needed in a national e-health system? A research roundtable sponsored by the University of Melbourne Steering Committee for Health Informatics, Monday 30 November 2009: Report of Proceedings. Retrieved July 1, 2013, from http://www.healthinformatics.unimelb.edu.au/hbi/past-activities/files/ehealth_competence_roundtable_summary.pdf
- Van Moorsel, G. (2005). Library-sponsored instruction improves core informatics competencies among allied health students: a research-based case study. *Journal of Allied Health, 34*(3), 145-152.
- Van Veen, M., Mulder, F., & Lemmen, K. (2004). What is lacking in curriculum schemes for computing / informatics? In: ITiCSE '04 Proceedings of the 9th annual SIGCSE conference on Innovation and technology in computer science education. ACM New York, NY, USA, pp. 186-190. doi:10.1145/1007996.1008046
- Walker, A., Yong, M., Pang, L., Fullarton, C., Costa, B., Dunning, A.M.T. (2013). Work readiness of graduate health professionals. *Nurse Education Today, 33*(2), 116-122.
- Wen, H., & Tan, J. (2005). Mapping e-health strategies: Thinking outside the traditional healthcare box. *International Journal of Electronic Healthcare, 1*, 261-276.
- WHO World Health Organization. (2013). [Website]. Retrieved July 1, 2013, from <http://www.who.int/topics/ehealth/en/>
- Wiemeyer, J., & Kliem, A. (2012). Serious games in prevention and rehabilitation – A new panacea for elderly people? *European Journal of Aging and Physical Activity, 9*, 41-50.
- Wiljer, D., Urowitz, S., Apatu, E., DeLenardo, C., Eysenbach, G., Harth, T., Pai, H., & Leonard, K. (2008). Patient accessible electronic health records: Exploring recommendations for successful implementation strategies. *Journal of Medical Internet Research, 10*, e34.
- Wu, Z., Chen, H., & Jiang, X. (2012). Overview of knowledge discovery in traditional Chinese medicine. Pp.1-26 in Z. Wu, H. Chen & X. Jiang. *Modern Computational Approaches to Traditional Chinese Medicine*. Elsevier, London.
- Yap, K.Y.-L., Kuo, E.Y., Lee, J.J.J., Chui, W.K., & Chan, A. (2010). An onco-informatics database for anticancer drug interactions with complementary and alternative medicines used in cancer treatment and supportive care: An overview of the oncorx project. *Supportive Care in Cancer, 18*(7), 883-891.
- Yuen, E., Herbert, J., Forman, E., Goetter, E., Comer, R., & Bradley, J.-C. (2013). Treatment of social anxiety disorder using online virtual environments in Second Life. *Behavior Therapy, 44*(1), 51-61.
- Zelnick, C., & Nelson, D. (2002) A medical informatics curriculum for 21st century family practice residencies. *Family Medicine, 34*(9), 685-691.

Appendix A. Method used to select papers for literature review

Scholar was used as a starting point to rapidly and easily scope the volume and characteristics of the literature, a widely used and recognised technique (Hightower and Caldwell, 2010). Selection of papers to retrieve in full-text was based on the title of the article and the abstract. An indicative corpus of literature (comprising about 30 papers) was found in this way. Search terms used in various combinations included: allied-health assessment clinical clinician computer curriculum competency degree dentistry education ehealth framework health informatics information interprofessional learning literacy medicine nursing practitioner professional skill student teaching university.

Databases related to the medical field and education fields (MEDLINE, ERIC, CINAHL, Scopus and Web of Science) were searched. This step retrieved approximately 100 additional papers. MeSH terms used were:

Interdisciplinary OR Interprof*

AND

Clinic* OR Allied Health OR Public Health OR Acupuncture OR Ambulance Professionals OR Paramedicine OR Audiology OR Chiropractic OR Counselling OR Dentistry OR Exercise and Sports Science OR Homeopathy OR Massage OR Musculoskeletal Therapy OR Medicine OR Naturopathy OR Nursing OR Optometry OR Orthoptics OR Orthotics OR Osteopathy OR Pharmacy OR Physiotherapy OR Podiatry OR Psychology OR Radiography OR Social Work

AND

Educat* OR Curricul* OR Teach* OR Learn* OR Competenc*

AND

E-health OR Ehealth OR Informati* OR Comput* OR Online OR Internet OR Tele* OR Electronic OR ICT or IT OR Technology OR Knowledge Management OR Evidence Based*

The reference list at the end of every paper identified in step 1 and step 2 was checked to find further papers. Those deemed relevant on the basis of title were sourced in full-text. At this stage around 200 papers had been retrieved.

Each paper was read by two researchers at doctoral level with information science and information systems expertise, and categorised according to the clinical health profession on which it focused. Within each profession, each paper was further analysed according to key themes. Some of these papers were excluded, once reviewed, because they did not address the majority of these themes, for instance if they predominantly reported on curriculum proposals, teaching tool trials, or the general state of student and staff attitudes and skills. A shortlist of fewer than 20 papers resulted. Key themes used were adapted from Bordage and Harris (2010):

- learners and their learning needs;
- intended competencies or learning outcomes;
- content covered;
- relationship of the curriculum to standards and accreditation;
- teaching methods and modes of delivery;
- assessment of student learning;
- evaluation of educational quality.

From these papers we selected six papers to summarise. The criterion was to provide a selection that gave a balance of professions and of pedagogical approaches over the decade. The selection of these six papers from the shortlist at step 4 was reviewed by two additional researchers at professorial level with health informatics and health sciences expertise. With each case we summarized, we also included citations to all other papers at step 4 that were relevant to ehealth education in the same profession.

Appendix B. Survey and interview questions and respondent characteristics

The survey listed ten statements, each with two examples as prompts. A six-point Likert scale measured the extent of agreement or disagreement with each statement. Each statement also invited free-text comments and examples.

1. Our academic department / school demonstrably values the learning, teaching and assessment of at least some aspects of ehealth in this degree program.
For example.... We have opened a new computer lab for students, or we market ICT components of the degree to prospective students, or etc.
2. The professional / industry body that accredits this degree program requires that at least some aspects of ehealth are included in learning, teaching and assessment.
For example.... There are specific statements in this body's curriculum guidelines, or we field specific questions by this body's auditors, or etc.
3. The major employers of graduates of this degree program expect that at least some aspects of ehealth are included in learning, teaching and assessment.
For example.... Graduates are expected to know how to use iPads on the ward, or how to conduct a Cochrane review, or etc.
4. Independent expertise about ehealth is used to support decision-making about learning, teaching and assessing ehealth in this degree program.
For example.... Curriculum designers have consulted information from the National eHealth Transition Authority, or the International Medical Informatics Association, or etc.
5. The curriculum content in this degree program addresses at least some aspects of ehealth.
For example.... Topics include evidence-based practice, or clinical decision support systems, or etc.
6. The teaching methods in this degree program address at least some aspects of ehealth.
For example.... Students have to use telehealth for some of their placements, or there is always a guest lecture series by a qualified health information manager, or etc.
7. The assessment strategies in this degree program address at least some aspects of ehealth.
For example.... There are specific exam questions about clinical coding, or there is an essay topic about electronic health records, or etc.
8. The way that students use technology outside of study influences the approach this degree program takes to their ehealth learning needs and learning outcomes.
For example.... We assume that students all know how to find health information online, or that they all use health apps on their iPhones, or etc.
9. The educational preferences of students in this degree program influence the approach this degree program takes to their ehealth learning needs and learning outcomes.
For example.... We cater for the fact that students prefer hands-on clinical experience to any other type of teaching, or the fact that they want to do more of their degree online in their own time, or etc.
10. Specific educational resources would encourage our academic department / school to do more to improve learning, teaching and assessment of ehealth in this degree program.
For example.... We need an Australian ehealth textbook, or academic versions of health software programs, or etc.

The survey also collected confidential data about participants and their educational contexts:

- Participant's name
- Participant's educational institution name
- Field/s of study of this degree program

Academic level of this degree program
 Approximate number of individual students enrolled in this degree program in 2011
 If the participant directed or coordinated more than one clinical health degree program, they were asked to choose the degree with the largest student enrolment as the basis of their survey responses.

Interview participants were asked ten questions:

1. What do you understand the term ehealth to mean in general?
2. What would you say your students understand about ehealth generally?
3. What would you say your colleagues in this department or school think about ehealth generally?
4. Where, when and how have you come across information about ehealth?
5. What aspects of ehealth do you feel you ought to know more about, if any?
6. How do you think ehealth is affecting the way professionals in your field are doing their work?
7. What connection do you see between ehealth and health informatics, if any?
8. What did you think about the survey and do you have any questions or comments about the project or about the ideas behind the survey?
9. Could you elaborate on your response to survey question number/s [SPECIFIED]?
10. Summing up, if a colleague asked you for advice about teaching ehealth to students in profession [SPECIFIED], what advice would you give them?

Respondents' State/ Territory and profession were:

Australian Capital Territory	3
Clinical Psychologist	1
Occupational Therapist	1
Physiotherapist	1
New South Wales	23
Audiologist	1
Chiropractor	1
Clinical Psychologist	1
Dental Hygienist	1
Dental Practitioner/ Dietitian/ Medical Imaging Professional/ Nutritionist/ Oral Health Therapist/ Radiographer/ Sonographer (Multiple responsibilities)	1
Exercise/ Sports Scientist/ Health Informatician/ Occupational Therapist/ Orthoptist/ Physiotherapist/ Radiation Therapist/ Radiographer/ Sonographer/ Speech Pathologist (Multiple responsibilities)	1
Exercise/Sports Scientist	1
Medical Practitioner	1
Midwife	1
Midwife/Nurse	1
Nurse	2
Occupational Therapist	1
Orthoptist	1
Pharmacist	1
Physiotherapist	3
Psychologist	2
Social Work	1
Speech Pathologist	2
Northern Territory	1
Psychologist	1
Queensland	22
Counsellor/ Social Worker	1
Dental Practitioner	1
Dietitian/ Nutritionist	1

Exercise/ Sports Scientist	2
Exercise/ Sports Scientist/ Physiotherapist	1
Health Informatician/ Nurse	1
Medical Imaging Professional	1
Medical Imaging Professional/ Radiographer/ Sonographer	1
Medical Laboratory Scientist	1
Midwife	2
Nurse	3
Oral Health Therapist	1
Pharmacist	1
Physiotherapist	1
Psychologist	1
Radiation Therapist	1
Social Worker	1
Sonographer	1
South Australia	8
Audiologist/ Medical Practitioner/ Midwife/ Nurse/ Occupational Therapist/ Optometrist/ Paramedic/ Physiotherapist (Multiple responsibilities)	1
Clinical Education (A Multi development program)	1
Dietitian	1
Dietitian/ Nutritionist/ Recreational Therapist	1
Exercise Physiologist	1
Nurse	2
Pharmacist	1
Tasmania	7
Generic health science degree leading to various allied health, and environmental health training program	1
Health Informatician	1
Medical Laboratory Scientist	1
Midwife	1
Nurse	2
Paramedic	1
Victoria	33
Ambulance Professional	1
Ambulance Professional/ Paramedic	1
Audiologist	1
Ultrasound Education	1
Dietitian/ Nutritionist	1
Exercise/ Sports Scientist/ Homeopath Massage/ Musculoskeletal/ Myotherapist/ Naturopathy/ Nutritionist/ Traditional Chinese Medicine Practitioner/ Western Herbal Medicine Practitioner (Multiple responsibilities)	1
Massage/ Musculoskeletal/ Myotherapist	1
Medical Imaging Professional/ Radiographer	1
Medical Practitioner	2
Medical Imaging Professional/ Radiation Therapist	1
Midwife	3
Nurse	4
Occupational Therapist	1
Osteopath	3
Paramedic	2
Physiotherapist	2
Psychologist	2
Public Health Professional	1
Social Worker	1

Sonographer	1
Traditional Chinese Medicine Practitioner	2
Western Australia	8
Chiropractor	1
Dental Practitioner	1
Dietitian	1
Exercise/ Sports Scientist/Clinical Exercise Physiologist	1
Midwife	1
Pharmacist	1
Psychologist	1
Speech Pathologist	1

Respondents' educational institutions, by type of institution, were:

Rural University	9
1960s-1970s University	8
New Generation University	6
Australian Technology Network-like University	5
Group of Eight University	5
Technical and Further Education Institution	2

Appendix C. Workshop program, panellist and participant details

Workshop program running sheet:

Introduction to workshop program and participants	Participants will be asked to make introductory statements on the place of ehealth education in health profession degrees.
What does it mean for health professionals to be competent in ehealth?	The project team will present a review on eHealth competencies and curriculum development, internationally and in Australia.
Why do health professionals need be competent in ehealth?	Panel session, followed by a Question & Answer session (information on panellists provided below).
How can we develop ehealth competence in students in the health professions?	The project team will provide a review of current practices identified from surveys and interviews.
Curriculum challenge	Participants will be involved in small group activities related to: the goals and targets for ehealth education for prospective students. designing teaching and assessment methods for effective learning by an interprofessional group of students.
Curriculum challenge	Groups of participants report back on their group discussions.
Reflection and evaluation	Project team close the workshop by providing reflections on the workshop, key messages and next steps.
National EHealth Transition Authority (NEHTA) presentation: Building toward a national ehealth future	Extra session on the Personally Controlled Electronic Health Record (PCEHR) system.

Workshop panellists:

Brisbane Thursday 9 February 2012	Brett Silvester, CIO of Health Exchange Ltd. Glynda Summers, District ED of Nursing - Informatics, Queensland Health Sonya Hilberts, Education Officer, NEHTA
Melbourne Friday 24 February 2012	Andrew P. Howard, CIO, Department of Health, Victoria Louise Schaper, CEO , Health Informatics Society of Australia (HISA) Andrew Cording, Chief Pharmacist, St. Vincent's Hospital, Melbourne Sonya Hilberts, Education Officer, NEHTA
Perth Wednesday 15 February 2012	Alan Piper, CIO, WA Health Cathy Teager, Program Officer, Workforce Innovation and Reform, Health Workforce Australia James Semmens, Director, Centre for Population Health Research, Curtin University

	David Mountain, Head of Emergency Department, Sir Charles Gairdner Hospital Sonya Hilberts, Education Officer, NEHTA
Sydney Friday 10 February 2012	Steven Boyages, CEO , Clinical Education and Training Institute , NSW Siaw Teng Liaw, Professor, Centre of Primary Care and Equity, University of NSW Ian Wilson, Professor, School of Medicine, University of Western Sydney Sonya Hilberts, Education Officer, NEHTA

Number of workshop participants by profession:

Dentistry	1
Epidemiology	1
Exercise/ Sports Science	2
Health Information Management	1
Health Sciences	2
Medical Imaging	2
Medicine	4
Nursing	14
Occupational Therapy	4
Paramedic	2
Pharmacy	7
Physiotherapy	8
Psychology/ Behavioural Sciences	2
Social Work	1
Speech Pathology	1
TOTAL	52

Number of workshop participants by State/ Territory where degree program is based:

Australian Capital Territory	1
New South Wales	11
Queensland	11
South Australia	2
Tasmania	2
Victoria	9
Western Australian	16
TOTAL	52

Appendix D. Job advertisement search criteria and analysis flowchart

Step 1:

Search for all jobs in healthcare sector in all States/ Territories

Results: ~1620

Step 2:

Is the job for a clinical health professional?

Narrowed results: ~1200

Step 3:

Does the job description specify the need for a clinical health profession degree?

Narrowed results: ~1000

Step 4:

Is the job recently advertised? Is it unique (i.e. not a duplicate of an advertisement already viewed)?

Narrowed results: ~800

Step 5:

Does the job description contain sufficient information to sustain analysis?

Narrowed results: ~600

Step 6:

Do the selection criteria for the job include at least one of the keywords?

Narrowed results: ~70

Step 7:

Detailed review and report of analysis.

Appendix E. External evaluation report

Evaluation conducted by Juanita Fernando, FACHI, PhD, MA, BA, Grad Cert Bus Sys, Higher Education Consultant, October 2012 - May 2013

Aim

This evaluation provides a final report focusing on the extent to which the project has contributed to coordinated interprofessional curriculum renewal for eHealth capability initiatives in clinical health professional degrees in the Australian higher education sector as perceived by project participants.

Data collection

This report concerns an online evaluation survey and qualitative interview data that was used to seek the views of seventeen individuals, who were involved with the project, about the contribution it has made to coordinated interprofessional curriculum renewal for eHealth capability to support curriculum renewal. These included ten participants in surveys, interviews and workshops, four reference group members and three members who contacted the research team because they were interested in project updates. Follow-up interviews with consenting participants were completed in March 2013. Seven of the seventeen survey participants agreed to follow up interviews. Interim data from survey responses was reported in December 2012. All interview and survey evaluation data is combined in this report.

The online survey asked respondents to identify their role(s) in the project and to state their level of agreement on a five point Likert scale (1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree and 5 = Strongly Agree) with statements relating to the contribution project activities and/or resources had made or were likely to make to thinking and practice related to coordinated interprofessional curriculum renewal for eHealth capability in clinical health professional degrees in their own teaching, in their university and in Australia or elsewhere. Respondents could also provide open-ended comments on how the project might have made a difference to coordinated interprofessional curriculum renewal for eHealth and on the outcomes and potential impacts of the project.

In October 2012, the evaluator individually contacted 128 project participants by email and invited them to complete the online survey and to volunteer to participate in a follow up interview. Participants had four weeks in which to complete the survey. A reminder email was sent at the end of the two weeks.

Seventeen participants (13% of the total group) completed the survey. Of the seventeen survey respondents, ten (59%) identified themselves as participants in surveys, interviews and workshops; four (23.5%) identified themselves as reference group members; and three (17.5%) identified themselves as those who contacted the research team because they were interested in project updates. It is not possible to say with certainty what percentage of each of these groups completed the survey because two respondents from the surveys, interviews and workshops group identified themselves as members of the group that had contacted the research team due to their interest in project updates. Finally, one participant from the surveys, interviews and workshops group identified themselves as a member of the reference group.

At the conclusion of the survey, seven participants agreed to respond to follow up interviews. Each participant was then contacted to schedule the interviews and arrange communication technology; that is whether by Skype or telephone. The interviews were conducted between December 2012 and March 2013. All the survey and interview data were collated and analyzed and form the basis of this report.

Findings

The findings are based on participant responses to the online survey and follow-up interviews.

Are project activities/resources likely to make a difference to how you think about and plan to use the project website to support curriculum renewal for eHealth capability?

Summary

The majority of respondents identified ways in which the project has made a positive difference to the way they think about and plan to use the project website to support curriculum renewal for eHealth capability through interaction with other expert participants and an emerging community of practice. Discussion with colleagues during project workshops and interviews exposed respondents to new ideas fostering a shared definition of eHealth capability in the curriculum. Most respondents have continued to utilize resources on the project web site to provide an evidence base for embedding interprofessional renewal into their curriculum or to inform further studies. One respondent asked for ongoing sessions to ensure curriculum renewal for eHealth remained a work priority. Another respondent felt project outcomes required clarity and direct engagement with participants and a final respondent felt the project did not address the underlying issue of engaging students effectively. Most respondents believed the sessions were well executed overall and the project activities and resources would make a difference to improving curriculum renewal for eHealth.

Are project activities/resources likely to make a difference to improving curriculum renewal for eHealth capability across your organisation/faculty/department in general?

Summary

Respondents noted the value of project activities /resources for building confidence and centralising evidence from past research and other work on the web site. The site was also an effective comparison point from which educators could assess local activities. Discussions about accreditation requirements were especially useful. While some respondents believed the real life impact of the project would not be effective until 2013, it would make a difference to improving curriculum renewal for eHealth capability across their organisation, faculty or department. One participant expressed doubt about encouraging colleagues to review eHealth capability across the curriculum and the web site, although project outcomes were useful. A final participant was worried the project did not analyse concerns about the crowded health curricula in the context of eHealth curriculum renewal.

Are project activities/resources likely to make a difference to improving curriculum renewal for eHealth capability more widely in Australia or elsewhere?

Summary

The majority of respondents considered the range of resources/activities accessible on the project web site would provide an effective tool that was likely to make a difference to improving curriculum renewal for eHealth capability more widely in Australia or elsewhere. Evidently the site provided a scholarly benchmark for future research worldwide. One respondent was less optimistic, feeling that underlying issues, such as a crowded curricula and student engagement were not included in project outcomes. Survey responses generally recognised ongoing value in the project web site.

Which project activities/resources are likely to make a difference to improving curriculum renewal for eHealth capability in your own teaching, across your organisation and or more widely in Australia and elsewhere?

Summary

Most respondents considered that the inventory of resources, list of 10 key competencies and discussion papers are most likely to make a difference to improving curriculum renewal for ehealth capability in their own teaching, across their faculty/university, and/or more widely in Australia and elsewhere. Evidently the published resources provided a scholarly benchmark for their own teaching and university graduate attribute and pedagogical policies. The resources could be actively applied in context to make a difference to improving curriculum renewal for eHealth capability from publication. Interview responses generally recognised ongoing value of resources available from the project web site.

Additional comments on project outcomes and potential impacts

Summary

Respondents generally commented on the positive contribution they feel the project has made to conversation around improving eHealth knowledge and competencies in health care. At the same time, they were concerned that outcomes were hindered by a range of structural factors beyond the ambit of project aims. These included full clinical teaching schedules with limited scope to introduce eHealth curriculum, lack of structural support from teaching institutions, a dearth of eHealth champions and succession planning in clinical practice and a mismatch between the relevance of eHealth pedagogies and other health pedagogies in the curriculum. Participants also commented on the wide range of unwieldy system designs used across practice environments, the lack of a framework or rubric to chart progress in this domain and unmet employer needs. Most respondents expressed concern that although good progress was made, the issues they raised during interview will undermine the benefit of project outcomes overall.

Do you have any suggestions for specific actions by specific groups to progress work in this area after the project is finalised in December 2012?

Summary

Six participants commented on the need for further papers and research findings, especially cross-university work, to be published discussing eHealth competencies. Four of the participants emphasised the need for further work partnering with industry because Australian universities have proved “moderate” in their approach to eHealth curriculum renewal. One participant said “*I think (funding applications) and all of those things (project outcomes) will put pressure on healthcare educators and healthcare users to provide ongoing education in this area.*” The same person was particularly concerned this project would not be extended so risking the momentum gained. The view is supported by three other respondents, who indicated the networking opportunity provided by the project website should be maintained past project closure as a scholarly benchmark and to encourage higher degree research. A final participant commented on the need to involve patients in the process of coordinated interprofessional curriculum renewal in support of practitioners moving to the eHealth domain. One participant summed up the views of many when he said that project activities and resources are “*certainly a first point of reference for our further development of the eHealth curriculum here.*”

Additional comments on participating in the project

Summary

Five respondents were very positive about their experience of project participation. One of these commented on the enthusiasm and commitment of the research team, another two respondents believed the project outcomes embedded very good and informative resources on the web site. They felt key stakeholders were actively engaged throughout the project. Still another respondent found project resources “*instructive*” in the context of a “*positive*”

impact” on future projects in this field. A fifth respondent commented, “*It was a joy [to participate in the project] and I feel honoured ... to be involved*”. Three participants commented on the need for a discussion forum to promote ongoing collaborations. One said “*I would love to be more involved in it [eHealth curriculum renewal]*”. Two others felt the project provided a good learning experience for them; one said “*I made friends with people there and you get an understanding of the bigger picture*”. Yet another participant commented on the “*timeliness*” of the project, while a final participant emphasised the importance of peer reviewed publications that emerged from the project so “*there are things there for people to look at ... not just internal working papers*”.

Conclusions from the project evaluation

Feedback from participants acknowledges the importance and timeliness of the project and supports the conclusion that the project has contributed to improving coordinated interprofessional curriculum renewal for eHealth capability in clinical health professional degrees in Australian and other higher education sectors in a number of ways.

First, the project has focused attention on improving coordinated interprofessional curriculum renewal for eHealth capability, an area seen as critical to the future of the sector. It has also enabled most participants to feel more confident and optimistic about their capacity to influence eHealth curriculum renewal.

The project has also provided a collaborative and collegiate forum for interested individuals from different disciplines and institutions, both within and outside Australia. It has brought together a range of educators, who felt isolated, to a centralised community of practice. The community of practice will be used to discuss and share ideas and experiences about coordinated interprofessional curriculum renewal for eHealth capability into the future, so helping to encourage and reinforce ongoing efforts in this area.

In addition, the project has generated and disseminated both scholarly outcomes, including reports and peer-reviewed papers and practical resources, such as the discussion paper on accreditation requirements, to provide an objective source of information. The project also provides a basis for continuing discussion of key issues and the development of good practice in curriculum renewal activities to support eHealth.

Finally, the project has supported participants across a range of disciplines to engage in discussions encouraging them to reflect on, make more explicit and further develop their curriculum renewal practices to support eHealth.

Recommendations arising from the project evaluation

The project has made a positive contribution to increasing awareness of, knowledge about, and engagement in coordinated interprofessional curriculum renewal for eHealth capability in clinical health professional degrees.

Below are recommendations based on feedback and suggestions from participants about ways project outcomes can be consolidated and extended.

These relate to continued involvement of current project participants (Recommendations 1 and 2); further dissemination of information and resources (Recommendations 3 and 4); engagement of a wider range of academic, government and business staff (Recommendations 5 and 6); and extension of project activities (Recommendations, 7 and 8).

The recommendations are conditional on funding and continuation of the project in some form.

Recommendation 1

Maintain involvement of the project 'alumni' as a community of practice using the momentum and good will generated by the positive experiences of participants to date.

Recommendation 2

Facilitate the establishment of same discipline mentoring relationships between project participants and others interested in curriculum renewal for eHealth.

Recommendation 3

Support further dissemination of project outcomes through maintenance and regular updating of the project web site on new ideas and emerging practices and ongoing quarterly newsletters to bring ideas and resources to the attention of potential new users.

Recommendation 4

Seek endorsement of the project outcomes from relevant business, professional and accreditation bodies.

Recommendation 5

Adapt / promote project activities and resources for use as part of initial and continuing university academic staff development courses.

Recommendation 6

Engage relevant university leaders such as DVCs / PVCs Teaching and Learning, government leaders from organizations such as Health Workforce Australia and the National E-Health Transition Authority and business leaders from professional and other bodies in discussion about university policies and pedagogical initiatives in relation to curriculum renewal for eHealth

Recommendation 7

Develop detailed 'how to' guidelines aimed at both experienced and novice users with specific advice, step by step instructions and actual case studies on how to develop curriculum renewal for eHealth at their home institutions.

Recommendation 8

Seek funding to continue / extend the current project with the aim of developing and piloting new resources and activities that explicitly reflect the participatory and collaborative nature of curriculum renewal for eHealth, industry collaboration focusing on competencies, concerns about the crowded health curricula and the practical requirement for trainee clinicians to use eHealth knowledge during study.