Department of Surgery Austin Health

AUSTIN SURGERY RESEARCH PRIZE
At Johnson & Johnson medical, surgical training and medical education has always been an integral part of our commitment to transforming patient care and the advancement of minimally invasive surgery. We have facilitated the training of surgeons, operating room nurses and other health care professionals on the latest surgical procedures and instrumentation for decades. We believe in grass roots activity and will continue to support training programs long into the future.

The department provides opportunities for scientific research in a wide variety of fields in a warm, friendly and collegial atmosphere. Three separate research groups with international repute provide excellent opportunities for advancement in both basic science and clinical research. Researchers and students have easy access to supervisors and support and close supervision at all times. Modern facilities and easy access to transport ensure a pleasant working environment.

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“Not everything that can be counted counts
Not everything that counts can be counted”
- William Bruce Cameron
The philosophies of one age have become the absurdities of the next, and the foolishness of yesterday has become the wisdom of tomorrow.

- Sir William Osler

The Austin Surgery Research Prize

Congratulations on the fifteenth birthday of the Austin Surgery Research Prize. It was born in 2003 as a hesitant crawling infant and has now developed into an agile confident teenager. I hope it matures in the future to an elderly healthy and wise person. Over the years this event has provided local trainees the opportunity to present their research projects and be subject to the scrutiny of scientific rigour. Already some of the participants have developed into outstanding academics and researchers.

The success of this event has truly been a team effort involving the participant trainees, adjudicators and the support of attending surgical and anaesthetic staff and the administrative staff of the Department of Surgery. Special thanks also go to the financial support provided by Johnson and Johnson.

To all of you a sincere thank you and gratitude for your involvement and support.

Prof C Christophi
Head, Department of Surgery
Austin Health
0830 - Breakfast

0900 Su Kah Goh - “Malnutrition is associated with poor outcomes after liver transplantation: a promising target for pre-transplantation nutritional intervention.”

0915 David Liu - “Outcomes of delayed gastric emptying following laparoscopic repair of very large hiatus hernias.”

0930 Tatenda Nzenza - “A Noteworthy Issue: The quality of handwritten surgical operative notes from surgical trainees.”

0945 Stephen Kunz - “Winter is coming: A prospective trial teaching trauma to medical students using a Game of Thrones theme.”

1000 Munad Khan - “Heart rate monitoring in a surgical registrar.”

1015 Daniel Ng - “Thoracic Surgery in a Regional hospital: Assessing the surgical and oncological outcome.”


1045 Modher Al-Shawi - “The effectiveness of Intraoperative Hyoscine Butylbromide (Buscopan©) in reducing postoperative catheter-related bladder discomfort in urological patients: A prospective, randomized, placebo-controlled, double-blinded study”

1100 Osamu Yoshino - “A risk stratification for pancreatic leak after pancreaticoduodenectomy.”

1115 Tom Tiang - “Laparoscopic Bile Duct Exploration for Bile Duct Stones Using Choledochoscopy. A Retrospective Study of 6-year Data from The Northern Hospital.”

1130 Adjudication

1145 Announcement of winner & presentation of Prize

“Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones is a house.”

- Jules Henri Poincaré
Malnutrition is associated with poor outcomes after liver transplantation: a promising target for pre-transplantation nutritional intervention.

Su Kah Goh1, Brooke Chapman2, Sarah Romero3, Jacqueline Luke4, Peter Angus2, Robert Jones1,3, Christopher Christophi1, Adam Testro3 & Vijayaragavan Muralidharan1

1 Department of Surgery, Austin Health, Melbourne; 2 Nutrition & Dietetics Department, Austin Health, Melbourne; 3 Victorian Liver Transplantation Unit, Austin Health, Melbourne; 4 Physiotherapy Department, Austin Health, Melbourne

BACKGROUND: Malnutrition is prevalent in recipients undergoing liver transplantation. However, the implication of nutritional status on morbidity and mortality remains unclear. This study aims to evaluate the impact of malnutrition on recipient outcomes.

METHODS: A retrospective review of 390 adult recipients who underwent liver transplantation between January 2009 and June 2016 was performed. Recipients with fulminant liver failure or those requiring re-transplantation were excluded. A total of 321 recipients was analysed. Nutritional status was determined by the subjective global assessment (SGA) at wait-listing and at transplantation. Outcome measures comprised the development of infection within the index admission, rejection within 90-days, and biliary anastomotic strictures within 90-days, as well as readmission within 90-days, intensive care unit (ICU) length of stay (LOS), hospital LOS, graft survival and recipient survival.

RESULTS: Malnutrition (SGA-B & SGA-C) was identified in 67% of the recipients at wait-listing. Progressive decline in nutritional status was observed at transplantation (wait-list median 4.4-months), where 77% of the recipients were malnourished. Of these, 18% (n=58) were severely malnourished (SGA-C). Severe malnutrition at transplantation was associated with longer ICU LOS (147-hours vs 89-hours, p=0.008), longer hospital LOS (40-days vs 16-days, p<0.01) and increased incidences of infection (55.2% vs 33.8%, p=0.014) when compared to the well-nourished recipients (SGA-A). Other outcome measures were not associated with nutritional status.

CONCLUSIONS: This large study demonstrates the impact of malnutrition on early recipient morbidity. Nutritional interventions prior to transplantation may potentially improve outcomes and reduce the economic burden on our healthcare system.

Su Kah Goh
Current Position: PhD candidate, SET 2 Trainee (General Surgery)

Su Kah graduated from the University of Melbourne in 2008. He is currently undertaking a PhD to study the role of circulating DNA in liver transplantation. He has also recently developed interests in the impact of nutrition on recipient outcomes after transplantation.

PERSONAL CONTRIBUTION

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Outcomes of delayed gastric emptying following laparoscopic repair of very large hiatus hernias over five years

David S. Liu¹, Chek Tog¹, Hou K. Lim¹, Peter Stiven², Sarah K. Thompson³, David I. Watson⁴, Ahmad Aly¹.

¹ UGI Unit, Austin Health, Melbourne; ² UGI Unit, Chelsea Hospital, Gisborne, New Zealand; ³ UGI Unit, Royal Adelaide Hospital, Adelaide; ⁴ UGI Unit, Flinders Medical Centre, Adelaide;

BACKGROUND: Laparoscopic repair of large hiatus hernias are increasingly being performed by Specialist General and Upper Gastrointestinal Surgeons. Whilst results from these procedures are largely encouraging, we have noticed that a subgroup of patients develop large volume food retention in the stomach following hiatus hernia repair. Despite our experiences, little is known about delayed gastric emptying (DGE) following hiatus hernia surgery.

HYPOTHESIS & AIMS: Here, we aim to quantify the incidence of DGE following laparoscopic repair of very large hiatus hernias, identify key risk factors for its occurrence, and determine its impact on clinical outcomes, with a particular focus on patients’ quality of life, gastrointestinal symptomatology, and daily function.

METHODS: Analysis of data collected from a multicenter prospective randomised trial of patients who underwent laparoscopic mesh versus sutured repair of very large hiatus hernias (>50% of stomach in chest). DGE was defined as gastric food retention visualised at endoscopy after 6 hours of fasting at 6 months post surgery. Quality of life (QoL), gastrointestinal symptomatology and daily function were assessed with the SF-36 questionnaire, Visick scoring and structured surveys administered prior to surgery and at 1, 3, 6 and 12 months after surgery.

RESULTS: The incidence of post-operative DGE was 18.6% (19/102 patients). Following univariate and multivariate analysis of numerous operative factors, division of short gastric vessels (RR: 6.27, p=0.003) and revisional hiatus hernia surgery (RR: 6.19, p=0.021) independently predicted DGE. This was associated with poorer QoL, adverse gastrointestinal symptomatology including higher rates of bloating, nausea, vomiting and anorexia, as well as reduced patient satisfaction with their operation and recovery. These differences were still present 12 months after surgery.

CONCLUSIONS: The incidence of DGE following large hiatus hernia repair is substantial and impairs patient outcomes. We have highlighted potential areas for caution when performing laparoscopic hiatus hernia surgery to minimise the risk of this complication.
A Noteworthy Issue: The quality of handwritten surgical operative notes from surgical trainees.

Tatenda Nzenza, Todd Manning, Shomik Sengupta, Damien Bolton and Nathan Lawrentschuk
Urology Unit, Austin Health, Melbourne;

BACKGROUND: Surgical operation notes are crucial for medical record keeping and information flow in continued patient care. In addition to inherent medical implications, the quality of operative notes also has important economic and medico-legal ramifications. Further, well documented records can also be useful for audit purposes and propagation of research, facilitating the improvement of delivery of care to patients. We aimed to assess the quality of surgical operation notes written by junior doctors and trainees against a set standard, to ascertain whether these standards were met.

METHODS: We undertook an audit of Urology and General Surgery operation notes handwritten by junior doctors and surgical trainees in a tertiary teaching hospital over a month period both in 2014 and 2015. Individual operative notes were assessed for quality based on parameters described by the RCSE guidelines.

RESULTS: Based on the RCSE guidelines, a significant proportion of analysed surgical operative notes were incomplete, with information pertaining to the time of surgery, name of anaesthetist and DVT prophylaxis in particular being recorded less than 50% of the time (22.42%, 36.36% and 43.03% respectively). Overall, 80% compliance was achieved in 14/20 standards and 100% compliance was attained in only 1 standard. Experience level of the trainees and degree of completeness was also assessed. We divided the trainees into 3 groups: pre-SET (Surgical Education and Training), SET level 1 – 3 and SET level 4 – 6. The pre-SET group achieved less than 50% compliance in only 2 standards (time at 47.72% and haemostasis at 44.18%). In this group, 80% compliance was achieved in 16/20 standards and 100% compliance attained in 10 standards. The SET level 1-3 group achieved less than 50% compliance in 5 standards (time at 6.67%, elective/emergency procedure at 40%, name of anaesthetist at 33.33%, position at 42.2% and DVT prophylaxis at 20%). 80% compliance was achieved in 16/20 standards and 100% compliance was attained in 8 standards. With respect to the SET level 4-6 group, there was less than 50% compliance in 4 standards. (time at 17.33%, name of anaesthetist at 30.67%, position at45.3% and DVT prophylaxis at 26.67%). 80% compliance was achieved in 14/20 standards and 100% compliance was attained in 3 standards.

CONCLUSIONS: The quality of surgical operation notes written by junior doctors and trainees demonstrated significant deficiencies when compared against a set standard. There is a clear need to educate junior medical staff and to provide systems and ongoing education to improve quality. This would involve leadership from senior staff, ongoing audit and the development of systems that are part of the normal workflow to improve quality and compliance.

Tatenda Nzenza
Current Position: Urology Research Fellow (Full-Time)

Tatenda graduated from Monash University in 2012 and has worked at the Austin as a surgical resident where he developed an interest in Urology. Tatenda is currently enrolled in a Doctor of Medical Science degree at the University of Melbourne.

PERSONAL CONTRIBUTION
Conceptualization & Design 90%
Ethics Application & Submission 90%
Lab Work / Conducting Study 90%
Data Collection 70%
Data Analysis 90%
Conclusion & Discussion 90%
**Winter is coming: A prospective trial teaching trauma to medical students using a Game of Thrones theme**


**BACKGROUND:** The primary assessment and management of trauma is an expected skill for junior doctors, despite being an inconsistent part of medical school curriculums. Additionally, the need for educational systems to enhance cognitive and practical performance is high, given an increasing volume of information and skills expected on graduation from medical school. Simulation based education is a safe, moderate fidelity teaching method that can mimic the stress of clinical situations, with demonstration of practical skills, with appropriate biometric feedback, however there is limited evidence to support it for trauma teaching.

**HYPOTHESIS & AIMS:** Our purpose was to evaluate the impact of a novel trauma teaching model on final year medical students within a non-trauma centre, using Game of Thrones (GoT) themed content applied to Advanced Trauma and Life Support principles. We hypothesised that following completion of the GoT trauma evening, final year medical students would improve their non-cognitive domains relating to trauma, and demonstrate a significant increase in MCQ scores designed to assess their competence.

**METHODS:** A prospective study was conducted, inviting final year medical students from the Austin clinical school to participate in a trauma workshop, which consisted of a lecture on the primary survey, followed by interactive stations on intubation, intercostal catheter insertion, intra-osseus access, along with two simulation sessions with scenarios drawn from the recent popular fantasy series. Students completed pre- and post- test surveys examining their self-perceived knowledge, skills, and confidence with trauma. Given the relatively advanced clinical skills being offered, they also completed questions regarding the perceived appropriateness and value of the session. Their knowledge was objectively tested through one of two validated quizzes, allocated immediately prior to and after the workshop in a randomized, crossover fashion.

**RESULTS:** Forty-six students attended, with 42 completing all questionnaires. The pre-workshop survey revealed students were interested in trauma, irrespective of their intended medical speciality, yet few had received formal teaching of the subject (12%). Their self-report knowledge (p<0.001), skills (p<0.001) and confidence (p<0.001) increased, and their MCQ scores improved by 23% (p<0.001). Ninety-eight percent would recommend the session to a colleague and 100% agreed the content was appropriate for their level.

**CONCLUSIONS:** The Game of Thrones themed trauma workshop is a well-received, valuable and effective means of teaching primary assessment to final year medical students.

**PERSONAL CONTRIBUTION**

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Stephen Kunz

Current position: (More than) full time cardiac surgical registrar

Stephen is interested in trauma, critical care, and general surgery. He is a clinical lecturer, RACS EMST instructor, has taught in Timor Leste, and is undertaking multiple research projects at the Austin. Outside of work he enjoys cooking, rock-climbing, and spending time with his cats (and spouse).
Heart rate monitoring in a surgical registrar

Munad Khan, Paul Strauss
General Surgery Unit, Central Gippsland Health Service, Sale.

BACKGROUND: Surgery is well known to be a demanding and challenging career. It no doubt subjects trainees to a range of physical and mental stressors. However, no study has been undertaken to quantify the physiological effect of working as a surgical registrar, arguably a particularly challenging time during a career as a surgeon. Unfortunately, it is not easy to accurately monitor the physiological impact of the working demands in a dynamic profession such as surgery given the unpredictable hours, movements and unique environments in which surgery takes place. However, we chose to focus on dynamic heart rate as an indicator of the demands of surgical training. In this study, a wrist band device that continuously measures heart rate was used to monitor heart rate changes on a day to day basis in a single surgical registrar.

HYPOTHESIS & AIMS: The aim of the study was to observe any discernible differences in resting heart rate between on call and off call days over the course of a new six month surgical registrar rotation. It was hypothesized that on call days would produce an increase in resting heart rate.

METHODS: The Fitbit Charge HR® was worn for the duration of a six month rotation in general surgery by a single surgical registrar. Times when the device was removed were limited to: Scrubbing for an operation; Swimming; Showering; The daily resting heart rate was logged in a computerized database and descriptive statistics were calculated to retrospectively identify factors leading to variance in resting HR.

RESULTS: The average resting heart rate during aggregated on call days was 64.8. This was remarkably similar to the average resting heart rate on off call days (64.9). However, when analyzing on a weekly basis, it was found that weeks including an entire on call weekend registered an average resting heart rate of 65.39 which was slightly greater than weeks including rostered off weekends (64.47). The lowest daily resting HR (58) occurred during an off call, no operating, clinic only day. Conversely, the highest daily resting HR (71) occurred during an on call day including a 4AM trauma. Furthermore, the variance between resting heart rate during on call and off call days appeared to decrease over the course of the six month rotation.

CONCLUSIONS: Overall there was no significant difference in resting heart rate during on call and off call days during the study period. However, individual identifiable stress factors do have the potential to provoke an increase in resting heart rate. Furthermore, consecutive on call days have the most influence in increasing resting heart rate and trends over a six month period indicate the value of experience in arresting fluctuations of resting heart rate.

Munad Khan
Current Position: NSET Trainee commencing Urology SET in 2018

Munad Khan is a second year non-SET registrar currently working in Burnie, Tasmania. The study presented is based on a surgical registrar rotation undertaken in Sale in 2016.

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Thoracic Surgery in a Regional hospital: Assessing the surgical and oncological outcome.
Daniel Ng Ying Kin, Andrew Barling.
Surgical Unit, Bendigo Health, Victoria

BACKGROUND: The provision of a surgical specialty like Thoracic surgery has been mainly in tertiary hospitals. Through one visiting Thoracic Surgeon from Melbourne, Bendigo Hospital caters for the northern region of Victoria. The unit is run by General surgical registrars and I noted that patients have been managed well. A patient with a new lung lesion could be worked up and managed completely in Bendigo Hospital in terms of diagnosis and treatment that includes neo-adjuvant therapy, surgical resection and adjuvant therapy.

HYPOTHESIS & AIMS: With specific instructions, it seems possible to provide a safe and effective Thoracic service in Bendigo. I wanted to assess the safety and efficacy of the service retrospectively for primary lung cancer with curative intent in terms of post-operative complication (30 days). If the outcome of the project is positive, we could hypothesize that other larger regional hospitals could adopt such strategy.

METHODS: A retrospective data collection spanned a period of 24 months. Thoracic cases were extracted from Inpatient Management (iPM) and history of each patient was taken from different sources. Inclusion criteria included VATS-Assisted and/or Thoracotomy, lung resection (Wedge, segment or lobe resection) and with curative intent in primary lung cancer. Exclusion criteria included non-malignant conditions and lung metastatectomy. A total of 115 cases were obtained and after applying the selection criteria the number came down to 33. Each case was looked into in order to identify any 30-day post-operative complication and oncological outcome.

RESULTS: It was noted that no patient had any major adverse post-operative complication. However, 11/33 had minor complications while infection was the most common complication (16.1%), all treated non-operatively. Lobectomy is the gold standard for lung cancer and this was performed in 64% of cases. Of the 33 patients, 2 were followed-up in the private setting. The oncological outcome was good while only 10/31 were given adjuvant chemotherapy. Amongst the 21 who did not receive chemotherapy, 19 would receive marginal additional benefit and 2 were not appropriate for chemotherapy.

CONCLUSIONS: Despite the small cohort of patients, this study provides an indication that Thoracic surgery can be performed safely with good surgical and oncological results in a regional hospital. A health service would require an intensive care service with fully qualified Intensivist, qualified anaesthetist from ANZCA and a medical Oncology service. These services would most likely be available in larger regional hospitals, giving the thought that a surgical specialty like Thoracic Surgery could be easily expanded in other peripheral services. This idea, if successful, will greatly alleviate the workload in busier metropolitan hospitals and decrease the waiting time for treatment of primary lung cancer.

Daniel Ng Ying Kin
Current position: Non-accredited General Surgical Registrar, Austin HPB/T unit.

My primary and secondary education were done in Mauritius and I gained my MBBS with Monash University in 2010. I did my internship in Shepparton hospital before embarking at Austin Health the following year as a House Medical Officer. My passion lies in General Surgery and through the Austin, I had the opportunity to gain experience in several hospital in Victoria, Go Manchester united!
BACKGROUND: Ogilvie syndrome is a rare complication of pseudoobstruction among medical, surgical and obstetric patients. Pseudoobstruction is a pathological condition where bowel function is partially impaired without mechanical causes. It may require intensive monitoring, supportive management, colonoscopic decompression of the large bowel, or in extreme cases surgical decompression. 1-3% of patients will suffer bowel perforation and of that group, a >50% mortality rate observed. Despite the syndrome being well recognised, the risk factors and aetiology remain unclear.

HYPOTHESIS & AIMS: To identify risk factors for Ogilvie Syndrome in women undergoing caesarean section. A secondary objective is to audit recognition and management of the condition.

METHODS: The Obstetrics Department at The Northern Hospital, Melbourne, delivers over 3500 babies per annum. Nine years of retrospective data was obtained from the hospital database. All cases of caesarean section with one or more of the following complications were identified: bowel obstruction, ileus, pseudoobstruction, or Ogilvie. The files of each case were examined to determine the diagnosis of pseudoobstruction using the definition of: pain, distension, and obstipation, with the presence of bowel sounds. The disease group was compared with a control of randomly selected caesarean sections over the study period. Variables include: age, parity, repeat caesarean, anaesthesia, planned or emergency delivery, blood loss, co-morbidities, radiology ordered, referral to general surgery, management type, length of stay, and complications during the operation. Results were compared using Statistics Package for Social Sciences (SPSS, version 24) by using Chi-Square tests and independent T-test. Controls were randomized to obtain a figure of 203. A p-value of less than 0.05 was applied for statistical significance. All results are described as mean +/- standard deviation.

RESULTS: 28 pseudoobstructions and 203 case controls were identified. Incidence of pseudoobstruction among patients undergoing caesareans was 0.36%. 14 of these cases had a general surgical consult and all referred had radiological investigations. Conservative management was the most consistent management option, with only one patient undergoing laparotomy. Identified risk factors were combined general and regional anaesthesia (p<0.001) and blood loss (464 +/- 174ml vs 670 +/- 323ml, p<0.001). Patients with Ogilvie had a greater length of stay (4.9 +/- 1.7days vs 3.8 +/- 1.6days, p=<0.001). There were no differences observed in emergency vs elective, age, gestation, or parity.

CONCLUSIONS: Pseudoobstruction remains a relatively rare complication of caesarean section and thus management decisions do not always follow a consistent methodology. Recognition of this condition is important and clinicians should have an elevated suspicion in patients after having a complex anaesthetic or significant blood loss. Prompt recognition and early imaging are crucial in management and hospital administrators should plan for increased lengths of stay.

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The effectiveness of Intraoperative Hyoscine Butylbromide (Buscopan©) in reducing postoperative catheter-related bladder discomfort in urological patients: A prospective, randomized, placebo-controlled, double-blinded study

Modher Al-Shawi1,2, Brennon Timm1, Ni Davis2, Selena Saykao1 and Stephan Brough1
1Department of Urology Launceston General Hospital, 2Department of Urology, Austin Health & ONJCC.

BACKGROUND: Catheter-related bladder discomfort (CRBD) is a distressing recovery room symptom in urological patients who require intraoperative insertion of a urinary catheter (UC). The prevalence of UC associated discomfort is between 47-90%.

HYPOTHESIS & AIMS: The aim of this study is to assess whether administration of 20 mg of intraoperative intravenous Buscopan© reduces the incidence of postoperative CRBD in the recovery room in urological patients undergoing endoscopic urological procedures under general anaesthetic (GA).

METHODS: We conducted an ethically approved, single centre, prospective, double-blinded, randomized controlled trial comparing 20 mg of intravenous Buscopan© with a normal saline placebo given prior to reversal of anaesthesia. Participants included adult males ≥18 years of age undergoing an endoscopic urological procedure requiring GA and insertion of a UC. The trial drug was administered intraoperatively by the anaesthetist prior to reversal of anaesthesia. Patients were assessed in the recovery room for the presence and severity of CRBD using a validated recovery nurse-assessed CRBD score (0-3). Observations were made at 5, 15, 30 and 60 minutes and at the time of discharge from recovery. The primary outcome variable was improvement in immediate postoperative CRBD with buscopan©. Results were evaluated using a mixed-effects linear regression analysis and data are presented as a mean standard ± deviation. Analog pain score, pain killers requirements in recovery and pulse rate as well as any adverse events associated with the administration of the trial medication were also recorded.

RESULTS: 50 male patients were randomized into the Buscopan© (n=27) and placebo groups (n=23). At 5 minutes, CRBD score for the Buscopan group was 0.46± 0.73 versus 0.79 ±1.05 for the placebo group (p = 0.47). At 15 minutes, CRBD score for the Buscopan© group was 0.75 ± 0.93 versus 0.72 ± 0.92 for the placebo group (p = 0.5). At 30 minutes, the CRBD for the Buscopan© group was 1.12 ± 1.05 versus 0.69 ± 0.78 for the placebo group (p = 0.67). At 60 minutes, the CRBD for the Buscopan© group was 1 ± 1 versus 0.88 ± 0.92 for the placebo group (p = 0.74).

CONCLUSIONS: This study has shown no significant benefit from administering intraoperative Buscopan© to prevent immediate postoperative CRBD in patients after endoscopic urological procedures.

PERSONAL CONTRIBUTION

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Modher Al-Shawi
Current position: Urology SET4 trainee.

Modher is a fourth year Urology trainee at the Austin Hospital. After working extensively overseas he moved to Australia in 2008 when he worked in Darwin, Newcastle, Launceston and currently living in Melbourne Victoria with his wife Rana and son Ibrahim. He is interested in surgical innovation a horse riding, a dedicated teacher and a passionate mentor for junior surgical prospects.
A risk stratification for pancreatic leak after pancreaticoduodenectomy

Osamu Yoshino; Mehrdad Nikfarjam; Vijayaragavan Muralidharan; Michael A. Fink; Graham Starkey; Robert M. Jones; Christopher Christophi; Marcos Vinicius Perini.
The University of Melbourne, Department of Surgery, Austin Health,

BACKGROUND: Pancreatectomy (PD) is the mainstay treatment for malignancies involving pancreatic head, duodenum and distal bile duct. Despite recent medical advances, postoperative complication rate remains up to 60%. Post-operative pancreatic leak (PL) is the most common and morbid complication. Soft pancreas, small pancreatic duct, high intraoperative blood loss and obesity are found to be associated with PL. Serum C-reactive protein level (SCRP) has been associated with post-operative complications in various surgical areas. Nevertheless, there is no Australian study regarding the risk factors for post-operative complications and the value of CRP following PD

HYPOTHESIS & AIMS: We hypothesized that there is an association between post-operative SCRP measurements and complications following PD. We also aimed to develop a risk stratification score for PL.

METHODS: A retrospective analysis was performed from a prospectively recorded database for patients underwent PD between January 2008 and January 2015 at Austin Hospital, Melbourne, Australia. Clinical, surgical and laboratorial variables were extracted. Complications were classified using Dindo-Clavien complication grade (DCCG). ROC curve analysis was performed to determine threshold values of SCRP associated with DCCG and PL. Univariate analysis and logistic regression analysis were used to develop the risk stratification scoring system.

RESULTS: Consecutive 189 patients ranging from 15y to 86y (mean 65.2y) were analysed. Complications rate was 63% with 27.1% of DCCG Grade 3 or above and 1% of mortality. PL rate was 14% and 50% of those were clinically significant. SCRP levels were significantly higher from day 2 afterward among patients with PL and after day 3 in patients with DCCG 3 or above. ROC curve was performed with the SCRP values to stratify the risk of PL (SCRP on day2, cut off 170.9mg/L, AUC: 0.775, p<0.001 95%IC 0.67-0.85) and the severity of complications (SCRP on day 3, cut off 299mg/dl, AUC:0.72, 95%IC 0.63-0.80). Patients with values of SCRP on POD 2 above 170.9 mg/L had a higher risk of developing PL (p=0.02, OR:10.1, CI95% 1.2-84). Patients with SCRP on POD 3 above 299mg/L had a higher risk of having DCCG 3 or above after PD (p<0.001, OR:7.4, CI95% 2.5-21.5). Australian risk stratification score system was developed based on pathological tumour type, size of pancreatic duct, pancreatic texture and SCRP on day 2. High score will predict pancreatic leak with positive predictive value of 0.29 and negative predictive value of 0.98

CONCLUSIONS: Higher SCRP was observed from day 2 among patients who had PL and DCCG 3 complications or higher. The severity of postoperative complication can be predicted with SCRP on day 3. The Australian risk stratification score could predict the risk of pancreatic leak. Further external validation in large independent sample is advised.

Osamu Yoshino
General Surgery SET4 Trainee.

Dr Osamu Yoshino is originally from Japan with previous sub-speciality background of Acute medicine and Trauma. Since he graduated from Tohoku University, Sendai, Japan in 2003, he has been maintaining his research interests including his PhD: fluid resuscitation and abdominal compartment syndrome at University of Newcastle, Australia.

PERSONAL CONTRIBUTION

| Conceptualization & Design | 50% |
| Ethics Application & Submission | 100% |
| Lab Work / Conducting Study | 100% |
| Data Collection | 100% |
| Data Analysis | 70% |
| Conclusion & Discussion | 70% |
Laparoscopic Bile Duct Exploration for Bile Duct Stones Using Choledochoscopy. A Retrospective Study of 6-year Data from The Northern Hospital

Thomas Tiang, Yahya al-Habbal, Isabella Reid, Trevor McQuillan, Tuck Yong.

Northern Health,

BACKGROUND: Catheter-related bladder discomfort (CRBD) is a distressing recovery room symptom in urological patients who require intraoperative insertion of a urinary catheter (UC). The prevalence of UC associated discomfort is between 47-90%.

HYPOTHESIS & AIMS: The aim of this study is to assess whether administration of 20 mg of intraoperative intravenous Buscopan© reduces the incidence of postoperative CRBD in the recovery room in urological patients undergoing endoscopic urological procedures under general anaesthetic (GA).

METHODS: We conducted an ethically approved, single centre, prospective, double-blinded, randomized controlled trial comparing 20 mg of intravenous Buscopan© with a normal saline placebo given prior to reversal of anaesthesia. Participants included adult males ≥18 years of age undergoing an endoscopic urological procedure requiring GA and insertion of a UC. The trial drug was administered intraoperatively by the anaesthetist prior to reversal of anaesthesia. Patients were assessed in the recovery room for the presence and severity of CRBD using a validated recovery nurse-assessed CRBD score (0-3). Observations were made at 5, 15, 30 and 60 minutes and at the time of discharge from recovery. The primary outcome variable was improvement in immediate postoperative CRBD with buscopan©. Results were evaluated using a mixed-effects linear regression analysis and data are presented as a mean standard ± deviation. Analog pain score, pain killers requirements in recovery and pulse rate as well as any adverse events associated with the administration of the trial medication were also recorded.

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CONCLUSIONS: This study has shown no significant benefit from administering intraoperative Buscopan© to prevent immediate postoperative CRBD in patients after endoscopic urological procedures.

PERSONAL CONTRIBUTION

| Conceptualization & Design | 30% |
| Ethics Application & Submission | 00% |
| Lab Work / Conducting Study | 33% |
| Data Collection | 33% |
| Data Analysis | 100% |
| Conclusion & Discussion | 30% |

Thomas Tiang
Current position: General Surgery SET3 Trainee

I completed my undergraduate degree in Science at the University of Auckland before completing my Medical Degree in Queensland. I started Surgical residency in Victoria in 2010 and have been here since. I have two children with one on the way so am busy outside of work with my wife and kids. Otherwise golfing and fishing when I can.
**AUSTIN RESEARCH PRIZE - PAST WINNERS**

**2003:** Mehrdad Nikfarjam - The Influence of Vascular Inflow Occlusion on Progressive Liver Necrosis and Microvasculature Following Interstitial Laser Thermotherapy

**2004:** Nathan Lawrentschuk (Joint Winner) - Tumour Hypoxia in Renal Cell carcinoma using Polarographic Oxygen Sensor Measurements, Immunohistochemistry and serum Osteopontin.

Stephen Warrillow (Joint Winner) - A randomised, double-blind, placebo-controlled cross-over pilot study of glibenclamide in patients with septic shock

**2005:** Nathan Lawrentschuk - In-vivo tumour hypoxia, angiogenesis and characterisation of carbonic anhydrase IX expression with xenografted human Renal Cell Carcinoma in animal models using 124I-cG250 Positron Emission Tomography, Biodistribution, and Oxygen studies.

**2006:** Cris Cuthbertson - Capillary morphology is changed by severe acute pancreatitis and is improved by hyperbaric oxygen.

**2007:** Peter Wong (Basic Science Prize) - 18f-Fluorothymidine Positron Emission Tomography (Flt-Pet) As A Marker Of Cellular Proliferation In Renal Cell Carcinoma

Laurence Weinberg (Clinical Prize) - Pharmacoeconomics Of Inhalational Anaesthetics Agents: An 11-Year Cost Identification Analyses

**2008:** Russell Hodgson (Basic Science Prize) - Blockade with soluble ICOS-Ig prolongs survival of cellular xenografts

Julian Liew (Clinical Prize) - An anatomic feasibility study: Nerve transfer to the triceps muscle using the posterior division of the axillary nerve.

**2009:** Russell Hodgson (Basic Science Prize) - Local Expression of ICOS-Ig Promotes Xenograft Survival Through The Induction of Regulatory T Cells

Simon Chong (Clinical Prize) - Minimally invasive measurement of cardiac output during surgery and critical care: A meta-analysis of accuracy and precision.
AUSTIN RESEARCH PRIZE - PAST WINNERS

2010: **Russell Hodgson (Basic Science Prize)** - ICOS-Ig Secreting Xenografts Have Prolonged Survival And Are Associated with Increased T Regulatory Cells And IL-10 Expression.

**Vacchara Niumsawatt (Clinical Prize)** - Risk factors of development of Acute Gangrenous Cholecystitis and its treatment outcomes

2011: **Stanley Tay** - SAVE Study: Reduced volatile agent usage following introduction of Et-control system

2012: **Kapil Sethi** - Comparison of Renal Preconditioning techniques in a rat model.

2013: **Matthew Lee** - Radial to femoral arterial blood pressure differences during liver transplantation surgery.

2014: **Lawrence Lau** - Assessment of Liver Remnant using ICG Clearance Intraoperatively during Vascular Exclusion: Early experience with the ALIIVE technique.

2015: **Dermot O’Kane** - “Zinc protects the kidney against warm ischaemia reperfusion injury in a pre-clinical large animal model.”

2016: **Todd Manning** - “Modelled perspective of laparoscopic lens fogging and its preventative measures in standard and robotic laparoscopes.”
Impact of blood flow occlusion on direct and indirect laser induced thermal liver injury

M Nikfarjam, C Malcontenti-Wilson, C Christophi.

BACKGROUND:
Laser, radiofrequency and microwave are common techniques for local destruction of liver tumours by focal hyperthermia. The main limitation of focal hyperthermia treatment is the volume of necrosis that can be achieved. Blood flow occlusion is commonly advocated as an adjunct to focal hyperthermia to increase the volume of tissue necrosis based on macroscopic and histological assessment of immediate or direct thermal injury. This study examines the impact of blood flow occlusion on direct and indirect laser induced thermal liver injury in a murine model using histochemical methods to assess tissue vitality.

METHODS:
Focal hyperthermia produced by laser (Nd-YAG - wavelength 1064 nm) was applied to the liver of inbred male CBA strain mice at 2W for 50 seconds (100J). Treatment was performed with and without temporary portal vein and hepatic artery blood flow occlusion. Animals were killed upon completion of the procedure to assess direct thermal injury and at 24, 48 and 72 hours to assess the progression of tissue damage. The maximum diameter of necrosis was assessed by vital staining for nicotinamide adenine dinucleotide (NADH) diaphorase. Microvascular changes were assessed by laser Doppler flowmetry, Confocal in-vivo microscopy and scanning electron microscopy.

RESULTS:
The direct thermal injury (mean(S.E.) assessed by NADH diaphorase staining was significantly greater following focal hyperthermia treatment without blood flow occlusion than with blood flow occlusion (3.3(0.4)mm vs. 2.9(0.3)mm; P=0.005). Tissue disruption, cracking and vacuolization was more pronounced adjacent to the fibre insertion site in the group treated with focal hyperthermia combined with blood flow occlusion. There was an equivalent increase in the extent of injury following therapy in both groups that reached a peak at 48 hours. The maximum diameter of necrosis in the focal hyperthermia alone group at 48 hours was significantly greater than the focal hyperthermia combined with blood flow occlusion group (5.8(0.4)mm vs.5.3(0.3)mm; P=0.011). The patterns of microvascular injury were similar in both groups, varying in extent.

CONCLUSIONS:
Temporary blood flow inflow occlusion appears to decrease the extent of initial injury measured by vital staining techniques and does not alter the time sequence of progressive tissue injury following focal hyperthermia therapy.

N Lawrentschuk, C Murone, AMT Poon, J Sachinidis, G O'Keefe, LG Johns-Putra, Z. LIU, I Davis, AM Scott, DM Bolton

BACKGROUND:
The purpose of our research is to evaluate oxygen levels and angiogenesis within renal cell cancers (RCC), as evidence suggests they are hypoxic, given their resistance to radiotherapy and chemotherapy. Hypoxia has now been shown in other tumours to correlate with resistance to treatment and poor prognosis. Our study builds on the finding of hypoxia in RCC and explores its relationship with immunohistochemical markers of hypoxia and a new novel marker of hypoxia in tumours, serum osteopontin.

METHODS:
Patients who were undergoing radical nephrectomy for RCC had : 1) Evaluation of oxygen levels (pO2) within their renal cell cancers in vivo using a Polarographic Oxygen Sensor. 2) Immunohistochemistry including microvessel density to confirm at a sub-cellular level the relationship of hypoxia with the expression of proteins associated with hypoxia and angiogenesis in RCC and 3) Human osteopontin ELISA immunoassay techniques to analyse the serum levels of osteopontin.

RESULTS:
30 patients have been recruited thus far and we have demonstrated that RCC are relatively hypoxic (median pO2 7.2mmHg) compared to normal renal tissue (26.3mmHg). Microvessel density is increased in RCC compared to normal tissue indicating increased angiogenesis. Other markers if hypoxia were also increased. Serum osteopontin in patients with RCC was greater at 17.65 ± 5.3 ng/ml (mean ± 95% C.I., range 5-41) compared to controls 8.75 ± 2.17 ng/ml (range 8-12).

CONCLUSIONS:
Renal cell cancers are relatively hypoxic and more angiogenic compared to normal tissue within the same kidney. This may explain resistance to radiotherapy and chemotherapy whilst helping to identify future therapeutic targets in the management of advanced renal cell cancer. Serum osteopontin has been demonstrated to be raised in RCC and is a novel tumour marker for renal cell carcinoma.
A randomised, double-blind, placebo-controlled cross-over pilot study of glibenclamide in patients with septic shock

Stephen Warrillow, Moritoki Egi, Rinaldo Bellomo

BACKGROUND:
Severe sepsis often causes a hypotensive shock state. Hyperpolarisation of the vascular smooth muscle cell membrane, due to the marked K+ efflux prevents Ca2+ entry into cells and may be responsible for ‘vasoplegia’. Glibenclamide (normally an oral hypoglycaemic agent) blocks the ATP-dependent K+ channel and may prevent hyperpolarization this restoring intra-cellular Ca2+ levels and re-sensitising vascular smooth muscle to noradrenaline. Animal studies have demonstrated that glibenclamide restores vascular sensitivity to noradrenaline. However, this effect has not been previously studied in humans. Objective: To test whether glibenclamide restores noradrenaline responsiveness in septic shock patients.

METHODS:
Prospective, double-blind, placebo-controlled cross-over pilot study, in 10 patients with septic shock requiring an infusion of noradrenaline to receive either enteral glibenclamide 20mg or placebo. After twenty-four hours, each patient crossed over to receive the alternative therapy. The primary end-point was the change in noradrenaline infusion rate over time with maintenance of target mean arterial pressure. Secondary end-points included changes in heart rate and serum lactate levels.

RESULTS:
Glibenclamide was adequately absorbed enterally and, as expected, induced a significant decrease in serum glucose concentration (Mean glucose: 5.97 ± 2.17 vs 7.65 ±2.43 (P<0.0001) and increased the need for parenteral glucose administration. During glibenclamide treatment mean noradrenaline requirements fell from 13 to 4 µmol/min compared to a change from 19 to 7 µmol/L for placebo. The two changes represented a decrease of 78.9% and 71.1% in dose respectively (NS). There were also no significant changes in heart rate, mean arterial blood pressure and lactate concentration.

CONCLUSIONS:
Glibenclamide was well absorbed enterally and exerted its hypoglycaemic effect reliably. However, it failed to achieve a greater reduction in noradrenaline dose than placebo. Our observations suggest that, in septic humans, blockade of ATP-potassium dependent channels does not have a potent effect on vasomotor tone.
In-vivo tumour hypoxia, angiogenesis and characterisation of carbonic anhydrase IX expression with xenografted human Renal Cell Carcinoma in animal models using 124I-cG250 Positron Emission Tomography, Biodistribution, and Oxygen studies.

Nathan Lawrentschuk, C Murone, A Rigopolous, A Mountain, D Wang, G O’Keefe, G Jones, FT Lee, Ian Davis, Andrew M Scott, Damien M Bolton

BACKGROUND:
Hypoxia stimulates angiogenesis and has been demonstrated in tumours where it correlates with resistance to treatment and poor prognosis. We have demonstrated hypoxia in human Renal Cell Carcinoma (RCC). The purpose of animal models was to further evaluate oxygen levels within RCC whilst also focusing on expression of the protein carbonic anhydrase IX (CA IX). This protein is stimulated by hypoxia and involved in angiogenesis and may be a potential tumour target for imaging and future therapies. The human antibody cG250 binds to CAIX in vivo allowing biodistribution and PET studies when radiolabeled with iodine-124 (I124).

METHODS:
Balb/c nude mice had human RCC (SK-RC-52) xenografted subcutaneously. Tumours were grown to different volumes with oxygen levels measured. Further groups then had the radiolabelled monoclonal antibody 124I-cG250 (that binds to CA IX) injected intravenously and had Positron Emission Tomography (PET), gamma counting and oxygen studies performed on days 0, 1, 2, 3, 5, 7, 10 and 14 post injection. Immunohistochemistry and autoradiography was also performed.

RESULTS:
An inverse relationship between tumour volume and hypoxia within the model was established (P<0.001). Furthermore, CA IX was expressed by tumours with maximal uptake of 124I-cG250 on days 2/3 by distribution with gamma counting that could be correlated with uptake on PET imaging. Also, 124I-cG250 as read by gamma counter correlated with noninvasive PET scanning standardised uptake values of the radioisotope within tumours.

CONCLUSIONS:
The xenograft model confirms our previous findings that human RCC are relatively hypoxic compared to normal tissue. Also, that the level of hypoxia is inversely proportional to tumour size. CAIX was confirmed as an imaging and potential therapeutic target in RCC. Finally, a correlation was made between PET scanning with 124I-cG250 and biodistribution within tumours by gamma counting confirming the potential to serially PET scan animals rather than sacrifice in future biodistribution studies. This has major implications for animal ethics and the design of future biodistribution studies that are routinely used to characterised new radioisotopes and radiolabeled antibodies used to treat a variety of cancers.
Capillary morphology is changed by severe acute pancreatitis and is improved by hyperbaric oxygen.

C. Cuthbertson, K. Su, C. Malcontenti-Wilson, V. Muralidharan, C. Christophi

BACKGROUND:
Severe acute pancreatitis is characterized by alterations to the microcirculation, particularly affecting the capillary tree, which lead to pancreatic necrosis. The morphology of the pancreatic microvasculature is known to be affected in severe pancreatitis, but the effect of hyperbaric oxygen is unknown. The aims of this study are to determine the progression of pancreatic microvascular changes caused by acute pancreatitis and to determine the effect of the administration of hyperbaric oxygen (HBO).

METHODS:
Sixty seven male Wistar rats weighing 250-350g were induced with severe pancreatitis by bilio-pancreatic infusion of 4% sodium taurocholate. Animals were randomised to either HBO treatment or control. HBO treatment (100% oxygen for 90 minutes at 2.5 Atmospheres) was commenced 6 hours following induction of pancreatitis, and continued 12-hourly. Surviving animals underwent microvascular polymer casting of the pancreas at six, 24, 48 and 72 hours following commencement of treatment, and equivalent time points for control animals. Normal and Sham-operated animals also underwent casting. Microvascular casts were created by the injection of freshly prepared Mercox resin through a cannula in the thoracic aorta. The pancreas was removed after 24 hours of polymerisation and further prepared for scanning electron microscopy of the resin cast. Scanning electron micrographs of the casts were compared for capillary density, poor capillary filling, vessel diameter, and major morphological changes.

RESULTS:
Normal pancreatic microvascular casts showed a dense network of capillaries, with multiple anastomoses (Image 1). Significant morphological changes appeared at 24 hours post induction (Image 2). Microvascular casts demonstrated poor capillary filling, decreased capillary density and increased capillary cast diameter. Capillary diameter was increased (from 6.7µm to 10.3µm at 24hr, p<0.01, and 11.8µm at 48hr, p<0.001), capillary heterogeneity was increased (range increased from 13.8µm to 21.4 µm, p<0.001) and capillary density was reduced (from 1140µm-2 to 758µm-2, p<0.01). These changes occurred at 24 hours post induction and were maintained at 48 and 72 hours. Treatment with HBO reduced the severity of microvascular morphological changes at each time point (Image 3). These changes became apparent at 48 hours post induction, and were maintained at 72 hours. At 48 hours, capillary diameter was decreased toward normal (from 11.8µm to 8.4µm, p<0.01), range was reduced, and capillary density was increased (from 722µm-2 to 901µm-2, p<0.01).

CONCLUSIONS:
Microvascular parameters are affected by acute pancreatitis, with changes detected at 24 hours and maintained until at least 72 hours. HBO improves the microvascular morphology parameters in acute pancreatitis towards normal values. HBO has potential as a unique alternative therapy in acute pancreatitis.
18f-Fluorothymidine Positron Emission Tomography (Flt-Pet) As A Marker Of Cellular Proliferation In Renal Cell Carcinoma

Wong P1,2; Lee ST2,3,4; Eng J3; Murone C2; Berlangieri SU3; Pathmaraj K3; O’Keefe GJ3; Byrne AJ3; Lawrentschuk N1,2; Davis ID2; Bolton DM1; Scott AM2,3,4.

1 Department of Surgery (Urology), University of Melbourne, Austin Health, Heidelberg, Australia. 2 Ludwig Institute for Cancer Research, Austin Health, Heidelberg, Australia. 3 Centre for PET, Austin Health, Heidelberg, Australia. 4 Department of Medicine, University of Melbourne, Austin Health, Heidelberg, Australia.

BACKGROUND:
18F-FLT-PET (Fluorothymidine Positron Emission Tomography) has been used to non invasively measure cellular proliferation in a number of tumour types. However, its role in renal cell carcinoma (RCC) has not been established. We aim to assess FLT-PET in RCC, and to compare it to immunohistological measurements of proliferation.

METHODS:
Patients with suspected RCC suitable for nephrectomy had preoperative FLT and FDG (fluorodeoxyglucose) PET/CT scans. Surgical samples were obtained for immunohistochemical analysis (Ki-67). Qualitative visual grading relative to normal kidney and analysis of maximum standardized uptake value (SUVmax) of each PET scan was assessed using co-registered low-dose 5mm CT and prior triple phase CT imaging. Uptake in RCC using FLT PET was compared to FDG PET. Statistical analysis comparing Ki-67 and SUVmax was performed.

RESULTS:
A total of 19 patients (13 clear cell, 5 papillary and 1 transitional cell carcinoma) underwent preoperative PET scans, with immunohistochemical data available for 13. Visual grading found most tumours had radiotracer uptake that was equal or less than the contralateral kidney. FLT uptake was generally less than FDG. Bivariate analysis showed a positive correlation between Ki-67 & FLT SUVmax (p-value 0.001, r = 0.8) and between Ki-67 & FDG SUVmax (p-value 0.005, r = 0.73).

CONCLUSIONS:
Uptake of FLT in RCC is less than FDG. There is positive correlation between FLT uptake and Ki-67 proliferative index in RCC suggesting that the degree of proliferation within RCC can be predicted by PET imaging. Further study is required to determine whether this correlates with patient outcome.
Pharmacoeconomics Of Inhalational Anaesthetics Agents: An 11-Year Cost Identification Analyses

Laurence Weinberg, David Story, Larry McNicol

BACKGROUND:
Anaesthetic departments account for 2-3% of the total hospital budget, with anaesthetic drugs accounting for 5-8% of total pharmacy expenditure. Inhalational agents account for 20% of anaesthetic drugs therefore are one of the areas that are most amenable to immediate cost reduction in the anaesthetic department budget. This study is a cost identification analyses assessing inhalational anaesthetic agent expenditure at Austin Health over an 11-year period. Pharmacoeconomic modeling is used to evaluate strategies to curtail costs.

METHODS:
The number of bottles utilised of three volatile agents (Isoflurane, Sevoflurane, Desflurane) was collected each month for the financial years ending 1997 to 2007. The acquisition costs and the cumulative drug expenditure in dollars for each agent were calculated. Inhalational agent utilisation patterns and unit price changes were evaluated. Pharmacoeconomic modeling using low fresh gas flow anaesthesia was performed to evaluate practical methods for reducing anaesthesia costs. The rational use of the cheaper generic volatile agent Isoflurane was used in pharmacoeconomic cost-containment strategy models.

RESULTS:
For the financial years ending 1997 to 2007, pharmacy acquisition costs for a bottle of Isoflurane (250mL), Sevoflurane (250mL) and Desflurane (240mL) were $157, $336, $170 respectively, and for the financial years ending 2005 to 2007, cost per bottle was $109, $265, $180 respectively. The number of bottles of Isoflurane decreased from 384 bottles/year in 1997 to 204 bottles/year in 2007. The number of bottles of Sevoflurane increased from 226 bottles/year in 1998 to 875 bottles/year in 2007. Desflurane use commenced at Austin Health in 2002 with 34 bottles being used. This increased to 163 bottles/year in 2007. Expenditure for Isoflurane decreased from $88,985/year in 1997 to $22,006/year in 2007. In contrast, Sevoflurane expenditure increased from $11,442/year in 1997 to $274,692/year in 2007. Desflurane expenditure increased from $5,855/year in 2002 to $29,340/year in 2007. Total cumulative expenditure for inhalational agents was $100,427/year in 1997, increasing to $326,038/year in 2007. Pharmacoeconomic modelling demonstrates that the cost of an inhalational agent for a 60-minute anaesthetic, at 1 Minimum Alveolar Concentration, at fresh gas flows of 1L/min (low flow), is $1.54 for Isoflurane and $6.89 for Sevoflurane. At fresh gas flows of 6 L/min (high flow), costs increase to $9.20 for Isoflurane and $47.47 for Sevoflurane. Cost modelling reveals if Sevoflurane usage between 1997 and 2007 would have been reduced by 40% per year and substituted for the cheaper inhalational agent Isoflurane, a total savings of $866,565 would have been achieved for this 11-year period. Similarly, conservative cost analyses predicts that if the current trends in volatile anaesthetic agents continue at Austin Health over the next 10 years, a 40% reduction per year in Sevoflurane usage could be achieved by utilising Isoflurane in its place, a total net savings in excess of $1.8 million will result.

CONCLUSIONS:
Cost analyses of anaesthetic drugs is necessary in today’s economic climate. Low flow anaesthesia is a simple but highly effective method of cost minimization for inhalational anaesthetic agents. Cost containment is also influenced by the rational use of available inhalational agents.
An anatomic feasibility study: Nerve transfer to the triceps muscle using the posterior division of the axillary nerve.

Liew J H, van Zyl N

BACKGROUND:
This study proposes the co-aptation of the posterior division of the axillary nerve to the lateral head of triceps nerve as a new, alternative option for triceps reconstruction in the tetraplegic patient. This study provides anatomical data in order to appraise the feasibility of nerve transfer to the triceps using the posterior division of the axillary nerve.

METHODS:
Morphologic features of the axillary nerve from the quadrangular space and the radial nerve from the triangular space were studied in 9 cadaveric arms under 2.0x loupe magnification. Nerve lengths, diameters, and branches were recorded.

RESULTS:
Average arm length was 312 mm. The average diameter of the posterior division of the axillary nerve was 2.5 mm whilst that of the lateral head of triceps nerve was 2.1 mm.
Nerve transfer was possible in all upper limbs except one where no branch to the lateral head of triceps could be identified. In full adduction the average overlap of the nerve transfer was 16.75 mm, whereas, when the arm was abducted to 90 degrees, the average amount of nerve overlap was 10.5 mm.

CONCLUSIONS:
Nerve transfer from the posterior division of the axillary nerve to the lateral head of triceps is anatomically possible. It provides a possible alternative to reconstruct elbow extension with the advantages of preserving the anatomy and biomechanics of the native muscles, avoiding the need for synthetic prosthesis as well as avoiding donor defects from tendon graft harvest.
Blockade with soluble ICOS-Ig prolongs survival of cellular xenografts

Hodgson R, Christiansen D, Ierino FL, Sandrin MS

BACKGROUND:
Xenografts are one possible solution to the lack of donor organs for diseases such as Diabetes Mellitus. T cell costimulatory pathways are integral to acute cellular rejection against these grafts. Inducible Co-Stimulator (ICOS) pathway blockade has been shown to prolong allograft survival, but there is limited data for xenograft models. Our hypothesis is that local expression of the fusion molecule ICOS-Ig by cells in allograft or xenograft models will prolong survival of cellular grafts.

METHODS:
Porcine Iliac Endothelial cells (PIEC) were transfected with cDNA of the fusion molecule ICOS-Ig. Intracellular and secreted expression was confirmed and quantified using immunoperoxidase staining and Western Blot analysis. In vitro testing of supernatant in mixed lymphocyte reactions was performed. In vivo survival was examined using a subcutaneous graft model in mice.

RESULTS:
ICOS-Ig containing supernatant gave a 99.5% reduction in proliferation of an allograft mixed lymphocyte reaction. Similarly, xenogeneic proliferation was inhibited by 84.3%. In addition an 84.5% reduction in proliferation was observed when PIEC expressing ICOS-Ig were used as stimulators. PIEC-ICOS-Ig xenografts showed prolonged survival compared to wild-type PIEC xenografts (mean survival 34 vs 12 days, p=0.0025) in a subcutaneous graft models in Balb/c mice.

CONCLUSIONS:
Blockade of T cell co-stimulation by the fusion molecule ICOS-Ig has been demonstrated to decrease proliferation in allograft and xenograft in vitro models. Further, there is significant prolongation of survival of PIEC transfected with ICOS-Ig in vivo. These data suggest that further investigations for the role of T cell co-stimulatory blockade in xenografts, through the local expression of ICOS-Ig, are warranted.
Minimally invasive measurement of cardiac output during surgery and critical care: A meta-analysis of accuracy and precision.

Philip J Peyton, Simon Chong.

BACKGROUND:
When assessing the accuracy and precision of a new technique for cardiac output measurement, the commonly accepted criterion for acceptability of agreement with a reference standard is that the percentage error (95% limits of agreement/mean cardiac output) should be 30% or less. We reviewed published data on four different minimally invasive methods adapted for use during surgery and critical care: pulse contour techniques, esophageal Doppler, partial carbon dioxide rebreathing, and transthoracic bio-impedance, to assess their bias and percentage error in agreement with thermodilution.

METHODS:
An English language literature search identified published papers since 2000 which examined the agreement in adult patients between bolus thermodilution and each method. For each method a parametric assessment was performed using studies in which the first measurement point for each patient could be identified, to obtain a pooled mean bias and percentage error weighted according to the number of measurements in each study.

RESULTS:
47 studies were identified as suitable for inclusion: N studies, n measurements: mean weighted bias [% error] were: pulse contour N = 25, n = 714: 0.1 L/min [40.7%]; esophageal Doppler N = 2, n = 57: -0.8 L/min [42.1%]; partial CO2 rebreathing n = 145: 0.0 L/min [43.6%]; transthoracic bio-impedance N = 13, n = 435: -0.1 L/min [42.9%];

CONCLUSIONS:
No method has achieved agreement with bolus thermodilution which meets the expected 30% limits. The relevance in clinical practice of these arbitrary limits should be reassessed.
Local Expression of ICOS-Ig Promotes Xenograft Survival Through The Induction of Regulatory T Cells

Hodgson R, Ziolkowski A, Christiansen D, Simeonovic C, Ierino F, Sandrin M

BACKGROUND:
Xenografts are one possible solution to the lack of donor organs for diseases such as Diabetes Mellitus. The acute cellular rejection of xenografts is one of the critical processes that must be overcome. We have previously shown that blockade of T cell co-stimulation with locally expressed ICOS-Ig can prolong the survival of cellular xenografts. The mechanisms for this prolongation of survival have hitherto remained unknown, with the induction of regulatory T cells (Tregs) being one possibility. Tregs, through their secretion of IL10, TGFβ and interferon-γ, suppress activated T cells to downregulate the immune response, and may also have a role in tolerance to transplanted grafts. We show here that locally expressed ICOS-Ig induces Tregs and prolongs cellular xenograft survival.

METHODS:
Porcine Iliac Endothelial cells (PIEC) were transfected with cDNA encoding the fusion molecule ICOS-Ig. Subcutaneous xenograft transplants with wild-type PIEC or PIEC-ICOS-Ig were performed in BALB/c mice; either single grafts, or a dual graft model with a wild-type PIEC graft on one flank and a PIEC-ICOS-Ig on the opposing flank. Grafts were sampled for immunohistochemistry and real-time PCR at days 7 and 14, with overall survival also being measured.

RESULTS:
Locally expressed ICOS-Ig prolongs xenograft survival when compared with wild-type grafts (median survival 34 vs 12 days, p=0.0025). When wild-type PIEC and PIEC-ICOS-Ig cells are grafted in the same mouse, wild-type PIEC graft survival is prolonged (median survival 28 vs 12 days, p<0.05), indicating a systemic effect of ICOS-Ig. Increased numbers of Tregs were found in the perigraft region of wild-type PIEC grafts in the dual graft model when compared with wild-type PIEC single grafts at days 7 and 14.

CONCLUSIONS:
Locally expressed ICOS-Ig prolongs survival of cellular xenografts, with the mechanism both local and systemic. The presence of ICOS-Ig induces perigraft Tregs which are associated with prolonged survival of xenografts. These data suggest that locally expressed ICOS-Ig may play an important role in prolonging xenograft survival and the induction of tolerance through the presence of Tregs.
Risk factors of development of Acute Gangrenous Cholecystitis and its treatment outcomes

V Niumsawatt.

BACKGROUND:
Gangrenous cholecystitis is considered a more severe form of acute cholecystitis. The risk factors associated with this condition and its impact on morbidity and mortality compared to non-gangrenous acute cholecystitis is poorly defined.

METHODS:
Patients with histologically confirmed acute cholecystitis treated between 2005-2010 were identified from a prospectively maintained database. Those with gangrenous cholecystitis were then compared to those with non-gangrenous acute cholecystitis.

RESULTS:
184 patients with non-gangrenous acute cholecystitis and 106 patients with gangrenous cholecystitis were identified. The risk factors associated with gangrenous cholecystitis included older age (P = 0.001), diabetes (P = 0.049), delay in operation (P < 0.001), temperature of >38°C (P < 0.001), tachycardia (P = 0.002), detection of muscle rigidity on examination (P = 0.01), elevations in white cell count (WCC) (P < 0.001), C-reactive protein (CRP) (P = 0.001), bilirubin (P = 0.029) a GGT (P < 0.001), and elevated urea and creatinine (P < 0.05). There was no overall difference in complications between the two groups. There was a lower incidence of common bile duct stones in the gangrenous cholecystitis group (25% versus 13% P = 0.017). Gangrenous cholecystitis was however associated with an increase in post-operative ICU/HDU requirement (P = 0.023) and was associated with increased mortality (P = 0.017).

CONCLUSIONS:
Gangrenous cholecystitis has certain clinical features and associated laboratory findings that may help differentiating it from non-gangrenous cholecystitis. It is associated with a higher incidence of mortality. Minimizing a delay in operative management, which is noted in this condition may potentially improve treatment outcomes.
ICOS-Ig Secreting Xenografts Have Prolonged Survival And Are Associated with Increased T Regulatory Cells And IL-10 Expression

Hodgson R, Christiansen D, Ziolkowski A, Mouhtouris E, Simeonovic C, Ierino F, Sandrin M

BACKGROUND:
Many patients die waiting for organ transplantation due to a lack of donor organs. Xenografts are an unlimited resource, however solutions to barriers such as acute cellular rejection have yet to be elucidated. T regulatory cells (Tregs), through their secretion of IL10, TGFß and interferon-γ, suppress activated T cells to downregulate the immune response seen in acute cellular rejection, and may also have a role in tolerance to transplanted grafts. We have previously shown that blockade of T cell co-stimulation with locally expressed ICOS-Ig can prolong the survival of cellular xenografts and now show that this response is xeno-specific and associated with increased IL-10 expression and induction of Tregs.

METHODS:
Porcine Iliac Endothelial cells (PIEC) were transfected with cDNA encoding the fusion molecule ICOS-Ig. Subcutaneous xenograft transplants with wild-type PIEC or PIEC-ICOS-Ig were performed in BALB/c mice; either single grafts, or a dual graft model with a wild-type PIEC graft on one flank and a PIEC-ICOS-Ig on the opposing flank. Grafts were sampled at days 7 and 14 and characterised with immunohistochemistry, flow cytometry and Q-PCR.

RESULTS:
Locally expressed ICOS-Ig prolonged xenograft survival when compared with wild-type grafts (median survival 34 vs 12 days, p=0.0025). When wild-type PIEC and PIEC-ICOS-Ig cells were grafted in the same mouse, wild-type PIEC graft survival is prolonged (median survival 28 vs 12 days, p<0.05), indicating a systemic effect of ICOS-Ig. This result was found to be xeno-specific, with no prolongation of similarly grafted EL4 allografts. Immunohistochemistry revealed increased numbers of FoxP3+ cells in the perigraft region of both PIEC-ICOSIg grafts and dual PIEC and PIEC-ICOS-Ig grafts at days 7 and 14. Flow cytometry of the graft infiltrating lymphocytes revealed the majority of these FoxP3+ cells to be of the CD4+CD25+FoxP3+ Treg phenotype. Furthermore, Q-PCR of these grafts revealed differences in expression of IL-10 but not TGFß or IFN-γ.

CONCLUSIONS:
The presence of ICOS-Ig induces perigraft Tregs which are associated with prolonged survival of xenografts. The increased expression of IL-10 in these grafts indicates a critical role of T cell/macrophage binding and antigen recognition in the presence of ICOS-Ig. These data suggest that locally expressed ICOS-Ig may play an important role in prolonging xenograft survival and the induction of tolerance through the presence of Tregs.
SAVE Study: Reduced volatile agent usage following introduction of Et-control system

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BACKGROUND: Total cumulative expenditure for inhalational agents at Austin Hospital was $270,000 for the 2010 financial year. Anaesthesia pharmacoeconomic modelling in our department shows that inhalational agent costs will continue to escalate whilst resources remain finite. In order to evaluate strategies to reduce costs within a finite hospital budget, we hypothesised that the use of Et control on the Aisys Carestation anaesthesia delivery system (GE Healthcare®) during volatile anaesthesia will significantly reduce usage compared to current practice. The Aisys Carestation is an anaesthesia delivery system designed to minimise fresh gas and volatile usage by achieving and maintaining set target values using an automated algorithm with low-flow anaesthesia.

METHODS: Following ethics approval, numbers and duration of volatile general anaesthesia cases, along with volatile costs and CO2 absorbent costs were reviewed from Health Information Service and Pharmacy in a 12-week period prior to and a 12-week period after the introduction of Et-control. Inclusion criteria were all general anaesthesia requiring a volatile agent. Primary end-point was average cost per day of volatiles. We also surveyed Et-control use, looking at rates of utilisation plus flow rates used, to determine the generalisability of our findings.

RESULTS: Over the two time periods, there were 1818 vs. 1810 cases analysed with no statistical difference between gender (p=0.32), age group (p=0.87), ASA scores (p=0.73) or mean workload (153 vs. 160 hr/wk, p=0.37). Use of Et control on the Aisys Carestation anaesthesia delivery system showed a substantial reduction in inhalational agent cost ($376/day vs. $316/day, p=0.01) representing a 19.7% daily cost reduction when corrected for number of anaesthesia hours. Sevoflurane use was 182 bottles (45.5L) vs 148 (37L), Desflurane the same at 20 (4.8L), and Isoflurane the same at 1 (0.25L). CO2 absorbent cost did not increase significantly ($0.07/day). Our survey had a 65% response rate (1169/1810), and showed Et-control was used in 89% of cases, with a mean flow rate of 0.63 vs 3.2L/min.

CONCLUSIONS: Low flow anaesthesia is a simple but highly effective method of cost minimisation for inhalational anaesthetic agents. Use of Et-control on the Aisys Carestation anaesthesia delivery system significantly reduces volatile cost compared to previous routine practice. Real cost savings were approximately 20% or $35,000 per 10,000 general anaesthetic hours.
Comparison of Renal Preconditioning techniques in a rat model.

K Sethi, O Patel, J Ischia, L Xiao, G Baldwin, A Shulkes, DM Bolton

BACKGROUND: Renal preconditioning (RPC) is a technique that exposes tissue susceptible to ischaemia into triggering a family of intracellular transcription factors, the Hypoxia Inducible Factors (HIFs), to protect against kidney injury. Preconditioning may offer protection to cells against irreversible nephron loss and tolerate ischaemia beyond the accepted critical ischaemia time. Whilst these techniques have been explored in other organs, no study has compared the effects of these techniques in the kidney. There is also emerging evidence that a combination of these preconditioning techniques may confer greater protection in tissue.

METHODS: 24 solitary kidney-model Sprague Dawley rats were divided into groups of 6 undergoing either a) control, b) 30mg/kg subcutaneous cobalt chloride (CoCl$_2$) treatment over 24 hours, c) intermittent clamping (IC) consisting of 5 minutes renal artery clamping followed by 10 minutes reperfusion over 4 cycles, or d) a combination of both CoCl$_2$ and IC. Following preconditioning, all rats underwent 40 minutes of renal artery clamping (critical ischaemia) and were followed up with serum renal function tests and animal health scores for 7 days.

RESULTS: All rats demonstrated the greatest rise in serum creatinine at 24 hours, and urea at 72 hours with a return to basal levels by day 7. All preconditioning methods improved renal function following critical ischaemia up to 72 hours (mean +/- SEM creatinine in γmol/l: control group, 273.3 +/- 40.3; CoCl$_2$, 76.3 +/- 10.7 p<0.0005; IC, 76.3 +/- 36.2 p<0.05; combination, 271.1 +/- 76). Rats treated with CoCl$_2$ had the lowest rise in serum creatinine at 24 hours (Control 390.5 +/- 18.4; CoCl$_2$, 144.7 +/- 31.5 p<0.0001). Whilst the control group had a 50% mortality rate, no rats in the preconditioning groups died (p<0.005).

CONCLUSIONS: Individual cobalt treatment offers greater protection against renal damage than intermittent clamping or a combination of these techniques in the kidney. Development of similar agents that specifically target the same mechanistic pathway of HIF activation would offer the greatest benefit in renal preconditioning for clinical application. An approach that stimulates kidney cells into protecting themselves by preconditioning prior to ischaemic damage has great promise for use in a wide variety of medical and surgical conditions in the future.
Radial to femoral arterial blood pressure differences during liver transplantation surgery.

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BACKGROUND: Maintenance of cardiovascular stability during orthotopic liver transplantation (OLTx) is a significant challenge to the anaesthetist. Accurate real-time monitoring of the circulation is essential for the optimisation of blood volume status and titration of vasopressor support to minimise circulatory instability and reduce perioperative risk. Discrepancies in arterial blood pressure measurements at different measurement sites have been demonstrated in vasodilated states during cardiac surgery. A small number of published studies in OLTx have shown mixed results. This has important implications for anaesthetic practice, as measured arterial blood pressure is a primary determinant of fluid and vasopressor administration. We compared arterial blood pressure measurements in the radial and femoral arteries during OLTx to determine whether significant discrepancies between them exist, and whether arterial blood pressure measurements at the two sites can be used interchangeably.

METHODS: Twenty-five patients were enrolled. Radial and femoral arteries were cannulated with a standardised arterial line kit. Systolic arterial pressure (SAP), diastolic arterial pressure (DAP), mean arterial pressure (MAP) and pulse pressure (PP) were measured at four time points. For each patient, an overall difference in each blood pressure parameter was calculated by averaging across the four time points. Agreement between arterial sites was assessed by the method described by Bland and Altman. Correlation was assessed by Pearson’s correlation coefficient.

RESULTS: Overall radial to femoral arterial pressure differences are expressed as mean difference, standard deviation and percentage error.

SBP: -14.9mmHg, 24.8mmHg, 47.0%;  DBP: -2.0mmHg, 5.2mmHg, 20.8%
MAP: -4.8mmHg, 4.5mmHg, 13.1%;   PP: -13.5mmHg, 25.5mmHg, 91.8%

CONCLUSIONS: In patients undergoing liver transplantation, SAP and PP values from the radial artery neither agree nor correlate with femoral artery values. Insertion sites cannot be used interchangeably for these measurements. For MAP and DAP, radial and femoral sites can be used interchangeably. The observed difference in central and peripheral arterial pressures has implications for the accuracy of devices that derive haemodynamic parameters from pulse waveform analysis.
Assessment of Liver Remnant using ICG Clearance Intraoperatively during Vascular Exclusion: Early experience with the ALIIVE technique.

L Lau, C Christophi, M Nikfarjam, G Starkey, M Goodwin, L Weinberg, L Ho, V Muralidharan

BACKGROUND: The most significant risk following major hepatectomy is post-operative liver insufficiency. Current preoperative assessment of the future liver remnant (FLR) relies upon assumptions which may not be valid in the setting of advanced resection strategies. Post-operative indocyanine green (ICG) clearance has recently been shown to be the earliest and most accurate marker for liver insufficiency after hepatectomy. This report describes and assesses the feasibility of the ALIIVE technique, which replicates the post-hepatectomy state intraoperatively, prior to vascular division, for functional FLR evaluation with ICG clearance.

METHODS: Ten patients undergoing planned major liver resection (hemihepatectomy or greater) were recruited. Routine preoperative assessment included CT and standardized volumetry. ICG clearance was measured noninvasively using a finger spectrophotometer at various timepoints including following parenchymal transection during in-flow and out-flow occlusion before vascular division, the ALIIVE assessment. Outcome parameters were post-hepatectomy liver failure and post-operative mortality.

RESULTS: There was one mortality and three cases of post-hepatectomy liver failure. The patient who died had the lowest ALIIVE ICG clearance (7.1%/min vs 14.4 +/- 4.9). Routine preoperative CT and standardized volumetry did not predict outcome.

CONCLUSIONS: The novel ALIIVE technique is feasible and uniquely assesses actual future liver remnant function before the point of no return during major hepatectomy. This technique may be useful as a check-step to offer a margin of safety to prevent post-hepatectomy liver failure and death.
Zinc protects the kidney against warm ischaemia reperfusion injury in a pre-clinical large animal model

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BACKGROUND: Surgery offers the only definitive cure for renal cancer. Partial nephrectomy (PN) is the gold standard surgical approach for many of these cancers. During these surgeries it is necessary to interrupt the renal blood supply in order to facilitate safe tumour resection, and avoid excessive blood loss. This interruption to renal blood supply, achieved by clamping the renal artery, results in kidney damage depending on the “ischaemia time”. To date there has been no definitive method of preventing or reducing this renal damage in humans. An agent or method that could facilitate protection against ischaemia of this nature would have major implications for long term outcomes of patients undergoing PN, as well as kidney transplant. Our laboratory has previously shown that zinc protects against ischaemia-reperfusion (I-R) injury in a rat model. Rodents are not always reliable as a preclinical model for human disease however, and therefore in this study the renoprotective effect of zinc preconditioning was investigated in a large animal (ovine) model of renal I-R injury.

METHODS: Merino ewes were subjected to 60 minutes of occlusion of the left renal artery to induce I-R injury, followed by right nephrectomy. Sheep were preconditioned with intravenous infusion of either zinc chloride (ZnCl2) or saline at 24hr and 4hr prior to occlusion. Blood samples were collected daily following surgery for seven days. Serum urea and creatinine concentrations were used as markers of renal function.

RESULTS: ZnCl2 treatment was well tolerated with no obvious adverse effects. The sheep treated with ZnCl2 (0.5mg/kg) had a marked reduction in renal injury; evidenced by smaller rise in serum creatinine and urea levels after surgery compared with the control sheep. The mean serum creatinine on day 3 for ZnCl2 treated sheep was 154±9μmol/L as compared to 666±149μmol/L in saline treated sheep (Fig.1). The mean serum urea on day 3 for ZnCl2 treated sheep was only 6.4±1.3 mmol/L as compared to 34.0±9.6 mmol/L in saline treated sheep.

CONCLUSIONS: We have demonstrated that zinc preconditioning protects against warm renal ischaemia in a pre-human (ovine) model. This result has lead to collaboration with a commercial partner, Phebra, to perform phase 1 and 2 human trials of zinc preconditioning in patients undergoing partial nephrectomy.
Modelled perspective of laparoscopic lens fogging and its preventative measures in standard and robotic laparoscopes.

Manning T, Papa N, McGrath S, Khan M, Campbell N, Perera M, Lawrentschuk N

BACKGROUND: Laparoscopic lens fogging (LLF) during laparoscopic and robotic procedures hampers vision, impedes operative efficiency and increases risk of inadvertent patient injury. Attempts to reduce intra-operative LLF have led to the development of various anti-fogging fluids, warming devices and intra-operative techniques. Despite this growing body of potential solutions, comparative effectiveness has been poorly addressed in current literature. We aimed to construct a model peritoneum to simulate LLF and to compare the efficacy of various anti-fogging techniques for standard and robotic laparoscopes.

METHODS: A model peritoneum (figure 1) was created using a plastic 8 litre container filled with water. Intraperitoneal space was formed using a suction bag with multiple ports and was suspended within the water. The model was then incompletely filled with heated sausages to simulate intraperitoneal viscera. The humidity and temperature was recorded and regulated at an ambient temperature of 40.1 °C and humidity of 87-88%. Various anti-fogging products were assessed including FredTM, ResoclearTM, chlorhexidine, betadine and heated water. These products were used on either a laparoscope at room temperature or applied to a scope after use with a disposable Matrix scope warmer. Visual acuity was evaluated by the same investigator for all testing and rated according to a standardized scale created by the investigators. Fogging of the laparoscope was assessed for each product 30 times and a mean vision rating was recorded.

RESULTS: FredTM was better than all other methods and was improved further with the addition of the scope warmer. Chlorhexidine, ResoclearTM and the Scope warmer were equivalent and were superior to warming the scope using warmed saline. The environment that affected standard laparoscopes did not incite fogging in the robotic scope and thus it was superior to the standard laparoscope in our model.

CONCLUSIONS: In standard laparoscopes, the most superior preventative measure was Fred utilised on a prewarmed scope. Despite improvements in LLF with other products Fred was superior to all other techniques. The robotic laparoscope performed superiorly regarding LLF compared to standard laparoscope.
“A number of years ago, when I was a freshly-appointed instructor, I met, for the first time, a certain eminent historian of science. At the time I could only regard him with tolerant condescension.

I was sorry of the man who, it seemed to me, was forced to hover about the edges of science. He was compelled to shiver endlessly in the outskirts, getting only feeble warmth from the distant sun of science-in-progress; while I, just beginning my research, was bathed in the heady liquid heat up at the very center of the glow.

In a lifetime of being wrong at many a point, I was never more wrong. It was I, not he, who was wandering in the periphery. It was he, not I, who lived in the blaze.

I had fallen victim to the fallacy of the ‘growing edge;’ the belief that only the very frontier of scientific advance counted; that everything that had been left behind by that advance was faded and dead.

But is that true? Because a tree in spring buds and comes greenly into leaf, are those leaves therefore the tree? If the newborn twigs and their leaves were all that existed, they would form a vague halo of green suspended in mid-air, but surely that is not the tree. The leaves, by themselves, are no more than trivial fluttering decoration. It is the trunk and limbs that give the tree its grandeur and the leaves themselves their meaning.

There is not a discovery in science, however revolutionary, however sparkling with insight, that does not arise out of what went before. ‘If I have seen further than other men,’ said Isaac Newton, ‘it is because I have stood on the shoulders of giants.’

- Isaac Asimov,
Austin Research Prize 2007
Participants & Joint Winners
Laurence Weinberg & Peter Wong

2013 Participants & Adjudicators

2015 Winner Dermot O’Kane

2003 Winner Mehrdad Nikfarjam

Austin Research Prize 2009 Participants
Austin Research Prize 2011
Participants

Austin Research Prize 2008
Participants & Joint Winners
Russell Hodgson & Julian Liew.

2003 Winner
Mehrdad Nikfarjam

Austin Research Prize 2014
Winner Lawrence Lau, participants & Adjudicators

Austin Research Prize 2011
Participants
Medicine is a science of uncertainty and an art of probability.

- Sir William Osler

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