# Studies in Health Technology and Informatics

This book series was started in 1990 to promote research conducted under the auspices of the EC programmes' Advanced Informatics in Medicine (AIM) and Biomedical and Health Research (BHR) bioengineering branch. A driving aspect of international health informatics is that telecommunication technology, rehabilitative technology, intelligent home technology and many other components are moving together and form one integrated world of information and communication media. The series has been accepted by MEDLINE/PubMed, SciVerse Scopus, EMCare, Book Citation Index – Science and Thomson Reuters' Conference Proceedings Citation Index.



## Volume 178

*Recently published in this series*

Vol. 177. B. Blobel, P. Pharow and F. Sousa (Eds.), pHealth 2012 – Proceedings of the 9th International Conference on Wearable Micro and Nano Technologies for Personalized Health
Vol. 176. T. Kotwicki and T.B. Grivas (Eds.), Research into Spinal Deformities 8
Vol. 175. S. Gesing, T. Glatard, J. Krüger, S.D. Olabarriaga, T. Solomonides, J.C. Silverstein, J. Montagnat, A. Gaignard and D. Krefting (Eds.), HealthGrid Applications and Technologies Meet Science Gateways for Life Sciences
Vol. 174. B. Blobel, R. Engelbrecht and M.A. Shifrin – Large Scale Projects in eHealth – Partnership in Modernization – Proceedings of the EFMI Special Topic Conference 18–20 April 2012 Moscow, Russia
Vol. 173. J.D. Westwood, S.W. Westwood, L. Felländer-Tsai, R.S. Haluck, R.A. Robb, S. Senger and K.G. Vosburgh (Eds.), Medicine Meets Virtual Reality 19 – NextMed
Vol. 171. P.B. Cerrito, Data Mining to Determine Risk in Medical Decisions
Vol. 170. G.J.E. De Moor (Ed.), Transatlantic Cooperation Surrounding Health Related Information and Communication Technology
Vol. 169. A. Moen, S.K. Andersen, J. Aarts and P. Hurlen (Eds.), User Centred Networked Health Care – Proceedings of MIE 2011
Vol. 168. D.P. Hansen, A.J. Maeder and L.K. Schaper (Eds.), Health Informatics: The Transformative Power of Innovation – Selected Papers from the 19th Australian National Health Informatics Conference (HIC 2011)

ISSN 0926-9630 (print)
ISSN 1879-8365 (online)

# Health Informatics: Building a Healthcare Future Through Trusted Information

Selected Papers from the 20th Australian National Health Informatics Conference (HIC 2012)

Edited by

Anthony J. Maeder

*University of Western Sydney, School of Computing, Engineering and Mathematics, Sydney, Australia*

and

Fernando J. Martin-Sanchez

*University of Melbourne, Faculty of Medicine, Dentistry and Health Sciences, Melbourne, Australia*

IOS Press

Amsterdam • Berlin • Tokyo • Washington, DC

ISBN 978-1-61499-077-2 (print)
ISBN 978-1-61499-078-9 (online)
Library of Congress Control Number: 2012942559

*Publisher*
IOS Press BV
Nieuwe Hemweg 6B
1013 BG Amsterdam
Netherlands
fax: +31 20 687 0019
e-mail: order@iospress.nl

*Distributor in the USA and Canada*
IOS Press, Inc.
4502 Rachael Manor Drive
Fairfax, VA 22032
USA
fax: +1 703 323 3668
e-mail: iosbooks@iospress.com



PRINTED IN THE NETHERLANDS

*Health Informatics: Bu*
*A.J. Maeder and F.J. M*
*IOS Press, 2012*
*© 2012 The authors a*

A record of twent
any field of ICT,
Health Informatic
Australasian Colle
annual Australian
through to this sta
and New Zealand
vides a valued pl
also consolidates
in health informat

The HIC 201
Trusted Informati
of health data an
flows are being i
electronic health
issues need to rem
priorities of admi
sumers, and an in
managing and usi
of health informa
adoption of new n

Papers in this
lour to the landsca
As always, it is a
set of papers has
practical. The ca
many elements of

The double b
lume has been co
experts in the fiel
specialists. The as
ing this processes
ly acknowledged,
Health Informatic
sional acceptance
pared with 39 for
previous Scientifi
tion process for a
reviewers' recom
35 papers finally

# Contents

Preface v
*Anthony J. Maeder and Fernando J. Martin-Sanchez*

Acknowledgements vii

Understanding Doctors' Perceptions of Their Prescribing Competency and the Value They Ascribe to an Electronic Prescribing System 1
*Melissa T. Baysari, Johanna I. Westbrook and Richard O. Day*

Privacy with Emergency Medical Information Used in First Response 7
*Peter R. Croll and Kimberly M. Ambrosoli*

The Cradle Coast Personally Controlled Electronic Health Record Evaluation Research Plan 14
*Elizabeth Cummings, Colleen Cheek, Winifred van der Ploeg, Peter Orpin, Heidi Behrens, Sharon Condon, Linda Jaffray, Isabelle Ellis, Barbara Ringeisen Arnold, Robyn Brogan and Timothy Skinner*

An Australian Roadmap for ICT Research and Development for Ageing? Lessons from a European Union Initiative 20
*Elizabeth Cummings and Patrick Nixon*

An Information Management System for Patients with Tuberculosis: Usability Assessment with End-Users 26
*Jonathan Darby, Jim Black, David Morrison and Kirsty Buising*

We Are Not Educating the Future Clinical Health Professional Workforce Adequately for E-Health Competence: Findings of an Australian Study 33
*Ambica Dattakumar, Kathleen Gray, Kerryn-Butler Henderson, Anthony Maeder and Helen Chenery*

Influencing Factors for Adopting Personal Health Record (PHR) 39
*Karen Day and Yulong Gu*

Exploring the Role of Pathology Test Results in the Prediction of Remaining Days of Hospitalisation 45
*Blanca Gallego, Oscar Perez-Concha, Frank Lin and Enrico Coiera*

Exergames for the Elderly: Towards an Embedded Kinect-Based Clinical Test of Falls Risk 51
*Jaime A. Garcia, Karla Felix Navarro, Daniel Schoene, Stuart T. Smith and Yusuf Pisan*

Managing Collaboration Across Boundaries in Health Information Technology Projects 58
*Karin Garrety, Andrew Dalley, Ian McLoughlin, Rob Wilson and Ping Yu*

[10] Stop TB policy paper: contributing to health system strengthening: guiding principles for national tuberculosis programmes. World Health Organization. Available from: http://www.who.int/tb/health_systems/en/ Accessed February, 2012.
[11] Kawamoto K, Del Fiol G, Lobach DF, Jenders RA. Standards for scalable clinical decision support: need, current and emerging standards, gaps, and proposal for progress. *Open Med Inform J.* 2010;4:235-44.

*Health Informatics: Building a Healthcare Future Through Trusted Information*
*A.J. Maeder and F.J. Martin-Sanchez (Eds.)*
*IOS Press, 2012*

*doi:10.3233/978-1-61499-078-9-33*



# We are not educating the future clinical health professional workforce adequately for e-health competence: Findings of an Australian study

Ambica DATTAKUMAR [a], Kathleen GRAY [a], Kerryn-Butler HENDERSON [b c], Anthony MAEDER [c] and Helen CHENERY [d]
[a] *Health and Biomedical Informatics Research Unit, University of Melbourne, Australia*
[b] *Department of Health Policy and Management, School of Public Health, Curtin University, Australia*
[c] *School of Engineering, Computing and Mathematics, University of Western Sydney, Australia*
[d] *Faculty of Health Sciences, University of Queensland, Australia*

**Abstract.** This paper reports on a national study of the present approaches in Australian tertiary education, to preparing future clinical health professionals to work competently in an increasingly e-health enabled healthcare sector. The argument for increasing clinical health professionals' knowledge about e-health and health informatics has been advanced repeatedly over past decades in Australia and elsewhere. However, peer-reviewed accounts of good practice in implementing and evaluating e-health education in health profession degrees anywhere are scarce. Our study reports on surveying approximately 100 degree coordinators in 40 clinical health professions in 30 universities across Australia. It finds that currently, teaching and assessment of future clinical health professionals does not ensure that Australia will have a clinical workforce that is adequately professionally empowered to work with e-health. This paper provides important baseline data for planning improvements to e-health education for Australia's future clinical health professionals.

**Keywords.** education, e-health, health professions

## 1. Background and Concise Literature Review

Future clinical health professionals will need to be able to work competently with information and information technology in an increasingly e-health enabled healthcare sector. Clinical health professionals are those that are involved in observing and treating patients directly. The argument for increasing clinical health professionals' knowledge about e-health and health informatics has been advanced repeatedly; see [1] for a recent Australian example and [2], [3] for contemporary international perspectives.

The e-health education of entry-level clinicians in the health professions appears not to be keeping up with current trends and demands for the changing technological environment in which they work, especially e-health innovations. Previous qualitative

accounts have documented cases where university education did not equip clinical health professionals to work in a professionally empowered way with information and communication technologies in their workplaces [4], [5]. Indeed, there appears to be a need for a comprehensive review of e-health education, especially to strengthen implementation and evaluation of curriculum [6].

This paper aims to provide such an overview of e-health education for Australia's future clinical health professionals, across all professions, states and tertiary education institutions.

## 2. Methods

A survey, administered online, listed 10 statements, each with examples or prompts. A 7-point Likert scale measured the extent of agreement or disagreement with each statement (strongly disagree, disagree, neutral, agree, strongly agree, don't know, not applicable). Each statement also invited free-text comments or examples.

Based on the Australian and New Zealand Standard Classification of Occupations in medicine, nursing and other health professions [7], and on national university websites and technical college program handbooks, extensive efforts were made to identify the coordinator of every relevant degree, resulting in personal invitations to 400 prospective participants. They represented degrees in Medicine, Nursing, Allied Health, Complementary Therapies and numerous other clinical professions which prepared entry-level professionals at levels 6 through 10 of the Australian Qualifications Framework, i.e. Bachelor through to Doctorate degrees. 105 surveys were completed, during the second half of 2011 (incomplete surveys are not included in this total). The survey questions and information on the participating professions and educational institutions can be found in [8].

Descriptive statistical analysis of the quantitative survey data was automatically generated by the online survey tool. Thematic analysis of the qualitative data was based on four key questions that are founded on previous review of the literature [6]. As noted by Creswell on page 220 [9], 'the quantitative and qualitative data collection may be presented in separate sections, but the analysis and interpretation combined the two forms of data to seek convergence or similarities amongst results'.

## 3. Findings and Discussion

This section presents findings from the survey, grouped under the four key questions and accounting for a representative cross section of the data. Example quotes chosen from the survey responses are included to illustrate various viewpoints from a range of professions, with the actual participant number shown as PXX.

### *3.1. Why do health professionals need to be competent in e-health?*

Survey participants were asked whether the professional / industry body that accredits their degree program required that at least some aspects of e-health are included in learning, teaching and assessment. **31.5%** of the participants agreed. **38.1%** of the participants disagreed.



- Accreditation body requires inclusion of e-health in learning, teaching and assessment:
  *"It is required that students demonstrate an awareness of electronic record storage - in the competency based outcome standards".* Speech Pathologist, P104
  *"The Bachelor of Nursing at SNM 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, P61
  *"Guidelines for curriculum content and accreditation requirements contain specific statements about the inclusion of e-health*". Behavioral and Social Sciences, P1
- Accreditation body does not require inclusion of e-health in learning, teaching and assessment:
  *"There is no explicit statement in the list of Standards and Elements on e-health in the Australian Physiotherapy Council accreditation requirements, however, e-health may be seen as imbedded within some of the standards eg. operate effectively across a range of settings; participate in quality improvement processes".* Physiotherapist, P96
  *"This is not stated specifically by the accrediting body".* Occupational Therapist, P8
  *"Not one of their criteria, but it is expressed in discussion".* Medical Practitioner, P24

This suggests that if the accrediting body does not include statements on e-health competencies, it may not be specifically addressed in curriculum and assessment. Thus, students may not receive formal education in this area.

When participants were asked whether the major employers of their graduates expected some aspects of e-health to be included in their degree, **61.9%** of the participants agreed and **21.9%** of the participants disagreed.

- Employers expect graduates to be competent in e-health:
  *"Graduates would be expected to be able to access all forms of electronic information regarding patient records and care*". Medical Practitioner, P89
  *"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, P88
  *"Our students would be required to know how to use patient records, how to access and undertake reviews of the literature".* Dietitian /Nutritionist, P29
- Employers do not expect graduates to be competent in e-health:
  *"Major employers require content & skill knowledge but not necessarily e-health capability. However, by the time our distance students graduate they have good e-technology skills".* Clinical Psychologist, P2
  *"Very little technology, apart from those who go into health placements and employment pathways, is required of social workers when compared with other disciplines. e-health notes and statistics would be the major requirement for hospital-based students. Child protection requires knowledge and use of client information systems".* Social Worker, P95
  *"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, P77

There is a divide between the accreditation requirements of degrees and the employer expectations of graduates.

### 3.2. What does it mean for a health professional to be competent in e-health?

Participants were asked whether they use independent expertise to support decision-making about learning, teaching and assessing e-health in the degree. While **20.9%** of participants agreed, **49.5%** disagreed.

- Academics utilise external resources/expertise to support decision-making:
  *"Yes we use info from NEHTA [National E-Health Transition Authority]".* Dietitian, P100
  *"E-technology consultant employed within the school".* Nurse, P79
  *"We are discussing content with other e-health academics".* Public Health professional, P94
- Academics not utilising external resources/expertise to support decision making:
  *"We have not yet included specific aspects in curriculum design*". Occupational Therapist, P84
  *"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, P91
  *"No external expertise has been called upon at this point in time".* Social Worker, P95

This may indicate a lack of awareness of key resources on e-health competencies amongst those responsible for curriculum change.

### 3.3. How can we build e-health capability in students in the health professions?

Participants were asked two questions on this issue, one about the curriculum content of the degree program and the other about teaching methods and whether they addressed e-health. While **83.8%** of participants agreed, **9.6%** disagreed that e-health is included in their curriculum content.

- Curriculum content addresses e-health:
  *"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, P13
  *"Evidence-Based practice, Communication, Clinical Decision Support systems, Professional Experiences in actual health care agencies".* Nurse, P61
  *"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, P32
- Curriculum content does not address e-health:
  *"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, P22
  *"We cover evidence-based learning of psychological skills, knowledge & research, but nothing is specifically related to "e-health".* Psychologist, P4
  *"Only limited specific discussion of evidence based practice however would not include this as part of e-health or informatics".* Nurse, P81



Many participants stated that Evidence-Based Practice was a key part of the curriculum. This may reflect a misconception that this is a sufficient way to address e-health in the curriculum.

**51.4%** of participants agreed that the teaching methods used in the degree program address at least some aspects of e-health. **28.6%** of participants disagreed.

- Teaching methods address e-health:
  *"Students have access to remotely located guest lecturers who present using teleconferencing".* Nurse, P15
  *"Guest speaker from the State Government Perinatal Data Collection Unit".* Midwife, P80
  *"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, P69
- Teaching methods do not address e-health:
  *"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, P4
  *"The teaching methods to date do not use telehealth or other methods".* Dietitian/ Nutritionist, P90
  *"Not at this stage, again as above it's a new program and we are looking towards doing this".* Dietitian, P55

There seems to be no clear view of what methods are effective for teaching e-health to future health professionals.

### 3.4. How can we assess the e-health capability of students in health profession degrees?

Participants were asked whether the assessment strategies in their degree program addressed some aspects of e-health. **30.5%** of participants agreed and **43.8%** disagreed.

- Assessment addresses aspects of e-health:
  *"Our assessment strategies are always aligned with our learning objectives and so yes some of our strategies will address some aspects of e-health".* Medical Imaging Professional/Radiographer, P88
  *"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, P53
  *"Not a subject of an assessment item. Some components of public health essays may touch upon e-health as a component of a question or as part of an answer".* Medical Practitioner, P89
- Assessment does not address aspects of e-health:
  *"There are no assessment strategies in this degree program which include this area".* Massage/Musculoskeletal/Myotherapist, P6
  *"Our assessment strategies do not address anything related to e-health".* Psychologist, P4
  *"Our students use electronic records in our clinic however they are not assessed on them".* Chiropractor, P102

The absence of assessment strategies related to e-health in these degree programs makes it hard to judge whether future health professionals have gained competence in this area.

## 4. Conclusion

At present we cannot be confident that Australia is equipping its future clinical health professional workforce to be competent in e-health. This may come as a surprise to public and private sector investors in e-health, and indeed to the general public.

Although there may be pockets of good practice within particular professions or institutions, this study has sought to take a broad view across universities, professions and levels of qualification. The current teaching and assessment of future health professionals is mostly inconsistent and informal, and as many as 80% of those surveyed lack confidence in the adequacy of e-health inclusion in their curricula. Based on these findings, more needs to be done to educate future clinicians.

In order to make significant improvements to the e-health education of future clinical health professionals in Australia, considerable efforts are needed to develop e-health expertise among academic teaching staff and to develop curriculum resources for teaching and assessing e-health competence. Accordingly, these findings are part of a larger project [10] to encourage and support Australian universities to include e-health curriculum where it is not yet in place, and to engage in collaborative continuing improvement where it is.

## References

[1] Smith, S.E., Drake, L.E., Harris, J.G., Watson, K., & Pohlner, P.G., Clinical Informatics: A Workforce Priority for 21st Century Healthcare, *Australian Health Review,* **35** (2011), 130-135.
[2] Hersh, W., The Health Information Technology Workforce: Estimations of Demands and a Framework for Requirements, *Applied Clinical Informatics*, **1** (2010), 197-212.
[3] Eldredge, J.D., Morley, S.K., Hendrix, I.C., Carr, R.D., & Bengston, J., Library and Informatics Skills Competencies Statements from Major Health Professional Associations, *Medical Reference Services Quarterly*, **31** (2012), 34-44.
[4] Gray, K., & Sim, J., Factors in the Development of Clinical Informatics Competence in Early Career Health Sciences Professionals in Australia: A Qualitative Study, *Advances in Health Sciences Education*, **16** (2010), 31-46.
[5] Nagle, L. Everything I know about Informatics, I didn't Learn in Nursing School, *Nursing Leadership*, **20** (2007), 22-25.
[6] Gray, K., Dattakumar, A., Maeder, A., Chenery, H., Educating Future Clinicians about Clinical Informatics: A Review of Implementation and Evaluation Cases, *European Journal of Biomedical Informatics*, **7** (2011), 48-57.
[7] Australian Bureau of Statistics, Australian and New Zealand Standard Classification of Occupations. (2009). Available from http://www.abs.gov.au/ausstats/abs@.nsf/mf/1220.0
[8] Dattakumar, A., Gray, K., Chenery, H., Butler-Henderson, K., & Maeder, A., E-health education for Australia's future health professionals: a discussion paper (2012).
[9] Creswell, J.W., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, Sage Publications, USA, 2009
[10] Clinical Informatics Education, Coordinated Interprofessional Curriculum Renewal for e-health capability in clinical health professional degrees. (2012). Available from http://clinicalinformaticseducation.pbworks.com

*Health Informatics: Building a Healthcare Future Through Trusted I*
*A.J. Maeder and F.J. Martin-Sanchez (Eds.)*
*IOS Press, 2012*

*doi:10.3233/978-1-61499-078-9-39*

# Influencing factors fo personal health reco

Karen DAY and Yulong C
*National Institute for Health In*
*The University of Auckla*

**Abstract. Background** This paper reports on a s investigated factors influencing the adoption of Persona with specific reference to those linked to Electronic H conditions are a growing concern in healthcare delivery services outstrips resources. PHRs could be useful i people with long term conditions, e.g. diabetes. **Meth** Theory approach to gather initial data to inform future we were guided and informed by data collected.[1] The for PHR research using the Technology Acceptance emerging topics will be pursued with constant compari subsequent studies. We interviewed ten patients from a practice who had been using a PHR linked to their doct System, and observed them using and navigating the s Three groups of factors appeared to influence the partici Their perception that convenience, time saving (for personnel and their GP), efficiency and effectiveness of PHR. (2) Computer and health literacy contribute to be the PHR. PHR usage impacts positively on the relation vice versa, and improves their ability to navigate the h clear how PHR-related services are paid for, whe circumstances. **Discussion** These findings are in keepin al[3] who indicate that patients are interested in viev results, medicines and diagnosis lists, and ordering corresponding with their clinicians. Literacy does mat PHRs providing a transparent 'source of truth' and mem laboratory results and diagnoses. The combination of co requires further research. The cost of incorporating PH needs to be articulated so that it makes sense in the model. **Limitations** of this research include the small s small context and self-selection into the interview co groups of influencing factors have been elicited observations to indicate potential acceptance and adopti long term conditions. The next step is to examine the s term conditions and how PHRs support self-care.

**Keywords.** personal health record, self-care, chronic illn

## Introduction

More and more people are developing long-term conc develop combinations of conditions that result in comple As clinical resources diminish and the rate of long t