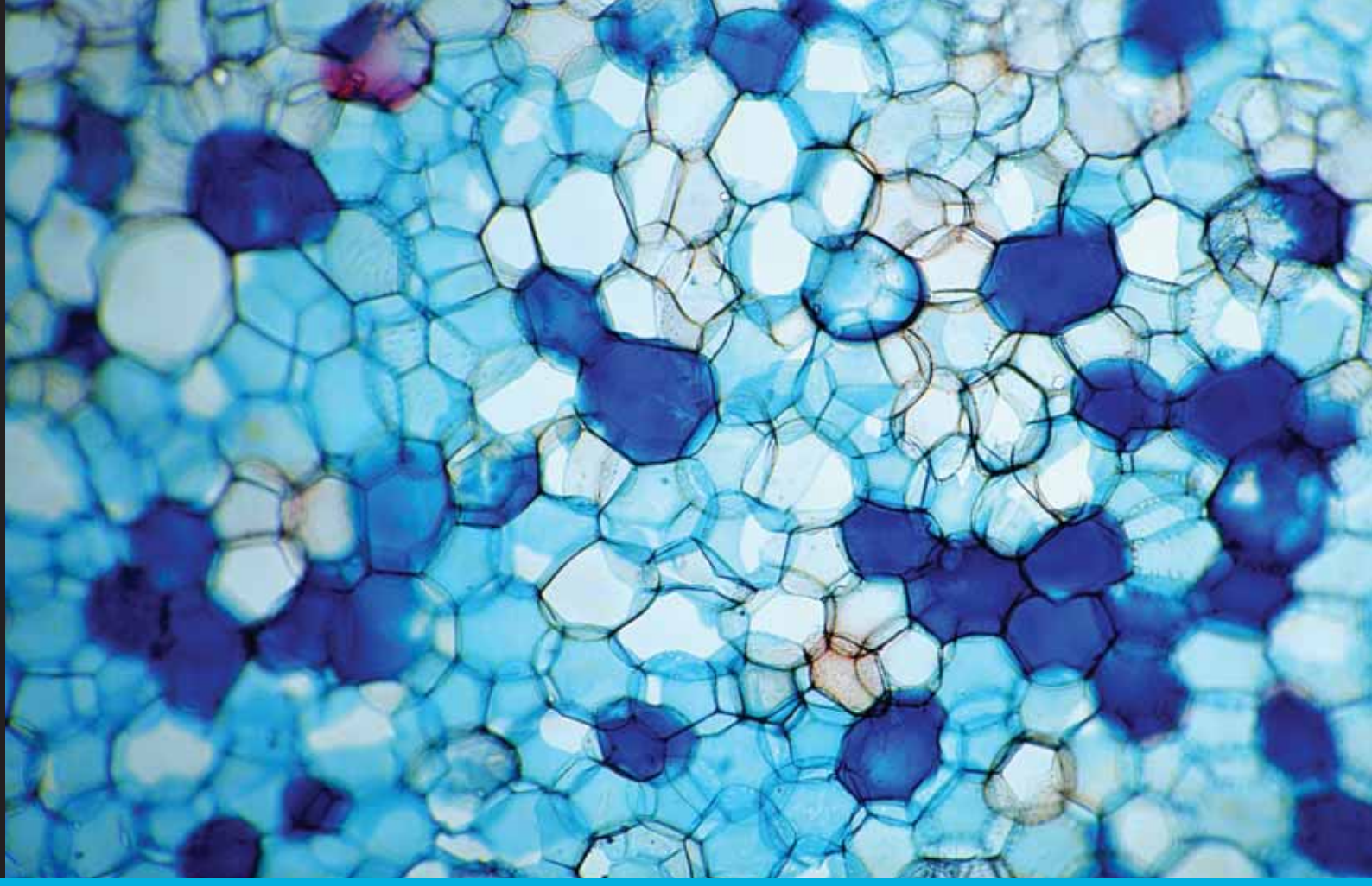

centre for health informatics

annual report 05

THE UNIVERSITY OF NEW SOUTH WALES

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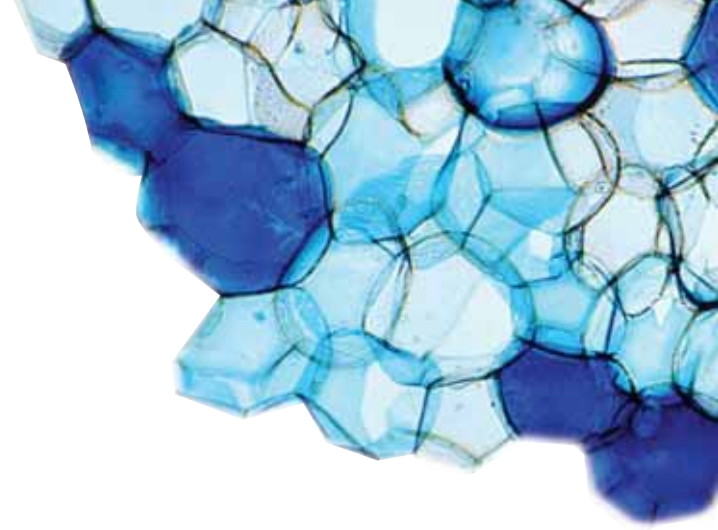


what we do

The Centre of Health Informatics (CHI) is building an international reputation as a research leader in the application of information technology to healthcare.

Its principal aim is to map the complex organisational systems that shape today's health system and to design rigorous, system-wide interventions that provide a sustainable platform for future health systems, locally and internationally.

The Centre's main activities are the development of intelligent systems to support evidence-based healthcare, the development and application of evaluation tools to assess the impacts of information technology in healthcare, and fostering an awareness of how management and communication systems shape the safety and quality of healthcare delivery.

The Centre conceives that the potential use of information and communication technology in healthcare settings will occur incrementally in some areas and radically in others. It also acknowledges that while some changes in healthcare are highly predictable, others are clouded by an uncertain, and potentially chaotic future.

A facility of the University of New South Wales Faculty of Medicine, the Centre for Health Informatics is a research partner to major healthcare providers, research institutions and governments, including the New South Wales Department of Health, the National Institute of Clinical Studies and The Commonwealth Department of Health and Ageing.

CHI makes contributions to:

SCIENCE:

Making break-through discoveries in information, communication, cognitive and organisational science needed to support health service innovation and biomedical researchers.

POLICY:

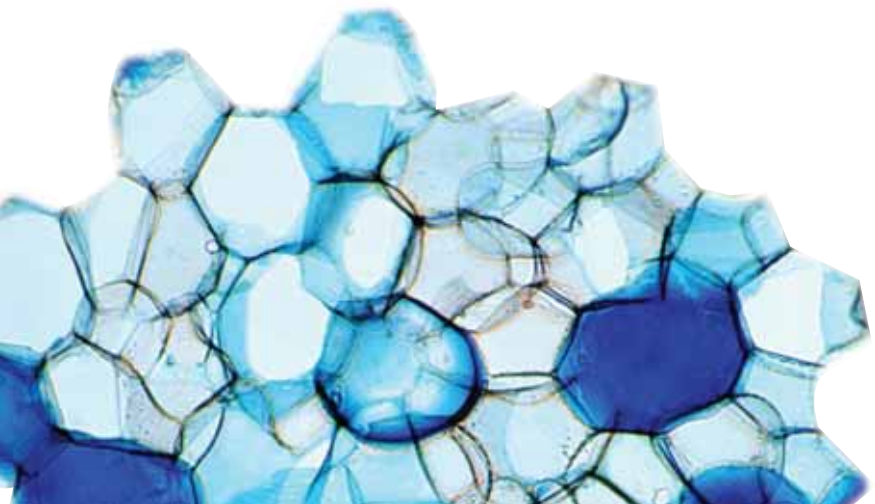
Providing expert input and leadership into government, shaping e-health policy priorities and goals.

INNOVATION:

Inventing novel information technologies and methods that can transfer into industry and health services.

EDUCATION:

Training future researchers through postgraduate research degrees, and educating clinicians, technologists and policy makers in health informatics through postgraduate programs.



contents

director's report

The Centre for Health Informatics is committed to working within the health system to foster fundamental change and innovation. The next twenty years will see a health system having to adapt to a decreased clinical workforce, increasing demand on its services, and continual challenges from external shocks, including natural diasters, pandemics and civil strife.

Our research program is designed to significantly enhance our State and national capacity to effectively incorporate information and communication technologies (ICT) into health services, and to minimise the ever present associated risks of failure.

CHI conducts research to influence policy and practice focused on hospitals and primary care. Increasingly, however, we also work in the areas of population health and surveillance. Significant current projects include:

- Development of new methods to enhance adoption of evidence-based recommendations using advanced information retrieval technologies;
- Partnership with NSW Health to develop methods to support infectious disease outbreak detection and risk assessment;
- Evaluation of the statewide NSW Health Electronic Medical Record rollout;
- Evaluation of the Virtual Critical Care Unit (ViCCU);
- Research into advanced methods to interpret complex linked data sets including clinical and genetic data, including computer supported discovery systems e.g. Automated analysis of microbial gene patterns to predict virulence.

Since its creation in 2000, CHI has grown significantly in size, as measured by research income, staff and research output. Over the last 6 years CHI has established itself as the national leader in health informatics research, and attracted over $10 million in research funds.

Academic organisations like CHI have a special role to play in supporting the national e-health agenda. Industry typically welcomes technical innovation, but lacks the ability to engage in long-term R&D. Governments for their part are not well placed to keep in-house experts in complex multi-disciplinary fields like health informatics. As a result, CHI's remit is therefore to conduct longer-term projects, often of a fundamental nature, which cannot be supported by the short funding cycles of industry or government. We constantly envision new futures in response to the health system's needs, and explore new, sometimes radical solutions to meet them. CHI is thus something of a 'hot house' for new ideas.

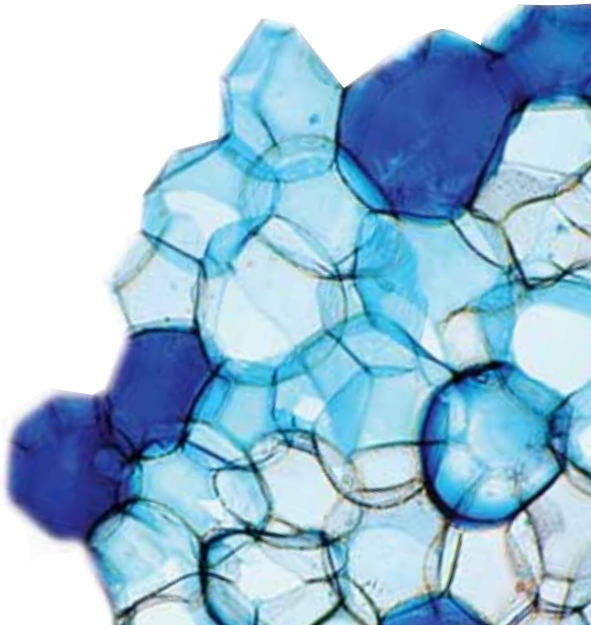
We also have a clear role in guiding and supporting government, industry and health services in shaping policy and plans in the near term.

CHI is a unique and multi-disciplinary organisation, and the expertise of its staff puts it in a very strong position to provide advice and guidance on many complex ICT and informatics issues. Locally, we have continued to work closely with government, and have research projects in partnership with both the NSW Department of Health and the Federal Department of Health and Ageing.

We welcome Professor Peter Smith as incoming Dean to the Faculty, and are excited by his commitment to the importance of the 'nano-info-bio' convergence, and the role of informatics in driving health services and bioscience research.

We are thankful that our work has been so well received by its funders, and the broader clinical community, and over 2006 will continue to develop our research program, to ensure it remains at the cutting edge of clinical informatics.

Prof Enrico Coiera
Director



highlights and achievements of 2005

- A strong performance in national competitive grants schemes in 2005 saw three new grants awarded to the Centre for commencement in 2006. These included an ARC Discovery grant to carry out basic research into the use of text-processing technologies to find new ways of summarising clinical evidence, an ARC Linkage grant in partnership with the Centre for Infectious Diseases & Microbiology-Public Health, Institute of Clinical Pathology and Medical Research (ICPMR) to study new computer approaches to biosurveillance of infectious diseases, and an NHMRC Project grant to undertake the first Australian study of errors associated with medication management systems in hospitals. These three new grants are worth $1,184,000.
- We are also proud to have been awarded research funds of $428,000 from the HCF Health & Medical Research Foundation for 2006, to start a new study into the impact of clinical communication processes on clinical error with a specific focus on medication administration, and to fund two new HCF PhD scholarships that will grow our research efforts in the use of simulation modeling to understand health system behaviours.
- Our research generated 14 journal papers, nineteen conference papers and presentations and four book chapters in the international scientific literature. A paper by Westbrook et al. scored an accompanying editorial in the journal Medical Decision Making, and in August 2005 ISI Science identified a JAMIA paper by Ash, Berg and Coiera as a 'fast-breaking' paper making a significant impact upon the research community.
- Our research staff were invited to give presentations including at the 2nd Middle East Conference on Healthcare Informatics in Dubai, the Scandinavian Health Informatics Conference in Denmark, the Annual Scientific Meeting of the Australasian Association of Clinical Biochemistry, the Royal Australian and New Zealand College of Radiologists Annual General and Scientific Meeting, the AMA Electronic Health Forum, and the SimTecT Health Care Simulation Conference.
- Researchers also presented findings at the XIX Medical Informatics Europe 2005 Conference, Geneva Switzerland where the paper by Westbrook and Coiera was ranked 2nd out of over 500 papers.
- Two CHI PhD students, Dr Vitali Sintchenko and Dr Marilyn Rob graduated in December 2005, the first to graduate from the Centre.
- CHI research continued to feature in the media with appearances on ABC Radio National's The Health Report in November, 2UE Malcolm T Elliot show and in the Sydney Morning Herald in July.
- The excellence of our researchers was reflected in the award of a Dean's Postdoctoral Fellowship to Dr. Farah Magrabi, to carry out research that should lead to safer designs for electronic prescribing systems. Prof. Coiera received a prestigious Faculty Award from IBM. A/Professor Westbrook was elected as a Fellow of the American College of Medical Informatics, an honour received by only two other Australians. Mr Andrew Georgiou was elected as a Fellow of the Australian College of Health Informatics.

- We were delighted to host two senior international Visiting Fellows, Dr. Pieter Touissant from the Netherlands, and Dr. Oystein Nytro from Norway for several months. Our first international Masters exchange student, Frode Skjaeveland, joined us from Aalborg University in Denmark, and will be the forerunner of many other students joining us for 3 to 6 month research projects from Aalborg. In addition, Dr Azman Abu Bakar from Malaysia joined the Centre for 8 weeks on a World Health Organisation fellowship.
- In conjunction with the State visit of Their Majesties the King and Queen of Sweden, CHI hosted a one-day meeting with the Swedish eHealth Delegation, headed by Prof Carlstedt-Duke, Dean of Research for the Karolinska Institute, in November of 2005. In Prof. Duke's summary presentation to the royal party he noted that "the Centre for Health Informatics is among the leading institutions in this area throughout the world. We were very enthusiastically received with generous hospitality, with active open discussions from both sides. The discussions were so stimulating that we had to drag the delegates away from there for the next appointment."
- Commercialisation of our QuickClinical (QC) intelligent web search technologies, in partnership with New South Innovations (NSi), saw us continue to build partnerships with content providers, and earn much needed funds by provision of software and consultancy services through the year.
- In partnership with the Wentworth Area Health Service, and funded by the NSW Department of Health, we carried out a detailed clinical evaluation of the Virtual Critical Care Unit (ViCCU) which links the Emergency Departments of the Nepean and Blue Mountains hospitals.
- CHI staff were involved in the organising committees for the 12th World Congress on Medical Informatics Conference for 2007, in Brisbane and the 14th National Health Informatics Conference in Sydney in 2006. CHI will also host a satellite international conference in 2007, to specifically look at socio-technical aspects of health informatics.

partners and major funders

We are grateful to our partners and funders for their ongoing support of our research program. CHI's research is supported by the following organisations:

> NSW Health

> Australian Research Council (ARC)

> National Health and Medical Research Council (NHMRC)

> Federal Department of Health & Ageing

> HCF Health and Medical Research Foundation

> National Institute of Clinical Studies

science

break-through discoveries that drive health service innovation

CHI conducts fundamental and applied research to map the complex nature of health systems and design scientifically rigorous interventions that will sustain tomorrow's health system.

Early warning systems in an unstable world

Detecting and responding to threats to human health and safety from bio-terrorism has taken on new significance in the wake of September 11 and the ensuing war on terror.

Adding to a sense of urgency is the rise and re-emergence of infectious diseases such as avian influenza (bird flu), SARS, HIV/AIDS, hepatitis C, Legionnaire's disease, and the human variant of mad cow disease called Creutzfeldt-Jakob disease.

Longstanding infectious diseases such as malaria, tuberculosis, cholera and dengue fever have also increased their range and incidence in recent decades.

Centre for Health Informatics researchers are evaluating the predictive power of a novel early warning system that blends traditional and non-conventional surveillance data to trigger an early response to these threats.

"Our current detection systems often fail to provide sufficiently early warnings that lead to policy actions to prevent widespread disease outbreaks," says Dr Vitali Sintchenko, a Research Fellow with the Centre for Health Informatics.

"Research has shown that increase in sales of anti-diarrhoeal drugs can trigger public health actions three weeks earlier than traditional monitoring and reporting of human Cryptosporidium parvum infections."

Spread often by contaminated drinking water, Cryptosporidium is a parasite that causes self-limiting diarrhoeal disease in humans and other mammals and is resistant to most water-purification techniques.

"If we blended traditional laboratory-based surveillance data with 'syndromic' data like medication sales we might be able to detect and respond earlier than we do now," Dr Sintchenko says.

"Over the coming months we will be examining different weightings for a novel blend of data to provide early warnings for a range of threats to human health."

The work is funded by an ARC Discovery grant.

Using genome science to predict microbial virulence

Working with Professor Lyn Gilbert and her colleagues at the Centre for Infectious Diseases & Microbiology (CIDM) at Westmead Hospital, we are exploring the use of new machine learning methods to analyse the large and complex data sets now being generated by new genetic methods, to see if we can identify genetic patterns that will allow clinicians to rapidly identify microorganisms most likely to result in significant clinical disease.

We are focussing on Streptococcus pneumoniae and Streptococcus agalactiae (group B streptococcus, GBS) which are important invasive pathogens, and which cause substantial morbidity and mortality, worldwide.

If we are successful, then the routine identification of "medically relevant genotypes" of individual strains, with rapid analysis and interpretation of genetic and other relevant data, could have a major impact on clinical management or public health response to outbreaks or the emergence of new strains.

Improved surveillance will predict the need for changes in clinical management or disease control measures to improve outcomes.

The work is funded by an NHMRC project grant.

Enhancing the effectiveness of clinical evidence

Good clinical decisions rely upon clinicians' abilities to access up-to-date evidence. Online information retrieval systems are designed to deliver this information, yet there is poor evidence about how these systems work in every day clinical practice and whether use improves decision-making.

Our ongoing research program into evidence delivery technologies has focused on the development and trial of the Quick Clinical evidence retrieval system. As part of that program we have become interested in how humans use evidence once they find it, because an enhanced understanding of the ways in which people are affected by evidence should translate into improved information access technologies. We have specifically been interested in understanding how retrieved documents then shape decisions.

In work published in the Journal of the American Society for Information Science and Technology, we have demonstrated that, despite accessing good evidence, clinicians are still strongly influenced by their prior beliefs, and the order in which evidence is viewed. Accessing and reading evidence on its own will not necessarily result in a clinician either changing their clinical decision or altering their prior views.

We have developed a predictive model using Bayesian belief revision that predicts the likely answer a clinician will give to a clinical question in about 75% of cases, based only upon knowledge of their prior belief, and the documents they encounter through a search engine. With these predictive models, we are now in the process of developing and trialing new search interfaces which aim to 'de-bias' clinicians so that they are more likely to arrive at a correct answer after viewing clinical evidence.

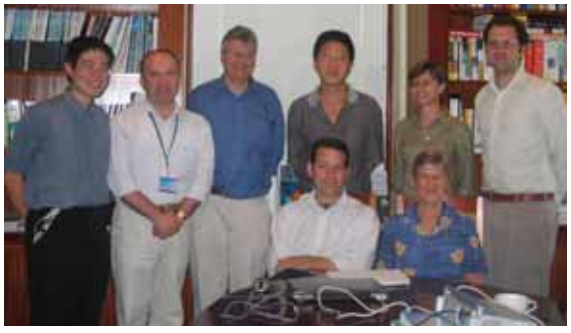
The de-biasing work for Quick Clinical is funded by an ARC APAI Scholarship.

JASIST 57(7):873-880, 2006

Online evidence systems improve clinical decision making

A landmark study conducted by the Centre provided the first empirical evidence that providing experienced clinicians with access to an online evidence system improved their accuracy in answering clinical questions. By triangulating these results with those obtained from our previous evaluation studies of the use of online evidence systems we have amassed compelling evidence that such systems bring about positive and measurable improvements in evidence-based patient care.

JAMIA, 12: 315-321, 2005 Med Dec Mak, 25: 178-185, 2005, Int J Med Inform, 74: 1-12, 2005



CIDM and CHI partner to use genome science to predict microbial virulence

Geospatial mapping of infectious disease outbreaks

policy

expert input and leadership that shapes public policy

Through lobbying and partnering, CHI helps to shape policy that supports the take-up and the evolution of informatics technologies throughout the health system. CHI staff sit on a large number of committees and advisory boards, and actively engage in State and National policy fora, providing expert advice on health informatics issues. Through membership of the Australian Health Information Council (AHIC), we have contributed to ongoing policy thinking around electronic decision support, national capacity building in research and education, the professionalisation of informatics, and nurturing a culture of evaluation for health IT projects. Through membership of the State Ministerial Advisory Council for Medical and Health Research, we have ensured that the substantial opportunities generated by linking the State's research strengths in IT with the State's advantages in translational clinical research are recognised, and we continue to participate in activities that will mould a State research platform in health informatics.

Do clinical information systems improve health care efficiency?

While the evidence grows for the effectiveness of ICT in many health service settings, there are still considerable risks to widespread adoption of ICT. There remain too many large-scale failures, and clinicians are still too often disappointed by the systems provided. Many factors contribute to the poor uptake or failure of IT in health. We lack clear measures to benchmark the impact of IT, especially at the organisational level, making it hard to know why projects succeed or fail. We know remarkably little about the complex nature of clinical work and decision-making. Information models that work well in industries like aviation have not migrated readily into health. Health, with its many professional subgroups and complex work processes has fewer formal control mechanisms than other industries. Variability in resource availability and the expression of disease between individuals also hinders the mass automation of health processes.

Consequently, the poor uptake of IT in health care is in part due to a failure to design flexible information systems that support complex health care decisions, and a lack of evaluation models to benchmark the impact of these systems. Health informatics research has focussed sharply on these issues recently, identifying how people and organisational factors strongly influence IT system use. The socio-technical nature of health information systems is slowly being revealed as a major determinant of success. As a result, the traditional 'technology push' that characterises much IT investment in health is being replaced by the recognition that information systems encompass people and their interactions, and not just the technology.

In 2005 we completed the first Australian study of the impact of computerized pathology order entry systems to improve the efficiency of care delivery in hospitals. Using a controlled before and after design we compared the average time pathology test results were available for clinicians when a paper-based ordering system was used compared to a computerised ordering system. On average results were available 15 minutes faster following the introduction of the computerised system. However, several additional studies revealed that system introduction had a significant impact on the work processes of doctors and laboratory staff.

This study is part of a major program of research examining how computerized pathology systems impact upon the work of both clinicians and laboratory staff which is being undertaken at multiple hospital sites in NSW. This work has included publication of the first systematic review of the impact of these systems on pathology services with a summary of indicators suitable for use in the evaluation of these systems. As hospitals across the

country move to implement computerized ordering systems the results of this work is of direct relevance to health care professionals, policy makers, system designers and health care managers. This work is support by an Australian Research Council Linkage grant in partnership with NSW Health.

J Clin Path, 59: 533-536, 2006 Clin Biochem Rev, 27: 79-87, 2006

Changing healthcare policy *in silico*

Geoff McDonnell is a firm believer that changes to the financing and delivery of healthcare, be they big ones like modifications to Medicare, or smaller ones such as changing a hospital admissions policy, should be computer simulated before they're launched in the real world.

"Modelling the impacts of proposed changes to healthcare before they become policy is smarter, safer, cheaper and quicker," says Dr McDonnell, an MIT and Harvard-trained physician and engineer.

"The inherent complexity of healthcare systems means that foreseeing the full impact of changes to policy and practice is nearly impossible."

A Simulation Research Fellow at the Centre for Health Informatics, Dr McDonnell uses modelling software to understand and improve the interaction between structure and action in healthcare and policy. He has successfully used dynamic systems modelling in commercial engineering and healthcare projects in Australia.

"Real world experiments can be extremely expensive and irreversible – often for decades – because they often require significant capital investment and workforce realignment," Dr McDonnell says.

"The most important positive changes we can make in dynamic systems like healthcare are often counter-intuitive. For example, hospitals often try to absorb the spike in demand for acute care hospital beds that occurs in wintertime by increasing the number of acute care beds in the Emergency Department.

"That's an intuitive quick fix approach to the problem. In fact, widening access to a hospital's front door only slows down the system and exacerbates the initial problem. Dynamic modelling in the UK and Australia has shown that the best solution to this kind of problem is the non-intuitive one of increasing the hospital's 'downstream' post-acute capacity.

"My dream is that in future, we'll resist the temptation to make changes in healthcare policy until we modelled their impacts ahead of time."

The Effectiveness of Telemedicine in Emergency Departments – Providing an evidence-base for IT health policy

An evaluation of the clinical impact of an ultra-broadband telemedicine application which links the Emergency Departments at Nepean Hospital with the smaller Blue Mountains Hospital (BMH) was completed. This study examined the effectiveness of the Virtual Critical Care Unit (ViCCU) system, developed by CSIRO in collaboration with clinicians at the participating hospitals, to improve the management and patient outcomes of acutely unwell patients presenting to the BMH.

Introduction of the system was associated with some significant changes in patient management with an increase in patient discharges from BMH and a decrease in admissions. Some patient sub-groups experienced more clinical procedures following system use such as increased use of inotropes in patients transferred from BMH. No statistically significant changes were found in the main outcome indicators, including length of stay for local or transferred patients, rapid acuity score (between arrival and transfer), hours on ventilation, or hours in intensive care for those patients transferred to NH.

The study demonstrated that the telemedicine system resulted in changes to patient management, but did not significantly impact upon clinical outcome indicators for acutely unwell patients who made up the study sample. The results also suggested that the system may be more beneficial for less acute presentations including fractures and plastic surgery. Overall clinicians at both sites supported the use of the system. Interview data revealed that the introduction of the system had changed clinicians' relationships and workloads in different and important ways.

Evaluations of pilot systems such as ViCCU play an important role in providing an evidence-base to inform policy decisions about the further design and application of such technologies prior to widespread implementation.

innovation

inventing novel technologies and methods for industry and health services

To translate our basic discoveries into tools that will shape the future of healthcare, CHI is focused on protecting its IP, developing demonstrator projects with partners in the health sector, and where appropriate commercialisation of our innovations.

Software to interpret complex radiology images

Scientists at the Centre for Health Informatics are teaching computer software to read radiology images to accelerate the accurate identification and diagnosis of lung diseases.

"Because a lung X-ray typically generates between 300 and 600 images the job of examining every scan is very time-consuming," says CHI computer scientist, Dr Tatjana Zrimec.

"Our software is capable of rapidly identifying radiological lung abnormalities so that clinicians can short-cut the process and simply examine those scans identified by the software as abnormal.

The software, which is being trialed jointly by UNSW's School of Computer Science, I-MED Network Ltd and Philip Medical Systems, discriminates between abnormalities based on characteristic morphologies, such as "honeycombing", nodules and the thickening of particular lung structures.

Using the High Resolution CT images of the lungs from 500 patients the software trial has hastened the accurate diagnosis of pulmonary diseases such as emphysema, asbestosis, idiopathic pulmonary fibrosis and bronchiectasis.

"The trial will tell us if smart software can help diagnosis of lung diseases," Dr Zrimec says. "On the evidence so far, it seems that we can".

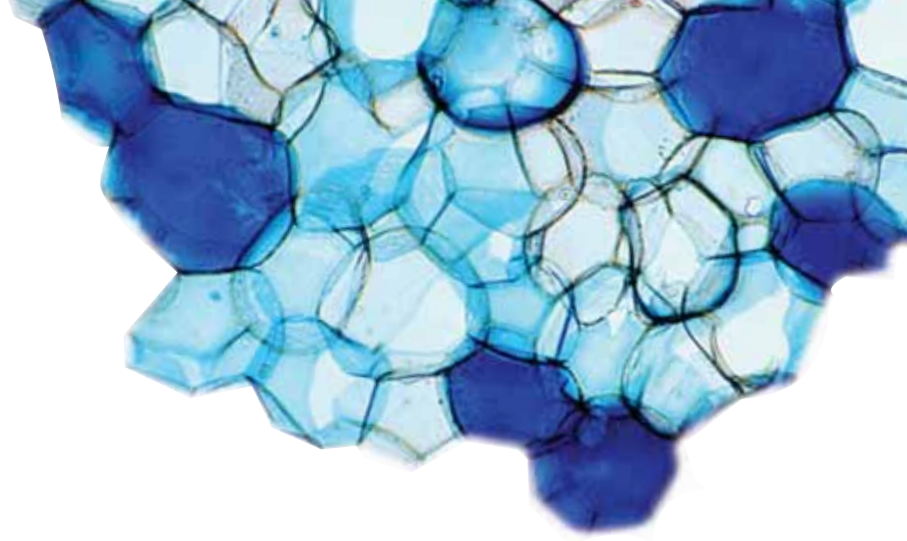
The Centre for Health Informatics and its research partners plan to "go live" in 2006 and evaluate the software in several Sydney hospitals.

Measuring clinicians' work and communication patterns

How will electronic health records in hospitals influence the way doctors and nurses communicate and the ways they work? Computers both create new opportunities to communicate by allowing access to information from many locations, but may also reduce face to face communication with colleagues. Some work tasks will be made more efficient while others may take longer.

We have developed new study approaches and data collection tools to accurately measure and time work tasks and communication events, including interruptions. In the past observational studies of clinical work involved gathering lengthy audio or video records, and labour intensive transcription, mark-up and analysis of these data sets. We are now working with a much more light-weight approach using hand held PDAs and purpose built task tracking software which allows us to accurately measure clinical work, and generate data that are immediately available for statistical analysis, significantly reducing the length of time required for these kinds of study.

An initial study of over 240 hours of direct observation of nurses on hospital wards has been completed and revealed new evidence about the interruptive nature of clinical work and how nurses in different roles distribute time across work tasks. This study will be replicated following the introduction of an electronic medication management system to measure how these work patterns change.

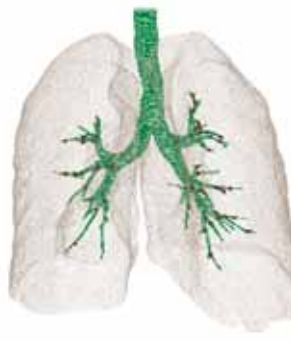


De-biasing search engines to make them better decision aides

People experience a number of cognitive biases when using search engines, tending to favour documents not because of their content, but shaped by the order in which they are viewed, amongst other things.

Is it possible to design a search engine interface that 'de-biases' the user, so that they are more likely to be influenced by the content of documents they read, rather than these basic cognitive biases?

Annie Lau has been working on this question, and has developed a number of different user interfaces, which for example, allow users to sort documents after they have been read. By engaging in these 'de-biasing' activities, we hope that users focus more on content, and arrive at decisions in keeping with the evidence they have read, rather than their past beliefs. Annie is conducting a series of trials over 2005 to test these new user interfaces.



3-D Anatomical lung models used to help assist X-ray interpretation

PDAs used to measure patterns of clinical work

education

Training future researchers and educating clinicians, technologists and policy makers in health informatics

In 2005 the Centre's first PhD students graduated, Dr Vitali Sintchenko and Dr Marilyn Rob. Dr Sintchenko's thesis was "Decision by design - decision support for antibiotic prescribing in critical care", and Dr Rob's thesis was "Ear, nose and throat surgery among young Australian children". Dr George Alvarez also received his Masters Degree on the topic of communication patterns of medical teams in the intensive care setting. Attracting high caliber research students to the Centre is an important element of our strategy to build national capacity in health informatics research and to supporting our cutting edge research programs.

Research students in 2005:

Annie Lau

The impact of information searching on decision-making – the investigation of cognitive biases during information searching.

Nerida Creswick

The impact of point of care clinical systems on the work of clinical groups

Andrew Georgiou

An investigation into the implications of electronic ordering systems for pathology laboratories

Amanda Ampt

The Effect an Electronic Medication Management System on Nurses' Medication Work Practices

Heather McDonald

An examination of the health care accreditation surveying process: Factors which influence health care accreditation surveyors and the reliability of the survey process

Frank Lin

Translating bacterial molecular epidemiology into information to improve infectious disease risk assessment and control

Giselle Azambuja

A framework to extract, interpret and structure relevant information from clinical free-texts.

International Fellows

We hosted two international fellows for six months, Dr Øystein Nytrø from the Department of Computer Information Science and Norwegian Electronic Health Record Research Centre in Norway; and Dr Pieter Toussaint from the Clinical Informatics Department, Leiden University Medical Centre, The Netherlands. Øystein and Pieter worked on a number of projects, including modeling communication patterns in health care organizations, and made a welcome contribution to the intellectual life of CHI during their stay.

New Student Exchange Program with Denmark

In 2005 we established an exchange program with Aalborg University in Denmark whereby final year students in their Masters in Biomedical Engineering and Informatics Program spend a term at the Centre. In 2005 Frode Skjæveland worked with the Evaluation Research Team to develop a handheld PDA data collection device for use in observational studies of medication administration errors. Three new Danish students will join the Centre for part of their studies in 2006.

Some highlights of the year include:

A Royal Visit

In November the Centre received a visit from a Swedish Trade Delegation investigating e-health led by Professor Jan Carlstedt-Duke, Dean of Research at the Karolinska Institute. The delegates spent a day at CHI to hear of our research programs. This day was followed by an official seminar attended by His Majesty Carl XVI Gustaf, King of Sweden, and Her Majesty Queen Silvia where Professor Coiera had a further opportunity to present an overview of the Centre's research. Such invitations continue to indicate international interest in the Centre's work.

New International Research Links

Highlights of international visits to the Centre in 2005 include: Dr Donald McInnes, Harvard University, Dr Ted Braun, Calgary Health Region, Ms Nancy Hughes, President and CEO of the Canadian Chamber of Commerce, Ms Joan McGregor, Executive Director, Regional Service Planning, Calgary Health Region, Dr Alejandro Jada, Centre for Global eHealth Innovation, Canada, Assoc Professor Christian Nøhr, Virtual Centre for Health Informatics, Aalborg University, Denmark. A group of representatives from the Norwegian Knowledge Centre for the Health Services, including Sarah Rosenbaum, Øystein Eiringand Lena Nordheim visited the Centre to discuss the use of Quick Clinical search technologies as part of a new Norwegian electronic library of health.

centre for health informatics

Statement of Financial Performance
for the Year Ended 31 December 2005

	2005 $	2004 $	Notes
Income			
External Funds (i)	1,694,544.46	1,717,627.75	1
Other	0.00	353,218.99	2
Faculty Contribution	521,846.34	426,467.12	
UNSW Contribution	38,716.00	14,602.00	3
Total Income	2,255,106.80	2,511,915.86	
Expenses			
Payroll	1,688,742.37	1,699,159.39	4
Equipment	31,205.25	82,864.45	5
Materials	222,548.55	508,580.59	6
Travel	28,896.71	61,444.55	7
Total Expenses	1,971,392.88	2,352,048.98	
Operating result	283,713.92	159,866.88	
Surplus (Deficit) Bfwd from Prior Year	929,329.31	769,462.43	
Accumulated Funds Surplus (Deficit)	1,213,043.23	929,329.31	
(i) Excludes debtors (unpaid invoices)	0.00	265,922.00	

Notes to the Statement of Financial Performance

1. There are no 2005 'Other Income' due to the closure of all external accounts residing outside the Faculty of Medicine due to the departure of the Biomedical Laboratory. CHI has now consolidated those accounts under External Funds
2. Increase in Faculty Contribution due to an increase of 4% in the enterprise agreement
3. Increase in RIBG & Faculty Research Grant
4. Slight reduction in payroll attributed to a reduction in staff
5. Reduction in expenses is due to an uncertainty of future grants

appendix

staff

Professor Enrico Coiera
Director

Associate Professor Johanna Westbrook
Deputy Director

Dr Tatjana Zrimec
Senior Lecturer

Sarah Behman
Business Manager

Andrew Georgiou
Senior Research Fellow

Dr Bob Jansen
Senior Research Fellow

Margaret Williamson
Senior Research Fellow

Dr Geoff McDonnell
Research Fellow

Dr Farah Magrabi
Research Fellow

Dr Vitali Sintchenko
NICS Research Fellow

Victor Vickland
Research Fellow

Ken Nguyen
Software Engineer

Martin Walther
Software Engineer

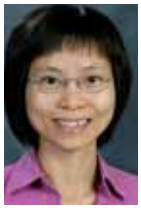
Michelle Brear
Research Scientist

Nadine Mallock
Research Assistant

Sangeeta Ray
Research Scientist

Keri Bell
Administrative Assistant

Samantha Sheridan
Administrative Assistant

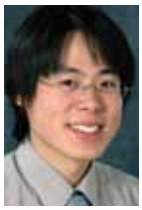


Becky Siu
Administrative Assistant

Amanda Ampt
PhD candidate

Nerida Creswick
PhD candidate

Annie Lau
PhD candidate



Frank Lin
PhD candidate

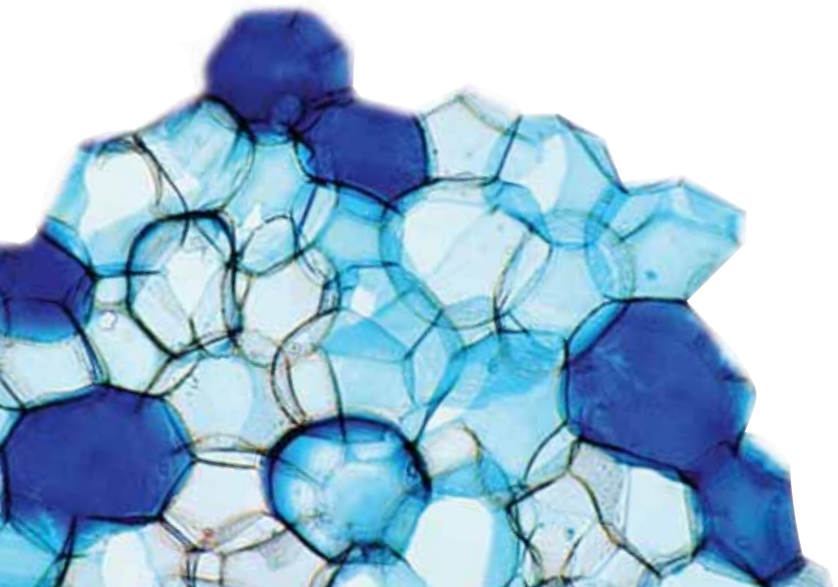
Ginsele Azambuja
PhD candidate

Dr George Alvarez
Masters candidate

Leanne Kearney
Nurse Researcher

Hendra Suryanto
Research Scientist

Sylvia Birch
Pharmacist Researcher



grants

Evaluating the impact of information and communication technologies on organisational processes and outcomes: a multi-disciplinary, multi-method approach.

Funding Source:	Australian Research Council, and NSW Health	
Investigators:	A/Professor J Westbrook, Dr AS Gosling, Dr R Iedema,	
	A/Professor J Braithwaite, Professor E Coiera, D Ayres, T Mathieson	
Funding Source:	NSW Health	
Funds:	2003($)	$135,468
	2004($)	$136,968
	2005($)	$137,606
	2006($)	$137,606
Funding Source:	Australian Research Council (ARC) Linkage grant	
Funds:	2003($)	$138,193
	2004($)	$136,225
	2005($)	$139,076
	2006($)	$107,228

Changing decision-making behaviour in general practice by providing access to online evidence.

Funding Source:	National Health & Medical Research Council (NHMRC) Project grant	
Investigators:	Professor E Coiera, A/Professor J Westbrook, Professor M Kidd,	
	Professor R Day	
Funds:	2004($)	$139,250
	2005($)	$67,125

Development of techniques and models to evaluate the impact of health information technologies on clinical practice and outcomes, 2004 NHMRC Population Health Career Development Award

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

Investigators: A/Professor J Westbrook

Funds:		
	2004($)	$85,250
	2005($)	$85,250
	2006($)	$85,250
	2007($)	$85,250
	2008($)	$85,250

Learning strategies for personal agents to assist professional users in searching the web

Funding Source: Australian Research Council (ARC) Discovery Project

Investigators: Professor E Coiera, Professor P Compton, Dr T Zrimec

Funds:		
	2004($)	$102,340
	2005($)	$104,489
	2006($)	$104,489

Development of a 'benchmark' evaluation methodology for electronic decision support systems in the clinical environment

Funding Source: Australian Department of Health and Ageing

Investigators: Professor E Coiera, Dr C Newman, A/Professor J Westbrook

Funds:		
	2004($)	$90,909
	2005($)	$113,636

NSW Health Capacity Building Infrastructure grant

Funding Source: NSW Department of Health Investigators:
Professor E Coiera, Professor B Celler,
A/Professor J Westbrook, A/Professor N Lovell

Funds:		
	2003-2004($)	$500,000
	2004-2005($)	$500,000
	2005-2006($)	$500,000

Virtual Critical Care Unit evaluation project

Funding Source: Wentworth Area Health Services, NSW Department of Health subcontract

Investigators: Professor E Coiera, A/Professor J Westbrook

Funds:

2004($)	$50,000
2005($)	$125,000
2006($)	$25,000

Agent Mediated Team Interaction in a hospital environment project (extension)

Funding Source: Smart Internet Technology CRC

Investigators: Professor E Coiera, A/Professor W Wobcke

Funds:

2002($)	$38,250
2003($)	$66,356
2004($)	$104,606
2005($)	$30,220

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e-Health Demonstrator Project

Funding Source: Smart Internet Technology CRC

Investigators: Professor E Coiera, Dr R Jansen

Funds:

2004($)	$51,000
2005($)	$17,000

National Institute of Clinical Studies (NICS) Fellowship Sintchenko

Funding Source: National Institute of Clinical Studies (NICS)

Funds:

2004($)	$36,000
2005($)	$72,000
2006($)	$12,000

Summary paper: integrated care program

Funding Source: Department of Health and Ageing

Investigators: Professor E Coiera

Funds: 2005($) $17,250

Translating bacterial molecular epidemiology into information assessment

Funding Source: NHMRC Project grant

Investigators: Professor L Gilbert, Professor E. Coiera, V. Sintchenko

Funds:	2005($)	$35,000
	2006($)	$25,000
	2007($)	$25,000

Impact of electronic medication administration records (e-MARs) on admin errors

Funding Source: UNSW Gold Star Award

Investigators: Westbrook JI, Dean-Franklin B, Coiera E, Day R, Duffield C, Williamson M

Funds:	2005($)	$40,000

Promotion of EDS evaluation framework and web based tools

Source of funding: Department of Health & Ageing

Funding Source: Department of Health and Ageing

Investigators: Professor E Coiera, A/Prof. Johanna Westbrook

Funds:	2005($)	$52,038

Socio-technical systems design & healthcare

Funding Source: IBM Faculty Award

Investigators: Professor E Coiera

Funds:	2005($)	$40,000

publications

Books and Book Chapters

Georgiou A (2005) The Data-Information-Knowledge Model: Understanding its Uses and Limitations, In *Encyclopedia of Informatics and Biomedicine*

Harris M, Penn D, Taggart J, **Georgiou A**, Burns J, Powell Davies G (2005) Chronic disease registers and their use for recall and audit in primary health care, In *Encyclopedia of Informatics and Biomedicine*

Marks GB, Baker DF, **Williamson M** (2005) *Monitoring asthma in populations*, In Peter Gibson (ed), Monitoring Asthma, Dekker

Sintchenko V (2005) Information processing in clinical decision-making, In *Encyclopedia of Informatics in Healthcare & Biomedicine,* Idea Group

Journal Articles - refereed

Alvarez G, Coiera EW (2005) Interruptive communication patterns in the intensive care unit ward round, *International Journal of Medical Informatics*, vol.74, pp.791-796

Ampon RD, **Williamson M**, Correll PK, Marks GB (2005) The impact of asthma on self-reported health status and quality of life: a population-based study of Australians aged 18-64, *Thorax*, vol.60, pp.735-739

Braithwaite J, **Westbrook JI**, Iedema R (2005) Restructuring as gratification, *Journal of the Royal Society of Medicine*, vol.98, no.12, pp.542-544

Coiera E, Walther M, Nguyen K, Lovell NH (2005) An architecture for knowledge-based and federated search of online clinical evidence, *Journal of Medical Internet Research*, vol.7, no.5

Coiera E, Clarke R (2005) "e-Consent": the design and implementation of consumer consent mechanisms in an electronic environment. *IMIA Yearbook of Medical Informatics 2005*: Ubiquitous Health Care Systems. Haux R, Kulikowski C, editors. Stuttgart: Schattauer, pp.224-235.

Magrabi F, Lovell NH, Henry RL, Celler BG (2006) Designing home telecare: a case-study in monitoring cystic fibrosis, *Telemedicine Journal and e-Health*, vol.11, no.6, pp.707-719

Magrabi F, Coiera EW, Westbrook J, Gosling AS, Vickland V (2005) General practitioners' use of online evidence during consultations, *International Journal of Medical Informatics*, vol.74, no.1, pp.1-12

Marks GB, Correl PK, **Williamson M** (2005) Asthma in Australia 2005, *Medical Journal of Australia*, vol.183, no.9, pp.445-446

Sintchenko V, Iredell JR, Gilbert GL, **Coiera EW** (2005) Handheld computer based decision support reduces patient length of stay and antibiotic prescribing in critical care, *Journal of American Medical Informatics Association*, vol 12, pp.398-402

Touissant PJ, **Coiera EW** (2005) Special issue: supporting communication in health care, *International Journal of Medical Informatics* Oct;74(10):779-81

Westbrook JI, Coiera EW, Gosling AS (2005) Do online evidence systems help experienced clinicians answer clinical questions? *Journal of the American Medical Informatics Association*, vol.12, pp.315-321

Westbrook JI, Duggan AE, Duggan JM, Westbrook MT (2005) A 9 year prospective cohort study of endoscoped patients with upper gastrointestinal symptoms, *European Journal of Epidemiology*, vol.20, no 7, pp.619-627

Westbrook JI, Gosling AS, Coiera EW (2005) The impact of an online evidence system on confidence in decision making in a controlled setting, *Medical Decision Making*, vol.25, no.2, pp.178-185

[Editorial on this paper: Hersh WR (2005) Ubiquitous but unfinished: online information retrieval systems, *Medical Decision Making*, vol.25, no.2, pp.147-148]

Westbrook JI, Gosling AS, Westbrook MT (2005) Use of point-of-care online clinical evidence retrieval systems by junior and senior doctors in NSW public hospitals, Internal Medicine Journal, vol.35, no.7, pp.399-404

Westbrook JI (2005) Exploring the interface between organisations and clinical information systems. Health Information Management Journal (Editorial), vol.34, no.4, pp.102-103

Georgiou A, Westbrook JI, Braithwaite J, Iedema R (2005) Multiple perspectives on the impact of electronic ordering on hospital organisational and communication processes. *Health Information Management* 34(4) 130-135

Conference Papers – full papers refereed

Brear M, Westbrook JI, Newman C, Salter C, Stapleton S, Murphy M, Cregan P, Coiera EW (2005) Organisational barriers to telemedicine implementation: results from qualitative research, *Conference Proceedings of the 14th National Health Informatics Conference*, Grain H, Wise M, Chu S (eds), Melbourne, July-August

Georgiou A (2005) Health inform New Zealand atics – an emerging academic discipline facing the challenge of realism, *International Association of Critical Realism 9th Annual Conference, Engaging Realist Alternatives*, Sydney, July

Georgiou A, Westbrook JI, Braithwaite J, Iedema R, Dimos A, Germanos T (2005) A Context-Mechanism-Outcome Approach to the Evaluation of Computerised Physician Order Entry Systems. Editors Grain H, Wise M, Chu S. *Conference proceedings of the 14th National Health Informatics Conference*, Melbourne pp.214-219

Harris MF, Wan Q, Powell Davies PG, **Georgiou A**, Burns J, Penn D (2005) Getting there! Improvements in diabetes care in general practice 2000-2002. In Sansoni J and Tilley L (eds) Health Outcomes 2005: *Making a difference. (Paper) The Australian Health Outcomes Collaboration*, Canberra, August

Hirsch G, Homer J, **McDonnell G**, Milstein B (2005) Achieving health care reform in the United States: toward a whole-system understanding, *International System Dynamics Conference*, Boston, USA, July

Wan Q, Harris M, Jayasinghe U, Flack J, **Georgiou A**, Penn D, Burns J (2005) Coronary Heart Disease Absolute Risk (CHDAR) and Diabetes Care in Type 2 Diabetes in General Practice, *General Practice and Primary Health Care Research Conference*, Adelaide, July

Westbrook JI, Coiera EW, Braithwaite J (2005) Measuring the impact of online evidence retrieval systems using critical incidents and journey mapping, Connecting Medical Informatics and Bio-Informatics: *Proceedings of XIX Medical Informatics Europe Conference*, Engelbrecht E, Geissbuhler A, Lovis C, Mihalas G (eds), Geneva Switzerland, ISO Press, pp.533-538

Westbrook JI, Georgiou A, Dimos A, Germanos T (2005) The effects of IT on the laboratory: a quantitative and qualitative study of the impact of a computerized pathology order entry system, **Improving Laboratory Medicine Australasian Association of Clinical Biochemists Annual Scientific Conference**, Sydney, October

Zrimec T, Busayarat S (2005) Automatic Honeycombing Detection using texture & structure analysis, 2005 ICSC *Congress on computational intelligence: methods & application*, Istanbul, Turkey

Zrimec T, Busayarat S (2005) Automatic detection of pulmonary arteries and assessment of bronchial dilatation in HRCT images of the lungs, *2005 ICSC Congress on computational intelligence: methods & application*, Istanbul, Turkey

Malik A, Zrimec T (2005) Classification of medical images using energy information obtained from wavlet transform for medical image retrieval, HEALTHCOM 2005 - Proceedings of the 7th International Workshop on Enterprise Networking and Computing in Healthcare Industry, Busan, Republic of Korea

Busayarat S, **Zrimec T**, Wilson P (2005) Knowledge-directed automatic bronchi detection method for sparse HRCT scans of the lungs, Proceedings Image and vision computing New Zealand, Dunedin, New Zealand

Busayarat S, **Zrimec T** (2005) Automatic assessment of bronchial dilatation in HRCT images of the

lung based on a template matching technique, Proceedings of 2005 Asia-Pacific Workshop on visual information processing, Hong Kong

Zrimec T, Busayarat S (2005) A model of the human lung using a 3D high resolution CT atlas, Nineteenth International joint conference on artificial intelligence, Edinburgh, Scotland

Conference Papers, Presentations & Invited Presentations

Coiera E, Invited Presentation, Do online libraries improve decision making?, National Institute of Clinical Studies Forum, XIII Cochrane Colloquium, Melbourne, October 2005 (Co-presenter, Sir Muir Grey)

Coiera E, Invited Keynote: 2nd Middle East Conference on Healthcare Informatics, Dubai Knowledge Village, 10 April, 2005. Four rules for the reinvention of healthcare

Coiera E, Invited Keynote: Annual Scientific Meeting of the Australasian Association of Clinical Biochemistry (Sydney, October)

Coiera E, Invited address: Royal Australian & New Zealand College of Radiologists Annual General & Scientific meeting (Sydney, October)

Coiera E (2005) *Provider and User Consultation*, Australian Medical Association Electronic Health Forum, Canberra, December [invited presentation]

Coiera E, Invited Lecture: On line evidence-based decision support. Joint Italo-Australian E-Health Symposium, Sydney 22-3 March

Georgiou A, Magrabi F, Westbrook JI, McDonnell A (2005) *System dynamics approach to the issue of hospital access block*, International Conference on Health and Social Care Modelling and Applications, Adelaide (Accepted abstract)

Georgiou A, Westbrook JI, Braithwaite J, Iedema R (2005) *The impact of computerised pathology order entry systems on pathology services - a context-mechanism-outcome approach*, 13th National Health Informatics Conference, Melbourne, July - August

McDonnell G **(2005) *Keynote Address*, Society for Hospital Pharmacists, Brisbane, November**

McDonnell G **(2005) *Plenary Invited Speaker,* SimTecT Health Care Simulation Conference, Brisbane, November**

Westbrook JI (2005) *Behavioural change as an obstacle*, Australian Medical Association Electronic Health Forum, Canberra, December [invited presentation]

Westbrook JI (2005) *Funding policy-relevant research*, Health Informatics, The Sax Institute Health Policy & Research Exchange, Sydney, November [invited presentation]

Westbrook JI (2005) *Evaluating the impact and benefits of clinical systems*, Northern Sydney Central Coast Area Health Service Clinical Informatics Symposium, Terrigal, August [invited presentation]

Westbrook JI, Coiera EW (2005) Results of the ViCCU Evaluation, Presentation to Deputy Director General of NSW Health, Sydney, December [invited presentation]

Westbrook J, Coiera EW, Magrabi F (2005) The outcomes when clinicians use online evidence systems, *Annals of Family Medicine*, December (invited commentary)

Westbrook JI, Georgiou A (2005) Opening Keynote address: *Multi-method evaluation of point of care clinical systems*, Health Informatics Conference, Denmark, August [invited presentation]

Westbrook JI, Georgiou A, Iedema R, Braithwaite J, **Ampt A**, Forsyth R (2005) *Evaluating the impact of electronic ordering systems*, Presentation to Royal Prince Alfred Hospital, Sydney, May [invited presentation]

Westbrook JI, Georgiou A (2005) *Evaluation of the impact of pathology order entry systems*, South Western Sydney pathology & clinical staff, Sydney, April [invited presentation]

Zrimec T (2005) Artificial Intelligence in Medicine & IJCAI 2005 Conferences, Scotland, UK, July-August

Media

Interview with Prof Coiera, ABC National Radio, Healthcare Knowledge, Norman Swan, 14 November 2005.

Doctors and nurses tie in skills exam, Sydney Morning Herald, 7 February 2005.

The battle lines for eHealth, Computerworld Australia, 16 March 2005.

staff contributions

Committees

Professor Enrico Coiera

Chair, NSW Health IT Industry Reference Group

Australian Health Information Council

Ministerial Advisory Council in Medical and Health Research in NSW

Cancer Research Advisory Committee of the Cancer Institute NSW

Associate Professor Johanna Westbrook

NSW Health Electronic Medical Record (EMR) Management Committee

NSW Health Electronic Medical Record (EMR) Research & Evaluation Committee

Australian College of Health Informatics Membership Committee

National Institute for Clinical Studies Fellowship Review Committee

11th World Congress on Medical Informatics (Medinfo 2004) Member Scientific Review Panel

Vitali Sintchenko

Member, Pathology Informatics Working Party, Royal College of Pathologists of Australasia

Chair, eNotification Pilot Study Working Party, NSW Health

Sarah Behman

OHS Committee

Editorial Boards

Professor Enrico Coiera

HealthInsite

Artificial Intelligence in Medicine Journal

Journal of the American Medical Informatics Association

International Journal of Medical Informatics

Knowledge Engineering Review

Journal of Medical Internet Research

The Informatics Review

Other current appointments

Professor Enrico Coiera

OpenClinical - Member Scientific Advisory Board

Medinfo 2007 - Member Scientific Programme Committee Chair, Scientific Committee International Sociotechnical Conference 2007

Associate Professor Johanna Westbrook

Chair, Scientific Committee National Health Informatics Conference HIC 2004

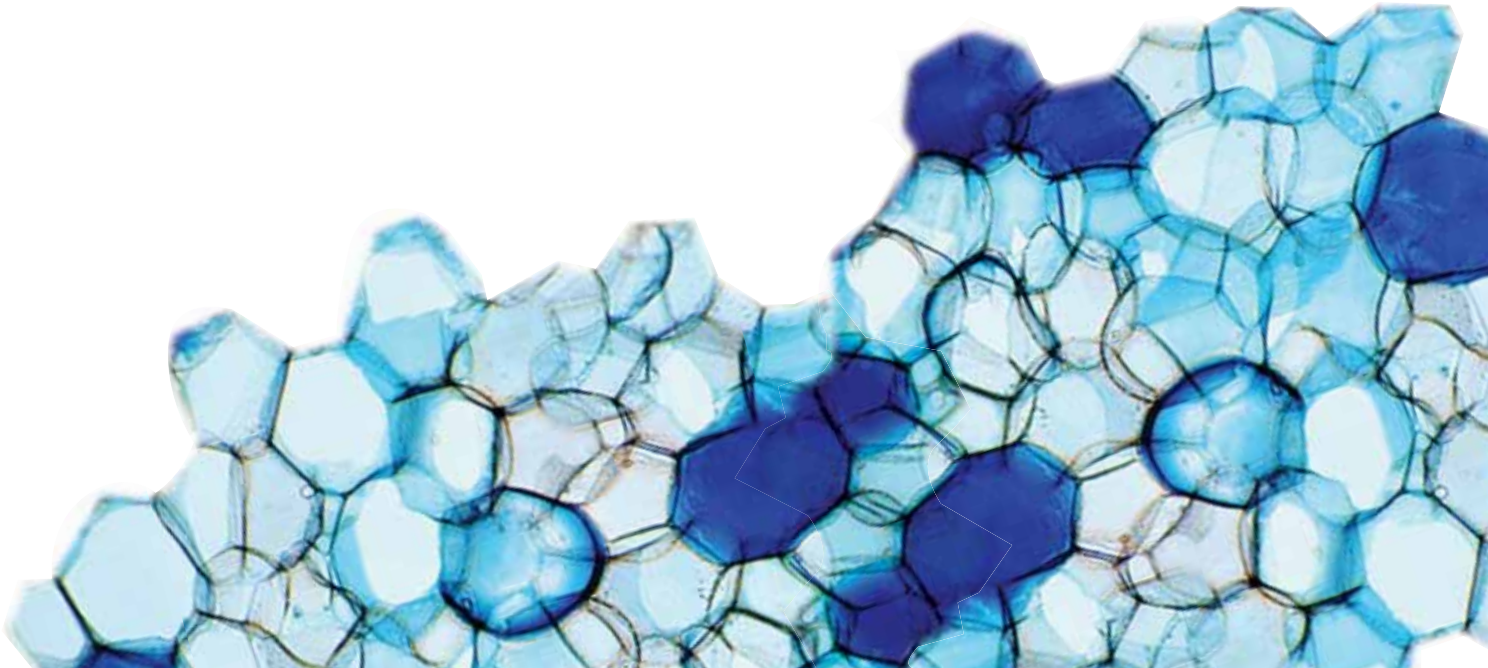
Chair, Scientific Committee International Sociotechnical Conference 2007

Vitali Sintchenko

Centre for Infectious Diseases and Microbiology - Public Health, Westmead (CIDM-PH)

Margaret Williamson

Australian Centre for Asthma Monitoring



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