# Abstracts of Papers

Australian and New Zealand College of Anaesthetists Annual Scientific Meeting, 7 to 11 May, 2018, Sydney Convention and Exhibition Centre, Sydney, New South Wales

These abstracts are published as supplied and have not been subjected to editorial review, correction or styling. ANZCA is responsible for obtaining author permissions for publication and ethics considerations.

**Improving cephazolin re-dosing practices**

*Dr Luke Anderson (John Hunter Hospital, University of Newcastle, Newcastle, NSW), Dr Robert Marr (Monash Medical Centre, Melbourne, Victoria)*

**Introduction:** Surgical site infection (SSI) is a common, preventable cause of post-operative morbidity. Intraoperative re-dosing of cephazolin is recommended for surgical procedures extending beyond two half-lives of the drug, to decrease the risk of SSI. Failure to re-dose is an independent risk factor for the development of SSI. Despite re-dosing recommendations, compliance is low, with rates of 20-27% reported in the literature. Reminder based interventions have improved re-dosing rates from 20% to 58%. Intraoperative decision support systems have led to re-dosing rates of 84-98%. The aim of this project is to improve intraoperative cephazolin re-dosing to comply with guidelines 60-80% of the time over a 6 month period.

**Method:** A retrospective audit of anaesthetic records was conducted to obtain a baseline rate of re-dosing. This was followed by an education-based intervention, consisting of guideline dissemination and feedback of audit results. Cases performed at John Hunter Hospital from January 1st 2017 to January 31st 2017 were audited to produce baseline data. The educational intervention occurred in July 2017, and cases from 1st August 2017 to 31st August 2017 were audited to observe the effect of the intervention. Cases were included if an indication for cephazolin prophylaxis was present, the patient was 18 years of age or older, and underwent a procedure of greater than 3 hours' duration. Cases were excluded if therapeutic antibiotics were used, cephazolin was not the recommended agent, the patient had a major beta-lactam allergy or cardio-pulmonary bypass was used (due to prolongation of cephazolin half-life). Sample size was calculated to detect a significant change in re-dosing practice for subsequent audit cycles. A sample size of 25 was calculated to give a power of 0.8 and a two-sided alpha of 0.05. This sample size was doubled to 50, to increase study power. Pearson Chi-square ($\chi 2$) test was performed to determine any statistically significant difference between groups before and after the intervention.

**Results:** 50 cases were included in the initial audit. Intra-operative re-dosing rates were low, with overall compliance of 34% in the January period. The target sample size for the post-intervention period was unable to be reached due to a lack of cases greater than 3 hours' over the audited period. 42 cases were included in the post-intervention analysis. 36% of patients received repeat intra-operative dosing when indicated in the post-intervention group. There was no significant improvement in re-dosing rates post intervention [Percentage difference 2%, Chi-squared = 0.04 (95% CI-16.83 to 21.03, p=0.84)].

**Conclusion:** There was no significant improvement in intra-operative cephazolin re-dosing practices with an educational intervention based on audit-feedback cycling and guideline dissemination. This is consistent with the low efficacy of educational interventions seen in the literature. Reminder based interventions have been shown to have the greatest effect in improving re-dosing rates. This will form the next intervention as a part of continued plan-do-study-act (PDSA) cycling. Due to the absence of electronic intraoperative prescribing at our institution, a smartphone app will be developed to deliver reminders to clinicians responsible for intra-operative re-dosing.

**Improving the Fidelity of Cardiopulmonary Exercise Testing (CPET) for Preoperative Risk Assessment in Major Non-Cardiac Surgery**

*Dr Jarrod Basto (Peter MacCallum Cancer Centre, University of Melbourne, Melbourne, Victoria), Dr Hilmy Ismail (Peter MacCallum Cancer Centre, University of Melbourne), Dr Michael Li (Peter MacCallum Cancer Centre, University of Melbourne), Dr Vladimir Bolshinsky (Peter MacCallum Cancer Centre, University of Melbourne), Ms Jamie Waterland (Peter MacCallum Cancer Centre, University of Melbourne), Dr Alan Herschtal (Peter MacCallum Cancer Centre, University of Melbourne), Dr Kate Burbury (Peter MacCallum Cancer Centre, University of Melbourne), Professor Alexander Heriot (Peter MacCallum Cancer Centre, University of Melbourne), Professor Bernhard Riedel (Peter MacCallum Cancer Centre, University of Melbourne)*

**Introduction:** The traditional paradigm of preoperative CPET assessment, established three decades ago, places oxygen consumption (VO2; measured at anaerobic threshold [AT] and peak exercise [pVO2]) at the centre of preoperative risk prediction. VO2, is traditionally dichotomised (AT <10-11 mL.kg.min-1 and pVO2 <16 mL.kg.min-1) for ease of surgical risk prediction [1]. Despite an increasingly elderly population with higher comorbid disease burden, surgical and anaesthetic practice continues to evolve and undertake more complex surgery within the framework of sub-specialised care. Within this context, these dichotomised

VO2 values may lack diagnostic fidelity to risk-evaluate and guide patient optimisation prior to major surgery. In non-surgical populations, cardiorespiratory disease associates with impaired CO2 output [2] and incompetent chronotropic response associates with increased mortality. As such, we evaluated the utility of: (i) CPET-derived CO2 kinetics (PeCO2; PETCO2; Ve/VCO2) and chronotropic response as risk predictors for adverse post-operative outcomes; (ii) standard blood tests to improve CPET risk modelling.

**Methods:** We retrospectively analysed 84 patients undergoing CPET prior to major colorectal surgery. Parameters measured: Demographic data, Charlson Comorbidity Index, conventional preop blood tests (haemoglobin, WCC, neutrophils, albumin) and CPET-derived VO2 (AT, pVO2), VCO2 (VE/VCO2, PETCO2, Pe'CO2), and heart rate response (HRR) parameters. Postoperative outcomes assessed: (i) Morbidity using Comprehensive Complication Index (CCI, which considers all Clavien-Dindo graded complications) and (ii) 1-year minimum Overall Survival (OS). Statistical methods used univariable Cox proportional hazards and linear regression analysis.

**Results:** Patients (mean±SD) were 62 (±12) years old, 55% male, 27.8 (±5.6) kg.m-2 BMI and Comprehensive Complication Index (30±19). Univariable modelling showed no association between traditional VO2 kinetic parameters and OS (AT; HR=0.89 [0.72-1.10]; p=0.25); pVO2; HR=0.91 [0.80-1.04]; p=0.15). Peak VO2 corrected for body surface area (pVO2/BSA >710mL.min-1.m-2) associated with reduced postoperative morbidity (p=0.019) and improved OS (HR=0.13 [0.03-0.56]; p=0.001). VCO2 kinetics at AT (PETCO2; HR=0.89 [0.82-0.96]; p=0.004 and PeCO2; HR=0.86 [0.78-0.95]; p=0.003) and HR response to peak exercise (HR=0.10 [0.02-0.48]; p=0.02) were robust predictors of OS. Low preoperative haemoglobin (p=0.001) and elevated neutrophil levels (p=0.01) associated with reduced OS and morbidity, respectively. Using bivariate analysis, predictive accuracy for postoperative morbidity and for OS improved significantly (p<0.01) if pVO2/BSA considered chronotropic response to peak exercise or preoperative neutrophil count and PeCO2 at AT, neutrophil count for predictive modelling of postop morbidity and OS, respectively.

**Conclusions:** Traditional CPET-derived VO2 parameters may be outdated in our evolving patient population and subspecialised surgical care. Peak VO2 indexed to BSA may more accurately inform risk. The kinetics of VCO2 and HR combined with routine blood tests may further refine risk predictive models to assist in identifying at-risk patients and those with modifiable cardiorespiratory disease amenable to preoperative optimisation.

**References:** 1. Bolshinsky V, et al., Diseases of the Colon & Rectum, 61: 124-138, 2018. 2. Hansen JE, et al., Chest, 132: 977-983, 2007

## Time-driven activity based costing to model the utility of parallel induction room redesign in high turnover surgical lists

*Dr Jarrod Basto (Peter MacCallum Cancer Centre, University of Melbourne, Melbourne, Victoria), Dr Rani Chahal (Peter MacCallum Cancer Centre, University of Melbourne), Professor Bernhard Riedel (Peter MacCallum Cancer Centre, University of Melbourne)*

**Introduction:** Time-Driven Activity Based Costing (TDABC) is an important tool in quantifying complex costs within healthcare and has been used to project costs of altered staff ratios and workflow modifications prior to implementing process improvements [1]. Under a parallel induction design, additional personnel are used to optimise theatre efficiency by using an induction room to perform anaesthesia related procedures and induction in subsequent patients but prior to completing the preceding surgical case. In doing so, the non-operative time between cases is reduced and this may potentially improve case throughput [2]. As such, parallel induction exists in contrast to a traditional serial induction design where patients are induced in theatre sequentially by the same anaesthetic team. Within this context, we used TDABC to model personnel costs and time savings for a high turnover operating list of breast and melanoma procedures under a parallel induction design following an observational trial within theatre.

**Methods:** We instituted an observational trial of serial and parallel workflow in theatre among 19 surgical lists (10 parallel; 9 serial). Non-operative time was defined from the final closure of skin until the beginning of surgical preparation. Statistical analysis of non-operative time differences was performed by two-tailed t-tests comparing mean differences of log-transformed data. Using observed process times, we constructed a 6-case model of our all-day operating list integrating non-operative time under either a serial or parallel induction design. Using TDABC we subsequently assigned personnel costs to these models based on differences in personnel input, including an additional 20 minutes per turnover of anaesthetic nursing input. We also evaluated the mean revenue generated from analysed cases using the weighted inlier equivalent separation (WIES) of single day admissions to determine potential added value from scheduling an additional case.

**Results:** Our observational trial in theatre demonstrated an 11-minute reduction in median non-operative time (p <0.0001) under a parallel induction design (24 minutes; IQR 18-35) compared to a serial induction design (35 minutes, IQR 29-44). Modelling this improvement using TDABC, our high turnover list of 6 cases projected a reduced total operating list time of 9.8% (55 minutes) under a parallel induction design, at an increase of 1.8% to theatre-designated personnel costs for the day. This redesign would allow for an additional typical short duration case, e.g. Wide

Local Excision, to be performed, with a return on investment averaging $2,818 and a projected time requirement of 58 minutes (operative and non-operative time included).
**Conclusions:** A parallel induction design significantly reduced non-operative time within our trial in theatre. Projecting this improvement within our high turnover operating list demonstrated a 55-minute saving in total operating list time, expected to come at minimal increase in personnel costs as assessed by TDABC. An additional case short duration case, e.g. Wide Local Excision, is likely feasible under this model and represents value for our all-day, high turnover operating lists.
**References:** 1. French KE, et al., Healthcare, 4: 173-180, 2015. 2. Sandberg WS, et al., Anesthesiology, 103: 406-418, 2005.

**Costoclavicular vs paracoracoid approach to infraclavicular brachial plexus block: a randomized controlled trial**

*Dr Brigid Brown (Western University, London, Ontario, Canada), Dr Pauline Magsaysay (Western University), Dr Janice Yu (Western University), Dr Yves Bureau (Western University), Dr Shalini Dhir (Western University)*

**Background:** Infraclavicular brachial plexus block is a regional anesthesia technique used for upper limb surgeries below the humerus. The traditional method of performing an infraclavicular block is using the paracoracoid approach(PC), in which the ultrasound transducer is placed near the coracoid process in the sagittal plane and the cords of the brachial plexus are visualized around the axillary artery. However, in this view, the cords are separated from one another, there is significant variation in the position of the individual cords relative to the axillary artery, and all 3 cords are rarely visualized in a single ultrasound window. Recently, a new approach to the infraclavicular block has been described in the literature, in which the ultrasound transducer is placed parallel to the clavicle and the block needle is inserted inplane from a lateral direction into the costoclavicular (CC) space. Anatomic studies have described how at this position, the cords are clustered together around the lateral edge of the artery at a more superficial level compared with the PC. The cords and needle may therefore be easier to visualize with less needle manipulation to perform the block. Potential benefits of this approach may include a faster onset of block and lower incidence of vascular puncture. When the patient's arm is abducted, the plexus is moved further away from the pleura adding a level of safety. These studies all conclude that there is a need for more research into this approach evaluating safety and efficacy. We have undertaken a randomized controlled trial evaluating the feasibility of the CC infraclavicular block.
**Methods:** After ethics approval was obtained, 70 adult patients undergoing ambulatory upper limb surgery were enrolled and randomized by a computer-program randomization to undergo either a paracoracoid or costoclavicular inflaclavicular block. Allocation concealment occurred using sealed opaque envelopes, which were opened after enrolment. Exclusion criteria included inability to give informed consent, allergy to local anesthetics, narcotic abuse, peripheral neuropathy, coagulopathy, BMI ?35, and pregnancy or breastfeeding. Both groups received the same volume and concentration of 35 mL of 0.5% ropivacaine injected under ultrasound guidance with nerve stimulation. Primary outcome was block onset time and block success at 30 minutes. Other secondary measured outcomes included performance times, complications during block insertion (paresthesia, vascular puncture, pleural puncture), patient satisfaction, and postoperative complications. Patients were followed up by phone call at postoperative days one and seven.
**Results:** Primary outcomes- Overall there was no statistically significant difference between sensory block onset time between groups. Similarly, block success at 30 minutes was the same between both groups, with similar conversion to general anesthetic and local anesthetic supplementation. Secondary outcomes- No significant difference in total procedure time – paracoracoid- 162 seconds, costoclavicular 188 seconds. Complications during the block – no difference between the groups. Postoperative complications were also similar between the groups as was patient satisfaction scores at day 1 and day 7 postoperative.
**Conclusion:** In conclusion we have found in this non-inferiority study that the novel costoclavicular approach of infraclavicular brachial plexus block resulted in similar block onset times, block success, and complication rates compared with the traditional paracoracoid approach.

**Effect of adding clonidine to ropivacaine in transversus abdominis plane blocks: a randomized pharmacokinetic study**

*Dr Jennifer Crawford (Royal Prince Alfred Hospital, University of Sydney, Sydney, NSW), A/Prof John Loadsman (Royal Prince Alfred Hospital, University of Sydney), Mr Kenny Yang (Royal Prince Alfred Hospital, University of Sydney), Prof Peter Kam (Royal Prince Alfred Hospital, University of Sydney)*

**Introduction:** Clonidine has been used successfully to prolong the duration of action of local anaesthetics in peripheral nerve blocks, but its mechanism of action in this setting remains unclear. Some previous studies have supported that clonidine acts via a pharmacodynamic mechanism (Kroin et al. 2004) but other studies suggest that clonidine exerts a vasoconstrictor effect (Kopacz & Bernards 2001) similar to adrenaline, limiting the washout of local anaesthetic from its site of deposition. Therefore, we measured plasma ropivacaine concentrations after patients received transversus abdominis plane (TAP) blocks with and without clonidine.
**Methods:** Eighty women undergoing laparoscopic gynaecological surgery were randomly assigned to receive

1 of 4 TAP block solutions: 3 mg/kg of 0.2% ropivacaine (control), ropivacaine with clonidine 2 mcg/kg (clonidine), ropivacaine with 1:400,000 adrenaline (adrenaline), or ropivacaine and a subcutaneous injection of clonidine 2 mcg/kg (SC clonidine). Total venous plasma ropivacaine concentrations were measured up to six hours after the block using gas chromatograph mass spectrometry.
**Results:** There were no significant differences in plasma ropivacaine concentrations between the control group and the clonidine group at any time point in the study, nor were there differences in the mean maximum ropivacaine concentration (Cmax) or time to maximum concentration (Tmax). The SC clonidine group also did not differ from the controls. Plasma ropivacaine concentrations in the adrenaline group were significantly lower than the controls from 10 to 90 minutes ($p<0.003$), and the Cmax was less than that of the control group (1.36 mcg/ml vs 1.99 mcg/ml, $p<0.001$) with a longer Tmax (103.5 min vs 51.0 min, $p=0.001$).
**Conclusions:** Clonidine at a concentration of 1.35 mcg/ml added to ropivacaine in TAP blocks did not produce vasoconstriction as evidenced by a lack of reduction in plasma ropivacaine concentrations, lack of reduction in Cmax, and lack of prolongation of Tmax. Adrenaline, however, did cause vasoconstriction, consistent with previous studies. The 2 mcg/kg dose of clonidine used in this study was based on other previous studies but because 0.2% ropivacaine and high volume TAP blocks were used in this study, the final clonidine concentration may have been too low to cause vasoconstriction. Previous studies that have demonstrated a vasoconstrictor effect of clonidine have used clonidine concentrations of 10 mcg/ml or greater (Kopacz & Bernards 2001). Further studies should evaluate whether a vasoconstrictor effect is present when clonidine is used at higher concentrations and investigate the role of other possible pharmacodynamic mechanisms of action.
**References:** Kopacz, D.J. & Bernards, C.M., 2001. Effect of clonidine on lidocaine clearance in vivo: a microdialysis study in humans. Anesthesiology, 95(6), pp.1371–1376.
Kroin, J.S. et al., 2004. Clonidine prolongation of lidocaine analgesia after sciatic nerve block in rats Is mediated via the hyperpolarization-activated cation current, not by alpha-adrenoreceptors. Anesthesiology, 101(2), pp.488–494.

### Sevoflurane in the penthrox inhaler

*Dr Timothy Makar (Austin Hospital, Melbourne, Victoria), Dr Ned Douglas, Professor Philip Peyton (Austin Hospital, Melbourne University)*
**Introduction:** The Penthrox inhaler was designed to deliver Methoxyflurane for analgesia and procedural sedation in ambulance and military settings1. Its performance has only been assessed for Methoxyflurane, which has not been used as an anaesthetic for many years in mainstream anaesthesia. Sevoflurane has many advantages over methoxyflurane for procedural sedation. First principles calculations suggest the Penthrox inhaler should deliver useful concentrations of sevoflurane for this purpose. The study aimed to evaluate the performance of the Penthrox inhaler delivering sevoflurane, as a precursor to clinical trials.
**Methods:** An apparatus to simulate spontaneous ventilation was established. A Penthrox inhaler was filled with sevoflurane liquid and connected to the apparatus. A gas analyser (Datex Corp) sampled concentrations of sevoflurane. Two tidal volumes were tested (500ml and 1000ml), and other variables explored were occlusion of the dilutor hole on the inhaler and hand-warming the inhaler during delivery and the volume of sevoflurane initially instilled into the inhaler. The baseline trial involved a ventilation pattern of 1000ml x 14bpm, dilutor hole covered, unwarmed and 6mls of sevoflurane. Comparisons were made with all of the non-test variables held at these settings. Gas concentrations were recorded and displayed graphically. The difference between peak and plateau inspired concentrations and the time until depletion to an inspired concentration less than 0.2% were compared descriptively.
**Results:** The pattern of inspired sevoflurane concentration was predictable, with an initial high peak, plateau phase and then a linear decline until exhaustion. A a closed dilutor hole delivered a higher plateau sevoflurane concentration than open (1.6% vs 0.6%) but depleted the inhaler faster (6min vs 13min). Warming the inhaler resulted in higher plateau sevoflurane concentrations (2.1% vs 1.6%) but the inhaler was depleted faster (5min vs 6min). A ventilation pattern of 500ml x 14bpm compared to 1000ml x 14bpm resulted in a higher plateau sevoflurane concentration (2.0% vs 1.6%) and slower depletion from the inhaler (12min vs 6min). An instillation volume of 12mls compared to 6mls of sevoflurane lead to higher peak concentrations (3.1% vs 2.2%), higher plateau concentrations (1.8% vs 1.6%) and a longer time to depletion from the inhaler (10min vs 6min).
**Conclusions:** The Penthrox inhaler delivers clinically useful concentrations of sevoflurane in a bench model in most trials. The delivery profile follows a predictable pattern of high and rapidly declining concentration, followed by a plateau at a clinically useful concentration, followed by a linear decline to zero. The duration of useful plateau delivery is variable according to the volume of agent instilled in the agent and can be customised to the expected duration of procedure. Further clinical trials are required to investigate if this apparatus can produce reliable anaesthesia or sedation in humans, before consideration of clinical use.
**References:** 1. Dayan AD. Analgesic use of inhaled methoxyflurane. Hum Exp Toxicol. 2015 Feb 19;35(1):91–100

### Skin-to-epidural space distance in pregnancy: stronger association with body mass index than abdominal subcutaneous fat thickness

*A/Prof Victoria Eley (The Royal Brisbane and Women's Hospital, The University of Queensland, Brisbane,*

*Queensland), Dr Adrian Chin (The Royal Brisbane and Women's Hospital, The University of Queensland), Dr Renuka Sekar (The Royal Brisbane and Women's Hospital, The University of Queensland), A/Prof Tim Donovan (The Royal Brisbane and Women's Hospital, The University of Queensland), Dr Amy Krepska (The Royal Brisbane and Women's Hospital, The University of Queensland), Dr Sheridan Bell (The Royal Brisbane and Women's Hospital, The University of Queensland), Dr Mitchell Lawrence (The Royal Brisbane and Women's Hospital, The University of Queensland), Dr Shaun McGrath (The Royal Brisbane and Women's Hospital, The University of Queensland), Mr Lachlan Webb (Queensland Institute of Medical Research Berghofer), Dr Alex Robinson (The Royal Brisbane and Women's Hospital, The University of Queensland)*

**Introduction:** Body mass index (BMI) is used to classify obesity but does not account for the distribution of adipose tissue. Measurement of abdominal subcutaneous fat thickness (SCFT) by ultrasound scan (USS) is a surrogate measure for central obesity1 and predicts adverse pregnancy outcomes.2 This study determined if the abdominal SCFT measured at the routine 18-22 week USS was correlated with skin-to-epidural space distance during labour epidural or caesarean section (CS) and compared this with BMI.

**Methods:** We analysed a sub-set of participants from a single-centre, prospective cohort study that assessed the relationship between SCFT and maternity outcomes at a tertiary hospital with approximately 4200 annual deliveries (HREC/14/QRBW/492). An opt-out approach was used. We identified those who had received an epidural (for labour analgesia) or combined spinal-epidural (for CS) and obtained demographic information, mode of delivery and skin-to-epidural space distance from the electronic patient record. This was a sample of convenience, including only singleton pregnancies. Standard cervix-placenta images were obtained during the routine 18-22 week USS. Three abdominal SCFT measurements were subsequently obtained by one trained operator and the average calculated. Pearson's correlation coefficient was calculated to describe the relationship between SCFT and skin-to-epidural space distance. This was repeated for the booking BMI and skin-to-epidural space distance, to determine which relationship was stronger. Linear regression was used to test for strength of association and adjusted R2 values calculated to determine if skin-to-epidural space distance was more strongly correlated with SCFT or BMI.

**Results:** Data was obtained for 493 women delivering between February 2015 and June 2016 (46% of the total sample of 1071). The mean (SD) age was 30.5 (5.5) years; 241 (48.9%) were nulliparous, 348 (70.6%) Caucasian and 458 (92.9%) delivered at a gestation >37 weeks. The mode of delivery was as follows: vaginal delivery 242 (49.1%), emergency CS 137 (27.8%), elective CS 114 (23.1%). The median (IQR) booking weight was 67.5 (60.0-80.0) kg and BMI was 25.0 (21.9-29.2) kg/m2; 107 (21.7%) had a BMI ≥ 30 kg/m2 and the BMI range was 17.3-56.7 kg/m2. The median (IQR) SCFT was 16.2 (13.0-20.9) mm, range 7.0-73.4 mm. The median (IQR) skin-to-epidural space distance was 5.0 (4.5-6.0) cm, range 3.0-10.0 cm. There was a significant correlation between SCFT and skin-to-epidural space distance, $r=0.526$, $p<0.001$ and also between BMI and skin-to-epidural space distance, $r=0.682$, $p<0.001$. The adjusted R2 value (adjusted for age, parity, premature delivery, mode of delivery) for SCFT was 0.280 and for BMI was 0.464.

**Conclusions:** This novel study demonstrated a moderately strong correlation between both SCFT and BMI, with skin-to-epidural space distance. BMI showed the stronger association, explaining 46% of the variability in skin-to-epidural space distance. This study will inform further work on the relationship between SCFT, BMI and locating the epidural space.

**References:** 1. Fox CS, Massaro JM, Hoffmann U, et al. Abdominal Visceral and Subcutaneous Adipose Tissue Compartments: Association With Metabolic Risk Factors in the Framingham Heart Study. Circulation 2007;116:39-48. 2. Kennedy NJ, Peek MJ, Quinton AE, et al. Maternal abdominal subcutaneous fat thickness as a predictor for adverse pregnancy outcome: a longitudinal cohort study. BJOG 2016;123:225-32.

**Pre-operative neurocognitive impairment and delirium in the post-anaesthesia care unit: an observational study**

*Dr Amy Gaskell (Waikato Hospital, University of Auckland, Auckland, New Zealand), Ms Ashleigh Brough (University of Auckland), Ms Abbe Meads (University of Auckland), Prof Jamie Sleigh (Waikato Hospital, University of Auckland)*

**Introduction:** With the aging population, increasing numbers of patients with neurocognitive impairment will undergo anaesthesia and surgery; these patients are at higher risk of experiencing postoperative delirium. Current guidelines for the prevention of postoperative delirium advise routine preoperative cognitive screening to identify patients at high risk[1]. Delirium in the post-anaesthesia care unit (PACU) has been linked to further episodes of postoperative delirium and other adverse outcomes[2], however the optimal method of measuring early neurocognitive recovery following anaesthesia is not clear. The 3-Minute Diagnostic Assessment for Delirium using the Confusion Assessment Method (3D-CAM) is a tool validated for the diagnosis of delirium, however it has not been reported in the PACU setting. Our aims were to determine the baseline cognitive status of our surgical population, estimate the incidence of PACU delirium, and to appraise the feasibility of preoperative cognitive screening and 3D-CAM testing in PACU as research tools. This is a pilot study in preparation for a planned randomised controlled trial of two intraoperative strategies to improve early neurocognitive recovery following anaesthesia in older patients.

**Methods:** We recruited patients aged 60 years and older undergoing elective surgery at Waikato Hospital. The study had ethics and local authority approvals and informed consent was obtained from participants. The Montreal Cognitive Assessment (MOCA) was performed preoperatively and 3D-CAM assessments were performed in the post-anaesthesia care unit. Logistic regression was performed to test the association between preoperative MOCA scores and performance in the 3D-CAM in PACU.
**Results:** 112 participants underwent preoperative cognitive evaluation. The median (IQR) MOCA score was 24 (22-26); 79 (71%) participants scored below the normal range (MOCA score over 26) and 11 (10%) participants had a score of 17 or lower. The MOCA took a median time (IQR) of 12 (10-15) minutes to complete. Of the 89 participants who underwent 3D-CAM evaluations in PACU, 39 (43%) met 3D-CAM criteria for delirium and 74 (83%) had evidence of inattention. 3D-CAM testing took a median (IQR) of 3 (2-4) minutes. Preoperative MOCA scores were associated with post-operative delirium (unadjusted OR 0.88[0.79-0.99] per MOCA point, p=0.028).
**Conclusion:** Mild-moderate neurocognitive impairment is common in older patients undergoing surgery and is associated with PACU delirium. The 3D-CAM appears to be a feasible tool for use in the post-anaesthesia care unit.
**References:** 1. Aldecoa C, Bettelli G, Bilotta F, et al. European Society of Anaesthesiology evidence-based and consensus-based guideline on postoperative delirium. European journal of anaesthesiology 2017;34(4):192-214. 2. Hernandez BA, Lindroth H, Rowley P, et al. Post-anaesthesia care unit delirium: incidence, risk factors and associated adverse outcomes. British journal of anaesthesia 2017;119(2):288-90.

**Simulation to assess latent safety threats and operational preparedness within anaesthetic locations in a new children's hospital**

*Dr Nathalie Gomes (Monash Health, Monash Simulation, Melbourne, Victoria), Dr Noel Roberts (Monash Health, Monash Simulation)*

**Introduction:** Prior to the opening of Monash Children's Hospital, the Monash Anaesthesia, Simulation and Paediatric Surgical Departments planned and implemented in-situ simulations to detect and rectify latent safety threats (LSTs) and assess operational preparedness of anaesthetic and associated departments. LSTs have been defined as system-based threats to patient safety that can materialize at any time and are previously unrecognized1. The simulations also provided an opportunity for staff to become more familiar with the new environment, and to practice procedural guidelines within an interprofessional team. Simulation has been shown to play a meaningful role in systems testing and staff orientation to new departments2.
**Methods:** Scenarios appropriate for interprofessional involvement were designed around routine cases, patient transfers, and management of crises. Clinical environments included operating theatres, NICU, Diagnostic Imaging (DI), and the Children's Cancer Centre (CCC).
Participants were employees from nursing, medicine and administration, who were soon to work in the new facility. Prebriefing sessions included orientation to the environment and simulation equipment. Following each scenario, formal debriefing took place guided by experienced facilitators. Discussion involved analysis of and reflection on performance. Systematic identification of any systems issues together with suggested solutions was then sought. After the session, participants were asked to complete an online questionnaire to specify any other potential improvements, and to explore reflection and feelings of improved workforce preparedness. The primary outcome measure was the number and type of LSTs identified. The secondary outcome measures were the participants' assessment of the impact of simulation on workforce preparedness and the likelihood of communication of issues of concern in the future.
**Results:** Fourteen simulations were implemented over 4 days and over 50 LSTs were identified. Those of high priority included the failure of two line isolation systems to come back online after a system test shut down, inadequate emergency alarm volumes in each theatre, delays in accessing certain life-saving medications (eg Intralipid) due to storage site location, and equipment, staffing and ergonomic issues in NICU, DI and CCC. For each high priority issue identified, relevant leadership reviewed the proposed solutions and implemented changes. All high priority LSTs were addressed before opening the facility. 60% of participants responded to the online questionnaire. All respondents either agreed or strongly agreed that their participation in the simulations improved workforce preparedness. In addition, more than 80% agreed or strongly agreed that they were more likely to communicate issues of concern in the future as a result of the simulation testing.
**Conclusions:** In-situ simulation is an effective and practical means of identifying LSTs and operational preparedness in operating theatres and off-the-floor anaesthetic locations within new facilities. In addition, it may increase the likelihood that issues of concern are raised by staff once the facility is open.
**References:** Alfredsdottir H, Bjornsdottir K. Nursing and patient safety in the operating room. J Adv Nurs. 2008;61(1):29-37. Adler MD et al. Use of simulation to test systems and prepare staff for a new hospital transition. J Patient Saf. 2015;00:00.

**A pilot study on the perioperative ROTEM changes across obesity categories during lower limb joint replacements**

*Dr Usha Gurunathan (The Prince Charles Hospital and University of Queensland, Brisbane, Queensland), Dr Lisa*

*Stanton (The Prince Charles Hospital), Dr Rachael Weir (The Prince Charles Hospital), Dr Karen Hay (QIMR), Dr Scott Mckenzie (The Prince Charles Hospital), Mrs Brownyn Pearse (The Prince Charles Hospital)*

**Introduction:** Major orthopaedic joint surgery such as total hip and knee replacements may contribute to hypercoagulability in all patients. Obese patients undergoing joint replacements are reportedly at higher risk of thrombotic complications than non-obese because of their increased clotting tendencies and aspirin resistance (1). Coagulation changes during major joint replacements have been examined using conventional clotting tests, but most of these studies have been old and cannot be fully accepted with surgical practice changes (2). Furthermore, these studies have only looked at selective thrombotic or fibrinolytic markers and their utility detecting hypercoagulability is questionable. Functional viscoelastic point of care test such as ROTEM (rotational thromboelastometry) provides a timely, comprehensive assessment of overall clotting pathway. There is limited information about the coagulation changes during joint replacements using the rotational thromboelastometry (ROTEM) assays. This necessitates a preliminary study on the coagulation changes in patients undergoing lower limb joint replacements and the influence of obesity on those changes. Methods: Eligible patients undergoing THR and TKR were recruited for this study. Their demographic, medical, treatment history and laboratory test results were collected. There were no changes in surgical or anaesthetic management. Data on intraoperative factors including type of surgery, duration of surgery, type of anaesthesia, tranexamic acid, transfusion, intraoperative complications were recorded. These patients were followed up until discharge. Venous blood samples were taken ROTEM and Multiplate analysis at four time points, namely, beginning and end of surgery, day 1 and day 3 following surgery. Three different kinds of ROTEM assays: INTEM, EXTEM and FIBTEM were performed.

**Results:** Forty seven patients (M=20, F=27) were recruited for this pilot study. The mean age was 67 +/- 9 years (range: 45-81). Mean BMI: 34 kg/m2(SD:8), waist circumference: 110 cm (SD: 18); Hip circumference: 115 cm (SD: 16), waist to hip ratio: 0.96; Neck circumference: 41 cm (SD: 5). Significant changes ($p<0.01$) were observed with time; with EXTEM decrease in CFT, increase in alpha angle & MCF, with INTEM: Decrease in CFT, A10 & MCF, and with FIBTEM: Increase in A10, MCF & alpha angle. With an increasing BMI, both with EXTEM and INTEM, CFT decreased and MCF &A10 increased. On average MCF increased 0.18 units for each additional unit of BMI. These results were significant at the 5% level.

**Conclusion:** There was some evidence that ROTEM parameters varied with BMI across the perioperative period. Specifically, both with EXTEM and INTEM, compared to baseline preoperative values, CFT decreased and MCF &A10 increased with increasing BMI. Some of these changes have been linked to adverse outcomes such as postoperative thromboembolic complications in the literature.

**Reference:** 1. Campello E, Zabeo E, Radu CM, et al. Hypercoagulability in overweight and obese subjects who are asymptomatic for thrombotic events. Thromb Haemost. Jan 8 2015;113(1):85-96. 2. Thorson CM, Van Haren RM, Ryan ML, et al. Persistence of hypercoagulable state after resection of intra-abdominal malignancies. J Am Coll Surg. Apr 2013;216(4):580-589; discussion 589-590.

## Transnasal sphenopalatine ganglion block for post dural puncture headache – results of a local case series

*Dr Nathan Hewitt (St George Hospital, Sydney, NSW), Dr Andrea Jeyendra (St George Hospital), Dr Izreen Mohamed Iqbal (St George Hospital), Dr Leonard Kalish (The Sutherland Hospital, Sydney, NSW)*

**Introduction:** Transnasal sphenopalatine ganglion block (SPGB) has been described as a minimally invasive treatment option for post dural puncture headache (PDPH)1. It may be safer and as efficacious as the gold standard epidural blood patch (EBP)1,2. We report a case series of 16 patients receiving SPGB to manage PDPH at two sites within the South Eastern Sydney Local Health District.

**Methods:** A transnasal SPGB was performed in 16 consecutive patients as first line management of a confirmed symptomatic PDPH between June 2016 and December 2017. The SPGB was performed in patients positioned supine with a slight head down tilt. Co-phenylcaine forte spray was used to topicalise both nasal passages, before cotton tips coated in 2% viscous lignocaine were inserted along the nasal floor, to the nasopharynx bilaterally. Additional 0.5mL aliquots of 0.5% bupivacaine with adrenaline 1:200,000 were applied to the cotton tip at 5 minute intervals over 20 minutes (total 4mL). The primary outcomes assessed were pain scores (using the numerical rating scale (NRS)) and opioid requirements pre- and post intervention. Secondary outcomes assessed were time to mobilisation, need for further intervention (EBP or repeat SPGB) and time to hospital discharge.

**Results:** There were 18 SPGBs performed on 16 patients (95% female). PDPH following epidural analgesia in obstetrics accounted for 9/16 (56%), while the remaining 7/16 cases occurred post diagnostic lumbar puncture (LP). Lower pain scores were reported in 83% of patients immediately post SPGB (NRS 5.9 pre- vs. 2.4 post-SPGB; p=0.005), with complete resolution of pain in 39%. However, there was no reduction in pain score at 24 hours (NRS 5.9 vs. 4.4; p=0.30). There was no difference in the opioid requirement in the 24 hours pre- or post-SPGB (oral morphine equivalent 11mg vs. 13mg; p=0.26). The average time to mobilisation and hospital discharge was 11 and 36 hours, respectively. One obstetric patient received a primary SPGB two days following a failed EBP with good effect. Five patients required further intervention following SPGB. Two patients received a second

SPGB, which successfully treated the pain in one. In total, 4/9 obstetric patients (44%) required an EBP for failed SPGB. No patient treated with a SPGB following a LP required further intervention.

**Conclusions:** SPGB may provide symptomatic relief in mild to moderate PDPH. It may be a useful adjuvant allowing early symptom control and the optimisation of oral analgesia, or sole therapy in mild cases. All non-obstetric, and 56% of obstetric patients were discharged without requiring an EBP. The SPGB is minimally invasive, easily repeatable and provides promising results in the observed cohort. A dedicated prospective multi centre RCT examining its efficacy is warranted.

**References:** 1.Cohen S, Ramos D, Grubb W, Mellender S, Mohiuddin A, Chiricolo A. Sphenopalatine ganglion block: A safer alternative to epidural blood patch for postdural puncture headache. Reg Anesth Pain Med 2014;39:563. 2.Patel P, Cohen S, Zhao R, Mellender S, Shah S, Grubb W. Sphenopalatine ganglion block (SPGB) vs epidural blood patch (EBP) for accidental post dural puncture headache (PDPH) in obstetric patients – a retrospective observation. The American Academy of Pain Medicine Annual Meeting. California, 2016.

### Anaesthesia record keeping in an Australian metropolitan tertiary public teaching hospital

*Dr Victor Hui (Austin Health, Melbourne, Victoria), Dr Fiona Desmond (Austin Health)*

**Introduction:** The anaesthetic record is the only anaesthetic related record that documents the patient's perioperative journey. The Australian and New Zealand College of Anaesthetists (ANZCA) has published a professional document detailing what should be recorded in an episode of anaesthetic care1. The aim of this project is to determine documentation compliance to college recommendations in an Australian tertiary hospital.

**Methods:** Austin Health is a metropolitan tertiary public teaching hospital in Melbourne, Australia; it provides 980 beds across three campuses. Patients having surgery at Austin Health over a 7 day period were included in this audit. Exclusions include: gastroscopy, colonoscopy, flexible cystoscopies, local anaesthetic only procedures without sedation, chronic pain procedures and if the patient's medical records were not electronically available. Austin Health's anaesthetic records are paper based and require the anaesthetist to manually record all data. The patient's anaesthetic records were retrospectively analysed. The primary outcome was the incidence of inadequately documented anaesthetic records according to the ANZCA recommendations. This project received ethical approval from the Austin Health Human Research Ethics Committee prior to data collection.

**Results:** During the period of 20th to 26th March 2017 inclusive, 588 patients underwent a procedure and 381 were included for this project. Overall, 17% (64/381) of the included charts followed all of the ANZCA recommended guidelines. Specific inadequately documented areas of the anaesthetic record and its incidence of completion include: name of procedure (95%), date of procedure (84%), name of surgeon (43%), ASA score (80%), allergies (98%), anaesthetic consent (80%), name or signature of anaesthetist (90%), eye protection (72%) and airway device (92%).

**Conclusions:** Overall, the number of charts compliant in all ANZCA recommendations was poor. Particularly important areas that were not completed include: planned or actual procedure, name or signature of anaesthetist, consent, airway assessment and airway device. Lack of adequate documentation in these areas could lead to patient morbidity and medico-legal issues; the completion rate should be 100%. This project should raise awareness for all hospital staff that anaesthetic documentation is important and can be improved on.

**References:** 1. Australian and New Zealand College of Anaesthetists. The Anaesthesia Record. Recommendations on the Recording of an Episode of Anaesthesia Care. PS06. Revised 2006. Accessed from: http://www.anzca.edu.au/documents/ps06-2006-the-anaesthesia-record-recommendations-o.pdf (last accessed 25/07/17)

### Post-operative outcomes among patients undergoing elective hip and knee joint replacements – impact of pre-operative anaemia

*Dr Dinushka Kariyawasam (Canberra Hospital, ACT Health, Canberra, ACT), Miss Dannielle Duong (Western Sydney University, Sydney, NSW), Dr Sharavni Gupta (Blacktown and Mount Druitt Hospital, Sydney, NSW), Dr Viraj Kariyawasam (Blacktown and Mount Druitt Hospital )*

**Introduction:** Pre-operative anaemia is associated with adverse outcomes among patients undergoing elective surgery. These include increased length of stay, post-operative infections and mortality. Older age and co-morbidities have also been implicated with poor outcomes post-surgery. More than 50% of anaemic patients were found to be iron deficient.

**Aim:** To assess the rate of pre-operative anaemia and it's impact on post-operative outcomes among patients undergoing elective hip and knee replacement surgeries.

**Methodology:** Patients who underwent elective hip and knee surgery at Blacktown and Mount Druitt hospitals between 1st July 2015 to 30th June 2016 were included. Anaemia was classified according to WHO criteria. Patient demographics, co-morbidities, anthropometry, pre, intra and post-operative parameters were collected. Continuous variables are presented as medians and ranges. Categorical variables are presented as percentages. Kruskal-Wallis and chi square non-parametric analyses were performed. Binary logistic regression analysis was performed to identify factors associated with complications.

**Results:** A total of 472 patients underwent elective Hip and Knee replacement surgeries during the study period. 10 patients were excluded due to lack of preoperative haemoglobin. Prevalence of anaemia was 19.7% (n=91). Mild anaemia was found in 75 patients, while 16 had moderate anaemia. Only 14 patients with anaemia had ferritin level performed. Patients with anaemia were older and had a higher comorbidity index. Mean length of stay among all patients was 7.1 days (SD 5.5). Patients with anaemia had a significantly higher length of stay compared to non-anaemic patients (8.64 vs 6.73, p=0.003). They were likely to be readmitted within 30-days post discharge (12.1% vs 5.4%, p=0.016). They also required higher blood transfusions compared to non-anaemic patients (14.35 vs 2.7%, p<0.0001). A total of 140 (30.3%) patients had complications post-surgery. Infective (18.0%), renal impairment (8.2%) and cardiovascular (5.6%) complications were the commonest reported. Anaemia was associated with higher rate of overall complications (p<0.0001), renal impairment (p<0.0001) and infective complications (p=0.005). Anaemia was found to be an independent predictor of any complication (Odds ratio (OR) 2.20, 95% confidence interval (CI) 1.26-3.86, p=0.006), renal impairment (OR 3.65, 95%C 1.77-7.54, p<0.0001) and infective complications (OR 1.88, 95%CI 1.03-3.41, p=0.038) on multivariate regression analysis.

**Conclusion:** Among patients undergoing elective hip and knee surgery, anaemia was associated with increased length of stay, 30 day readmission rates, increased blood transfusion rates and complications. Infective and renal complications were significantly higher among patients who were anaemic pre-operatively. Assessment of anaemia is poorly performed. Correcting anaemia may present an opportunity to improve the surgical outcomes in post elective hip and knee replacements.

## Rotational thromboelastometry (ROTEM®) in obstetrics: baseline parameters in uncomplicated and complicated pregnancies. A prospective observational study on elective Caesarean section patients

*Dr Julie Lee (The Royal Brisbane and Women's Hospital, The University of Queensland, Brisbane, Queensland), A/Prof Victoria Eley (The Royal Brisbane and Women's Hospital, The University of Queensland), A/Prof Kerstin Wyssusek (The Royal Brisbane and Women's Hospital, The University of Queensland), A/Prof Jeremy Cohen (The Royal Brisbane and Women's Hospital, The University of Queensland), Dr John Rowell (The Royal Brisbane and Women's Hospital, The University of Queensland), Ms Mandy Way (QIMR Berghofer Medical Research Institute), Professor Andre Van Zundert (The Royal Brisbane and Women's Hospital, The University Of Queensland)*

**Introduction:** Rotational thromboelastometry (ROTEM®) is a point-of-care test of coagulation. The use of ROTEM® is well established in hepatic and cardiac surgery, but not as yet in the obstetric setting1,2. Formal baseline parameters are yet to be established in normal pregnancy. This prospective observational study aimed to establish baseline parameters in an Australian obstetric population undergoing elective Caesarean sections (CS).

**Methods:** Ethics approval and written informed consent were obtained. Women undergoing an elective CS were recruited at a tertiary referral hospital during a 12-month period in 2016. The sample included women with uncomplicated and complicated pregnancies. Patients were considered "uncomplicated" if obstetrically and medically low risk, whilst patients were considered "complicated" if they had pre-existing co-morbidities including obesity, pregnancy-related conditions, or on medications affecting coagulation. Patients were recruited from the maternity preadmission clinic if they were booked for an elective CS at greater than 30 weeks' gestation. ROTEM® sampling occurred on insertion of an intravenous cannula pre-operatively. ROTEM® reference ranges were derived by calculating the 2.5 and 97.5 percentiles for INTEM/EXTEM/FIBTEM amplitude at 5 minutes (A5), amplitude at 15 minutes (A15), coagulation time (CT), maximum clot firmness (MCF) and clot formation time (CFT).

**Results:** Of the 200 women recruited, 132 (59%) were uncomplicated and 68 (34%) were complicated pregnancies, with a mean age of 32.7 years (SD 5.0), median gestation of 39 weeks (IQR 38.3-39.3) and median BMI of 25.6 kg/m2 (IQR 22.0-29.7), of which 23 (11.5%) had a postpartum haemorrhage (PPH) with a median volume of 450 mL (IQR 300-600) blood loss. Forty-six (23%) women were nulliparous and 132 (66%) were presenting for a repeat CS. ROTEM® reference ranges were derived based on results from 132 patients in the uncomplicated group. The median and interquartile range (IQR) for selected ROTEM® parameters are as follows: FIBTEM A5 20 mm (IQR 17-22), FIBTEM A15 23 mm (20-25), FIBTEM CT 53 s (50-57), FIBTEM MCF 24 (20-27), FIBTEM CFT 265 (160-628), EXTEM A5 53 mm (50-57), EXTEM A15 67 mm (65-70), EXTEM CT 54 seconds (s) (49-57), EXTEM MCF 70 mm (68-73), EXTEM CFT 64 s (57-72), INTEM A5 51 mm (48-55), INTEM A15 66 mm (63-68), INTEM CT 165 s (145-186), INTEM MCF 69 mm (66-71), and INTEM CFT 63 s (54-72).

**Conclusion:** We have provided reference ranges for ROTEM® values in women with uncomplicated pregnancies presenting for an elective Caesarean section. As expected, these ranges show an increase in coagulability during normal pregnancy compared to the non-pregnant population.

**References:** 1. King K, Setty S, Thompson K, McGlennan A and Wright A. Rotational thromboelastometry (ROTEM) - the future of point of care testing in obstetrics? Archives of Disease in Childhood- Fetal and Neonatal Edition. 2011; 96: 120-1. 2. Wegner J and Popovsky MA. Clinical utility of thromboelastography: one size does not fit all. Seminars in thrombosis and hemostasis. 2010; 36: 699-706.

**Rotational thromboelastometry (ROTEM®) in obstetrics: baseline parameters in uncomplicated and complicated pregnancies. A prospective observational study on parturients**

*Dr Julie Lee (The Royal Brisbane and Women's Hospital, The University of Queensland, Brisbane, Queensland), A/Prof Victoria Eley (The Royal Brisbane and Women's Hospital, The University of Queensland), A/Prof Kerstin Wyssusek (The Royal Brisbane and Women's Hospital, The University of Queensland), A/Prof Jeremy Cohen (The Royal Brisbane and Women's Hospital, The University of Queensland), Dr John Rowell (The Royal Brisbane and Women's Hospital, The University of Queensland), A/Prof Rebecca Kimble (The Royal Brisbane and Women's Hospital, The University of Queensland), Ms Mandy Way (QIMR Berghofer Medical Research Institute), Professor Andre Van Zundert (The Royal Brisbane and Women's Hospital, The University of Queensland)*

**Introduction:** Rotational thromboelastometry (ROTEM®) is a point-of-care test that provides rapid and specific coagulation assessment. The use of ROTEM® is well established in hepatic and cardiac surgery, but not as yet in the obstetric setting1,2. This prospective observational study aimed to establish baseline parameters in an Australian parturient population.

**Methods:** The study population was recruited at a tertiary hospital via an opt-out approach approved by the local ethics committee. Patients were included in the study upon presentation to the labour ward at the point of requiring intravenous cannulation or venepuncture. The sample included women with uncomplicated and complicated pregnancies. Patients were considered "uncomplicated" if obstetrically and medically low risk, whilst patients were considered "complicated" if they had pre-existing co-morbidities including obesity, pregnancy-related conditions, or on medications affecting coagulation. Patients aged 18 to 55 years inclusive and at greater than 30 weeks' gestation who presented to the obstetric unit in established labour were included. There was no exclusion based on co-morbidities. ROTEM® reference ranges were determined by calculating the 2.5 and 97.5 percentiles for the uncomplicated group for INTEM/EXTEM/FIBTEM amplitude at 5 minutes (A5), amplitude at 15 minutes (A15), coagulation time (CT), maximum clot firmness (MCF) and clot formation time (CFT).

**Results:** Of 174 women, 107 (61.5%) were uncomplicated, with a mean age of 29.3 years (SD 5.4), median gestation of 39 weeks (IQR 37.1-40.3) and median BMI of 24.3 kg/m2 (IQR 21.7-30.4), of which 102 (58.6%) were delivered vaginally with the remainder proceeding to a CS. 104 (59.8%) women were nulliparous. Postpartum haemorrhage (PPH) was seen in 37 (21.3%) parturients with a median blood loss of 400 mL (IQR 250-700). The median and interquartile range (IQR) for selected ROTEM® parameters of uncomplicated women were as follows: FIBTEM A5 21 mm (IQR 18-24), FIBTEM A15 25 mm (21-27), FIBTEM CT 50 s (48-54), FIBTEM MCF 26 (22-29), FIBTEM CFT 188 (109-391), EXTEM A5 55 mm (52-58), EXTEM A15 69 mm (66-71), EXTEM CT 52 seconds (s) (48-56), EXTEM MCF 72 mm (69-73), EXTEM CFT 59 s (53-70), INTEM A5 53 mm (50-56), INTEM A15 67 mm (64-69), INTEM CT 164 s (144-182), INTEM MCF 70 mm (68-71), and INTEM CFT 59 s (52-67).

**Conclusion:** We have provided reference ranges for ROTEM® in labouring pregnant women. As expected, these ranges show an increase in coagulability during normal pregnancy compared to the non-pregnant population.

**References:** 1. King K, Setty S, Thompson K, McGlennan A and Wright A. Rotational thromboelastometry (ROTEM) - the future of point of care testing in obstetrics? Archives of Disease in Childhood- Fetal and Neonatal Edition. 2011; 96: 120-1. 2. Wegner J and Popovsky MA. Clinical utility of thromboelastography: one size does not fit all. Seminars in thrombosis and hemostasis. 2010; 36: 699-7.

**Use of recovery phase kinetics following cardiopulmonary exercise testing to predict postoperative complications and 1-year mortality after major intra-abdominal cancer surgery**

*Dr Michael Li (Peter MacCallum Cancer Centre, Melbourne, Victoria), Prof Kwok-Ming Ho (Royal Perth Hospital, University of Western Australia, Murdoch University, Perth, Western Australia), Dr Amelie Muellem (University of Cologne, Germany), Dr Luis Cuadros (Peter MacCallum Cancer Centre), Mr Jarrod Basto (Peter MacCallum Cancer Centre), Dr Hilmy Ismail (Peter MacCallum Cancer Centre, University of Melbourne), Prof Robert Schier (University of Cologne), Prof Bernhard Riedel (Peter MacCallum Cancer Centre, University of Melbourne)*

**Introduction:** Over the past decade, cardiopulmonary exercise testing (CPET) – especially oxygen consumption at Anaerobic Threshold (AT) and at peak exercise (pVO2) – have been studied for preoperative risk stratification. Less attention has been given to significance of CPET parameters during the recovery phase. Studies have shown that impaired chronotropic response to exercise is associated with an increased risk of morbidity after abdominal surgery. 1. Similarly, impaired speed of heart rate recovery (HRR) to baseline following a 6-minute walk test has also been reported to associate with increased risk of complications following lung cancer resection. 2. This study aimed to assess whether a slower HRR after exercise – a marker of parasympathetic dysfunction – is (a) associated with an increased risk of postoperative morbidity and 1-year mortality after major cancer surgery, and (b) better than other recovery kinetics in predicting these two clinical outcomes.

**Methods:** The ability of the following recovery kinetic parameters, including changes in HRR, oxygen uptake (VO2R), mixed expired CO2 (PeCO2), end-tidal CO2 (PETCO2),

and minute ventilation to carbon dioxide ratio (Ve/VCO2) measured from the time when peak exercise capacity was achieved to the 1st, 2nd, 3rd, 4th and 5th minutes after cessation of exercise, to predict postoperative morbidity and 1-year mortality after major cancer surgery was assessed in this retrospective cohort study. PeCO2 was calculated using the Hansen method by dividing 863 by the Ve/VCO2 slope. Area under the receiver-operating-characteristic (AUROC) curve was used to evaluate the ability of the recovery kinetics to discriminate between patients with and without postoperative morbidity (Grade III or higher Clavien-Dindo complications) and 1-year survival.

**Results:** Of the 80 consecutive patients who had had major intra-abdominal cancer surgery between September 2013 and August 2015, 13 (16%) patients died upon follow-up. The HRR and VO2R slopes were both significantly different between survivors and non-survivors, with a modest ability to predict 1-year survival (HRR: AUROC 0.74, 95% confidence interval [CI] 0.59-0.89, p=0.002; and VO2R: AUROC 0.74, 95%CI 0.61-0.86, p=0.008). The post-exercise recovery kinetics for CO2 exchange parameters (PETCO2, PeCO2, Ve/VCO2) were not significantly different between survivors and non-survivors. None of the recovery kinetic parameters including HRR were predictive of high grade postoperative morbidities.

**Conclusions:** This small pilot study showed that both the rate of recovery of the heart rate (HRR) and oxygen consumption (VO2R) after maximal exercise were modest predictors for medium-term survival after major intra-abdominal cancer surgery but not major postoperative complications. Whether combining these two recovery kinetic parameters with the standard CPET variables, such as AT and pVO2, would enhance the overall predictive ability of CPET is unknown and warrants further investigation. Whether HRR can outperform other markers of parasympathetic function such as heart rate variability is also uncertain but deserves comparative studies.

**References:** 1. Hightower CE, et al. Br J Anaesth 2010;104:465-71. 2. Ha D, et al. J Thorac Cardiovasc Surg 2015;149:1168-73.

### A two-year retrospective review of the predictors of pulmonary morbidity following rib fracture at a tertiary metropolitan hospital

*Dr Nicholas Lightfoot (Middlemore Hospital, Auckland, New Zealand), Dr Ashley Scott (Northumbria NHS Foundation Trust, United Kingdom), Dr Anna Rainey (Auckland City Hospital, Auckland, New Zealand), Ms Hannah Widjaja (University of Auckland, Auckland, New Zealand), Mr Kevin Henshall (Middlemore Hospital), Dr Andrew Cameron (Middlemore Hospital)*

**Introduction:** Blunt chest trauma leading to rib fracture is a common trauma induced injury. In addition to significant pain, patients are at risk of adverse events such as post-traumatic pneumonia, mechanical ventilation or death. Those who are more than 65 years of age, who have sustained poly-trauma or multiple fractures are at an elevated risk of rib fracture induced morbidity and mortality. Following a death after isolated thoracic trauma in an older patient at our institution, we have reviewed our management strategies and outcomes. We hope to determine the predictors of adverse pulmonary events on patient presentation to hospital to help further refine our pathways of care.

**Methods:** Hospital Research Office approval was obtained prior to study conduct. Patients presenting to our institution between the 1st January 2015 and the 31st December 2016 with clinical or radiological evidence of rib fracture were identified from a trauma database and electronic review of radiology reports. The primary outcome was the occurrence of pulmonary morbidity, defined as either pneumonia or the need for ventilatory support during the index hospital admission. Univariate logistic regression was used to identify predictors of pulmonary morbidity on presentation to hospital. From these results a multivariate model was developed. The performance of the model was assessed through visual inspection and calculation of the area under a ROC curve. Continuous parameters are presented as mean (± standard deviation) or median (interquartile range) as appropriate and number (percent) for categorical data. Statistical tests were two-tailed with $p<0.05$ for significance.

**Results:** During the study period 293 patients presented with rib fractures. There were 224 males (76.5%) and 69 females (23.5%). Thirty-two patients (10.9%) experienced pulmonary morbidity. These patients were older (70 (33) years versus 50 (28), $p<0.001$), with a greater Charlson score (3 (4) versus 1 (2), p=0.001) and had experienced a greater number of fractures (5 (3) versus 3 (3), p=0.004). The Length of Stay was greater in patients with pulmonary morbidity (11.4 (16.3) days versus 4.0 (6.0), $p<0.001$). There were significant differences in the rate of Critical Care Unit admission (31.3% versus 15.4%, p=0.03) and mortality at 60 days (21.9% versus 3.1% $p<0.001$). On multivariate modelling factors predictive of pulmonary morbidity were age (Odds Ratio (OR) 1.1, 95th% Confidence Interval 1.03 – 1.17, p=0.003), baseline platelet count (OR 1.01, 1.00 – 1.01, p=0.03), baseline albumin (OR 0.87, 0.79 – 0.95, p=0.003), baseline creatinine (OR 1.02, 1.00 – 1.03, p=0.02), baseline presence of respiratory comorbidity (OR 4.6, 1.2 – 17.5, p=0.02) and the Charlson Comorbidity Index (OR 2.1, 1.1 – 3.8, p=0.02). The predictive model generated for pulmonary morbidity had an area under the ROC curve of 0.743 (95th% Confidence Interval 0.662 – 0.824). At their point of maximisation, the sensitivity was 0.906 and the specificity 0.479, this yielded a positive predictive value of 0.176 and a negative predictive value of 0.977.

**Conclusion:** In this series we have shown that rib fractures are associated with serious morbidity and at times mortality. We will use our model to standardise care and optimise

referral for advanced pain management and Critical Care review. Moving forward we will further validate our model and use this information to generate a score to help predict patient morbidity

**The predictors hyponatraemia following elective primary unilateral knee arthroplasty at a tertiary hospital. A retrospective review and predictive model**

*Dr Nicholas Lightfoot (Middlemore Hospital, Auckland, New Zealand), Mr Navneet Singh (University of Auckland, Auckland, New Zealand), Dr Julian Dimech (Middlemore Hospital), Dr Nicholas Gormack (Counties Manukau District Health Board, Auckland, New Zealand), Dr Joyce Tai (Middlemore Hospital), Dr Andrew Cameron (Middlemore Hospital)*

**Introduction:** Knee arthroplasty is a commonly performed procedure. There has been a drive to standardise care such that patient recovery can be accelerated leading to reductions in hospital length of stay. Others have reported as to the impact of delirium, constipation and nausea on length of stay after hip and knee arthroplasty. Little has been written about the impact of disorders of electrolyte balance in patients undergoing total joint arthroplasty. We hope to determine the rate of hyponatraemia in patients who have undergone knee arthroplasty at our institution and to elucidate any association between hyponatraemia and hospital length of stay, alternations in patient specific recovery metrics and complication profiles.

**Methods:** University and Hospital Research Ethics approval was obtained prior to study conduct. Patients who underwent elective primary total knee arthroplasty (TKA) at our institution between the 1st January and 31st December 2014 were retrospectively enrolled. Fluid balance and laboratory data was manually extracted from clinical records and merged with a pre-existing Departmental TKA database. The primary outcome was the occurrence of hyponatraemia (defined as a sodium level of less than 135mmol/L) during the first three post-operative days. Demographic and outcome data were reported for the two groups. Univariate then multivariate logistic regression with demographic, operative, laboratory and pharmaceutical data were then used to identify significant predictors of post-operative hyponatremia. Continuous parameters are presented as mean (± standard deviation, SD) or median (interquartile range, IQR) as appropriate and number (percent) for categorical data. Statistical tests were two-tailed with $p<0.05$ for significance.

**Results:** Two-hundred and thirty-six patients underwent primary unilateral TKA during the study period. There were 97 (41.1%) males and 139 (58.9%) females. One-hundred and seven (45.3%) patients experienced hyponatraemia within the first three post-operative days. These patients were older than those who maintained normal sodium levels (70 (IQR 13) versus 65 (12) years, $p<0.001$). For those who experienced hyponatraemia, the hospital length of stay was marginally, but significantly prolonged (4.3 (2.1) versus 4.1 (1.8) days, $p=0.04$). There was no difference between the Day One ($p=0.82$) and Day Two ($p=0.12$) Quality of Recovery-15 scores between those with hyponatraemia and a normal sodium level. Differences in the time to assisted weight bearing following surgery ($p=0.35$) and thirty-day readmission rate ($p=0.10$) were again insignificant. Predictors of hyponatraemia within the first three post-operative days on multivariate modelling were operative duration (Odds Ratio (OR) 0.98, 95th% Confidence Interval 0.97 – 1.00, $p=0.04$), loop diuretic use (OR 6.2, 1.5 – 25.6, $p=0.01$), thiazide diuretic use (OR 3.3, 1.2 – 9.0, $p=0.02$) and a preoperative sodium level of 140-145mmol/L (OR 0.09, 0.02 – 0.48, $p=0.01$). Total oral fluid intake during the first three days was not predictive ($p=0.06$).

**Conclusion:** Hyponatraemia is a common finding following TKA. This led to prolongation of length of stay of approximately five hours. This may be clinically insignificant by itself but when combined with other factors could present an opportunity to attain gains in productivity. We will continue to modify our predictive model with the aim to reduce hyponatraemia in this population.

**Haemoglobin rise during separation from cardiopulmonary bypass in adults: a prospective observational study**

*Dr Dash Newington (The Prince Charles Hospital, Brisbane, Queensland), Mrs Nicole Tysoe (The Prince Charles Hospital)*

**Introduction:** At our institution we noticed that haemoglobin (Hb) levels often rise sharply during separation from cardiopulmonary bypass. We designed a study to determine if this Hb rise consistently occurs and the magnitude of any increase. Such knowledge may reduce unnecessary intraoperative red cell transfusion in cardiothoracic surgical patients.

**Methods:** The study was designed to detect a 2g/L Hb difference with a significance of $p<0.05$ and a power of 80%. All adult patients undergoing elective or emergency cardiopulmonary bypass procedures at our institution between 28/12/2017 and 25/01/2018 were recruited. A baseline blood gas was collected prior to initiation of cardiopulmonary bypass. At the end of each bypass run, after rewarming, an arterial blood gas was taken from the bypass pump. A simultaneous sample taken from the patient's arterial line was also processed for comparison. A subsequent intraoperative blood gas was taken after separation from cardiopulmonary bypass at a time determined by the treating anaesthetist. A study form was completed for each patient recording: age, body mass index, surgical procedure, baseline albumin and creatinine, bypass duration, if diuretics were given, if haemofiltration was used, and details of any fluid or blood products administered by the anaesthetist or perfusionist between the final bypass blood gas and the first gas collected after separation from bypass. Blood gas

samples were processed on one of two Radiometer ABL800 Flex machines. The machine used to analyse each sample was documented.

**Results:** 72 patients were included in the study (sample size calculation of 64 plus a 10% margin of safety). Patient age ranged from 16-83 years. Surgical procedures included coronary artery bypass grafting, valve surgery, aortic surgery, adult congenital procedures, atrial myxoma resection, insertion of heartware, pulmonary thromboendarterectomy, and heart and lung transplants. The median bypass duration was 76 mins. Hb difference from the final bypass sample to the first sample after separation from bypass ranged from a 5g/L decrease to a 34g/L increase. 64 patients (89%) demonstrated a Hb rise, with 14 patients (19%) demonstrating a rise of 10g/L or greater. The data did not have a normal distribution (skewness 1.679, kurtosis 5.218). The median Hb increase was 5.5g/L (IQR 2.0-9.0, Z-.6831 p <0.001) and the mean increase was 6.33g/L (95% CI 4.87-7.80, p<0.01) over a median duration of 27 minutes (SD 16.758). This occurred despite 21 patients (29%) having received crystalloid (mean 410ml) during separation from bypass and only 3 patients (4%) having received either packed red cells, haemofiltered pump blood or cell-saver blood (mean 300ml). There was no significant correlation between Hb difference and the time lapse between samples, duration of cardiopulmonary bypass, or baseline albumin or creatinine levels. There was a weak positive correlation (r = 0.239, sig. 2-tailed 0.004) between baseline Hb and Hb difference. Hb levels measured from simultaneous samples taken from the bypass pump and patient's arterial line, and from the two machines used to process the samples did not significantly differ.

**Conclusions:** The majority of patients showed a statistically and clinically significant increase in Hb during separation from bypass. Further studies are warranted to establish why this increase in Hb occurs and to better characterise and predict subgroups of patients who do not respond as expected.

**The effect of a pulmonary bundle of care on postoperative pulmonary complications: A quality improvement project**

*Dr David Shan (Peter MacCallum Cancer Centre, University of Melbourne, Melbourne, Victoria), Dr Rani Chahal (Peter MacCallum Cancer Centre, University of Melbourne), Dr Hilmy Ismail (Peter MacCallum Cancer Centre, University of Melbourne), Ms Jamie Waterland (Peter MacCallum Cancer Centre, University of Melbourne), Professor Bernhard Riedel (Peter MacCallum Cancer Centre, University of Melbourne)*

**Introduction:** Enhanced Recovery After Surgery (ERAS), a multimodal perioperative care pathway, aims to achieve early functional recovery following major surgery. Despite the widespread delivery of ERAS, postoperative pulmonary complications (PPC) remain a common cause of postoperative morbidity and mortality. Reported incidence of PPC (2%-40%) is dependent on patient risk factors and surgical complexity. Following a baseline prevalence audit, we added a multidisciplinary respiratory care bundle to our ERAS program to specifically target PPC. This pulmonary package, "iCOUGH", adapted from that piloted at Central Manchester University Hospital (UK) [1], combines Incentive spirometry, Cough/deep breathing, Oral care, Understanding education, Get-out-of-bed and Head-of-bed elevation. We implemented iCOUGH within a typical quality improvement framework of OODA (observe, orientate, decide, act) loops.

**Methods:** We evaluated the baseline incidence of PPC over a two-month period (observe: April–May 2017). Patients included those undergoing major (≥2hours) elective upper gastrointestinal, colorectal, and head and neck cancer surgery with an intermediate-to-high baseline risk of PPC. The ARISCAT (Assess Respiratory Risk in Surgical Patients in CATalonia) score, a validated predictive index of PPC assessed baseline risk [2]. ARISCAT scores of 26-44 and ≥45 defined patients at intermediate and high risk of PPC respectively. We adapted (orientate-decide) the iCOUGH intervention to include the Active Cycle of Breathing Technique (aCOUGH), and then implemented (act) across a similar cohort of patients that were identified during preoperative anaesthetic clinic visits. The aCOUGH bundle was re-emphasised during patient educational 'Surgery School (SS)' sessions (led by perioperative staff) and on ward visits. Compliance to aCOUGH components and incidence of PPC were then monitored prospectively (June–November 2017) in all eligible patients (re-observe). A monthly run-chart was created to display the ongoing compliance with aCOUGH against the incidence of PPC.

**Results:** Bundle compliance (≥3 components) rates increased from 56.4% to 78.9% (p=0.01) over the first six months of implementation. Following step-wise delivery of aCOUGH, and after six months of implementation (October–November 2017; n=71) the overall PPC rates reduced from a baseline rate of 43.6% to 26.8% (17/39 vs. 19/71; p=0.07) but this did not achieve statistical significance. In the subgroup with highest risk of PPC (ARISCAT score≥45) the rate was reduced significantly from 83.3% to 16.7% (5/6 vs. 1/6; p=0.02). This reduction in PPC did not achieve statistical significance in intermediate risk patients, with a reduction from a baseline incidence of 36.4% to 27.7% (12/33 vs. 18/65; p=0.38).

**Conclusion:** The aCOUGH bundle of care resulted in a significant reduction in PPC rates in high-risk patients. Our preliminary data supports the ongoing aCOUGH program, which in conjunction with our SS holds promise to significantly reduce PPC in at-risk surgical patients. This program also has the potential to improve patient satisfaction through patient engagement during the peri-operative period. Sustained improvement in PPC rate is expected as components of aCOUGH become refined (by using OODA loops) and self-sufficient (embedded into the clinical culture) through ongoing clinician feedback.

**References:** 1. Moore JA, et al. Anaesthesia 72: 317-27, 2017. 2. Canet J, et al. Anesthesiology 113: 1338–50, 2010.

**Programmed intermittent bolus administration of local anaesthetic provides superior analgesia compared with continuous infusion via extra-pleural catheters following thoracic surgery: A retrospective analysis**

*Dr Luke Willshire (Austin Health, Melbourne, Victoria), Dr Matthew Kilpin (Austin Health), Dr Bridget Bishop (Austin Health), Dr Brett Pearce (Austin Health)*

**Introduction:** Surgically sited extra-pleural local anaesthetic (LA) catheters are an effective method of analgesia for patients following thoracotomy and video-assisted thoracoscopic surgery (VATS). However, there is no consensus in the literature as to the most beneficial regimen of LA delivery. Our objective was to determine whether a programmed intermittent bolus (PIB) technique provides superior analgesia via an extra-pleural catheter following thoracic surgery when compared to a continuous LA infusion regimen.

**Methods:** We performed a retrospective, single-centred, observational study assessing 87 adult patients who received an extra-pleural catheter following VATS or thoracotomy. Data were collected from our institution's scanned medical record. Patients were excluded if they underwent multiple procedures, had an oesophagectomy or were opioid tolerant. All patients received a surgically sited extra-pleural catheter. Patients were stratified into two groups based on the percentage of their total daily ropivacaine dose they received as boluses: Controls (<10%; n=29) and PIB (≥10%; n=55). Our primary outcome was Oral Morphine Equivalent Daily Dose (OMEDD) consumption day one post-thoracic surgery. Secondary outcomes included OMEDD consumption on days two and three post-operation, pain scores via the Numeric Rating Scale, daily ketamine use, and daily ropivacaine dose. Prospective subgroup analysis was performed comparing Low-Dose PIB (10-<25%; n=34) and High-Dose PIB (≥25%; n=21) against Controls.

**Results:** There was no difference between groups in age, weight, gender, BMI and type of surgery. The PIB group had lower mean OMEDD consumption on each day post-thoracic surgery compared to Controls, which was significant on day three (day one mean difference (95% CI): 44.1mg (-8.5 – 96.9), p = 0.10; day two: 47.3mg (-5.2 – 99.7), p = 0.08; day three: 98.1mg (39.7 – 156), p = 0.001). There was a reduction in the number of patients requiring ketamine infusions in the PIB group compared with Controls on each day. This was statistically significant on days two (p = 0.02) and three (p = 0.04). There was a small difference in maximum pain scores favouring the PIB group which was not statistically significant. There was no difference in total ropivacaine dose. Subgroup analysis demonstrated a consistently greater effect for the High-Dose PIB group compared with the Low-Dose PIB group. The High-Dose PIB group had a greater reduction in OMEDD use on all days when compared with Controls; this was significant on days two and three (day one mean difference (95% CI): 41mg (-31.7 – 113.7), p = 0.26; day two: 69.3mg (6.3 – 132.2), p = 0.03; day three: 114mg (40.5 – 188), p = 0.003).

**Conclusion:** Our study has demonstrated a reduction in OMEDD use with PIB via extra-pleural catheters for three days post-thoracic surgery, which was significant on day three. There was also a concomitant reduction in ketamine use and no difference in pain scores or ropivacaine dose. This effect was dose dependant, being more evident in the High-Dose PIB group. Overall, PIB, particularly in higher doses, appears to provide superior analgesia to continuous infusion when administered via an extra-pleural catheter in thoracic surgery.

**Volatile anaesthesia and perioperative outcomes related to cancer (VAPORC): An interim report of a feasibility study for an international, multi-centre, prospective RCT**

*Dr Ken Yee (Peter MacCallum Cancer Centre, Melbourne, Victoria), Dr Julia Dubowitz (Royal Melbourne Hospital, Melbourne, Victoria), Dr David Shan (Peter MacCallum Cancer Centre), Professor Bernhard Riedel (Peter MacCallum Cancer Centre), Dr Jonathan Hiller (Peter MacCallum Cancer Centre), Dr Hilmy Ismail (Peter MacCallum Cancer Centre), Dr Alexander Heriot (Peter MacCallum Cancer Centre), Dr Erica Sloan (Peter MacCallum Cancer Centre)*

**Background:** Currently, it is estimated that more than 80% of cancer patients require anaesthesia for either definitive cancer resection or diagnostic, supportive and palliative procedures. General anaesthesia for surgery can be delivered as either volatile-based general anaesthesia or as total intravenous anaesthesia (TIVA) using propofol. Both techniques are used routinely in clinical practice and are interchangeable according to anaesthetist preference. Preliminary studies suggest that TIVA with propofol and/or neuraxial anaesthesia associate with favourable cancer outcomes. Additionally, antiadrenergic, antiinflammatory strategies including adjunct therapies like nonselective βblockers and nonsteroidal antiinflammatory drugs are also associated with improved cancer outcomes. In contrast, volatile anaesthetic agents may adversely amplify adaptive and prosurvival transcriptional (HIF1α/β and PI3K/Akt/mTOR mediated) pathways to accelerate cancer growth. As such, our current anaesthetic techniques may modulate these processes to adversely impact on the global burden of disease related to cancer. We conducted a feasibility study toward conducting a phase IV, international, multi-centre, single blind, randomised control trial (VAPOR-C).

**Methods:** Patients scheduled for elective, major resection of cancers are currently being recruited and randomised to either volatile or propofol TIVA general anaesthesia. The feasibility trial will measure the ability to recruit eligible patients into the study with the criteria of a recruitment

rate of at least 75% to be considered feasible. The study protocol will also be assessed as feasible if a successful delivery rate of at least 90% of either anaesthetic technique is achieved. Data collection and analysis will be performed to refine the primary endpoints for the larger VAPOR-C study. These endpoints will relate to: Recurrence-free survival, postoperative morbidity and mortality and quality of life outcomes.

**Results:** Screening commenced on 21/8/2017, and the trial has been active for 93 days or 3 months. Of the 255 patients screened from pre-anaesthetic clinic (PAC) and elective theatre lists using the criteria of patient age, cancer, type and stage of cancer 93 patients (36%) met the selection criteria. Of these 93 patients, 66 patients were approached for recruitment and 51 agreed to participate in the trial. The 27 patients that were eligible but were not approached for the trial were either too ill at the time of screening, the incorrect cancer type or the research team was unavailable. 15 patients refused to participate and two patients were considered not appropriate by the treating anaesthetist. The trial achieved a recruitment rate of 77% of eligible patients with 100% of delivery rate of either anaesthetic technique in all procedures undertaken. Reasons for patients not meeting the selection criteria primarily included: incorrect surgical procedure length/type of surgery, metastatic disease or non-English speaking background. A total of 103 blood biomarker time points have been collected to date and will be batched for analysis (CTCs, cytokines, cDNA, flow cytometry) later to identify the most sensitive time points and clinically relevant biomarkers on which the large VAPOR-C trial will focus.

**Discussion:** The trial is currently on track to achieve the required feasibility criteria at Peter MacCallum with several refinements made to the Vapor-C protocol, so that this trial can be performed at future national and international sites.