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Annual Report 2003

CENTRE FOR HEALTH INFORMATICS

ANNUAL REPORT

2003

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Introduction

The Centre for Health Informatics (CHI) became operational at the beginning of 2000, and now is the largest health informatics research group in Australia, with 23 full time research staff and 8 research students. It has attracted over \$6 million in funding since its inception, and continues to grow its research output year on year. CHI has successfully completed several large-scale projects for both State and Federal departments of health, and senior staff sit on Federal and State policy bodies and are regularly consulted because of the broad mix of expertise now contained in the Centre.

The Centre for Health Informatics developed as a collaborative venture of the Faculty of Medicine and the Faculty of Engineering in close association and with the Graduate School of Biomedical Engineering (GSBME). The two Co-Directors of CHI are Professor Branko Celler (Electrical Engineering) and Professor Enrico Coiera (Medicine) who are assisted by A/Prof. Nigel Lovell (GSBME), Deputy-Director (Engineering Informatics) and A/Prof. Johanna Westbrook Deputy-Director (Clinical Informatics).

Aims

The Centre's aim is to research, develop and commercialise information and communication technologies and processes specifically targeted at healthcare priority areas. It aims to become one of the top five health informatics research groups internationally, foster a national research culture of excellence in informatics, and develop a state and national capacity that enables wide scale improvements in health service delivery through the appropriate and intelligent use of information and communication technologies.

Objectives

The Centre for Health Informatics is committed to research and education that:

- Leads the way, producing and distributing world-class research in the development and application of information and communication technologies (ICT).
- Provides training and development opportunities to build up State and Australian expertise
- Fosters the development of a State and national consensus on the key ICT research problems requiring attention
- Encourages the use of robust research and development methodologies

Research

CHI operates four research streams:

Evidence-based Decision Support: Conducting basic research into clinical evidence needs at the point of care, barriers to the uptake of evidence, and developing technologies to provide on-line access to clinically relevant information to support decision making by clinicians and consumers.

Clinical Communications: Understanding how organisational communication processes impact the quality and safety of health care delivery, and how new processes and technologies can be used to improve communication.

Informatics Evaluation: Assessing the effectiveness of new information and communication technologies in improving health outcomes and delivery.

Home Telecare: Design and evaluation of monitoring systems that will facilitate the management of patients in their home, with information passed to their primary care giver, and with the overall objective of improving clinical outcomes, reducing overall health expenditure and allowing the elderly and the chronically ill to stay at home longer.

Mission

Over the past year, the Centre has pursued its core objectives of:

- Fostering co-operative relationships between the University, Federal and State Health Departments, Regional and Area Health Services, and individual institutions;
- Providing a local UNSW, State and National focus for multi-disciplinary research and development activities in the field of health informatics;
- Responding in a timely way to requests from groups inside and outside the University for advice and consultation on health information systems issues, including undertaking research consultancies where appropriate;
- Facilitating the development of training and education systems in health informatics both within and outside the University; and
- Communicating effectively the results of research and analysis to relevant policy-makers and decision-makers in the health care system.

Goals

To this end the Directors committed the Centre to the following goals in 2003:

- Continue to develop the key research streams for Centre activity in the medium-term (2-5 years);
- Identify new research projects for development in 2003 based on core capabilities and strategic considerations;
- Develop the Centres' physical facilities on the UNSW campus with capacity for growth in both Medical Informatics and Biomedical Systems laboratories and a reduced Secretariat;
- Plan and implement systems for effective Human Resources management in recruitment, selection and retention of research and administrative staff; and
- Secure alternative funding to that previously available from UNSW central fund allocations in 2000-2002, to support core infrastructure as a basic resource for future years of operation.

Specific achievements

Key achievements include:

MEDICAL INFORMATICS LABORATORY

- Reporting and publications arising from 2002, completion of the 2-year evaluation of the NSW Departments of Health's Clinical Information Access Project (CIAP), which demonstrated the critical role that online evidence access plays in enhancing clinical decisions across the state, as well as the significant barriers that remain to its widespread adoption across all areas.
- Partnering with NSW DOH to obtain an Australian Research Council Linkage Grant, commencing 2003, to evaluate the forthcoming state-wide Point of Care Clinical Systems (PoCCS) project, worth over \$1 million in cash.
- Completion of partnering with Merck Sharpe and Dome in an Australian Research Council SPIRT Grant (commenced 2001, worth over \$1.5 million in cash), to develop software technology that provides general practitioners with immediate access to relevant evidence at the point of care. It has demonstrated that the technology is effective in answering clinical questions, is clinically acceptable, and can be used effectively at the point of care. The system was commercialised in 2003, with patients pending.

BIOMEDICAL SYSTEMS LABORATORY

- Partnering with HPM Technologies (a wholly-owned subsidiary of HPM Industries Pty Ltd) in the establishment of an Australian Research Council Linkages Grant Project commenced in 2003, which will develop Smart Home technologies. This 5-year grant includes collaboration with Argus Solutions Limited in the use of their iris recognition technology.
- Commencement of an ARC Discovery Grant worth over \$600,000 across 5 years for interactive home telehealth research (2003-2007).

WHOLE OF THE CENTRE

- Securing of a NSW Health Capacity Building Infrastructure Grant of \$1.5 million over 3 years (fiscal 2003-2007)

Directors Report

Medical Informatics Laboratory – Prof Enrico Coiera

The Medical Informatics Laboratory conducts its research around three intertwined themes of:

- Evidence-based Decision Support;
- Clinical Communication; and
- Informatics Evaluation.

The drivers for our research are the increasingly challenging clinical environment, in which both consumers and clinicians struggle to work within an ever more complex health system, constrained by diminishing resources. We believe that mastery of the health system's information and communication processes is one of the keys to the development of a sustainable health system in the future.

As in previous years, the year work for the Lab remains busy and challenging, as new projects are undertaken, sometimes with very short lead times between conception and implementation. The capacity for the Lab to respond rapidly to requests from Government and Industry has increased significantly in the last year, as the research staff have now developed considerable expertise in their specific project areas. I am pleased to report that each project met reporting obligations under the different grant agreements, delivering to time and budget.

Highlights of this year's research include:

- Delivery of the final report of the statewide analysis of clinician use of the New South Wales Department of Health's Clinical Information Access Project (CIAP). The CIAP is accessible to over 55,000 clinicians across the State. Our research represents possibly the first large-population based examination of the use of evidence in routine practice;
- Securing an ARC Linkage grant of over \$1 million dollars, in partnership with the NSW Department of Health, to evaluate their forthcoming state-wide Point of Care Clinical System (POCCS), which will eventually see leading edge information technology deployed at the point of care across all the state's hospitals;
- Completion of a tender for the Federal Department of Health and Ageing, surveying the state of Decision support technologies nationally and internationally, which formed the basis for many of the recommendations that appeared in the National Electronic Decision Support Taskforce Report;
- Completion of Version 3 of the Quick Clinical system (QC2), which is the code name for our ARC SPIRT funded program looking at innovative ways of delivering on-line information to clinicians in a way that matches the needs of their clinical tasks, and the time-pressured demands of their work environment. At the end of 2002 we completed our national trial of QC3, with over 220 general practitioners using the system in routine practice;

- The completion of a project funded by the National Institute of Clinical Studies for a project that spans the evaluation and decision support streams, comparing the effectiveness of QC and traditional information retrieval systems.
- A key feature of the Laboratory is a conscious attempt to foster a cohesive culture that is supportive of individuals, embraces multidisciplinary work, and encourages responsibility taking and continuing professional development. We carry out a series of half-yearly reviews to encourage interaction between the different projects, and once each year spend a rewarding and challenging two days off-site where all the project team members work together to shape a shared vision of where MIL will head in the next few years.

One of the biggest challenges in developing the Laboratory has been the ongoing task of building research teams where most individual researchers come to the work without the needed cross-disciplinary skills required in health informatics. Over the last two years, that situation has changed, and our staff with technology backgrounds has a much richer understanding of the health issues that drive the Laboratory's research programs. Equally our clinically trained staff are now much more familiar with the process of technology design and implementation, a prerequisite for going from clinical problem to informatics solution.

The work completed over the last year will form the basis of a large number of publications that will come out over the next 12 months, and is also seeding the conceptualization of several new projects, which are currently the subject of new grant applications. We are thankful that our work has been so well received by its funders, and the broader clinical community, and over 2003 will engage in a complete review of the Laboratory's research program, to ensure it remains at the cutting edge of clinical informatics.

Biomedical Systems Laboratory - Prof Branko Celler

2003 was a successful year for the Laboratory with the awarding of two ARC Grants. In addition, the recently won \$1.5 million (over 3 year) NSW Department of Health Capacity building grant awarded to CHI will support a knowledge management person in the Home Telecare stream.

The two principles grants are the ARC Discovery Grant on Home Telecare Frameworks and the ARC Linkages Grant with HPM on Smart Home Technology. Both these grants are for five years duration (from 2003-2007). The Discovery Grant is now focussing on knowledge management, clinical reporting and wireless support of home telecare. The NSW Health funding will assist in progressing this work.

For the Linkages grant with HPM, initial activity involved receiving training on the HPM iControl system and installation of iControl at BSL. The first major project was a literature review of home automation systems and compilation of a 100 page report summarising the state-of-the art in research, commercial systems and where the field is heading. This provided a context within which to understand iControl and to suggest projects for the future. Following the literature review BSL undertook to help HPM establish their iPoint system - an XML and HTML interface to iControl. This project involves developing software to connect to and test the interface. At the same time and following on from this we are building towards the next major project - a scheduler and scripting language for iControl that will allow HPM to implement complex logic conditions in iControl. This project will involve HPM and BSL in some ideas-oriented collaboration and extend into 2004. These initial projects, as well as achieving something of practical use, build the relationship between HPM and BSL and will be a solid foundation for future health aware smart-home technologies.

The Tasmanian Intelligent Island initiative is an initiative first proposed by Neville Roach Chairman of the Intelligent Island Board to Branko Celler. The intention was to explore the possibility of CHI providing a mentoring function to the new Bio-informatics Centre of Excellence to be established in Tasmania. CHI held numerous internal meetings to discuss this opportunity and both Branko Celler and Enrico Coiera travelled to Tasmania to present to the Intelligent Island Board and the working party established to coordinate the Centre of Excellence bid.

This initiative, in addition to providing significant research support, will facilitate the development of large-scale "whole of population" trials in areas of significant interest to CHI, including home telecare and Quick Clinical. These will be funded separately and will require input from both state and federal governments.

In terms of future funding opportunities and strategic alliances, discussions are underway with NICTA to negotiate IP and work activity that will possibly be funded by NICTA. The area of research is pervasive networks and implantable bionics.

Management Committee

It is a requirement of the University that a Management Committee be established for each Centre. The management committees, according to University guidelines, should consist mainly of University staff with a direct interest in the affairs of each Centre including the Dean of the relevant Faculty as Chairperson. Our Management Committee is constituted in accordance with UNSW guidelines and comprises Deputy Vice-Chancellor (nominee); Dean, Faculty of Medicine; Dean, Faculty of Engineering; Co-Director, Faculty of Engineering; Co-Director, Faculty of Medicine. Since this Committee has governance responsibility for operational management of the Centre it meets quarterly. Three meetings were held during 2002, the number in brackets represents attendance:

- Professor Bruce Dowton, (Chair) Dean, Faculty of Medicine (2)
- Professor Brendon Parker, (Deputy Chair) Dean, Faculty of Engineering (1)
- Professor Colin Sutherland, representing the Pro-Vice-Chancellor (Research) (1)
- Professor Branko Celler, Co-Director of CHI, Faculty of Engineering (2)
- Professor Enrico Coiera, Co-Director of CHI, Faculty of Medicine (3)
- Professor Gavin Andrews, Scientia Professor, School of Psychiatry, Faculty of Medicine (appointed June 2002) (2)
- Professor Paul Compton, Head, School of Computer Science & Engineering (1)

COUNTS excludes nominees attending on behalf of Committee Members:

An Advisory Committee to assist and guide Directors and the Management Committee on all policy matters was re-composed in August 2002 with acceptances from:

- Professor Branko Celler, Co-Director of CHI, Faculty of Engineering, UNSW
- Professor Enrico Coiera, Co-Director of CHI, Faculty of Medicine, UNSW
- Ms Dianne Ayres, Clinical Systems Strategy Unit, Information Management Directorate, NSW Health Department, Australia (*)
- Professor Kenneth Brummel-Smith, Bain Chair, Providence Centre on Aging, Portland, USA
- Professor John Fox, Head, Advanced Computation Laboratory, Cancer Research UK, London Research Institute, UK
- Dr Robert Wooding, Chief Information Officer, Health and Aged Care (*)
- Professor Edward H Shortliffe, Professor and Chair, Department of Medical Informatics, Columbia University, USA
- Dr Steinar Pedersen, President of the International Society of Telemedicine, Head Department of Telemedicine, University Hospital of Troms, Norway

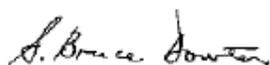
The membership changed in 2002 to include additional representatives of Government instrumentalities & industry (*).

Comment from the Chair of the Management Committee

I am pleased to present the annual report of the Centre for Health Informatics. The Centre has exhibited strong growth in competitive research grants in this, its third year of operation. The number of successful research consulting engagements with Commonwealth, State and Industry partners is pleasingly increasing. The total turnover of research funds awarded to CHI since its inception is approximately \$6 million and both laboratory components of the Centre achieved excellent results in securing grants for 2003 with at least one large ARC grant in each laboratory awarded for up to 3 or 4 years into the future.

The Management Committee of CHI has actively monitored the progress of scientific development in both the Biomedical Sciences and Medical Informatics Laboratories. Enhanced financial reporting has provided the Management Committee with a clear view of quarterly and annual performance on which to make strategic decisions for the benefit of the Centre and UNSW.

The Management Committee is pleased to commend the annual report.

A handwritten signature in cursive script, reading "S. Bruce Dowton".

Professor SB Dowton

Evaluation Research Stream

1) Evaluation of the Clinical Information Access Program (CIAP)

Funding Source: NSW Department of Health

Investigators: A/Professor Johanna Westbrook & Dr Sophie Gosling

Duration: 3 Years

Funds: 2000(\$): 11,650
2001(\$): 252,594
2002(\$): 192,503

Description

The Clinical Information Access Project (CIAP) provides health professionals in New South Wales with online access to clinical decision support information at the point of care. CIAP is designed to support evidence-based practice in order to improve the quality of patient care. CIAP also has an important role to play in supporting clinicians geographically isolated from colleagues and resource bases.

The CHI designed a two-year evaluation program of CIAP consisting of four stages. The aim of the CIAP evaluation was to improve understanding of clinicians' information needs and assess the extent to which the CIAP supports clinical decision-making processes and improves patient care. The three central questions addressed by the research were: Do clinicians use online evidence and why do they use it? What factors influence online evidence use? What impact does use have on clinical practice?

In 2003 the CIAP evaluation was completed with the publication of two further reports. Three further journal papers were published and a paper on the findings from the NSW-wide survey of allied health professionals' use of CIAP won the best paper award at the *11th National Health Informatics Conference*.

2) National Institute of Clinical Studies (NICS)

Funding Source: National Institute of Clinical Studies (NICS)

Investigators: Prof Enrico Coiera, A/Professor Johanna Westbrook & Dr Sophie Gosling

Duration: 1 Year

Funds: 2002/03(\$): 82,952

Description

Online clinical information retrieval (IR) systems located at the point-of-care may help clinicians be evidence-based. Current online clinical IR systems are based upon a standard library search model (LM). However, the context of care imposes different constraints upon decision-making and information needs. Clinicians have

diverse skill sets, education and resources. Consequently IR systems need to be designed to the specific needs of different clinical contexts. To address this, the CHI has developed an information retrieval system, called Quick Clinical (QC), which is structured around clinical questions, localised to the needs of different clinical groups. The QuickClinical (QC) information retrieval system is possibly the first of a new generation of intelligent evidence delivery systems that are designed to search for evidence using clinical questions. Designed and built by the Centre for Health Informatics, QuickClinical aims to make the search for, and access to, evidence as natural a part of routine clinical work as possible, with the hypothesis that this will enhance the usage of evidence in routine clinical care.

This study compared the effectiveness of two IR systems (LM and QC) for three user groups (n=75): 26 hospital doctors (HDs), 18 general practitioners (GPs) and 31 clinical nurse consultants (CNCs). In a laboratory environment, clinicians were presented with eight clinical scenarios. Clinicians were randomised to use either system. The responses to the scenarios were compared pre and post the use of the allocated IR system. Fifty clinicians participated in focus groups following system use.

System use resulted in a 21% improvement in clinicians' answers, from 29%(95%CI 25.4-32.6) correct prior- to 50%(95%CI 46.0-54.0) post-system use. In 33%(95%CI 29.1-36.9) answers were changed from incorrect to correct. In 21%(95%CI 17.1-23.9) correct pre-test answers were supported by evidence found using the system, and in 7%(95%CI 4.9-9.1) correct pre-test answers were changed incorrectly. For 40%(35.4-43.6) of scenarios incorrect pre-test answers were not rectified following system use. Despite significant differences in professional groups' pre-test scores (family practitioners 41% (95%CI 33.0-49.0), hospital doctors 35%(95%CI 28.5-41.2) and clinical nurse consultants 17%(95%CI 12.3-21.7; $\chi^2=2.6,df=2,p=.73$) there was no difference in post-test scores. Overall the QC system was faster at finding correct answers than the LM system. QC was faster and more accurate for doctors, but not for CNCs. There was a wide range of views regarding the IR systems. This study indicates that online evidence is moderately useful for clinicians, but further work is needed to tailor systems to different clinical groups and contexts of care to increase their effectiveness.

The data provided from this study also led to an examination of the impact of online evidence retrieval systems on clinicians' confidence in their answers and the evidence found. Prior to using online evidence, 37% of doctors and 18% of CNCs answered the scenarios correctly. These clinicians were more confident (56% very confident or confident) in their answers than those with incorrect (34%) answers. Doctors with incorrect answers prior to searching rated their confidence significantly higher than did nurses who were incorrect. Clinicians with correct answers had greater confidence in the evidence found compared to those with incorrect answers. Doctors were more confident in evidence found confirming an initially correct answer than were nurses. Over 50% of clinicians who persisted with an incorrect answer after searching reported that they were confident or very confident in the evidence found. Clinicians who did not know scenario answers before searching placed equal confidence in evidence that led them to a correct or incorrect answer.

In 2003 a final report of the study findings was presented to The National Institute for Clinical Studies and a paper on the findings is forthcoming: *Westbrook JI, Gosling AS, Coiera EC. (2004) The impact of an online evidence system on confidence in decision making in a controlled setting. Medical Decision Making (accepted)*

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

Funding Source: ARC Linkage

Investigators: A/Professor J Westbrook, Dr AS Gosling, Dr R Iedema , A/Prof J Braithwaite, Prof E Coiera, D Ayres, T Mathieson

Industry Partner: NSW Health Department

Duration: 4 Years

Funds: 2003(\$): \$135,000
2004(\$): \$130,000
2005(\$): \$130,000
2006(\$): \$107,228

Description

This project will develop and test a Multi-method Evaluation Model (MEM) to measure the impact of information and communication technologies (ICT) on organisational processes and outcomes. The model addresses the practical complexity and political fragmentation of human practice in determining ICT use and outcomes, by considering organisational and socio-cultural factors. Key factors that predict acceptance, effective use and improvement in processes and outcomes will be identified. The generic predictive model will highlight factors which improve organisational processes and outcomes.

The health care sector provides a most appropriate setting for developing and testing a multi-method evaluation model for measuring the impact and consequences of ICT on complex organisational processes and outcomes. The two types of ICT we will examine, order-entry and electronic prescribing, are analogous to on-line ordering of supplies in an electronic supply-chain configuration and point-of-delivery systems which are used for example, in the finance, manufacturing and construction sectors.

In health, a key goal of ICT is to improve decision-making processes of individuals and teams, resulting in improved patient and organisational outcomes. The emphasis is on supporting better and more informed decision-making by providing access, or alerts, to relevant 'evidence', reducing reliance upon gut feelings, potential biases related to personal and patient characteristics and past experience. This goal of ICT is equally applicable, for example, in the justice system. Work on decision-making processes of police officers and people in the judiciary show that these groups are subject to the same potential biases as clinicians in terms of placing greater reliance on individual and situational characteristics, rather than objective evidence. However our understanding of the effectiveness of ICT to improve decision-making is poor as research has concentrated on issues of diffusion of technology rather than measuring the consequences of that technology.

Our research focuses on a) developing and applying innovative and empirically rigorous measurement techniques to the evaluation of point-of-care ICT, b) demonstrating the effects of ICT on the delivery and outcomes of health services, and decision-making processes, c) investigating organisational, professional socio-cultural and technical factors influencing the effective use of ICT.

Communication Research Stream

1) Communication behaviours in the clinical setting

Funding Source: NSW Department of Health

Investigators: Professor Enrico Coiera, Ms Rosemary Spencer, and Ms Pamela Logan

Duration: 2 Years

Funds: 2000(\$): 196,124

2001(\$): 85,115

2002(\$): Carried forward

Description

This study, looking at communication systems in the New South Wales health system, was endorsed by the Department of Health Clinical Systems Steering Committee in May, 2000 and work in the study commenced in January, 2001.

The projects will develop and disseminate the communication behaviour study methodology successfully piloted in an earlier study of Accident and Emergency Departments, as well as extend the data collection and analysis to other sectors of the health system. This effectively builds on the earlier work to develop a strong skill set for the sustainable evaluation and improvement of communication systems within the NSW health sector.

Project 1: Analysis of communication behaviour data

Aims: Project 1 aims to collect of a new set of observations to allow a detailed analysis of clinical communication behaviour.

Current status: Completed. In 2001, 20 hours of observational data were collected from an urban Emergency Department. Comparison with a previous data set collected from the same department has been completed. A more detailed role-based analysis of the 2001 data was undertaken to inform Project 3 which aimed to identify interventions that could potentially improve hospital communication processes.

Project 2: Development and dissemination of observational methodology

Aims: Project 2 aims to develop, refine and test the Communication Observation Method (COM), which measures communication patterns in clinical settings. The overall aim of Project 2 is to produce detailed documentation of the validated methods in order to facilitate the use of the methodology by other researchers.

Current status: Completed. The project aims were achieved through: the collection and analysis of a new

observational data set to allow comparison with previous data (Project 1); refinement and development of communication event and attribute definitions to provide a more comprehensive coding system; conducting reliability studies on the observational techniques and coding processes; design of a data entry system and analysis process; and the production of a detailed manual describing the COM.

These tools can now be used more widely by NSW Health to measure communication processes in clinical settings and assess the benefits and impact of the use of the developed method in these settings. This refinement has also improved the efficiency of the data collection and analysis processes. The project leverages investment in existing methodology and allows transfer to other NSW institutions and researchers.

Project 3: Development of interventions to improve communication

Aims: Based upon the user needs identified within Project 1 and earlier studies, Project 3 aims to identify interventions that could potentially improve hospital communication processes.

Current status: Completed. The project aims were achieved through undertaking: a more detailed role-based analysis of the 2001 data (Project 1); conducting focus groups with clinical staff; reviewing related literature. Both quantitative and qualitative analysis methods were employed to examine communication practices and generate rich descriptions of communication patterns in clinical settings. A detailed report was produced which outlined communication patterns, issues, and potential interventions to support communication in an emergency department setting.

All three projects contributed to identifying communication and information requirements of clinical teams from complex clinical environments. Armed with this knowledge, the most effective use of information technology could be identified and effort channeled to developing clinical systems tailored to clinician's preferred processes.

Decision Support Research Stream

1) ARC SPIRT 2002 (Quick Clinical)

Funding Source: ARC SPIRT Grant (No.: C00107730; RO ref: 0112320)

Industry Partner: Merck Sharp and Dohme Pty Ltd

Investigators: Professor Enrico Coiera & A/Professor Nigel Lovell

Duration: 3 Years

	ARC	Partner
Funds:		
2001(\$):	139,000	350,000
2002(\$):	146,958	605,000
2003(\$):	91,068	400,000

Description

Work in this ARC SPIRT Grant (No.: C00107730; RO ref: 0112320) commenced in early 2001. The “Quick Clinical” project is developing an experimental on-line information retrieval system for use in the clinical setting. Quick Clinical is designed around the specific information needs that arise within the clinical context, and is designed to operate under the resource constraints of clinical work. The Quick Clinical research project aims to:

- Understand evidence needs of GPs;
- Understand how to deliver evidence in a clinical setting;
- Develop core IT innovations needed to access and integrate multiple evidence sources to simplify clinical access; and
- Develop a prototype on-line and just-in-time system for clinical trial with GPs.

Following the development of QC version 3.0 in October 2002, a national field trial with 193 GPs was completed during a four-week trial run in November 2002. GPs who had a computer with Internet access in their consulting room were recruited. The study examined the frequency and purpose of system use from data collected via automatically generated computer log files and self-reports via online user feedback. The trial was recognised by the RACGP’s QA&CPD (Quality Assurance and Continuing Professional Development) Program. GPs who completed both surveys were eligible for 10(Group 2) QA&CPD points.

One hundred and ninety-three participants conducted 1680 searches over the four-week trial. The number of searches ranged from 1-74 (mean = 8.7 and mode = 1). The use of the system varied over the week with 22.5% of searches on Wednesdays. Some use also occurred over weekends. Searches were conducted both during and after practice hours. Seventy-nine percent were performed between 9am-7pm and 62% were initiated in consulting rooms, suggesting that the system integrated into day-to-day workflow and was used during consultations. The most frequent questions related to diagnosis (37%) and treatment (32%). Search subjects

included a broad spectrum of diseases, including common conditions such as asthma, diabetes and heart disease.

The relevance of search results was assessed using a randomly assigned feedback prompt to users following search results. GPs reported that in 73% of specific queries reviewed the results obtained online were important or very important to the care of their patient. The technical feasibility of the QC system was also shown in the study. The system was able to support 193 GPs over four weeks. The study indicates that QC can support evidence-based decision-making in general practice.

Home Telecare Research Stream

1) Adding a health dimension to integrated automation solutions for intelligent homes

Funding Source: ARC Linkage Program LP0347193
Industry Partner(s): HPM Industries Pty Ltd, Iris Australia trading as Argus Solutions Ltd.
Investigators: Professor Branko Celler & A/Professor Nigel Lovell
Duration: 5 Years

	ARC	Partner (HPM)
Funds (Cash):		
2003(\$):	170,000	50,000
2004(\$):	215,000	50,000
2005(\$):	250,000	50,000
2006(\$):	196,374	50,000
2007(\$):	209,854	50,000

Description

We present a vision for the implementation of intelligent health care technology in the home of the future, focusing on areas of research that have the highest potential payoff over the next ten years for the community, the government and our industry partners. By "intelligent health care technology" we mean smart devices and systems that are aware of their context and can therefore assimilate information to support care decisions. We aim to integrate these systems into existing home automation systems designed and marketed by our industrial collaborators. Outcomes will be underpinned by new knowledge acquisition and knowledge based decision systems.

2) A comprehensive framework for interactive home telehealth research

Funding Source: ARC Discovery Grant DP0345179
Investigators: Professor Branko Celler & A/Professor Nigel Lovell
Duration: 5 Years
Funding: 2003(\$):140,000
2004(\$):115,000
2005(\$):120,000
2006(\$):120,000
2007(\$):120,000

Description

We propose the development of a comprehensive research framework for the next generation of home telecare technology. The framework will support the unattended recording of patient physiological data and allow for patient management and information review by health professionals. It will include knowledge management tools to support clinical decision making. Research will also be conducted into the development of mobile community networks and ambulatory monitoring technologies based around Bluetooth piconets. The long-term outcomes of this research will be improved patient health outcomes in the chronically ill and a decreased overall health care expenditure by reducing hospital admissions.

Consolidated financial reports by Operating Unit

Centre for Health Informatics - Medical Informatics Laboratory (Faculty of Medicine)

Statement of Financial Performance for the Year Ended 31 December 2003

	2003 \$	2002 \$
Income		
(i) External Funds	1,391,243.85	1,059,577.64
(ii) UNSW Contribution	7,358.00	0
(iii) Other Income	<u>14,576.01</u>	<u>12,400.00</u>
Total Income	1,413,177.86	1,071,977.64
Expenses		
(iv) Payroll	786,110.65	621,111.81
(vi) Equipment	31,063.57	39,558.18
(vii) Materials	144,723.01	181,938.91
(vii) Travel	<u>19,824.78</u>	<u>18,524.24</u>
Total Expenses	981,722.01	861,133.14
Operating result	431,455.85	210,844.50
Surplus(Deficit) Bfwd from Prior Year	444,533.72	233,689.22
Correction of Prior Year Accumulated Fund	0.00	0.00
Adjusted Brought Forward	444,533.72	0.00
Accumulated Funds Surplus(Deficit)	<u><u>875,989.57</u></u>	<u><u>444,533.72</u></u>
(i) Includes debtors (invoices raised, unpaid at 31-12-03)	501,250.30	304,292.97

Notes to the Statement of Financial Performance:

- (i) 2003 External research funds (all categories 1-4) including MEDSI Research, Business activities (BA101-CHTMED-PSW2155 and BA101-CHTEVAL-PS02817), Scholarships (BE002-PSM4125). 2002 Major debtors at year-end include \$250,000 for ARC Project owed as two invoices from November & December each year by industry partner Merck Sharp & Dohme (Australasia) Ltd; \$8,774 for Prof E Coiera travel to England (HCMMICConf, Royal College of Surgeons Edinburgh).
- (ii) UNSW Contribution includes Research Infrastructure Block Grant received from Faculty of Medicine. No other UNSW contributions were provided in 2003; the UNSW internal grant for 'establishment funds' ceased in 2002. No UNSW infrastructure grant in 2002.
- (iii) 2003 Other income includes interest on invested funds (UNSW Short-term pool) of \$13,576 and funds awarded for special uses eg, \$1,000
- (iv) 2003 Materials includes accounts for scholarship stipends (\$60,970.40) paid to PhD students expended against research funds income. 2002 Materials expenses includes \$554,767.78 internal contributions transfers (account 6921) from MEDSI projects to administrative infrastructure accounts (PSW2155) & internal transfer of \$225,000 to Accumulation Fund (PS02670) which are NOT included in total as zero net effect. 2002 NHMRC PhD Scholarship Stipend (PSM4125) included in Payroll expenses.

Signed by Director:



Prof Enrico Coiera

Signed Business Manager:



Mr Steven Tipper

Centre for Health Informatics - Biomedical Systems Laboratory
(School of Electrical Engineering & Telecommunications, Faculty of Engineering)
Statement of Financial Performance
for the Year Ended 31 December 2003

	2003	2002
	\$	\$
Income		
(i) External Funds	331,942.09	300,100.33
(ii) UNSW Contribution	0.00	100,000.00
(iii) Other Income	<u>15,000.00</u>	0
Total Income	346,942.09	400,100.33
Expenses		
(iv) Payroll	424,206.14	212,093.24
(vi) Equipment	3,920.96	8,304.26
(vii) Materials	38,344.32	19,300.29
(vii) Travel	<u>5,621.75</u>	<u>19,017.39</u>
Total Expenses	472,093.17	258,715.18
Operating result	-125,151.08	141,385.15
Surplus(Deficit) Bfwd from Prior Year	-193,084.49	-334,469.64
Correction of Prior Year Accumulated Fund	0.00	0.00
Adjusted Brought Forward	-193,084.49	-334,469.64
Accumulated Funds Surplus(Deficit)	<u><u>-318,235.57</u></u>	<u><u>-193,084.49</u></u>
(i) Includes debtors (unpaid invoices at 31-December)	14,652.86	0.00

Notes to the Statement of Financial Performance:

(vii) 2002 - Significant paper-error occurred in 2002 UNSW accounts processing of Lab Consumables (& 'income' c/fwd) of \$20,207,369.92 (ie, >\$20M) in adjustment for a currency conversion error. This amount is unrealised and does not reflect the activity in the account in 2002. Transfer of Business Activities Account (PSW2154) from the Centre to the ELEC entity occurred in 2003 and the small nett favourability is not included in the above Centre figures for BioMedical Systems Laboratory.

Signed by Director:



Professor Branko CELLER

Signed by Business Manager:



Mr Steven TIPPER

Centre for Health Informatics - Secretariat
(Administrative unit to both CHI Laboratories)
Statement of Financial Performance
for the Year Ended 31 December 2003

	2003	2002
	\$	\$
Income		
(i) External Funds	5,034.75	2,575.68
(ii) UNSW Contribution	0.00	260,000.00
(iii) Other Income	<u>1,704.00</u>	9,610.00
Total Income	6,738.75	272,185.68
Expenses		
(iv) Payroll	63,422.93	190,985.80
(v) Equipment	840.00	4,417.03
(vi) Materials	15,134.32	19,940.66
(vii) Travel	<u>2,698.67</u>	<u>4,138.76</u>
Total Expenses	82,095.92	219,482.25
Operating result	-75,357.17	52,703.43
Surplus(Deficit) Bfwd from Prior Year	47,015.01	-5,688.42
Correction of Prior Year Accumulated Fund	0.00	0.00
Adjusted Brought Forward	47,015.01	0.00
Accumulated Funds Surplus(Deficit)	<u><u>-28,342.16</u></u>	<u><u>47,015.01</u></u>
(i) Includes debtors (invoices raised, unpaid at 31-12-03)	351.29	0.00

Notes to the Statement of Financial Performance:

- (i) External funds: cost-recoveries for work by the Business Manager for external clients plus charges for use of Samuels 210 Teaching Laboratory to cover consumables & maintenance use by users (gross income: \$3,094 against expenses: \$3,137)
- (ii) Zero UNSW contribution for the Centre applied in 2003 as per Management Committee plan for period 1999-2002 establishment funds except rollover of accumulated balance from previous year.
- (iii) Internal income charges for users of Samuels 210 CHI Teaching Laboratory
- (iv) Payroll includes Business Manager (0.5 FTE cost-recovery from 1 July 2004 from NSW Health Capacity Building Grant) + Senior Software Engineer to 30-01-2004 @ \$4,799 borne by Secretariat on behalf of both Laboratories before transfer of employee to BSL (Engineering) & salary of Administrative Officer @ \$33,638 terminated PE 30th June 2003 on budget constraint.
- (vi) Includes \$4,899 unreconciled purchase card items held account as 'suspense' for all Centre cards charges at 31-12-2003

Signed by Directors:



Professor Enrico COIERA



Prof Branko CELLER



Signed by Business Manager: Mr Steven TIPPER

Professor Branko Celler



DIRECTOR, BIOMEDICAL SYSTEMS LAB

*Head of the School of Electrical Engineering and Telecommunications,
Director of the Biomedical Systems Laboratory, and Co-Director of the
Centre for Health Informatics at UNSW*

Branko G Celler received his BSc in Computer Science and Physics in 1969, BE (Hons) in Electrical Engineering in 1972 and PhD in Biomedical Engineering in 1978, from the University of New South Wales, Australia. From 1977 to 1980 he was a Postdoctoral Fellow working at the John Hopkins School of Medicine in Baltimore, USA. He returned to UNSW in 1981 as a Lecturer, where he was appointed Associate Professor in 1991 and Professor in January 1997. At the present time he is Head of the School of Electrical Engineering and Telecommunications, Director of the Biomedical Systems Laboratory, and Co-Director of the Centre for Health Informatics at UNSW.

Research interests include biomedical instrumentation; signal processing and medical expert systems. Over the last 8-10 years Prof Celler has been actively involved in R&D on the application of information and communications technology in primary health care and he has a particular interest in home telecare and the remote monitoring of health status of the elderly at home.

Professional & Scientific Memberships

- Churchill Fellowship Selection Committee, NSW Chapter- Professional Category •
- Editorial Board Journal of Telemedicine and Telecare - British Medical Association
- IEEE Transactions on Information Technology in Medicine
- International Journal of Biomedical Measurement, Informatics and Control
- Imperial College / MIT International Consortium on Medical Imaging
- Technology (ICMIT)
- Technical Committee on Biomedical Engineering and Control
- IFAC, International Federation of Automatic Control
- Institute of Electrical and Electronics Engineers (IEEE)

Fellow

- Institute of Engineers Australia
- Australian Institution of Radio and Electronics Engineers (IREE)

President

- Bioelectronics Group of the IREE (1984-1986)

Membership on Academic Boards

- Computer Engineering Management Committee (1993-)
- Faculty Executive Committee, Faculty of Engineering University of NSW (1992-)
- Head of School Advisory Committee School of Electrical Engineering (1985-1990)
- Electrical Engineering Careers Committee (1996-), Chair

Professor Enrico Coiera



DIRECTOR, MEDICAL INFORMATICS LAB

Professor Coiera is the Foundation Chair in Medical Informatics, Faculty of Medicine, UNSW. Director of the Medical Informatics Laboratory, and Co-Director of the Centre for Health Informatics at UNSW

Professor Coiera received his medical degree from the University of Sydney in 1982 and a PhD in computer science from the University of New South Wales in 1989. Between 1990-1998 he worked at Hewlett-Packard's Research Laboratory in Bristol as a senior research scientist and manager. In 1999 he was the first Australian elected as a Fellow of the American College for Medical Informatics. He is an Adjunct Professor in Computer Science at the University of New South Wales. He became the founding President of the Australian College of Health Informatics in 2002.

He is the author of *The Guide to Health Informatics*, now used as the basis for many courses in health informatics. His research publications have focused on highlighting the importance of communication processes for informatics research, on informing the clinical community about the importance of new technologies like the Internet, and evidence-based decision support technologies.

Current Research Funding, Grants and Awards

Australian Research Council

- SPIRT: Coiera, Lovell: Intelligent search engine for Continuing Medical Education, Industry Partner Merck Sharpe and Dome. 2001-2003 Total Funds **\$1.72 million**
- Linkage: Westbrook, Gosling, Iedema, Braithwaite, Ayres, Mathieson, Coiera. Evaluation of the impact of information and communication technologies on organisational processes and outcomes: A multi-method approach. 2003-2007 **\$1.04 million**

NSW Department of Health

- Capacity Building Infrastructure Grant: Coiera, Celler, Westbrook, Lovell. 2003-6: **\$1,500,000**

Professional & Scientific Memberships

Committees

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

Editorial Boards

- 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

Professional memberships

- Fellow, Australian College of Health Informatics
- Fellow, American College of Medical Informatics
- Member, American Medical Informatics Association
- Member, British Medical Association

Other current appointments:

- OpenClinical - Member Scientific Advisory Board
- HIC 2003 - Chair scientific committee
- Medinfo 2004 - Member Scientific Programme Committee

Associate Professor Johanna Westbrook



DEPUTY DIRECTOR (CLINICAL)

Johanna Westbrook was appointed as Associate Professor in January 2001 and is also the Program Manager for the Evaluation Stream in the Medical Informatics Laboratory

Associate Professor Westbrook joined CHI in 2001 as Evaluation Program Manager. Prior to joining the Centre for Health Informatics, Johanna was Head of the School of Health Information Management at the University of Sydney.

Johanna's expertise centres on the evaluation of health care and information systems. She has held senior positions within the health sector including, Quality Manager St. Vincent's Hospital Sydney, and Manager of the NSW Health Outcomes Program, NSW Department of Health. Johanna's research experience in health care evaluation is extensive and ranges from studies of the evaluation of health services at an organisational level, eg patient falls in hospital, needle stick injuries and patient satisfaction, to the analysis of large health datasets to examine quality of care and health outcomes at state and national levels (eg complications of hospital care and variations in diagnostic procedure rates). She has conducted several large epidemiological studies including assessment of the prevalence of gastrointestinal conditions in the community and the long-term outcomes of patients with dyspepsia and gastro-oesophageal reflux.

Evaluation research led by A/Prof Westbrook at the Centre for Health Informatics includes the first population study of clinicians' use of online evidence to support improved clinical decision-making conducted. This involved study of the use of an online evidence system by 55,000 clinicians across NSW via the analysis of computer web logs, indepth case studies including measurement of socio-cultural factors such as the impact of clinical team functioning, and a random survey of 5,511 clinicians. A unique aspect of this work was the application of rigorous epidemiological techniques in concert with qualitative research methods. In 2003 she led a successful \$2.1M ARC grant to evaluate the impact of information and communication technologies on health care organisational processes and outcomes. In 2003 Johanna was admitted as a Fellow of the Australian College of Health Informatics (ACHI).

The evaluation research stream at the Centre is focused on:

- Designing and implementing multi-method evaluations to assess the use and impact of clinical information systems on health care practice and outcomes.
- Developing rigorous and innovative approaches to the evaluation of clinical information systems
- Producing empirical data to inform decisions about the effective use of IT in health care, including implementation and system design.

Competitive Funds Received 2003:

- Westbrook JI, Gosling AS, Iedema R, Braithwaite J, Ayres D, Mathieson T, Coiera EW (2003-2006), Evaluating the impact of information and communication technologies on organisational processes and outcomes: a multi-disciplinary, multi-method approach, Australian Research Council – Linkage: **\$2,196,427 (\$1.1M cash)**
- Westbrook JI (2003) Web log analysis of the NSW Public Health Bulletin, NSW Health: **\$21,000**
- Coiera EW, Westbrook JI, Kidd M, Day R (2004-2006) Making decisions using online evidence in general practice, National Health and Medical Research Council (NHMRC): **\$202,625**
- Westbrook JI (2004-2008) Career Development Award , National Health and Medical Research Council (NHMRC): **\$417,500**

Associate Professor Nigel Lovell



DEPUTY DIRECTOR (ENGINEERING)

Nigel is an Associate Professor in the Graduate School of Biomedical Engineering UNSW. He was appointed as Deputy-Director of the Centre on its formation in 1999

Nigel Lovell received the BE (Hons) and PhD degrees from the University of New South Wales (UNSW), Sydney, Australia. He has worked at the University of Technology, Sydney and as a Visiting Professor in the Faculty of Medicine, Johns Hopkins Hospital. He is currently a Faculty member of the Graduate School of Biomedical Engineering.

Prof Lovell's research work has covered areas of expertise ranging from eb-enabling technologies, biological signal processing, cardiac electrophysiology, visual prosthesis design and physiological modeling. He has published over 140 journal articles, books, patents and refereed conference proceedings, been awarded over \$8 million in R&D and infrastructure funding, and been involved in organizing over 20 conferences and workshops. Over his career he has completed a similar number of industry and Government consultancies.

He serves on the Editorial Boards for "Physiological Measurement", "Journal of Neural Engineering" and as Associate Editor for "Transactions on Information Technology in Biomedicine". He was the Co-Chair of the "Joint World Congress on Medical Physics and Biomedical Engineering" that was held in Sydney, August 24th - 29th, 2003.

Prof Lovell serves as an elected member of the Administrative Committee of the IEEE-EMBS, which is the largest international biomedical engineering professional society. He currently is the Vice President of the IEEE EMBS (2002 - 2005). In addition, he is currently the IEEE-EMBS web-master. For his major contributions to the IEEE in this and other areas, in 2000 he was awarded the prestigious Millennium medal.

Steven Tipper



BUSINESS MANAGER

Steven was appointed as Business Manager of the Centre for Health Informatics in February 2000.

Steven holds a Bachelor of Applied Science (Biomedical Science) Degree from the NSW Institute of Technology (1979) and Master of Health Administration Degree from the University of New South Wales (1989), a Commission as an Officer in the Australian Army (served 1983-1986) and is a Fellow of the Australian College of Health Service Executives. From mid-2001 to the present he has been an elected Board Member of the Health Informatics Society of Australia Ltd, continuing in 2003 as the Hon. Treasurer, and as an Executive Committee member of the HISA (NSW) Branch of the Society. He holds an Adjunct Lecturer appointment in the Department of Physiology & Pharmacology, School of Medical Sciences, Faculty of Medicine, University of New South Wales.

Steven has over 20 years experience in the public healthcare sector before joining the Centre to apply his scientific, academic and administrative skills. He is well known from his work as a Hospital Scientist (Clinical Microbiology, St. Vincent's Hospital Sydney 1979-1989) and a variety of positions over five years in hospital and Area-based health administration at Director of Administrative Services level or similar (South Western Sydney Area Health Service 1989-1995). He has also been a TAFE tutor/demonstrator (Biological Sciences, Granville 1996) before returning to St Vincent's as Manager of the New South Wales Medicines Information Centre (1997-2000) where he reformed practices in drug information services and provided consultancy on Commonwealth-funded projects in the area of health information management (IT/IM) and polypharmacy national projects (eg, DiNCQUMGP, ADIN). As Business Manager of the Centre, Steven is responsible for day-to-day administration for CHI projects and strategic advice which supports the Directors in planning Centre research development.

Professional Memberships/Interests

- Australian College of Health Service Executives (Fellow) FCHSE.CHE
- Health Informatics Society of Australia, Board Member (Treasurer) and NSW Branch Executive Committee member

External Grants

- **NHMRC project grant** 300435, **Title:** Changing decision-making behaviour in general practice by providing access to online evidence, **Chief investigators:** Prof Enrico Coiera, A/Pr Johanna Westbrook,

Prof Michael Kidd, Prof Richard Day, **Associate investigators:** Dr Sophie Gosling, Dr Giovanna Zingarelli, Mr Steve Tipper. 2004-2005: **\$202,625**

- **NHMRC Development Grant** application (April 2003) No: 300591 **Title:** Development of the QuickClinical on-line evidence based decision support system [*Commercialisation “proof-of-concept” for a new approach to evidence system design and on-line evidence retrieval technology*], **Chief investigators:** Prof Enrico W. Coiera, A/Prof Nigel H Lovell, **Associate investigators:** Mr Steven W. Tipper. 2004: **\$122,000**
- **General Practice Computing Group [Consultancy] GPCG Project 1, RFT 72/0203:** Consultancy to the Centre for General Practice Integration Studies. This project report presents the results of *Chronic Disease Functionality*, a review of the functionality required of software systems to support chronic disease care in general practice. The project was commissioned by the General Practice Computing Group, funded by the Department of Health and Ageing, and conducted by a consortium including the Centre for General Practice Integration Studies at the University of NSW, the Centre for e-Health at the University of Ballarat, Australian Divisions of General Practice, the University of Adelaide and the Chronic Disease Alliance.

Dr Sophie Gosling



RESEARCH SCIENTIST - EVALUATION

Sophie was appointed as a Research Scientist in the Evaluation Research Program in January 2001 until August 2003.

Dr Sophie Gosling joined the Centre for Health Informatics in January 2001, as research scientist in the evaluation research program. Sophie is a Clinical Psychologist. She received a first class degree in Psychology in 1989 from the University of Bristol. She qualified as a Clinical Psychologist in 1993, and received a Doctorate in Clinical Psychology in 2000, from the South Thames (Salomons) Clinical Psychology Training Programme and Canterbury Christ Church University College. She also holds a post-graduate diploma in Systems, Organisations and Families from the Tavistock Clinic and University of East London.

Sophie worked as a practicing clinical psychologist in London for seven years, specialising in paediatric and community services. As part of a multi-disciplinary team, she helped to establish and run a specialised mental health service for adolescents. She conducted a number of projects, including a client satisfaction survey, changes in attendance rates to clinic appointments, an analysis of service users and an evaluation of a children's group.

In 1998 Sophie set up a new service for children and families with HIV. Her doctoral thesis was based on this work. She is a member of the Australian Psychological Society and is a NSW State registered psychologist. Sophie is a foreign affiliate of the British Psychological Society. As project officer in the Faculty of Pharmacy at

the University of Sydney, she worked on research evaluating a specialised service in community pharmacy for people with diabetes.

Her research interests include health informatics evaluation, clinical decision making processes and use of information technology, paediatric psychology and HIV.

Nerida Creswick



RESEARCH ASSISTANT - EVALUATION

Nerida was appointed as a Research Assistant in the Evaluation Research Program in May 2002

Nerida is a Research Assistant, working part-time in the Evaluation research program since May 2002. Since February 2002, Nerida has also worked as a part-time research assistant at the School of Health Information Management at the University of Sydney. Nerida graduated with a Bachelor of Applied Science (Health Information Management) (Honours Class I) from the University of Sydney in 2002. Between 1999 and 2002 Nerida held a number of part-time positions including working as a research assistant for Laeta Pty Ltd and undertaking clinical data classification and entry at the Family Medicine Research Centre at the University of Sydney.

Rosemary Spencer



RESEARCH ASSISTANT - COMMUNICATION

Rosemary was appointed as a Research Assistant in the Communication Research Program in January 2001

Rosemary joined the Centre for Health Informatics as a Research Assistant in the Communication Research Program in January 2001. Rosemary is a registered nurse who has worked in a variety of clinical settings including: psychiatry, diabetes education, and intensive care nursing. She received a first class honors Degree in Nursing from the Australian Catholic University, Sydney in 1995 and a postgraduate Diploma in Psychiatric Nursing from the University of Melbourne in 2000. She also obtained a Master of Arts (Cognitive Science) from the University of NSW in 1999.

Pamela Logan



RESEARCH ASSISTANT - COMMUNICATION

Pam was appointed as a Research Assistant in the Communication Research Program in August 2001 until January 2003.

Pamela is a Research Scientist with the Communication research program. Between 1989 and 1993 Pamela held a number of positions as registered nurse in a variety of clinical settings both in the UK and New Zealand. These areas included: trauma/orthopaedics at the Alexandra hospital, Redditch, UK; surgery/urology at Guys Hospital in London; elderly care/palliative care/young disabled at the Parklands Mercy Hospital, Auckland, New Zealand; maxillo/facial surgery, Guys Hospital, London. From 1993 nursing experience became more community focused, initially as a community nurse in Central London and then as a registered health visitor until moving to Sydney at the end of 2000.

Qualifications

- 2000: Master of Science awarded distinction (Health Sciences) University of London, UK
- 2000: ENB Registered nurse prescriber, UK
- 1996: Diploma in Community Health Care (Health visiting) NESOC/Open University, UK
- 1995: ENB 998 Teaching and Assessing in clinical Practice, UK
- 1993: ENB 934 Care of Patients with HIV/Aids, UK
- 1989: Certificate of Nursing (RGN) Mid-Worcestershire School of Nursing, UK

Hugh Garsden



SENIOR SOFTWARE ENGINEER

Hugh was appointed as the Senior Software Engineer for the Centre for Health Informatics in January 2000 and relocated to BioMedical Systems Laboratory and TeleCare Research from January 2003

Hugh Garsden received his BSc in Physics in 1980 from the University of Queensland, and his BSc (Hons) in Computer Science in 1990 from the University of Adelaide. He also studied some psychology as an undergraduate. He has been working mostly in research and development in the fields of Software Development and Biomedical Science, applying his skill as a software engineer and as a scientist.

In 2000 he joined the Centre for Health Informatics as a software engineer and was also in charge of the Centre's website. His work has spanned a wide range of programming methodologies within many varied domains. He has implemented and maintains the Web site for the member database of the IEEE EMB Society (worldwide). He has contributed to research in speech recognition, programming languages and health informatics.

Memberships

- Member, IEEE (incl. Engineering in Medicine and Biology Society)
- Member, Health Informatics Society of Australia
- HL7 Australia

Qualifications:

- BSc. (Hons.) (Computer Science)

Research Interests

- WWW Software Development
- Smart+Wireless Internet
- Biomedical Signal Processing
- Software Project Management
- Artificial Intelligence, Cognitive Science
- Software Engineering for Scientific Applications

Dr Tatjana Zrimec



PROGRAM CO-ORDINATOR – HEALTH INFORMATICS

Dr Tatjana Zrimec joined the Centre for Health Informatics as a senior lecturer in February 2002

Tatjana's main focus has been on developing a new Master of Health Informatics program. Tatjana is a computer scientist. She received her Bachelor of Computer Science in 1977, Master of electrical engineering in 1980 and Doctor of Philosophy degree in 1990 from the University of Ljubljana, Slovenia.

She worked as an academic since her graduation at the University of Ljubljana. In 1998 she was promoted to Associate Professor and worked at the same university until 2000. She moved to the University of Sydney in 2001 with a desire to continue research in Medical Imaging.

Her research career began in the Biocybernetics and Robotics Laboratory of the University of Ljubljana. She was involved in developing systems for computer control of experiments in biocybernetics. Later, with her appointment as an assistant professor, she moved to the Artificial Intelligence Laboratory. She was interested in

applying Artificial Intelligence in Medicine and she was involved in the development of several expert systems for medical applications.

After her PhD, she was awarded a Fellowship for Postdoctoral Study at The Turing Institute, Glasgow, UK, by The Royal Society. She worked in the robotics laboratory, investigating adaptive control. She also spent six months as a research fellow at the University of New South Wales. In 1993 she received two-year grant from the Digital Equipment Corporation and by the Slovenian Ministry of Science and Technology to begin work in Medical Imaging.

Her work in Medical Imaging was directed toward exploring new possibilities of image processing by using information from heterogeneous sources. This involved the modelling of anatomical organs, image fusion and computer graphics. In recognition of this work she was awarded a Best Paper prize for the paper "Knowledge representation for model-based image processing in medicine" by the International Society of Applied Intelligence in 1995.

Her research interests include Medical Imaging, Knowledge-based Image Processing, Visualisation, Knowledge Discovery and Data Mining, Robotics and Machine Learning.

Competitive Funds

Sowmya A, Zrimec T, Compton P (2001) Learning Medical Image, Knowledge, Australian Research Council, Linkage - Project, 2002 – 2004: **\$410 000**

Coiera E, Compton P, Zrimec T (2003) Learning strategies for personal agents to assist professional users in searching the Web, ARC project - 2004-2006: **\$300 000**

Luis Chuquipiondo



PROJECT MANAGER – QUICK CLINICAL

***Luis was appointed in June 2001 as Project Manager,
Quick Clinical Project until June 2003***

Luis Chuquipiondo received his Bachelor degree in Industrial Engineering from the University of Lima, Peru; his Graduate Management Certificates from the Australian Institute of Management and Deakin University, Australia and achieved AQF Level 5 in Project Management in 1999, CPMG. Currently, Luis is undertaking a MBA (Tech Management) course.

Luis' expertise expands beyond the IT Project Management arena to that of Management and Business Process Re-engineering. As [Senior] Project Manager/Director & Consultant, Luis has worked for large corporate and consulting organizations such as Peakhour, CSC, IBM, Australian Trade Commission, Woolworths and Telemovil (and IT&T operator in South America). The focus of Luis work has been on the delivery of high-tech

IT solutions on behalf of his employers to clients such as NAB, Medibank Private, WorkCover South Australia, Shopfast.com, Aon Risks Services, Universal Music Group (UMG), Ultramere/Tee-Book, and MarchiFirst, amongst others.

Luis' consultative project management work has covered areas of expertise ranging from software development using web-enabling technologies to client-server applications and infrastructure implementation projects. Luis' current role within the Centre for Health Informatics covers the management of the Quick Clinical project, a three-year \$1.7 million SPIRT funded project focused on the delivery of just in time medical information to General Practitioners. The project has met all its deliverables on time and under budget. Amongst other Luis' largest projects are the Y2K upgrade of over 7,000 workstations and 200 servers and peripherals for IBM Australia (a \$30 million project with over 60 team members).

Memberships

- Reg PM, Australian Institute of Project Management (AIPM)
- Member of the Association of Professional Engineers, Scientists and Managers of Australia (APESMA)
- Member of the Institute of Engineers, Australia (IE)

Qualifications:

- Diploma in Project Management (AQF Level 5), CPMG, Australia
- Graduate Certificate Management (Tech Management), Deakin University, Australia
- Business Management Certificate, Australian Institute of Management (AIM)
- Bachelor Degree in Industrial Engineering, University of Lima, Peru
- Other seminars & courses in Leadership, Business and Technology

Martin Walther



SOFTWARE ENGINEER – QUICK CLINICAL

Martin was appointed in April 2001 as a Software Engineer

Martin received his degree in Computer Science in 1994 from the Institute of Technology Brugg-Windisch, Switzerland. In 1995 and 1996 worked at ASCOM telecommunication Systems, where he developed realtime software for digital telephony systems. Later, in 1998 Martin obtained a Master's degree in Artificial Intelligence from the University of Edinburgh, UK. Presently he is involved in the research and development of an Evidence-based Decision Support System at the Centre for Health Informatics at UNSW.

Martin's research interests are in Artificial Intelligence, particularly Evolutionary Algorithms (eg Genetic Programming and Algorithms), Neural Networks and Machine Learning. Another area of interest is software engineering, specifically software architecture and modeling of large-scale complex systems.

Ken Nguyen



SOFTWARE ENGINEER – QUICK CLINICAL

Ken was appointed in January 2001 as a Software Engineer

Kenneth Nguyen received his BE (Hons) in Computer Engineering from the University of New South Wales (UNSW) in 2000. He was invited to become an Associate Lecturer while still an undergraduate for the School of Computer Science and Engineering (CSE) at UNSW. Presently he is conducting research in the area of Evidence-based Decision Support with the Centre for Health Informatics at UNSW.

His research interests lie in Artificial Intelligence, in particular Multi-Agent Systems (MAS). His recent work has involved developing a team of agents to behave intelligently in a noisy, collaborative, adversarial, and real-time domain. His work has led him to compete in the international competition, RoboCup, representing UNSW. Ken also likes to dabble in Machine Learning and Physics.

Victor Vickland



RESEARCH ASSISTANT – QUICK CLINICAL

Victor was appointed in September 2001 as a Research Assistant and is currently completing his PhD

Victor Vickland received his first degree in clinical psychology (MPsych) from the University of Lodz Poland in 1978. He gained his early research experience in the field of neurophysiology. He also worked in R&D (medical instrumentation) and as a coordinator in the field patient care and rehabilitation. Victor received his second degree in health sciences (BHSc) from the University of Technology, Sydney in 2000.

He is interested in the application of computers in medicine, information retrieval systems and evidence based medicine. Presently, he is involved in the development of the decision support system for the general practice.

Dr Farah Magbrabi



RESEARCH FELLOW – DECISION SUPPORT SYSTEMS

Farah was appointed in May 2002 following completion of her PhD

Farah Magbrabi is a Research Fellow in the Decision Support Systems Research Stream. She recently completed a PhD in Biomedical Engineering at UNSW. Her thesis proposes a framework for designing home telecare related to patient self-monitoring of health.

She joined the Centre as a Research Scientist in May 2002. Her research interests include, the design and evaluation of decision support technologies to support evidence-based medicine in general practice and home telecare. She received a BE (Hons I) in Electrical and Electronics Engineering from the University of Auckland, New Zealand.

Dr Adelle Coster



RESEARCH ASSISTANT – HOME TELECARE

Adelle Coster joined the Biomedical Systems Laboratory in 2002

Adelle Coster received her BSc (Honours) in Physics in 1991 and PhD in 1998 from the University of New South Wales. She joined the Biomedical Systems Laboratory as a Vice-Chancellor's Postdoctoral Research Fellow in 2000. Previous to this she spent 2 years at the Niels Bohr Institute for Theoretical Physics in Copenhagen, Denmark. In 2001 she received the Young Biophysicist Award from the Australian Society for Biophysics.

Her research interests include the biophysical modelling of the dynamics of excitable tissues, particularly the sinoatrial node in the pacemaker of the heart. She is also involved in the extraction and classification of events from triaxial accelerometer data (in collaboration with Merryn Mathie), and modelling artificial neural network dynamics, learning systems, and expectation and conditioning phenomena in networks.

Dr Coster's research interests include the biophysical modelling of the dynamics of excitable tissues, particularly the sinoatrial node in the pacemaker of the heart. She is also involved in the extraction and classification of events from triaxial accelerometer data, artificial neural network dynamics, learning systems, and expectation and conditioning phenomena in networks.

Dr Jim Basilakis



CLINICAL PROJECT MANAGER – HOME TELECARE

Jim Basilakis was appointed in January 2001

Jim uses his clinical skills as an emergency medicine physician in the Prince of Wales Hospital Sydney. Combined with an interest in medical technology development for the design, testing and implementation of a Home Telecare System developed at the University of New South Wales. In 2002, Jim was the Clinical Project Manager conducting a pilot trial funded by the Commonwealth Department of Health and Aged Care for the remote monitoring of elderly patients in the community of Sydney and Wagga-Wagga, providing communication and liaison between medical and engineering staff involved in the Home Telecare project.

Key achievements:

- Successful completion of the trial demonstrating technical feasibility, usability and important clinical data for impacting on patient care using a Home Telecare system.
- Successfully integrating a new technology into the current health care system, linking patients to their General Practitioner, allied health staff and tertiary hospital.
- Assisting in securing continued government and commercial funding for further development of the Home Telecare system into a second phase of manufacturing, testing and commercialisation.

Stephen Ong



HARDWARE/SOFTWARE ENGINEER – HOME TELECARE

Stephen was appointed as Hardware/Software Engineer in August 2000

Stephen Ong received his BSc in Physics and BE (Hons 1) in Electrical in 1997 from University of New South Wales. Since then he has been working in the development of a Real Time ECG diagnosis system.

In August 2000, Stephen started work in the Biomedical System Lab as Hardware/Software Engineer. He was involved in the development of the home telecare system. He was responsible for the development of the biomedical instrumentation of the system.

Professional interests includes:

- Digital Signal Processing, Software engineering, Electronics, Artificial intelligence

Khang Hyung



SOFTWARE ENGINEER – HOME TELECARE

Khang was appointed in January 2000

Khang Huynh was appointed as Software Engineer to the Biomedical Systems Laboratory in January 2000. He is a conscientious, professional and hard-working fellow responsible for most of the Home Telecare software creation. Now into his third year of the Home Telecare project his efforts are concentrated on further testing and enhancement of the Home Telecare software and its related information system.

Rudino Salleh



HARDWARE ENGINEER – HOME TELECARE

Rudino Salleh was appointed in January 2000

Rudino's research interests include Home Telecare System, microchip micro-controllers application, assembly language & C++ programming, pc parallel/serial interfacing, remote control via the phone, IR sensors for human temperature measurement.

Qualifications:

- BE University of New South Wales

Mailis Wakeham



OFFICE ADMINISTRATOR

Mailis was appointed as the Office Administrator at the Centre for Health Informatics in May 2000 until June 2003

Mailis joined CHI in May on a one year contract to support the Business Manager of the Centre. Her background includes an undergraduate degree in Health Administration (UNSW) and five years work experience in an

administrative capacity at UTS. Her work in the CHI Secretariat has involved supporting the Business Manager in general administration and finance, and assistance with the highly successful Home Telecare Launch in August 2002, which was attended by the Federal Minister for Health.

Keri Bell



PERSONAL ASSISTANT

*Keri was appointed as Professor Enrico Coiera's
Personal Assistant in May 2002*

Keri is responsible for providing assistance to Professor Coiera as a Director of the Centre and administrative support to all research staff in the Medical Informatics Laboratory. During the past year she has had significant commitments to the Electronic Decision Support Taskforce project, as well as providing administrative support to the National Institute of Clinical Studies project team. Keri is on maternity leave from the end of December 2003.

PhD Students

Dr Vitali Sintchenko



VITALI SINTCHENKO

Supervisor: Professor Enrico Coiera

Thesis topic "The use of computer-assisted decision support improves the quality of antibiotic prescribing for hospitalised patients".

Background

Given the current proliferation of antibiotic resistance in hospital-acquired pathogens and the escalating cost of antibiotic prescribing, new methods to encourage rational antibiotic use need to be developed. While the uptake of clinical guidelines has been shown to be poor, computer-based decision-support systems demonstrate promise in influencing clinical behaviour. We focus on two distinct but interconnected tasks of cognitive assessment of physician's decision to prescribe antibiotics in critical care setting and its information support. We initially study clinicians prescribing behaviour and their information needs to ensure rational evidence-based prescribing. We then design, build and trial a computer-based decision support system (DSS) that contains capabilities to both present guidelines on prescribing and also to present data feedback on past decisions to support situation assessment.

Our *general hypothesis* is that the use of computer-assisted decision support improves the quality of antibiotic prescribing for hospitalised patients. This hypothesis is based upon the following sub-hypotheses: Variation observed in the use of antibiotics could be reduced if physicians could more fully utilise the predictive information on patterns of antibiotic resistance within their institution, obtained from microbiology laboratory tests.

Variation observed in the use of antibiotics could be reduced if physicians could modify their decisionmaking behaviour based on the results of a computer-assisted consultation permitting access to prescribing guidelines.

Aims of the study

The *general aim* of this project is to optimise antibiotic prescribing in the critical care setting so as to reduce or delay the emergence of increasing antibiotic resistance among nosocomial bacterial pathogens.

Specific aims are:

- To test the hypothesis that optimal antibiotic prescribing in the critical care setting can reduce or delay the emergence of increasing antibiotic resistance among nosocomial bacterial pathogens.
- To design and trial a computer-based clinical decision support system (DSS), incorporating data of local resistance and prescribing patterns as well as evidence-based algorithms for antibiotic use for specific clinical indications.

- To measure the effect of the DSS use on the quality of antibiotic prescribing in a critical care setting.

Projected time-points leading to submission

First year:

- Literature review.
- Survey of Australian intensive care and infectious disease practitioners.
- Cognitive task analysis of antibiotic prescribing in ICU. Collection of baseline data on antibiotic prescribing and specific bacterial resistance patterns in the intervention site (Westmead Hospital).
- Design of algorithms for prototype DSS to guide antibiotic use in critical care using user-centred design techniques.

Second year:

- Completion and analysis of survey on evidence-based antibiotic prescribing in critical care.
- Conducted a web experiment to study prescribing decision making and information use. Statistical analysis and paper preparation.
- Design and validation of hand-held computer based evidence adaptive decision support system for critical care antibiotic prescribing task.

Third year

- ‘In vivo’ clinical trial of hand-held computer based evidence adaptive decision support system for antibiotic prescribing at Westmead Hospital. Pre- and post-intervention comparison of antibiotic usage and trends in local antibiotic resistance. Analysis of the decision support system’s log files.
- Follow-up survey of clinicians to evaluate the system acceptance and decision satisfaction.
- Preparation and submission of papers for publication in journals and dissemination of results and software.

The project to be completed in 2004.

Daoming Zhang



DAOMING ZHANG

Supervisor: Professor Branko Celler

Thesis topic “Ambulatory Monitoring and RF transmission of Physiological Parameters”

Daoming is investigating the cardiovascular responses to running when a runner’s step rate is synchronized with his heart rate. A mathematical model of the cardiovascular system has been developed for simulating the cardiovascular responses to running exercise. A portable monitoring device has been designed to measure a runner’s heart rate and step rate during running exercise and transmit the measured data to a PC wirelessly in real-time.

Annie Lau



ANNIE LAU

Supervisors: Professor Enrico Coiera and A/ Professor Nigel Lovell

Thesis Topic “The impact of information searching on decision-making – the investigation of cognitive biases during information searching”

Background

Information searching plays an important part in the decision-making process. Decisions improve with better access to relevant information, and searching for documents on the Web is increasingly an important source of that information. To develop computational systems that can actively support decision making by retrieving relevant information, we need to develop models of the process of seeking and reviewing Web documents, and of the impact of documents on decisions.

Using a database of searches that Westbrook and Gosling have collected by giving clinicians real-life scenario cases to solve by Web searching, we have developed a Bayesian model that predicts how different documents influence an individual’s decision outcome. We found that: clinicians’ decision outcome can be predicted based on the documents they accessed – their investigation process does not consist of one source of information only but of multiple sources; and clinicians’ personal attributes, pre-search opinion, search experience, and the documents they accessed have an impact on their decision outcome.

We also observed that *how* the documents were accessed had an impact on the decision outcome. People experience cognitive biases during information searching and decision-making, such as the *primacy effect* – a bias to the first document read; *recency effect* – a bias to the last read document; *exposure effect* – bias to the document viewed for the longest period, and *reinforcement effect* – bias to documents accessed more than once. Our preliminary findings suggest that documents read at these points of effect do over-influence the reader’s decision making, i.e. when a person reads a document at a particular effect, there is an increased likelihood that the person follows the implication of that document compared to those who read the document at other points during the information searching journey.

Overall, these findings lead us to the following research questions: “Do cognitive biases encountered during information searching affect our decision-making? If so, to what extent?” and “Would correcting for these biases have an impact on decision-making?” The working hypothesis is that supporting/correcting for biases during information searching affects decision-outcome, and the underlying assumption is that people display cognitive biases during information searching.

Aims and objectives

1. To verify the assumption, and to test and investigate the limitations of the hypothesis
2. To design and implement a prototype that supports/corrects for cognitive biases during information searching

3. To trial the prototype and investigate whether it changes information searching behaviour and improves decision outcome

Publications:

Lau AYS, Coiera E, Lovell N (2002) "The need for evidence-based knowledge at the point of care: what problems do general practitioners have?", *Health Informatics Conference*, August, Melbourne.

Lau A, Ong SS, Mahidadia A, Hoffmann A, Westbrook J, Zrimec T (2003) "Mining Patterns of Dyspepsia Symptoms Across Time Points Using Constraint Association Rules", In Whang, K-Y., Jeon, J., Shim, K. and Srivastava, J. (Eds.): *Advances in Knowledge Discovery and Data Mining, 7th Pacific-Asia Conference, PAKDD 2003, Seoul, Korea, April 30 - May 2, 2003, Proceedings*, Lecture Notes in Computer Science 2637, Springer, pp. 124-135

Merryn Mathie



MERRYN MATHIE

Supervisor: Professor Branko Celler

Thesis topic "Using accelerometry for long-term home monitoring of subjects with chronic disease conditions"

Merryn's research examines accelerometry, which is a technique that allows body movement to be directly and continuously measured and quantified in a natural setting for the patient. The use of piezo-resistive accelerometers placed at the waist to measure parameters useful to long-term home monitoring of functional status in chronic disease is being investigated. The ageing of our population and the increasing costs of hospital care have led to a renewed interest in alternative models for health care delivery. One such system is home telecare, in which the health of the subject is monitored remotely while the subject is at home.

For people living in the community with a chronic disease condition, for example, congestive heart failure, chronic obstructive pulmonary disease or a neuromuscular disorder, management of the condition so as to maximise quality of life is of primary importance. Measures of functional activity, metabolic energy expenditure and gait can provide useful information for the clinician. Parameters such as are traditionally assessed by interviewing the patient or their carer, or by utilising validated questionnaires.

It is hypothesized that accelerometric techniques, combined with intelligent signal processing, can be used to detect adverse events, such as falls, and also to provide an objective measure of clinically relevant parameters of movement in a low-cost, practical manner.

Dr Mohammadreza Rahimpour



MOHAMMADREZA RAHIMPOUR

Supervisor: Professor Branko Celler

*PhD student of Biomedical Engineering (field of Home Telecare),
Graduate School of Biomedical Engineering*

Reza holds a Medical qualification (MBBS) from Tehran University Medical School, Iran, and commenced his PhD in 2002 to explore the consumer attitudes and preferences to introduction of modern technology.

His research will develop the methodology for accessing psychological characteristics important in the design, development and deployment of home telecare systems.

Masters Students

Dr George Alvarez



GEORGE ALVAREZ

Supervisor: Professor Enrico Coiera

George commenced a Masters of Science at the Centre for Health Informatics in February 2002

George is currently completing a Masters of Science degree by research at the Centre of Health Informatics. He is interested in the systematic cause of medical error, with a major interest in providing appropriate medical interventions based on his experience in Intensive Care. His specific area of study is the communication patterns of medical teams in the intensive care setting.

Qualifications:

- Medical school and physician training at the University of Manitoba, Winnipeg, Canada.
- Intensive Care Fellowship, University of Western Ontario, London, Canada.

Publications, Conferences and Presentations

Books and Book Chapters published or in Press in 2003

Allen BJ, **Lovell NH** (eds) (2003) Proceedings of the World Congress on Medical Physics and Biomedical Engineering (Vol 4 IFMBE Proceedings ISSN 1727-1983 and Vol IOMP Proceedings), ISBN 1-877040-14-2. 2100 papers.

Coiera EW (2003) Guide to Health Informatics, 2nd Ed, Arnold, London.

Coiera EW, Simpson C (eds) (2003) Proceedings of the Combined Conferences of the 11th National Health Informatics Conference (HIC) and 12th National RACGP Computer Conference, p.246.

Sintchenko V, Westbrook J, Tipper S, Mathie M, Coiera E (2003) "Report on electronic decision support activities in different healthcare settings in Australia" In Electronic Decision Support for Australia's Health Sector, National Electronic Decision Support Taskforce, Commonwealth of Australia, ISBN 0642821615.

Journals published or in Press in 2003

Ayre PJ, **Lovell NH**, Woodard JC (2003) Non-invasive flow estimation in an implantable rotary blood pump: a study considering non-pulsatile and pulsatile flows. *Physiological Measurement*, 24, pp.179-189.

Braithwaite J, Black D, **Westbrook JI** (2003) The impact of changing health care policy on the work of clinicians: longitudinal literature review and grounded focus group data. *British Clinical Governance Bulletin*, 3, (6) pp.11-12.

Celler BG, Lovell NH, Basilakis J (2003) Using information technology to improve the management of chronic disease. *Medical Journal of Australia*, 179 (5) pp.242-246.

Coiera EW (2003) Interaction Design Theory. *International Journal of Medical Informatics*, 69, pp.201-218.

Coster ACF, **Celler B** (2003) The Phase Response of Model Sinoatrial Node Cells. *Annals of Biomedical Engineering*, 31 (3) pp.271-283.

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Gosling AS, Westbrook JI, Coiera EW (2003) Variation in the use of online clinical evidence: a qualitative analysis. *International Journal of Medical Informatics*, 69 (1) pp.1-16.

Hallum L, Tsafnat G, **Lovell NH**, Suaning GJ (2003) Artificial vision for the blind. *Australasian Science*, 24 (1) pp.21-23.

Mathie MJ, Coster ACF, Celler BG, Lovell NH (2003) Classification of movements using a triaxial accelerometer, with specific application to independent living in the home. *Medical and Biological Engineering and Computing*, (in press).

Mathie MJ, Coster ACF, Lovell NH, Celler BG (2003) Accelerometry: providing an integrated, practical method for long-term, ambulatory monitoring of human movement. *Physiological Measurement*, (in press).

Mathie MJ, Coster ACF, Lovell NH, Celler BG (2003) Detection of daily physical activities using a triaxial accelerometer. *Medical and Biological Engineering and Computing*, 41 (3) pp.296-301.

Mathie MJ, Coster ACF, Lovell NH, Celler BG, Lord SR, Tiedmann A (2003) A pilot study of long term monitoring of human movements in the home using accelerometry. *Journal of Telemedicine and Telecare*, (in press).

Sintchenko V, Coiera EW (2003) Which clinical decisions benefit from automation? A task complexity approach. *International Journal of Medical Informatics*, 70, pp.309 -316.

Westbrook JI, Talley NJ (2003) Diagnostic investigation rates and use of prescription and non-prescription medications among dyspeptics: A population based study of 2,300 Australians. *Alimentary Pharmacology and Therapeutics*, 17, pp.1171-1178.

Journal Articles – submitted in 2003

Gosling AS, Westbrook JI, Spencer R (2004) Nurses' use of online clinical evidence. *Journal of Advanced Nursing*.

Magrabi F, Coiera E, Westbrook J, Gosling A, Vickland V (submitted 2003) General practitioners' use of online evidence during consultations, *International Journal of Medical Informatics*.

Mathie MJ, Coster ACF, **Celler BG, Lovell NH** (under review 2003) A theoretical and experimental foundation for the interpretation of signals from triaxial accelerometers. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*.

Sintchenko V, Coiera EW, Iredell J, Gilbert G (under review 2003) The impact of decision support on antibiotic prescribing decisions: an interactive web experiment, *Journal American Medical Informatics Association*.

Westbrook JI, Gosling AS, Coiera EW (under review 2003) Do clinicians use online evidence to support patient care? A study of 55,000 clinicians, *Journal American Medical Informatics Association*.

Conferences, Presentations and Papers 2003

Ayre PJ, **Lovell NH** (2003) Identifying Physiologically Significant Pumping States in Implantable Rotary Blood Pumps Using Non-Invasive System Observers. Proceedings 25th Annual International Conference of the IEEE EMBS, ISBN: 0780377907, September, Cancun, Mexico.

Camacho F, Avolio A, **Lovell NH** (2003) Linear transformation method for generating central aortic blood pressure waveforms. IFMBE Proceedings, World Congress on Medical Physics and Biomedical Engineering, ISBN: 1 877040 142, August, Sydney.

Camacho F, Avolio AP, **Lovell NH** (2003) A Linear Regression Model for Assessment of Interdependent Parameters of Central Aortic Pressure Determined from the Peripheral Pulse. Proceedings 25th Annual International Conference of the IEEE EMBS, ISBN: 0780377907, September, Cancun, Mexico.

Celler BG, Lovell NH (2003) A web-based EHR and supporting information technology infrastructure for home telecare. Proceedings Combined 11th National Health Informatics Conference & 12th National RACGP Computer Conference, August, Sydney.

Celler BG, Lovell NH (2003) Home telecare for the management of chronic disease. Proceedings Combined 11th National Health Informatics Conference & 12th National RACGP Computer Conference, August, Sydney.

Celler BG, Lovell NH, Basilakis J (2003) A clinical trial of a home telecare system for the management of chronic disease. IFMBE Proceedings, World Congress on Medical Physics and Biomedical Engineering, ISBN: 1 877040 142, August, Sydney.

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Cloherly SL, Dokos S, **Lovell NH** (2003) A Gradient Model of the Rabbit Sinoatrial Node. Proceedings 25th Annual International Conference of the IEEE EMBS, ISBN: 0780377907, September, Cancun, Mexico.

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Dokos S, **Lovell NH** (2003) Parameter estimation in cardiac ionic models using pseudo-random current injections. IFMBE Proceedings, World Congress on Medical Physics and Biomedical Engineering, ISBN: 1 877040 142, August, Sydney.

Gosling AS, Westbrook JI (2003) Factors associated with differences between professional groups' use of point-of-care online evidence: A survey of 5,511 health professionals, HIC 2003 - Health Informatics Conference, August.

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Lau A, Ong S, Mahidadia A, Hoofman A, Westbrook JI, Zrimec T (2003) Mining patterns of dyspepsia symptoms across time points using constraint association rules. 7th Pacific-Asia Conference on Knowledge Discovery and Data Mining PAKDD. Seoul, Korea.

Magrabi F, Lovell NH, Celler BG, Henry RL (2003) A framework for designing home telecare. IFMBE Proceedings, World Congress on Medical Physics and Biomedical Engineering, ISBN: 1 877040 142, August, Sydney.

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Mathie MJ, Coster ACF, Lovell NH, Celler BG (2003) Use of a triaxial accelerometer in unsupervised monitoring of human movement. IFMBE Proceedings, World Congress on Medical Physics and Biomedical Engineering, ISBN: 1 877040 142, August, Sydney.

Morris AR, **Westbrook JI**, Moore K (2003) Idiopathic detrusor overactivity in women – a longitudinal study over 5-10 years International Continence Society Meeting, Florence.

Rudrapatna M, Wong J, Busayarat S, Misra A, Sowmya A, **Zrimec T**, Kossoff G, Lucas P, Wilson P (2004) IMIKA - Internet-based medical image & knowledge acquisition, Electronic Imaging Science and Technology - IS&T/SPIE's 16th Annual Symposium, January, San Jose, CA.

Spencer R, Logan P, Coiera EW (2003) Exploring emergency department communication patterns, Evidence to Excellence': in Emergency Care Conference, August, Sydney.

Spencer R, Logan P, Coiera EW (2003) Socio-technical factors surrounding practices related to telephone, paging and information system use in an Emergency Department, HIC 2003 - Health Informatics Conference, August.

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Suaning GJ, Hallum LE, Chen SC, Preston PJ, **Lovell NH** (2003) Phosphene Vision: Development of a Portable Visual Prosthesis System for the Blind. Proceedings 25th Annual International Conference of the IEEE EMBS, ISBN: 0780377907, September, Cancun, Mexico.

Tipper S, Lovell N (2003) Telecare: Shifting the Focus, New England Area Health Service forum auspiced by Australian College of Health Service Executives New England Regional Group, Tamworth, 5th December 2003

Tipper S (2003) Informatics: Linking Health System Outcomes to Facilities Development, Australasian Health & Health Facilities Conference, Sydney, 6 November 2003

Tipper S (2003) Emerging cyber medicine technologies risks and benefits, Legal Challenges In Cyber Medicine Seminar for Baker & McKenzie Cyberspace Law and Policy Centre, UNSW, Sydney, 31 July 2003

Tipper S (2003) After Hours Primary Medical Care Symposium (Facilitator and interviewer on IT/IM panel), Department Health & Aged Care, Canberra, April 2003

Tipper S (2003) The National agenda for the Health Informatics Society of Australia, HISA (NSW Branch) State Conference, February 2003

Walsh M, Illife J, **Coiera EW** (2003) Building workforce capacity in health information, Health Online Summit, Brisbane, March.

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Westbrook JI, Duggan AE (2003) Outcomes of dyspepsia: a followup study 8-9 years post-endoscopy. Gastroenterological Society of Australia Conference, Cairns.

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Zrimec T, Wang J (2003), Learning to Recognize Objects - Towards Automatic Calibration of Color Vision for Sony Robots, IEEE International Conference on Industrial Technology - ICIT'03, Maribor, December.

Papers and Research consultancy reports 2003

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Gosling AS, Westbrook JI (2003) Pilot study of methods to assess the impact of the Clinical Information Access Program (CIAP), on clinical practice and its economic value. Kensington: Centre for Health Informatics, University of NSW, pp.1-67. ISBN 0733420281.

Westbrook JI, Braithwaite J, **Coiera E** (2003) Medical educational issues related to the implementation of point-of-care clinical systems in NSW. Report to the Medical Training and Education Council of NSW.

Westbrook JI, Gosling AS (2003) Summary report of the results of the evaluation or the clinical information access Program (CIAP). Kensington: Centre for Health Informatics, University of NSW, pp.1-20. ISBN 073342029X.

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