

PERIOPERATIVE CARE ABSTRACTS

PC1 META-ANALYSIS OF EPIDURAL ANALGESIA VERSUS PERIPHERAL NERVE BLOCKADE AFTER TOTAL KNEE JOINT REPLACEMENT

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Background: Postoperative pain after major knee surgery can be severe. Our aim was to compare the outcomes of epidural analgesia and peripheral nerve blockade (PNB) in patients undergoing total knee joint replacement (TKR). Moreover, we aimed to compare outcomes of adductor canal block (ACB) with those of femoral nerve block (FNB) after TKR.

Methods: We conducted a systematic search of electronic information sources, including MEDLINE; EMBASE; CINAHL; and the Cochrane Central Register of Controlled Trials (CENTRAL). We applied a combination of free text and controlled vocabulary search adapted to thesaurus headings, search operators, and limits in each of the above databases. Pain intensity assessed on visual analogue scale (VAS), nausea and vomiting, systolic hypotension, and urinary retention was the reported outcome parameters.

Results: We identified 12 randomised controlled trials (RCTs) comparing outcomes of epidural analgesia and PNB reporting a total of 670 patients. There was no significant difference between two groups in VAS scores at 0–12 h (MD -0.48; 95 % CI -1.07–0.11, $P = 0.11$), 12–24 h (MD 0.04; 95 % CI -0.81–0.88, $P = 0.93$), and 24–48 h (MD 0.16; 95 % CI -0.08–0.40, $P = 0.19$). However, epidural analgesia was associated with significantly higher risk of postoperative nausea and vomiting (RR 1.65; 95 % CI, 1.20–2.28, $P = 0.002$), hypotension (RR 1.76; 95 % CI, 1.26–2.45, $P = 0.0009$), and urinary retention (RR 4.51; 95 % CI, 2.27–8.96, $P < 0.0001$) compared to PNB. Moreover, pooled analysis of data from 6 RCTs demonstrated no significant difference in VAS score between ACB and FNB at 24 h (MD -0.00; 95 % CI, -0.56–0.56, $P = 0.99$) and 48 h (MD -0.06; 95 % CI, -0.14–0.03, $P = 0.23$).

Conclusions: PNB is as effective as epidural analgesia for postoperative pain management in patients undergoing TKR. Moreover, it is associated with significantly lower postoperative complications. ACB appears to be an effective PNB with similar analgesic effect to FNB after TKR. Future RCTs may provide better evidence regarding knee range of motion, length of hospital stay, and neurological complications.

PC2 COULD THIRST-TRIGGERED SELF-ADMINISTRATION OF INTRAVENOUS FLUID LEAD TO MORE RAPID REHYDRATION THAN CLINICIAN-DIRECTED INFUSION?

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Introduction: Fluid management is a major factor determining patient outcomes, yet in reality fluid administration is haphazard. Thirst however, is a highly sensitive and reliable indicator of fluid deficits. We designed an experiment to investigate the potential for a thirst-driven fluid administration system, as an individualised goal directed therapy.

Methods: Following university ethics approval we performed a randomised double crossover trial on 15 healthy male volunteers, of average age 32years and BMI 24.4kg/m². Twice, after administrations of oral Furosemide (40mg) and 8-14hours of fluid restriction, subjects received 4hour IV fluid infusions. In the treatment arm, subjects pressed a trigger to relieve their thirst; administering a 200ml bolus. In the control arm fluid was infused as per NICE guidelines (30ml/kg/24hr) with a 500ml bolus delivered in response to clinical signs of dehydration. Measurements of plasma osmolality and urine specific gravity were taken before and after each trial.

Results: More fluid was infused in response to thirst than by adherence to NICE guidelines, with a mean difference of 764ml ($p=0.0005$). Thirst-driven fluid administration was fitted to an exponential function of time, levelling off after a mean half-life of 97min. In the thirst driven arm there was a greater reduction in urine specific gravity and thirst score with mean differences 0.0053g/cm³ ($p=0.002$) and 3.2/10 ($p=0.003$) respectively. Plasma osmolality demonstrated no fluid overload.

Conclusion: A system delivering fluid in response to subjective thirst is effective at promptly correcting fluid imbalances.

Take-home Message: Thirst-driven fluid administration has potential as part of an enhanced recovery pathway.

PC3 PRE-OPERATIVE ANAEMIA - IS THERE A PROBLEM? - ESTABLISHING A SERVICE

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Introduction: Pre-operative anaemia is associated with increased morbidity, mortality and blood transfusion in the peri-operative period. Blood transfusion, whilst life saving in acute major haemorrhage is a limited resource and is itself associated with increased morbidity and mortality. It is unclear if treating anaemia in the peri-operative period affects morbidity or mortality. However, it has been shown to reduce the need for blood transfusion and published guidelines recommend active management of pre-operative anaemia.

Method: A retrospective observational review was undertaken to determine the prevalence of anaemia and transfusion for all cystectomies, major colorectal procedures and lower limb arthroplasties performed during 2015. Demographic data, transfusion rates and prevalence of anaemia (defined by the WHO) were collected.

Result: 72 patients underwent Cystectomy- with a median length of stay (LOS) of 6 days [IQR 5-9 days]; the prevalence of anaemia was 38% with a transfusion rate of 18%. 305 patients underwent major colorectal surgery with a median LOS of 7 days [ISR 4-10 days]; the prevalence of anaemia was 39% with a transfusion rate of 14%. 312 patients underwent primary hip or knee arthroplasty with a median LOS of 5 days [IQR 3-9days]; the prevalence of anaemia was 17% with a transfusion rate of 13%.

Conclusion: Our data is in keeping with large observational studies. All groups demonstrated an increased transfusion rate in the anaemic cohort. There is currently no pathway in place at our institution to capture and actively manage these patients. This led to the development of a pre-operative pathway to identify, investigate and optimise anaemic patients.

Take-home message: Pre-operative anaemia is common, easy to diagnose and with enough organisation easy to rectify. This may reduce morbidity, decrease blood transfusion and shorten length of stay.

PC4 THE MANAGEMENT OF PERI-OPERATIVE ANAEMIA IN COLORECTAL PATIENTS IN A TERTIARY HOSPITAL

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Introduction: Peri-operative anaemia and transfusion are associated with increased morbidity, prolonged hospital stay and post-operative complications.

Method: Retrospective review of unselected colorectal patients who presented for colorectal surgery. We reviewed the peri-operative haemoglobin levels, incidence of haematinics testing and incidence of peri-operative transfusion.

Result: We reviewed 207 patients [94 females and 113 males] in the study. 75 (36.2%) patients presented with pre-operative anaemia. 26 (34.6%) of these patients were on pre-operative haematinics. The median duration from pre-operative assessment to surgery is 11 days (IQR 21-6 days). The mean pre-operative haemoglobin for male patients was 131±19 g/L and mean pre-operative haemoglobin for female patients was 122±15 g/L. The mean post-operative haemoglobin for male patients was 115±18 g/L and for female patients was 103±15 g/L. 37 (17.8%) patients required peri-operative transfusion within the first 48 hours.

Conclusion: A significant 36.2% of our study patients presented with anaemia pre-operatively. Only 34.6% of these patients had pre-operative haematinic screening. It is vital that we detect and treat anaemia to maximize total red cell mass prior to surgery. Current evidence suggests early detection of anaemia and preoperative management with iron replacement therapy reduces transfusion rates, morbidity and mortality.

Take-home message: The median duration of 11 days from pre-operative assessment to surgery makes it necessary to assess and treat anaemia patients during their first hospital appointment. Consideration for intravenous iron infusion to expedite and maximise total red cell mass should be made this stage.

PC5 EVALUATION OF A PERIOPERATIVE FIT 4 SURGERY SCHOOL

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Introduction: A pilot pre-operative surgery school was commenced in May 2016 at UHS. The aim of the school was to provide patients with advice and tools to enable behaviour modification and improve fitness for surgery.

Method: The school consisted of a two-hour classroom based session covering the benefits of exercise, nutrition, ERAS, and lifestyle modification advice regarding smoking and alcohol intake. All patients undergoing elective major colorectal and urological resections were invited to attend. Patients were asked to complete an evaluation sheet, as well as a lifestyle questionnaire post surgery to ascertain

patient reported lifestyle changes. This was compared with a control group of patients who had undergone similar surgery but not attended school.

Results: During the pilot, 89 patients attended the school. Feedback showed that 53% of patients were planning on changing their behaviour as a result of attending. 93% of patients stated that they would recommend a friend having surgery to attend the school. 61 lifestyle questionnaires were returned postoperatively. 31 who had attended school and 30 who had not. Of the patients that drank alcohol regularly, 57% of those who attended school reduced their alcohol intake, compared to 60% of patients who did not attend school. However, the alcohol drinkers who attended school were more likely to abstain completely (22%), than those who had not attended school (5%). 32% of school patients stated that they had improved their diet prior to surgery, compared with 27% of non-school patients. 26% of school patients increased their exercise levels prior to surgery compared to 13% of non-school patients. Only one smoker attended the school, therefore comparison not possible.

Conclusion: Introduction of a *Fit 4 Surgery School* has been shown to be considered useful by patients. Results of the lifestyle questionnaire suggest that attending school can result in positive behaviour and lifestyle changes prior to surgery. Particularly in relation to abstinence from alcohol and increasing exercise levels.

PC6 SEPSIS MANAGEMENT: 'GOLDEN HOUR ANTIBIOTICS'

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Introduction: The concept of standardised evidence-based care for patients for emergency laparotomy patients is promoted by the Emergency Laparotomy Collaborative. One of the 6 elements is pre-operative early treatment of sepsis with antibiotics. Our project aimed to improve the administration of antibiotics within the first hour of diagnosis.

Method: Our National Emergency Laparotomy Audit data generally shows that 50% of patients received preoperative antibiotics. We conducted a snap audit of 10 randomly selected emergency laparotomy patients. 6 patients were identified as showing signs of sepsis but only 2 met the target of receiving antibiotics within 1 hour. As part of World Sepsis Day, we ran an Antibiotic Workshop, which included a specially commissioned film for ward teams to learn to reconstitute and administer antibiotics. We assessed their awareness of the 1 hour target and confidence in preparing and administering antibiotics before and after the workshop.

Results: 23 attended the workshop and 22 were aware of the 1 hour target in sepsis with only 10 (43%) being aware that this target was frequently missed. Nearly all (21) agreed that prescribing doctors should administer antibiotics to achieve this target. Only 14 (61%) felt confident in doing so prior to attending this workshop. This increased to 22 (96%) following the workshop training.

Conclusion: An antibiotic workshop increases confidence and empowers teams including doctors to administer antibiotics immediately when sepsis is diagnosed, improving pre-operative care of patients for emergency laparotomy.

Take-home Message: Doctors diagnosing sepsis must be able to give intravenous antibiotics.

PC7 NURSE-LED ASA GRADING IN PREOPERATIVE ASSESSMENT TO GUIDE INVESTIGATIONS AND RISK SCORING

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Introduction: NICE guidance(NG45)¹ and Surgical Outcomes Risk Tool³(SORT) use ASA grade for guiding preoperative investigations and shared decision making in preoperative assessment(POA). ASA grading is subjective and we identified that our POA nurses required training to be confident in using the ASA physical classification system (PCS) for these purposes.

Method: POA nurses were paired with consultant anaesthetists and asked to score for 10 patients using the ASA PCS.⁴ Each staff member was blinded to their colleagues' results. The lead clinician then reviewed results.

Result: 63 patients were assessed in total with an overall 76% agreement between scores. There were no differences in score of more than one ASA grade. Feedback included that many anaesthetists were unaware that the ASA PCS, 2014 included BMI and lifestyle factors. POA nurses reported difficulty in grading alcohol intake, requesting definition for the terms 'minimal' and 'social' alcohol for ASA Grades 1 and 2.

Conclusion: This study raised awareness of the updated ASA PCS and led to defining subjective terms: alcohol intake <14units/week, 14-21U/week, >21U/week or alcohol risk score $\geq 5^5$ for ASA 1, 2 or 3 respectively. This exercise has increased confidence and POA nurses now use NICE(NG45) for preoperative investigations and SORT to inform risk assessment.

Take-home message: POA is nurse-led in the UK and management shouldn't assume staff have required knowledge and confidence to commence ASA scoring. This should be assessed locally and training provided. Local guidance to reduce the subjectivity of terms within the 2014 ASA PCS system may improve accuracy.

PC8 THE FINANCIAL IMPLICATIONS OF BLOOD GROUP & SAVE ANALYSIS ON PATIENTS REQUIRING PRIMARY TOTAL KNEE ARTHROPLASTY SURGERY.

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Introduction: Current practice for an elective primary total knee arthroplasty (TKA) procedures includes blood-group analysis prior to surgery at pre-operative anaesthetic assessment clinic (POAC) and repeated on the day of surgery. Our study aims to evaluate the current transfusion incidence and financial implications of Group-and-Save (G&S) analysis in patients undergoing elective TKA surgery.

Method: Retrospective review of 350 patients undergoing primary TKA surgery at our DGH, between January 2014-January 2016. We evaluated G&S requests, and pre-/post-operative haemoglobin results.

Result: 350 TKA procedures were analysed. 0.9%(n=3) patients required a blood transfusion post-op. Mean decline in haemoglobin day one post-op was 17g/L. 97.9%(n=325) of patients had duplicate G&S samples taken at POAC and on the day of surgery. The national cost of a G&S is estimated to be £30. Our unit performed 289 TKA procedures in 2015. Therefore, estimated cost of pre-operative G&S analysis for TKA procedures is £17,340 per annum.

Conclusion: The incidence of blood transfusions associated with primary TKA is extremely low. Three patients who received a transfusion were for reasons unrelated to a primary surgical complication, nor were they indicated according to National Blood Transfusion Guidelines(2013). Despite this, we perform duplicate G&S investigations as standard for TKA surgery. This has a significant cost to the trust, and imposes unnecessary additional demand on pathology services. In view of these findings we aim to propose a change to pre-operative blood-group analysis protocols for TKA surgery with associated cost and resource saving benefits.

Take-home message: Blood transfusions following primary total knee arthroplasty is extremely rare. We propose that G&S investigations are therefore unnecessary with huge cost and resource implications.

PC9 LOW VS STANDARD URINE OUTPUT TARGETS IN PATIENTS UNDERGOING MAJOR ABDOMINAL SURGERY: A RANDOMISED NON-INFERIORITY TRIAL

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Introduction: A minimum hourly urine output of 0.5 mL/kg is a key target guiding perioperative fluid therapy, thought to indicate adequate renal perfusion. Few data support this standard practice, which may contribute to fluid overloading. We hypothesised that a lower perioperative urine output target is safe and decreases fluid administration.

Method: We randomly assigned (1:1) patients without significant kidney injury risk factor undergoing colectomy within an established enhanced-recovery programme to a minimum urine output target of 0.2 mL/kg/h (Low group) or 0.5 mL/kg/h (Standard group) from induction of anaesthesia until 8 am two days after surgery. Maintenance fluid were standardised and additional fluid administered to achieve urine output targets. Primary outcome was non-inferiority of the Low group for urine neutrophil gelatinase-associated lipocalin (uNGAL) on the first postoperative day with a margin of non-inferiority of 2.5x control.

Result: Forty participants completed the study. The Low group received 3170 mL (95% CI 2380 to 3960) intravenous fluids vs 5490 mL (4570 to 6410) in the Standard group (p=0.0004), and was non-inferior for uNGAL [14.7 µg/L (IQR 7.60-28.9) vs 18.4 µg/L (IQR 8.30-21.2), Pnon-inferiority=0.0011], serum cystatin (Pnon-inferiority<0.0001), serum creatinine (Pnon-inferiority=0.0004), and measured glomerular filtration (Pnon-inferiority=0.0003). Effective renal plasma flow increased in both groups after surgery and more in the Standard group (Pnon-inferiority=0.125).

Conclusion: A perioperative urine output target of 0.2 mL/kg/h is non-inferior to the standard target of 0.5 mL/kg/h, and results in a large intravenous fluid sparing. This target should be adopted in surgical patients without significant kidney injury risk factor.

Take-home message: The current definition of perioperative oliguria, 0.5 mL/kg/h, is unnecessarily high. In patients without significant risk factors for acute kidney injury, a lower target of 0.2 mL/kg/h is safe and results in an intravenous fluid sparing of some 2.4 L in the perioperative period.

PC10 INCIDENCE OF POST-OPERATIVE ATRIAL FIBRILLATION IN ABDOMINAL SURGERY: A SYSTEMATIC REVIEW

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Introduction: Atrial fibrillation is a common cardiac arrhythmia and can occur de novo following a surgical procedure (POAF). Whilst there is extensive research on POAF following cardiac surgery, there is limited evidence on AF following abdominal surgery. We set out to identify rates and risk factors for POAF following abdominal surgery.

Method: A systematic search of the EMBASE, MEDLINE and Cochrane databases was reported in line

with PRISMA guidelines. Studies were selected if they reported cases of AF in a gastrointestinal or urological surgical population within 30 days of operation.

Result: Initial searches identified 787 papers, from which 13 full texts were retrieved. Following review, eight retrospective cohort studies were included involving 5197 patients, of whom 563 (10.8%) developed POAF. Common operations included oesophagectomy, nephrectomy and liver transplant. Identified risk factors included prior ischaemic heart disease and hypertension. POAF was associated with an increased rate of complications such as pneumonia and anastomotic leaks, increased length of stay and increased all cause mortality.

Conclusion: Symptomatic POAF is a common post-operative problem in the studied population. Despite this, there is relatively little research into its management. Furthermore, there may be a cohort of patients with asymptomatic POAF, adding to disease burden. Future work could define risk factors to allow targeted prophylaxis and investigate optimum management.

Take-home message: Atrial fibrillation is common post-operatively resulting in increased morbidity and mortality, and it is likely an asymptomatic cohort also exists. High quality prospective studies are required, including routine ECGs, to define risk factors and optimum management.

PC11 HIGH INTENSITY INTERVAL TRAINING SIGNIFICANTLY IMPROVES ANAEROBIC THRESHOLD WITHIN 28 DAYS IN THE COMORBID ELDERLY

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Introduction: Cardiorespiratory fitness declines with age, increasing the morbidity and mortality associated with major intra-abdominal surgery. Anaerobic threshold (VO₂AT), an objective measure of cardiorespiratory fitness, is independently associated with perioperative mortality. High intensity interval training (HIIT) comprises high intensity bouts of exercise (>85% heart rate max) interspersed with low intensity recovery periods. HIIT can induce meaningful increases in VO₂AT and other objective measures of cardiorespiratory performance, within 4-6 weeks in the young. It is unknown whether such improvements in performance are achievable within similar timeframes following HIIT, in the elderly individuals most likely to present for major intra-abdominal surgery.

Method: Independent community dwelling volunteers (age >75) with chronic co-morbid conditions (ASA grade >1) undertook 12 sessions of HIIT over 4 weeks. Cardiopulmonary exercise testing (CPET) was used to quantify performance before and after the programme. Exclusion criteria were per ATS/ACCP guidelines for CPET.

Result: 14 volunteers (4 female, median age 81 (78-85)) completed 12 sessions of HIIT training within 4 weeks. VO₂AT and VO₂PEAK increased following adherence to the training programme ((VO₂AT 1.72±2.0mls/kg/min; p=0.01) (VO₂PEAK 2.45±3.25mls/kg/min; p=0.01)). Total load (Watts) achieved during CPET also increased following training (8.1±11.9W; p=0.03). No adverse events were reported during training, with participants reporting high levels of acceptability and enjoyment.

Conclusion: These results show that elderly individuals with co-morbid conditions can safely and feasibly undergo HIIT, making similar gains to their younger counterparts. Larger outcome studies are needed to determine if HIIT should be incorporated into prehabilitation programmes for individuals scheduled for major intra-abdominal surgery.

Take-home message: High intensity interval training can induce rapid cardiorespiratory fitness improvements in the comorbid elderly. HIIT is a feasible way of improving fitness within clinical timeframes.

PC12 RISKS OF PERIOPERATIVE RESUSCITATION WITH CHLORIDE-LIBERAL CRYSTALLOIDS

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Background: Despite debate, 0.9% saline remains the leading choice for intravenous resuscitation worldwide. We examined whether perioperative therapy with chloride-restrictive crystalloids was associated with fewer complications.

Method: After IRB approval, using a multi-hospital repository of electronic medical records (Cerner HealthFacts, Kansas City, MO, USA), we categorized adults as either exposed to 0.9% saline exclusively or to at least 500 ml of chloride-restrictive crystalloids (in addition to or instead of 0.9% saline) over 72 hours after cardiac surgery (CS). Using multivariate regression in propensity-score matched cohorts, with and without pre-existing chronic kidney disease (CKD), we adjusted for differences between exposure groups in: demographics (patient, hospital, and procedural attributes); chronic comorbidities; acute illness; baseline laboratory values; and fluid volumes. Then we estimated the association between exposure to chloride-restrictive crystalloids and, acute kidney injury (AKI), mortality, and complications. We also examined if effects on AKI varied with hyperchloraemia and preoperative creatinine values.

Result: In 11,573 adults who had undergone CS across 63 US hospitals, 86% without and 14% with CKD, when compared with exclusive resuscitation with 0.9% saline, therapy with chloride-restrictive crystalloids was independently associated with lower risk-adjusted odds of AKI and mortality (0.57 and 0.6 respectively with CKD; and, 0.71 and 0.69 without CKD). Chloride-restrictive solutions were

associated with reduced risk of AKI independent of hyperchloraemia and of preoperative creatinine (benefits were greatest between creatinine values of 1-2 mg/dL).

Conclusion: Perioperative resuscitation with chloride-restrictive crystalloids was associated with decreased risks when compared with therapy with saline exclusively - especially in patients with pre-existing CKD.

Take-home message: When compared with perioperative intravenous resuscitation with chloride-restrictive crystalloids, exclusive therapy with 0.9% saline was associated with increased risks of acute kidney injury in adults undergoing cardiac surgery, especially among those who had chronic kidney disease prior to surgery.

PC13 A RANDOMISED, CONTROLLED, DOUBLE-BLIND CROSSOVER STUDY ON THE EFFECTS OF ISOVOLUMETRIC AND ISOEFFECTIVE INFUSIONS OF COLLOID VERSUS CRYSTALLOID ON RENAL PERFUSION, BLOOD FLOW AND VOLUME

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Introduction: Hyperchloraemia resulting from infusions of 0.9% sodium chloride has a significant effect on renal blood flow and volume in healthy adults. The purpose of this study was to investigate the effect of crystalloids and colloids with similar chloride concentrations (unlikely to cause hyperchloraemia) on renal blood flow, renal perfusion, renal volume and bladder volume using MRI techniques.

Method: Ten healthy adult males received intravenous infusions of 1.5 L crystalloid (infusion A), 0.5 L colloid (infusion B) or 1 L crystalloid with 0.5 L colloid (infusion C), over 60 minutes in a randomised, double-blind manner, with cross over studies 7 to 10 days later. Blood sampling was performed for haematocrit and chloride. Baseline data were collected from arterial spin labelling to determine renal cortex tissue perfusion and phase contrast MRI to determine renal artery blood flow velocity. Bladder volume was assessed using single shot, fast spin echo sequence with 30 axial contiguous slices.

Result: There were no differences in blood expansion or serum chloride concentrations between the three groups. Renal artery flow decreased in all groups (A, -14.7 %; B, -8.1 %; C, -16.4%) but there were no significant differences between infusion types. Global renal perfusion reduced in all groups (A, -17.2%; B, -9.9%; C, -21.9%).

Conclusion: In the absence of hyperchloraemia, there was no difference in the effects on renal haemodynamics between the three infusions, irrespective of volume or type.

Take-home message: In the absence of hyperchloraemia, there was no difference in the effects on renal haemodynamics between the three infusions, irrespective of volume or whether the infusions contained colloid or crystalloid or both.