Successful Scholar

Research for virtual reality

Recipient of a Foundation for Surgery Research Scholarship Ben Dixon looked into how to take up new technology in the theatre

While computerised innovations such as advanced navigation displays with real-time image guidance may have the potential to improve surgical accuracy and efficiency, more research must be undertaken to ensure that the extra data provided does not impair, rather than enhance, surgical safety, according to Head and Neck Cancer Surgeon Mr Ben Dixon.

The recipient of a Foundation for Surgery Research Scholarship in 2012, Mr Dixon conducted PhD research into the benefits of 3D “virtual views” and augmented reality for use by surgeons through a Research and Clinical Fellowship at the Guided Therapeutics Program based at the University of Toronto, Canada.

Augmented reality is a live, direct or indirect view of the physical world, the elements of which are augmented by computer generated sensory input such as sound, video or graphics.

The technology was expected to improve surgical accuracy and patient care, but Mr Dixon instead found that increased data and sensory input could cause surgeons to become distracted.

Mr Dixon conducted his research with the cooperation and support of scores of senior surgeons who gave up their time to use the high-tech equipment on cadaver specimens in an operating theatre specifically equipped and designed by Mr Dixon for experimental purposes.

He found that while there was scope for greater integration of computer-assisted technology, trained surgeons were unable to efficiently complete tasks while being presented with additional stimuli, meaning that great caution must be taken in how information was displayed.

“Until I began this work there was very little research looking at the detrimental effects of such technology or why, with such rapid advances in computer technology, it hadn’t taken off within the field of surgery as might have been expected,” Mr Dixon said.

“People had assumed it was because of slow computer speeds or problems with accuracy, or that junior surgeons could find using such devices made tasks more difficult while senior surgeons didn’t need it, but we found something quite different.

“We found, for instance, that if you present a trainee surgeon with unfamiliar anatomy yet provide them with extra computer-generated information, they cannot use the extra information.

“We also found that experienced surgeons were no more likely to pick up truly unexpected findings than their more junior colleagues.

“This represents a fundamental limitation between how much external information the human brain can usefully absorb and use, which requires significant further research.”

With many papers already published and more being assessed, Mr Dixon said that in one study, published in Surgical Endoscopy, surgeons completed tasks on a cadaver model with some salient, but unexpected, findings placed in their field of vision such as a foreign body (a screw) and one critical complication.

He said that just 41 per cent of surgeons recognised additional information using a standard display such as a computer monitor while the group using an augmented reality display showed even poorer results.

“This was an extraordinary finding in that almost everyone missed the unexpected and it suggests strongly that the use of advanced technology provided no gains in efficiency, but did increase distraction,” Mr Dixon said.

“This inability to see the unexpected is known as inattentional blindness which is the failure to notice an unexpected stimulus in your field of vision when you are performing attention-demanding tasks.

“Our experiments showed that placing the same information on a sub-monitor, rather than a head-up display mitigated the cost of the surgeons’ attention without compromising efficiency.

“It is the same reason that cars have GPS equipment as a monitor on the dashboard, even though head-up “out-the-window” prototypes have been around for years.

“Projecting images into your real-world view competes for attention and becomes dangerous as has been shown in other fields that have developed such technology including the military, aviation and the automotive industries.

“In our field, there has now been enough research done to know that the technology works, but more research needs to be done to fully understand how surgeons interact with the equipment.”

Mr Dixon, now a Fellow, conducted his PhD under the supervision of Professor Peter Choong, University of Melbourne and the Department of Surgery at St Vincent’s Hospital, and Professor Jonathon Irish at the University of Toronto, Department of Otolaryngology, Head and Neck Surgery.

Now back working at the Peter MacCallum Cancer Institute and St Vincent’s Hospital in Melbourne, Mr Dixon said further research would require the input of psychologists, behavioural scientists and software developers to fully understand how humans interact with machine-driven input and whether there are basic limitations to how useful such data can be.

“I went into this field of research very keen to understand how we could better integrate this technology into surgery.
Successful Scholar

Career Highlights

Scholarships
2012: RACS Foundation for Surgery Research Scholarship
2011: RACS Morgan Traveling Scholarship

Conference Presentations
Dixon BJ, Daly MJ, Chan H, Vescan A, Witterick I, Irish JC. The hidden cost of enhanced real-time image guided surgery; 5th World Congress for endoscopic surgery of the brain, skull base and spine, Vienna, Austria, March 2012.

but the more involved I became the more problems I found,” he said.

“This means that experience has no impact on the unexpected, but very few senior surgeons believe me when I tell them this.”

Mr Dixon said it had been a wonderful experience working with such a diverse group of people as those attached to the Guided Therapeutics Program which included surgeons, IT experts, radiologists and engineers; he also thanked the College for its support.

The Section of Academic Surgery Annual Meeting of Academic Departments will be held in Adelaide on Thursday 14th November 2013

This year Day 1 of this meeting will consist of two workshops. We have excellent and interesting speakers who will be presenting during the day, with time to spend on discussion after each session and during the small group workshops which will occur at the end of the day.

The hidden cost of enhanced real-time image guided surgery: Augmented real-time image guided surgery reduces task workload during endoscopic sinus surgery.

Mr Dixon said it had been a wonderful experience working with such a diverse group of people as those attached to the Guided Therapeutics Program which included surgeons, IT experts, radiologists and engineers; he also thanked the College for its support.

“During the last part of my PhD work in Canada I received incredible support from highly trained and experienced surgeons and at one stage had 70 surgeons give up their time to do endoscopic surgery, some using this technology and some not,” he said.

“It is always very difficult to get very experienced surgeons, skilled in a particular surgery, working together on a research project, so I was extremely grateful for their support.

“I am also very appreciative of the support given to me by the RACS and I hope my work goes some way to helping us as a profession understand which technologies to embrace and which to approach with caution.”

With Karen Murphy

The Surgical Research Society 50th Annual Scientific Meeting will be held in Adelaide on Friday 15th November 2013

This meeting is open to those involved in or interested in research, including surgeons, surgical or medical trainees, researchers, scientists and medical students.

JEPSON LECTURER:
Professor Guy Maddern
Dept Surgery, Queen Elizabeth Hospital, Woodville, South Australia.
“50 years of the Surgical Research Society.”

ASSOCIATION FOR ACADEMIC SURGERY GUEST SPEAKER:
Dr Chris Breuer
Professor of Surgery and Director of the Tissue Engineering Program Nationwide Children’s Hospital, Columbus and Ohio State University
“The development of tissue engineered vascular grafts for use in children.”

SOCIETY OF UNIVERSITY SURGEONS GUEST SPEAKER:
Professor David J Hackam, MD, PhD FACS
Professor of Surgery, University of Pittsburgh School of Medicine Children’s Hospital of Pittsburgh of UPMC
“Small cells for small patients: The interaction of the innate immune system with intestinal stem cells in necrotizing enterocolitis”

Preliminary Notice – Surgical Research Society Annual Meeting

This meeting is open to those involved in or interested in research, including surgeons, surgical or medical trainees, researchers, scientists and medical students.

You are encouraged to stay overnight and attend Day 2 of this meeting which will be held at the same venue in Adelaide. This meeting is open to those involved in or interested in research, including surgeons, surgical or medical trainees, researchers, scientists and medical students.

Contact
For further information, please telephone Sue Pless on +61 8 8219 0900 or email academic.surgery@surgeons.org.

The Surgical Research Society 50th Anniversary Dinner
The Adelaide Club
7.00pm.

PRELIMINARY NOTICE – SURGICAL RESEARCH SOCIETY ANNUAL MEETING

The Surgical Research Society 50th Annual Scientific Meeting will be held in Adelaide on Friday 15th November 2013.

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CALL FOR ABSTRACTS:
The call for abstracts will be open on Monday 29 July 2013 and must be submitted no later Monday 23 September 2013. Abstract forms will be available from the email address below.

AWARDS AND GRANTS:
The following will be awarded to the best presentations:
• Young Investigator Award
• Developing a Career in Academic Surgery Award
• Three Travel Grants
• Best Poster Award

A dinner commemorating the 50th anniversary of the SRS will be held the evening prior to the SRS Meeting at the Adelaide Club on Thursday evening, 14 November 2013.

CONVENOR:
Professor Guy Maddern

CHAIR, SRS
Professor Leigh Delbridge

FOR FURTHER INFORMATION CONTACT:
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Ben Dixon enjoying the Canadian snow with his family

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