



UNSW
THE UNIVERSITY OF NEW SOUTH WALES

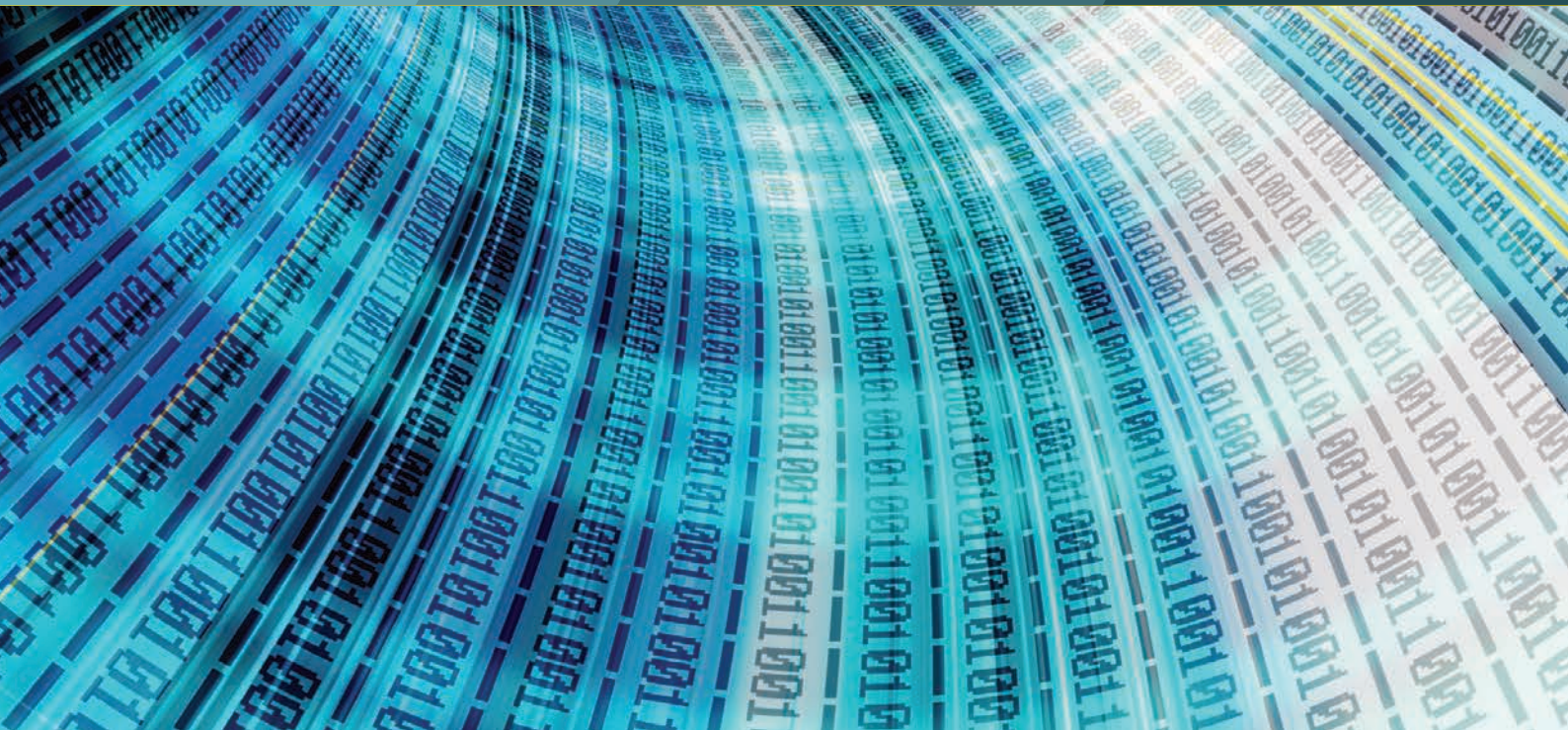
Centre For Health Informatics 2012

& NHMRC Centre of Research Excellence in
Informatics and e-Health (CRE)

Never Stand Still

Medicine

Centre For Health Informatics



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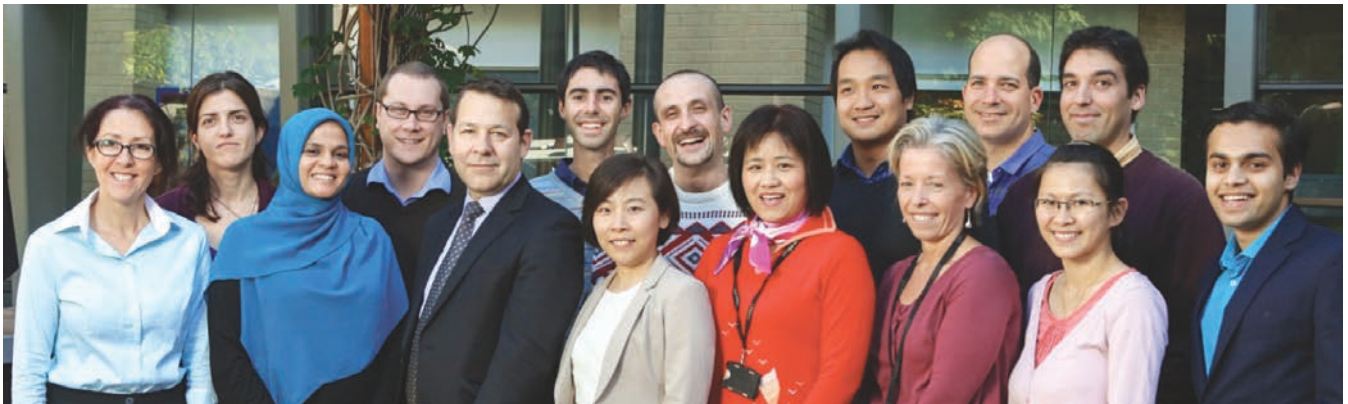
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What we do



From left to right: Denise Tsiros, Dr Blanca Gallego Luxan, Dr Farah Magrabi, Dr Adam Dunn, Prof Enrico Coiera, Dr Filippo Galgani, Dr Ying Wang, Dr Oscar Perez Concha, Dr Xujuan Zhou, Angus Liu, Jackie Mullins, Dr Guy Tsafnat, Dr Miew Keen Choong, Dr Amael Arguel, Agam Misra.

The Centre for Health Informatics (CHI) is Australia's oldest and largest academic research group in e-health and informatics. **CHI conducts fundamental and applied research in the design, evaluation and application of information and communication technologies for healthcare and the biosciences.** Building a sustainable health system for the 21st Century will require the reinvention of much of the present day system and require the intelligent use of these technologies to deliver high quality, safe, efficient and affordable healthcare.

The Centre's work is internationally recognised for its groundbreaking contributions in a number of areas including clinical communication, the impact of information technology (IT) on patient safety, evidence-based decision support technologies for consumers, clinicians and translational bioinformatics.

A research centre of the University of New South Wales and part of the Australian Institute of Health Innovation, CHI is supported by the UNSW Medicine and we have partnered with major healthcare providers, research institutions and government.

CHI aims to drive change in healthcare and biomedicine by making contributions to:

Science

Break-through discoveries in information, communication, cognitive and organisational science needed to support health service innovation at a systems level.

Policy

Providing expert input and leadership into government, shaping policy priorities and goals.

Innovation

Invention of novel technologies and methods that can be transferred into industry and health services.

Education

Training future researchers through research degree programs to educate clinicians, technologists and policy makers in health informatics.

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Director's Report

By Prof Enrico Coiera

For many decades health and biomedical informatics has seemed to be a specialized endeavor, something for the backroom, for the 'techies', and not really as important as 'basic' biomedical research. Those of us in the discipline always knew it to be otherwise, given that our primary research goal was nothing less than to refashion, from its foundations the way healthcare is delivered. The last few years have seen what we always knew became mainstream. Along with the realization that health services research is an absolute requirement for any modern health system, quickly follows, the recognition that informatics underpins much of this endeavor.

Internationally governments everywhere are trying to find ways of improving the effectiveness of their investment in healthcare. Many, such as the UK and the US, have invested heavily in e-health. While this should be a positive turn of events, most have also struggled to turn that investment into tangible improvements. The reason for the current failure of much 'nation scale' e-health is simple – **governments too often ignore research and the guidance of the evidence it has produced** – and instead charge ahead with technically driven projects. Australia is no exception in this matter, with our national Personally Controlled Electronic Health Record (PCEHR) a classic example of a top down and technically driven system design. Perhaps it is necessary for these expensive mis-steps to occur. Governments of all persuasions must learn the much needed lessons about the complexity of healthcare, and the challenges of implementing a complex intervention such as e-health into an equally complex health delivery system.

What is clearly also necessary is for researchers in e-health to step up to the national debate. It is no longer sufficient to simply do good research and publish the results.



Prof Enrico Coiera, Director

We need to ensure that when policy decisions are made, that they are shaped by the research evidence. This means that we need to become advocates for the evidence when decisions are made. Universities have a privileged role, where we are relatively independent of commercial or political agendas, and so must "speak truth to power", no matter how uncomfortable that sometimes is.

One area in which we have been quite vocal over the last few years has been the safety of e-health. It is clear that e-health, when it is well done, saves lives and saves money. It is also clear that when it is poorly designed, built, implemented or used, it also has the power to harm. We have been advocating, nationally and internationally, the need to monitor e-health systems to ensure they do no harm, and to improve the design, implementation and training in safe use for these systems. For much of the last decade there has been much resistance to these ideas, but this year has seen e-health safety become a mainstream concern. In the USA, the Institute of Medicine (IOM) recently published a very influential report on this issue, and we are pleased to see that our local research was one of the major sources drawn upon by the IOM. In Australia, again in response to our advocacy, the PCEHR now has a clinical governance structure in place to oversee safety, a small but important next step in our local response to this critical issue.

Director's Report

This year saw the kick off for our new NHMRC Centre for Research Excellence in e-health (CRE), and one of its three programs is devoted to e-health safety. Although very modest in terms of funding, we believe our determination to monitor and understand why e-health leads on occasion to patient risk or harm is essential, given there is currently a national vacuum in this area.

On more local matters, CHI now has a strong set of mid career research leaders, all directing their own individual research programs. It is very pleasing to see this next generation of research leaders begin to make their mark, both in building up new teams under their leadership, as well as making important contributions to the science and practice of informatics in healthcare.

We continue to perform strongly as a Centre in attracting Category 1 grant funding. In 2012 we were awarded two new NHMRC project grants, as well as a share in a new NHMRC Program Grant in Implementation Science.

The two new project grants are particularly significant as both were first time awards to research fellows Dr Blanca Gallego Luxan and Dr Adam Dunn – 'harbingers', we are sure of many more to come from both of these exciting researchers.

UNSW and the UNSW Medicine continue to be supportive of our work with salaries and NHMRC salary top-ups. We were successful in receiving \$98,000 for a Medical Research Equipment and Infrastructure grant to extend our computational cluster as well as \$40,000 in Goldstar awards for near misses in the competitive grant NHMRC 2011 rounds. UNSW provides us our infrastructure support as part of the Australian Institute of Health Innovation.

Key Performance Indicators

The Centre for Health Informatics (CHI) was **awarded multiple new grants and contracts in 2012.**

- › National Health & Medical Research Program grant, \$10.8 million (see picture below) CHI to receive over \$360K per year for the next 5 years
- › NHMRC Project: Dynamic prediction of hospital length of stay, re-admission and death, \$312,069, 2013-2015, (Gallego Luxan, Hillman, Martin-Sanchez)
- › NHMRC Project: Using collaboration networks to measure bias and inefficiency in the production and translation of evidence about cardiovascular risk, \$214,182, 2013-2014, (Dunn)
- › NHMRC, Early Career Fellowship, \$299,564, 2013-2016, (Ong)

Contracts include:

- › National eHealth Transition Authority (NeHTA), \$175,000, 2012, (Coiera, Magrabi)
- › National Prescribing Service (NPS) \$200,000, 2012 (Coiera, Tsafnat)

In 2012 our research generated **51 publications**, which included 32 peer-reviewed journal articles, 1 book, 3 book chapters, 3 conference abstracts, and 6 peer reviewed conference papers.

Our research staff was invited and gave keynote conference presentations:

Coiera E. Keynote, Interruptions, multitasking, error. The Australasian Conference on Error in Medical Imaging, 17 November 2012, Melbourne, Victoria.

Coiera E. Invited address, E-health. 2012 iFHP Executive Development Programme, 2 May 2012, Sydney, NSW.

Coiera E. Opening keynote address, E-health heresy. Innovation Series: Sustainable healthcare solutions, 27 March 2012, Sydney, NSW.

Coiera E. Opening keynote address, SoMe Ehealth Heresy. Social Media in Healthcare Conference, 5 May 2012, Sydney, NSW.



The Chief Investigators at the announcement of the NHMRC program grant's success: from left to right, Prof Bill Runciman, Prof Ken Hillman, Prof Jeffrey Braithwaite, The Hon Tanya Plibersek, Minister for Health, Prof Johanna Westbrook, Prof Enrico Coiera and Prof Ric Day.

Key Performance Indicators

Lau A. Invited address, *Healthy.me: an online research platform to support patient journeys and engagement with health services*, South West Sydney Clinical School Liverpool Hospital, March 2012, Sydney, NSW.

Lau A. Invited address, *How e-Health Affects the Way Consumers Make Decisions and Manage Their Health - Results from multiple empirical studies*, eHealth Conference at CeBIT Australia, 23 May 2012, Darling Harbour, Sydney, NSW.

Lau A. Invited address, *How e-Health Affects the Way Consumers Make Decisions and Manage Their Health - Results from multiple empirical studies*, e-Health and dietetics: The art and science of practising dietetics online - 16th International Congress of Dietetics, September 2012, Sydney, NSW.

Magrabi F. Invited address, *Automated identification of patient safety incident reports*, WHO Expert Consultation Information Models for Patient Safety Incident Reporting, September 2012, Tokyo, Japan.

Magrabi F. *Ensuring patient safety without stifling innovation*, Social Media in Healthcare Conference, 24-25 May 2012, Sydney, NSW.

Magrabi F. *Health Informatics to Improve Patient Safety*, Monthly seminar of the Engineers Australia Sydney Division, Southern Highlands & Tablelands Regional Group, May 2012, Mittagong, NSW.

Magrabi F. *Innovating with information technology*, University of Malaya – Curtin University, Summer School on Health Innovation, December 2012, Kuala Lumpur, Malaysia.

Magrabi F. *Patient Safety and Health Information Technology*, American Medical Informatics Association, 10x10 professional development course on patient safety and health information technology (HIT), November 2012, Chicago, USA.

Magrabi F. *The TechWatch Study: Monitoring e-health incidents in general practice*, 10th Measuring & Reducing Avoidable Adverse Events, September 2012, Sydney, NSW.

Tsafnat G. Invited address *Understanding Plasmids with Mobile Genetic Element Grammars*, 2nd Annual World Congress on Cellular and Molecular Biology, 18-20 May 2012, Beijing, China.

MEDIA

In 2012 CHI researchers again featured heavily in the press and news including:

Remove industry bias from clinical trials before it's too late. Dunn A, 12 December 2012

<http://theconversation.com/remove-industry-bias-from-clinical-trials-before-its-too-late-11242>

Pharma's influence over published clinical evidence. Dunn A, 4 April 2012

<http://theconversation.com/pharmas-influence-over-published-clinical-evidence-5325>

Why clinical research should be freely exchanged. Dunn A, Coiera E. 4 May 2012. *Sydney Morning Herald's National Times*.

<http://www.smh.com.au/opinion/society-and-culture/why-clinical-research-should-be-freely-exchanged-20120503-1y0v3.html>

More tests vital for health IT. Coiera E, Magrabi F. 2 December 2012. *Sydney Morning Herald*.

<http://www.smh.com.au/action/printArticle?id=3856330>

The Sydney Morning Herald printed a summary of our research on open source clinical trial data, 3 May 2012

Interview: ABC National TV news 16 April 2012
National e-health clinical safety governance news item following on from MJA editorial.

Interview: A Current Affair Channel 9
"Cyberchondria" 25 September 2012
<http://aca.ninemsn.com.au/article.aspx?id=8538315>

Interview ABC radio Newcastle with Jill Emberson,
Test orders on day of discharge, 15 August 2012

PRESS CLIPPINGS

Now where was I? Fight Safety Australia, 89:14-19 (2012);

The sterile hanger Fight Safety Australia, 89:46-49 (2012);

Online data to “transform medicine”, Medical Journal of Australia, InSight 29 October, 2012;

e-Health records: Beware of assumed benefit Medical Journal of Australia, 2012; 197 (6): 319.

The Wicked complexity of Healthcare IT, Pulse+IT, 16 July 2012;

E-health records’ security at risk, *Sydney Morning Herald*, the Age, June 19, 2012;

Researchers call for clinical data to be open source, The Australian, May 4, 2012;

Concerns for patient safety with e-records, Sydney Morning Herald, the Age 15 April 2012;

Experts warn about e-health safety, The Australian, 15 April 2012;

Doubts e-health record launch will deliver. Medical Observer 14 February 2012;

The 2012 Archives of Internal Medicine paper ‘Last Orders’ looking at follow up of hospital test results ordered on the day of discharge went ‘viral’ internationally with over 330 media mentions internationally, as well as significant social media pick up. It was covered in major newspapers (including Bloomberg Business Week, Reuters, le Figaro, *The Sydney Morning Herald*, *Australian Doctor*, *Pulse IT*), in online news sites (including Fox News, CNBC, Yahoo news, Health Day, Medline Plus, ehealthspace.org, healthfinder.gov), and received well in excess of 200 Twitter mentions.

Research Funders

We are grateful to our partners and funders for their ongoing support of our research programs, CHI’s research is supported by the following organisations and we are also grateful to the UNSW Medicine for their ongoing support.

National Health and Medical Research Council (NHMRC)

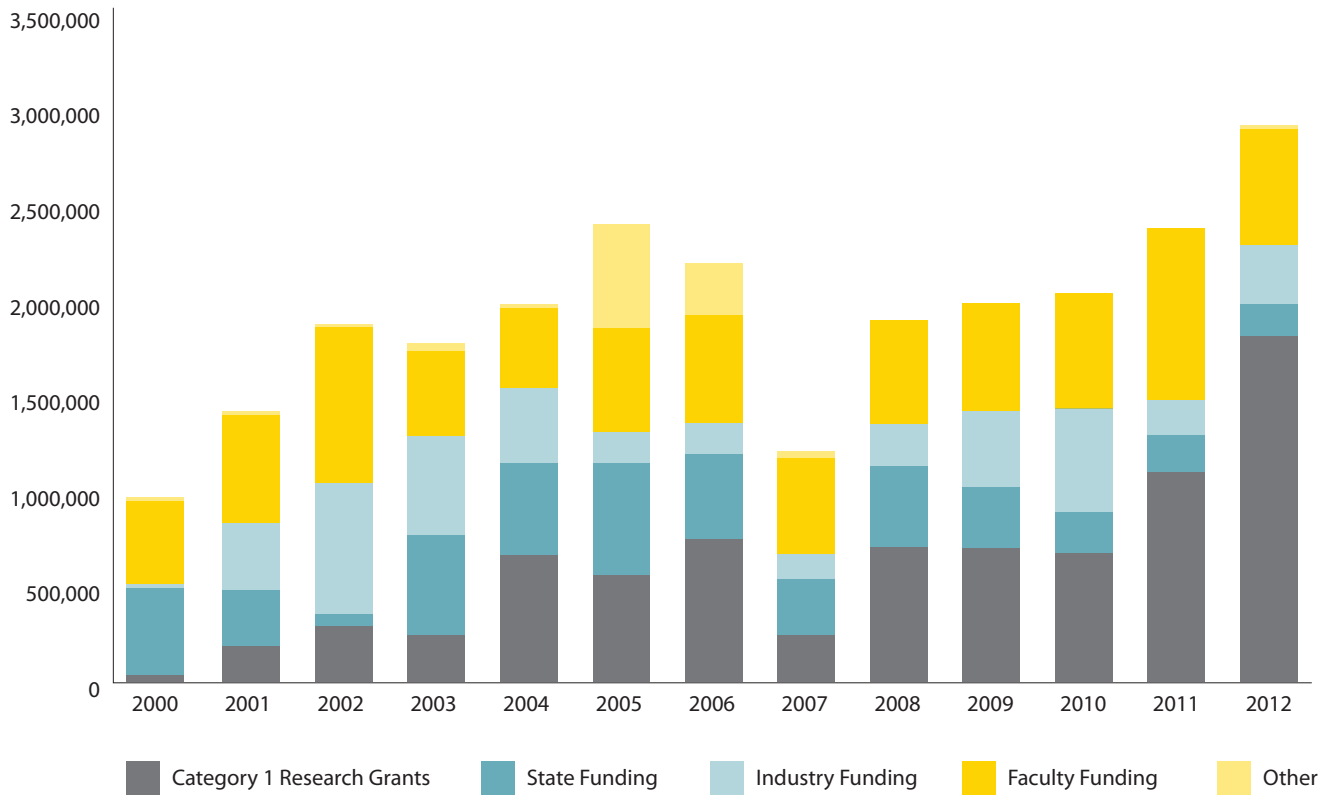
NSW Ministry of Health

National e-Health Transit Authority (NeHTA)

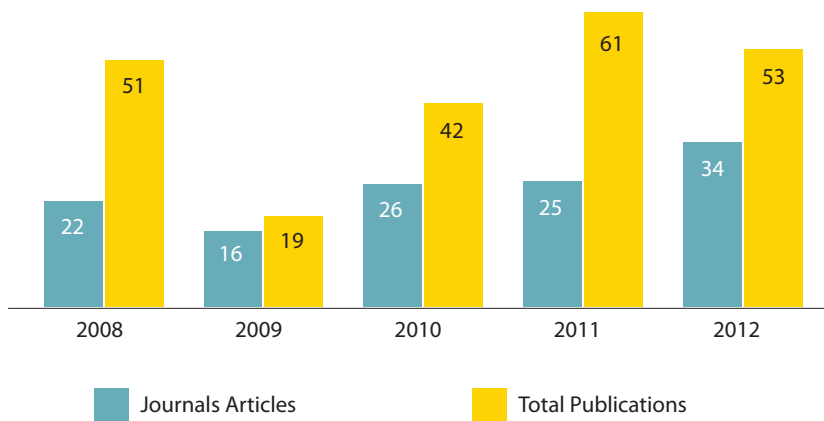
National Prescribing Services (NPS)

Key Performance Indicators

CHI 2000-2012 Funding Sources



Publications output and headcount 2008-2012



Collaborators

The Centre's national and international collaborators include:

NATIONAL

Australian Commission on Safety and Quality in Health Care (ACSQHC)

Australian Patient Safety Foundation, South Australia

Blackdog Institute, UNSW

Centre for Clinical Governance Research in Health, Australian Institute of Health Innovation, UNSW

Centre for Infectious Diseases and Microbiology, Westmead Hospital, NSW

Centre for Health Systems and Safety Research, Australian Institute of Health Innovation, UNSW

Centre for Primary Health Care and Equity, UNSW

Centre for Research on Evidence Based Evidence, Bond University, Queensland

Clinical Excellence Commission, NSW

Flinders University, South Australia

The George Institute, Sydney

The Kirby Institute, UNSW

Prince of Wales Hospital, Sydney

St Vincent's Hospital, Sydney

School of Computer Science and Engineering, UNSW

School of Public Health and Community Medicine, UNSW

Simpson Centre for the Health Services Research, Australian Institute of Health Innovation, UNSW

South Australia Health

South Western Sydney Local Health Network, Cancer Services

Sydney South West Area Health Service, General Practice Unit

University of Adelaide, SA

University of Melbourne, VIC

University of Sydney, Sydney

University of Technology, Sydney (UTS)

University of Western Sydney, NSW

UNSW Counselling and Psychological Services, UNSW

UNSW Health Service Clinical Research Unit for Anxiety and Depression (CRUFAD), UNSW

Westmead Hospital, Sydney

INTERNATIONAL

Aalborg University, Denmark

Harvard Medical School, USA

Hospital for Sick Children, Toronto, Canada

Indraprastha Institute of Information Technology (IIIT), Delhi, India

Johns Hopkins University, USA

University of Applied Sciences

Weihenstephan Triesdorf, Bavaria

NHMRC Centre for Research Excellence in Informatics and e-Health

The NHMRC Centre for Research Excellence (CRE) in e-health commenced operation in 2012, and will run for an initial five years. Investigators in the CRE come from UNSW, Bond University, Sydney University and the University of South Australia. Prof Coiera directs the \$2.5 million CRE, for which the program work includes new collaborative research between the Centre for Health Informatics at UNSW and its two partner Universities. The other lead investigators of the CRE are Prof Paul Glasziou (Bond), Prof Siaw-Teng Liaw (UNSW), Dr Vitali Sintchenko (Sydney), Prof Bill Runciman (South Australia), Dr Farah Magrabi (UNSW) and Dr Blanca Gallego Luxan (UNSW).

The CRE targets major evidence gaps in the safety and quality of clinical and consumer e-health systems.

It also intends to contribute robustly to national e-health policies, and urgently build national capacities in e-health research to meet current and emerging national health priorities. The CRE is conducting a collaborative research program with three major aims, where research evidence is urgently needed, and opportunities for translational impacts are high:

Aim 1 – A national e-health incident monitoring system: To monitor the safety and quality of e-health implementations as they roll out nationally, the CRE is developing, and will in the early stages operate, a national e-health critical incident system. Analysis of incident reports can generate critical alerts for government, vendors, clinicians and the community, as well as contribute to the development of an international classification of information technology (IT) related incidents, and theoretical and empirical models of IT failure.

Aim 2 - Consumer e-health trials: Despite the growing national investments in consumer personal health record systems, we know little about their impact on health outcomes, or the types of errors that are associated with their use. Given the importance of disease prevention and self-management in the chronically ill, the CRE is trialling a consumer e-health system to measure its potential impact on outcomes and / or service utilisation.

Aim 3 - Evidence-based decision-support: Whilst current clinical decision support systems typically improve clinical decisions overall, there are significant risks that clinicians can be misled in certain settings or circumstances, which can lead to making poorer decisions. The CRE is developing the next generation in evidence-based decision support technologies, engineered to minimise risks within the current systems that can mislead users, or fit poorly into practice. The CRE will also pioneer the use of these technologies to support systematic review teams.

The CRE is offering an **integrated training program**, in partnership with AIHI, to attract and retain the 'best and brightest' to a career in e-health research, and to support these individuals from their time as doctoral candidates through to helping mid-career postdoctoral research fellows become established and independent research leaders. The CRE wishes to make excellence in doctoral candidate support a defining feature of its contribution. It has established a *formal doctoral program in e-health and health informatics research* to provide both specialised topic specific training as well as a general core set of skills in research methods.

Research Programs

Patient Safety Informatics

PROGRAM LEADER: DR FARAH MAGRABI

The safety of e-health

The risks which e-health may pose to patient safety are widely acknowledged but largely unexplored. Our program monitors e-health safety using reports of critical incidents and is developing automated methods for surveillance of IT systems. We are also investigating models for the safety governance of e-health.

The systematic analysis of patient safety incidents is well-established in medical practice. Incidents can trigger root -cause analyses in health services, or provide early warnings of unexpected drug reactions or infectious outbreaks. Our research extends these methods to incidents associated with e health (eg. patient harm due to a software error or difficulty in using software), and have pioneered this approach to develop methods internationally.

The goals of this work are to:

- › detect IT related incidents
- › develop a robust classification for these IT incidents
- › use our classifications to track the evolving causes of IT-related harm in Australia
- › promulgate the classification internationally.

We are currently working with state health departments in New South Wales and South Australia, and we plan to extend our work to the other states and territories to track IT incidents in hospitals nationwide. For general practice, we have developed a new incident-monitoring system called TechWatch which was deployed to general practitioners across Australia in 2012. Incidents can be reported to TechWatch <http://www.techwatch.unsw.edu.au/> either online or over the phone to trained operators.

Incident classification

Since 2009 we have analysed 1,385 IT incidents in Australia, the United States and the United Kingdom. The resulting classification systems have become the de facto international standard to detect and classify e-health incidents. By mid 2013, our classification had been used to examine 4,833 incidents (including by the US and the UK governments). In 2012 the Pennsylvania Patient Safety Authority used our classification to examine one of the largest repositories of incidents in the US, and issued a Patient Safety Advisory in December 2012 with specific recommendations for the procurement, implementation and use of IT systems. At the same time the ECRI Institute, a US federal patient safety organisation, used our classification to undertake an in-depth analysis of incidents nationally (called a *Deep Dive*[™]).

In the UK our classification system has been adopted by the National Health Service (NHS) in Wales and we are currently working with the Health and Social Care Information Centre in England to examine incidents from the English NHS, one of the largest civilian IT programs ever undertaken worldwide.

Research Programs

Automated identification of incident reports

Ten percent of admissions to Australian acute-care hospitals are associated with harm to patients (adverse events). The reporting of incidents (near misses and adverse events) by health professionals is now well established and the rate of reporting continues to increase. Current methods, which rely on retrospective manual review of incident reports, do not permit timely detection of safety problems and can no longer keep up with this growing volume of data. In New South Wales alone, more than 120,000 patient-safety incidents were reported in 2009. We are evaluating automated text classification methods to capture incident reports by type and risk rating.

Our goal is to track ten types of patient-safety problems nationally working with St Vincent's Hospital, Sydney, the NSW Clinical Excellence Commission and South Australia Health.

Working with the Australian Commission on Safety and Quality in Health Care (ACSQHC) we have shown that text classifiers based on simple machine-learning techniques such as naïve Bayes and support vector machines can be effective in automatically identifying incidents in two priority areas – clinical handover and patient identification. More recently we have shown the feasibility of using this technique to identify IT related incidents.

Automated surveillance of IT systems

Currently, most safety problems are detected when health professionals report incidents.

Since they are not expert in technology, many software problems either go undetected, or are detected only after an adverse event. Moreover, clinical IT systems are made up of multiple disparate components which interact to produce new emergent behaviours that only become evident after they are deployed in the real world. Based on syndromic surveillance methods used for the early detection of disease outbreaks, our research monitors IT systems in real time to early detect any software or user generated errors in clinical information that might lead to an adverse event. Our goal is to develop a surveillance framework for the early detection of e-health-related adverse events, to minimise risks to patient safety. Specifically, the research aims to develop:

- › fault-detection methodologies to facilitate automated detection of e-health-related adverse events in real time
- › intelligent predictive models to forecast potential future e-health-related adverse events.

e-health safety governance

Historically e-health or clinical software systems have not been subject to regulation – unlike software embedded in medical devices (an ECG system, for example). Moreover, little evidence is available to shape regulations and governance strategies for e-health. The goal of this part of our research are to investigate models for the governance of e-health.

Most recently we led, with colleagues from the UK, the US and Europe, a comparative review of the safety governance for e-health in six countries – Australia, the US, England, Canada, Denmark and The Netherlands. The review examined a broad range of national initiatives including guidelines, standards, certification, regulation and incident monitoring, and found significant gaps in the safety governance of e-health. We are currently working with the Australian Commission on Safety and Quality in Health Care to review the international evidence about the monitoring of, and response to, clinical incidents associated with e-health.

Modelling and Simulation in Health

PROGRAM LEADER: DR BLANCA GALLEGO LUXAN

Stream 1: Patterns of Patient Safety in Hospitals

When patients go to hospital, they expect to receive high levels of safety and care at all times. However, it is well known that hospital stay is sometimes associated with harm. In this research project, we are using administrative datasets and Electronic Health Records (EHR), to identify which groups of patients are at high risk of harm.

Incidence and Impact of adverse events in hospitalised patients

Retrospective analyses of hospital admissions in several countries have revealed significant rates of adverse events. These rates vary depending on event definition, sample size and measurement methods. The effect of these adverse events on mortality and morbidity is also widely recognised although quantitative estimates and preventability remain controversial. In this study we aim to answer the following question: If a patient is admitted to hospital for a specific reason and experiences a potentially preventable adverse event, what is the increase in the risk of death and does this excess risk continue after discharge?

Are hospitals less safe during the weekends and nights?

Hospitals function differently on the weekends, mainly due to lower staffing levels, the use of locum staff, and unavailability of some tests or procedures. It has also been documented that junior doctors feel clinically exposed at weekend and night shifts, and that hospital governance is worried about covering these shifts. In this study we analyse patterns of excess mortality following weekend/night admission to identify which patients are more affected by poorer quality of care at hospital and which reflect lack of community support. We propose solutions which can improve the quality of care offered to patients on weekends and nights both in the hospital as well as in the community.



Research Programs

Stream 2:

Predictive Models using Electronic Health Records

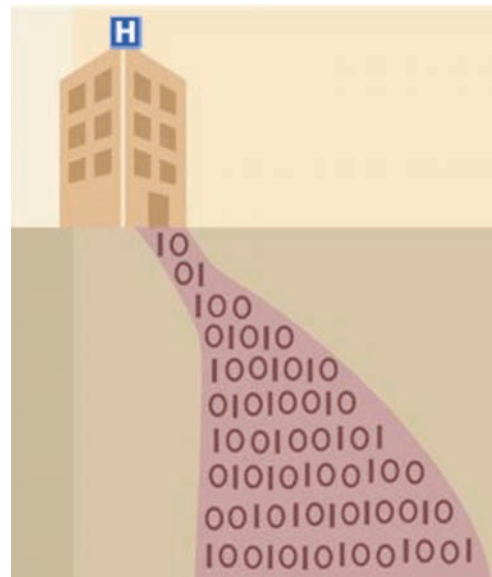
Healthcare systems are under increasing pressure to improve the appropriateness and efficacy of current patterns of care. The rapid growth in Electronic Health Record data has generated an unprecedented source of information. Appropriate use of this data has the potential to improve healthcare delivery making it safer and more cost-effective. This series of research projects focuses on the analysis of Electronic Health Records, in particular on their utility as predictors of healthcare delivery and patient outcomes.

Dynamic Prediction of hospital length of stay, re-admission and death

The aim of this project is to develop a predictive method that calculates days expected to be in hospital, days expected to live and days expected until next hospitalisation, in real time during a hospital admission. For each patient admitted to hospital, this method delivers an initial baseline prediction (and corresponding uncertainty) at the time of admission, followed by a series of updated predictions as new information becomes available, up to a final prediction of post-discharge mortality and readmission at discharge.

General Practitioners' response to non-acute severe conditions

One of the problems of lack of compliance with guidelines in general practice is an inappropriate response by doctors to conditions such as very high cholesterol, high blood pressure or uncontrolled glucose levels. Although not acute, these conditions pose serious short to long term risks to health. In this project we examine how Australian general practitioners respond to some of these conditions by looking at follow-up consultations, referral to specialists, prescription of new course of treatments or changes in existing treatments, and selected patient outcomes.



Querying Electronic Health Records to support clinical decision making

Existing methods for the development and practice of evidence-based medicine have well known important limitations. Some of these limitations can be addressed by comparing treatment outcomes using Electronic Health Records.

<http://www.healthinformatics.unimelb.edu.au/about/people/fms.html>

We are developing new methods to create "virtual cohorts" that allow clinicians to assemble a group of patients who are matched to their current patient, such historical cohorts can help in decision making when there is an absence of research evidence, for example when co morbidity is present.

Consumer Informatics

PROGRAM LEADER: DR ANNIE LAU

Our research program seeks to answer questions about the 'impact', 'design' and 'science' of consumer Information and Communication Technology (ICT) systems. Using our innovative e-health research platform *Healthy.me*, we continue to provide rigorous empirical evidence on how web-based and mobile applications affect the way patients and consumers make health decisions and manage their health.

The emergence of "Web 2.0" means that the Internet is no longer only being used to just search for information about diseases or treatments, but it is also being used to connect individuals previously unknown to each other (eg. via Twitter), and assist people to engage with their existing social networks (eg. via Facebook). Health-related social media interventions are now being developed but the efficacy of these interventions is still relatively unknown. In our research, we seek to investigate the impact of social media and online social networks on patients and consumers, and examine ways we can systematically manipulate the "crowd" around us to positively influence health behaviours and outcomes.

Encouraging self-management among people with asthma

Working with the Centre for Primary Health Care and Equity UNSW, we launched a randomised controlled trial examining the efficacy of our personally controlled health management system *Healthy.me* for patients' self-management of asthma.

People living with asthma are invited nationwide to use the web-based *Healthy.me* for 12 months to manage their condition.

We hypothesize that use of *Healthy.me* will increase their uptake of early intervention to prevent asthma exacerbation. This trial will test whether system use is associated with i) significant improvement in asthma control, ii) increased compliance according to the asthma cycle of care, iii) reduced unplanned utilisation of health services, and iv) reduced frequency of exacerbations. Participant recruitment is underway and the trial will continue into 2014.

Increasing uptake of STI screening among young people

Working with the Kirby Institute and the School of Public Health and Community Medicine UNSW, we have launched another randomised controlled trial examining the efficacy of *Healthy.me* on the uptake of sexually transmitted infection (STI) screening among young people. Young people (aged 18-29) are invited to use the web-based *Healthy.me* for six months to engage with peers, health services and health professionals to seek assistance for sexual health concerns. The trial will test specifically whether system use is associated with i) increased uptake of STI screening, ii) increased help-seeking behaviours for sexual health concerns, and iii) a positive change in the perceptions, attitudes, intentions or readiness towards seeking screening for STIs. Participant recruitment is in progress and the trial is due for completion at the end of 2013.

Research Programs

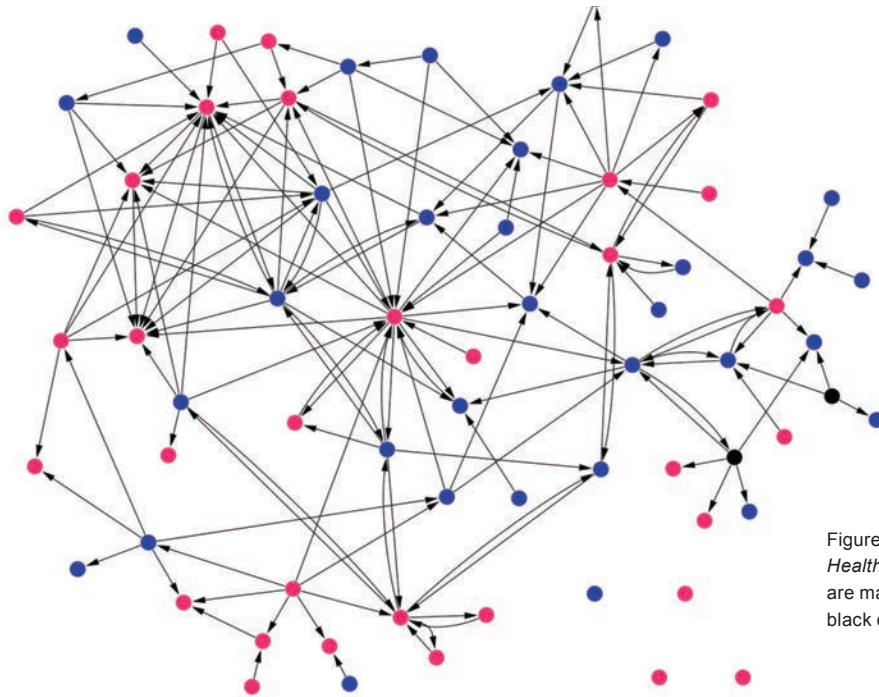


Figure 2: Online social networks of *Healthy.me* participants (blue dots are male, red dots are female, and black dots are general practitioner)

Mobile version of *Healthy.me*

Healthy.me is continuously under development, a mobile implementation of the system is being iteratively designed from its web-based version and a fully functional system is expected in late 2013. The mobile version of *Healthy.me* will be available in both the iOS and Android platforms. To our knowledge, this could be the first personally controlled health management system in Australia that provides consumers an integrated environment to manage their health in the mobile and web-based platforms.

Next steps

Plans for 2013-2014 include collaborating with the Royal Hospital for Women to assess the feasibility of the mobile version of *Healthy.me* for pregnant women diagnosed with gestational diabetes mellitus. Studies providing rigorous empirical evidence on how e-health, mobile applications, social media, and online social networks affect our health decisions, behaviours and outcomes will be conducted throughout the year.

In 2012-2013 we are delighted to have a number of highly motivated students joining our team. These include: Nathan Mortimer, Animesh Singla and Kevin Phang (UNSW Medicine), Marlene Biederer (Weihenstephan-Triesdorf University of Applied Sciences, Germany), and Liliana Laranjo (Faculdade de Medicina da Universidade de Lisboa, Portugal).



Figure 1: Mobile app of *Healthy.me*

Clinical Decision Support Systems and Translational Bioinformatics

PROGRAM LEADER: DR GUY TSAFNAT

Our program aims to help scientists and clinicians make better decisions more quickly. We are developing algorithms that automate the decision tasks typically performed by scientists and clinicians in their day to day tasks.

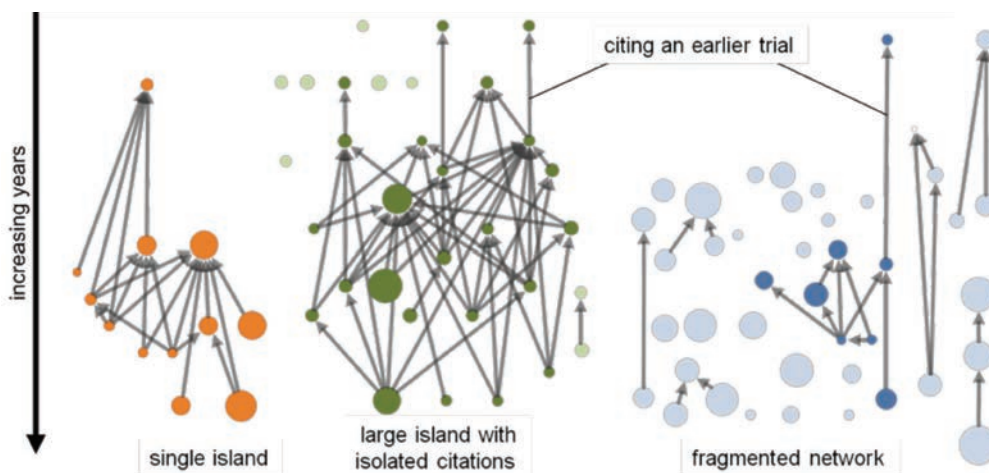
In collaboration with Centre for Research on Evidence Based Practice at Bond University and Johns Hopkins University we have studied citation networks of clinical trial literature (Figure). Findings from this study will serve as the foundation for an innovative approach to finding research literature without using keyword-based search (which often produces too many erroneous results to be useful), this is the first step in our plan to automate the retrieval and synthesis of research evidence.

We have established a relationship with Therapeutic Guidelines Australia, the premier producer of clinical practice guidelines who will be one of the first EBM organisations to trial our retrieval and automation technologies. TGA will help us test a range of technologies for automation and support of evidence reviewers and will share data with CHI.

The year has also seen the conclusion of a project funded by the National Prescribing Service which resulted in a novel tool to extract information from de-identified electronic medical records in primary care. Such records only include short text fields which are non-standard, often typed in haste and lack the contextual narrative which would normally be used by computers to extract meaning. The project developed the natural language processing tool LexiVar to group events in the data after correcting for typos, expanding acronyms and identifying synonyms. LexiVar enhances the internal consistency of large primary care datasets with millions of consultation, prescription and test orders and enables population-level analysis of such events.

Dr Filippo Galgani joined our team this year after being awarded his PhD from UNSW.

Mr Agam Misra has been awarded a Master of Philosophy degree from UNSW for his work on linking biomedical concepts with human genes to find novel associations between genes and diseases. Gene-disease association studies are at the core of biomedical research into human genetic diseases such as cancer, Alzheimer's disease, and diabetes. Agam was supervised by Dr Guy Tsafnat and Dr Miew Keen Choong.



Three archetypes of citation networks found in the evidence literature: one where all clinical trials cite each other directly or indirectly (left) make up 54% of the trials, networks where most of the trials are cite each other, but not all (centre) and rare networks with only very few trials cite each other (right) which make up only 4% of the literature.

Research Programs

Clinical Evidence Surveillance

PROGRAM LEADER: DR ADAM DUNN

Doctors rely on clinical trials and other studies to compare the safety and efficacy of the different treatments they offer to patients. Sometimes however treatments arrive on the market that are unsafe and lead to patient harm. Pharmacovigilance is a process that relies on doctors and patients reporting these unexpected harms. Our goal is to detect treatments that are risky in a different way: by tracking the biases in the research published about them. Using computational methods based on network science, we are looking for new 'signals' that could indicate problems with the research evidence such as polarisations in opinion or avoidance of evidence in reviews and guidelines. If successful this research will allow us to detect problematic treatments faster, and in turn will help doctors make better decisions about treatments with their patients.

Main Aim

Clinical evidence comparing treatment options is essential to improve clinical decision-making, yet there is a persistent gap between the evidence clinicians need and what is provided by clinical trials, meta-analysis, reviews and guidelines. This evidence gap has caused problems in the past, where harmful or ineffective drugs have become widely prescribed when they should have been withdrawn. The problem appears to lie in the bias and inefficiency of the complex networks of evidence production and translation. We call the process of detecting these problems *clinical evidence surveillance*.

The aims of the project are to develop the methods that will be used to monitor and track the production and translation of clinical evidence to detect the risk of harm associated with evidence translation failures.

This project will apply network science methods to measure the effect of such biases: how and where in the pipeline between the laboratory and the patient's bedside they affect the evidence that is produced and the way it becomes pharmacological and prescribing practice. We will focus on the conditions and treatments associated with cardiovascular risk.

The project uses data-mining methods on databases of clinical trial registrations, published clinical trials, meta-analyses, reviews and guidelines. Our studies are designed to reveal biases – including differences between research inside and outside the commercial pharmaceutical industry – in the design of clinical trials, patchy reporting as a consequence of biases in publication, and selective citation biases which show up in guidelines as incomplete evidence.

Networks will be identified for study based on the co-authorship and citation patterns from the publications that make up the evidence-base for cardiovascular risk, including systematic reviews and guidelines. Case studies for drugs with known problems in evidence translation, followed by a broader cross-sectional study of treatments for conditions associated with cardiovascular risk, will be used to reveal the signals in these networks that are associated with failures in evidence translation and harmful outcomes.

By applying network science to the translation of clinical evidence, we aim to deliver a new, integrated set of methods for detecting problems in the evidence base faster for treatments that are approved in Australia. This new form of pharmacovigilance should assist the health system to monitor poor evidence translation, and thus improve the quality and safety of clinical decision-making.

Statement of Financial Performance

CHI STATEMENT OF FINANCIAL PERFORMANCE 2012

| | 2012 | 2011 | Notes |
|--|------------------|------------------|-------|
| | \$ | \$ | |
| Income | | | |
| External Funds | 2,294,876 | 1,571,997 | 1 |
| UNSW Research Infrastructure | | 98,137 | |
| Faculty Contribution | 596,516 | 670,667 | 2,3 |
| Total Income | 2,891,392 | 2,340,801 | |
| Expenses | | | |
| Payroll | 2,260,636 | 1,994,028 | |
| PhD Scholarships | 38,073 | 42,421 | |
| Equipment | 32,629 | 114,406 | |
| Materials | 174,569 | 391 | |
| Travel | 64,700 | 25,573 | |
| Total Expenses | 2,570,607 | 2,176,819 | |
| Operating Result | 320,785 | 163,982 | |
| Surplus (Deficit) B/Fwd from Prior Year | 147,350 | -16,632 | |
| Accumulated Funds Surplus | 468,135 | 147,350 | |

Notes to the Statement of Financial Performance

1. External revenue includes CHI component of the Australian Institute of Health Innovation, NHMRC Patient Safety Grant and NSW Dept of Health Capacity Building Infrastructure Grant.
2. Faculty contribution in 2012 includes salary support for one academic and one general administration and \$80K Enterprise Bargaining gaps
3. Faculty contribution also includes one Goldstar award, Early Career Research award and a Career Advancement Fund

CRE STATEMENT OF FINANCIAL PERFORMANCE 2012

| | 2012 | Notes |
|--|----------------|-------|
| | \$ | |
| Income | | |
| NHMRC CRE | 510,969 | |
| UNSW funds (ebGaps) | 110,100 | 1 |
| Total Income | 621,069 | |
| Expenses | | |
| Payroll | 478,337 | |
| PhD Scholarship | 0 | 2 |
| Equipment | 7730 | |
| Materials | 12,461 | |
| Travel | 1,562 | |
| Total Expenses | 500,090 | |
| Operating Result | 120,979 | |
| Surplus (Deficit) B/Fwd from Prior Year | 0 | |
| Accumulated Funds Surplus | 120,979 | |

Notes to the Statement of Financial Performance

1. Faculty contribution in 2012 salary support
2. PhD students, yet to be recruited

Management Committee

Committee Role

The management committee's role is to monitor the financial performance of the centre and ensure that the business objectives of the centre are pursued. The committee meets at least three times a year and meetings are minuted and distributed appropriately.

Management Committee

Prof Denis Wakefield (Chair)
Associate Dean of Research, UNSW Medicine, UNSW

Prof Gavin Andrews
Director, *Clinical Research Unit for Anxiety and Depression (CRUfAD)*, St Vincent's Hospital UNSW

Prof Nigel Lovell
Scientia Professor Graduate School of Biomedical Engineering, UNSW

A/Prof Maurice Pagnucco
Head of School, Computer Science and Engineering, UNSW

Committee Meetings in 2012

2 April 2012

18 July 2012

3 December 2012



Agam Misra with his co supervisor
Dr Miew Keen Choong on
graduation day

Staff

2012 Teaching

Centre for Health Informatics' senior research staff participates in various teaching capacities.

Dr Farah Magrabi contributed lectures on Health Informatics:

1. UNSW, Graduate School of Biomedical Engineering (2010–present)
Clinical Information Systems (BIOM9450)
2. UNSW, School of Public Health & Community Medicine (2011–present)
Clinical Governance & Risk Management (PHCM9748)

Dr Guy Tsafnat contributed lectures on Bioinformatics:

1. UNSW, Computer Science and Engineering (2011–present)
Introduction to Bioinformatics (BINF1001)

2012 Student Supervision

| PhD Student | Main Supervisor | Co-Supervisor |
|--------------------|------------------------|-------------------------|
| Tom Bowden | Prof Enrico Coiera | Prof Jim Warren |
| Janine McIlwraith | Prof Enrico Coiera | Dr Farah Magrabi |
| Jason Thorne | Prof Enrico Coiera | Dr Blanca Gallego Luxan |
| David Lyell | Prof Enrico Coiera | Dr Farah Magrabi |

Masters of Philosophy (MPhil) Students

| | | |
|-------------------|--------------------|---------------------|
| Werner Van Huffel | Prof Enrico Coiera | |
| Agam Misra | Dr Guy Tsafnat | Dr Miew Keen Choong |

Honours Students

| | |
|------------------------|----------------|
| Stefan Haunsberger | Dr Guy Tsafnat |
| Andreas Huettl | Dr Guy Tsafnat |
| August Gilg | Dr Guy Tsafnat |
| Marlene Petra Biederer | Dr Annie Lau |

2012 successfully completed students

| | |
|------------|-------|
| Agam Misra | MPhil |
|------------|-------|

Staff



Prof Enrico Coiera
Director



Dr Guy Tsafnat
Senior Research Fellow



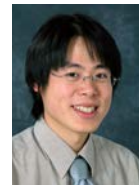
Dr Tatjana Zrimec
Conjoint Academic



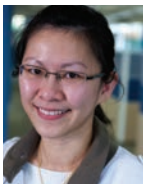
Dr Farah Magrabi
Senior Research Fellow



Dr Blanca Gallego
Senior Research Fellow



Dr Frank Lin
Conjoint Academic



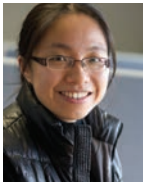
Dr Miew Keen Choong
Postdoctoral
Research Fellow



Dr Geoff McDonnell
Research Fellow



Dr Vitali Sintchenko
Conjoint Academic



Dr Annie Lau
Research Fellow



Dr Adam Dunn
Research Fellow



Denise Tsiros
Finance &
Administration



Dr Kevin Chai
Postdoctoral
Research Fellow



Dr Ying Wang
Research Fellow



Jackie Mullins
Administrative &
Executive Assistant



Dr Amael Arguel
Research Fellow



Dr Stephen Anthony
Postdoctoral
Research Fellow



Angus Liu
Research Assistant



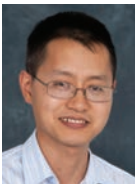
Diana Arachi
Research Assistant



Tom Bowden
PhD Candidate



Agam Misra
Masters Student



Vitaliy Kim
Java/Jee Programmer



Jason Thorne
PhD Candidate



David Lyell
PhD Candidate



Jingbo Liu
Programmer



Janine McIlwraith
PhD Candidate



Oscar Perez Concha
Postdoctoral
Research Fellow



Werner Van Huffel
Masters Candidate



Dr Filippo Galgani
Postdoctoral
Research Fellow

Sandeep Kaur
Masters Candidate

Visiting Honours Student

Stefan Haunsberger

Andreas Huettl

August Gilg

Marlene Petra Biederer



Mei-Sing Ong
Postdoctoral
Research Fellow

Grants

PATIENT SAFETY: ENABLING AND SUPPORTING CHANGE FOR A SAFER AND MORE EFFECTIVE HEALTH SYSTEM

Funding Source: National Health & Medical Research Council (NHMRC)

Investigators: Prof Jeffrey Braithwaite, Prof Johanna Westbrook, Prof Enrico Coiera, Prof William Runciman, Prof Richard Day

Total Funds: \$8,400,000

| | | |
|-------------------|------|-------------|
| CHI Funds: | 2009 | \$630,914 |
| | 2010 | \$788,352 |
| | 2011 | \$995,285 |
| | 2012 | \$1,307,801 |
| | 2013 | \$1,364,465 |

CAPACITY BUILDING INFRASTRUCTURE GRANTS PROGRAM NO 2

Funding Source: NSW Health

| | | |
|-------------------|------|-----------|
| CHI Funds: | 2010 | \$205,541 |
| | 2011 | \$192,216 |
| | 2012 | \$155,057 |
| | 2013 | \$80,312 |

EVALUATING THE SAFETY OF COMPUTER DECISIONS SUPPORT SYSTEMS IN GENERAL PRACTICE

Funding Source: NHMRC

Investigator: Dr Farah Magrabi

| | | |
|---------------|------|-----------|
| Funds: | 2010 | \$103,250 |
| | 2011 | \$88,250 |
| | 2012 | \$98,250 |

NEAR REAL-TIME IDENTIFICATION OF PATIENT SAFETY INCIDENTS REPORTED BY HEALTH PROFESSIONALS

Funding Source: NHMRC

Investigator: Dr Farah Magrabi

| | | |
|---------------|------|-----------|
| Funds: | 2012 | \$130,767 |
| | 2013 | \$114,771 |
| | 2014 | \$68,725 |

CENTRE FOR RESEARCH EXCELLENCE IN E-HEALTH

Funding Source: NHMRC

Investigator: Prof Enrico Coiera, Prof Paul Glasziou, Prof Siaw-Teng Liaw,
A/ Prof Vitali Sintchenko, Prof William Runciman, Dr Farah Magrabi

| | | |
|---------------|------|-----------|
| Funds: | 2012 | \$493,380 |
| | 2013 | \$553,425 |
| | 2014 | \$553,425 |
| | 2015 | \$466,337 |
| | 2016 | \$433,303 |

REPORTS OUTLINING IMPROVEMENTS TO NEHTA CLINICAL SAFETY PROCESSES

Funding Source: National E-Health Transition Authority (NEHTA)

Investigators: Prof Enrico Coiera, Dr Farah Magrabi, Peter Hibbert

| | | |
|---------------|------|-----------|
| Funds: | 2011 | \$35,200 |
| | 2012 | \$184,500 |

STRATEGY TO MEET THE QUALITY AND UTILITY OF CLINICAL INFORMATION EXTRACTED FROM GP ELECTRONIC HEALTH RECORDS

Funding source: National Prescribing Service Limited (NPS)

Investigator: Dr Guy Tsafnat

| | | |
|---------------|------|-----------|
| Funds: | 2012 | \$100,000 |
| | 2013 | \$100,000 |

Funding Source: UNSW Career Advancement Fund

Investigator: Dr Miew Keen Choong

| | | |
|---------------|------|---------|
| Funds: | 2012 | \$5,000 |
|---------------|------|---------|

Funding Source: UNSW Faculty Research Grant

Investigator: Mei-Sing Ong

| | | |
|---------------|------|----------|
| Funds: | 2012 | \$20,000 |
|---------------|------|----------|

DISCOVERING LARGER-THAN-GENE ANTIBIOTIC-RESISTANCE STRUCTURES USING COMPUTATIONAL GRAMMARS

Funding Source: UNSW Goldstar

Investigator: Dr Guy Tsafnat

| | | |
|---------------|------|----------|
| Funds: | 2012 | \$40,000 |
|---------------|------|----------|

Publications

BOOKS

1. **Magrabi F.** *A framework for designing home telecare: Using technology to support new models of healthcare delivery*: Lambert Academic Publishing; 2012.

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2. Forero R, Nugus P, **McDonnell G**, McCarthy SM. *Iron meets clay in sculpturing emergency medicine: A multidisciplinary sense making approach*. In: Deng M, Ralaf, Vaccarella M, editor: Oxford: Inter-Disciplinary Press (E-book chapter); 2012. p. 13-25.
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6. **Bowden T, Coiera E.** Comparing New Zealand's 'Middle Out' health information technology strategy with other OECD nations. *International Journal of Medical Informatics*. 2012; (Available online: 31 December 2012).
7. **Choong MK, Tsafnat G.** Genetic and epigenetic biomarkers of colorectal cancer. *Clinical Gastroenterology and Hepatology (CGH)*. 2012; 10(1):9-15.
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18. **Gallego B**, Westbrook M, **Dunn AG**, Braithwaite J. Investigating patient safety culture across a health system: Multi-level modelling of differences associated with service types and staff demographics. *International Journal for Quality in Health Care*. 2012; 24(3):1-10.
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