Cardiac arrest following the use of hydrogen peroxide – time to reconsider its use

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Hydrogen peroxide has a multitude of uses and its disinfectant properties have been utilised in the cleansing of surgical wounds for many years. It decomposes rapidly to water and oxygen following exposure to tissue catalase which manifests itself with the characteristic ‘bubbling’ seen on application to wounds as oxygen is released. 10 ml of 6% hydrogen peroxide releases 200 ml of free oxygen which can be potentially fatal when absorbed into the vasculature. Despite numerous case reports of oxygen emboli following the use of hydrogen peroxide during surgery, we describe the first case reported to the MHRA.

Description
A 63-year-old female was admitted electively for a revision of above knee amputation under general anaesthesia. The induction and maintenance phase was uneventful until towards the end of the procedure. The wound was irrigated with 50 ml of 6% hydrogen peroxide, the stump was lifted and the surgeon proceeded to dress the wound and bandage the limb. At this stage a sudden drop in end-tidal CO2 was noted followed rapidly by ST segment changes and PEA arrest. ROSC followed 1 mg of adrenaline and one cycle of CPR. A 12 lead ECG and on-table echocardiogram showed acute right heart strain and a provisional diagnosis of pulmonary embolus was made. The patient was stabilised and transferred to the intensive care unit. A CTPA showed no sign of pulmonary emboli and a repeat ECG 4 h following the event showed normal sinus rhythm. The patient was successfully extubated with no evidence of neurological deficit. A repeat echocardiogram 24 h following the event was normal and the patient was discharged home 4 days later.

Discussion
The use of hydrogen peroxide is widespread worldwide and branches across different specialty groups. In 1920 The Lancet reported the use of intravenous hydrogen peroxide by British army doctors in India during an influenza epidemic [1]. They reported positive findings but were aware of the potential risk of oxygen emboli. There are multiple case reports of venous oxygen emboli described in the literature which include stroke and death reported as sequelae [2, 3]. Despite its regular use as a disinfectant there is no evidence that can be found to support this claim. The use of hydrogen peroxide in orthopaedic surgery is to cleat and dry the bony bed before cementing joint prosthesis to increase bone-cement strength. This theory has been tested and has not stood up to further scrutiny [4]. The hazards of using hydrogen peroxide are clear and well reported but the benefits are yet to be proven. As a consequence we believe its use during surgery should be reconsidered.

References

Pecs and Serratus plane block for chest wall analgesia in multiple rib fractures

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We present a case of polytrauma with multiple rib fractures, where a Pecs block and Serratus plane block was effective in providing chest wall analgesia.

Description
A 20-year-old, male motor biker sustained multiple injuries following a road traffic collision. He sustained fractures of left femur, pubic rami, right ulna, right ribs 1, 2, 4-9 and a flail fracture of ribs 8, 9 with a right sided pneumothorax and pulmonary contusion. Initial CT revealed no intracranial or spinal injury. Patient was haemodynamically stable and had a GCS of 15/15. He had a chest drain inserted on the right side. Despite receiving paracetamol, 27 mg intravenous morphine and 30 mg oral morphine the patient was still in severe pain with a score of 3/3 on an abbreviated verbal rating scale. Though he was maintaining oxygen saturation of 96% on 4L/O2, he was unable to deep breathe or cough. Attempts to provide thoracic epidural analgesia, paravertebral and intercostal blocks were abandoned due to excessive pain on movement making positioning impossible. We obtained verbal consent from the patient to perform Pecs and Serratus plane blocks. A mixture of 2% lignocaine and 0.25% bupivacaine with adrenaline was used. 10 ml of the above mixture was deposited with a 22G, 50 mm Stimuplex needle, in-plane under ultrasound guidance, between Pectoralis major and minor, 10 ml between Pectoralis minor and Serratus anterior and 5 ml between Latissimus dorsi and Serratus anterior. Using 9 ml of the above mixture, intercostal nerve blocks were performed for lower rib fractures. The patient’s pain score decreased significantly from 3/3 to 0/3 within 10 min. His respiratory rate decreased from 22/min to 12/min and was able to cough and deep breathe. Optimal chest wall analgesia was achieved for next 5 h, patient made a good recovery after fixation of limb fractures.

Discussion
Effective analgesia is essential in blunt thoracic trauma, to prevent morbidity from pulmonary complications. Positioning patients for thoracic epidural, paravertebral blocks and intercostal nerve blocks can be challenging in polytrauma patients. Pecs block and Serratus plane block have been described as a mode of analgesia for breast surgery involving the axilla [1, 2]. Our case demonstrates the successful use of Pecs and Serratus plane block to provide analgesia for multiple rib fractures. Advantages of the block in this setting are supine positioning of the patient, easy superficial sonoanatomy and the simple skills required to perform the block. In future, for prolonging the duration of effective analgesia, we would consider catheter insertion and infusion of local anaesthetics.

References
High flow nasal cannula as an oxygen delivery device during awake fibreoptic intubation

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Awake fibreoptic intubation (AFOI) is widely performed for anticipated difficult airway management. However, patients remain at risk of hypoxia due to the sedation, application of local anaesthesia, complications of the procedure and the nature of the pathology. Recently, high flow humidified oxygen via nasal cannula (HFNC) has been adopted as an oxygen delivery system. We report our experience of using HFNC for AFOI.

Description
We reviewed 20 cases where AFOI was performed using Optiflow™ (Fish & Paykel Healthcare, UK) to deliver oxygen. All cases had complex oro-pharyngeal or laryngeal pathology. The mean (SD) body mass index of the patients was 26.95 (8.57) kg.m⁻² and mean (SD) age was 60.73 (13.53) years. Mean (SD) baseline oxygen saturations (SpO₂) was 98.3 (1.6) %. The oropharynx was anaesthetised in all patients with 4% lignocaine and 100 mg cocaine was applied to the nasal passage in 15 patients for nasal intubation. Conscious sedation was administered via target controlled infusions of remifentanil and propofol. Optiflow™ 30 to 60 L.min⁻¹ was applied before onset of sedation until successful tracheal intubation was confirmed and tracheal tube connected to the ventilator, a mean (SD) time of 19.14 (2.93) min. Mean (SD) SpO₂ immediately post intubation was 99.9 (0.4) % and mean end-tidal carbon dioxide was 4.7 (0.6) kPa. There were no desaturations during any procedure, nor any cases of apnoea or airway trauma. During the routine post-operative visit all patients reported a comfortable experience in terms of oxygen application.

Discussion
The 4th National Audit Project of the Royal College of Anaesthetists (NAP4) highlighted how awake intubation techniques can fail [1]. Challenging anatomy combined with over-sedation, changes in dynamic inspiratory airflow with local anaesthesia and airway trauma or vomiting leading to partial obstruction, are all potential causes. Previous AFOI studies have shown the incidence of desaturation below 80% to be 1.5% with low-flow nasal cannula [2] and significant desaturation has been reported in groups using a nasal probe [3]. With HFNC the high flow rate provides a nasopharyngeal reservoir of oxygen allowing a higher FIO₂ to be delivered and a low level of positive expiratory pressure [4]. The humidification of inspired gases aids mucus-ciliary clearance and increases patient comfort. Our case series suggests HFNC can be tolerated in patients undergoing AFOI and HFNC may be one option to minimise the potential risk of desaturation.

References

Accidental intra-arterial injection of rocuronium via misplaced intravenous cannula

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We present a case of accidental cannulation of the dorsal carpal branch of the radial artery (DCR) with subsequent intra-arterial injection of rocuronium.

Description
A 74-year-old woman was anaesthetised for an emergency laparotomy. After induction we inserted an 18 gauge cannula on the lateral aspect of the right wrist, attached Hartmann’s solution and injected 40 mg of rocuronium. While positioning the patient we noted the patient had mild blanching of the right thumb and forefinger which worsened with flushing of the drip. We recognised arterial cannulation, stopped the drip and the blanching resolved. 20 mg of lignocaine was given intra-arterially to prevent vasospasm. The operation proceeded uneventfully and on recovery we explained the error to the patient and sought vascular opinion. No further treatment was necessary and regular neurovascular examination of the hand over the next 24 h was normal. Four days later we examined the patient and noticed the left side of her body was underdeveloped. A 4 mm dilated, tortuous DCR ran across the right radius into the anatomical snuff box in the space usually occupied by the cephalic vein. The vessel had a palpable pulsation, was easily compressible, did not collapse when cuff pressure exceeded systolic and displayed no vasomotor activity. Ultrasound confirmed the presence of a dilated DCR in the normal anatomical position with a poor ulnar supply on the right and a poor radial supply on the left.

Discussion
To our knowledge this is the second reported case of intra-arterial injection of rocuronium [1]. In the first, brachial artery injection resulted in hyperaemia and delayed capillary refill, and was treated with lignocaine and heparinized saline without adverse outcome. We observed transient localised blanching without perfusion compromise, probably reflecting the smaller area supplied by the DCR. Treatment can include limb elevation, local anaesthetic injection, anticoagulation and stellate ganglion block. Warning signs can be subtle and a high index of suspicion is necessary. Pressure transducing and blood gas analysis can be helpful; however cannula removal is safest if any uncertainty remains. Anaesthetists should be aware that the DCR lies close to the cephalic vein at the wrist. In summary our patient had a non-locomotor non-collapsing ectatic DCR [2] in the position of the cephalic vein. These factors contributed to accidental arterial cannulation. Whether her haemiplasia and asymmetrical vascularity played a role is uncertain.

<table>
<thead>
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<td>Pulsatile flashback with redder than expected blood</td>
<td>Blood pressure cuff inflated above systolic, post pre-oxygenation with 100% oxygen</td>
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<td>Palpable pulse proximal to the cannula</td>
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<td>Distal sign of ischaemia</td>
<td>18 gauge cannula in 4mm branch vessel without vasomotor activity</td>
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<td>Painful cannula insertion</td>
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Table 1 Warning signs of arterial cannulation.

Acknowledgements
Published with the written consent of the patient.

References
Optimisation of cardiac output using milrinone monitored by LiDCORapid™ in a patient with severe peripartum cardiomyopathy undergoing elective caesarean section

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Peripartum cardiomyopathy (PPCM) causes major morbidity and mortality and management requires a multidisciplinary approach. This case report demonstrates the use of cardiac output (CO) monitoring to optimise haemodynamic stability and isotropic support during operative delivery.

Description
A 37-year-old woman was diagnosed with PPCM 3 months postpartum. Trans-thoracic echocardiography (TTE) showed sinus rhythm, a moderately dilated left ventricle (LV), severely impaired systolic function and an ejection fraction (EF) of 31%. A month later she fell pregnant despite being counselled about the risks of pregnancy and PPCM. Her breathlessness during moderate exertion remained stable barring one exacerbation at 27 weeks. Elective caesarean section was expedited at 37 weeks due to increasing breathlessness. Medication included bisoprolol 10 mg bd, furosemide 80 mg od and enoxaparin 100 mg bd, stopped 36 h pre-operatively. Prior to surgery the patient was able to climb 1½ flights of stairs and repeat TTE was unchanged. For surgery, a de novo epidural was chosen to reduce haemodynamic instability. Arterial BP, LiDCO™ CO monitoring and central venous access was obtained. Extracorporeal membrane oxygenation was available in case of decompensation. Epidural anaesthesia was established to reduce haemodynamic instability. Arterial BP, LiDCO™ CO monitoring was essential for this case to maintain adequate CO and arterial BP in the face of many factors that act to destabilise the patient’s cardiovascular system e.g. poor LV function, epidural sympathetic blockade, uterotonic drugs and inotropes. The LiDCORapid™ has been shown to be a reliable, minimally invasive, CO monitor in high risk obstetric patients [1]. The use of milrinone in obstetrics has been reported previously [2]. We used this drug to increase myocardial contractility and reduce afterload.

Figure 1 Cardiac output measurements.

References

Sevoflurane Dräger 2000 Vaporiser ‘locked on’ during maintenance of anaesthesia

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The accurate delivery of volatile anaesthetic agents is an integral part of the safe induction and maintenance of anaesthesia. It is important to be aware of the equipment malfunctions that can occur with modern day vapourisers to minimise adverse outcomes.

Description
A 4-year-old female patient presented for elective dental extraction. She was normally well (ASA I) and weighed 20 kg. The anaesthetic plan was for an inhalational induction followed by insertion of a laryngeal mask airway (LMA). The anaesthetic machine was checked prior to use in accordance with the AAGBI guidelines [1]. The patient was induced with 100% oxygen, sevoflurane and nitrous oxide. The induction was uneventful and the patient was self-ventilating and oxygenating well. An attempt was then made to reduce the inspired sevoflurane concentration from 6%, as the MAC was now 1.5. This led to the discovery that the vaporiser control dial could only be moved from 6% to 8% and could not be reduced below 6%. The vaporiser could not be removed from the breathing circuit because the vaporiser-locking arm could not be inserted into the control dial top whilst it was in use. This meant the sevoflurane vaporiser was effectively ‘locked on’. The control dial top of the vaporiser had to be forcibly removed (Fig. 1) to allow the vaporiser to be disconnected from the breathing circuit. The child was switched to a different sevoflurane vaporiser for the remainder of the case. The child’s observations remained stable throughout. On investigation it was discovered that the plastic ‘nib’ on the control dial top had come loose and become trapped in the interlocking system inside the lid. There were no other problems with the vaporiser and it is likely this fault occurred when the volatile was turned on at the time of induction.

Discussion
This case report highlights a technical issue with a Dräger vaporiser (Vapor 2000) that, to our knowledge, is previously unreported. The MHRA issued a report in 2006 alerting that damage to the nibs on the colour coded plastic control dial would compromise the safety interlock system. This enables two vapourisers to be turned on at the same time accidentally [2]. Our case reports the plastic nib becoming trapped inside the interlock system preventing the full range of movement of the control dial top. Discussions with Dräger are ongoing to come up with a solution to prevent this happening again. One option is to lengthen the plastic nib to reduce the risk of it breaking loose.
Consequences of accidental dural puncture with an introducer needle for emergency caesarean section

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The introduction of safer spinal needles in 2012, following National Patient Safety Agency alert. NPSA/2009/PSA008B, has had a mixed reception. We report a case of accidental dural puncture (ADP), occurring with the introducer of a non-luer spinal needle, and subsequent patient morbidity. To date, we believe this is the first report of dural puncture with non-compatible needle-syringe combination.

Description

A parturient, with a BMI of 24, at term required an emergency caesarean section (CS) due to cord prolapse. Spinal anaesthesia was performed with a Neuracal® 25 Gauge 90 mm Whittacre needle (Vygon). The injectate was prepared using our hospital’s standard regime in a 3 ml Surety® syringe. Following insertion of the introducer free flow of cerebrospinal fluid (CSF) was seen. The injectate was unable to be administered via the luer connector on the introducer. The introducer was withdrawn slightly, the spinal needle was advanced through the introducer, CSF flow was again observed and the injectate administered. Unfortunately, the block achieved was not sufficient for surgery to commence so general anaesthesia was administered. The following day the patient exhibited symptoms consistent with post dural puncture headache (PDPH) and required two epidural blood patches.

In the same week, another case of introducer associated ADP occurred on our unit. This was for another peri-partum procedure in which the spinal anaesthetic was successful, with no morbidity arising from the dural puncture. These events prompted examination of the equipment available in our centre (Fig. 1).

Discussion

PDPH is a recognised complication of spinal anaesthesia, and ADP with the introducer has been reported, with and without subsequent headache [1, 2]. These occurred with luer connection needles and syringes. Concern was raised during the introduction of safer spinal needles, that in the event of ADP the operator would be unable to inject the anaesthetic via the introducer [3], as might previously have occurred. We wish to highlight the variation in length, up to 30%, of the introducer needles available; additionally it was alarming that the longest introducer measured 39 mm, as our patient’s epidural space was located at less than 35 mm.

Figure 1 Spinal needles available on our unit. Top to bottom: Neuracal® 25G 90 mm Whittacre (Vygon), Surety® 25G 103 mm Sprotte, Surety® 25G 90 mm Sprotte (Pajunk®). The introducers on the top two needles are 30% longer than the bottom two.

Acknowledgments

We thank the patient for her consent.

References


Sugammadex: an adjunct in rocuronium anaphylaxis?

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Anaphylaxis during anaesthesia is a rare event. However, in such cases, neuromuscular blockade is the most common cause [1], with rocuronium being the principle offender [1]. Following the introduction of sugammadex for reversal of rocuronium-induced neuromuscular blockade, there have been a small number of case reports in its use in suspected rocuronium-induced anaphylaxis [2, 3].

Description

We present a case of a 47-year-old Asian male given sugammadex as a treatment for suspected rocuronium anaphylaxis. The patient was admitted to the Intensive Care Unit with leptospirosis sepsis. On day 4 he was intubated due to respiratory failure using propofol, fentanyl and rocuronium. This was unforeseen.

A repeat dose of rocuronium was given on day 5 to improve ventilator synchronisation. Immediately following this he developed severe bronchospasm and tidal volumes dropped significantly. He became hypotensive and noradrenaline requirements increased dramatically. Despite this the patient had a cardio-respiratory arrest (pulseless electrical activity). Following one cycle of cardiopulmonary resuscitation and a single bolus of adrenaline a return of spontaneous circulation was achieved. Severe anaphylaxis was diagnosed and treated with hydrocortisone, chlorphenamine and adrenaline. Despite this, there was no improvement in bronchospasm or haemodynamic stability after 10 min. Therefore sugammadex 400 mg was given. Oxygen saturations and bronchospasm rapidly improved within minutes and ventilation eased. Rocuronium-induced anaphylaxis was not definitively confirmed as the patient died from multiple organ failure on day 10.

Discussion

Rocuronium was the only additional drug given before the patient deteriorated and was the presumed culprit. This case highlighted a significant, rapid clinical improvement following sugammadex administration after rocuronium administration, although it is unclear what role routine medical management may have contributed to this. The exact mechanism of sugammadex in rocuronium anaphylaxis is unknown and rationale for its use in this context remains questionable [4]. Nevertheless, this case and other case reports suggest that the use of sugammadex can assist rapid clinical improvement in presumed rocuronium-induced anaphylaxis. Evaluating the available evidence we would advocate the consideration of sugammadex use in titrated doses [3] in suspected rocuronium anaphylaxis.

Acknowledgements

City Hospital, Birmingham.

References

Designing a dedicated transfer trolley for major trauma patients

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Accurate injury determination is vital in major trauma patients and CT has a critical role in this. Major Trauma Centres (MTC) are benchmarked nationally on criteria set by the Trauma and Audit Research Network including CT scanning these patients within 30 min. This is a challenging target to meet as the time frame must include handover from prehospital teams, primary survey and treatment of life threatening injuries, initiation of full physiological monitoring, and safe and rapid transfer to the CT scanner.

Description
University Hospital Southampton is one of 17 MTC. Switching from diagnostic and treatment initial stage to transfer to CT mode previously involved a cumbersome transfer of monitoring, ventilator equipment and infusion pumps. Commercially available generic transfer trolleys exist, but are typically large and cumbersome, usually intended for inter hospital transfers. We describe the design and implementation of a transfer trolley, specifically intended for rapid transfer of major trauma patients between the ED, CT scanner and other hospital departments. The aim was a trolley that could be used right from patient arrival, and throughout intubation and other emergent procedures, subsequently avoiding the need for multiple transfers of vital monitoring during this potential period of instability. Space is at a premium within our busy Emergency Department Resuscitation Room. It was critical that the Trauma Team Leader had uninterrupted sight line access to the team and patient and that the Trauma Team could work around the patient with the trolley attached. It needed to be easily manoeuvrable, utilisable as the sole monitoring during the scanning process, and able to carry all monitoring equipment as well as a ventilator, oxygen, suction, warming device, infusion pumps and rapid transfusion device. Successive prototypes were designed each with adjustments made after review by clinical staff. Finally, after a consultation period, the trolley was put into active service in 2014.

Discussion
The trolley has exceeded expectations. It carries all vital equipment plus additions such as that for patient warming. It allows seamless monitoring of the major trauma patient through their immediate admission period to improve patient safety. It is improving time to CT as well as reducing interruptions to patient treatment through unnecessary delays while switching from hard standing to portable equipment. We believe we have significantly improved both patient safety and the care that the major trauma patient receives through a purpose built piece of equipment designed through a clinician and engineering partnership.

Premedication using combined oral midazolam and ketamine for patients with developmental delay and/or behavioural difficulties

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Anaesthesia for patients with developmental delay and/or behavioural difficulties can be problematic. If premedication is needed, often larger doses of sedative medication for effective analgesics are required, with good results in as few as 65% when midazolam is used alone [1]. Combined midazolam and ketamine shows improved efficacy [2] whilst reduction in individual drug doses provides a better safety profile. Our aim was to produce a guideline for combined oral midazolam and ketamine premedication in challenging cases of developmental delay and/or behavioural difficulties and we present details of the small case series where it has been successfully used.

Description
A literature search was undertaken reviewing combined midazolam and ketamine as premedication. Studies demonstrated that doses of 0.5 mg/kg midazolam and 3 mg/kg ketamine given together orally up to 30 min prior to procedure produced a calm compliant patient, without excessive sedation, salivation, nausea/vomiting or delirium. No evidence of desaturation or bradypnoea [3] and no significant delay in discharge from recovery has been shown [3]. Combining the literature with the logistics of our ward and theatre environments we produced our guideline. It has been used on 6 cases, including adult and paediatric patients, all with severe behavioural difficulties associated with developmental delay. All cases involved anaesthesia for dental surgery. 2 cases required ‘Best Interests’ meetings due to previous failed attempts at premedication causing cancellation of cases. All 6 cases using the combined premedication led to successful anaesthesia where preoperatively the patient was calm and compliant but not over sedated. No airway complications and no delayed discharges were noted. In all cases the parents/careers were satisfied with the result.

Discussion
We have produced a guideline to be used by anaesthetists at our trust for the premedication of challenging cases of developmental delay and/or behavioural difficulties where behaviour modification rather than sedation is the key. The guideline has been formally reviewed by the trust sedation committee, our anaesthetic peers, theatre and ward staff. It has been successfully applied clinically in 6 cases at our trust, including cases where previous midazolam premedication had been inadequate leading to unsatisfactory perioperative experiences. The case series is small but we feel that success lies in the appropriate selection of cases.

Acknowledgments
We would like to thank Dr Simon Courtman, Plymouth Hospitals NHS Trust, for his information and advice.

References
Evaluation of Masimo pronto-7 point of care haemoglobin oximeter (Spo2Hb) compared with standard laboratory based haemoglobin in pre-assessment clinic context

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Pre-operative anaemia is common and an independent risk factor for a complex peri-operative course. The commonest cause of anaemia is treatable iron deficiency. If detected and treated early, it is possible to place patients in a lower risk group pre-operatively. This device offers the advantage of returning a result within 60 s and is non-invasive.

Methods

In line with standard quality control measures for laboratory based tests we evaluated this non-invasive finger probe oxymetric haemoglobin measurement device on all patients who consented, who were having blood tests as part of their pre-operative assessment clinic visit. To assess accuracy, we compared the results of the device with those of the laboratory based Sysmex haemoglobin analyser and constructed a Bland–Altman plot. To assess precision we tested 2 single individuals more than 10 times each and compared with our laboratory approved POCH-i full blood count point of care device and present mean, standard deviation and coefficient of variation.

Results

Patient 1 – Range 130–143 g/l Mean 135.5 SD 4.8 CV 3.5% POCH-i 129 and 127 g/l
Patient 2 – Range 109–145 g/l Mean 131 SD 9.6 CV 7.4% POCH-i 142 and 146 g/l

Agreement between the 2 devices was within 5 g/l for 21 of 54 samples (39%). One standard deviation of the difference between the 2 devices was between -18 g/l and +5 g/l and 72% of samples were within this range. However, of those patients who were outside of 1 SD from the mean of this difference, 4/7 (total sample 54) or 57% were anaemic and hence were our target population. The device only flagged up 2 patients as anaemic, both of whom were anaemic on our laboratory based test.

Discussion

Our pre-assessment service does not currently have access to point of care haemoglobin testing, although in the peri-operative setting, POCH-i FBC, Hemacue and blood gas haemoglobin are available. Based on the results of this current evaluation we could not make the economic case for introduction of this device at present although we are actively considering the other point of care devices which are already available in the trust. Were this technology to improve in terms of accuracy it would be very attractive as it scored consistently highly in terms of patient satisfaction on account of being non-invasive, which none of the other devices are.

Acknowledgements

Many thanks to Charlotte Rowlands (Masimo) for assistance.

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Comparison of initial flow in single and double-hole pencil point spinal needles

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The double-hole pencil point spinal needle has two openings just proximal to the tip of the needle and this design may reduce the time taken to visualise cerebrospinal fluid in the hub of the needle when compared to a single-hole pencil point needle.

Methods

We designed an experiment to assess time taken to visualisation of fluid in the needle hub comparing a 25G 103 mm double-hole pencil point (DHPP) spinal needle (Eldor Spinal Needle, Eldor CSEN, Jerusalem, Israel) with a 25G 103 mm single-hole (SHPP) pencil point spinal needle (Polymedic®, Temena, Carrières-sur-Seine, France). The cerebrospinal fluid (CSF) space was modelled using a fluid filled measuring cylinder with a hole at the base through which the introducer needle and spinal needle was inserted. The fluid used in the model was 0.9% sodium chloride solution with a dye added to aid detection of fluid in the hub of the needle. Time taken to first visualisation of fluid in the needle hub was measured at pressures of 10 cmH2O and 20 cmH2O to simulate CSF pressure in the lateral and sitting positions respectively [1]. For each experiment unblinded measurements were conducted by two independent observers.

Results

The time taken to visualise fluid in the needle hub with both low and high pressure models was significantly greater with the DHPP needle. At 10 cmH2O the mean (SD) time taken was 3.59 s (0.45) with the SHPP needle compared to 7.76 s (3.60) with the DHPP needle (p-value 0.0019). At 20 cmH2O the mean time taken was 1.19 s (0.32) with the SHPP needle compared to 2.69 s (0.68) with the DHPP needle (p < 0.0001).

Discussion

Visualisation of CSF in the hub of a spinal needle is the endpoint sought to confirm correct placement of the needle when performing a subarachnoid block. Delay in visualisation may make the procedure more challenging and should be minimised where possible. This study has demonstrated that the time taken for fluid to appear in the needle hub is significantly greater with DHPP spinal needle compared to the commonly used SHPP needle. The reason for this delay is unclear; it could be due to the combined area of the two holes being less than the area of the opening in the single-hole spinal needle or alternatively the two hole configuration may reduce flow due to altered fluid dynamics.

Reference

Development of a realistic epidural simulator – a translational research project

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Epidual insertion is considered a difficult technique, and has an inevitable learning curve [1]. Complications, including post dural puncture headache (PDPH) are still a cause of significant morbidity [2]. A variety of haptic and traditional physical epidural simulators exist which aim to improve training and reduce complications, but they lack realism and are not widely used. A highly portable five-layered silicon epidural simulator has been developed through several iterations of local testing and expert opinion. This study aims to assess the current model at five UK centres.

Methods
Following ethics and R&D approval, anaesthetists with a range of experience from five UK centres (Abertawe Bro Morgannwg, Cardiff and Vale, Cwm Taf, Leicester and Nottingham) were consented to perform an epidural on the simulator with their preferred technique. Each anaesthetist completed a questionnaire evaluating the ‘feel’ of five different layers – skin, subcutaneous tissue, supraspinous ligament, interspinous ligament and ligamentum flavum, and an overall assessment. A visual analogue scale (VAS) was implemented with a scale ranging from ‘too soft’ (0 cm) to ‘too hard’ (10 cm). The VAS midpoint (5 cm) was labelled ‘about right’.

Results
One hundred and forty one anaesthetists with experience ranging from 1.25 to 39 years evaluated the simulator. Collective VAS scores from all layers were non-parametric (Kolmogorov-Smirnov < 0.05) and resulting box and whisker plots are shown in Fig. 1.

Discussion
Of the participants, 30% had previous experience of using an epidural simulator and only two participants stated that previous models were better than this one. Median VAS scores for subcutaneous tissue (5.0 cm), supraspinous ligament (5.0 cm), interspinous ligament (5.1 cm) and ligamentum flavum (5.3 cm) were close to the target score of 5 cm. Although participants felt that the skin was too soft (3.6 cm), the median VAS score for overall assessment was on target (5.0 cm). It is speculated that the wide range of opinion reflects individual variation in visual and haptic perceptions during epidural insertion. Data gathered during this evaluation will help in further development of this simulator. This could provide an excellent training tool, allowing reflective learning and practice before advancing onto real patients. Such a tool has potential to reduce the incidence of complications and improve patient safety.

Figure 1 VAS results. The ideal score is five.

Acknowledgements
The simulator was developed in collaboration with MBI (Wales) Ltd with an I4I NIHR grant.

References

An observational cohort study into the effects of altruistic live related kidney donation on recipient and donor groups as measured by cardiopulmonary exercise testing (CPET)

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Over the last 10 years, demand for renal transplant has grown by around one third whereas the supply of donor organs is largely unchanged [1]. The number of living donors has gradually risen to address an increased demand, requiring otherwise healthy individuals to undergo major surgery. Chronic kidney disease is associated with chronic exercise intolerance and heart failure; whether donation has such physiological consequences has not, as yet, been investigated. This prospective observational cohort study sought to compare CPET outcomes between live related kidney donors and their respective recipients in the immediate peri-operative period.

Methods
Fifteen matched live related kidney donors and recipients were recruited to the study. Each patient underwent CPET on a cycle ergometer using a standardised protocol. CPET, Duke Activity Scale Index (DASI) and and blood tests were conducted in the immediate pre-operative period, at 6 weeks and 12 weeks postoperatively. SPSS was used to analyse data using Wilcoxon signed rank test.

Results
Anerobic threshold (AT) increased by 21.6% at 6 weeks (p = 0.05) and by 39.6% at 12 weeks (p = 0.001) post renal transplantation. In contrast, renal donation was associated with a 20.0% reduction in AT at 6 weeks (p = 0.001), before a return to baseline at 12 weeks. Neither group showed a significant change in VE/VCO2. There was significant decrease in V02 peak in the donor group at 6 weeks (p = 0.011) which also resolved by 12 weeks. However the trend toward an increase in V02 peak post transplantation failed to reach significance. The DASI score mirrored the changes in AT in the donor group, there was a 19.5% decrease in DASI score at 6 weeks (p = 0.03), before a return to baseline. However there was no relationship between DASI score and AT in the recipients. Changes in Hb mirrored the changes in AT in the recipient group, however there were no changes in Hb in the donor group.

Discussion
The data suggest that recovery from renal transplantation and donation are different. Renal transplant is associated with an increase in AT suggesting a reversal of the chronic exercise intolerance associated with CKD. Donation is associated with an initial fall in exercise tolerance, reversed at 3 months, suggesting that chronic exercise intolerance is not a feature of renal donation. The

<table>
<thead>
<tr>
<th>Lines related recipients</th>
<th>Lines related donors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op</td>
<td>6 weeks</td>
</tr>
<tr>
<td>Anaerobic threshold (AT)</td>
<td>77.4 (6.7)</td>
</tr>
<tr>
<td>(mmol L⁻¹)</td>
<td></td>
</tr>
<tr>
<td>Ventilation equivalent for VCO2 (kcal/min)</td>
<td>26.3 (2.0)</td>
</tr>
<tr>
<td>Peak oxygen uptake</td>
<td>38.5 (4.0)</td>
</tr>
<tr>
<td>(mL/min/1.73 m²)</td>
<td></td>
</tr>
<tr>
<td>Duke Activity Scale Index (DASI)</td>
<td>91.1 (16.7)</td>
</tr>
<tr>
<td>(index DASI)</td>
<td></td>
</tr>
<tr>
<td>Serum total cholesterol</td>
<td>169.5 (29.4)</td>
</tr>
<tr>
<td>(mg/dL)</td>
<td></td>
</tr>
<tr>
<td>Serum HDL cholesterol (mg/dL)</td>
<td>51.4 (11.0)</td>
</tr>
<tr>
<td>Serum triglycerides (mg/dL)</td>
<td>132.0 (32.0)</td>
</tr>
</tbody>
</table>

changes in AT do not appear to be explained by peri-operative changes in Hb. DASI scores broadly appear to correlate with these findings.

References
The application of cricoid pressure during rapid sequence induction – time to let go and grab an ultrasound?

A. Fearnley, S. Badiger and I. Ahmad
Guy’s and St Thomas’ NHS Foundation Trust, London

The application of cricoid pressure during rapid sequence induction in patients at high risk of regurgitation is considered standard practice [1]. The validity of this manoeuvre has been questioned due to variations in the anatomical relationship between the upper oesophagus and the cricoid cartilage and the deleterious effects the manoeuvre may have on laryngoscopy [2, 3]. Any benefit from the technique will only be realised if pressure is applied at the correct location in the neck. The aim of this study was to determine the accuracy with which anaesthetic assistants are able to identify the cricoid cartilage and explore a possible role for ultrasound in helping to identify this important landmark.

Methods

Four healthy volunteers underwent neck ultrasound to identify the cricoid cartilage. The cricoid cartilage was marked with an invisible ultraviolet marker pen and then covered with a clear occlusive dressing. Twenty anaesthetic assistants were enrolled as candidates. Each candidate was invited to examine each volunteer in turn and mark where they thought the cricoid cartilage was using a non permanent marker pen. The neck of each volunteer was then examined using a handheld ultraviolet light in the presence of the anaesthetic assistant to reveal the true location of the cricoid cartilage. Any discrepancy was measured and recorded. The mark drawn was then removed with an alcohol wipe ready for the next candidate. Data was collected and analysed using non parametric statistical analysis.

Results

Anaesthetic assistants accurately identified the cricoid cartilage in 21% of attempts, were within 5 mm in 44% of attempts and were more than 15 mm above or below the cricoid in 21% of attempts (median 0 mm (IQR 6 mm to 7.3 mm [range –32 to 43 mm])). There was no statistically significant difference in the accuracy of localisation of the cricoid cartilage between anaesthetic assistants of differing levels of experience, p = 0.16.

Discussion

More than 50% of attempts to provide cricoid pressure during rapid sequence induction may be ineffective due to inaccurate identification of the cricoid cartilage. More than 50% of patients may gain no protective benefit from this manoeuvre during rapid sequence induction due to a failure to accurately locate the cricoid cartilage. Laryngoscopy may be made more difficult despite a lack of any protective benefit. Identification of the cricoid cartilage with ultrasound is a rapid and non invasive procedure that can be mastered with minimal training [4]. The use of ultrasound is likely to maximise the efficacy of cricoid pressure during rapid sequence induction.

References


Developing a phantom model for caudal anaesthesia

K. Fraser, J. Willers, C. Jenkins, N. Wanigasinghe and D. Uncles
Worthing Hospital

Caudal blocks (CBs) provide effective post-operative analgesia in both paediatric and adult patients. Whilst commercial training models are available to assist learning for neuraxial blocks, no equivalents exist for use in CBs. We set out to develop a simple and realistic CB phantom model for use as an effective teaching aid.

Methods

A plastic model pelvis was used to create the CB phantom. A series of precision holes were milled in the sacrum of the pelvis to replicate the sacral hiatus and a sacral epidural space carefully created in a similar fashion including an anterior drainage hole to drain any injected fluid. A latex surgical glove was stretched firmly over the coccyx to represent the sacrococcygeal ligament. A separate removable plastic insert containing gel beads which expand in size when absorbing water was placed immediately superficial to the glove: the model was covered with 10 mm foam and secured using a 2.0 surgical suture to a skin-coloured quilted padded material fashioned to represent skin folds and buttocks. The model’s design philosophy was to replicate successful needle insertion with a characteristic ‘snap’ and unimpeded injection of fluid into the sacral canal. In contrast, too superficial an injection would result in activation of the gel beads to cause bulging over the sacrum, simulating subcutaneous injection. The model was evaluated as a teaching tool by 20 anaesthetists in our institution employing established criteria for simulator assessment by questionnaire using a 5 point Likert scale (1 strongly disagree – 5 strongly agree). A 20 G cannula was used to perform the block and sterile water used as a local anaesthetic substitute.

Results

Anaesthetists’ evaluations were analysed (Table 1). There was a strong positive response to this new teaching resource from both groups of anaesthetists.

Table 1 Question responses from anaesthetists with (n = 10) and without (n = 10) clinical experience of performing caudal anaesthesia. Median score (with IQR [range]).

<table>
<thead>
<tr>
<th>Questions</th>
<th>With CB experience</th>
<th>Without CB experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model appears a reasonable substitute for practice</td>
<td>4 (4.4 [3.4])</td>
<td>4 (3.5–4.5 [3.5])</td>
</tr>
<tr>
<td>I am now more comfortable with the equipment</td>
<td>4 (3.75–5 [3.5])</td>
<td>4 (4–5 [3.5])</td>
</tr>
<tr>
<td>I would be more confident performing on a patient</td>
<td>4 (3.45–4.5 [3.5])</td>
<td>4 (3.5–4.5 [3.5])</td>
</tr>
<tr>
<td>The model reasonably resembles the real thing</td>
<td>4 (4.5 [4.5])</td>
<td>4 (4.4–4.5 [4.5])</td>
</tr>
<tr>
<td>It is a useful training aid for inexperienced trainees</td>
<td>4 (4.5–5 [4.5])</td>
<td>4 (4.5–5 [4.5])</td>
</tr>
<tr>
<td>Trainees should use before ‘practising’ on patients</td>
<td>5 (4.5–5 [4.5])</td>
<td>4 (4.5–5 [4.5])</td>
</tr>
<tr>
<td>I would use this model for teaching</td>
<td>5 (4.75–5 [4.5])</td>
<td>4.5 (4.5 [4.5])</td>
</tr>
<tr>
<td>Would you recommend this learning tool to others</td>
<td>4.5 (4.5 [4.5])</td>
<td>4.5 (4.4–4.5 [4.5])</td>
</tr>
</tbody>
</table>

Discussion

Whilst phantom models cannot replace the experience gained from performing CBs on patients, they can increase confidence in trainees by possessing a greater familiarity with correct anatomical landmarks and equipment used and the requirements for correct injection of local anaesthetic for a successful block. They may also assist preparation for professional examinations.

Reference

A novel, low-cost reusable ultrasound phantom for chest drain insertion

K. Hunter, J. Willers, J. Hews, L. Hodgson, T. Malley and D. Uncles
Western Sussex Hospitals NHS Foundation Trust, Worthing Hospital

The use of simulation models for chest drain insertion is well established, with both animal models and commercial synthetic trainers available. The former have organisational and infection control issues. The latter can be costly, with usage restricted to small drains (12FG). Both incur significant costs in carcasses and cartridge replacement. Under the current training regime exposure to chest drain insertion can be limited [1]. A trainee anaesthetist may not insert their first chest drain until working in intensive care. Sparse early experience and the introduction of guidelines for ultrasound use have emphasised the need for training in chest drain insertion [2]. Having successfully developed a self-repairing ultrasound simulator for central line insertion we resolved to investigate whether the same material would withstand the wider diameter dilatation necessary for chest drain insertion.

Methods
The prototype simulator was assembled flat in a plastic tray. We used upholstery foam as a base to represent lung with non-latex exercise band as pleura. To create ribs we used electrical twin and earth cable, which has a similar cross-sectional size and ultrasound appearance. This was positioned on the pleura at appropriate intervals. Intercostal muscles and subcutaneous tissue were moulded using ispaghula husk gel treated with propionic acid as a preservative, and then stuck to the pleura. Another layer of exercise band was used to fashion skin. To test the phantom a coin was tossed and on the intercostal space closest to where it landed an ultrasound probe length (60 mm) was marked and an ultrasound image was obtained with a Sonosite S-nerve using a high frequency probe. Ten consecutive full dilations for an 18F chest drain (rocket) were performed on the same space. Immediately after this, another ultrasound image of the marked space was obtained.

Results
The ispaghula husk phantom remained self-healing with repeated 18FG dilatation. The second image showed minor derangement of the husk pattern, but no track marks revealing the path of dilatation. The pleura remained contiguous. The skin showed 3 mm lacerations at insertion suggesting that it may have to be replaced after more than 3 insertions per centimetre, this is however an extremely simple procedure.

Discussion
We have developed a simple cheap model for chest drain insertion from readily available materials that can be reused multiple times. Further testing is required to assess the model as a simulator compared to existing animal and synthetic apparatus.

References

The incidence of post-operative ketosis and metabolic acidosis

M. Koutra, C. Flynn, S. Jhanji and T. Wigmore
Royal Marsden Hospital, London

Metabolic acidosis is common following major surgery [1]. Figge’s modification of Stewart’s theory of acid base balance provides insight into the pathogenesis of acid base abnormalities [2] more accurately than traditional methods for the assessment of acid-base status including the Henderson-Hasselbach approach and the corrected anion gap (AGcorr) [3]. We have anecdotally noted the presence of ketonuria in patients with unexplained post-operative metabolic acidosis. The aim of this study was to define the incidence of post-operative metabolic acidosis using Figge’s equations compared to more conventional measures. It also aimed to measure the incidence of ketonuria (as an indicator for the presence of ketoacids) following major surgery.

Methods
This observational study was performed in a single NHS Trust. Ethics approval was obtained. Adult patients who underwent major cancer surgery were enrolled. Diabetic patients were excluded. All participants had blood samples taken for blood gas and electrolyte analysis within 1 h of admission to the Critical Care Unit as per local protocol. Base excess (BE) was calculated using the Henderson-Hasselbach equation. Figge’s equations were used to calculate total acids (TAs) and unmeasured acids (UMAs). A fresh urine sample was taken immediately following surgery for dipstick analysis of ketonuria. The strength of correlation between measures of metabolic acidosis was assessed using Spearman’s correlation coefficient (r).

Results
Ninety nine patients were recruited (57 female, median age 58 (IQR 21) years). The incidence of post-operative ketosis and metabolic acidosis was defined as TAs > 5 mEq/l was 45.5%. All acidic patients had positive values for UMAs, 53.3% had hyperlactaemia (serum lactate > 2 mmol/l), 4.4% had ketonuria and 8.8% had both. There was significant correlation between TAs and AGcorr (r = 0.791, p = 0.00), but insignificant correlation between TAs and BE (r = 0.046, p = 0.649) and TAs and ketonuria (r = −0.192, p = 0.057). There was no difference in post-operative fluid therapy between acidic and non-acidotic patients (r = 0.003, p = 0.975).

Discussion
Almost half of the patients who underwent major cancer surgery developed a metabolic acidosis. UMAs as calculated by Figge’s equation were always present in these patients. Although we hypothesised that ketoacids may represent a significant proportion of UMAs, our study demonstrated that ketonuria correlated poorly with TAs. The measurement of AGcorr as a conventional bedside test correlates well with TAs, but may underestimate the incidence of metabolic acidosis in the peri-operative setting.

References
NEAMS – NEuraxial Anaesthesia Midline Signs

B. Parker, R. Isaacs, A. Diddee and M. Wee
1West Hertfordshire NHS Trust, 2University Hospital Southampton NHS Trust, 3Poole Hospital NHS Foundation Trust

Neuraxial anaesthesia is a well established anaesthetic modality. Palpation of the midline landmarks has been shown to be the most important predictor of the ease of regional anaesthesia [1]. When we can’t palpate these landmarks for example in obesity, we have to rely on other signs. We present two practical novel signs to aid location of the midline. The hair follicles in the middle of the back face directly downwards, whilst that on either side are angled towards the midline – the follicular sign. This aids midline location. A Plumb Line from the most prominent vertebral spinous process - C7 - can help find the midline in the back – the C7 Plumb Line Sign [2]. We called these new signs ‘NEAMS’.

Methods
We did a non invasive single blinded study on 15 volunteers. The two signs i.e., the follicular sign and the C7 Plumb Line sign were each compared to the midline located using ultrasound scan, which we considered the Gold Standard. A difference of less than or equal to 0.5 cm between the two signs and the ultrasound location of the midline, we considered clinically insignificant. Pearson Correlation Coefficient was used. Ethics approval was sought and not required.

Results
There was excellent correlation of 0.96 between the follicular sign and the ultrasound location of the midline. A correlation of 0.86 between the C7 Plumb Line Sign and the ultrasound location of the midline, we considered clinically insignificant. Pearson Correlation Coefficient was used. Ethics approval was sought and not required.

Discussion
Direction of hair follicles and the C7 Plumb Line technique can consistently indicate the midline in the back when palpation is difficult. These two non invasive signs can serve as further aids to location of the midline for neuraxial anaesthesia.

References

Comparison of intraoperative fluid therapy targeted by pleth variability index with oesophageal doppler in major colorectal surgery

S. Wannakulasuriya, S. Davies, J. Wilson and D. Yates
York Teaching Hospital NHS Foundation Trust

Goal directed fluid therapy in major abdominal surgery has been shown to reduce complications, hospital length of stay, critical care admissions and to improve recovery of gut function [1]. The majority of studies have investigated targeting values derived from oesophageal Doppler (OD) or changes in the arterial waveform during mechanical ventilation. These methods require the placement of an oesophageal probe or arterial cannulation. The pleth variability index (PVI) is a non-invasive technique which calculates the change in pulse oximeter plethysmographic waveform amplitude with ventilation. It has been shown to predict fluid responsiveness in patients undergoing major colorectal surgery [2]. In this study we compared the volume of fluid administered with goal directed fluid therapy using PVI or OD in low risk patients undergoing major colorectal surgery.

Methods
38 low risk patients were studied in this randomised control trial following ethical approval. All patients had oesophageal Doppler and PVI probes placed and were randomised to have fluid therapy directed by using one of these technologies. The primary outcome was the volume of fluid administered intra-operatively. Intraoperative and postoperative lactate and base excess was measured. Blinded post-operative follow up was carried out for 7 days using the Post-Operative Morbidity Survey (POMS) [3]. Data was collected on 24 h fluid balance, complications and length of stay. Data was analysed using IBM SPSS v 20.

Results
There was no significant difference between PVI and OD groups in mean total fluid administered (1286 ml vs 1520 ml p = 0.300) or mean intraoperative fluid balance (+839 ml vs +1145 ml p = 0.150). Less fluid was administered in the PVI group at 30 min (mean 398 ml vs 578 ml p = 0.004) and 1 h (mean 554 ml vs 862 ml p = 0.006) but there was no significant difference in cumulative fluid administration beyond this time point or in fluid balance at 24 h. There was no significant difference in intraoperative lactate or base excess. Mean lactate measured in the recovery room was significantly higher in the PVI group (1.98 mmol/l vs 1.21 mmol/l p = 0.007) but there was no significant difference by day 1. There was no significant difference in proportion of patients with positive POMS scores at days 1, 3, 5, 7, in total complication rate or in hospital length of stay.

Discussion
In low risk patients undergoing major colorectal surgery there was no significant difference in the volume of intraoperative fluid administered or post-operative outcomes when using non-invasive PVI technology to target fluid therapy compared to OD.

References
An audit of stress ulcer prophylaxis use in a district general hospital HDU/ITU

P. Brock and S. Deshpande
South Tyneside NHS Foundation Trust

Endoscopic studies have shown that stress related mucosal disease can be seen in 75–100% of patients within 24 h of arrival to ITU [1, 2]. While only 0.1–4% of ITU patients will go on to develop clinically significant gastrointestinal (GI) bleeding [3], of those who do develop GI bleeding, mortality is significantly increased 48.5% vs 9% [4]. Therefore, while blanket prescription of drugs to prevent stress ulcers to all HDU/ITU patients is not ideal due to the low level of occurrence of significant GI bleeds and the cost and side effects of these drugs, prophylactic treatment to a high risk group does have clinical value. Identifying those patients who would benefit most from stress ulcer prophylaxis and treating them appropriately was the central goal of this audit.

Methods
A literature review was performed and standards for the audit defined based on the best available evidence. The pre-intervention audit looked at the management of 35 patients at South Tyneside ITU/HDU. A prescribing algorithm based on the literature search results was then produced and introduced into the ITU/HDU. Medical and nursing staff were briefed on the algorithm and it is placed at the start of every patient’s notes. In the post intervention audit 39 patients had their management examined.

Results
Post intervention improvements were seen in the percentage of patients who were appropriately given stress ulcer prophylaxis (100% of those who required treatment post intervention vs 97% pre-intervention). In the group who did not require stress ulcer prophylaxis, there was a fall in those who were given it unnecessarily (33% vs 66%). Overall, there was an improvement in the use of appropriate oral treatment over intravenous (76% vs 33%) and an improvement in the appropriate use of H2 receptor antagonists over proton pump inhibitors (83% vs 0%).

Discussion
The changes in practice as a result of this audit will have decreased the cost of drug administration in the ITU/HDU by increasing the proportion of H2 receptor antagonists and oral drugs that were used. They have reduced unnecessary use of PPI therapy and so reducing their potential side effect burden, particularly reducing the risk of clostridium difficile infection in a population often treated with broad spectrum antibiotics. In addition, they have ensured that patient safety is maximised by giving stress ulcer prophylaxis to all who need it. This has been done with an intervention of minimal cost, is easy to maintain and can be updated as new evidence emerges.

Acknowledgements
The authors have no commercial interest related to this audit. They would like to thank the staff of South Tyneside HDU/ITU.

References

Time interval between neuroaxial block and skin incision in elective caesarean sections – can we be more efficient?

B. Buddeberg and L. Wee
University College Hospital, London

Our obstetric unit delivers 6000 babies per year and has a caesarean section (CS) rate of 30%. We observe variable time intervals between performing the neuroaxial block and surgical incision. A literature search failed to find recommendations for this time interval; but there are reasons why this should be kept to a minimum. Complications of the block may affect maternal and fetal wellbeing [1]; and delays increase costs [2]. Also, a spinal block has a finite duration and delays to skin incision will reduce the amount of time available for surgery. We conducted a study to investigate the time interval between block being ready (defined as loss of cold sensation to T4) and surgical incision.

Methods
Attending anaesthetists were asked to complete a questionnaire for all elective CS performed under neuroaxial block over a 4 week period in Sept-Oct 2013. We defined our own standard as follows: between block ready and surgical incision – 10 min. We aimed to achieve 90% compliance with our standard. Descriptive statistics were performed.

Results
We received 63 questionnaires out of 86 cases. Of these, 59 (68%) were included in our study, 4 being incomplete. Results are shown in the table. Our standard of 10 min between block ready and skin incision was achieved in 58% (34/59) of cases.

Discussion
We selected 10 min for the time interval between block ready and skin incision as our standard as we thought this was a reasonable amount of time for us to complete the World Health Organization (WHO) time out, allow the obstetricians to scrub and prepare the patient for surgery. We failed to achieve 90% compliance with our standard. Improving these figures should improve efficiency. For instance, in our unit we perform 6 CS in an all day list. Losing 10 min per patient totals 60 min which may make the difference between completing the list or not. Failure to complete the list in the time allocated leads to cancellations and over running. Running costs for an operating theatre average out at £1200 per hour [2]. The most common reason cited for the time delay was that the obstetricians were not ready. After presenting our data to the labour ward team, we agreed to introduce measures to improve our time management. We now have the junior obstetrician present at the time of block insertion, who calls the obstetric consultant immediately after injection of the spinal dose. Early observations indicate success of this implementation. We plan to repeat our audit after a year.

References
Patient reported satisfaction following the introduction of an Enhanced Recovery Programme in elective hip and knee arthroplasty surgery

A. Cave, C. Eitel and B. Ayres
St Richard’s Hospital, Chichester

Enhanced recovery programmes are now commonplace in elective joint arthroplasty surgery. The benefits are well described, often related to reduced length of stay, earlier mobilisation and improved patient satisfaction [1]. Chichester and Worthing Enhanced Recovery Programme (CWERP) was introduced into our Trust in July 2012 for all primary hip and knee arthroplasty surgery. We surveyed patients to inquire how the benefits of the programme transcribe to patient satisfaction post-operatively.

Methods
Pre CWERP, all hip and knee arthroplasty patients received a non-standardised approach to premedication, anaesthesia, surgery and postoperative analgesia. Since July 2012, all patients are enrolled into a standardised hip and knee integrated care pathway. Pre-operatively, this involves attendance at a Joint School education class. This 1–2 h session includes education by a nurse facilitator, dietitian, physiotherapist, occupational therapist and anaesthetist, plus question time. Patients are informed of what to expect during their stay and what is expected of them. Two weeks following their hospital discharge, all patients are sent a postal questionnaire, agreed by Kent Surrey and Sussex Enhancing Quality and Recovery Programme [2]. The questionnaire specifically asks questions regarding their satisfaction with the care provided during their admission. A pre-paid envelope is included for their return questionnaire.

Results
A total of 1130 questionnaires were posted to patients between January and November 2013; the return rate of our questionnaire was high at 70%. Most patients (93%) felt they had their questions answered by the multi-professional team and 97% of patients felt they were treated with dignity. The majority of patients (98.4%) felt they were given enough information about their operation and 98% of patients understood the benefits of early mobilisation. Unfortunately 9.7% of patients felt they were not told of possible complications from the surgery; 14.1% of patients did not have the opportunity to discuss their goals and 9.4% of patients were not told whom to contact if worried on discharge.

Discussion
The majority of patients felt they were given enough information about their operation and care and felt their concerns were generally well addressed. However, surgeons need to be more thorough when consenting patients regarding the complications of surgery. Setting of patient goals has now been addressed ever, surgeons need to be more thorough when consenting patients regarding their operation and care and felt their concerns were generally well addressed. How-

References

Royal College of Anaesthetists curriculum review: survey of trainers and trainees

A. Devlin
Royal College of Anaesthetists, London

The Curriculum for a CCT in Anaesthetics was revised in 2010 and since then there have been significant changes in the delivery of postgraduate medical training. In light of this and the recommendations of the Shape of Training Review, the Royal College of Anaesthetists (RCoA) commissioned a review of the Curriculum. This survey was carried out as part of the review.

Methods
The survey comprised both free text and tick-box style questions. All trainers and trainees using the RCoA e-Portfolio were asked to complete the survey. Emails were sent to all Clinical Directors in the UK asking for the link to the survey to be widely disseminated. The survey was also publicised on the RCoA website, social media and the Bulletin. A survey hosting website was used to gather responses. Results were analysed using Microsoft Excel.

Results
There were 3069 responses, giving an overall response rate of 41.7%. 49.9% of trainees and 31.9% of trainees registered with e-Portfolio responded, with higher rates from College Tutors (65.3%), Training Programme Directors (87.1%) and Heads of School (64.3%). The results of the tick-box style questions are shown in Table 1. Strong themes emerged from the text responses. Many respondents said that mandatory Higher Cardiac and Neuro-anaesthesia blocks are depriving them of training opportunities in more relevant areas. A similar number felt that the volume of workplace based assessments is excessive and that they spend time ‘chasing’ these to the detriment of other training opportunities. The assessment requirements of some schools of anaesthesia were criticised as unduly onerous. Others said that they are lacking in emergency anaesthesia experience due to service commitments to ICU and obstetrics, and some trainees felt that close supervision was hampering their independent practice.

Table 1 Results of tick-box survey questions

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am familiar with the contents of the Curriculum</td>
<td>0.6%</td>
<td>3.8%</td>
<td>11.0%</td>
<td>34.8%</td>
<td>49.7%</td>
</tr>
<tr>
<td>I can easily find the information I need</td>
<td>1.7%</td>
<td>9.8%</td>
<td>22.2%</td>
<td>53.1%</td>
<td>13.2%</td>
</tr>
<tr>
<td>The volume of learning outcomes is too great</td>
<td>1.0%</td>
<td>5.5%</td>
<td>40.2%</td>
<td>34.1%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Some areas are irrelevant to the practice of a consultant anaesthetist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The current structure of anaesthetic training meets the needs of a new consultant</td>
<td>3.4%</td>
<td>15.2%</td>
<td>29.8%</td>
<td>48.0%</td>
<td>3.6%</td>
</tr>
<tr>
<td>The Shape of Training review suggests shortening training to 4-6 years.</td>
<td>44.0%</td>
<td>30.7%</td>
<td>7.5%</td>
<td>13.0%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Is this feasible in anaesthetics?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Spiral learning’ is a sound principle on which to base anaesthetic training</td>
<td>2.5%</td>
<td>6.6%</td>
<td>15.7%</td>
<td>57.4%</td>
<td>17.8%</td>
</tr>
<tr>
<td>Is spiral learning well delivered in your school?</td>
<td>12.0%</td>
<td>29.1%</td>
<td>58.9%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion
There was an enthusiastic response to the survey, and the results show that the Curriculum and anaesthetic training in the UK are broadly fit for purpose. The valuable information obtained from this survey will direct the work of the Curriculum Review. The structure of Higher training and the burden of workplace based assessments will now be reviewed in detail as part of this project, and training in emergency and indigent anaesthesia will also be investigated to ensure that trainees are adequately prepared for consultant practice.

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R. Farrands, H. Aladin and R. Sachdeva
Queen Elizabeth Hospital, Birmingham

Safely managing airways is a fundamental anaesthetic skill yet the 4th National Audit Project (NAP4) of the Royal College of Anaesthetists found that a key factor in adverse airway events was the failure to plan for failed intubation. NAP4 recommended that all anaesthetic departments should have an explicit policy to manage unexpectedly difficult or failed intubations including dedicated difficult airway trolleys, providing equipment familiar to staff. We evaluated knowledge of the contents of our departmental difficult airway bags and tested individuals’ knowledge of their location in case of an emergency.

Methods
Seventy-two professionals responsible for airway management in theatres at the Queen Elizabeth Hospital in Birmingham were assessed through an anonymous survey over a 5 day period. Anaesthetic consultants, trainees and operating department practitioners (ODPs) had to describe the equipment required for each plan of the DAS guidelines, provided in the difficult airway bags, record the exact location of their nearest difficult airway bag and mark its location on a floor plan. Based on recommendations from the NAP4 national study, our audit standard was that all anaesthetic professionals should be familiar with the departmental guidelines on failed intubation (the DAS algorithm) and know the exact contents and location of their nearest difficult airway emergency bag.

Results
We showed that only 35% of anaesthetic professionals correctly identified the equipment provided for each plan of the DAS algorithm for failed intubation. Only 50% could accurately describe the location of their nearest difficult airway bag and mark it correctly on the departmental floor plan, whilst 26% were unable to describe the bag’s location. ODPs were better informed than anaesthetists, 61% identifying the correct bag location compared to only 47% of all doctors.

Discussion
Despite published NAP4 recommendations on the provision of difficult airway equipment and training, our results demonstrated that knowledge of the location and contents of the difficult airway bags amongst staff routinely managing airways remains poor. To improve safety within Birmingham the airway bags have been replaced by easily identifiable airway trolleys and training sessions have clarified the trolley contents and location. The departmental induction has been changed to include the location of each difficult airway trolley and floor plans clearly showing the nearest difficult airway trolley are displayed in each anaesthetic room. A re-audit in September 2014 following the next departmental induction will re-test individuals’ knowledge of the departmental emergency airway equipment.

Lung protective ventilation in theatre: can simple interventions change anaesthetists’ behaviour?

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Over 230 million people worldwide require major surgery each year [1]. Mechanical ventilation in theatre is associated with increased risk of post-operative pulmonary complications [1]. There is increasing evidence that high tidal volumes and limited use of positive end-expiratory pressure (PEEP) contributes to this harm [1, 2]. This project examines whether simple low-cost interventions can improve anaesthetists’ in-theatre approach to lung protective ventilation.

Methods
The authors reviewed the evidence and set an audit standard that all patients requiring mechanical ventilation in theatre should be ventilated using 6 ml/kg ideal body weight (IBW) and appropriate PEEP. An observational audit of current practice was performed in December 2013, recording ventilation parameters at hourly intervals for 43 patients. IBW and ventilation as ml/kg IBW were calculated. Results of this audit were presented to our department in February 2014 and four related interventions made. Ideal body weight was calculated for every patient in pre-operative assessment clinic and printed on the summary letter. Anaesthetic charts were modified to include boxes for IBW, target tidal volume, and 15 min recording of tidal volume and PEEP. Charts of IBW for different heights and sexes, along with target tidal volumes were placed in all anaesthetic rooms. Finally, ventilator start-up settings were modified to a low inspiratory pressure (10 cmH2O), higher rate (14/min) and PEEP on (4 cmH2O). We allowed 3 months for colleagues to adjust to these changes, and then re-audited ventilation practices.

Results
The initial audit collected ventilation parameters on 42 patients. Height was available for 30 patients and IBW calculated. On re-audit, data on 41 patients was collected. Height was available for 39 patients. Table 1 shows the proportion of measurements exceeding each ml/kg IBW category for both audits along with the proportion of patients receiving PEEP.

Discussion
Research comparing lung protective and normal ventilation in theatre has suggested that protective ventilation results in fewer pulmonary complications and shorter lengths of stay [3]. This project demonstrates that education and simple interventions, that make calculating target tidal volume (6 ml/kg IBW) easy, can markedly change the ventilation practices of anaesthetists.

Table 1 Comparison of results from initial and re-audits.

<table>
<thead>
<tr>
<th>Initial audit</th>
<th>Re-audit following intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>(% measurements)</td>
<td>(% measurements)</td>
</tr>
<tr>
<td>Over 6 ml.kg⁻¹ IBW</td>
<td>90</td>
</tr>
<tr>
<td>Over 7 ml.kg⁻¹ IBW</td>
<td>65</td>
</tr>
<tr>
<td>Over 8 ml.kg⁻¹ IBW</td>
<td>42</td>
</tr>
<tr>
<td>Over 9 ml.kg⁻¹ IBW</td>
<td>27</td>
</tr>
<tr>
<td>PEEP used</td>
<td>72</td>
</tr>
</tbody>
</table>

References
Audit of the perioperative management of diabetes in a district general hospital over a 12 year period that includes the introduction of recommendations from the 2011 NHS diabetes national guideline

K. Leyden and T. Wright
Northampton General Hospital

This audit series was started in 2002 when a pattern of critical incidents related to the management of diabetes in the perioperative period was recognised. It has been repeated in 2006, 2009 and 2013 with significant changes in our management of diabetes informed by the audit results and national initiatives. The 2013 audit was performed 18 months after the adoption of recommendations from the 2011 NHS Diabetes publication ‘Management of adults with diabetes undergoing surgery and elective procedures: improving standards’ [1].

Methods
We collected the data prospectively by attaching a questionnaire to the front of the audit and incident reporting form that anaesthetists complete for all cases in our hospital. The plasma sodium concentrations relating to the variable rate intravenous insulin infusions (VRIII) were obtained retrospectively from our hospital biochemistry reporting system.

Results
Data for the 2013 audit was collected over 2 months, 2236 forms were completed and 171 identified diabetes giving an incidence in this population of 7.6% (in 2009 1996 forms were completed, 120 identified diabetes – an incidence of 6%, in 2006, 30 were identified and in 2002, 102). Results for 2006 have been omitted from the table because of the small number.

| Table 1 Comparative data for the audit series: | 2002  
(n = 102) | 2009  
(n = 120) | 2013  
(n = 171) |
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Managed using a VRII (‘vidling scale’)</td>
<td>59%</td>
<td>45%</td>
</tr>
<tr>
<td>Managed by manipulation of their normal regime</td>
<td>41%</td>
<td>55%</td>
</tr>
<tr>
<td>Hypoglycaemic preoperatively (CBG ‘Capillary Blood Glucose’ &lt; 4 mmol/l)</td>
<td>16%</td>
<td>8%</td>
</tr>
<tr>
<td>Hyperglycaemic preoperatively (CBG &gt; 12 mmol/l)</td>
<td>12.6%</td>
<td>4.9%</td>
</tr>
<tr>
<td>VR III given 0.45% NaCl/D5% glucose/0.15% KCl as substrate</td>
<td>0</td>
<td>82%</td>
</tr>
<tr>
<td>VR III given 5% glucose as substrate</td>
<td>89%</td>
<td>4%</td>
</tr>
<tr>
<td>Average (mean) change in plasma sodium concentration while on VRII (mmol/l)</td>
<td>to -0.4</td>
<td>to -0.17</td>
</tr>
</tbody>
</table>

Discussion
The NHS diabetes recommendations include; improve preoperative blood sugar control, manipulate normal diabetes medications to achieve good control in the intraoperative period, only use VRII for those who will miss more than one meal and change the substrate fluid for the VRII from 5% glucose to 0.45% saline with 5% glucose and 0.15% (or 0.3%) potassium chloride. While recognising the limitations of a questionnaire based audit conducted in the clinical scenario our audit does appear to demonstrate a good improvement in blood sugar control preoperatively and a large reduction in the use of VR III that will reduce the number of patients exposed to the risks of intravenous insulin administration. A small average reduction in plasma sodium concentrations while on VR III’s was shown in 2009 when 5% glucose was the majority substrate that could not be demonstrated in 2013. This may mean that there is now less risk of postoperative hyponatraemia. Also, our anaesthetic incident reports related to the management of diabetes fell from 33 in 2009 to 18 in 2013.

Acknowledgements
Dr Natasha Robinson, audit and incident reporting system. Dr Kate Solan, Dr Sunjay Bhadresha, Dr Awanee Kumar and Dr Samantha Ellis, work on earlier audits. Dr Anne Kibert, Dr Jonathan Rippin, Diabetologists. Anaesthetic colleagues.

Reference

The ‘anaesthesia shout-out’: a staff survey of a local adaptation to the WHO surgical safety checklist

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The role of the WHO surgical safety checklist in improving patient safety is well publicised. Its benefits include improved teamwork, safety, morale, and reduced near-misses [1]. Additions and modifications to fit the local practice are encouraged [2]. In our hospital, adherence to the WHO checklist is good (> 95%). Despite this, we experienced a few critical incidents around the ‘time-out’. One incident involved serious patient harm due to failure to ventilate an anaesthetised patient following transfer to the operating room. We devised the ‘anaesthesia shout-out’ which takes place following induction of anaesthesia and establishment of monitoring prior to the ‘time-out’. This step requires the responsible anaesthetist to explicitly confirm that the patient is (i) oxygenated, (ii) ventilated and (iii) anaesthetised. Only when this step is completed may the ‘time-out’ be carried out. Following a 6-month period where this adaptation was incorporated into the checklist, we conducted a staff survey to evaluate satisfaction with the ‘anaesthesia shout-out’.

Methods
Questionnaires were randomly distributed to 60 members of staff over a 1-month period, 15 in each staff group consisting of nurses, ODPs, surgeons and anaesthetists.

Results
The shout-out was well-supported by all staff groups. All of the ODP and theatre nursing staff agreed that it improved communication and teamwork. Ninety percent of respondents thought it focused the attention of the theatre team appropriately on the patient. Eighty-eight percent of all respondents agreed that it was a valid component of the surgical safety checklist, and 75% believed it improved patient safety.

Discussion
The ‘anaesthesia shout-out’ received widely positive support. Additional comments included: ‘keeps whole team focused on clinical state of patient’, ‘really helpful to novice anaesthetists and inexperienced ODPs’, ‘great for lists with multiple anaesthetists’ and ‘allows appropriate pause for stabilisation after transfer’. The main proposed benefits were that it focuses attention on the patient and improves teamwork. The WHO ‘time-out’ is traditionally done at a somewhat chaotic time involving staff movement, and patient stabilisation following induction and transfer. This may distract the team from ensuring patient safety. An explicit step to confirm oxygenation, ventilation and adequacy of anaesthesia was introduced in our hospital. Our survey showed that the ‘anaesthesia shout-out’ was appreciated by all staff groups as a valid safety measure, and we believe it may be beneficial to other hospitals.

References
Sedation practise in six acute hospitals – a snapshot survey

South West Anaesthetic Research Matrix
South West Peninsula Deanery, Plymouth

Procedural sedation is central to contemporary medicine. Anaesthetic drugs, increasing complexity of procedures and sicker patients all increase potential for patient harm. However the number of UK hospital patients receiving procedural sedation is unknown. Our trainee research group, the South West Anaesthetic Research Matrix (‘SWARM’) undertook a sprint survey of all procedural sedation administered over 48 h throughout the 6 acute hospitals in the South West Peninsula deanery.

Methods
Conducted simultaneously across 6 hospitals, 73 data collectors comprising SWARM anaesthetic trainees and Peninsula Medical School students enabled capture rates close to 100%. All age groups in all areas of the hospital were included provided that sedation had being given to facilitate a procedure. Basic demographics, location, time, operator grade, drugs and doses were recorded. No attempt was made to measure clinical outcomes.

Results
360 patients aged one to 96 years old were recorded. Principal users were endoscopists (56%), anaesthetists (34%) and cardiologists (13%); 83% of operators were consultants. All sedation after 18:00 took place in theatre with an anaesthetist present; no sedation happened after 23:00. Sedation occurred on a medical/surgical ward 5 times, all in urgent or emergency situations. No sedation took place on the paediatric wards.

The most prevalent hypnotic was midazolam (274/360); 50% of the time it was co-administered with fentanyl, median doses 2 mg and 50 mcg respectively. Propofol was used by both anaesthetists (82/360) and non-anaesthetists (6/360). Fentanyl was the principal analgesic used, most patients receiving 100 mcg or less. Endoscopists generally preferred midazolam/fentanyl combinations, only the cardiology used diazepam.

Discussion
This multicentre prospective survey demonstrates that sedation practice can be audited in acute hospital trusts. Previous National Audit Projects [1, 2] run by the RCoA have measured relevant activity (the denominator) over a short time period. A national study of sedation could use the model presented here to capture rates close to 100%. All age groups in all areas of the hospital were included provided that sedation had been given to facilitate a procedure. No attempt was made to measure clinical outcomes. No attempt was made to measure clinical outcomes.

Acknowledgements
For full contributor list please see http://www.ukswarm.com.

References

Evaluation of post-operative analgesia in patient’s undergoing major maxillo-facial and head & neck surgery

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Our hospital is the regional site for major maxillo-facial and head and neck surgery. We have recently changed our post-operative analgesic regime as a result of guidance from the Medicines and Healthcare products Regulatory agency (MHRA) in June 2013. The MHRA highlighted safety concerns over the routine use of diclofenac and codeine phosphate. Data has shown that the cardiovascular risk with diclofenac is similar to that of the selective COX-2 inhibitors [1]. The MHRA also recommended that coenzyme phosphate use is not recommended in children who are at risk of breathing difficulties due to the potential of airway obstruction [2]. Although our patients are adults, we felt that the potential for airway compromise post-operatively was significant and the potential risks could not be ignored. Therefore since June 2013 our post-operative analgesic practice has changed from the prescription of diclofenac to ibuprofen and codeine phosphate to oxynorm. Due to the change in our prescription we decided to audit our practice to see if we are still providing satisfactory analgesia.

Methods
Twenty patients included with 10 undergoing head and neck surgery and 10 maxillo-facial surgery. We recorded documented pain scores for the first 72 h post-operatively and all analgesia administered. After discussion at departmental audit it was felt our standards should be: (i) 90% of patient pain scores should be 1 or less at any point in the first 72 h post-operatively. (ii) No 2 pain scores should be greater than 1 consecutively. (iii) All patients should be discharged from recovery with a pain score of 0 or 1.

Results
The analgesic regime in our patients revealed a multi-modal approach including regular IV paracetamol, ibuprofen 400 mg 4 times a day and when required 5 mg oxynorm for the maxillo-facial patients, plus regular oxynorm 5 mg 5 times a day for the major head and neck cases. Osteotomy patients all had a hiloform for 24 h post-operatively. 100% of pain scores were 1 or less during the first 72 h post-operatively. 0% of pain scores were greater than 1 consecutively. 100% of patients were discharged from recovery with a pain score of 0 or 1.

Discussion
Our survey has showed that the recent change in the post-operative analgesic regime for major maxillo-facial and head and neck patients, driven by the recent MHRA safety alerts, provides efficacious analgesic control post-operatively. Eighty percent of pain scores were recorded as 0 during the first 72 h post-operatively. 0% of pain scores were greater than 1 consecutively and 100% of patients were discharged from recovery with a pain score of 0 or 1.

Acknowledgements
For full contributor list please see http://www.ukswarm.com.

References

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Epidural catheter migration during patient controlled epidural analgesia: two cases

Sandwell & West Birmingham NHS Trust

Catheter migration for epidural anaesthesia is a rare, but if unidentified, potentially disastrous complication of epidural analgesia [1–3]. We report two cases where patients with epidurals in situ required a caesarean section during labour; case one as a ‘category 2’ (urgent operative delivery for maternal or fetal compromise, not immediately life-threatening) [4] and case two as ‘category 1’ (immediately life-threatening to mother or fetus).

Description

In both cases, earlier insertion of a lumbar epidural had been uneventful and patient-controlled epidural analgesia (PCEA) had been working well. In the first case, immediately prior to bolusing the epidural, significant sensory and motor block was identified by the anaesthetist, with no prior warning from the midwifery team. The catheter was suspected to be intrathecal. It was therefore decided to use the epidural as an intrathecal catheter and 2.5 mg bupivacaine was given to provide regional anaesthesia. The operation was performed without incident. In the second case, epidural catheter migration was not suspected. Aspiration was negative and a full anaesthetic dose of 75 mg bupivacaine was given without test dose. This led to a total spinal anaesthetic and subsequent cardiorespiratory arrest. A perimortem caesarean section was performed. Mother and baby were discharged home after 2 weeks, and at follow up after 6 months had recovered without complications.

Discussion

These cases highlight the importance of vigilance when converting from epidural analgesia to anaesthesia. We advocate a mandatory neurological examination before ‘top up’ and the careful aspiration of all epidural catheters before giving a safe and detectable test bolus. In the event of major complication, early liaison with the obstetric team is vital. In addition, the continued education of allied health professionals is essential in the early identification of developing complications.

References

Ethylene glycol toxicity masked by paracetamol overdose

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Early diagnosis of ethylene glycol (EG) poisoning is time critical to prevent morbidity and mortality. EG is metabolised to glycoaldehyde, and subsequently into glycolic, glyoxylic and oxalic acid which are attributable for EG’s toxicity [1]. Glycolate chemically resembles lactate and in-vitro and in-vivo experiments demonstrate this resemblance to cross-react with L-Lactate enzyme-based assays, such as those used in point-of-care testing, leading to artefactually raised L-Lactate levels [2].

Description
We describe an interesting case of a 64-year-old woman transferred from her local emergency department to a quaternary liver transplant centre following an apparent paracetamol induced hyperacute hepatic failure. Her initial biochemistry showed a pH 6.8, a lactate unrecordably high and an alanine transaminase of 1000. She was commenced on N-acetylcysteine therapy and transferred to a specialist liver intensive care unit. Despite intensive treatment her lactate levels measured by point-of-care blood analysers remained invariably high. On further questioning with the family it was revealed she had access to antifreeze, the major component being EG. She was tested for EG levels which came back positive with a level of 38 mg/l and was commenced on fomepizole.

Results
Despite intensive therapy her lactate levels rose in serum lactate is cleared with normal renal function, however in renal impairment further promotes this rise in serum lactate. CVVHF removes both metformin and excess lactate, early, thereby reducing mortality and morbidity [4].

Discussion
Since the UK Prospective Diabetes Study, metformin has become the drug of choice for overweight diabetic patients [1]. It decreases blood glucose levels by decreasing hepatic gluconeogenesis and intestinal absorption of glucose while improving peripheral glucose utilisation. Lactic acidosis is a rare but classic side effect of metformin with an estimated mortality rate between 30 and 50% [2]. The pathophysiology of MALA is controversial. It is thought to inhibit complex 1 of the electron transport chain, preventing the utilisation of reduced NADH thus reducing ATP production [2]. This in turn activates the enzyme AMPK, a regulator of cellular metabolism [3]. AMPK negatively regulates the ATP consuming processes of gluconeogenesis from alanine, pyruvate and lactate [3]. The resulting rise in serum lactate is cleared with normal renal function, however in renal impairment lactate levels rise with an ensuing ‘Type B’ (aerobic) lactic acidosis. As metformin is exclusively excreted unchanged by the kidneys, its accumulation in renal impairment further promotes this rise in serum lactate. CVVHF removes both metformin and excess lactate, early, thereby reducing mortality and morbidity [4].

References
Moyamoya disease (MMD) is a rare hereditary cerebral occlusive arteriopathy with a prevalence of 0.006 cases per 100 000 [1]. Occlusion of the terminal internal carotid arteries causes a fragile collateral circulation and CT angiography gives the disease its name with a ‘puff-of-smoke’ (moyamoya in Japanese) appearance. Strokes are common and anticoagulation is necessary to reduce stroke risk. Cerebrovascular response to hypercapnia is abnormal and cerebrovascular steal has been reported [2].

Description
A 29-year-old primigravida presented at 39 weeks gestation for an elective caesarean section. She was diagnosed with MMD aged 28 following ischaemic and haemorrhagic strokes which resolved. Treatment included aspirin 75 mg and dalteparin 5000iu daily, both having been taken the day before surgery. A combined spinal epidural (CSE) was performed with 11 mg hyperbaric bupivacaine and 300 µg diamorphine injected intrathecally. Epidural top-ups of 2% lidocaine with 1:200 000 adrenaline 15 ml were required to achieve a surgical block. Alfentanil 250 g was given intravenously for discomfort during delivery of the baby. The blood pressure was maintained to within 10% of baseline using a continuous phenylephrine infusion with crystalloid co-loading. The operation was uneventful.

Discussion
In MMD, haemorrhagic strokes may occur in the fragile collateral circulation, while ischaemic strokes may occur in the occluded vessels. These may be precipitated by hypertensive and hypotensive crises respectively. Labour pain causes hypertension and is therefore contraindicated. Caesarean section (CS) performed under general anaesthesia carries a risk of pulmonary aspiration and hypertensive surges but reduction of the cerebral metabolic rate may offer neuroprotection while the PaCO2 needs careful control to avoid cerebral hypoperfusion. Regional anaesthesia risks hypotension but avoids aspiration and allows direct monitoring of the mother’s neurology. Our patient was anticoagulated which theoretically increases the risk of an epidural haematoma. On balance, we felt that the benefits of regional anaesthesia outweighed the risks. Anaesthesia was titrated with a CSE; intravenous fluids and phenylephrine allowing tight blood pressure control. A dose of alfentanil was given for discomfort and the operation was uncomplicated. In conclusion, the choice of anaesthesia for CS in a patient with MMD needs careful consideration, and we demonstrated that a CSE may be used safely. We recommend early anaesthetic referral to enable discussion and planning.

References

Inverse takotsubo cardiomyopathy in the peripartum period
R. Krishnan and S. Das
North Middlesex University Hospital NHS Trust

Takotsubo cardiomyopathy (TCM), also known as broken heart syndrome, is a stress induced cardiomyopathy, thought to be caused by excessive catecholamine release due to acute medical illness or emotional or physical stress. The word takotsubo is a Japanese word meaning ‘octopus pot’, which is used to trap an octopus. This pot resembles the shape of the left ventricle during imaging which shows apical ballooning, left ventricular akinesia or hypokinesia combined with basal hypercontractility. Inverse TCM is a variant of TCM with similar pathophysiology but with different presenting symptoms and reverse features on imaging i.e. basal hypokinesia. TCM and its inverse variant were first reported in the Japanese literature and its awareness in the Western population is more recent.

Description
A 29-year-old female patient presented for an emergency lower segment caesarean section (LSCS) which was conducted under spinal anaesthesia. During the LSCS and in the immediate postoperative period she complained of chest pain. There was no clinical evidence of pulmonary oedema. Upon investigation, she was found to have ECG changes suggestive of non-ST elevation myocardial infarction with positive results for troponin I. Hence, she was initially treated as a case of acute coronary syndrome. However, a subsequent coronary angiogram showed no obstruction or spasm of the coronary arteries while an echocardiogram showed a left ventricular ejection fraction of ~25% with basal hypokinesia. Further evaluation with cardiac magnetic resonance imaging, with gadolinium, showed characteristic absence of delayed gadolinium hyperenhancement with hypokinesia of the basal segments. Hence, a diagnosis of inverse TCM was made and the patient was treated appropriately.

Discussion
TCM is treated with aspirin, β-blockers, angiotensin converting enzyme inhibitors and diuretics, with recovery of left ventricular function typically occurring in 2–4 weeks. As TCM is caused by catecholamine overload, the use of inotropes and vasopressors can cause haemodynamic instability. Patients who present with persistent hypotension may be evaluated by echocardiography for an intra-cavitary pressure gradient. If a dynamic intraventricular pressure gradient is detected, inotropic drug therapy should be discontinued and intravenous β-blockers administered to increase diastolic filling time and left ventricular end-diastolic volume.

The aim of reporting this case was to raise awareness of TCM and its inverse variant in the general population and in the obstetric population in particular.

References
Caesarean section in a Rhesus null parturient with a uterine fibroid

R. Laird and P. Stewart
Altnagelvin Hospital, Londonderry

The anaesthetic management of a caesarean section is made more challenging by the combination of pre-operative anaemia, a large uterine fibroid and a patient with the rare blood group Rhesus null.

Description

A 40-year-old lady presented to antenatal booking at 10 weeks gestation. Booking investigations revealed a haemoglobin of 10.3 g/dL, with the blood group O Rhesus null. The 20-week anomaly scan demonstrated a 5 cm anterior fibroid. At 21 + 3 days gestation the patient was referred with right upper quadrant pain. Haemoglobin level was 7.6 g/dL, with further tests indicating an iron deficiency anaemia. Ultrasound at 23 weeks gestation showed a large mixed solid and cystic mass in the right upper quadrant. A magnetic resonance imaging scan was recommended. The scan demonstrated a heterogeneous mass measuring 188 x 139 x 159 mm, in keeping with a degenerating fibroid. Due to the transverse lie of the foetus and the large fibroid an elective caesarean section at 38 weeks was planned. The main anaesthetic concerns included the preoperative anaemia, the anticipated difficult caesarean section with the potential for a large blood loss and the rare blood group. Management focused on maximising haemoglobin levels pre-operatively, starting an international search for compatible blood donors and ensuring a planned delivery. The Northern Ireland blood transfusion service and National frozen red cell bank in Liverpool secured 2 units of packed red cells in Liverpool. One week prior to the caesarean section the 2 units of blood were issued in an emergency. One further unit was secured in South Africa however the donor then developed a viral illness. The caesarean section was postponed for a week, in which time the South African donor recovered and another unit was secured in Brazil. They were couriered to our hospital. The caesarean section was performed at 38 + 6 days under spinal anaesthesia. Pre-operative haemoglobin was 9.1 g/dL. Surgical time was 45 min and the estimated blood loss was 500 ml. There was no blood transfusion required. The patient was discharged home on day three post-operatively and her haemoglobin was 7.2 g/dl on discharge.

Discussion

Red blood cells from people who have the Rhesus null phenotype lack Rhesus proteins, and thus, Rhesus antigens. This phenotype occurs in approximately 1 in 6 x 10^8 individuals [1]. There is very limited literature regarding the management of Rhesus null parturients and our knowledge was mainly gained from our regional Haematology unit. This case demonstrates the importance of good communication with all members of the multi-disciplinary team.

Reference


Acute skin failure due to Stevens-Johnson syndrome: management in ICU

S. Lawton, M. Prince, J. Drinkwater, I. Dods and A. Padmakumar
Chesterfield Royal Hospital NHS Foundation Trust

Dermatological emergencies are rarely encountered by intensive care unit (ICU) physicians (0.47% of ICU admissions) [1]. Stevens-Johnson syndrome (SJS) is one such condition that causes acute skin failure (ASF) due to immune complex-mediated hypersensitivity. It is triggered by exposure to drugs or pathogens. ASF, a life-threatening dermatological condition, carries a mortality risk of 40–50% (determined by SCORTEN scale) [1, 2]. We report a patient who survived a severe form of SJS to raise awareness of unique challenges such as difficult airway, skin care, nutrition and choice of analgesics.

Description

A 21-year-old lady presented with a 5-day history of painful swelling of lips (cold sores), odynophagia, pooling of saliva, vesicles in perioral, oral and periorbital areas, target lesions on limbs, neck and torso. She was diagnosed with SJS and treated with immunoglobulin (IVIG), methylprednisolone and morphine. Intravenous acyclovir was added for presumed oral herpes simplex virus. She was observed in the emergency department whilst awaiting response to therapy. She was admitted to ICU for airway monitoring, careful mouth, eye and skin care, management of nutrition and pain. The key clinical concern was the potential for airway compromise due to opharyngeal oedema (Fig. 1). Other challenges were providing enteral nutrition, as she could not open her mouth due to painful lesions. Inserting a nasogastric tube posed risk of airway haemorrhage. However, she did not require endotracheal intubation or artificial nutrition support as she responded well to medical therapy. She was discharged to the ward on day five of ICU stay.

Discussion

In view of the difficult airway (mucosal oedema, limited mouth opening), strategies for securing definitive airway were in place, including awake fibreoptic intubation or awake tracheostomy – each with advantages and disadvantages. There were risks of airway trauma and haemorrhage with instrumentation. SJS management posed ethical dilemmas such as stopping analgesics (anti-inflammatories and paracetamol) due to the risk of triggering new lesions. However, she responded well to intravenous morphine. This report demonstrates that a high index of suspicion for SJS helped make an early diagnosis and initiate prompt therapy. Careful ASF management ensured patient comfort and prevented secondary wound infection. Watchful monitoring and allowing time for medical therapy to have effect led to a good clinical outcome in this complex cutaneous emergency.

Figure 1 Perioral oedema due to haemorrhagic vesicular lesions.

Acknowledgements

We thank the patient and the medical illustration department.

References

Subcutaneous local anaesthetic infiltration testing: guides choice of regional anaesthesia in an obstetric patient with Ehlers-Danlos syndrome exhibiting likely local anaesthetic resistance

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King’s College Hospital, London

Ehlers-Danlos syndrome (EDS) is a group of inherited connective tissue disorders. We outline the successful regional anaesthetic management of a patient requiring caesarean section with EDS and associated features.

Description
A 41-year-old woman was scheduled for an elective caesarean due to symptomatic postural orthostatic hypotension (POIS). She had a history of exercise induced ventricular tachycardia, cervical instability with CSF/6 cord compression causing upper limb paraesthesia and a family history of local anaesthetic resistance. Subcutaneous infiltration testing to establish local anaesthetic sensitivity appeared to show greater loss of sensation with lignocaine vs bupivacaine. We proceeded with low dose combined spinal-epidural (CSE). 500 ml crystalloid was infused prior to regional anaesthesia to avoid POTS induced hypotension. The spinal may have failed due to bupivacaine resistance as suggested by skin testing or for other standard reasons [2]. The anaesthetic management of POIS induced tachycardia and invasive arterial blood pressure (BP) and cardiac output monitoring established. On epidural insertion the patient complained of dysaesthesia, with a notable drop in BP treated with a phenylephrine bolus and an infusion (0-0.8 mcg/kg/min). Once the BP stabilised, a spinal was inserted with free flow of CSF and 11 mg hyperbaric bupivacaine with 0.3 mg diamorphine given. At 17 min there were no signs of spinal block so we moved to lignocaine (200 mg with 50 mcg adrenaline) for epidural loading followed 10 min later by a repeat dose. At 37 min, there was minimal motor block (Bromage I) but good sensory block to cold bilaterally to T4 and no pain on testing with surgical forceps. The patient was comfortable at the start of surgery but required an additional epidural dose of 100 mg lignocaine with 25 mcg adrenaline mid-way through surgery as she experienced discomfort. At the end of surgery (110 min) motor block was den-ser (Bromage III), with sensory block to T12.

Discussion
Delayed onset time and variable resistance to local anaesthetic has been reported with EDS [1] and this was our rationale for performing skin testing. General anaesthesia would have necessitated careful manipulation of the airway to avoid c-spine damage. We opted for a CSE to maintain haemodynamic stability. The spinal may have failed due to bupivacaine resistance as suggested by skin testing or for other standard reasons [2]. The anaesthetic management of POIS and EDS has been reported previously where the epidural failed but spinal was successful [3]. Despite the slow onset of an adequate block, a CSE allowed us to use both neuraxial forms with different local anaesthetics to achieve successful regional anaesthesia with a single technique.

References

Spontaneous splenic rupture in two primigravida

A. White, T. McNamee, C. Hennell, R. Gilliland, D. Chandranath, L. Doherty, R. James and M. Duffy
1Mater Hospital, Belfast, UK, 2Belfast Health & Social Care Trust, Belfast, UK, 3Ulster Hospital, Belfast, UK, 4Royal Victoria Hospital, Belfast, UK

Spontaneous splenic rupture in pregnancy is potentially fatal. Two cases are presented.

Description
Case 1: A 24-year-old primigravida at 36 weeks gestation was admitted with syncope associated with abdominal pain. She had pregnancy induced hyperten-sion but was otherwise healthy. On arrival she was moribund and demonstrated fetal bradycardia. The patient was transferred immediately to theatre for emergent caesarean section with a presumed diagnosis of placental abruption. A classical rapid sequence induction was conducted and a live male infant was delivered. No uterine abnormality was identified. Catastrophic haemorrhage from the splenic area was addressed via an upper midline laparotomy by the obstetric team. The general surgical team performed a splenectomy. She had an uneventful stay on ICU for 24 h postoperatively. Histopathological examination of the spleen revealed a capsular tear but no other abnormality.

Case 2: A 27-year-old primigravida at 36 weeks gestation presented with epigastric pain and vomiting. Shortly after admission she had vomiting associated with shock and fetal bradycardia. Emergent caesarean section was performed following classical rapid sequence induction and a live male infant was delivered. Life threatening haemorrhage from the upper abdomen was addressed by the general surgeons performing splenectomy for haemostasis. She was transferred to ICU for postoperative care which was uneventful. Histopathological examination of the spleen showed a capsular tear but was otherwise normal.

Discussion
Spontaneous splenic rupture in pregnancy is rare and has high maternal and fetal mortality [1, 2]. It is challenging in masquerading as placental abruption, ectopic pregnancy and uterine rupture [1]. Hypervolaemia, splenic enlargement, diminished peritoneal cavity volume and muscular contractions during pregnancy may play pathophysiological roles [2]. It is an important differential to consider when haemodynamic collapse occurs in a pregnancy [3]. These two cases were managed in an emergent fashion with blood and clotting products, platelets and tranexamic acid. Resuscitation was facilitated by early intervention by skilled multispecialty teams emphasising the importance of communication in the operating theatre between anaesthesia, obstetric, surgical and critical care teams. Obstetric haemorrhage protocols were employed in both cases and reinforces the vital role of laboratory and support staff. Tranexamic acid was administered based on evidence from the CRASH-2 trial [4]. The results of the ongoing WOMAN Trial are eagerly anticipated.

References
A training day for undergraduate students using practical workshops combined with theatre sessions to teach essential skills and inspire interest in anaesthetics

S. Akrimi, T. Malley, J. Willers, P. Thorburn, C. Bygrave and D. Uncles
Worthing Hospital, Western Sussex Hospitals NHS Foundation Trust

Exposure to anaesthetics in undergraduate medical training is minimal [1], despite a wide range of competencies and skills relevant to anaesthetic practice outlined in the GMC Tomorrow’s Doctors [2]. The competing demands of other areas of the curriculum and the unpredictable nature of both theatre and non-theatre environments for appropriate experience remain a challenge for those delivering training.

Methods
An anaesthetic training day for undergraduate students was developed comprising of traditional theatre sessions and short practical workshops covering airway skills, vascular access, chest drain insertion and regional anaesthetic techniques. The day was designed and actively managed to allow students to rotate between theatre and workshops depending on where the most opportunity for skills-exposure was. A questionnaire was developed for students to report what they learned from theatre and practical sessions and to evaluate which part of the day was most useful both for learning and considering anaesthetics as a career.

Results
Feedback was obtained from 30 final year medical students. Students scored the usefulness of practical workshops higher than theatre sessions (Table 1). When asked to compare, students reported the practical workshops were the most useful part of the day (practical sessions 73%, theatre sessions 3%, both 23%). Factors reported by students most important in considering anaesthetics as a career were the opportunity to speak with trainees and consultants (30%), practical experience (26%), observing the anaesthetist’s role (22%), quality of teaching (13%) and the environment and staff (9%).

Discussion
Challenges to providing training to undergraduate students include short time within the specialty and most opportunity to practice skills being limited to the start of a case. This training day combined practical workshops with shorter sessions in theatre. The workshops were flexibly delivered to allow maximal exposure for each individual student and ensured all had a chance to practice essential skills. Additionally, we delivered workshops introducing more advanced skills to be used in theatre however these were preferred by students and, importantly, kept them engaged throughout the day. We suggest that practical workshops in addition to shorter, focused time in theatre, improves successful learning, the opportunity for skills-practice and time to explore anaesthetics as a career.

Table 1: Responses from questionnaire (1 = strongly disagree, 5 = strongly agree).

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Median (IQR [range])</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>I found the theatre sessions useful</td>
<td>4 (4–5 [1–5])</td>
</tr>
<tr>
<td>I found the practical sessions useful</td>
<td>5 (5–5 [4–5])</td>
</tr>
</tbody>
</table>

References

A new cost-effective model developed for training in cricothyroidotomy

S. Akrimi, N. Singh, J. Willers, T. Malley, C. Bygrave and D. Uncles
Worthing Hospital, Western Sussex Hospitals NHS Foundation Trust

Effective training in needle and surgical cricothyroidotomy is essential, but challenging. Models allow practice, however those commercially available are expensive and have parts requiring frequent replacement. Furthermore, there is little published research into development of this training equipment. An ideal model should be realistic, portable, easy to produce, reusable and cost effective. Here, we have worked to develop a new, anatomically accurate, low-cost model.

Methods
The larynx was made from a length of 35 × 60 mm PVC bathroom drainpipe with space for a cricothyroid membrane (CTM), made using medical tape, cut into it. The external surface was built up using bathroom sealant. Skin and superficial fascia were made from foam covered with 3M Microfoam™. Rotating this between uses provided a new surface for puncture. Standard ventilator tubing and a reservoir bag recycled from clinical use were attached to show effective ventilation. Users received a tutorial demonstrating needle and surgical cricothyroidotomy and then attempted both procedures on the new model before completing a two-part evaluation form. Firstly participants were asked to rate the model as a tool for learning and whether they would recommend it to others. Participants were asked about previous training, what they learned using this tool and how it compared to previous teaching. The second part used a previously trialled questionnaire [1] and asked participants to score their experience against several statements.

Results
Forty-four participants (medical students 17, foundation trainee 1, core trainee 7, higher trainee 13, non-training grades 3, consultants 4) were enrolled. Both questionnaires were completed by 31 participants; 4 and 9 participants completed the first and second parts only. Responses are shown in Table 1. All participants reported they had learned using this model. Most commonly reported were skill-specific learning (the procedure, familiarity with equipment and dexterity), anatomy and increased confidence.

Table 1: Responses for questionnaire 1 (1 = lowest, 5 = highest) and questionnaire 2 (1 = strongly disagree, 5 = strongly agree).

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Median (IQR [range])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire 1</td>
<td>How would you rate this model as a tool for learning?</td>
</tr>
<tr>
<td>Questionnaire 1</td>
<td>How would you recommend this to others as a tool for learning?</td>
</tr>
<tr>
<td>Questionnaire 2</td>
<td>The model appears a reasonable substitute for practice</td>
</tr>
<tr>
<td>Questionnaire 2</td>
<td>I am more comfortable with the equipment having used this</td>
</tr>
<tr>
<td>Questionnaire 2</td>
<td>I would be more confident now, if I had to perform this on a patient</td>
</tr>
<tr>
<td>Questionnaire 2</td>
<td>The model reasonably resembles the real thing</td>
</tr>
<tr>
<td>Questionnaire 2</td>
<td>The model would be a useful training aid for inexperienced trainees</td>
</tr>
<tr>
<td>Questionnaire 2</td>
<td>Trainees should use this model before ‘practising’ on patients</td>
</tr>
<tr>
<td>Questionnaire 2</td>
<td>I would use this model for teaching surgical airways</td>
</tr>
</tbody>
</table>

Discussion
Respondents rated this model as useful and recommend it for their learning and the training of others. The model is simple and construction required minimal expertise. The larynx took 20 min to construct, had a cost of £0.80 and does not require replacement. Skin and CTM are also simple to construct and cost £0.27 per attempt. This model provides a reliable, re-usable and cost-effective alternative to current products with excellent results in evaluation.

Reference
Block height for caesarean section: textbook recommendations

W. Allen, J. Hoyle and S. Yentis
Magill Department of Anaesthesia, Chelsea and Westminster Hospital, London

Surveys of practice suggest that obstetric anaesthetists have increased the height of central neuraxial blockade they consider to be adequate before caesarean section and are increasingly using touch over pinprick or cold [1]. We have looked at ‘core’ textbooks of anaesthesia over the last 70 years to see if there has been a change in the recommended acceptable height of block and means of assessment.

Methods
We looked at standard textbooks with at least three editions for advice regarding the height of blockade and the method of assessment.

Results
Three general and four obstetric anaesthetic textbooks were examined. The recommended heights of block, and method of testing, are listed in Table 1.

<table>
<thead>
<tr>
<th>Textbook</th>
<th>Year</th>
<th>Height</th>
<th>Modality</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Synopsis of Anaesthesia (Lee)</td>
<td>1947–1950</td>
<td>T9–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1950–1959</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1959–1964</td>
<td>T8–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1964–1968</td>
<td>T8–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1968–1973</td>
<td>T8–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1973–1977</td>
<td>T8–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1977–1982</td>
<td>T8–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1982–1987</td>
<td>T8–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1987–1993</td>
<td>T6–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1993–1999</td>
<td>T6–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1999–2005</td>
<td>T4–Cold,</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pinprick &amp;</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>touch</td>
<td>NS</td>
</tr>
<tr>
<td>A Practice of Anaesthesia (Wylie and Churchill-Davidson)</td>
<td>1960</td>
<td>T6–T8</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1966–1972</td>
<td>T5–T8</td>
<td>NS</td>
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<tr>
<td></td>
<td>1972–1978</td>
<td>T5–T8</td>
<td>NS</td>
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<tr>
<td></td>
<td>1978–1984</td>
<td>T5–T8</td>
<td>NS</td>
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<tr>
<td></td>
<td>1984–1995</td>
<td>T5–T8</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>2003–2009</td>
<td>T4–T8</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pinprick</td>
<td>NS</td>
</tr>
<tr>
<td>A Practice of Anaesthesia (Miller)</td>
<td>1961–1966</td>
<td>T8–NS</td>
<td>NS</td>
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<tr>
<td></td>
<td>1966–1968</td>
<td>T8–NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1968–1970</td>
<td>T8–NS</td>
<td>NS</td>
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<tr>
<td></td>
<td>1970–1978</td>
<td>T8–NS</td>
<td>NS</td>
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<tr>
<td></td>
<td>1978–1984</td>
<td>T8–NS</td>
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<td></td>
<td>1984–1995</td>
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<td>1995–2001</td>
<td>T7–NS</td>
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<td>2001–2009</td>
<td>T7–NS</td>
<td>NS</td>
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<tr>
<td>Principles and Practice of Obstetric Anaesthesia (Crawford)</td>
<td>1959–1965</td>
<td>T8–T9</td>
<td>NS</td>
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<tr>
<td></td>
<td>1965–1972</td>
<td>T8–T9</td>
<td>NS</td>
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<tr>
<td></td>
<td>1972–1978</td>
<td>T8–T9</td>
<td>NS</td>
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<tr>
<td></td>
<td>1978–1984</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1984–1995</td>
<td>T8–T9</td>
<td>NS</td>
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<tr>
<td>Obstetric Anaesthesia and Analgesia (Moir)</td>
<td>1976–1980</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1980–1986</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1986–1992</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1992–1998</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1998–2004</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td>Obstetric Anaesthesia for Obstetrics (Shnider and Levinson)</td>
<td>1979–1985</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1985–1991</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1991–1998</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1998–2004</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td>Obstetric Anaesthesia Principles and Practice (Chestrnut)</td>
<td>1994–1997</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>1997–2004</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>2004–2009</td>
<td>T8–T9</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS, not stated.

Conclusion
The height of acceptable block, as recommended by textbooks, has increased over the decades. However, the majority of textbooks do not state the technique or modality of block assessment, further adding to the confusion surrounding central neuraxial blockade for caesarean section [2].

References

Pre-operative anaemia and cardiac surgery: a retrospective analysis

J. Allen, M. Lee, C. Fullwood and K. Pendry
1 Central Manchester NHS Foundation Trust, 2 University of Manchester

Anaemia is increasingly prevalent in the UK population as a consequence of increasing co-morbidities and longevity. Anaemic patients have been shown to be at increased risk of co-morbidities post cardiac [1] and non-cardiac surgery [2], while transfusion of autologous blood has also been shown to have adverse patient outcomes [3]. The aim of this project was to objectively quantify the effect of anaemia on length of stay, blood and blood products transfused and post-operative complications.

Methods
A retrospective study was carried out on all patients undergoing cardiac surgery at a single centre in 2010 giving a total of 501 patients for analysis. Anaemia was defined according to World Health Organization criteria of less than 13 g/dl in males and 12 g/dl in females. Statistical analysis of the data included Kruskal–Wallis and Fisher’s Exact Test.

Results
A total of 99 (22%) patients were anaemic at listing (69 male, 30 female) with a median haemoglobin (Hb) of 11.9 male (IQR 11.40–12.60) and 11.35 female (IQR 10.45–11.70). Two hundred and sixty three (58.4%) patients were not anaemic at listing. The remaining 139 patients we were unable to find a completed Hb recording prior to surgery. Analysis of length of stay using Kruskal–Wallis test showed a significant reduction in both critical care (p value 0.004) and total hospital stay (p value < 0.001) in the non-anaemic vs anaemic groups. Analysis of blood and blood products transfused showed a significant reduction in all transfusions with Fisher’s exact test giving p-values of p < 0.001 for packed red cells, p < 0.001 for fresh frozen plasma and p < 0.003 for platelets. Fisher’s exact test showed a significant reduction in the number of patients (n = 8) requiring post-operative haemofiltration in the non-anaemic group (n = 2) giving a p value 0.003.

Discussion
These results show a significant reduction in the length of hospital stay, blood and blood products transfused and post-operative complications in patients who were not anaemic at the time of listing for surgery. This has implications for both patient care and also cost for the trust. Whether there is a link between the need for transfusion and prolonged stay as a consequence of this we are unable to say. Results of ongoing studies to determine whether pre-operative treatment and optimisation of anaemic patients prior to cardiac surgery are awaited.

References
Gauging the gel in Fybogel

L. Barnes, J. Willers, S. Harirahan and D. Uncles
Worthing Hospital

It has been nearly 20 years since the use of ispaghula (psyllium) husk (ISP) in regional anaesthesia ultrasound phantoms (RAUSPs) was first described [1]. As Fybogel or Metamucil it has been a regular component of home-made RAUSPs acting as a contrast medium in gelatin. However there have been no studies evaluating any other ultrasound (US) related properties other than its ability to provide scatter, or any on its gel-forming ability except as a laxative or food thickener. We have explored its wider role as a RAUSP medium.

Methods
Plain ISP was sourced from a health food store. It was mixed at various concentrations with water at various temperatures and then subjected to various degrees of heating. The most promising gel preparations were evaluated as to suitability as RAUSP mediums employing established criteria for the ideal RAUSP [2].

Results
ISP gel exceeded most of the criteria for an ideal RAUS, medium, and complied with the remainder.

Discussion
ISP appears to be an US medium of extreme utility and versatility. Preparation and use is easy, and differs from other mediums due to its stability under high temperatures and molecular structure containing both free and trapped water molecules [3]. It slowly forms a porridge consistency low-strength gel at low temperature. With increasing temperature, the gel strength increases and gelling time shortens. Gel strength increases with concentration, but it is difficult to achieve concentrations higher than 10%. This gel is less dense than water. When subjected to microwaving the gel expands slightly and then suddenly collapses to a form a substrate denser than water. With further heating, boiling will occur before rapid regression once microwave energy is removed. This end product can be cast, folded, hot or cold pressed, layered, cut, moulded and made into thin films or strands. It adheres to itself and a model can be built incrementally incorporating other structures. It exhibits a 'memory' and does not form needle tracts at concentrations < 5% per weight (20% per volume), and is self-repairing after needling up to 18FG dilation. Echogenicity can be varied by preparing contrast depleted ISP gel by thermal microfiltration extraction. If retained in a rigid container it maintains shape, but unsupported, structures fabricated from the gel require periodic reshaping over time. Infection and desiccation issues need to be addressed although it has potentially a long shelf life. In summary ISP shows great promise as a RAUSP medium.

Table 1 Characteristics of the ideal phantom for ultrasound guided procedures and ispaghula husk gel properties qualifying.

<table>
<thead>
<tr>
<th>Characteristics of the ideal phantom for ultrasound guided procedures</th>
<th>Ispaghula husk gel properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reproduce the texture and resistance of human tissue</td>
<td>Extremely similar, and with</td>
</tr>
<tr>
<td>Sufficient ultrasound penetration for targets to a depth of 10 cm</td>
<td>similar sonographic appearance</td>
</tr>
<tr>
<td>Easily repairable from the damage caused by needle insertion</td>
<td>Sonoluent to maximum scan depths</td>
</tr>
<tr>
<td>Targets that must be clearly distinguishable</td>
<td>Self-repairing: up to 18FG dilation, does not develop needle tracts</td>
</tr>
<tr>
<td>Targets must not corrode over time</td>
<td>Can be prepared with differing texture to give best contrast</td>
</tr>
<tr>
<td>Needle - target contact clearly identifiable</td>
<td>Properties allows replacement and repositioning if targets in situ</td>
</tr>
<tr>
<td>Sufficient ultrasound penetration for targets to a depth of 10 cm</td>
<td>Texture allows observation of movement even out of plane</td>
</tr>
<tr>
<td>Be easily transportable</td>
<td>Sonoluent to maximum scan depths</td>
</tr>
<tr>
<td>Be composed of non-perishable material</td>
<td>Does not need refrigeration</td>
</tr>
<tr>
<td>Have different levels of difficulty/complexity that can be easily changed</td>
<td>If microwaved and preserved with propionic acid</td>
</tr>
<tr>
<td>Be easily reproducible</td>
<td>Unmatched ability to construct complex structures</td>
</tr>
<tr>
<td>Have a long shelf life</td>
<td>With microwave access</td>
</tr>
<tr>
<td>Affordable</td>
<td>If protected from desiccation and preserved with propionic acid</td>
</tr>
</tbody>
</table>

References

A retrospective study of postoperative hyperglycaemia and infection rates in bowel surgery

C. Crossland and H. Wakeling
Worthing Hospital, Western Sussex Hospitals Trust

Perioperative hyperglycaemia is associated with an increased incidence of postoperative infection [1]. The metabolic and endocrine response to surgical stress includes hyperglycaemia and glucose intolerance [1, 2]. We looked at preoperative and postoperative blood glucose levels in patients undergoing bowel surgery and the association with postoperative infection.

Methods
We collected data retrospectively from 128 patients who were part of a study of intraoperative fluid management [3]. All patients underwent bowel surgery and had blood glucose measured as part of an arterial blood gas sample pre- and post-operatively. No patient received an intraoperative steroid unless already taking one. We looked for association between postoperative infection and blood glucose above 7 mmol/l, age over 65, BMI over 25, and duration of surgery over 2 h. The chi-square test established significance.

Results
Two patients were excluded as markers of infection and postop BM had not been recorded. We collected data on 55 men and 71 women of ASA grades 1–4 with an age range of 26–89 years. 25 patients subsequently had markers of surgical site or pulmonary infection. There was no significant association between any of the variables examined and postoperative infection rates.

Discussion
Modern anaesthesia plays a central role in attenuating the body’s response to surgical stress and glycaemic control is an important part of this. In our study postoperative infection following bowel surgery was not significantly associated with age, BMI, surgery duration or blood glucose levels. However whilst relatively small numbers may have contributed to a lack of clinical significance, it is interesting to note that there was actually an inverse trend between higher glucose and infection in our study.

Table 1 Number of patients with each risk factor with evidence of postoperative infection (percentages) and corresponding p values.

<table>
<thead>
<tr>
<th>Glucose</th>
<th>Age</th>
<th>BMI</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 7 mmol/l</td>
<td>≤ 65</td>
<td>≤ 25</td>
<td>≤ 120 min</td>
</tr>
<tr>
<td>16/70 (22.9)</td>
<td>9/56 (16.0)</td>
<td>11/62 (17.7)</td>
<td>4/29 (13.8)</td>
</tr>
<tr>
<td>&gt; 7 mmol/l</td>
<td>&gt; 65</td>
<td>&gt; 25</td>
<td>&gt; 120 min</td>
</tr>
<tr>
<td>14/64 (21.9)</td>
<td>14/64 (21.9)</td>
<td>7/62 (11.3)</td>
<td>6/62 (9.7)</td>
</tr>
</tbody>
</table>

p = 0.32
p = 0.33
p = 0.56
p = 0.35

References

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A durable, haptically realistic, low cost home-made phantom for learning ultrasound guided fascia iliaca blocks

L.de Neumann,1 J. Willers,1 O. Sherwood,1 C. Crossland,1 W. Hauf1 and H. Rose2
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Currently available ultrasound guided regional anaesthesia phantoms (USRAPs) cater for visualisation of the needle endpoint, however, in practice, block placement also utilises the visualisation of different anatomical structures such as fascial planes, evaluation of tactile sensations including pops, and observing the movement of tissues. Having developed new materials for the manufacture of USRAPs, with a more realistic look and feel, we resolved to build one which would incorporate tactile feedback, be durable and of low cost. The use of US guided fascia iliaca blocks is recommended by the AAGBI in the management of patients with fractured neck of femurs [1]. It provides good quality analgesia and minimises opiate requirements in an often cognitively impaired population.

During this block the anaesthetist relies on locating fascial planes by pops and movement of tissues. Having developed new materials for the manufacture of USRAPs, with a more realistic look and feel, we resolved to build one which would incorporate tactile feedback, be durable and of low cost. The use of US guided fascia iliaca blocks is recommended by the AAGBI in the management of patients with fractured neck of femurs [1]. It provides good quality analgesia and minimises opiate requirements in an often cognitively impaired population. During this block the anaesthetist relies on locating fascial planes by pops and movement of tissues. Having developed new materials for the manufacture of USRAPs, with a more realistic look and feel, we resolved to build one which would incorporate tactile feedback, be durable and of low cost.

Methods

We constructed analogues of iliopectineus, pectineus and sartorius from polyacrylamide embedded in ispaghula husk gel, which gave the appearance and consistency of muscles. These were placed in a rectangular food storage container with a femoral nerve surrogate made of cellulose foam impregnated with gelatine placed over the iliopectineus. This was then put into the sleeve of a size 8.5 latex surgical glove as a surrogate for the fascia iliaca. Medial to the nerve, above the fascia iliaca, we placed a pulsatile artery made from latex exercise tubing and a compressible vein from soft gelatine in a modelling balloon. Ispaghula husk gel as connective tissue analogue was placed over the structure to give space between the fascial layers. This was put into a larger food container and layered with the sleeve of a latex gauntlet, ispaghula husk gel, and a beige non-latex exercise band to simulate fascia lata, subcutaneous tissue, and skin, and kept in position with the clip-on lid with the centre portion removed.

Figure 1 US image of USRAP before and after needling 100 times.

Results

We made a USRAP with a realistic appearance and tactile feel, which gave the sensation of the two pops through the fascial layers. We tested its durability by needling it 100 times, after which we found no degradation in US image quality (taken with the Sonosite S-Nerve™, Fig. 1), or the sensation of pops.

Discussion

It is possible to build a visually and haptically realistic, low cost USRAP for the development of ultrasound guided regional anaesthesia skills. These techniques might be used in USRAPs for other nerves.

Reference


Investigation of crosslinked polyacrylamide as a medium for regional anaesthesia ultrasound phantoms

J. Hews, J. Willers, Z. Ozirat, R. Jeevananthan, W. Hauf and D. Uncles
Western Sussex Hospitals NHS Trust

Various mediums are described in the manufacture of ultrasound (US) phantoms developed to teach and learn regional anaesthesia techniques including fluid solidifying agents such as polisorb and polyacrylamide [1]. These substances are anhydrous crystals that are superabsorbent for water creating solid gel beads up to 400 times their original weight. They have many uses including mopping up clinical fluids in theatre. We discovered another fluid solidifying agent, crosslinked polyacrylamide (CPAM), which forms firmer hydrated gel beads. It is marketed as water storing crystals (Miracle-Gro Moisture Control Gel) that are embedded in soil to reduce the frequency needed for watering plants. We decided to investigate its suitability as a medium for ultrasound phantoms.

Methods

We hydrated CPAM crystals in water and mixed the resulting gel with gelatine, a medium known to resemble similar haptics of tissue. The mixture was set in a plastic container and evaluated for needling under US.

Results

We found the gelatine/CPAM mixture maintained a firm structure against compression of the US probe. It left no needle track marks enabling multiple use. Furthermore there was no ghosting phenomenon or refraction when passing the needle. The CPAM gel beads gave the US appearance observed of skeletal muscle in the transverse plane.

Discussion

Artificial materials for US phantoms should possess similar acoustic properties to soft tissue as is the case for water based agents such as gelatine [2]. However, they often have the disadvantage that needle tracks remain with each pass. Fluid solidifying agents do not leave such tracks but the more fluid nature of these products prevents them holding their shape under compression. As gelatine has a homogenous US appearance a scattering agent such as husk or corn-flour may be added to better resemble the appearance of tissues. CPAM overcame these problems. We discovered the scattering effect of CPAM simulated muscle. Further work adjusting the water content of hydrated CPAM might enable manipulation of the gel bead size, lucency and scattering to emulate other types of tissues under US.

Figure 1 Ultrasound image: top layer kitchen sponge cloth set in gelatine, middle layer gelatine, bottom layer CPAM/gelatine mix.

References

Evaluation of a DIY approach to cricothyroidotomy training

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Professional surgical cricothyroidotomy training models can be prohibitively expensive when organising a large-scale event. For the past 2 years we have organised an undergraduate conference that included a cricothyroidotomy workshop. We aimed to develop our own cheap but effective 'DIY' model using readily available materials, and evaluate its effectiveness as a teaching tool.

Methods

Our model was based on a sheep larynx with a porcine skin covering, attached to wooden off-cuts with a staple gun and retractable knife. All materials were sourced from a local butcher, wood store and DIY store. One-hundred delegates had attended the cricothyroidotomy workshop, run by anaesthetic and ENT clinicians. After a demonstration each trainee performed the procedure on their own individual model before completing an evaluation form. Aspects of the model were rated using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Results

Our model cost approximately £1 per delegate (including all parts and delivery costs). All one-hundred delegates completed the feedback form. Eighty-one had no previous training on a model, 19 had performed the procedure between 1 and 5 times on animal or cadaveric models, and no trainee had had no previous training on a model, 19 had performed the procedure costs). All one-hundred delegates completed the feedback form. Eighty-one had no previous training on a model, 19 had performed the procedure between 1 and 5 times on animal or cadaveric models, and no trainee had had no previous training on a model, 19 had performed the procedure.

Discussion

The idea for our DIY model was born from a dilemma: we wanted a useful and lifelike teaching aid for the demonstration of surgical cricothyroidotomy to a large audience, but with very limited funds. Our results suggest that our simple model provides a solution for individuals wanting to practise this procedure, or for the organisers of a larger training event. The success of our model was reflected in the feedback we received and so it is with confidence we recommend it to the wider medical community.

Table 1 Evaluation scores for our DIY model.

<table>
<thead>
<tr>
<th>Model characteristic</th>
<th>Median (IQR [range])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model is a reasonable substitute for practice</td>
<td>5 (4.5 [4-5])</td>
</tr>
<tr>
<td>Model reasonably resembles a human neck</td>
<td>4 (4.5 [3-5])</td>
</tr>
<tr>
<td>I am more comfortable with the equipment</td>
<td>5 (4.5 [4-5])</td>
</tr>
<tr>
<td>Having used this training model</td>
<td></td>
</tr>
<tr>
<td>I would be more confident in performing cricothyroidotomy after using this model</td>
<td>4 (4.5 [2-5])</td>
</tr>
<tr>
<td>Model is useful in teaching inexperienced trainees</td>
<td>5 (4.5 [4-5])</td>
</tr>
<tr>
<td>Training on this model was an enjoyable experience</td>
<td>5 (4.5 [4-5])</td>
</tr>
</tbody>
</table>

Acknowledgements

Mr Neil De Zoysa, Dr John Kilic, Dr Silvia Baciu, Dr Anthony Cochrane and Dr Rob Greenhalgh were instructors for the model.

Post-operative morbidity survey, mortality and length of stay following emergency laparotomy

T. Howes, L. Corrigan, T. Cook and C. Peden
Royal United Hospital, Bath

Thirty-day mortality for patients undergoing emergency laparotomy approaches 15% in the UK and is far greater amongst elderly patients (24.4%) [1]. Occurrence of any post-operative complication is the most important predictor of mortality following major surgery, and effective rescue from complications reduces mortality [2]. To date, studies of complications in this group are sparse and heterogeneous. The Post-Operative Morbidity Survey (POMS) is a validated method of quantifying post-operative complications [3] but its use in emergency laparotomy has not previously been described.

Methods

We studied 144 consecutive adult patients undergoing emergency laparotomy in a UK district general hospital, and prospectively quantified post-operative complications on four post-operative days using the POMS. Exclusion criteria were trauma laparotomies, vascular pathology (except mesenteric ischaemia), gynaecological pathology and procedures completed using an entirely laparoscopic approach. We examined how outcomes (length of stay and 28-day mortality) related to age group (< 80 years), pre-operative risk (ASA score and P-POSSUM predicted mortality) and post-operative complications as defined by the POMS.

Results

Cumulative POMS score was 3 (range 0–8) for all patients and was similar between the two age groups (p = 0.454). Patterns of morbidity were also similar, with infectious, pulmonary and gastrointestinal complications predominating in both age groups. Despite these findings, 28-day mortality was three-fold higher in the elderly cohort (33.3% vs 9.6%, p = 0.008) and median hospital stay was longer (17 days vs 11 days, p = 0.006). Both ASA score and P-POSSUM predicted mortality were associated with increased mortality, length of stay and number of POMS complications. Regression analysis found that cardiovascular, haematological, renal and wound complications predicted increased length of stay, and that early cardiovascular complications predicted mortality.

Discussion

Our findings confirm the high peri-operative risk experienced by these patients, especially the elderly, and are in agreement with outcomes reported by the UK Emergency Laparotomy Network. Of interest, we found that elderly patients experience the same number of overall complications with the same distribution but suffer significantly worse outcomes. We have used the POMS to demonstrate the most common sources of post-operative morbidity in patients undergoing emergency laparotomy, and observed that some of the less common complications (particularly cardiovascular) may be useful in predicting outcomes. In future, targeted prevention of certain types of morbidity may help improve outcomes.

References

Using P-POSSUM to predict morbidity and mortality in patients undergoing open liver resection

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Royal Surrey County Hospital NHS Foundation Trust

Outcome surveillance and patient-centred perioperative decision making have led to the popularity of scoring systems, such as the Portsmouth-modified Physiological and Operative Severity Score for the enUmeration of Morbidity and Mortality (P-POSSUM) [1], for predicting 30-day morbidity and mortality in surgical patients. Advances in surgical techniques and perioperative management, however, have lead to an overall reduction in morbidity and mortality for many different surgical specialties. This raises the question of whether P-POSSUM scoring remains applicable. We examined the ability of P-POSSUM scoring to predict outcomes in patients undergoing elective liver resection surgery.

Methods
P-POSSUM scoring was performed, and morbidity and mortality data were collected as part of a wider trial in patients undergoing elective open liver resection, for which research and ethic approval was granted [2]. Patients were allocated to 5 different morbidity risk groups and 7 mortality risk groups. The number of patients predicted to suffer postoperative morbidity/mortality in each group was compared with the actual number of patients observed to have post-operative morbidity/mortality. Statistical significance was taken as p < 0.05, using Chi square or Fisher’s exact tests.

Results
Data was evaluated from 91 patients undergoing elective, open liver resection. P-POSSUM significantly over-predicted the total number of patients experiencing postoperative morbidity (see below). There was no significant difference in the overall predicted and actual mortality between any of the risk groups.

<table>
<thead>
<tr>
<th>Risk group (%)</th>
<th>Predicted morbidity</th>
<th>Actual morbidity</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19</td>
<td>1</td>
<td>1</td>
<td>1.000</td>
</tr>
<tr>
<td>20-39</td>
<td>5</td>
<td>1</td>
<td>0.172</td>
</tr>
<tr>
<td>40-59</td>
<td>15</td>
<td>7</td>
<td>0.032</td>
</tr>
<tr>
<td>60-79</td>
<td>19</td>
<td>7</td>
<td>0.001</td>
</tr>
<tr>
<td>80-100</td>
<td>10</td>
<td>6</td>
<td>0.056</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>22</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

P-POSSUM predicted and actual mortality in patients undergoing elective, open liver resection.

Discussion
P-POSSUM scoring appears to be good at predicting mortality, but over-predicts morbidity in patients undergoing open liver resection. A potential factor which may contribute to the inaccuracy in this particular group of patients may be the over-representation of distally metastatic malignancy.

References

Comparison of subjective vs objective METS in evaluating pre-operative fitness

A. Makowski, K. Richardson and D. Seneviratna
Medway Maritime NHS

Functional capacity is a pivotal step in pre-operative risk assessment. Metabolic equivalent of task (MET) is a simple, practical, and easily understood physiological measure which expresses the energy cost of physical activities. It is defined as the ratio of metabolic rate during a specific physical activity to a reference metabolic rate, set by convention to 3.5 ml O2.kg⁻¹.min⁻¹ or equivalently. According to the European guidelines for cardiac patients having non-cardiac surgery [1], 4 METs is classed as moderate to excellent functional capacity and non-invasive cardiac testing is not a pre-requisite for high risk surgery, whereas those patients with < 4 METs require non-invasive cardiac testing prior to surgery.

Methods
We performed a retrospective analysis of 33 elective abdominal aortic aneurysm (AAA) patients aged 74 years (94% males), that were pre-assessed for elective AAA repair. All patients underwent a cardiopulmonary exercise test (CPET) on a stationary bike, whereby METS were taken at peak oxygen consumption (VO₂peak) (Objective METS). Patients also attended a pre-assessment clinic on a separate day, where METS were subjectively assessed by a pre-assessment nurse using ranked METS values corresponding to patients’ opinions of their maximal everyday physical activities (Subjective METS). Paired t-tests were calculated using SPSS v20 (Table 1).

Discussion
Patients tend to overestimate their physical ability in pre-assessment, which highlights the importance of utilising CPET in patients having elective AAA repair. We therefore need to emphasise the importance of carefully assessing METS to the pre-assessment team. Future research should ascertain the accuracy of subjective METS in other surgical populations.

Table 1 Comparison of objective and subjective METS preoperatively.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean ± SD</th>
<th>Paired 95% confidence upper</th>
<th>t</th>
<th>Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective METS</td>
<td>33</td>
<td>4.64 ± 1.3</td>
<td>−0.108</td>
<td>−2.451</td>
<td>0.02</td>
</tr>
<tr>
<td>Subjective METS</td>
<td>33</td>
<td>5.28 ± 0.9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reference
Differing venous and arterial blood flow using a central venous catheter model

T. Malley, J. Willers, L. Goosen, A. Walsh, M. Robson and S. Anderson

Worthing Hospital

Approximately 200 000 central venous catheters (CVCs) are inserted per year in the UK. Arterial puncture and cannulation during CVC insertion can lead to serious complications. The American Society of Anaesthesiology revealed that 35.7% of CVC related carotid artery injuries lead to mortality [1]. The incidence of arterial cannulation is up to 1% [2], equating to almost 2000 errors in the UK annually. Ultrasound guidance reduces the risk of arterial cannulation, but failure to identify puncture through the internal jugular vein into an artery remains possible. Pressure transduction through the introducer needle can help prevent arterial cannulation [3], accounting for 1600 errors prevented in the UK annually. Using a CVC model, we sought to determine whether the position of a guidewire could be reliably confirmed solely based on velocity or pulsatility of the blood.

Methods

The CVC model comprised of a 10 cm latex tube (artificial blood vessel) with one end connected to a syringe and guidewire. The other end was connected to three separate bags of fluid via a series of 3-way taps. The bags of fluid were hung onto a drip stand at pre-determined heights (using a transducer and monitor) to generate a systolic blood pressure of 50 mmHg, a diastolic BP of 30 mmHg and a central venous pressure of 20 mmHg, replicating a case of acute left ventricular failure. To generate arterial blood flow, a tap was left open to the 30 mmHg diastolic bag while the operator manually opened and closed a tap to the 50 mmHg systolic bag at a frequency of 2 Hz to create a pulsatile flow. Opening the tap connected to the 20 mmHg CVP bag generated venous blood flow. Fully blinded, 26 subjects (final year medical students through to consultant anaesthetists) were invited to judge whether flows through the syringe were venous or arterial.

Results

Arterial or venous pressures were chosen at random for each subject. All those shown arterial flow judged incorrectly as venous. All subjects shown venous flows judged correctly. There was no significant variability across experience levels.

<table>
<thead>
<tr>
<th>Students</th>
<th>Trainees</th>
<th>Consultants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial total</td>
<td>9</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Arterial correct 1st attempt</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Arterial correct 2nd attempt</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Venous total</td>
<td>5</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Venous correct 1st attempt</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Venous correct 2nd attempt</td>
<td>5</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Discussion

This novel experiment emphasises that an arterially placed guidewire cannot be confirmed solely on the basis of velocity or pulsatility of the blood emerging from the syringe. At such low blood pressures, arterial flows are mistaken for venous. In one study, 10 out of 51 arterial punctures were unidentified based on pulsatility [3]. Pressure transduction, alongside ultrasound guidance, during CVC insertion could play a vital role in further reducing complications from arterial cannulation.

References


Neurodevelopmental outcome at seven years of age following neonatal anaesthesia in very preterm infants

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1Royal Children’s Hospital, Melbourne, 2Murdoch Children’s Research Institute, Melbourne, 3Royal Women’s Hospital, Melbourne, 4Washington University School of Medicine in St Louis

The developing brain is subject to anaesthetic mediated neuronal apoptosis, the clinical significance of which is not yet determined. Premature neonates may be at increased risk of neuronal apoptosis and impaired neurodevelopment outcome. Surgery in preterm infants has been associated with adverse cognitive outcome but the contribution of anaesthesia to outcome is yet to be elucidated. We aim to assess the effects of surgery and the type of anaesthesia used in the neonatal period, on measures of brain development and neuropsychological performance at 7 years of age, in infants born ≤31 weeks’ gestation.

Methods

The Victorian Infant Brain Study (VIBeS) is a longitudinal observation cohort of very preterm infants (born ≤31 weeks’ gestation) and term controls. Records were reviewed for infants who had surgery prior to 42 weeks’ gestation and the type of anaesthesia used (general anaesthesia (GA) eg. intravenous or inhaled anaesthetic vs a non-general anaesthetic technique (NGAT) eg. axial or opioid / neuromuscular blockade only). Outcomes included the California neonatal score of verbal learning (CSSVL), Attentive Score, working memory, Movement ABC (MABC), Tower of London, executive function, speed of information processing and strengths and weaknesses questionnaires. Using Stata V12.1 models were fitted with generalised estimating equations and adjusted by gender, gestational age at birth, small for gestational age and sepsis.

Results

Two hundred and twenty four infants were recruited and followed through to 7 years. Their mean (SD) gestational age at birth was 27.4 (1.8) weeks and mean birth weight was 962 (233) g. Thirty-six infants had surgery and anaesthetic records were available for 31; 20 had GA, 11 had NGAT. Surgery was associated with small for gestational age (19% vs 7%), male sex (69% vs 47%), and sepsis (47% vs 31%) but not gestational age at birth. Lower CSSVL scores (−5.41, 95% CI −9.85, −0.96 p = 0.017) and MABC scores (−11.02, 95% CI −8.21, −3.83, p = 0.003) at 7 years were associated with neonatal surgery. No significant difference was found between the GA and NGAT scores for CSSVL (1.43, 95% CI −1.25, 8.11, p = 0.15) or MABC (3.97, 95% CI −2.8, 15.75, p = 0.508). No significant associations in the other outcome measures were found.

Discussion

In this cohort of very preterm infants, 16% were exposed to anaesthesia prior to 42 weeks gestation. We found an association between surgery and impaired neurodevelopment scores in 2 domains at 7 years of age, although this was independent of the type of anaesthesia used.

Acknowledgements

Charlotte Molesworth for the statistical analysis.

References

Thermal gradient: the primary driver of thermal perception?

C. Mullington, C. Wrench, J. He, D. Low, P. Strutton and S. Malhotra
Imperial College London, Liverpool John Moores University, Imperial College NHS Trust

Failure to maintain normothermia has implications for many aspects of perioperative care including surgical site infection, haemostasis and recovery duration [1]. Thermal perception (TP) is an important aspect of thermoregulation as it is the stimulus for behavioural responses. Current evidence suggests that skin (Tsk) and core temperatures (Tc) contribute equally to TP [2]. Thermal gradient (TG), the environment-skin temperature difference, is a key modulator of heat loss/gain but its influence upon TP is unknown. We hypothesised that both absolute Tc and Tsk have little influence on TP and that TG is the primary driver during cold exposure.

Methods

20 healthy subjects (10 male) lay supine between a water perfused mattress/blanket. Subjects were cooled for 45 min by perfusing 4°C water and then rewarmed for 75 min by perfusing 41°C water. Tsk was recorded from the left forearm, index finger and thigh. Tc was recorded using an ingreestable pill thermometry system. TP was recorded at 5 min intervals with an 11 point thermal discomfort score (TDS) [3]. Temperature data were averaged over 5 min epochs and expressed relative to baseline. Tsk recordings were averaged to establish mean Tsk. Mattress/blanket temperature (Tm/B) was recorded during 2 cooling/rewarming cycles without a subject present. TG was calculated as the difference between the Tm/B and the mean Tsk. Values are expressed as means ± SD. Data were analysed with one-way repeated measures ANOVA.

Results

Tsk was less than baseline between 2.5 and 57.5 min (p < 0.01) and greater than baseline between 62.5 and 120 min (p < 0.01). TDS decreased between 0 and 55 min (p < 0.001) and increased between 85 and 120 min (p < 0.001). Tc increased between 7.5 and 42.5 min (p < 0.03) and decreased between 72.5 and 120 min (p = 0.008). Mean Tsk decreased between 2.5 and 87.5 min (p < 0.001) and increased between 107.5 and 120 min (p = 0.008). TG decreased between 2.5 and 47.5 min (p < 0.001) and increased between 57.5 and 120 min (p < 0.01).

Discussion

In this experimental design Tc and Tsk were poorly perceived. Subjects reported feeling cold when Tc increased and hot when it decreased. During cooling TDS tracked Tsk but upon rewarming TDS increased whilst Tsk continued to fall. When subjects reported feeling warm Tsk was still less than baseline. TG was more accurately perceived. TDS tracked TG during cooling and rewararging. The return of TDS to baseline also coincided with the switch from a negative to a positive TG. Clinicians should be aware that during cold exposure patients may not perceive changes in Tsk and Tsk accurately and that a feeling of warmth may not indicate normothermia.

References


Investigation of paraffin gel wax and gelatine as medium for ultrasound phantoms

Z. Ozfirat, J. Willers, S. Harihar, W. Hauf, W. Shippam and D. Uncles
Western Sussex Hospital Trust

A study in 2013 found that paraffin based wax gel (PWG) (used in the manufacture of candles) was a suitable material for a phantom designed to train radiographers in ultrasound (US) guided breast biopsy, we therefore decided to investigate its use in regional anaesthesia US phantoms. As the speed of sound in PWG is very close to that of gelatine, we hypothesised that it would be possible to amalgamate the 2 materials to create an US phantom.

Methods

Material was sourced from a candlemaker supplier. We evaluated wax gel using established criteria for an ideal US phantom medium. Then gel wax was embedded in gelatine and evaluated for refraction and interface reflection.

Results

Gel wax complies with all the criteria for an ideal US medium

- Reproduce the texture and resistance of human tissue
- Inhibit sideways movement of the needle
- Sufficient ultrasound penetration to enable identification and location of targets up to a depth of 10 cm
- Easily repairable from the damage caused by needle insertion
- Have targets that must be clearly distinguished from the surrounding medium in the US image
- Have targets that do not corrode over time
- Identify clearly to the operator when contact between needle and target has been made
- Affordable
- Be easily transportable
- Be composed of non-perishable material
- Have different levels of difficulty/complexity that can easily be changed
- Be easily reproducible
- Have a long shelf life
- Suitability in US guided breast biopsy established
- Suitable in US guided breast biopsy established
- Solonculent to maximum scan depth
- 100% repairable with heat
- Forms extremely clear interfaces even with solonculent target interfaces
- Structures not affected by pressure or temperature
- Elastic allowing transmitted movement, insulating properties can be used to create a circuit
- £6.80 per kilogram and 100% recyclable
- Does not need refrigeration
- Millions of years old already
- Complex structures possible
- With access to a stove
- Millions of years old already

We found that PWG forms a sharp ultrasound interface with gelatine allowing clear targets to be formed within either medium, even though being solonculent. There is no refraction discernable between the two mediums as the US needle image is not distorted with no bend in the needle at any angle on scanning.

Discussion

PWG appears to be a promising material for RA US phantoms, with some limitations. Microwave heating is difficult due to poor energy absorption, hence PWG needs to be melted on a stove to remove needle tracts. This can be overcome by diluting with 2/3rd liquid paraffin to form a substance that is self repairing, but this is too weak to support an US probe unless embedded in foam rubber sponge. As a paraffin wax it is easy to insert targets either by dilution, or by thermal tunelling and can be melted, cast, carved or thermally sculpted to create a variety of structures. Absence of refraction allows use in combination with gelatine to create composite targets. Its low density and higher melting point compared to gelatine allows targets to be embedded into gelatine. This will require more than one castings as wax gel will float on liquid gelatine. Needle marks in gelatine are removed by heating in a microwave without melting, keeping wax gel structures in place and in shape. Thin gel wax layers created by floating it on gelatine can protect it from desiccation and infection. Although a petroleum product it not a fire hazard as attested by its stability in the presence of an open flame in gel wax candles.

References

Rectus sheath catheters reduce post operative morphine requirements following DIEP flap surgery

S. Patel, S. Rahman and O. Dulan
Royal Free Hospital

Breast reconstruction using deep inferior epigastric perforator (DIEP) flap is associated with significant postoperative pain at the donor site and traditionally has been treated with systemic opioids. The aim of this study was to evaluate if intermittent local anaesthetic (LA) delivery via a rectus sheath catheter can reduce opioid requirements post operatively.

Methods
A retrospective review of all unilateral DIEP flap reconstructions performed in our hospital over a consecutive 13-month period was conducted. Patients who had returned to theatre were excluded from the analysis. Patients were divided into 2 groups:

1) **Catheter Group (CG)** - patients who received a rectus sheath catheter as well as traditional opioids for post operative analgesia. These patients had their rectus sheath catheter inserted under direct vision by the surgeon at the end of the operation. LA delivery involved administration of 10 ml 0.5% bupivacaine at the end of the procedure, and regularly at 8 hourly intervals for 72 h post operatively.

2) **Non-Catheter Group (NCG)** - patients who had received traditional opioids only for post operative analgesia.

Results
Fifty one patients were included in the study: 24 in the CG, and 27 in the NCG. There were 3 patients who received a rectus sheath catheter as well as traditional opioids for post operative analgesia. These patients had their rectus sheath catheter inserted under direct vision by the surgeon at the end of the operation. LA delivery involved administration of 10 ml 0.5% bupivacaine at the end of the procedure, and regularly at 8 hourly intervals for 72 h post operatively.

Postoperative opioid (up to 72 h) consumption was compared between the 2 groups. All oral opioids used (tramadol, codeine, oramorph) were converted to equianalgesic intravenous morphine doses for comparison [1].

**Results**

Oral opioid requirements followed a similar trend, with a 47% reduction in the CG (p = 0.01). Overall, total post operative morphine requirement (PCA + oral opioid equivalent) was significantly reduced by 49% in the CG (p = 0.001).

**Discussion**

Intermittent LA delivery via a rectus sheath catheter significantly reduces post operative opioid requirements following breast reconstruction using DIEP flap. Larger prospective studies are required to investigate if the benefit extends to a reduction in post operative nausea and vomiting, patient satisfaction, cost and hospital stay.

**Reference**


Anaerobic threshold is poorly predictive of intensive care requirements in patients undergoing major colorectal operations

N. Plummer,1 C. Slawinski,2 D. Richardson,3 T. Owen,3 S. Laha3 and A. Jadav1
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Cardiopulmonary exercise testing (CPET) is used to predict perioperative risk, and define levels of post-operative care required [1]. Anaerobic thresholds (AT) of less than 21 mlO2.kg⁻¹.min⁻¹ have been associated with increased hospital stay, complication rate, and long-term mortality in colorectal patients [2, 3], and as such AT is commonly used as a proxy for overall operative fitness. We aimed to assess whether AT alone predicted ICU resource utilisation and short-term outcomes in patients undergoing major colorectal operations, when compared to the recommended outcome after interpreted CPET.

**Methods**

We reviewed a prospectively maintained database of patients undergoing CPET prior to major colorectal operations (as defined by OPCS-4) between September 2011 and August 2013. In-hospital mortality and length of stay data were retrieved from the digital case-notes. ICU requirements were drawn from the Critical Care Minimum Data Set. Binary logistic regression analysis was performed in SPSS 20, adjusted for age, gender, procedure, and operative technique.

**Results**

Of 183 patients who underwent CPET, 113 (62%) were recommended to receive post-operative ICU care. 18 of these were admitted directly to the ward post-operatively, and experienced a significantly higher in-hospital mortality rate (OR 13.4 (95% CI 1.6–115.3) p = 0.016), whereas immediate admission to ICU was not associated with a mortality decrease in patients recommended for ward-level care (p = 0.997). AT alone did not predict the need for level 3 care (p = 0.343), readmission to ICU (p = 0.795), or in-hospital mortality (p = 0.401), although it was predictive for mortality when the model was adjusted for post-operative ICU admission (p = 0.030). Poor AT was weakly correlated with ICU length of stay (Spearman’s ρ = −0.295, p < 0.001) but not total hospital length of stay (ρ = −0.097, p = 0.197).

**Discussion**

The clinician’s interpreted CPET outcome, dependent on exercise tolerance, patient co-morbidities, and planned procedure, accurately predicts the need for ICU care following major colorectal operations. However AT in isolation is poorly predictive of level 3 care, readmission to ICU, or in-patient mortality, and is only weakly predictive of ICU length of stay. Sole use of AT is therefore an inadequate tool for determining which patients will benefit from scarce ICU resources following major colorectal operations. Analysis of a larger cohort of patients and further CPET metrics will allow more accurate risk stratification, and prediction of use of ICU resources in such a patient group.

**References**


**POSTER ABSTRACTS**
The value of myocardial perfusion imaging in predicting cardiac events and hospital length of stay in abdominal aortic aneurysm repair

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Patients undergoing abdominal aortic aneurysm repair (AAA) have multiple comorbidities. Current guidelines from the American College of Cardiologists and American Heart Association (ACC/AHA) suggest we should consider non-invasive cardiac testing for patients with functional capacity less than 4 metabolic equivalents and more than two risk factors from the Revised Cardiac Risk Index. At our institution this involves myocardial perfusion imaging (MPI). We performed a retrospective study assessing value of MPI in predicting cardiac events and hospital length of stay.

Methods

We retrospectively studied 220 patients who underwent MPI as part of their pre-operative evaluation for either endovascular, or open AAA repair in our Institution from April 2008 to December 2013. Each patient underwent 2-day pharmacological stress MPI. Based on the extent of myocardial perfusion defects, evidence of inducible ischaemia and global left ventricular function, patients were classified into low (L) or intermediate/high (H) risk groups for peri-operative cardiac events. The patients were followed up for 12 months.

Results

The post-operative mortality for group L was 0.64%, 1.78% and 4.6% at 24-h, 30-day and 12 months. The post-operative mortality for group H was 1.56%, 4.68% and 16.6% at 24 h, 30-day and 12 months. Patients in group H had significantly higher mortality rate at 12 months, compared to group L (p < 0.01, RR 3.75). In group H, 25/64 patients (39%) had a confirmed cardiac review prior to surgery. Of the 25 patients referred to cardiology, 13/25 patients (52%) underwent coronary angiography and 5/13 patients (38%) underwent revascularisation. Within group H the mortality at 30 days and 12 months was 4% and 10% respectively in patients who had a cardiac review, compared to 5% and 19%, with no cardiac review. Elective open repair patients in group H had a significantly longer average length of stay in hospital compared to group L (16.5 days ± 14.5 SD vs. 9.5 days ± 4.9 SD, p = 0.024).

Discussion

MPI is a useful tool in pre-operative risk assessment for AAA surgery. Results suggest MPI has excellent negative predictive value for peri-operative events and cardiac mortality in low-risk patients. This replicates previous studies that show a negative predictive value of 99% for MI or cardiac death. High-risk patients with pre-operative cardiac review had an incremental survival benefit. This suggests that all patients classified as intermediate/high risk should receive a cardiology review pre-operatively. Intermediate/high risk patients undergoing open AAA repair had a significantly longer hospital stay. MPI may therefore have use in predicting the length of hospital stay.

References


Exploring the feasibility of measuring pre-dilation needle pressure with guide wire in-situ to prevent inadvertent arterial dilation during central venous catheterisation

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Recently we encountered an inadvertent arterial cannulation of the right subclavian artery using a Raulerson channelled syringe, despite employing ultrasound guidance [1]. Although transduction of needle tip pressures using such syringes is helpful, this is not possible once the guide wire is in-situ (GIS). A pressure transducer fixed to the introducer needle to confirm venous pressure with GIS before dilation has been described [2], however this is unavailable in the UK. Our aim was to establish if it was possible to detect the difference between venous and arterial pressure with a device constructed using components available to us and if so what pressure measurement values could be expected.

Methods

A blood vessel model was made from latex tubing incorporating a column of saline at one end. At the other end a channelled syringe was attached via a needle and a Vygon extension set with male Luer-lock ‘T’ connector and female Luer-lock with Bionector (Ref 822.111 E). Pressures were measured simultaneously in the blood vessel analogue and needle using our adapted set attached to a standard pressure transducing set. We simulated arterial pulsation using an epidural syringe and pressure wave forms were monitored. The height of the column of saline was reduced incrementally and pressures measured in mmHg, firstly without, then with GIS.

Results

Pulsations were clearly observed at both ends of our model with pulse pressures between 10 and 100 mmHg. Visible waveforms were transmitted with GIS. There was no statistical difference between the pressure values of vessel and needle without GIS. Once the guide wire was introduced, a difference was apparent at all pressures measured. Both the vessel pressure and the needle pressure decreased as the height of the column of fluid reduced. However the needle pressure with GIS was consistently lower when compared to that of the vessel (Fig. 1). The median (IQR [range]) decrease in pressure was 58% (52–60 [50–67]) (n = 22).

Discussion

This study has shown it should be possible to accurately confirm needle position prior to dilation after GIS using a transduced Vygon connector on a channelled syringe. Clearly visible pulse waves should alert the operator to inadvertent arterial puncture and prevent further vessel injury, which can occur in up to 5% of central venous catheterisations [3]. The pressure decrease caused by the guide wire in the needle as measured by our standard equipment was quantified enabling us to confidently implement this new safety initiative for the insertion of CVCs in our critical care patients.

References


Figure 1 Vessel pressure (black) and pressure in needle (white) with GIS.
Self-repairing ultrasound phantoms using gelatine embedded foams

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During our search to develop durable and affordable ultrasound guided regional anaesthesia (USRA) simulators we developed new materials with properties that allowed phantoms to be self-repairing after needling, preventing needle tract formation (NTF) seen with homemade gelatine based phantoms and their more expensive silicon commercial counterparts [1]. We explored whether this was possible to achieve with a gelatine based trainer.

Methods

We determined that modulating pH and thus molecular shape (changing gel strength, density and viscosity) had minimal effect on NTF and that it was purely a function of gel strength that occurred shortly after sol-gel transition. Concentrations of gelatine that were self-repairing were unable to maintain their own structure. We tried embedding the soft gelatine in various matrices attempting to create composite materials with the ultrasonic characteristics and self-repairing ability of the gelatine and the structural strength of the scaffolding. We investigated synthetic bath sponge (BS), cellulose based kitchen foams (CF) and latex based upholstery foam (UF) before testing strength, as well as ultrasonic and needling characteristics.

Figure 1 Ultrasound images of gelatine embedded foams: 1. Upholstery foam after several hundred needlings 2. Bath sponge 3. Layered cellulose foam.

Results

All foams retained the ultrasound transmission and self-repair properties of gelatine and the strength of the matrices. The foam provided scatter obviating the need for a contrast medium, with CF the densest and UF the least. None of the foams showed signs of NTF, with UF totally unchanged even after multiple dilations. Air was absent from all three, but sneaked back on the surface after squeezing, most with UF and least with CF. This was easily solved by sealing the surface either with a stronger gelatine solution and/or an impervious membrane. All were subjected to more than 100 needlings without any discernible deterioration.

Discussion

Composite materials are widely utilised in nature and industry, but thus far have been ignored in the manufacture of USRA simulators. Combining foam and gelatine accentuates the positive and minimises the negative properties of the two mediums. It is possible to construct a cheap phantom that is self-repairing after needling or Seldinger dilation with multiple applications for anaesthetic training. Structures mimicking nerves and vessels can be inserted into the phantom and layering the gelatine embedded foam creates fascial layers and muscle groups. This allows the practice and refinement of complex nerve blocks and vascular access placement techniques.

Reference


Development and evaluation of a pudendal nerve block trainer

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Anaesthetists are justifiably proud of their regional anaesthesia skills, however, there is a region where they seldom venture – pudendal nerve block (PNB). Traditionally PNB was the remit of obstetricians, (trans vaginally) but it is also increasingly used by surgeons at our hospital for postop analgesia for anorectal procedures, (transcutaneously with guiding finger PK). Furthermore chronic pain clinicians employ PNB to diagnose and treat pudendal nerve syndrome (posterior percutaneous approach). Unfortunately there is no easy way to teach the various techniques for PNB and there is no commercial trainer available. Consequently, the confidence and skills to perform these blocks are limited to senior clinicians. We resolved to develop a PNB trainer for use by obstetricians, surgeons and trainee anaesthetists (TA).

Methods

Our trainer was built using a plastic model of a pelvis. Ischiococcal and sacroctuberous ligaments fabricated from twisted cloth ties were attached in the correct anatomical positions. Pirimidalis, obturator internus and pelvic floor muscles were constructed from foam rubber and red latex sheets. Perineal tissue including an orifice was fabricated from upholstery foam. The pudendal nerve comprising both the sacral nerve origins and three distal branches was made with wire carefully bent so as to follow the correct anatomical path. Alcock’s canal on the obturator was constructed from transpore tape. This model was then evaluated as an aid to teach the three techniques of PNB described. Five groups of five assessors were used. A colorectal surgical group, an obstetric group, both experienced in PNBs, a consultant anaesthetist group of two pain specialists and three obstetric anaesthetists, SAS obstetric anaesthetists and lastly TAs. None of the anaesthetists had performed a PNB before. The utility of the trainer was evaluated using a five point Likert scale (1 strongly disagree-5 strongly agree) with an established format questionnaire [1].

Table 1 Median score (with IQR [range]) for colorectal surgeons, obstetricians, consultant, SAS and trainee anaesthetists.

Results

The feedback received suggests this simulator appears to be a useful tool for teaching PNB techniques.

Discussion

Although TAs are unlikely to use PNB in their routine practice, general cross discipline understanding and familiarity with this procedure could assist provision of improved postoperative analgesia in perineal surgery, as well as better anaesthesia during childbirth or instrumental deliveries without resorting to neuraxial blockade.

Reference

Management of perioperative cardiac arrest in a developing country: has there been any improvement

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The mortality of cardiac arrest (CA) can be reduced with continuous training of health care providers in cardiopulmonary resuscitation (CPR), and the provision of appropriate facilities. A previous audit done 10 years ago revealed poor adherence to established guidelines.

Methods

All perioperative cardiac arrests, which occurred between January 2013 and May 2014 at the Lagos University Teaching Hospital, were prospectively studied. Patients less than 16 years and cardiac arrests occurring outside the direct supervision of the anaesthetists were excluded.

Results

Forty-two cardiac arrests occurred in 2442 cases (incidence of 17.19 per 1000). Five (11.90%) occurred at induction, 10 (23.81%) intraoperatively, and 27 (64.29%) in the recovery period. Only one out of four patients with shockable rhythm received defibrillation. All patients received cardiac compression, 36 (85.7%) had IV adrenaline at a median dose of 2.5, IQR 2–4 ml, and interval of 5.62, IQR 5–7.67 min, but 6 (14.3%) did not receive adrenaline. Table 1. Atropine 1.2 mg was administered to 3 patients with bradycardia secondary to volatilized-induced cardiac arrest. Return of spontaneous circulation (ROSC) occurred in 18 patients (42.86%) and only 3 (7.14%) survived to hospital discharge.

Discussion

CPR is still not performed according to standard protocol in our institution [1, 2]. While some patients did not receive adrenaline. The interval of administering adrenaline is still more than that outlined by the advanced cardiac life support guidelines [3]. However, the interval has reduced from our previous study. A similar observation regarding adrenaline administration was made by Johansson et al. [4]. The use of defibrillation is still inadequate, while the use of atropine is now limited to volatilize agent induced CA. The incidence of CA in our institution increased, while the ROSC was better than 10 years ago [1, 2].

Table 1 Characteristics of cardiac arrest.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Present (n = 42)</th>
<th>10 Years Earlier (n = 13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence</td>
<td>17.19 per 1000</td>
<td>6 per 1000</td>
</tr>
<tr>
<td>Major Cause</td>
<td>Hypovolaemia</td>
<td>Hypovolaemia</td>
</tr>
<tr>
<td>Adrenaline dose interval (min)</td>
<td>5.62</td>
<td>7.5</td>
</tr>
<tr>
<td>CA at induction (frequency)</td>
<td>5 (11.90%)</td>
<td>2 (15.38%)</td>
</tr>
<tr>
<td>CA at intraoperative period (frequency)</td>
<td>10 (23.81%)</td>
<td>7 (53.85%)</td>
</tr>
<tr>
<td>CA at postoperative period (frequency)</td>
<td>27 (64.29%)</td>
<td>4 (30.77%)</td>
</tr>
<tr>
<td>Shockable Rhythm (number)</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Defibrillation (number)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Atropine (number)</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>ROSC (frequency)</td>
<td>18 (42.86%)</td>
<td>5 (38.46%)</td>
</tr>
<tr>
<td>Hospital Survival (frequency)</td>
<td>3 (7.14%)</td>
<td>4 (30.77%)</td>
</tr>
</tbody>
</table>

References


Regional analgesia for thoracotomy

I. Ahmed 1 and A. Ashworth 2
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This is a retrospective study on intra-operative and postoperative analgesic strategies used for Open Thoracotomy and Video Assisted Thoracotomy Surgery (VATS).

Methods

Case notes were reviewed for all patients who underwent thoracic surgery in January 2012 at Wythenshawe Hospital. Intra-operative analgesics were documented. Particular emphasis was paid to regional analgesia in terms of technique and ‘recipes’. Pain scores in recovery were documented, as were the postoperative analgesic strategies.

Results

Seventy four thoracotomy cases were carried out in this month, four notes were partially or completely missing and so were omitted. Hence the total was down to 70. Of those, 46 were open and 24 were VATS. For open surgery, thoracic epidural mixtures ranged from 0.125% -0.5% bupivacaine, +/- adrenaline. For VATS, there was more prevalent use of paravertebral blocks (PVB). Ninety five percent of patients who underwent VATS received PVB vs 69% of those who had open surgeries. On the other hand, only 5% of patients who had VATS received epidurals compared to almost a third of open thoracotomy patients. There were 5 different recipes for epidurals, and almost a dozen recipes for paravertebral blocks. There were several instances of no documentation or very poor documentation providing no details of the regional block used, level or drugs used.

Table 1 PVB recipes and pain scores following open surgery

<table>
<thead>
<tr>
<th>Total</th>
<th>Pain 0</th>
<th>Pain 1</th>
<th>Pain 2</th>
<th>Pain 3</th>
<th>Not recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 ml</td>
<td>x 1</td>
<td>x 0.25%</td>
<td>Bup.</td>
<td>Bup.</td>
<td>Bup.</td>
</tr>
<tr>
<td>40 ml</td>
<td>x 1</td>
<td>x 0.375%</td>
<td>Bup.</td>
<td>Bup.</td>
<td>Bup.</td>
</tr>
<tr>
<td>20 ml</td>
<td>x 2</td>
<td>x 0.25%</td>
<td>Bup.</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>13 ml</td>
<td>x 3</td>
<td>x 0.3%</td>
<td>Bup.</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>16 ml</td>
<td>x 3</td>
<td>x 0.25%</td>
<td>Bup.</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>20 ml</td>
<td>x 3</td>
<td>x 0.25%</td>
<td>Bup.</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>40 ml</td>
<td>x 0.25%</td>
<td>Bup.</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

Discussion

Epidurals provided superior pain relief in open surgery. Although half a dozen epidural ‘recipes’ were used, there was no obvious advantage detected by post operative pain scores. Of the group that received PVB, 3 had a pain score of 3 in recovery (all had epidurals) and in the others, neither injections had a single injection, neither injections were more effective than single injections. 20/46 patients had pain score 0 (10 of whom had epidurals, 9 had PVB, only one technique recorded). For VATS one patient received a single shot epidural and had a pain score of 0 in recovery. Almost a dozen ‘recipes’ for PVB, no obvious advantage detected by pain scores, and no obvious advantage of multiple over single injections.

References

Survey on anaesthetic practice in enhanced recovery for lower limb arthroplasty in the North East of England

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Enhanced recovery is the process of delivering continuous improvement across the whole acute care pathway, centred on shared decision-making between the patient and their healthcare team [1]. Anaesthetists play a vital role in different stages of a patient’s journey through enhanced recovery programme for lower limbs arthroplasty. Preoperative management is standardised in some hospitals. However, intra-operative management varies among different hospitals and from one anaesthetist to another. Intra-operative anaesthetic management has implications on patients’ postoperative mobility and time to discharge from the hospital. We conducted a survey to determine preferences and experiences of anaesthetists practising enhanced recovery for lower limb arthroplasty in the North East of England.

Methods
A questionnaire was designed on SurveyMonkey© website (Fig. 1). Survey links were emailed to 14 different NHS hospitals in the North East of England. All the anaesthetists conducting lower limb arthroplasty theatre lists were requested to fill in this survey. The survey window was open from 24th March 2014 up until 15th May 2014 (53 days).

Results
Forty seven anaesthetists completed the survey. Most of the anaesthetists prefer spinal anaesthesia with different strengths and doses of bupivacaine and levobupivacaine as central neuraxial local anaesthetic agent. Eleven out of 47 (23.4%) usually use varying doses of opioids for spinal with diamorphine and fentanyl being the main opioids. None of them inserts urinary catheter as a routine while 17 out of 47 (36.1%) administer tranexemic acid regularly. Thirty nine (83.0%) usually use varying doses of opioids for spinal with diamorphine and fentanyl being the main opioids. None of them inserts urinary catheter as a routine while 17 out of 47 (36.1%) administer tranexemic acid regularly. Thirty nine (83.0%) usually use varying doses of opioids for spinal with diamorphine and fentanyl being the main opioids. None of them inserts urinary catheter as a routine while 17 out of 47 (36.1%) administer tranexemic acid regularly. Thirty nine (83.0%) usually use varying doses of opioids for spinal with diamorphine and fentanyl being the main opioids. None of them inserts urinary catheter as a routine while 17 out of 47 (36.1%) administer tranexemic acid regularly. Thirty nine (83.0%) usually use varying doses of opioids for spinal with diamorphine and fentanyl being the main opioids. None of them inserts urinary catheter as a routine while 17 out of 47 (36.1%) administer tranexemic acid regularly.

Discussion
This survey shows the enhanced recovery programme is beneficial to the patients undergoing lower limb arthroplasty and the NHS in terms of better outcome and cost savings. However it also highlights the lack of uniformity in the way the anaesthesia is administered. The main problem has been post-operative pain which needs addressing to make the programme to be more successful.

Figure 1 Questionnaire
Q1. Which type of anaesthesia do you administer?
Q2. Which drug and dose do you use for spinal anaesthesia?
Q3. Do you use opioids for spinal anaesthesia?
Q4. Which opioid and what dose do you use for spinal anaesthesia?
Q5. Do you use urinary catheters?
Q6. Do you use Tranexamic Acid?
Q7. What problems do you encounter during surgery?
Q8. How do you manage postoperative pain?
Q9. Which post-operative problems do you encounter?
Q10. Usually when is patient discharged home from the ward?

Acknowledgements
Dr Muhammad Haseeb Ikram (North Tees & Hartlepool NHS Foundation Trust) for assisting in developing this survey and data collection.

Reference

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Collaboration between SWARM (Trainee research network) and clinical research nurses to maximise recruitment to sprint national audit projects

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1SWARM, Plymouth 2South West Peninsula Clinical NIHR Research Network
For full contributor list please see http://www.ukswarm.com

The SPRINT National Audits are a new initiative involving hospitals throughout the UK. They are intended to provide a ‘snapshot’ evaluation of clinical activity and patient centred perioperative outcomes. Our trainee led audit and research network links all six centres in the South West School of Anaesthesia. We collaborated with nurses from the Local Clinical Research Network (LCRN) to lead local recruitment to the first national sprint audit, SNAP-1 [1].

Methods
SNAP-1 comprised a UK wide evaluation of patient reported awareness (Brice Questionnaire) and satisfaction after anaesthesia (Bauer Questionnaire) conducted over 2 days in May 2014. All six SWARM sites recruited. To determine the impact of SWARM and LCRN involvement on recruitment, local leads at all sites retrospectively provided data on number of eligible patients, total number recruited and manpower required for the study.

Results
A total of 688 patients were recruited (Table 1). Site A was the highest recruiting centre. All centres had an acceptable recruitment rate of greater than 75%. All trusts exceeded their target recruitment.

Discussion
84% of eligible patients were recruited. Theatre activity was affected by a major incident at site C and a governance meeting at site D during the study window. Collaboration between the LCRN and trainee networks was associated with high recruitment rate to a national audit project, though local staffing arrangements varied. The site recruiting the most patients had minimal input from LCRN, whilst the site recruiting the highest proportion of patients had no SWARM contributors. Comparison with recruitment rates from a region without a trainee research collective might provide more insight into the success of such networks.

Table 1 SWARM and LCRN site recruitment to SNAP-1, stratified by centre.

<table>
<thead>
<tr>
<th>Site</th>
<th>Patients recruited/Eligible (estimated) n (%)</th>
<th>No. of SWARM members contributing</th>
<th>No. of LCRN nurses contributing</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>180/207 (87)</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>138/180 (77)</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>136/157 (87)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>D</td>
<td>72/80 (90)</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>E</td>
<td>95/126 (75)</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>67/68 (99)</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Totals</td>
<td>688/818 (84)</td>
<td>37</td>
<td>22</td>
</tr>
</tbody>
</table>

Acknowledgements
NIAA SNAP-1 lead by Dr R Moonesinghe and Dr E Walker. NIHR Clinical Research Network South West Peninsula supported by a Peninsula Deanery Innovation Grant.

References

Are preoperative clotting screens of benefit and does cutting down on the number performed shift pre-operative assessment work elsewhere?

B. Atterton and A. Dennis
Sheffield Teaching Hospitals NHS Foundation Trust

A 2011 service review of the Sheffield Teaching Hospitals’ (SHT) pre-operative assessment clinic (POAC) showed that over 1 month, 72% of patients (431/600) had a clotting screen. Many were requested for spurious reasons, e.g. ‘bruises easily’ and not one result changed management [1]. To cut down on the number of inappropriate tests a new policy based on NICE guidelines was introduced alongside staff education [2]. Adherence to this policy is the subject of this audit. We were conscious that cutting down on clotting screens in POAC may have shifted the work elsewhere so we also followed up patients to see if they had a screen in the time between their clinic appointment and the date of surgery.

Methods
All patients that attended the POAC over a calendar month in 2013 were included. A list of patients came from the clinics’ electronic diary. Information regarding their ASA grade, comorbidities, operation and whether they had a clotting screen or not came from a combination of three sources; a data collection tool used by the POAC staff when seeing patients, the electronic pre-operative assessment forms and ORMIS (Operating Room Management Information System). The results of the clotting screen came from ICE (Integrated Clinical Environment), a clinical investigation reporting system used by STH. For those patients that didn’t have a clotting screen in POAC, ICE was used to investigate any clotting screens they had between their POAC appointment and their surgery time and date as defined by ORMIS.

Results
In total 836 patients were seen during the 2013 sample month. Only 19% (n = 159) of these had a clotting screen compared to 72% in 2011 [1]. Fifty-seven percent were in-line with the new policy, however only 25% were felt to be inappropriate. Of the sampled patients, 92% (n = 765) had had surgery by the time of follow-up 6 months later; only a handful had had clotting screens in the interim. The majority of the interim clotting screens were due to an unplanned visit to A&E or to their GP, however 10 clotting screens were done on the morning of surgery. Of these, 2 were abnormal but were of no consequence and did not affect the planned surgery. Based on an average cost of £11 per clotting screen we estimate that the staff education and new policy has saved approximately £4800 a month.

Discussion
Staff education and a more restrictive clotting screen policy based on NICE guidance has produced a dramatic fall in the number of clotting screens performed in the SHT POAC with a consequential saving in time and money. It appears this has not resulted in a significant number of appropriate tests being missed and needing to be carried-out elsewhere.

References
Sepsis six: improving recognition and management of sepsis in the obstetric population

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1NHS Grampian, 2Aberdeen Maternity Hospital

Despite all the advances made since Alexander Gordon published his Treatise on the Epidemic Puerperal Fever of Aberdeen in 1795, sepsis is once again the leading cause of maternal mortality in the UK [1]. Simple care pathways such as Sepsis Six have been shown to reduce mortality from sepsis [2]. This audit aimed to improve recognition and management of sepsis in Aberdeen Maternity Hospital (AMH) through the introduction of Sepsis Six and an accompanying management flowchart and teaching program.

Methods

The Sepsis Six care bundle was researched and Scotland-wide expert opinion on its modification for use in obstetrics was noted. Initially a retrospective audit of case notes was undertaken to assess baseline compliance with Sepsis Six during February and March 2013. Cases were identified by reviewing the records of all patients discharged from AMH on antibiotics during that period, and of any patients notified through the local risk management system. A flowchart was designed to aid diagnosis and management and improve compliance with Sepsis Six; its introduction was underpinned by an education program for midwifery and medical staff including targeted teaching sessions, on-line communication and posters. Staff feedback was sought and further 2-week retrospective case note reviews were conducted as part of plan-do-study-act (PDSA) cycles aimed at further improving performance.

Results

207 consecutive cases were identified and of those 130 patient records were available for study. 49 patients met the criteria for sepsis. No patients received all the elements of Sepsis Six within 1 h.

The table below shows a breakdown of the individual Sepsis Six elements (delivered within 1 h) for the 49 patients identified with sepsis.

<table>
<thead>
<tr>
<th>Sepsis Six element</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV antibiotics administered</td>
<td>47 (96%)</td>
</tr>
<tr>
<td>Blood cultures taken</td>
<td>41 (84%)</td>
</tr>
<tr>
<td>O2 delivered</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Hb and lactate measured</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>IV fluids administered</td>
<td>23 (47%)</td>
</tr>
<tr>
<td>UOP measured</td>
<td>6 (12%)</td>
</tr>
</tbody>
</table>

Following introduction of the flowchart and teaching program compliance with the Sepsis Six care bundle has significantly improved.

Discussion

Service improvement can be driven in many ways and in this instance we first undertook a retrospective audit to identify barriers to compliance with Sepsis Six. The barriers identified were measurement of lactate and UOP, and delivery of O2, this enabled us to tailor our flowchart and education program to specifically address these areas. It also identified and supported targeted funding applications for new equipment, such as near patient lactate measurement. Further improvements in performance are being enhanced by staff involvement in the PDSA process. The progress we are making is being monitored and reviewed with ongoing audit, aiming for a safe, high quality experience for all women in our care.

References


Survey of internet usage for anaesthetic information in elective neurosurgical patients

F. Bari and R. Bajekal
Royal Victoria Infirmary, Newcastle upon Tyne

The 2015 Challenge Declaration produced by the NHS Confederation [1] has identified technology including digital exclusion and limited access to the internet by certain groups of patients as an area of focus. Use of the internet by patients for gathering information regarding health-related issues has increased markedly over recent years [2] but little is known regarding internet usage related to anaesthesia. This survey was designed to assess the use of the internet for information regarding anaesthesia in a group of elective neurosurgical patients.

Methods

An eight point questionnaire was given to all elective neurosurgical patients attending the day of surgery arrival ward over a 3-week period. Completion of the questionnaire was taken as implied consent. Questions focused on demographic information, general use of the internet and use specific to their planned hospital experience.

Results

One hundred and seven patients completed the survey. Ages ranged from 17 to 85 years. Highest educational level achieved ranged from GCSE or equivalent to Masters degree level. Twenty-three patients never used the internet whilst 15 patients used it for over 15 h per week. One hundred patients had attended pre-assessment clinic and ninety-nine patients had had a previous anaesthetic. Forty-five patients had not used the internet at all in relation to their hospital visit whilst 42 had searched for varied information including their medical condition (35), surgery (30), surgeon (11) and hospital facility (12). Only 2 patients recorded having searched the internet for any information regarding anaesthesia. Of those not using the internet, 53 had no unanswered questions about the anaesthetic and 12 did not know where to look. If directed to a particular anaesthesia-related information website 32 would have looked 45 would not and 30 declined to answer.

Discussion

Different aspects of healthcare are required by different patient groups and a wide variety of information sites are available. Few of our surveyed patient cohort used the internet for any information gathering prior to their procedure and anaesthetic information was not actively sought. These results mirror a large American survey [3] that found that patients did not seek information regarding anaesthesia but did have an interest if directed to appropriate websites. Most patients attend pre-assessment clinics and are able to have any concerns addressed. Perhaps patients should also be directed to useful anaesthesia websites for further information. The majority of our patients had had previous anaesthetics and this may have reduced their need for information gathering.

References

Use of local anaesthesia for intravenous cannulation: survey of midwives

K. Batte
Whittington Health, London

Many anaesthetists [1] routinely perform intra-dermal or subcutaneous local anaesthetic (LA) infiltration prior to wide-bore intravenous (IV) cannulation in order to reduce pain [2]. Patients on our unit who have been cannulated by an anaesthetist have commented on the lack of pain experienced compared to cannulation by other healthcare professionals on the delivery suite. We conducted a survey to explore the cannulation practices and opinions of the midwives on our unit.

Methods
We conducted a prospective survey on the use of LA for IV cannulation on the labour ward in a high-risk obstetric unit with more than 6000 deliveries per annum. We approached qualified substantive midwifery colleagues of all grades on our unit over a 1-month period in June 2012. In total 42 midwives were surveyed. We explored use of LA, reasons for doing so and factors which would encourage its usage, including preferred trainers.

Results
41 out of 42 respondents (98%) used LA for labour ward procedures other than cannulation. 35 respondents (83%) perform IV cannulation; 4 of 35 (13%) routinely use LA prior to the procedure (reduction of pain was cited by all as their rationale whereas 2 stated its use increased their confidence at cannulation). Of those performing cannulation, 5 (16%) had received training in LA use, but only 2 of these used it routinely. Those not routinely using LA for cannulation gave a number of reasons as summarised below.

Reasons cited for not using LA for cannulation:

<table>
<thead>
<tr>
<th>Positive responses (Percentage; number)</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>58; 18</td>
<td>Lack of training</td>
</tr>
<tr>
<td>52; 16</td>
<td>Pain of LA injection</td>
</tr>
<tr>
<td>42; 13</td>
<td>Increased difficulty of cannulation</td>
</tr>
<tr>
<td>26; 8</td>
<td>Concern of inadvertent LA injection</td>
</tr>
<tr>
<td>10; 3</td>
<td>Trained but not confident</td>
</tr>
<tr>
<td>10; 3</td>
<td>Not allowed</td>
</tr>
<tr>
<td>6; 2</td>
<td>Cannulation not painful</td>
</tr>
</tbody>
</table>

Those not using LA routinely would be encouraged to do so by: patient request (68% (21)), training 61% (19) and support from seniors 35% (11). 66% (23) of those able to cannulate would like further training in LA for cannulation; 96% (22) of these would like training from an anaesthetist, 78% (18) from a midwife, 52% (12) from a clinical skills trainer and 43% (10) from an obstetrician.

Discussion
Our department is fortunate to have a high proportion of midwives skilled in cannulation. However, whilst the vast majority are comfortable using LA for procedures such as perineal suturing only a small proportion of those able to perform IV cannulation use LA infiltration. Further training in its use would be valued by the majority surveyed and anaesthetists were the preferred trainers.

References

Introducing Schwartz centre rounds® to Watford General Hospital – challenging the status quo

M. Berry and R. Chaggar
Watford General Hospital

The current climate in the NHS is marred by negative sensationalist media scrutiny, extreme financial pressures and the ongoing repercussions following the Francis report. Providing compassionate, patient centred healthcare under these circumstances can be challenging. Schwartz Centre Rounds® were first developed by the Schwartz Center for Compassionate Healthcare in Boston, USA [1]. They are a pragmatic approach to support staff well being, foster compassionate patient care and organisational support by allowing hospital staff to get together once a month and reflect on the stresses and dilemmas that they have faced while caring for patients. Research pilots have shown that staff attending Schwartz Centre Rounds® feel better supported, have an improved understanding of how their colleagues think and are more resilient in dealing with the emotional pressures of their work [2]. Consequently introducing Schwartz rounds is being actively promoted by the Department of Health and they are currently run at 15 Trusts across the United Kingdom [3]. Witnessing some of the challenges highlighted above we took the initiative to introduce Schwartz rounds to Watford in an attempt to improve staff support and patient care.

Methods
To assess whether Schwartz rounds could prove a useful model for Watford we decided to run a pilot round. Following the same format as set out by the Schwartz Centre Foundation a pre-selected multidisciplinary panel consisting of four healthcare professionals discussed a clinical case. Each panel member spent 5 min presenting an aspect of the case, their involvement, the issues that it raised and its emotional impact. The remainder of the hour was opened up to the audience who were invited to share similar experiences, ask questions and reflect on what they heard. The round was open to all hospital staff and held over lunchtime.

Results
A total of 69 hospital staff attended the pilot round and 41 feedback forms were returned. The findings from our pilot survey demonstrated that the round was generally well received and many expressed the desire to attend future rounds.

Discussion
Presenting the survey findings to the executive team resulted in rapid implementation of Schwartz rounds at Watford. Despite being a new concept, its importance in improving patient care and staff support is increasingly recognised.

Table 1 Feedback summary.

<table>
<thead>
<tr>
<th>n = 41</th>
<th>Completely agree</th>
<th>Agree somewhat</th>
<th>Neither agree or disagree</th>
<th>Disagree somewhat</th>
<th>Completely disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant to clinical work</td>
<td>23</td>
<td>13</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Help me in caring for my patients</td>
<td>13</td>
<td>19</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Help me work better with my colleagues</td>
<td>13</td>
<td>21</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Overview and presentation was helpful</td>
<td>13</td>
<td>21</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Audience discussion was helpful</td>
<td>14</td>
<td>22</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>The facilitator helped the discussion today</td>
<td>22</td>
<td>15</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Insight into how others feel/think</td>
<td>18</td>
<td>18</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I plan to attend Schwartz Centre Rounds again</td>
<td>12</td>
<td>22</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Median</td>
<td>13.5</td>
<td>20</td>
<td>3.5</td>
<td>1.5</td>
<td>1</td>
</tr>
</tbody>
</table>

Acknowledgements
We would like to thank Mrs Samantha Jones CEO of West Hertfordshire Hospitals NHS Trust for enabling the successful implementation of Schwartz Centre Rounds®.

References
National neuroanaesthesia training survey
R. Campbell1 and J. Dinsmore2
1Queen Victoria Hospital, East Grinstead, 2St George’s Hospital, London

Spiral learning is based on the concept that core principles are learnt, understood, repeated and expanded as training progresses [1]. It has resulted in significant changes in anaesthetic training [2]. Neuroanaesthesia is an essential unit at intermediate and higher level training. However it is confined to specialist centres which can result in difficulties in delivery due to geographical constraints [3]. There have been concerns about out of hours training opportunities due to the impact of service provision. We wanted to know what training was offered and, importantly what training was being delivered.

Methods
An email questionnaire was sent to NASGBI linkmen regarding the structure of training at higher and intermediate level. Contact details of a trainee currently undertaking their neuroumodule were requested. A link to a ‘SurveyMonkey’ questionnaire was sent to this trainee to forward to all anaesthetic trainees who had recently or were currently undertaking their neuroumodules in the region. Data collected included training level, neuro-centre, module length, service provision, competencies, workplace based assessments (WPBAs), case-load, on-call duties, supervision, feedback, comfort with neurosurgical cases and overall experience.

Results
Responses were received from link consultant and trainees in every adult neuro-centre in the UK. There were a total of 175 trainee responses, 56% at intermediate, 36% at higher and 8% at advanced level. Module duration was 12 weeks for 48%, 8 weeks for 28% and 6 weeks for 5% of respondents. 3% had no set module. 93% obtained all required competencies and 96% of all WPBAs during their module. Total case numbers were < 50 for 62% and 50–100 for 35%. Comfort with a variety of neurosurgical cases is shown in Table 1. Only 46% covered neuroanaesthesia or neurointensive care out of hours. Overall rating for the module was good/excellent for 81%.

Discussion
There is significant variation in the duration and nature of neuromodules, in particular neurocritical care and on call commitments. Overall trainee satisfaction is high but there is room for improvement. Completion of training modules is based on achievement of competencies rather than numbers or case-mix. Our results suggest that some trainees complete their module without even having seen common procedures such as cervical spine surgery, burr holes or a craniotomy. Anaesthesia is a craft specialty with training acquired through experiential learning. Cases numbers are important and with limited time training programmes must be structured to encourage practical experience. Regular evaluation provides opportunity to improve the learning experience for trainees and ensure patient safety.

Table 1 Without direct supervision how comfortable would you feel to anaesthetise a patient for the following?

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Comfortable</th>
<th>Somewhat comfortable/unsureful</th>
<th>Uncomfortable</th>
<th>Extremely uncomftorlable</th>
<th>Not done ever</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Unit Blocks</td>
<td>66 (30.4%)</td>
<td>23 (11.2%)</td>
<td>55 (26.8%)</td>
<td>28 (13.7%)</td>
<td>5 (2.5%)</td>
</tr>
<tr>
<td>Ovariotomy</td>
<td>70 (34.7%)</td>
<td>30 (14.8%)</td>
<td>50 (25.2%)</td>
<td>25 (12.5%)</td>
<td>9 (4.5%)</td>
</tr>
<tr>
<td>Central Nerve Surgery</td>
<td>47 (23.5%)</td>
<td>32 (15.9%)</td>
<td>29 (14.5%)</td>
<td>24 (12.0%)</td>
<td>14 (7.1%)</td>
</tr>
<tr>
<td>Laminar Stere Surgery</td>
<td>23 (11.2%)</td>
<td>11 (5.4%)</td>
<td>26 (12.9%)</td>
<td>17 (8.5%)</td>
<td>12 (6.1%)</td>
</tr>
<tr>
<td>Neuroradiology procedures</td>
<td>47 (23.5%)</td>
<td>22 (10.9%)</td>
<td>52 (26.0%)</td>
<td>28 (14.0%)</td>
<td>17 (8.7%)</td>
</tr>
</tbody>
</table>

References
The rocky road to prehabilitation

R. Campbell, A. Barron and T. Vorster
Queen Victoria Hospital, East Grinstead

Enhanced recovery has become widespread throughout the NHS in an attempt to improve patient experience and outcome. However, as aspects of enhanced recovery have already become standards of care we must start to look for other targets to further improve care. The theory of ‘prehabilitation’ has emerged as such a potential target. The idea embodies individual patient optimisation in terms of diet, fitness, alcohol intake, smoking and psychological preparedness. It has been trialled in specialties such as oncology [1], urology [2] and vascular surgery [3] with promising early results. Therefore we decided to survey patients within our specialist centre regarding their receptiveness to the introduction of a potential prehabilitation program.

Methods

A paper questionnaire was given to patients preoperatively on the day of surgery asking what advice they had received regarding how to improve recovery, diet, alcohol intake, smoking, fitness, what to bring with them to hospital including entertainment, items to increase the comfort of their stay, changes they had made preoperatively, their involvement in surgical decision making and whether they would have liked advice on the above if it would potentially improve the speed and quality of their recovery.

Results

31 surveys were completed. Mean age 43.4 years (±16.3).

Discussion

We were surprised there weren’t more patients who wanted guidance even if adhering to it might improve speed and quality of recovery. Some patients already received some advice although it was not in a formal or standardised format. It is unclear what advice was given or its quality. Despite receiving information a minority of patients adopted any changes preoperatively. Patients are still fasting for prolonged and potentially detrimental time periods, possibly due to a lack of explanation of guidelines. This all shows that despite best intentions it may be difficult to engage patients in a prehabilitation programme particularly if they don’t understand the rationale. However, there was a significant proportion that would like further advice. Bearing in mind the potential benefit of even marginal improvements we have developed a patient information leaflet that will be provided at our preassessment clinic incorporating advice, support and background to prehabilitation. We will then repeat our survey to find out if additional information provided was thought to be useful or produced a change in patient behaviour.

Table 1 Summary of responses.

<table>
<thead>
<tr>
<th>Question</th>
<th>YES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you receive prep advice on how to improve recovery?</td>
<td>18 (58.1%)</td>
</tr>
<tr>
<td>Did you receive dietary advice pre op?</td>
<td>17 (54.8%)</td>
</tr>
<tr>
<td>Did you receive smoking advice pre op?</td>
<td>15 (68.2%)</td>
</tr>
<tr>
<td>Did you receive advice on alcohol intake pre op</td>
<td>15 (68.4%)</td>
</tr>
<tr>
<td>Were you advised what to bring in?</td>
<td>20 (64.5%)</td>
</tr>
<tr>
<td>Were you advised how to make stay more comfortable?</td>
<td>12 (38.7%)</td>
</tr>
<tr>
<td>Were you advised to bring entertainment?</td>
<td>11 (35.4%)</td>
</tr>
<tr>
<td>Did you feel empowered?</td>
<td>22 (70.9%)</td>
</tr>
<tr>
<td>Did you make any changes to get fit?</td>
<td>2 (6.5%)</td>
</tr>
<tr>
<td>Did you make any changes to improve diet?</td>
<td>6 (19.4%)</td>
</tr>
<tr>
<td>Fasting time fluid ±SD</td>
<td>9.2±5.4</td>
</tr>
<tr>
<td>Fasting time solids ±SD</td>
<td>10±4.5</td>
</tr>
<tr>
<td>Would you like advice on the following if it would improve your recovery?</td>
<td></td>
</tr>
<tr>
<td>Diet</td>
<td>12 (38.7%)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>11 (35.4%)</td>
</tr>
<tr>
<td>Smoking</td>
<td>7 (22.6%)</td>
</tr>
<tr>
<td>Fitness</td>
<td>12 (38.7%)</td>
</tr>
</tbody>
</table>

References


Introducing non-luer spinal products: the law of unintended consequences

L. Campbell
Brighton and Sussex University Hospital NHS Trust

In 2011, following several fatal clinical incidents, the National Patient Safety Agency recommended introduction of spinal products incompatible with intravenous products [1]. In April 2012 our trust switched to Surety™ compatible Sprotec spinal needles (Pajunk), replacing our Whitacre (Becton Dickinson) and Sprotte (Pajunk) products. In June 2013 a survey of our consultants was undertaken because of persistent anecdotal concerns about problems with spinal anaesthesia using the new product.

Methods

A ten question survey was sent to all 66 consultants. The questions explored current practice, frequency of regional placement, previous product preference and opinion of the new products, including problems and safety perceptions.

Results

There were 45 replies (68%). Negative comments and reports of clinical problems with the new product were made by 22 (49%) responders, with 15 people wanting to return to the old products. Seven of those calling for a return to the old product were from a subgroup of 15 who previously used Whitacre products. Negative comments about the product related to the needle (shaft, trochar, hub and the connection ‘fit’) and to the syringe (dead space). Fifteen consultants detailed very specific instances of one or more patients with inadequate block: 8 patients needed an unplanned GA or sedation, 7 a repeat spinal or epidural, 5 had intra-operative pain, 1 had delay to surgery and 1 had a high block (after disconnection during injection and an estimated replacement dose). Other less specific comments were made by 7 additional consultants relating to: failure of onset, slow onset, reduced density and short duration of blocks but 5 suggested problems were no more frequent with the new product. All respondents were asked about safety; 10 (23%) thought the product change had created patient safety risks.

Discussion

Comparisons between non-luer products [2,3] and ethical debates on introducing these products into clinical practice [4], have appeared in the literature. In view of the number of patients apparently affected in our hospital, our survey was reported to Safe Anaesthesia Liaison Group and by them to the Medicines and Healthcare Products Regulatory Agency. After consultation it was felt the clinical issues described were hard to attribute to the Pa-junk product, which was not felt to be faulty. Our conclusion is therefore, that transition to a subtly different product was causing users clinically significant technical problems with block placement. This survey demonstrates a possible unintended negative consequence of a well-intentioned safety directive.

![Figure 1](image_url)

Figure 1 Interventions in 22 patients with inadequate block

References


An audit of compliance with the Difficult Airway Society extubation guidance in an anaesthetic department of the University Hospital of South Manchester (UHSM)

D. Cegielski, S. Washington and D. Greig
University Hospital of South Manchester

Endotracheal extubation is a major part of the emergence from anaesthesia requiring several preparatory steps [1]. Up to one third of extubations encounter complications [2]. Little research exists into the current practice of extubation, suggesting ‘optimum’ extubation practice is from expert opinion rather than evidence based [3]. The Difficult Airway Society has published guidelines to minimise the risks of extubation [4].

Methods
Prospective audit during the period 01/12/13 to 01/01/14 and subsequent re-audit during 01/04/14 to 01/05/14 collected using a paper and electronic based proforma issued to all grades of anaesthetist at UHSM. During the interim period, there was an education session during a staff audit meeting and implementation of a new difficult airway (intubation and extubation) trolley with clearly described DAS algorithms in operating departments.

Results
Thirty anaesthetists were audited in period one (16 consultants and 14 trainees; C1 – ST3) and thirty (29 consultants and 21 trainees) in period two. Respectively, 80.0% and 84.0% of anaesthetists were aware of the DAS guidelines. Prior to extubation, 93.3% and 88.0% preoxygenated (0% and 6.8% pre-oxygenated patients with a view of achieving an FEO2 of greater than 90.0%) and 98.0% suctioned the oropharynx (33.3% and 38.8% under direct vision). 50.0% and 46.0% used a bite block (oropharyngeal airway or rolled gauze). 88.5% and 92.9% extubated patients upright but all commented on patient circumstances requiring left lateral positioning. 80.0% and 76.0% tested for neuromuscular blockade (33.3% and 44.7% train of four, 8.3% and 10.5% double burst), 86.7% and 86.0% awaited return of spontaneous breathing (34.6% and 34.9% using minute volume as a marker of adequacy). 73.3% and 70.0% applied positive pressure prior to extubation. Table 1 shows the number of consultants and trainees using adjunctive techniques to facilitate extubation.

Discussion
Both audit periods demonstrated that extubation practice is not always conducted as the Difficult Airway Society guidelines advise. Extubation practice is independent of seniority and is unchanged by education and equipment availability. The awareness of the DAS guideline is high overall but less staff have read them and fewer still practice all components regularly. This requires further investigation into the reasons behind individual practice, assessment of complication rates and comparison to national extubation practice.

Table 1 Comparison of anaesthetists in audit periods 1 and 2 using techniques to facilitate extubation.

<table>
<thead>
<tr>
<th>Techniques Used</th>
<th>Group 1 (consultants)</th>
<th>Group 2 (trainees)</th>
<th>Mean no. used on patients no. of anaesthetists (specified no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laryngeal Exchage</td>
<td>13</td>
<td>9</td>
<td>12.37</td>
</tr>
<tr>
<td>Gumshield Intubation</td>
<td>13</td>
<td>9</td>
<td>22.66</td>
</tr>
<tr>
<td>Intubation Catheter</td>
<td>9</td>
<td>4</td>
<td>12.65</td>
</tr>
<tr>
<td>Oral Exchage</td>
<td>14</td>
<td>7</td>
<td>21.10</td>
</tr>
</tbody>
</table>

References

Epidural analgesia for labour at the Royal Gwent Hospital: a review of 2013

R. Clyburn, J. Reynolds and M. Turner
Aneurin Bevan University Health Board, Cardiff University Medical School

Epidural analgesia is a common and effective method for providing pain relief during labour. At Royal Gwent Hospital (RGH) anaesthetists record all obstetric epidurals at the time of the procedure in a paper diary and also on an Access database. We aimed to determine the number, eventual mode of delivery, and complication rates for all recorded epidurals that took place in 2013 and where possible compare them to national standards.

Methods
We reviewed the diary records for information regarding all epidurals performed in 2013 at the RGH. Anonymised information was recorded on a pro-forma in Excel on a month-by-month basis.

Results
There were 3484 maternities at RGH in 2013. Of these, 887 (25.29%) had epidurals for pain relief in labour. 48% of those receiving an epidural had a spontaneous vaginal delivery, 17% had an instrumented delivery (ID) and 35% underwent caesarean section (CS). The overall CS rate was 30.3%. Of those who had an ID, 84% had an epidural top up, with 16% having a spinal. Of those progressing to CS 67% had a top up, 27% had a spinal and 6% underwent a general anaesthetic. We found that 1.7% epidurals resulted in accidental dural puncture (ADP), with 1.1% resulting in post dural puncture headache (PDPH). Re-site rates were 3.4%.

Discussion
Comprehensive reference standards regarding delivery outcomes following epidurals are difficult to find. The OAA quote an ID rate of 14% with an epidural compared to 7% without. We did not calculate the ID rate in women without an epidural, and so can’t determine the epidural’s impact. Our ADP and PDPH rates are similar to the often-quoted averages of 2% and 1% respectively. The failure rate identified by the proxy measure of re-sites seems low (3.4%). We would expect the failure rate to be 10–20%. This may relate to the PEA machine: either being superior to clinician top ups, or being inferior at recognising failing epidurals. High top-up rates are encouraging, especially for ID. This is an area with little in the way of a standard. We feel satisfied that the epidural complication rates are within agreed standards. Most published information regarding the effect of epidural analgesia on mode of delivery relates to impact data, rather than absolute figures in an observational context. Perhaps comparison with similar units in the region is a reasonable standard to work with. The effort required to collect this data was too great. Improvements in the database software and management could help with this, such as a monthly (and eventually live) obstetric anaesthesia ‘dashboard’ showing outcome and complication rates. Adopting this tool may drive improvements in quality.

References
A preliminary audit of consent for anaesthesia

E. Colgan1 and R. O’Donnell2
1School of Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow, 2NHS Lothian

Accepted practice in the UK is that all patients should receive a pre-operative visit by the anaesthetist who will be delivering their anaesthetic. As well as providing an opportunity to obtain information that will inform the conduct of the anaesthetic e.g. past medical history, an assessment of the airway etc. this visit allows for an explanation of the proposed anaesthetic technique, a discussion about the risks associated with anaesthesia and an opportunity for the patient to ask questions, facilitating informed consent. We aimed to establish whether standards of pre-operative consent for anaesthesia, as described by the Royal College of Anaesthetists (RCoA) and the Association of Anaesthetists of Great Britain and Ireland (AAGBI), were being met within our institution.

Methods

Patients were visited immediately prior to surgery. Demographic data, proposed anaesthetic technique and documented risks were obtained from the anaesthetic chart. Patients were asked what risks they recalled their anaesthetist informing them of, if they had been given an opportunity to ask questions, whether they had been provided with written information and how useful they found this. Patients were visited post-operatively and asked how satisfied they were overall with the pre-operative information provided by their anaesthetist and if there was any additional information they felt they should have been given.

Results

Data were collected for 28 patients. Of these, 43% (12) had risks documented on their anaesthetic chart by an anaesthetist. The median number of risks documented on the anaesthetic chart was 0 (IQR 0–3). The median number of risks recalled by patients was 1 (IQR 0–2). Ninety-six percent of patients (27) reported that they had been given an opportunity to ask questions. Twenty-one percent of patients (6) received written information about their anaesthetic. Reported post-operative patient satisfaction was high with a median score of 10/10 (IQR 9–10).

Discussion

Our data suggest that our institution is failing to achieve RCoA and AAGBI standards of pre-operative anaesthetic consent. Documentation of discussed risks was poor as was provision of written information. Despite this, however, patient satisfaction was high. We suggest that failure to adhere to accepted standards of consent, as established by the RCoA and AAGBI, leaves institutions and individual anaesthetists vulnerable should patients experience a negative outcome of anaesthesia. This data will be presented within our institution and measures implemented to improve compliance with RCoA and AAGBI guidelines following which, we plan to re-audit.

References


Audit comparing routine level 2 care versus standard ward care for the management of post operative hip fracture patients

A. Colhoun, L. Shaw and A. Elayaperumal
Sheffield Teaching Hospitals

Hip fracture surgery is recognised as being especially high risk due to the frailty of patients and their co-morbidities [1, 2]. Despite this, admission of these patients to Critical Care units is not common. Previous studies have shown a benefit of elective admission to a level 2 care facility following major abdominal surgery [3].

Methods

From June 2012 two Post Operative Surgical Unit (level 2) beds were made available daily for post hip fracture surgery. Patients were to be admitted routinely where possible. However where there were insufficient beds available the patients were selected according to clinical need as decided by the Trauma team. Outcome measures were assessed over a 6-month period comparing those admitted to POSU and those returning to the ward in the 6 months prior to the start of change implemented. Primary outcome measures were inpatient and 30-day mortality, length of stay and discharge destination. Secondary outcome measures were complications. Statistics performed on non parametric data using chi squared test and on parametric data by student’s t test.

Results

A total of 93 patient journeys were reviewed (44 level 2; 49 routine care). The mean patient age in each group was 82 years (level 2) and 85 years (routine) with mean Nottingham Hip Fracture Score of 18 (level 2) and 16 (routine care) with similar percentages of male patients in each group 22% (level 2) versus 18% (routine care). During the first 24 h complications rates were similar in both groups with the exception of respiratory failure which was more common in those in level 2 care (7 patients versus 2 patients, p=0.03). Complications occurring in both groups usually after the first 24 h were: chest infection / pneumonia, anaemia and electrolyte abnormality.

Discussion

Although we have shown an increased rate of identification of respiratory failure in the level 2 group in the first 24 h, this does not translate to better outcomes. This could simply represent the availability of beds and the sicker patients being admitted to the level 2 beds. Overall we have been unable to show a benefit of routine admission to a level 2 bed in terms of mortality, length of stay or increased long term care requirements. We would advocate allocation of level 2 resources to continue on a case by case basis but highlight the potential benefit for those at high risk of respiratory failure in the first 24 h post-operatively.

References

2. Older PO, Hall AC. Elective admission of patients to intensive care or high dependency following major surgery. Anaesthesia 1998; 53: 1229.

Figure 1 Summary of primary outcome measure results
Residual anaesthetic drugs in cannulae and intravenous lines – An audit of IV flushing practice in response to the April 2014 NPSA safety alert

R. Collin, P. Lucas, H. Ashhurst and S. Oswal
Bradford Royal Infirmary

A recent NPSA alert (April 2014) highlighted six incidents leading to cardiac or respiratory arrest attributed to residual anaesthetic drugs in IV cannulae [1]. This alert was preceded by related warnings and discussion in the literature [2, 3]. In response, this audit aims to assess local practice with regard to flushing IV cannulae after anaesthesia. Alerts state that all cannulae should be flushed after administration of anaesthetic drugs (particularly in children) and before transfer to the post anaesthetic care unit (PACU).

Methods
The audit was performed in two parts:

1. All anaesthetists at Bradford Royal Infirmary were asked to complete a survey assessing routine practice.
2. An observational study was conducted in PACU on a weekday morning. Observers and recovery staff were asked to complete an IV flushing assessment proforma.

Results
Survey responses:
Thirty out of 82 (36%) anaesthetists completed the electronic survey (16 consultants, 2 SAS, 4 ST3-7, 8 CT1-2).

The main survey question asked when anaesthetists would routinely flush IV cannulae:

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>After muscle relaxants</td>
<td>22 (73.33%)</td>
<td>8 (26.67%)</td>
<td>0</td>
</tr>
<tr>
<td>After antibiotics</td>
<td>16 (53.33%)</td>
<td>13 (43.33%)</td>
<td>1 (3.33%)</td>
</tr>
<tr>
<td>After a drug given in paediatric case</td>
<td>27 (90%)</td>
<td>3 (10%)</td>
<td>0</td>
</tr>
<tr>
<td>When using a central line</td>
<td>30 (100%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>When using a long term indwelling catheter/facess device</td>
<td>30 (100%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flushing lines before the patient goes to recovery/ward</td>
<td>18 (60%)</td>
<td>12 (40%)</td>
<td>0</td>
</tr>
</tbody>
</table>

Anaesthetists cited operating list time pressures and continuation of IV fluids as reasons why thorough flushing might not occur.

Observational study:
Twenty two adult GA cases were observed. In 8 instances the anaesthetist handed over that flushing had taken place. In 14 instances flushing was not mentioned. Of these 14 cases, 9 patients had been asked regarding all their drips flushed prior to transfer or were noted to have IV fluids running through the induction cannula. Five patients had not had IV cannulae flushed prior to transfer to PACU. Two patients were seen to have visible propofol in IV cannula ports.

Discussion
Our audit was limited by a low survey response rate and a small number of cases observed partly due to the need for timely assessment. Survey responses do not necessarily reflect actual practice. Accepting these factors, anaesthetists adhere to good practice in flushing central/indwelling catheters. Improvement can be made in ensuring flushing before transfer to PACU, flushing paediatric cannulae and when using muscle relaxant. In response our hospital is implementing strict operating department guidelines stipulating all drips are flushed before transfer to PACU and discussed at a standardised handover. Risk education to motivate all staff, documentation prompts and a poster campaign are being implemented. A more extensive re-audit in 3 months will assess the effectiveness of these essential interventions.

References

Academic evaluation of a conference run for anaesthetic nurses, midwives and students in Sierra Leone

R. Conway, J. Highgate and E. Shewry
Royal Sussex County Hospital, University Hospital Southampton

Sierra Leone is located in West Africa and underwent a 10-year civil war, ending in 2002, that resulted in over 50 000 deaths and millions displaced. It is ranked 180 out of 182 on the Human Development Index [1] with 52.9% of the population living below the poverty line [2]. It has the highest maternal mortality rate (1100/100 000) [3] and infant mortality rates (117/1000) [4] in the world. Life expectancy at birth is 46 years [4] and literacy remains low (43.3%) [5]. There are only 4 trained physician anaesthetists in Sierra Leone, covering a population of 5.7 million. Nurse anaesthetists provide the majority of anaesthetics. The African Conference Teams (ACTS) conference aimed to improve anaesthetic and midwifery practice through training, with the emphasis on safe sustainable care alongside building on knowledge from previous conferences (2009 and 2011).

Methods
A UK conference team made up of 8 doctors and 2 senior midwives travelled to Sierra Leone. The three day conference was held at the Princess Christian Maternity Hospital in Freetown and was attended by 32 candidates (22 nurse anaesthetists and 10 students) from 10 different hospitals located across Sierra Leone. Material was delivered as didactic lectures, small group sessions and practical workshops. It was split into three main topics: obstetric emergencies, airway management with trauma care and safe anaesthesia practice.

An exam made up of 10 questions, each with 5 true or false MCQ stems, was conducted at the start and end of the conference. The questions concentrated on the 3 main topics covered. There was no negative marking and no time limit.

Results
The average pre-conference score was 69% (14–92). The average post-conference score was 78% (54–84). The largest improvement seen was 56%.

Discussion
The exam would suggest that there was an increase in the level of knowledge after training that would contribute to safer future anaesthetic practice.

Acknowledgements
The AAGBI IRC and Mrs Thomson for their donations Dr Michael Koroma – Coordinating Anaesthetist Freetown, Sierra Leone. Sierra Leone Nurse Anaesthetist National Training Programme Mercy Ships.

References
An assessment of the accuracy of the pulse oximeters in clinical use at a typical district general hospital

V. Cunningham
Royal Gwent Hospital, Newport

Pulse oximetry is a standard part of anaesthetic monitoring, and oxygen saturation is used in many clinical guidelines to determine appropriate oxygen administration and therapeutic interventions. It is of great importance therefore, for pulse oximeters to be reliable and accurate to the manufacturers’ specifications of ±3% in the 70–100% saturation range. This audit set out to determine the accuracy of pulse oximeters in use at the Royal Gwent Hospital, using a portable microspectrometer, the Lightman. The aim was to produce guidelines for the frequency of calibration of pulse oximeters.

Methods
Testing of pulse oximeters was done at the site of their clinical use. The oximeter’s LED sensor is placed over a photodetector probe and the cable is plugged into the Lightman via a manufacturer specific adaptor. The emission spectra of the LEDs are then interrogated and a predicted degree of bias is displayed for the saturation values of 70%, 80%, 90% and 97%. If an electrical fault is detected, no interrogation is performed. Prior to testing with the Lightman the oximeter measured the oxygen saturation of the data collector as a crude test of clinical accuracy. Over the course of 3 months 102 pulse oximeters in a variety of clinical areas were tested.

Results
Of the 441 oximeters in clinical use at the Royal Gwent Hospital, 102 were tested. Seven failed the electrical test and 16 oximeters of the remaining 95 had a degree of bias of ≥±3%. Thirteen of the 16 inaccurate oximeters were found in the main theatre suite of the hospital. The greatest degree of bias found in any oximeter was +6%. Seventy nine pulse oximeters were accurate to within ±3%.

Discussion
The majority (~83%) of pulse oximeters in this DGH are accurate to within the manufacturers’ specifications. Of the inaccurate oximeters, 13 of the 16 were found within a clinical area where the reading is more likely to change oxygen therapy or intervention. This may be because these devices are in continuous use for many hours. In conclusion therefore, the recommended calibration frequency of pulse oximeters should be at set time intervals and vary according to the amount of usage, and should not occur simply because a fault is found. This audit needs to be repeated and expanded to include pulse oximeters from a new manufacturer, Mindray. At the time of data collection a suitable adaptor was not yet available from the makers of the Lightman.

Acknowledgements
The author would like to thank Dr Iljaz Hodzovic for his guidance with this audit, and Simon Fry of the Medical Electronics Department, St Woolos Hospital, Newport, for the loan of the Lightman device.

References
Anaesthetists spend much time training for rare, but potentially life-threatening emergencies, such as malignant hyperpyrexia. Equipment to manage such cases is available within the theatre environment; however, a recent survey conducted on the delivery suite at two hospitals suggests that anaesthetists frequently do not know its location [1]. We decided to conduct a survey within our own anaesthetic department, and implement simple changes to see whether anaesthetists’ awareness of emergency equipment location could be improved.

Methods
We distributed questionnaires amongst anaesthetists, asking them to detail the location of emergency equipment and drugs to the best of their knowledge. In addition, we asked the grades of the responding anaesthetists. Following poor performance in the initial survey, we introduced laminated posters into each anaesthetic room, detailing the exact location of emergency equipment. The consultants conducting local induction were also asked to modify the programme at the subsequent trainee rotation to include a tour of the department, emphasising the location of such equipment. The survey was then repeated.

Results
Responses were obtained from 23 anaesthetists in the initial survey and 22 in the follow-up survey. The breakdown by grade was as follows (initial:follow-up): Consultant - 7(9), ST5 - 3(2), ST4 - 8(4), Clinical fellow - 2(2). ACC1/CT - 3(5). Table 1 (below) summarises the number and percentage of anaesthetists identifying the correct location of each piece of emergency equipment.

### Table 1: Location of emergency equipment

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Initial Survey Consultant, n = 23(%)</th>
<th>Initial Survey Trainee, n = 16(%)</th>
<th>Follow-up Survey Consultant, n = 22(%)</th>
<th>Follow-up Survey Trainee, n = 13(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugammadex</td>
<td>6(26)</td>
<td>7(44)</td>
<td>7(77)</td>
<td>12(92)</td>
</tr>
<tr>
<td>Lipid emulsion</td>
<td>7(100)</td>
<td>11(69)</td>
<td>8(88)</td>
<td>11(84)</td>
</tr>
<tr>
<td>Malignant hyperpyrexia box</td>
<td>7(100)</td>
<td>14(88)</td>
<td>8(88)</td>
<td>13(100)</td>
</tr>
<tr>
<td>Difficult intubation trolley</td>
<td>7(100)</td>
<td>13(81)</td>
<td>9(100)</td>
<td>13(100)</td>
</tr>
<tr>
<td>Videolaryngoscope</td>
<td>7(100)</td>
<td>11(69)</td>
<td>9(100)</td>
<td>12(92)</td>
</tr>
<tr>
<td>Cardiac Arrest</td>
<td>7(100)</td>
<td>12(75)</td>
<td>9(100)</td>
<td>13(100)</td>
</tr>
</tbody>
</table>

Discussion
The results of the second survey were much improved with respect to the initial survey amongst trainees; the percentage of trainees correctly identifying the location of each piece of equipment increased compared to the first survey. This may be the result of placing laminated reminder sheets in each anaesthetic room, or may reflect improved local induction, particularly as the follow-up survey was conducted soon after a new rotation of trainees had started. Results amongst consultant anaesthetists were slightly worse during the follow-up period, all members of the department were able to correctly identify the location of both the cardiac arrest and difficult intubation trolleys. Further improvement may be seen by extending laminated reminders to the day surgery unit, and by conducting local drills of anaesthetic emergencies.

Reference

Reducing the risk in the pre-operative period: an audit of oral medication administration in patients fasted for surgery

Omitting medications in the pre-operative period can lead to increased morbidity and length of stay [1] and should be avoided wherever possible. Being fasted for surgery is not an indication for omitting medications [2], although this frequently occurs [3]. We audited our practice in trauma patients at Stoke Mandeville Hospital, and having found that we were unnecessarily withholding medications for this reason, designed a poster to educate ward staff. Following this intervention, completion of the audit cycle showed a marked improvement in performance.

Methods
Drug charts from all in-patients on trauma wards at Stoke Mandeville Hospital were examined over a recorded five day period for evidence that medications were being withheld due to patients being ‘nil by mouth’ (NBM). If this was found to be the case, the patient’s notes were examined for any documented evidence that there was a reason for the patient being NBM other than that they were being fasted for surgery. Posters were then placed in the trauma wards reminding all clinical staff that if the only reason that their patient is ‘nil by mouth’ is that they are awaiting surgery, then they should be given their oral medications; if there was any doubt, the on-call anaesthetist should be contacted. Five days after this intervention, data collection was repeated in the same manner.

Results
Thirty eight patients’ charts were initially examined, with 17 having had medications withheld due to NBM status (of which 1 was due to an unsafe swallow). Of the 16 patients who were not given oral medications due to being fasted for surgery, 9 had analgesia omitted, 4 had cardiovascular drugs omitted, 1 had antiepileptics omitted and 1 had antibiotics omitted. In total 32 medications were not administered. Following our poster education, 37 patients’ charts were examined, with only 3 having had medications withheld due to NBM status (of which 1 was due to intractable vomiting). Our intervention resulted in an absolute risk reduction of 37%.

### Table 2: Medication administration

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with medications not withheld (%)</td>
<td>22(58)</td>
<td>35(95)</td>
</tr>
<tr>
<td>Total number of patients</td>
<td>38</td>
<td>37</td>
</tr>
</tbody>
</table>

Discussion
Continuation of medications during the preoperative period is important to reduce the risk of complications following surgery yet we found that this was not being done in a significant number of patients in our hospital. Our simple and reproducible poster intervention resulted in significantly fewer medications being withheld and so a marked improvement in patient safety.

References
Conversion of spinal to general anaesthesia for caesarean section

A. Duncan,¹ G. Vickers¹ and S. Patel²
¹Royal Oldham Hospital ²The Royal Oldham Hospital

There is unequivocal evidence that regional anaesthesia (RA) is safer than general anaesthesia (GA) for caesarean section (CS) [1]. Conversion to general anaesthesia (GA) due to failed RA exposes women to the risks of both techniques. We aimed to determine the rate and reasons for conversion from spinal anaesthesia (SA) to GA.

Methods

After approval from our Trust audit department we conducted a retrospective audit. All women who had undergone anaesthesia for CS between January 2012 and September 2013 were identified. We analysed the records of those who had required conversion from SA to GA.

Results

Of the 8464 deliveries that took place, 1925 (23%) were performed by CS. 1563 (81%) under SA, 167 (9%) by epidural top-up and 195 (10%) under GA. 38 women required conversion from SA to GA.

Reasons for converting from SA to GA

- Procedural failure: 19 (50%)
- No time to establish block: 6 (16%)
- Intraoperative pain: 5 (13%)
- Maternal request: 4 (10.5%)
- Surgical complications: 4 (10.5%)

Procedural failure accounted for half of all conversions. Of these, 13 (68%) had a BMI > 30 kg/m² with 6 of those having a BMI > 40 kg/m². 9 (47%) were elective procedures and 9 (47%) were carried out by non-consultant grade anaesthetists.

Discussion

In the UK, the conversion rate from SA to GA is around 1.5% [2]. Our audit demonstrated a rate of 2.4%. Procedural failure was the most common indication for conversion to GA. Maternal obesity played a significant role in the majority of cases. Ultrasound could prove a useful adjunct for facilitating SA in obese obstetric patients undergoing elective CS. Ultrasound may help the operator identify the midline and appropriate lumbar interspace in patients in whom anatomical landmarks are difficult to palpate [3]. An estimation of the depth to the epidural space can also be made with ultrasound, assisting both SA and epidural placement. Despite its perceived benefits, significant investment in equipment and space can also be made with ultrasound, assisting both SA and epidural placement. Despite its perceived benefits, significant investment in equipment and space can also be made with ultrasound, assisting both SA and epidural placement.

References


Assessing venous thromboembolism risk and prescribing thromboprophylaxis: continuing the audit cycle following introduction of VTE question on the WHO checklist

S. Ellis, M. Rooms, L. Wee and R. Aziz
Department of Anaesthetics, University College London Hospital

Inadequate venous thromboembolism (VTE) risk assessment and failure to prescribe appropriate thromboprophylaxis contributed to VTE being the most common cause of direct death in the 2007 Confidential Enquiry into Maternal and Child Health (CEMACH) [1]. An audit in 2011 of our obstetric unit showed correct risk assessment was 91% and prescription was 93%. We introduced a VTE question on the World Health Organization (WHO) checklist at sign out to try and improve this rate.

Methods

We collected data on all women who had an operative procedure in our obstetric unit over a 3-week period between Aug and Sep 2013 on day 1 post procedure. The drug chart was used to identify the course of low Molecular Weight Heparin (LMWH) and Thrombo-Embolic Deterrent (TED) stockings while CDR (our electronic notes system) was used to check for VTE risk assessment. We also recorded the urgency and type of surgery. Local guidelines were used to determine whether the risk assessments and prescriptions were correct. We set a standard of 100% as recommended in the Green-top guideline [2]. Descriptive statistics were performed.

Results

We collected data on 91 women. The results are shown in the table. TEDs were prescribed for 68% of patients but 83% of patients were seen to be wearing TEDs. Risk assessment was performed in 47% of cases according to CDR.

<table>
<thead>
<tr>
<th>Surgical procedure</th>
<th>Risk assessment correct</th>
<th>LMWH prescription correct</th>
<th>TED stocking prescription correct</th>
<th>Complete VTE prophylaxis prescription (LMWH &amp; TED) correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caesarean section</td>
<td>18/42 = 43%</td>
<td>41/42 = 98%</td>
<td>29/42 = 69%</td>
<td>28/42 = 67%</td>
</tr>
<tr>
<td>Emergency caesarean</td>
<td>24/40 = 60%</td>
<td>40/40 = 100%</td>
<td>30/40 = 75%</td>
<td>30/40 = 75%</td>
</tr>
<tr>
<td>Other n = 9</td>
<td>1/9 = 11%</td>
<td>2/9 = 22%</td>
<td>3/9 = 33%</td>
<td>3/9 = 33%</td>
</tr>
</tbody>
</table>

Discussion

Our re-audit has identified improvement in LMWH prescriptions to 99% of caesarean sections, but this was 22% for other operative procedures. More women were wearing TEDs than were prescribed, even allowing for that, at 83%, this was short of the 100% standard we set. We failed to achieve 100% in both our standards. We found that risk assessments were recorded in a maternity information system that anaesthetists don’t have access to, and in fact, all the patients are risk assessed on this system in keeping with the Commissioning for Quality and Information (CQUIN) payment framework. Therefore our figure of 47% for risk assessment was probably incorrect and the real figure would have been much higher. In our unit, anaesthetists tend to prescribe VTE prophylaxis at the end of procedures and access to risk assessment might improve this process. Training and clearly visible guidelines on VTE prescription in our obstetric theatres should help to improve appropriate prescribing, and VTE risk assessment needs to be consolidated to one electronic system.

References

Re-audit on the management of inadvertent perioperative hypothermia in the Obstetric Unit, University Hospital Wales, Cardiff: the intravenous fluid warmer is of little benefit

R. Ellis, L. Bowen and R. Baraz
University Hospital Wales, Cardiff & Vales NHS Trust

Hypothermia carries potential negative multisystem effects and is poorly managed in obstetric units [1]. The National Institute for Health and Care Excellence (NICE) hypothermia guidelines recommend core body temperature is maintained between 36.5 °C and 37.5 °C (comfortably warm) [2]. Temperatures between 36 °C and 36.4 °C inclusive are 'not comfortably warm' and < 36 °C are 'hypothermic' [2]. In June 2012 all obstetric patients undergoing any procedure at University Hospital Wales delivery suite were included in a retrospective audit. Most had temperatures recorded pre- and post-operatively but none intra-operatively. Thirty two patients were not comfortably warm pre-operatively. Half (n = 51) were not comfortably warm and 14 were hypothermic post-operatively. No warming methods were used. Recommendations were made in accordance to NICE guidance [2].

Methods

Data were collected between 18/11/13 and 15/12/13. All patients should have their temperature measured on arrival to theatre and checked every 30 min. All normothermic patients (< 38 °C) should receive warm intravenous fluid. Of those receiving warm intravenous fluid < 50% should be comfortably warm post-operatively and none should be hypothermic. Intravenous fluids were warmed using the 3M Ranger; the standard equipment used.

Results

Ninety eight percent (n = 89) had temperatures checked every 30 min. All (n = 90) normothermic patients received warmed intravenous fluid. Fifty percent (n = 45) were comfortably warm post-operatively whilst 35% (n = 31) were hypothermic post-operatively. Pre and post-operative temperatures did not differ significantly between 2012 and 2013: 36.8 °C (n = 101) vs 36.8 °C (n = 90) (p = 0.542), and 36.5 °C (n = 105) vs 36.4 °C (n = 90) (p = 0.223) respectively. There were no correlations between temperature with either fluid volume or surgery duration. Temperature comparisons: 2012 vs 2013 with pre- vs post-operative

<table>
<thead>
<tr>
<th>Temperature range</th>
<th>2012 (without warmer)</th>
<th>2013 (with warmer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-operative n (%)</td>
<td>Post-operative n (%)</td>
</tr>
<tr>
<td>Pyrexial (37.5-38.0 °C)</td>
<td>6 (6)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Comfortably warm (36.5-37.5 °C)</td>
<td>59 (59)</td>
<td>42 (44)</td>
</tr>
<tr>
<td>Uncomfortably warm (36.0-36.5 °C)</td>
<td>29 (29)</td>
<td>38 (39)</td>
</tr>
<tr>
<td>Hypothermic (&lt; 36.0 °C)</td>
<td>2 (2)</td>
<td>13 (14)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100 (96)</td>
<td>100 (102)</td>
</tr>
</tbody>
</table>

Discussion

Temperatures were well recorded during the data collection period. There were no significant differences in peri-operative temperature measurements between those who received intravenous warmed fluids in 2013 compared to those who did not in 2012. Recommendations include regular temperature monitoring and the judicious use of warmed fluids. Re-audit with additional warming methods such as the warmed mattress is advised [2].

References


Resuscitation equipment checks – are we getting them right one year on?

M. Elsayed, I. Mohamed and F. Dallas
1. Cumberland Infirmary, 2Airedale General Hospital

The Resuscitation Council (UK) recommends a list of equipment that should be available for use in cardiopulmonary resuscitation in UK healthcare institutions [1]. Hospitals should provide equipment based on these standards and implement regular checks to ensure the standards are met [2]. Effective advanced life-support is dependent on readily available equipment that is in good working order [3]. A failure to perform daily checks of this equipment could lead to a lack of operator familiarity with resuscitation equipment, and a failure to identify malfunctioning devices. The potential patient safety implications of a failure to meet these standards are severe [4].

Methods

In this re-audit, routine resuscitation equipment checks in a 382-bed district general hospital were audited against standards set for a previous audit in January 2013 which used guidance from the Resuscitation Council guidelines, which state that ‘(a) all clinical areas should contain resuscitation trolleys with an up-to-date and immediately available list of ‘essential’ equipment, together with a record of equipment checks, which includes the date and time of each individual check, and the person undertaking it; (b) there should be a documented check of resuscitation equipment after 100% of resuscitation episodes; (c) the resuscitation trolley should be capable of being moved easily by all members of staff’ [1]. Data were collected on a single day in June 2014. Resuscitation trolleys were checked in all in-patient areas, including medical, surgical, paediatric and obstetric and gynecology wards; critical care areas, the coronary care unit (CCU), and the emergency department.

Results

Twenty-one clinical areas were surveyed. All areas (100%) had a list of essential equipment and record of daily check. All areas (100%) had written record to confirm that equipment was checked after each resuscitation event. Excluding the paediatric ward, all other 20 areas (95.2%) had a record of daily check of the mobility of the resuscitation trolley.

Discussion

Compared to last year’s audit, all clinical areas complied with the guidelines regarding frequency of checks of resuscitation equipment and the documentation of these checks (4.8% Improvement), including equipment check after use (100% Improvement). All areas excluding the paediatric ward, complied with checking the mobility of the resuscitation trolley (95.2% Improvement). This year’s improvement can be attributed to the development of a revised checklist following recommendation from the first audit. This re-audit findings were reported to the resuscitation officers to ensure continuity of adherence to guidelines.

References

A completed audit of transfusion and haemoglobin changes in primary THR and the relationship with length of stay and tranexamic acid use

E. England, P. Yoxall and S. Raftery
St Helen’s & Knowsley Trust, Prescot

Joint replacement surgery causes a significant burden on national blood stocks accounting for approximately 10% of hospital transfusions [1]. Allogenic blood transfusions are associated with increased morbidity and mortality [2]. There is a wide variation in transfusion rates in UK trusts, for primary total hip replacement (THR), with a reported national average of 25% [3]. The DoH has published guidance to reduce transfusions by introducing blood conservation strategies including cell salvage and use of pharmacological agents [4]. Our trust had no such guidelines and practice was variable. We aimed to look at our perioperative blood transfusion rates, whether we used any of the suggested conservation strategies and analysed the impact on length and cost of stay.

Methods
We retrospectively audited all 248 primary THR in 2012, assessing transfusion rates (including cell salvage), haemoglobin changes (96 h post-operatively), intra-operative fluid and tranexamic acid (TXA) use and length and cost of stay. The primary audit highlighted there was no standard practice in our trust. One clinician used TXA regularly and we found those patients had a reduction in transfusion rates. We implemented a protocol for our primary THRs that included TXA guidelines and practice was variable. We aimed to look at our perioperative blood transfusion rates, whether we used any of the suggested conservation strategies and analysed the impact on length and cost of stay.

Results
Our initial audit demonstrated a transfusion rate below the national average of 21% (n = 52), 117 units RBC at 0.47 units per patient (n = 248) perioperatively in primary THR. Following protocol introduction there was a significant transfusion rate reduction 12.3% (n = 9), 19 units RBC at 0.26 units per patient (n = 73). The overall transfusion rate for those receiving TXA is almost half that of those that didn’t 10.6% vs 20.3%. 2012 data highlights an increased length of stay for patients that received a transfusion (11.3 days vs 5.9 days). This conveyed an estimated additional cost of £183 000 for the trust. On statistical analysis of the whole data set (ANOVA) there was no evidence (p = 0.74) that TXA doses have an influence on length of stay per se but there was strong evidence (p < 0.0001) that TXA doses has an influence on change in haemoglobin (average drop g/l 2.8 vs 3.6).

Discussion
Following implementation of change we have achieved a 50% reduction in our transfusion rates for patients undergoing primary THR. Whilst TXA has a statistically significant effect on reducing Hb drops, its use does not convey a statistically significant reduction in length of stay. The reasons for increased length of stay associated with transfusion are likely multifactorial. We have now implemented a standardised protocol that includes guidance on perioperative blood conservation.

References

A survey of extubation practice and experience with advanced techniques

L. Foulds, J. Baruah-Young and S. Crawley
NHS Tayside

Complications are common at extubation and may result in significant morbidity and mortality [1]. In 2012, the Difficult Airway Society (DAS) published guidelines for the safe management of tracheal extubation in adult peri-operative practice [2]. The aim of this survey was to assess knowledge of the DAS extubation guidelines, determine current extubation practice within our trust, and identify potential deficiencies in training or experience in advanced techniques for the ‘at-risk’ extubation.

Methods
A questionnaire survey was designed and distributed to all grades of anaesthetists in NHS Tayside.

Results
A total of 80 anaesthetists responded, giving a 73% response rate. Of these respondents, 46 (58%) were consultants and career grade doctors. Seventy-seven (96%) were aware of the DAS extubation guidelines, although only 63 (79%) had actually read the guidelines. Seventy-two (90%) consider their strategy for extubation before the induction of anaesthesia. When preparing for extubation, 56 (70%) state they always perform oropharyngeal suctioning. However, only 15 (19%) use a laryngoscope to suction under direct vision. The commonest position for extubation in a fasted adult patient was sitting head-up, used routinely by 76 anaesthetists (95%). Nineteen (24%) anaesthetists stated they never insert a bite block, seven (9%) admitted to always doing so, 11 (14%) usually did and 42 (53%) sometimes did. The commonest type of bite block used was the Guedel oropharyngeal airway, used in 47 (77%). Only 10 (15%) anaesthetists, of grade ST3 and above, reported that they felt confident to perform all of the advanced extubation techniques described in the DAS extubation guidelines; with 15 (22%) confident in using an airway exchange catheter, 28 (41%) using an LMA exchange, 36 (53%) performing deep extubation and 42 (62%) extubating using remifentanil infusion.

Discussion
The vast majority of anaesthetists within our trust were aware of the DAS extubation guidelines and state they do develop an extubation strategy before the induction of anaesthesia. However, there was a lack of consistency in routine suctioning of the airway and bite block insertion, despite recommendations from DAS [2]. The Guedel oropharyngeal airway was the commonest type of bite block used despite concerns about efficacy and risk of dental damage [3]. The majority of anaesthetists were either not confident in performing the advanced extubation techniques, or stated that they need more experience or training. We plan to address these issues via education at departmental meetings, locally run workshops, and increased opportunity for observation and hands-on experience in theatres.

References
Laid back attitude and department centered training needs

N. Gautam and T. Kathirgamanathan
Watford General Hospital

Doctors with poor communication skills are unlikely to achieve success and are more likely to face complaints and litigation [1]. Good communication skills are more important when it takes place during the care of end of life situations. This audit follows a complaint about the laid back attitude of an anaesthetist during a conversation with a patient and his relatives during his final hours of life and aims to find out existing levels of communication skills in the staff and how to change at departmental level.

Methods

30 of our staff responded to a simple questionnaire.

Results

- How confident would you be to communicate in this clinical situation? Only 40% felt good or excellent in communicating.
- What would be the main strength of your communication style? Replies varied from empathy to language skill. Majority said empathy but no one mentioned language skill. - 40% mentioned that they had had complaints as a result of their poor communication.
- Despite communication skills being a part of the medical curriculum and the General Medical Council introducing language test for EU doctors, 60% of the surveyed staff did not have any training in the last 5 years.
- How can the department and hospital trust help in your communication skills? Almost all replies highlighted willingness and the need of support by ways of further training locally and attending communication skill courses.

Discussion

Observations have shown that relatives who experienced proactive communication strategies and techniques reported improvement in the perceived quality of death and reduced levels of anxiety and depression [2, 3]. This audit highlights the importance of assessing the level of communication needs as a majority (60%) of the staff need formal training. Evidence reveals deterioration of process and perceptual skills over time which could be taught and trained [4]. Doctors with different educational, cultural and other backgrounds should understand the importance of communication style in the process of caring at the end of life pathway. The willingness and need for support shown by a majority, highlights the need for a local policy and a communication lead for staff training and assessment. Simple interactive approaches such as simulation, observation, feedback based practice, workshops and objective assessment by mandatory training modules as part of personal development plans at appraisal should be adopted. The programme should include ‘Train the trainers’ for advanced communication skills to help locally. Future re-audits will ensure changes make improvements to close the audit loop.

References

Availability of training in pain medicine: bridging the trainee trainer gap
A. Green,1 C. Carey1 and M. Coupe2
1Brighton and Sussex University Hospitals NHS Trust, 2East Kent Hospitals University Foundation Trust

Pain medicine is developing rapidly both in terms of clinical practice and organisation. The 2010 CCT curriculum states that Core Trainees should be ‘competent in the assessment and effective management of acute post-operative and non post-operative pain’, have ‘a basic understanding of the management of chronic pain in adults’ and wherever possible ‘this should occur in a dedicated block’ [1]. With pain medicine becoming increasingly fragmented between primary and secondary care settings, we sought to find out how both trainees and trainers felt about the adequacy of pain training in the Kent Surrey & Sussex (KSS) region.

Methods
A Survey Monkey regarding training in pain medicine was sent to all core trainees and college tutors in the KSS School of Anaesthesia in June 2013. Questions were mapped to learning outcomes in the Core Training curriculum, covering acute pain assessment and management and the availability of attending consultant led ward rounds and clinics.

Results
In total 57 trainees and 15 college tutors responded to the questionnaire from all of the 15 hospitals that train core trainees in KSS. 11 (61%) of the trainers stated that their hospital offered a pain module in a dedicated block. Over 75% of college tutors felt that there were enough or more than enough opportunities to learn all the required skills in pain medicine. However, 48% of trainees felt that there were ‘none’ or ‘not enough’ opportunities. In addition 75% felt there were ‘none’ or ‘not enough’ opportunities to join consultant led ward rounds and 81.5% had no opportunities to attend outpatient pain clinics.

Discussion
This survey shows a significant variation between trainees’ and trainers’ opinions about training opportunities for core trainees in pain medicine. Although college tutors generally felt that opportunities were adequate, many trainees felt that they were not gaining the experience required to fulfill the criteria set out in the curriculum and importantly this gap may be going unnoticed. The apparent deficit in training could be addressed in a number of ways. Firstly, planning and execution of pain training must be carefully considered and reviewed by departments on a regular basis to ensure that learning opportunities are maximised, which would almost certainly be better managed if trainees undertook dedicated pain modules. Secondly it is the responsibility of both trainers and trainees to establish goals at the beginning of lists and ward rounds to ensure that needs are met and express any concerns to their college tutors. Pain medicine should also form part of trainees’ local and regional teaching programmes.

Reference

Intraoperative fluid management: an audit of the use of intraoperative cardiac output monitoring for major surgery in University Hospital Aintree, Mersey Deanery
H. Heffernan and D. Raw
University Hospital Aintree, Mersey Deanery

Patients undergoing major surgery can lose varying amounts of fluid during the perioperative period. During surgery, fluid losses are replaced by intravenously administered fluids. Too much fluid replacement, or too little fluid replacement, has been shown to be associated with poor outcomes [1, 2]. Intraoperative cardiac output monitoring (IOCOM) is a means by which fluid administration to patients undergoing major surgery can be precisely tailored to their individual needs. The aim of this audit was to assess the current use of IOCOM in University Hospital Aintree following guidance that was issued to all the anaesthesia specialty leads and consultants about the CQUIN pre-qualifier target. The local guidance was based on national guidance from multiple sources including NICE, NCEPOD, RCS and GIFTASUP [3–6].

Methods
Every case for which IOCOM was used from April-November 2013 was identified using data put into Omnicell. This number was compared to the total number of applicable operations (according to NICE guidance) performed in this period. Four areas were looked into more closely: Emergency laparotomies, elective liver resections, elective colorectal operations and elective upper GI operations. Random selection of 10 patients in each area was chosen and their case notes reviewed. Also the total number of ordered equipment for this period was reviewed to correlate findings. Recommendations were implemented and use of COM in emergency laparotomies was re-audited from April to May 2014.

Results
Total of 499 applicable operations performed from April to November 2013. Of these, 100 used IOCOM, demonstrating only 20% compliance with local guidance. CQUIN Pre-qualifier target of 30% was not met. Findings demonstrated that the use in emergency laparotomies was particularly poor - 30% used. This was reassessed from April to May 2014, after recommendations were implemented, and improved to 58%.

Discussion
Aintree University Hospitals NHS Foundation Trust has been using IOCOM for many operative procedures since 2008. Our goal is to achieve IOCOM in > 80% of applicable cases. This audit demonstrated that the use of IOCOM from April to November 2013 was suboptimal. Despite the recommendation that IOCOM should be considered for all emergency laparotomies prior to the initial audit, there was only 30% compliance with this. This was highlighted at our departmental audit meeting and it was made mandatory for all emergency laparotomies.

References
Audit of perioperative temperature control at Guy’s & St Thomas’ NHS Foundation Trust – closing the loop

S. Hodge and J. Wilson
Guy’s & St Thomas’ NHS Foundation Trust

The ability to maintain normothermia is lost under regional or general anaesthesia due to impaired hypothalamic regulation and the loss of normal responses. Hypothermia can lead to increased blood loss intra-operatively, wound infections, cardiac morbidity, pressure sores and longer recovery and hospital stays. NICE has published guidelines recommending care standards of the surgical patient to avoid inadvertent peri-operative hypothermia [1]. This re-audit aims to assess the adherence to these guidelines at GSTT.

Methods
The same proforma as used in previous audits was used to gather information during the peri-operative period regarding patient temperatures, monitoring and warming methods. Data was collected from all patients undergoing regional or general anaesthesia by the staff caring for them. Paediatric and cardiothoracic patients were excluded. The audit standard was set at 100% for all recommendations.

Results
One hundred and forty nine patients were audited. Pre-operatively, 72% of patients had their temperature measured; of these, 11% were under 36 °C but active warming was not commenced. In the theatre suites, 23% did not have their temperature checked prior to induction of anaesthesia but 25% of those measured were below 36 °C. There were no incident reports completed for these patients and no operations were cancelled. Intra-operative temperature was monitored in 46% of patients. Forced air warmers were used for 93% of patients undergoing anaesthesia for over 30 min. Only 39% of patients receiving over 500 ml intravenous fluids had that fluid warmed. The operating theatres were of an acceptable temperature (over 21 °C) in 47% of cases. Post-operative temperature was always measured but 31% of patients were hypothermic, this delayed the discharge of 1% of patients and 7% of patients were discharged from recovery with temperatures under 36 °C.

Discussion
There is poor compliance with the NICE guidelines and a notable deterioration has occurred since previous years. This has resulted in an increase in the incidence of perioperative hypothermia. The guidelines were published 4 years ago, so the issue of peri-operative hypothermia may not be in the forefront of people’s minds which should be addressed. The measurement of temperature post-operatively met the audit standard, however temperature monitoring pre and intra-operatively was extremely poor so the use of any active warming methods is unguided. Easy access to temperature measuring devices should be ensured and anaesthetists advised not to induce anaesthesia prior to confirmation of a temperature over 36 °C.

Reference

To evaluate the use of cell saver in revision hip arthroplasties

A. Huda, N. Zaidi, G. Titley, N. Zaidi and G. Titley
Royal Bournemouth Hospital

Patients undergoing revision hip arthroplasties are at a higher risk for perioperative blood loss and may need allogeneic red cell transfusion. In revision hip arthroplasty, many perioperative blood conservation strategies are in practice including the perioperative cell salvage. Guidelines from the British Orthopaedic Association also states that in elective arthroplasty, blood should be returned to the patient if no contraindication exists in this regard [1].

Methods
We retrospectively audited the use of cell saver in all revision hip arthroplasties done in our institution over a period of 1 year (November 2012–October 2013). Data was collected from patient’s files regarding perioperative blood loss, use of cell saver, transfusion of salvage and allogenic blood and mean drop in haemoglobin concentration.

Results
Perioperative cell salvage was practised in 26 (66%) out of 39 patients. Average documented blood loss during the surgery was 824 ml. The average drop in haemoglobin 24 h postoperatively was 29 g/l. The mean amount of blood processed from cell saver was 168 ml. 53% of patients required only salvaged blood, 19% required both autologous and homologous blood while 27% received only homologous blood during their stay in the hospital.

Discussion
Perioperative cell salvage emerged as an effective and safe technique to reduce the allogenic transfusion needs in revision hip arthroplasty. This has subsequent positive implications regarding patient safety, length of hospital stay and resource management [2, 3]. Our audit clearly demonstrates underutilisation of cell saver use in revision hip surgery (used in 66% of patients). The use of cell saver has demonstrated a positive effect in 53% of patients who do not require any additional transfusion. We need to improve our understanding and working knowledge about this technique at our institution so that it can be used effectively in all revision hip arthroplasties.

References
Blood transfusion after primary arthoplasty: searching for a way to reduce the need in a Glasgow teaching hospital

L. Hudman, C. Soulsby and S. McKinlay
Glasgow Royal Infirmary

The Scottish Healthcare Musculoskeletal Audit programme considers adherence to enhanced recovery principles post primary arthroplasty [1]. It has demonstrated comparatively high levels of post operative blood transfusion within our large Glasgow teaching hospital. This survey aimed to establish if this is ongoing, identify associated factors and implement risk reduction strategies.

Methods
Data was obtained prospectively via a proforma completed by the relevant anaesthetist for all patients undergoing primary hip or knee arthroplasty. Post-operative follow up identified those requiring a blood transfusion.

Results
Seventy-two patients underwent primary arthoplasty. (26 THR, 46 TKR). Nine patients received a blood transfusion. Transfusion rates were found to be significantly higher in those with lower pre-operative haemoglobin levels (Fig. 1). Sixty percent of anaemic patients were transfused compared to 8.9% patients with normal pre-operative haemoglobin. Protocol based transfusion triggers were adhered to in 89% cases. Receipt of a blood transfusion was associated with increased mean length of stay (6.4 vs 3.7 days). Only two of five patients with preoperative anaemia had haematinics done as part of the pre operative assessment itself (although a third had them done in the preceding 5 months). Both were referred to the GP but with no review evident before presenting for surgery.

Discussion
Pre-operative haemoglobin levels below the laboratory norm are associated with an increased incidence of post operative blood transfusion. This in turn is associated with increased length of hospital stay [2]. Current pre-operative processes of identification and investigation of these patients appears ineffectual. A nursing protocol to refer all anaemic patients for investigation, treatment and review prior to agreeing a date for surgery is planned to address this.

Fig 1: Comparative pre-operative haemoglobin levels of those receiving a blood transfusion post operatively and those who did not.

Acknowledgements
Scottish Healthcare Audits Team, Information Services Division, NHS National Services Scotland

References

Sedation or general anaesthesia for surgical termination of pregnancy?

T. Jaconelli and S. Gower
Hull and East Yorkshire NHS Trust

Surgical termination of pregnancy (STOP) is usually performed under general anaesthesia when performed by the NHS. This is in contrast to the private sector where conscious sedation is the preferred method of conducting the procedure [1]. A Report by the Department of Health Expert Group published in 2002 advocated the use of conscious sedation in STOP [2].

Methods
 Conscious sedation was conducted using the following protocol: (i) In the anaesthetic room patients are cunnulated with a 22 gauge cannula in the dorsum of their non dominant hand. They are then given 4 mg ondasenetrion and 2 mg midazolam intravenously (if there are no known drug allergies). (ii) When on the operating table they are given 1 mg alfentanil, 1 g paracetamol and propofol is titrated in 10 mg aliquots to achieve conscious sedation up to a maximum of 100 mg. An anaesthetic machine is present to allow bag mask ventilation if the patient is unable to maintain their own airway.

We collected data on 76 patients over a 4-month period from October 2012. We recorded the age of the patient, pre-procedure anxiety level using a visual analogue scale from 1 to 10, total time in theatre, patient satisfaction, the rate of conversion to general anaesthetic and surgeons satisfaction with the procedure.

Results
Pre procedure anxiety level on the visual analogue scale were on average 7, with the lowest being 1 and the highest being 10. The average age of the patient was 24, ranging from 14 to 42 years old. The average time in theatre was 11 min, ranging from 5 to 25 min. Patient satisfaction was as follows: 86% felt it was better than expected, 1% worse than expected and 13% as expected. The rate of conversion to general anaesthetic was 3%, where the patient had to have airway intervention (bag valve mask). 9% of patients had to have their airway held with a chin lift, this was deemed to be deep sedation. In one case 50 mg of extra propofol was used, due to patients body habitus, conscious sedation was achieved in this patient. Surgeon satisfaction was positive in 89% of cases, the remaining 11% of cases the surgeon commented that patient moved on cervical injection or on suction.

Discussion
The use of conscious sedation is a safe, alternative method of conducting STOP. It has a high patient and surgeon satisfaction rating with a low conversion to general anaesthetic rate. The procedure time was short this may have cost saving implications as it my increase patient throughput. Also, time in the anaesthetic room is shortened compared to patients undergoing general anaesthetic, although this was not formally compared.

References
Remifentanil PCA: an alternative to an epidural or just more work for the anaesthetist? An audit of conversion rate and mode of delivery

M. Jaffer, L. Relton, H. Swales, D. Duncombe, A. Bougeard and A. Lim
University Hospital Southampton

Remifentanil PCA was initially used as an alternative to regional anaesthesia, it has now extended to a routine analgesia option with high satisfaction scores and has been shown to reduce regional anaesthesia rates [1, 3, 4]. Remifentanil was first used in 2009 at the Princess Anne Hospital, but was removed following a critical incident. It was reintroduced in 2011 due to the enthusiasm of the midwifery staff, with a revision of guidelines, introduction of new safety protocols and extensive training [2].

Methods
This was a prospective audit, approved by the audit department, that was carried out between December 2012 and December 2013. All patients that had a remifentanil PCA for analgesia during labour were included. Data collected comprised current mode of delivery, additional anaesthesia, any clinical incidences and conversion to epidural following PCA use. This was compared to rates published by Ulster Hospital which has been running this service for over 10 years [4].

Results
Between December 2012 and December 2013 there were 5892 deliveries at the Princess Anne Hospital, 63% had normal deliveries, 23% had c-sections, 16% had an instrumental delivery. During the year, 1251 women had an epidural (compared with 1262 for the previous year). Remifentanil PCA was used by 395 patients, 54% had normal deliveries, 20% c-section, 26% had an instrumental delivery. Of the 395 patients, 37 opted for an epidural following a remifentanil PCA, which is a conversion of 9%. There were no serious incidents reported during this time.

Discussion
Remifentanil PCA is clearly an effective analgesic option for labour. Our conversion rate of 9% to an epidural compared to 10% from larger institutions [4] was similar, indicating appropriate patient selection, however we were not able to show a reduction in epidurals. Our epidural rate stayed the same despite a 2 fold increase in remifentanil use over the year. Of the women with remifentanil PCA, 54% went on to have a vaginal delivery (65% primips) which must reflect the 1 to 1 care provided and appropriate patient selection. There was a higher work load for the anaesthetist? Certainly it has in terms of setup, ensuring safe and staff satisfaction. We aim to introduce these changes soon and re-evaluate the 1 to 1 care provided and appropriate patient selection. There was a higher work load for the anaesthetist? Certainly it has in terms of setup, ensuring safe and extensive training [2].

References

A step towards improving theatre productivity for elective caesarean sections

S. Kale, C. Farrow, N. Owen and K. Miltsios
Whittington Hospital, London

NHS Institute for Innovation and Improvement developed The Productive Operating Theatre Programme to improve effective use of theatre time, staff and patient experience [1]. Good administrative system and organisation is essential to ensure theatre efficiency [2]. On this background, with the rational of making existing systems more productive, safe and reliable, we evaluated current practice in one of our main theatres, designated for elective sections, in a DGH set up.

Methods
Evaluation was carried out over a 4-week period, for planned caesarean sections. The data was collected concurrently by the anaesthetist for that case and from the theatre database. The exact time for all significant events, such as when patient was sent for or when theatre was clean and ready for the next patient, was recorded. Reasons for delays, duration of anaesthesia, surgery and problems encountered were also recorded. Time spent at and between different crucial stages in theatre was calculated from the data. Results are presented in the form of time in minutes, median (IQR [range]).

Results

<table>
<thead>
<tr>
<th>Parameters (Total 25 forms)</th>
<th>Median (IQR [range]) min</th>
<th>Reasons for delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient sent for to arrival in theatre</td>
<td>5 (1.5-14 [1-29])</td>
<td>Obstetric team not present, midwife busy preparing patient and completing paperwork for previous patient, awarling group and save</td>
</tr>
<tr>
<td>Patient's arrival to Spinal/CSE insertion</td>
<td>18 (15-22 [10-70])</td>
<td>Difficulty in establishing neuroaxial blockade, obstetrician and midwife not available, partner fainted, difficult IV access</td>
</tr>
<tr>
<td>Time between block ready and knife to Skin</td>
<td>6 (4-8 [1-12])</td>
<td>Obstetrician not immediately available</td>
</tr>
<tr>
<td>Surgery duration</td>
<td>45 (38-51 [31-141])</td>
<td>MOH, high BMI, previous laparotomy</td>
</tr>
<tr>
<td>End of surgery to patient leaving theatre</td>
<td>11.5 (10-14 [4-16])</td>
<td>No reason documented</td>
</tr>
<tr>
<td>Theatre turnaround time</td>
<td>10 (8.5-13.5 [6-15])</td>
<td>No particular reason recorded</td>
</tr>
<tr>
<td>Total time patient is in theatre</td>
<td>89 (80-100 [74-183])</td>
<td>Reasons mentioned above</td>
</tr>
</tbody>
</table>

Discussion
We noted that unavailability of the obstetric team and busy midwives at times has resulted in late starts and delay in some procedures in theatres. Procedural difficulties in IV cannulations and regional anaesthesia, delay in starting the surgery after a satisfactory block and prolonged turnaround time have also affected the overall theatre productivity. We have put forth some recommendations such as offering administrative support to midwives, ensuring a senior obstetrician is present for team brief for the elective c-section lists, making use of the anaesthetic room to improve patient turnaround time and most importantly encouraging staff nurses to take the lead role in increasing theatre efficiency. This could be a step towards enhancing theatre productivity as well as increasing patient and staff satisfaction. We aim to introduce these changes soon and re-evaluate the practice in the near future.

References
Practice of maternity WHO safety checklist

S. Kale, S. Singh, S. Setty and S. Brocklesby
Barnet General Hospital, London

The WHO Surgical Safety Checklist has proved its benefits in reducing surgical morbidity and mortality [1]. In 2011 a modified checklist for maternity was released by the NPSA [2]. Since January 2010 we have been using our trust maternity checklist and a specific category 1 C-sections WHO checklist was introduced in April 2013. In April 2014 we evaluated our current practice of maternity WHO checklist and also surveyed staff’s attitude towards the usage of the same, with the aim of identifying and improving any deficiencies.

Methods
We evaluated the practice over a 1-week period. Audit forms were distributed to the ODPs to independently record the compliance with WHO checklist. Additionally case notes were examined for the quality of checklist documentation. A questionnaire was distributed to a multidisciplinary team including anaesthetists, ODPs, obstetricians, midwives and scrub nurses requesting them to complete the survey.

Results
From ODP’s records and case notes we found that the WHO checklist was completed in 33 out of a total of 35 cases. For 2 emergency procedures, we could not find the checklist or any documentation if it was completed.

Maternity WHO checklist compliance

<table>
<thead>
<tr>
<th>Cases</th>
<th>Team Brief</th>
<th>Sign In</th>
<th>Time Out</th>
<th>Sign Out</th>
<th>Team Debrief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective (LSCS),</td>
<td>9/9</td>
<td>9/9</td>
<td>8/9 (88%)</td>
<td>6/9 (66%)</td>
<td>9/9 (0%)</td>
</tr>
<tr>
<td>Numbers (%)</td>
<td>(100%)</td>
<td>(100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency, Numbers (%)</td>
<td>22/24</td>
<td>24/24 (100%)</td>
<td>18/24 (75%)</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Numbers (%)</td>
<td>(91%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (%)</td>
<td>9/9</td>
<td>31/33</td>
<td>32/33 (95%)</td>
<td>24/33 (78%)</td>
<td>9/9 (0%)</td>
</tr>
<tr>
<td>(100%)</td>
<td>(94%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In 4/33 checklists, some sections under Sign in, Time out or Sign out were incomplete. Staff attitude survey showed 100% of staff were aware of the maternity WHO checklist and 94% were aware of the evidence related to the safety checklist. 84% of staff said the checklist improves communication. 35% said resistance was observed in the form of disengagement, time pressures during emergency procedures, confusion about who completes the particular segment of the WHO checklist and which form to be used for procedures other than Cat 1 and 4 LSCS.

Discussion
The WHO checklist was used in 94% cases. Sign out was completed in only 78% cases. In 12% cases some of the subsections under 3 steps were not filled in. Main obstacles were less than 100% staff involvement and not clear about the use of the WHO checklist for procedures other than LSCS. The audit results were presented in a multidisciplinary audit meeting and in a Labour Ward Forum to increase staff education and compliance. Based on our audit and survey, we have modified both elective and emergency WHOchecklists to avoid confusion. We have added ‘Category 1,2,3 and all other emergencies’ while ‘Category 4 and all other elective procedures’, is on emergency and elective checklist forms, respectively. We have designated the responsibilities such as Sign in by midwife, Time out by surgeons and Sign out by scrub team/anaesthetists. With all these changes in place, we plan to re-audit the practice soon.

References

Trainees’ attitudes to audit: motivations, misgivings and challenges to overcome

L. Kidd
Royal Devon and Exeter Hospital

Audit appraises current practice, striving towards improved safety, quality and standards. Audit is mandatory, a cornerstone of clinical governance and an essential part of the GMC’s Good Medical Practice [1] and therefore post-graduate training. It is a significant domain for scoring applications in job short-listing [2] and cannot be ignored by trainees or trainers. Anecdotally however, there is increasing apathy towards audit amongst trainees. To investigate the attitudes of trainees towards audit a deanery wide survey was distributed, assessing both motivations and the expectations of long-lasting change resulting from the intervention.

Methods
An anonymous online survey was sent out to trainees (Core and Specialist) across the Peninsula Deanery. Questions were designed to reflect the subjective nature of opinions using a ‘subjective scale’. Multiple ranked answers underwent sequence randomisation to reduce order bias.

Results
61 responses were received (response rate 44%), of whom 34 were core trainees. 62% of respondents felt the expectation for audit was ‘mandatory’, with a further 30% reporting a ‘list’ of expectation. The median number of audits involved with was 1/year. The four strongest supported motivations for performing audit were;

-Scoring ‘points’ for short-listing
-Expectation to perform audit as part of training
-Need to satisfy criteria for job applications
-ARCP requirement

The four least supported reasons were;

-Understanding the audit process
-Adherence to new guidelines
-Improving patient safety
-Improving patient care.

In their last audit, ‘No improvement’ in patient care was predicted by 15%, 23% for patient safety and 25% for clinical practice. 53% of trainees predicted long-term changes resulting. 67% felt that audit did not improve training.

Discussion
All doctors should take pride in the organisation they work for and the service that they provide - always striving to improve this. The greater purpose of audit is to improve all aspects of practice, but this survey suggests that many trainees no longer value audit as a tool for this.

Many trainees perform audits to pass an ‘ARCP’ or simply because they have to. Changing attitudes requires re-engagement of trainees. Achieving results requires motivated trainees who want to improve practice in response to problems they see. Trainee-led collaborations such as SWARM [3] (South West Anaesthetic Research Matrix), involvement in multi-centre regional and national audit projects and a move towards Quality Improvement may provide a tool to achieve long-term improvements and restore faith in the value of audit amongst trainees.

References
1. Good Medical Practice; 2013: General Medical Council.
Postoperative mortality in the UK is eight fold higher in the 0–5% predicted risk of death group and 3 fold higher in the 11–20% predicted risk of death group than in the USA [1]. Cardiopulmonary exercise testing (CPET) can be used to risk stratify patients pre-operatively. Admitting high risk patients directly to a Critical Care Unit (CCU) produces better patient outcomes than if patients are discharged to the ward [1]. This is the first audit of the CPET clinic at The Queen Elizabeth Hospital since it began in November 2012. The service aims to risk stratify all patients undergoing major laparoscopic surgery or laparotomies. Those patients identified as high (red) or intermediate (yellow) risk should have an intraoperative central line and be admitted to CCU postoperatively.

Methods
This was a retrospective audit over the time period 6/11/12-6/6/13. All patients aged over 50 undergoing abdominal surgery were identified from OR-MIS theatre software. Notes for 50 patients who underwent CPET were obtained and data collected on CPET grade, ASA, operation, admissions to CCU, central line insertion and length of stay in hospital.

Results
The number of patients qualified to undergo CPET was 349 but only 131 under went assessment. From the 50 patient note set 3 were removed from the audit, as their risk was unknown.

See Figure 1. Of the 17 patients risk stratified as red; 13 of these had planned CCU admissions postoperatively, 2 declined surgery and 2 had their operation modified to reduce their risk. 62% had a central line inserted. Of the 6 patients risk stratified as yellow; 3 had planned CCU admissions, 1 had an awake regional anaesthetic, 1 was only felt to be yellow risk due to a high BMI and 1 patient went to the ward. Only 1 patient going to CCU had a central line inserted. Of the 22 patients risk stratified as green; 6 had planned admissions to CCU and 3 had unplanned admissions to CCU. The planned admissions were due to other medical or surgical concerns identified preoperatively or for epidural care. Two of the unplanned admissions were due to significant intraoperative blood loss and one was for pain control.

Discussion
Half of patients undergoing CPET were yellow or red. If all 349 patients had undergone CPET, approximately 175 would have required postoperative CCU admission. How to meet this increase in demand on CCU should be considered. Only 63% of red patients and 33% of yellow patients going to CCU had intraoperative central lines. Educating anaesthetists on the use of risk stratification to optimize intraoperative care is needed.

References

Figure 1 Number of patients admitted to CCU according to CPET grade.
Efficacy and side effect profile of intrathecal opioids in major surgery

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The Royal Marsden NHS Foundation Trust, London

Intrathecal opioids are common adjuncts in spinal anaesthesia [1]. We compared intrathecal diamorphine with intrathecal morphine in terms of analgesic efficacy and incidence of side effects.

Methods
Data was collected retrospectively for patients undergoing spinal anaesthesia with intrathecal diamorphine or morphine between December 2010 and June 2013.

Results
Intrathecal diamorphine was used in 87 cases and morphine in 88. The dose range of diamorphine was 200–1000 mcg (mode 300 mcg) and of morphine 300–1000 mcg (mode 500 mcg).

a) Pain scores
Effective analgesia (‘analgesed’) was defined as a pain score ≤ 4 on movement (Numerical Rating Scale). T0, T4 and T24 represent hours after patient arrival in ICU. There was no statistically significant difference between the number of patients analgesed in the diamorphine group compared to the morphine group at any time point, with the exception of T4: significantly more patients were analgesed at rest at T4 in the morphine group (p = 0.03).

b) Patient controlled analgesia (PCA) requirement
There was significantly higher fentanyl PCA usage in the intrathecal diamorphine group in the first 24 h postoperatively (mean 59 mcg vs 15 mcg; p = 0.02). There was no significant difference in mean morphine PCA requirement (diamorphine group 29 mg vs 18 mg morphine group; p = 0.22).

c) Nausea and vomiting
There was no significant difference in antiemetic use at either 12 h or 24 h.

d) Respiratory depression
Three patients in each group had respiratory rates (RR)<8 at 12 h. At 24 h, 10 patients in the morphine group compared to 5 in the diamorphine group had RR < 8; this was not statistically significant (p = 0.16). Two patients received naloxone in the morphine group for serious respiratory compromise compared to 0 in the diamorphine group.

e) Itch
Significantly more patients required chlorphenamine for itch in the morphine group (11 vs. 4; p = 0.05).

Discussion
Intrathecal opioids contributed to effective analgesia after major surgery, with high proportions of patients being analgesed in the first 24 h. Greater PCA usage in the diamorphine group suggests that intrathecal morphine offers an analgesic advantage over diamorphine without a significantly worse side effect profile. Respiratory depression was uncommon but highlights the need for close patient monitoring for at least 24 h after intrathecal opioid delivery.

Table 1 Number of patients with effective analgesia at different time points at rest and on movement: No. analgesed/No. with data (%).

<table>
<thead>
<tr>
<th>Time</th>
<th>Diamorphine – at rest</th>
<th>Morphine – at rest</th>
<th>Diamorphine – on movement</th>
<th>Morphine – on movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>54/81 (66)</td>
<td>66/88 (79)</td>
<td>59/80 (74)</td>
<td>63/83 (76)</td>
</tr>
<tr>
<td>T4</td>
<td>42/56 (75)</td>
<td>46/48 (96)</td>
<td>37/45 (82)</td>
<td>32/34 (94)</td>
</tr>
<tr>
<td>T24</td>
<td>44/57 (77)</td>
<td>44/50 (88)</td>
<td>18/22 (82)</td>
<td>18/24 (75)</td>
</tr>
</tbody>
</table>

Audit of lung protective ventilation in a tertiary referral centre

H. Leung, S. Dalay, P. Isherwood and Z. Bashir
Queen Elizabeth Hospital, Birmingham

The landmark study of lung protective ventilation (LPV) was published in 2000 [1], which resulted in a change in ventilation practise nationally. A local LPV guideline was recently introduced in our ICU, which was modified from the ARDSNet guidance. Audit was conducted before and after the guideline introduction to detect any change of practice. Intubated and ventilated patients trigger for LPV if they meet one of the three criteria, i) $\text{FiO}_2 \geq 40\%$; ii) Plateau pressure $\geq 25$ cmH$_2$O; iii) suspected lung injury.

Methods
Intubated and ventilated patients were considered for data collection. Data was collected at bedside as a snapshot at a random time. Patients’ demographics and ventilation setting were recorded. Height and weight were taken as the record on computer system. Peak pressure was used as a surrogate measurement for plateau pressure. Compliance of LPV was measured in terms of i) tidal volume per kilogram; ii) peak pressure and iii) the correct matching between $\text{FiO}_2$ and peak end expiratory pressure (PEEP). Data was analysed to detect patients who require LPV, and whether the guideline was followed in these patients.

Results
There were 61 and 57 points of data collection in the audits before and after guideline introduction respectively, approximately three quarter of patients satisfied the criteria for triggering LPV in both audits. A small improvement of complete guideline compliance was seen after it was introduced. Peak pressure was kept below 30 cmH$_2$O in most patients in both audits. However, the tidal volume by weight and the $\text{FiO}_2$/PEEP match have room for improvement, despite showing a small increase in compliance. The median tidal volume was reduced from 7.3 to 6.8 ml/kg, and the peak pressure reduced from 24 to 19 cmH$_2$O after guideline introduction. Patients with no height and weight written on any ICU daily observation chart reduced from 47 to 45% after guideline introduction. The mean difference between actual and predicted body weight was 15.3 kg.

The table illustrates the percentage of patients compliant with the entire lung protective ventilation guideline, as well as individual aspects.

<table>
<thead>
<tr>
<th></th>
<th>Before guideline introduction</th>
<th>After guideline introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total compliance</td>
<td>7/47 (14.9%)</td>
<td>9/43 (21%)</td>
</tr>
<tr>
<td>Peak pressure &lt; 30 cmH$_2$O</td>
<td>41/47 (87%)</td>
<td>43/47 (93%)</td>
</tr>
<tr>
<td>Tidal volume &lt; 6 ml/kg</td>
<td>12/47 (26%)</td>
<td>15/43 (35%)</td>
</tr>
<tr>
<td>$\text{FiO}_2$/PEEP match</td>
<td>24/47 (51%)</td>
<td>29/43 (67%)</td>
</tr>
</tbody>
</table>

Discussion
The present audit showed a small increase in LPV compliance after a written guideline was introduced. Previous studies have shown that reduction of tidal volume in clinical practise was a slow process [2]. Common barriers to providing LPV such as reluctance to ventilate with low tidal volume and confusion between actual and ideal body weight [3], were observed in our unit. We will continue to educate medical and nursing staff about the benefits and practicality of using LPV, as well as re-auditing our practise in the future.

References
Clinical management of malignant hyperthermia – a quality improvement exercise using AAGBI guidelines, audit and simulation 2010–2014

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Malignant hyperthermia (MH) is a rare but serious complication of anaesthesia, the management of which is time critical and involves the organised and rapid delegation of tasks to improve a patient’s chance of survival [1]. The AAGBI published guidelines in 2007 and 2011 to aid this process [2]. Since 2010 our department has initiated several exercises in MH to analyse our efficacy in its management.

Methods
An audit was done in 2010 to assess knowledge of 2007 guidelines and suitability of theatre setup to manage an MH case. A multidisciplinary time test to prepare dantrolene was also undertaken, with subsequent changes to clinical practice. This was followed in 2013/14 by MH simulation assessment using COSBART scenarios (Continuing Scenario Based Anaesthetic Resuscitation Training) [3] with further changes to clinical practice.

Results
From the 2010 audit, AAGBI guidelines were present in 14/19 theatres (74%). Dantrolene was present in all stated locations but 50% was expired in one location. 8/16 (50%) of staff knew the correct location. 7/16 (43%) of anaesthetists knew the correct initial dose. 3/16 (19%) could correctly prepare dantrolene. Time range for dantrolene preparation was 3.58 to 16.54 min with one medical student failing to complete the task.

Table 1 COSBART MH scenarios (run ‘realtime’ with expired dantrolene)

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time from recognition of MH to delivering first dantrolene dose</td>
<td>17 min</td>
<td>6.15 min</td>
</tr>
<tr>
<td>Time for completion of dantrolene dose</td>
<td>33 min</td>
<td>13.30 min</td>
</tr>
<tr>
<td>Time taken to source ice</td>
<td>45 min</td>
<td>2.45 min</td>
</tr>
</tbody>
</table>

Discussion
The 2010 audit confirmed that allocating the task of dantrolene preparation to inexperienced team members could result in significant delays to treatment. This also correlated with the new 2011 guideline advice on task allocation. Following from this, departmental training on MH and task allocation took place, emergency algorithm folders for each anaesthetic machine were generated (including MH guidelines) and dantrolene expiry dates were included in weekly checks. The 2013 simulation showed that although guidelines and task allocations were well adhered to, the lack of a specific MH trolley (due to competing funding priorities) and cold packs resulted again in treatment delays and created a zone of chaos in theatre, rendering it akin to a bombsite after the scenario. It was clear that improvements were still needed. By 2014, our MH trolleys and cold packs were now funded. Subsequent running of scenarios demonstrated vast improvements in speed and organisation. Should an actual MH case present, an anaesthetic department could learn much from the subsequent morbidity and mortality analysis. Through audit, practice and full adherence to AAGBI guidelines, we have demonstrated our heightened ability to manage such a case and improve outcomes for our patients.

References

Audit of unsuccessful epidural analgesia during labour

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1Royal Devon and Exeter NHS Foundation Trust, 2Peninsula College of Medicine and Dentistry

Epidural analgesia is the gold standard for analgesia in labour. Failure of epidural analgesia among maternity patients is higher compared to general surgical patients. Definitions of failure, which include a composite endpoint comprise: failure to site, inadequate pain relief 45 min after placement, resiting, accidental dural puncture (ADP) and ineffective anaesthesia when tipped up for operative procedures [1, 2]; or a combination of these factors. Failure rates have been previously reported at 20% [3]. This audit examined the failure rate of labour epidural analgesia against the standards set by the Royal College of Anaesthetists (RCoA).

Methods
All epidurals performed for labour analgesia over a 3-week period were included. A retrospective notes review was performed. Data collected included: grade of performer, degree of block level and analgesic effect at 45 min, use for operative procedures and any other documented failure problems. Each epidural was evaluated against recognized College definitions of failure.

Results
Twenty-eight females underwent retrospective notes review. Core trainees, registrars and consultants inserted 32%, 57% and 11% of epidurals respectively. Insertion was abandoned in 1 patient. Block level was documented in 15 (54%) patients after 45 min. Analgesia was deemed adequate in 20 (71%) at 45 min post-insertion. Two epidurals required resiting. Fifteen (54%) women went on to have epidural top-ups for operative procedures; 2 of which had inadequate anaesthesia. No ADPs were reported. Labour epidurals were deemed unsuccessful in 11 (39%) cases; 2 (18%), 8 (73%) and 1 (9%) of which were inserted by core trainees, registrars and consultants respectively.

Discussion
Using a composite endpoint, the rate of unsuccessful labour epidurals was nearly double that previously reported [3], primarily as a result of inadequate analgesia 45 min post-insertion. RCoA guidelines propose adequate pain relief after 45 min is ≥88%; this audit reported only 71% adequate analgesia. Findings suggest performer inexperience does not necessarily cause failure. Conversely, the rate for resiting epidurals, ADP and adequacy of anaesthesia for operative procedures were all within RCoA guidelines. This audit highlighted a relative paucity of epidural block height documentation and an absence of patient pain scores. It is recommended that more rigorous documentation of such factors will allow earlier identification of inadequate epidural analgesia and facilitate prompt intervention. Regular anaesthetic review is also encouraged in the acute phase after epidural insertion to assess adequacy of pain relief.

References
Audit of anaesthetic quality
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In 2008 the National Health Service (NHS) Next Stage Review was presented to parliament, the vision behind the report was of an NHS that provides quality of care for all [1]. In a review of quality indicators in anaesthesia [3] noted a lack of academic interest in validating, reproducing and assessing quality indicators. In addition, where there is an evidence base, the use of quantitative indicators remains patchy and they have not been robustly shown to improve patient outcomes. In the UK there are currently no national standards for the measurement of quality of care in anaesthesia [2]. The aim of this audit was to identify anaesthetic quality indicators and use them to audit practice.

Methods
Six fields were recognised: handover, post-operative nausea and vomiting (PONV), post-operative pain, post-operative recovery time, unplanned airway management, reversal, overnight admission and intensive care unit (ICU) admissions were recorded. Anaesthetics were analysed from theatres at an acute hospital, and included patients over the age of 18 and of both sexes. All patients were elective patients, undergoing either urology, general, vascular or plastics procedures.

Results
The area requiring the most improvement was the management of pain, 33% of patients experienced pain. This was associated with an increased stay in the PACU, with the mean stay of patients in pain being 89 min compared to 34 min for those not in pain. One hundred percent of the patients who experienced PONV also required pain relief.

Discussion
When patients required pain relief their stay in recovery was almost three times longer. PONV rates were low, with only patients in pain experiencing PONV. Patient dissatisfaction was strongly correlated with a longer length of stay. Handover scores were consistently high with no association between low score and the other quality indicators. Temperature cannot be used as a quality indicator because the tympanic thermometer use was inconsistent. Therefore; patient satisfaction, pain, PONV and recovery time can be used to indicate the quality of the anaesthetic. To improve the anaesthetic it was recommended that teaching on pain management and PONV should be covered. In addition local guidelines and targets for pain management should be implemented. The quality indicators will be re-audited in 2015 after the recommendations have been put in place.

References

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A complete audit cycle of residual neuromuscular block in the recovery room
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Betsi Cadwaladr University Health Board, Bangor

Airway problems in recovery were a considerable issue in NAP4 [1] and as inadequate reversal will exacerbate any problems with extubation we quantified the incidence of residual neuromuscular blockade (NMB) in our recovery unit. At the same time we surveyed the department’s knowledge and practice regarding reversal. The audit cycle was continued until the incidence reached zero whereupon the department was surveyed again.

Methods
All patients operated on in Ysbyty Gwynedd over a 16-month period were included. Recovery staff completed an audit form if they clinically suspected residual NMB (inability to lift head off pillow or stick tongue out for 5 s; jerky movements; any other clinical suspicion). Each case of suspected residual NMB was investigated by retrospective analysis of the anaesthetic chart and audit form. The initial results were presented at a local audit meeting stressing a ‘train of four’ (TOF) ratio of > 0.9 as criterion for extubation [3]. This was followed up with several departmental emails highlighting best practice with subsequent audit results. All departmental staff were surveyed using a modified questionnaire [2, 3] at the start and end of the 16 month period.

Results
Each audit period lasted 4 months and was repeated four times in total. The initial audit identified five probable cases with an incidence of 0.52% (0.066–2.82%) [2]. Subsequent audits at four monthly intervals highlighted two, one and zero (respectively) probable cases. Thirty-nine anaesthetists out of a possible 41 partook in the surveys. The number of anaesthetists using a ‘train of four’ (TOF) ratio > 0.9 improved from three to 14. The number that ‘always’ reversed their patients remained the same i.e. 17/39.

Discussion
We feel that repeating this audit in a high-profile manner has resulted in an improvement in the incidence of residual NMB in our recovery unit, mirrored by an improvement in the departmental knowledge regarding reversal of neuromuscular blockade.

References
A quality improvement project to increase and focus the use of intraoperative cell salvage in obstetrics

M. Mancini, S. Griffiths, A. Pool, V. Skelton and P. Groves
King’s College Hospital, London

The use of intraoperative cell salvage (ICS) in obstetrics has been endorsed by many national organisations [1]. The benefits extend beyond reducing allogeneic blood transfusion [2] to reducing the risk of maternal postpartum anaemia and its associated consequences [3]. Our tertiary referral centre uses ICS for patients identified as high risk for bleeding during caesarean section. We looked at our current usage of ICS to identify areas for improvement.

Methods

We conducted a prospective audit of ICS use during elective and emergency caesarean sections over a 1-month period. Data collection included known risk factors for PPH [4], pre-and post-operative haemoglobin, estimated blood loss (EBL) and use of allogeneic blood. Our cell salvage system (Haemonetics® Cell Saver®) can process with 600 ml minimum of fluid (blood and anticoagulant) in the collection bowl. A sub-group analysis was performed of patients who may have benefited from the processing of cell salvaged blood defined as an EBL of > 600 ml.

Results

A total of 126 caesarean sections were performed in March 2014. Either EBL or use of ICS was not recorded in 8 cases. Therefore, 118 patients were included in the analysis as summarised in Table 1. Four patients received allogeneic blood post-operatively, of which ICS was only used once. Mean Hb drop for all patients was 10.7 g/l (SD 9.9) when using ICS vs 16.0 g/l (SD10.0) with no ICS. For emergency cases, mean Hb drop was 12.8 g/l (SD10.7) with ICS vs 19.3 g/l (SD 9.4) with no ICS.

Table 1. Use of ICS for patients undergoing caesarean sections.

<table>
<thead>
<tr>
<th></th>
<th>No. of patients</th>
<th>ICS - collection (%)</th>
<th>ICS - processed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>118</td>
<td>34 (29)</td>
<td>8 (7)</td>
</tr>
<tr>
<td><strong>Elective</strong></td>
<td>40</td>
<td>21 (53)</td>
<td>6 (15)</td>
</tr>
<tr>
<td><strong>Emergency</strong></td>
<td>78</td>
<td>13 (17)</td>
<td>2 (3)</td>
</tr>
<tr>
<td><strong>EBL &gt;600 ml</strong></td>
<td>52</td>
<td>14 (27)</td>
<td>8 (15)</td>
</tr>
<tr>
<td><strong>Elective</strong></td>
<td>20</td>
<td>10 (50)</td>
<td>6 (30)</td>
</tr>
<tr>
<td><strong>Emergency</strong></td>
<td>32</td>
<td>4 (13)</td>
<td>2 (6)</td>
</tr>
<tr>
<td><strong>Risk Factors†</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>68</td>
<td>24 (35)</td>
<td>7 (10)</td>
</tr>
<tr>
<td><strong>Elective</strong></td>
<td>18</td>
<td>14 (78)</td>
<td>5 (28)</td>
</tr>
<tr>
<td><strong>Emergency</strong></td>
<td>50</td>
<td>10 (20)</td>
<td>2 (4)</td>
</tr>
</tbody>
</table>

† Previous caesarean section; abnormal placentaion; failure to progress (as a surrogate for augmented or prolonged labour); failed instrumental, fibroid uterus; previous uterine surgery; multiple pregnancy, transverse lie, preclampsia, coagulopathy; advanced maternal age (> 35 years); BMI > 35 kg/m².

Discussion

Approximately two-thirds of the cases were emergencies but ICS was used proportionally more during elective caesareans (53%). There were more patients with an EBL > 600 ml (32/52) and known risk factors for PPH (50/68) occurring as emergency cases (32/50) but ICS was four times more likely to be used in these higher risk cases when they occurred as elective procedures. Emergency cases where ICS was used showed reduced Hb drop on day 1 post-operatively. To optimise the number of patients likely to benefit from cell salvage we have updated our guidelines to encourage the use of ICS (collection only) in all emergency cases and plan to include ICS in our WHO checklist.

References

2. OAA / AAGBI Guidelines for Obstetric Anaesthetic Services, June 2013.

The incidence and complications of retained central line guide wires

M. Mariyaseelvam, T. Clare, G. Wijewardena, A. Hutton and P. Young
The Queen Elizabeth Hospital NHS Trust Foundation, Kings Lynn, Peterborough and Stamford NHS Foundation Trust

Central venous catheters (CVC) are routinely used in the care of critically ill patients and are commonly inserted via the Seldinger technique [1]. The Signal document highlights the continued risk of retained central line guide wires post procedure [2]. Loss of the guide wire is a serious and life threatening complication where research has reported a 20% mortality in cases of retained guide wires [3]. The National Patient Safety Agency have made retained central line guide wires a never event [4]. In the last year there were 4 reported incidents of retained guide wires however, it is believed that under-reporting is likely, therefore we conducted a national survey to determine the rate of retained central line guide wires [4, 5].

Methods

A convenience sample of 129 cardiothoracic surgeons at the Annual Meeting of Cardiothoracic Surgeons, UK (2014) were asked to participate in the survey. They were asked how many cases of retained central line guide wires they had seen in the last 5 years. Surgeons were asked how these cases were managed and were asked to select all the methods of management that they had seen.

Results

Of the 129 delegates, 58 recalled at least 1 incidence of retained central line guide wires, and 2 were able to recall more than 10 instances in the last 5 years. The most common method of management of retained wires recalled was with interventional radiology (38%) or cardiothoracic surgery (41%). Some also described simple measures such as removal by clamping of the wire (19%) and in 1 case the participant reported that nothing was done.

Discussion

A retained central line guide wire is a never event with significant morbidity and mortality. Our survey shows that 44.9% of cardiothoracic surgeons had seen this problem, indicating that this is likely to be an underreported problem. Most patients had to undergo subsequent invasive and potentially unnecessary procedures in order to remove guide wire. Retained guide wires are commonly due to operator error [5]. Following recommendations to design out error, a novel guide wire has been developed with a central helical portion. This prevents the operator from over-inserting and accidentally retaining the guide wire.

Dr Young has patented the novel guide wire

References

Paediatric pre-admission anaesthetic information – are we reaching children and parents?

M. McDonald, E. Jenkins, M. Pachucki and P. Segar
Bristol Royal Hospital for Children

The Royal College of Anaesthetists (RCOA) has produced age-appropriate booklets to help children understand about their anaesthetic. The use of these booklets prior to admission is recommended in the RCOA Guidelines for the provision of Anaesthetic Services [1]. Our tertiary paediatric hospital also provides a website with anaesthetic information for parents and interactive webpages for children. It has been observed that knowledge of these resources is often poor. We aimed to quantify the use of the different resources available and to assess parents’ readiness to use online media.

Methods
Over a 1-week period, all parents of children having an elective procedure under general anaesthetic were asked to complete a questionnaire. Oncology patients and cardiac surgery patients were excluded from the survey.

Results
Of a possible 69 participants, 63 fully completed questionnaires (91%) were collected. Four (6%) parents were aware of one or more of the RCOA booklets. Only one family used them to prepare their child prior to admission. Thirteen (21%) of parents accessed the hospital website before the day of surgery, but none used it to source anaesthetic information for their child. Forty-eight (76%) parents relied on their own knowledge or information from friends and family to inform their children about general anaesthesia. Six (10%) families did not discuss anaesthesia with their child prior to admission. Twenty-nine (46%) parents felt that they did not have enough information pre-operatively to prepare their child adequately for their anaesthetic. Of these, 21 (72%) were first time general anaesthetics. Thirty-eight (60%) parents said that their preferred method to receive pre-op anaesthetic information was by email. Fifty-nine (94%) parents had internet access.

Discussion
Children and parents who have not been prepared for anaesthesia often find the experience much more difficult than those who have worked through their concerns in advance [2]. Although there is a large amount of information available to help parents and children prepare for anaesthesia prior to admission, our results showed that parents were often not aware of it, despite being directed to the RCOA booklets by a web link on the admissions letter they received. It is important to recognise and bridge this gap in communication. We aim to plan to provide emailed weblinks in our pre-admission correspondence to engage parents to take a proactive role in helping their children understand about their anaesthetic. The use of these booklets to help children understand about their anaesthetic is recommended in the RCOA Guidelines for the provision of Anaesthetic Services [1]. Our tertiary paediatric hospital also provides a website with anaesthetic information for parents and interactive webpages for children. It has been observed that knowledge of these resources is often poor. We aimed to quantify the use of the different resources available and to assess parents’ readiness to use online media.

References

A new approach to debrief in simulation – the RSCH template

A. McKechnie and W. McGearey
Royal Surrey County Hospital

Anaesthetists are often the driving force in simulation training and are regularly expected to debrief non anaesthetic scenarios. Simulation in a modern high fidelity simulation suite aims to make training a safe and effective way to learn. Debrief is the key component to aid learning in simulation [1] and has been described as the ‘heart and soul of the simulated experience’ [2]. However, debrief is a difficult task and as a busy simulation centre we train our own faculty and rely on them to debrief appropriately to ensure our learners get the most from their sessions.

Methods
We recognised not all faculty were as confident with the debriefing process as others so an online survey was performed. Our aim was to gain an understanding of faculty attitude towards debriefing and what we could do to improve matters.

Results
The survey showed 40% were unhappy debriefing in their non speciality subjects, many had no formal training and 85% thought a template would help. The goal was then to design a debrief template for each of our scenarios to enable faculty to have confidence in debriefing effectively in a robust and systematic way. We reviewed a number of debrief models and methods and looked at educational research in order to design our own template. We were guided by the work of Kurtz [3] and influenced by Flin [4] in trying to place the learner at the centre of the debrief whilst taking into account the clinical approach observed in the scenario in addition to non technical skills.

Discussion
The templates are specific for each scenario and are written to be curriculum mapped for observed practice whilst including discussion of human factors. There is an area providing suggestions for discussion points and beneath that is a section to make notes while observing performance. All follow the same pattern providing repetitive practice for less experienced faculty, and are designed to ensure standardised quality debrief. The feedback from faculty has been very positive and the regional group (SQUAD) ensuring quality simulation training have praised our design. Rather than a constraint to free discussion the template merely provides a crutch to assist faculty and to act as an ‘aide memoire’ where subject content may occur outside debrief facilitators, comfort zone. The template has improved our ability to offer a consistent, quality and robust learning experience. It is common practice to script and meticulously plan the content of our scenarios so authors feel the same attention should be invested in the educational analysis.

References
Prophylactic antibiotics in major trauma patients

A. Mortier
University Hospital Southampton NHS Foundation Trust

By definition, Major Trauma (MT) patients have complex injuries that often involve more than one body system or surgical specialty. Delays in the administration or omission of appropriate prophylactic antibiotics may lead to infective complications further down the line for these patients, ultimately affecting their outcome, although depending on injury such antibiotics are not always indicated. The aim of this audit was to determine whether MT patients presenting to University Hospital Southampton NHS Foundation Trust (UHST), a Major Trauma Centre (MTC), receive appropriate antibiotic prophylaxis, according to their injuries, in line with current guidelines.

Methods

A search was conducted for current local or national guidelines for the use of prophylactic antibiotics in MT patients. Although guidelines were identified for individual injury types, no single guideline was found to exist for patients with multiple injuries [1–3]. A new guideline was therefore produced following a literature search of current evidence (Fig. 1) in order to provide a set of audit standards [4–6].

50 consecutive adult MT cases presenting to UHST with an Injury Severity Score (ISS) > 15 (defined as Major Trauma) were identified using The Trauma Audit & Research Network (TARN). Information collected included time of injury and presentation, initial presenting hospital, and injuries sustained and if any antibiotics or other prophylaxis were given. Current practice was compared against the existing single injury guidelines and new multiple injury standards.

Results

When compared to the multiple injury set standards, initial prophylactic antibiotics were indicated in 69% of the cases. 38% of these cases received appropriate antibiotics across all hospitals, for the MTC this figure rose to 58%. 24% of all cases received antibiotics where antibiotic use was not indicated. Where an isolated injury guideline already existed (open limb fracture), the correct antibiotics specified by this guideline were given in 73% of cases.

Discussion

As no specific guidance for multiply-injured patients existed for when the initial patient data was obtained, it is unfair to comment on how practice at this time compared to existing standards. However the results obtained from this audit have highlighted the confusion surrounding prophylactic antibiotics in MT patients and the need for a single set of guidelines for multiply-injured patients. Such guidelines have now been produced and implemented in this MTC and will subsequently be re-audited.

References


NICE CG65 – perioperative hypothermia: Importance of correcting patient temperature to a core equivalent measure

J. Nevin, N. Hall and J. Duggan
Wansbeck Hospital, Northumbria, UK

Our organisation has adopted NICE CG65 core temperature thresholds (CTT) as a standard of care [1]. Repeated failure to achieve pre- and post-op CTT ≥ 36 °C in more than 30% of cases resulted in the problem being escalated to our Surgical Board. We set out to audit our compliance with this standard.

Methods

We obtained Caldicott approval and recruited 44 patients in January 2014. We recorded temperature on admission and on entering recovery with a Genus 2 infra-red thermometer (IFT), set to tympanic mode and calibrated for this purpose. We also recorded the use of active warming (resistive-heating). Tympanic temperature (TT) < 36 °C was considered hypothermia.

Results

Individual pre- and post-op TT are shown in Fig. 1. 16/44 (36%) pre- and 19/44 (43%) post-op cases were hypothermic. All patients were warmed in theatre. Eight cases were warmed pre-op in line with an existing protocol. Of the hypothermic cases, two cases pre- and four cases post-op were actively warmed. All patients had TT > 36 °C before discharge from recovery.

Discussion

Finding hypothermia in more than a third of healthy pre-op patients is nonsensical. CG65 guidance is explicit: When using any device to measure patient temperature, healthcare professionals should be aware of, and carry out, any adjustments that need to be made in order to obtain an estimate of core temperature from that recorded at the site of measurement and be aware of any such adjustments that are made automatically by the device used'. IFT apply a correction factor to TT when set to different modes. When G2 is set to core mode, it adds 1.1 °C to TT [2]. When we corrected our data to a core equivalent then none/44 pre-op and only one/44 post-op cases breached CTT ≥ 36 °C

References

Temperature of the peripheries in patients presenting to hospital in winter: a case for pre-warming for all?

J. Nevin, N. Hall and J. Duggan
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An assessment of risk is central to NICE CG65 regarding perioperative hyperthermia [1]. In 1933, Burton proposed a formula to calculate mean body temperature (MBT) from core (T_CORE) and mean skin temperatures (MST): MBT = 0.64T_CORE + 0.36MST. This model has been validated by Sessler [2]. CG65 did not identify temperature of the peripheral tissues as a risk factor. We postulate low MST may be another important and identifiable pre-op factor.

Methods

We obtained Caldicott approval and recruited 44 patients in January 2014. We measured skin temperature at seven sites with an infra-red non-contact thermometer (Fluke 651 HVAC Pro) and calculated MST weighted by surface area: head 9%, anterior torso 19%, posterior torso 18%, forearm 9%, upper arm 9%, thigh 18%, calf 18%. We also recorded tympanic temperature using a calibrated Genius 2 infra-red thermometer and corrected this to a core equivalent [3].

Results

MST was 31.4 ± 1.1 °C and individual values for MST are shown in Fig. 1. MST was ≤ 31 °C in 20/44 and ≤ 30 °C in 5/44 patients. All patients had a corrected core temperature ≥ 36 °C.

Discussion

MST is about 31–32 °C and 4–5 °C below T_CORE in a thermally neutral subject. On admission in January, half our patients were colder than this (≤ 31 °C) and five were particularly cold (≤ 30 °C). We believe this is due to environmental cold stress. Under anaesthesia, MST increases by 2 °C to about 34 °C by thermal redistribution (TR). Patients with colder peripheries are at greater risk of hypothermia by TR. Burton’s model predicts a drop in T_CORE of 0.56 °C for every 1 °C rise in MST. Half our patients may have gained benefit from active preoperative warming. Even for a thermally neutral subject a 2 °C rise in MST under anaesthesia by TR is a threat to postoperative T_CORE threshold > 36 °C (Δ2 °C MST → Δ1.2 °C T_CORE). Taking this into account should we offer pre-warming to all?

Figure 1 Range of individual pre-operative MST.

References


Maintaining body temperature in paediatric patients during magnetic resonance imaging under general anaesthesia – one complete audit cycle

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The James Cook University Hospital, Middlesbrough

Loss of thermoregulation during anaesthesia in children for magnetic resonance imaging (MRI) can result in patient cooling. Absorption of radiofrequency radiation, generated by the scanning process, may offset this heat loss [1–3]. An initial audit of 123 children in our department demonstrated a mean fall in body temperature of 0.36 °C, with some children becoming hypothermic (< 36 °C). The scanning room temperature varied over a wide range during this audit and the post MRI temperature was dependent upon the room temperature. To reduce temperature loss, two changes were identified; to tighten the temperature range in the scanning room if possible, and to switch off the fan in the bore of the scanner.

Methods

Following audit department approval, 102 children undergoing MRI under general anaesthesia had their temperature after induction but before scan, and after scan measured. The age, duration of scan and scanning room temperature were also recorded. Patient temperature was measured using Tempa DOT™ (3M Health Care), placed in the axilla. The fan in the bore of the scanner was switched off in all cases during audit 2.

Results

Two additional patients in audit 1 (†) failed to record a post MRI temperature on Tempa DOT™ (lower limit 35.5 °C) and felt cold. These patients were omitted from the analysis due to the possibility of equipment failure. There was a significant fall in temperature in both audits (p = 0.0001 vs p = 0.0006, paired t tests). The fall in temperature was significantly less in audit 2 (p = 0.0005, two group mean comparison t test (MCTT)). There was a significant reduction in the variability of scanning room temperature (p = 0.0001, variance ratio test) in audit 2, however the mean temperature was also significantly reduced (p = 0.0001, MCTT). Three patients were scanned in audit 1 when the room temperature was < 16 °C, one became hypothermic. There was no significant correlation between duration of scan and patient temperature in either audit (p = 0.667 vs p = 0.384, univariate linear regression (ULR)) or between room temperature and patient temperature in audit 2 (p = 0.248, ULR).

Discussion

Although the mean temperature of the room was lower in audit 2, the mean patient temperature reduction was significantly less and no patient became hypothermic. We believe the ‘wind chill’ effect of the fan, blowing air at room temperature across the patient, was an important component of patient cooling in audit 1. Preventing room temperatures of < 16 °C and turning off the fan in the scanner prevented hypothermia in our patient group.

Table 1 Comparison of results of audit 1 and audit 2. Values are mean (SD), median (IQR [range]) or number.

<table>
<thead>
<tr>
<th></th>
<th>Audit 1</th>
<th>Audit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of children</td>
<td>126</td>
<td>102</td>
</tr>
<tr>
<td>Age (years)</td>
<td>2 (1.5 [0.2–12])</td>
<td>2.5 (1.2–4.1 [0.08–15])</td>
</tr>
<tr>
<td>Pre MRI temperature  (°C)</td>
<td>36.98 (0.37)</td>
<td>37.02 (0.48)</td>
</tr>
<tr>
<td>Post MRI temperature (°C)</td>
<td>36.61 (0.41)</td>
<td>36.87 (0.57)</td>
</tr>
<tr>
<td>Change in temperature (°C)</td>
<td>0.36 (0.43)</td>
<td>0.15 (0.44)</td>
</tr>
<tr>
<td>Number of children with post MRI temperature &lt; 36 °C</td>
<td>6*</td>
<td>0</td>
</tr>
<tr>
<td>Duration of scan (min)</td>
<td>35 (30–45 [12–104])</td>
<td>30 (25–40 [20–100])</td>
</tr>
<tr>
<td>Scanning room temperature (°C)</td>
<td>20.80 (2.73)</td>
<td>19.38 (1.72)</td>
</tr>
<tr>
<td>Minimum/Maximum scanning room temperature (°C)</td>
<td>14:26</td>
<td>16:25</td>
</tr>
</tbody>
</table>

References

Quality outcomes in anaesthesia: a re-audit of current practice

D. Onwochei, M. Shah and K. Mukherjee
Medway Maritime Hospital

Quality of care is an important concept within the National Health Service. In anaesthesia, it can be difficult to measure the quality of care, as surgical factors confound outcomes, such as morbidity and mortality. The easiest way to measure quality of care in anaesthesia is to assess the quality of recovery, with important variables being postoperative nausea and vomiting (PONV), postoperative pain [1] (score of 0–10) and temperature [2]. We re-audited our practice 1 year on to see whether improvements had been made in the above areas, with the targets being to better the results of the 2012 audit.

Methods
Recovery staff filled out audit collection forms, prospectively, for all theatre cases requiring anaesthesia in main theatres and day surgery. Like the original audit, data collection took place over a period of 1 month from 18th November to 13th December 2013.

Results
A total of 464 cases were collected, comparable to the 470 collected in the 2012 audit. There were 289 main theatre cases and 175 day surgery cases. A definite improvement was demonstrated in temperature and nausea, although pain and vomiting were marginally worse, as shown in Table 1.

Discussion
Pain was mostly an issue in minor and moderate surgeries, especially laparoscopic cholecystectomy and gynaecological laparoscopies, as was the case in the previous audit. Included in our recommendation was the consideration of regional techniques, such as the subcostal transversus abdominis plane block for laparoscopic cholecystectomy [3]. Temperature was a significant issue in orthopaedics, with all recorded temperatures < 35 °C being orthopaedic cases. Routine temperature monitoring, warming blankets and fluid warmers should be standard in all cases lasting over 30-min, as per NICE guidance [2] and as recommended in the 2012 audit. The use of enFlow® fluid warmers has recently been adopted within the Trust, which should improve compliance. Risk assessment for PONV should be considered in pre-assessment clinic to further reduce rates in elective cases.

Table 1 Results of temperature, pain and PONV in the recovery period, comparing 2012 to 2013 audit.

<table>
<thead>
<tr>
<th>Quality indicator</th>
<th>2012 Audit</th>
<th>2013 Audit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cases</td>
<td>470</td>
<td>464</td>
</tr>
<tr>
<td>Temperature % &lt; 36 °C</td>
<td>49.9</td>
<td>34.5</td>
</tr>
<tr>
<td>Pain % score &gt; 5</td>
<td>17.7</td>
<td>18.8</td>
</tr>
<tr>
<td>Nausea (% of cases)</td>
<td>9.14</td>
<td>7.76</td>
</tr>
<tr>
<td>Vomiting (% of cases)</td>
<td>1.91</td>
<td>2.59</td>
</tr>
</tbody>
</table>

References
Obstetric ICU admissions: an audit of a London teaching hospital

S. Patel, S. Ward and P. Sultan
Royal Free Hospital, London

Obstetric intensive care unit (ICU) admissions are a good indicator of maternal morbidity. The UK intensive care national audit and research centre (ICNARC) published data regarding national obstetric ICU admissions for 2009–2012 [1], however this may not reflect local populations. The aim of this audit was to compare obstetric ICU admissions in our unit to national statistics.

Methods
All obstetric ICU admissions to the Royal Free Hospital (RFH), London, from January 1st 2009 until December 31st 2013 were retrospectively reviewed and audited using the hospital databases.

Results
There were 45 obstetric admissions to ICU. Key findings are summarised in Table 1. Ethnic origin included: white British 28%, white non-British 26%, Asian 26% and black 20%. Most admissions occurred in ‘recently pregnant’ women (87%). Overall, 73% of patients were admitted for obstetric indications, however, this varied between ‘currently pregnant’ and ‘recently pregnant’ groups. Two thirds of the ‘currently pregnant’ group were admitted with non-obstetric causes, with pneumonia (30%) as the leading diagnosis. In contrast, the ‘recently pregnant’ group were mainly admitted for obstetric causes; haemorrhage (56%) and hypertensive disease of pregnancy (31%) being primary reasons for admission in our unit. Nearly all ‘recently pregnant’ women required emergency surgery, and the majority (72%) were admitted within 24 h of delivery.

Discussion
The proportions of admissions between the ‘currently pregnant’ and ‘recently pregnant’ groups follow ICNARC trends. Our results and ICNARC are consistent showing haemorrhage as the leading cause of ICU admission in the ‘recently pregnant’ population. ‘Currently pregnant’ admissions in our unit were older than the national average, and our population also showed greater ethnic diversity. This may reflect the urban location of our unit and reinforces findings from the Confidential Enquiry into Maternal and Child Health reports that immigration and advanced maternal age are risk factors for maternal mortality [2]. The implications of being a tertiary centre for haemophilia and interventional radiology may explain the over-representation of haemorrhage (56% vs 36%) and emergency surgery (90% vs 48%) in our unit, as well as longer length of stay. This audit highlights that national statistics can provide guidance on obstetric ICU admissions, however local populations do vary, and auditing local practice is vital to identify parturients at highest risk of morbidity within local populations.

Table 1 Comparison of RFH and ICNARC Obstetric ICU admissions.

<table>
<thead>
<tr>
<th></th>
<th>RFH (n = 4)</th>
<th>ICNARC (n = 1188)</th>
<th>RFH (n = 39)</th>
<th>ICNARC (n = 5605)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetric ICU admissions (%)</td>
<td>13</td>
<td>17</td>
<td>87</td>
<td>83</td>
</tr>
<tr>
<td>Age (years), mean (SD)</td>
<td>37 (7)</td>
<td>28 (7)</td>
<td>30 (5)</td>
<td>31 (6)</td>
</tr>
<tr>
<td>Reason for admission (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstetric related</td>
<td>33</td>
<td>9</td>
<td>77</td>
<td>70</td>
</tr>
<tr>
<td>Non-obstetric related</td>
<td>66</td>
<td>91</td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td>Surgical status (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-surgical</td>
<td>83</td>
<td>89</td>
<td>8</td>
<td>47</td>
</tr>
<tr>
<td>Elective</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Emergency</td>
<td>17</td>
<td>9</td>
<td>90</td>
<td>48</td>
</tr>
<tr>
<td>ICU death, n (%)</td>
<td>0 (0)</td>
<td>20 (1.7)</td>
<td>1 (0.0)</td>
<td>73 (1.3)</td>
</tr>
<tr>
<td>ICU length of stay (days)</td>
<td>4 (3–7)</td>
<td>2 (1–4)</td>
<td>3 (2–4)</td>
<td>1 (0–2)</td>
</tr>
<tr>
<td>Total hospital stay (days)</td>
<td>11 (9–15)</td>
<td>8 (5–14)</td>
<td>10 (7–12)</td>
<td>7 (5–12)</td>
</tr>
</tbody>
</table>

Audit of peri-operative fluid restriction in patients attending for elective surgery

L. Phillips and M. Mcdougall
NHS Fife

Pre-operative fasting aims to protect patients from pulmonary aspiration. Traditionally, patients have been told to ‘fast from midnight.’ However, this practice is associated with excessive periods of fasting, and may result in patient discomfort and dehydration. Studies have demonstrated that shortened fasting protocols whereby patients are allowed to drink clear fluids until 2 h prior to surgery, are safe, and improve patient well-being. As a result, national guidelines now advocate this practice.

Methods
The aim of our audit was to examine practice with regard the restriction of clear fluids prior to surgery, within NHS Fife. We conducted a cross-sectional study across 4 departments. We collected data from 30 patients from each department. For each patient, the total time the patient had gone without oral fluids prior to surgery was noted. To identify factors that may impact on fasting practice, we asked patients whether they had been given information regarding fasting prior to admission. We also interviewed members of staff to assess their understanding of fasting guidelines. Following completion of the initial data collection, we undertook activities to promote enhanced staff understanding of the guidelines. These included presenting the findings of our initial audit, and producing a poster clarifying current recommendations. We then conducted a re-audit of 30 patients.

Results
The mean fluid restriction time for all patients during the initial audit was 7.01 (4.5) h. This was similar for all departments. The provision of written instructions did not result in shorter fasting times (7.33 (4.63) h vs 6.7 (3.44) h). Knowledge amongst staff was poor with few staff being aware that patients should be allowed clear fluids up until 2 h prior to surgery (22.2% of nurses, 14.3% of foundation doctors). Following measures to enhance staff understanding of guidelines, fasting times reduced to 5.9 (4.37) h.

Discussion
Our audit demonstrates, that within our hospital, oral fluid fasting times were longer than the recommended 2 h. A contributing factor was poor understanding of guidelines amongst staff. Activities aimed at enhancing awareness of problems associated with prolonged fasting have resulted in a reduction in fasting times. We aim to further reduce fasting times by distributing a poster summarising the guidelines to all members of staff in the hospital, and publishing it on the intranet. We also plan to incorporate teaching about fasting guidelines into junior doctor and nurse education programmes.

Acknowledgements
With thanks to the anaesthetic department, NHS Fife.

References
The Airway ‘Grab Bag’

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Following the National Audit Project 4 (NAP4), it was decided to make difficult airway equipment more readily available in theatres at Ysbyty Gwynedd, Bangor. One of the Operating Department Practitioners (ODP) suggested a portable version be devised for out-of-theatre airway emergencies; which can be challenging, especially with airway equipment not always immediately available. An airway bag was purchased and named the Grab Bag. For reasons of space and simplicity, its contents were based on the ‘DAM-IT’ algorithm [1]. We decided to survey awareness and usefulness of the bag, and see if there were any suggested improvements.

Methods

Thirty-eight candidates (32 anaesthetists of all grades and 6 ODPs) were asked to complete an anonymous questionnaire. Data was collected on: grade of seniority; awareness and location of the Grab Bag; frequency of use; usefulness (graded 1–10, 1 being least useful); need for further contents and most useful component.

Results

Of the 38, only one CT1-3 was unaware of the Grab Bag. All the remaining 37 knew where it was kept and 18 had used it at least once (8 trainees/residents, 5 consultants and 5 ODPs). Those who had used it scored its usefulness from 5 to 10 (median 8.5, mode 8). To improve the bag, 3 candidates suggested the inclusion of capnography (2), emergency induction drugs (2) and a heat-moisture exchanger (1). Opinions on the most useful part of the bag varied from its portability to the inclusion of laryngeal mask airways. However the most popular were Airtraq laryngoscope (9), gum elastic bougie (6) and the Emergency Induction Checklist developed for Ysbyty Gwynedd [2] (4).

Discussion

Awareness of the Grab Bag was good and those who were aware of it knew where to find it. Candidates who had used it, scored its usefulness at a median of 8.5 out of 10. We are attempting to incorporate the suggestions made, and will attempt to raise awareness of the Grab Bag at departmental induction. An out-of-theatre airway emergency can be a stressful situation for any grade of experience and can be life-threatening for the patient. We believe the equipment carried in our Grab Bag gives the anaesthetist and ODP a better chance of managing an airway emergency and therefore improve patient care.

References


Analgesia prescribing in the surgical admissions unit

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Lincoln County Hospital

Appropriate analgesia for acute surgical patients helps to reduce secondary complications such as hospital acquired pneumonia and pressure sores, as well as improving patient satisfaction. The World Health Organization analgesic ladder provides guidance on a step-wise approach to treating pain. In May 2014, an updated trust guideline for analgesia prescribing was introduced in United Lincolnshire Hospitals NHS Trust. Prescribing standards on the surgical assessment unit were prospectively audited both before and after the introduction of this guideline; completing the audit cycle.

Methods

Adult patients admitted to the surgical admissions unit who experienced pain as their main complaint were included. Data collection occurred on unannounced dates before and after the introduction of the guideline. Between audit cycles, educational presentations were given at junior doctor teaching sessions and surgical audit meetings. Forty-nine patients were included in the initial audit, and 50 patients in the re-audit. The audit standards were appropriate prescribing of paracetamol, non-steroidal anti-inflammatories (NSAID) and ‘breakthrough’ analgesia, avoidance of tramadol unless consulted with the acute pain team, and documentation of a pain score.

Results

Regular paracetamol prescribing increased from 58% to 98%. NSAID prescribing increased from 10% to 58% in appropriate patients. ‘Breakthrough’ analgesia was prescribed in 88% initially, but 86% following the guideline introduction. The use of tramadol remained similar at 88% in both audit cycles. A pain score was documented in 33% initially, but 30% after the guideline introduction.

Discussion

Following the introduction of the analgesia prescribing guideline, a marked improvement was noted in the prescription of paracetamol and NSAIDs in patients who could tolerate them. There is understandable reluctance amongst junior doctors to prescribe NSAIDs if they are unsure of the appropriateness given the potential adverse effects. However, during the educational presentations, doctors were made aware of patient groups where NSAIDs may be used for short term use and with concomitant gastro-protection. The prescription of ‘breakthrough’ analgesia allows nurses to administer additional pain relief should the patient require it, especially out of hours when doctor presence is reduced. It was disappointing to see that this had not improved. Further education is also needed to promote pain score documentation and consultation with the pain team prior to the use of tramadol.

References

2. Dr Webb A, Dr Havenhand A. Guidelines for the Assessment and General Management of Acute Pain in Adult Patients. ULHT Guidelines May 2014.
An audit of sugammadex use at a large district general hospital

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1Royal Gwent Hospital, Newport, 2University Hospital of Wales, Cardiff

Sugammadex is a unique drug for reversal of neuromuscular blockade. Its popularity within the UK is increasing however its cost remains relatively high. Sugammadex offers many advantages over traditional reversal agents; a more direct and predictable effect, rapid reversal of deep paralysis and a limited side effect profile [1]. Sugammadex was introduced into our trust formulary in September 2009 for ‘can’t intubate, can’t ventilate’ situations. In October 2011 it was approved for more expanded use and a protocol developed to guide administration.

Methods
An audit form was designed on introduction of the expanded protocol and anaesthetists were requested to complete a form each time they used sugammadex. A retrospective review of forms was completed in January 2014. We aimed to assess how frequently sugammadex was used, which patient groups received sugammadex, for what reasons and at what dose. We also aimed to evaluate adherence to local protocol to see if our policy should be modified.

Results
Ninety-three data forms were collected. In 91 cases use had been approved by a consultant anaesthetist and 73.3% of anaesthetists who administered the drug were consultants. The commonest dose was 2 mg/kg (78.4%), no doses of 16 mg/kg were administered. Of those whose BMI were documented, 70.4% had a BMI greater than 25. Common reasons for sugammadex use were the presence of chronic cardiopulmonary co-morbidities (40.8%), difficult airways (16.4%), partial reversal following attempted reversal with neostigmine (16.4%) and acute cardiovascular instability (9.7%). In 14% of cases sugammadex was administered outside trust protocol - the most frequent reason cited was to facilitate efficient working practices. In 8 cases the anaesthetist felt that sugammadex helped avoid use of critical care services.

Discussion
Studying the pattern of sugammadex use when unrestricted access is allowed have shown theatre time falling significantly by more than 20 min per case and a reduction in hospital length of stay [2, 3]. Additionally there were no cases of inadequate reversal postoperatively, and it has been shown that patients reversed with sugammadex are less likely to experience residual paralysis, postoperative desaturation, atelectasis or pneumonia than those who received neostigmine [4]. As a result of our audit we have proposed to broaden the indications for sugammadex use to include obesity, partial reversal with neostigmine and reduction in patient awakening times, and allow senior registrars to sanction its use. This may be beneficial in terms of reduced critical care admissions, improvement in theatre efficiency and in patient safety and wellbeing.

References
Varying impact of pain clinics on routinely employed outcome measures - results of a survey conducted at a London tertiary referral centre

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1Imperial College London, 2Chelsea and Westminster Hospital, London

Pain clinics manage complex chronic conditions. Although numerous studies report specific aspects of therapies and outcomes, service impact data on general heterogeneous populations are sparse [1, 2]. Patient reported outcome measures (PROMs) used for this purpose are manifold but it is unclear which to use. It also remains uncertain which routine variables (pain scores, quality of life (QOL) indicators, co-morbidities and demographics) predict treatment success [3]. Hence, a cross-sectional study was conducted to evaluate clinic performance employing different tools and to determine outcome predictors.

Methods
Patients attending follow-up appointments completed a modified short form brief pain inventory (BPI-SF) that also included medications, satisfaction and subjective improvement (SI) scores. Comparisons were made with BPI-SF responses at admission. Non-parametric tests were used to evaluate service impact, examine associations and determine outcome predictors.

Results
Sample size included 118 patients. Anti-neuropathic medications showed greatest increase in prescription rates from admission to follow-up (33.8%). Median pain scores did not differ between admission and follow-up but scores improved in 30% of patients. More patients had mild pain on follow-up than on admission (relative risk (RR): 2.7) and fewer patients had moderate pain (RR: 0.7). Although less than 1/3 had improved pain scores, 41% and 83% reported at least moderate SI and satisfaction with the service and treatment, respectively. Multiple variables including QOL indicators, demographics, comorbidities, pain duration and perceived helpfulness of treatment were significantly correlated with pain scores, SI and satisfaction. However when looking at responder and non-responders, only the number of painful regions and changes in mood predicted treatment success whereas SI was predicted by helpfulness of treatments.

Discussion
To the best of our knowledge, this is the first time a group of different variables have been analysed in an attempt to predict treatment success in a heterogeneous chronic pain population. The outcome indices employed here showed different degrees of impact of the service on pain experience and response to treatment. This calls into question the use of un-standardised outcome reporting for evaluating applied treatments and service performance. Furthermore as each outcome measure is influenced by a different set of variables the suitability of a particular PROM may vary depending on the specific variables present in a patient and the treatment goals aimed for.

References
Use of cell salvage in our obstetric department
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University College Hospital, London

Cell salvage in obstetrics is controversial due to a theoretical risk of precipitating amniotic fluid embolus. The concentration of fetal squamous cells and lamellar bodies has been shown to be lower in post-filtration samples than in maternal blood [1] and its use has been endorsed by several bodies [2, 3]. There is no consensus regarding indications for cell salvage, and its use in our department is sporadic.

Methods
We obtained a list from the operating theatre database of patients for whom cell salvage had been used in our obstetric unit over a 12-month period in 2013. The notes of these patients were examined and data of their obstetric history, documentation of cell salvage, blood loss and transfusion of blood products was collected. We also collected data on how many patients during this period were known to have a bleeding risk, to have refused blood products or whose blood loss in theatres was estimated at greater than 1.5L.

Results
The notes of 22 patients who underwent cell salvage were identified. The results are shown in the table. Placenta praevia was the most common indication (31%). During this period, 32 patients were known to have placenta praevia, 12 had anaemia or bleeding disorders and 5 refused blood products. At the same time, 85 patients had an estimated blood loss of greater than 1.5L and 41 received autologous blood.

Table 1 Use of cell salvage and its process

<table>
<thead>
<tr>
<th>Use</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective caesarean section</td>
<td>6 (27%)</td>
</tr>
<tr>
<td>Leucodepletion filter use documented</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Consent for cell salvage</td>
<td>22 (9%)</td>
</tr>
<tr>
<td>Salvaged blood transfused</td>
<td>22 (9%)</td>
</tr>
</tbody>
</table>

Discussion
Our documentation of cell salvage use and the process involved is poor. During the study period, we identified 49 patients with preexisting conditions or reasons in whom cell salvage could have been used. There were a further 85 patients with a large blood loss who might also have benefitted from cell salvage although it would have been more difficult to initiate if the blood loss was sudden and unexpected. Our study suggests that we are underusing cell salvage in obstetrics. The risks, costs and increasing scarcity of homologous blood should be an encouragement for greater use of cell salvage but uncertainty and fear of sudden and unexpected. Our study suggests that we are underusing cell salvage in obstetrics. The risks, costs and increasing scarcity of homologous blood should be an encouragement for greater use of cell salvage but uncertainty and fear of

References

An audit of anaesthesia and cognitive assessment in fractured neck of femur surgery in a tertiary centre
H. Takahashi, A. Simons and C. Parcha
University Hospitals Birmingham

Post-operative cognitive dysfunction (POCD) is frequently observed in elderly patients undergoing surgery [1]. Orthopaedic surgery is associated with a particularly high incidence of POCD [2]. POCD increases length of hospital stay and long-term cognitive problems in these patients [3]. Therefore pre- and post-operative cognition should be assessed in all hip fracture patients. Perioperative care should aim to reduce the incidence of POCD, but the cause and pathophysiology are unclear. Incidence of POCD 3 months after surgery is not significantly different between general and regional anaesthesia, although there is higher incidence of early POCD with general anaesthesia [4]. We set out to examine the assessment of cognition in patients undergoing hip fracture surgery, and possible associations between AMT and anaesthetic practice.

Methods
Data on anaesthesia and surgery was collected prospectively on all patients operated on in a 3-month period for neck of femur fractures. Details recorded include type of anaesthesia, type of operation, patient co-morbidities, pre-operative and lowest intra-operative blood pressure. Medical notes were reviewed later to identify AMT scores on admission and post-operatively.

Results
Of the 93 patients whose records were reviewed 78 (84%) had an AMT both pre- and post-operatively. Forty-two patients (57%) had diagnosed hypertension and 8 (11%) had known dementia. Forty-six (52%) patients had general anaesthesia only, 4 (5%) had spinal only, and 24 (32%) had both. The average increase in AMT score was 0.25. No statistically significant differences were observed between the pre- and post-operative AMT scores (p = 0.66). No correlation was observed between pre- and post-operative AMT change and difference in mean arterial pressure (R² = 0.006, p = 0.50).

Discussion
The small increase in mean AMT may be explained by a low score on admission due to pain, analgesia, and change in environment. All hip fracture patients should have a cognitive assessment on admission and post-operatively in accordance with the national hip fracture database. Only post-operative cognition in the early post-operative period was assessed, and follow-up assessment at 3 months and 1 year may yield significant results. Causes of POCD are multifactorial, and homeostasis should be maintained intra-operatively to reduce the risk. The first presentation with a hip fracture is often the first point of cognitive assessment, and therefore an opportunity to diagnose dementia. However, differentiating this from delirium is difficult, and other tests such as CAM-OG and 4AT are better in assessing delirium.

References
Critical incident monitoring is important in quality improvement as it identifies potential risks to patients by analysing adverse events or near-misses.

Methods
This study analyses the reported incidents in a tertiary hospital over a 4-year period.

Results
Four hundred and forty one incidents were reported out of 98 502 anaesthetics performed during the study period (2008–2011). There were 67 incidents of which no harm to the patient was caused, 116 unanticipated ICU admissions and mortality in 20 patients. Incidents were reported more frequently in ASA 5 patients (Odds ratio 13.70 with 95% CI of 4.35–7.43 compared to ASA 1) and out of hours (Odds ratio 1.79 with 95% CI of 1.45–2.23 compared to during daytime hours of 08:00 to 17:00). They occurred most commonly in maintenance phase (32.7%), followed by induction (27.6%). The most common types of incidents include airway and respiratory (24.9%) followed by drug related incidents (15.1%). Human error was attributed as a significant contributing factor in 276 incidents (61.5%) followed by patient factors (25.4%). Mitigating factors such as vigilance by staff involved was significant in 136 incidents (30.3%) and monitor alarms in 72 incidents (16.0%).

Discussion
Critical incident reporting is a valuable part of quality assurance. Identifying and mitigating risk factors associated with patient harm can improve patient safety. Higher ASA status appears to be the most important contributory factor that results in actual or potential patient harm in our study.

References

Audit of chest re-exploration following cardiac surgery – findings from investigating cell saver blood usage and its association with excessive bleeding

M. Thomas, K. Prabu, P. Jayia, G. Bozzetti and H. Luckraz
New Cross Hospital, Wolverhampton

Chest re-exploration for bleeding following cardiac surgery is a recognised and serious complication with the national documented standard rate of re-exploration being 3.4%. However, the audited chest re-exploration rate at New Cross Hospital for the year 2012 was 9.18%. Further investigation into the volume of cell saver blood transfusion has revealed statistically significant increased risk of bleeding and derangement of coagulation with higher cell saver usage.

Methods
In 2012, 924 patients underwent cardiac surgery at New Cross, Wolverhampton and their data was collected retrospectively from ITU charts, TEG machine logs and the PATS database.

Results
We found that 289 patients bled excessively in the first 6 h. The data was analysed by grouping patients into 3 groups of those who did not bleed, those who bled and did not require re exploration and those who bled and required re exploration. The mean volume of cell saver blood processed and reinfused was statistically higher in the bleeders. The thromboelastogram also confirmed statistically higher percentage of deranged R time and MA in those receiving higher volumes of cell saver transfusion.

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Re explored and bleeding</th>
<th>Re explored and not bleeding</th>
<th>Not bleeding</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>67</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>0.14</td>
</tr>
<tr>
<td>72</td>
<td>95</td>
<td>85</td>
<td>75</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>27</td>
<td>27</td>
<td>27</td>
<td>29</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>13.5</td>
<td>13.8</td>
<td>13.8</td>
<td>13.8</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>1.01</td>
<td>1.01</td>
<td>1.01</td>
<td>1.01</td>
<td>&lt; 0.1</td>
</tr>
</tbody>
</table>

Discussion
Cell saver or autologous blood transfusion is an important tool in cardiac surgery. The blood from the surgical field is aspirated through a heparinized circuit and then processed to return red blood cells in an effort to reduce the need for allogenic blood transfusion. The processing has long been suspected of discarding necessary clotting factors. This study has shown that excessive autologous/cell saver usage is associated with a serious clinical problem of excessive bleeding within the first 6 h post cardiac surgery. Bleeding post cardiac surgery is associated with higher mortality, higher need for clotting product transfusion, longer ICU stay, higher incidence of renal dysfunction and infection. This study reveals coagulopathy on the thromboelastogram. The cardiac anaesthetist and cardiac surgeon should be aware of this potential risk of using cell saver blood transfusion which if used within reason is an asset in cardiac surgery. Perhaps one could create a benchmark regarding the volumes of cell saver blood transfusion per BMI so as to prevent excessive cell saver usage.

References
Implementation of the national confidential enquiry into perioperative death (NCEPOD) classification for emergency surgery to analyse the efficiency in a large district general hospital

G. Trisolini Longobardi,1 J. Williams,2 E. Duff2 and N. Stevens2
1Cardiff and Vale University Health Board, 2Aneurin Bevan University Health Board

In 2004 NCEPOD introduced a classification of intervention regarding the timing of surgery [1]. Four categories; Immediate = 1, urgent = 2, expedited = 3 and elective = 4 should be recorded onto the Theatre Management System (TMS). Despite this, NCEPOD failed to set a standard for the number of cases that went over target times. Little has been published regarding this classification as a benchmark for quality. The audit aim was to introduce the NCEPOD system as an indicator of our emergency theatre efficiency.

Methods

The booking system was revised to introduce the NCEPOD classification as the triage tool. This was included into the booking form with a summary and a poster explaining the changes. Although NCEPOD suggest target times to theatre they are loosely described. To improve service quality we agreed on home targets. Category 1 = 1 h, 2 = 8 h, 3 = 48 h and 4 = planned with no target. Booking time and category was transferred from the booking form onto the TMS. Data was exported from the TMS over a 75-day period.

Results

During the audit 454 cases were booked for emergency surgery. The majority were category 2 cases (46%). Total cases for categories 1 to 4 were 57, 210, 159 and 13 respectively (8 cases were not categorised). The percentage of cases meeting the audit standards was category 1 = 68%, 2 = 70%, 3 = 99% and 4 = 100%. Data quality was assessed as adequate with only 11% (59) of data incomplete.

Discussion

Without a national standard there is no benchmark to compare performance. However the data can be used as a reference to monitor efficiency. This is useful with the centralisation of services our region is undergoing. The decision to stop all but life threatening cases at night favours patient safety over efficiency. The NCEPOD and the Association of Anaesthetists of Great Britain and Ireland have highlighted this issue [2].

Summary of Surgery Classification in NCEPOD

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Immediate</td>
</tr>
<tr>
<td>2</td>
<td>Urgent</td>
</tr>
<tr>
<td>3</td>
<td>Expedited</td>
</tr>
<tr>
<td>4</td>
<td>Elective</td>
</tr>
</tbody>
</table>

Table I Case management.

<table>
<thead>
<tr>
<th>Within time limit</th>
<th>Category 1</th>
<th>Category 2</th>
<th>Category 3</th>
<th>Category 4</th>
<th>No Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of cases</td>
<td>57</td>
<td>210</td>
<td>159</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Yes (68%)</td>
<td>36</td>
<td>126 (70%)</td>
<td>152 (99%)</td>
<td>13 (100%)</td>
<td></td>
</tr>
<tr>
<td>No (32%)</td>
<td>17</td>
<td>53 (30%)</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>4</td>
<td>31</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

References

2. The Association of Anaesthetists of Great Britain and Ireland (AAAGBI). Theatre Efficiency; Safety; Quality of Care and Optimal Use of Resources. AAAGBI, 2013.

Complications of accidental intra-arterial injections

M. Mariyaseelvam,1 G. Wijewardena,1 A. Hutton1 and P. Young1
1The Queen Elizabeth Hospital Kings Lynn NHS Foundation Trust, 2Peterborough and Stamford Hospitals NHS Foundation Trust

Arterial catheters are used for continuous and invasive blood pressure monitoring and blood sampling for arterial blood gas analysis. Patients are often sedated, ventilated and receiving multiple infusions through lines with numerous ports and it is easy to see how a drug can be inadvertently given intra-arterially (IA), especially in emergency situations [1]. Clear labelling, colour coded lines and extension sets and only using cannulas and tubing without injection ports for arterial pressure transduction are some of the measures introduced to prevent inadvertent arterial injection of medication [1]. Currently there are no specific mechanisms to prevent inadvertent arterial injection of medication [2]. It is a major clinical risk that may result in devastating consequences [2]. The standard three way tap with female luer connection port in the arterial line tubing is the foremost reason for many incidences of intra arterial injections, although it is colour coded, it is not different from any other three way tap in the intravenous line. It also has the drawback of being a potential entry site of bacteria into the blood stream as the sampling port is always flushed back to clear any blood. Furthermore, accidental disconnections at the three way tap may lead to catastrophic blood spillage.

Methods

We surveyed a convenience sample of delegates at the Annual General Meeting of Cardiothoracic Surgeons, UK (2014) to attempt to find the current incidence of accidental intra-arterial injections. They were asked whether they were aware of any unintentional intra-arterial injections having occurred in the last 5 years in their hospital.

Results

127/129 of the delegates surveyed responded. In the last 5 years 74.8% stated they had not seen any intra-arterial injections and 25.2% reported having seen accidental intra-arterial injections and the resulting life changing consequences.

Discussion

An article search for inadvertent IA injection of medications yields many case reports but true incident rates are unclear [1]. Our survey revealed that a quarter of delegates have seen this complication which is categorised as an adverse event. To prevent inadvertent IA injections of drugs a novel arterial non injectable connector (NIC) has been developed. The NIC has advantages over traditional systems as it incorporates a one-way valve that eliminates the possibility of accidental intra-arterial injection. This one way valve also prevents bacterial contamination of the arterial line, bleeding from the 3-way tap should it be left open accidentally and simplifies the blood gas sampling process [3].

References

An audit to assess labour epidural efficacy following standardisation of practice

H. Wrigley and P. Yoxall
St Helens and Knowsley NHS Trust

The aim of our audit was to establish the efficacy of our labour epidurals by assessing the height of the block we achieved whilst the epidural was in use and the requirements for ‘top up’ boluses. Following the initial audit we introduced a standardised loading dose to prevent disconnection from the epidural pump, therefore improving safety, and re-audited to see if this had any change to our epidural efficacy.

Methods
We performed the audit during February and then March 2013 by reviewing the notes of all women who had received labour epidurals. We noted the initial loading dose of local anaesthetic given, then the initial block height plus the highest and lowest blocks recorded. Finally we noted the number of top up boluses required. During February the anaesthetist was free to give any loading dose they chose, from March we standardised practice by asking everyone to give 10 ml solution via the pump to reduce need for disconnection. Following the initial loading doses all epidurals were run with a continuous infusion of 0.1% levobupivacaine + 2 mcg/ml fentanyl. The internal audit standards which we used were that 100% of women should have an initial sensory block level between T10 and T5.

Results
Fifty seven women received a labour epidural in February and seventy nine in March following standardisation of practice.

<table>
<thead>
<tr>
<th>Table 1 Sensory block level and top up bolus requirements before and after standardisation of practice. Values are number (percentage).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>February patients</td>
</tr>
<tr>
<td>Loading dose of 10 ml 0.1% levobupivacaine fentanyl</td>
</tr>
<tr>
<td>30 (53)</td>
</tr>
<tr>
<td>Initial block height T10-T5</td>
</tr>
<tr>
<td>50 (88)</td>
</tr>
<tr>
<td>Initial block height lower than T10</td>
</tr>
<tr>
<td>7 (12)</td>
</tr>
<tr>
<td>Initial block height higher than T5</td>
</tr>
<tr>
<td>0 (0)</td>
</tr>
<tr>
<td>Highest recorded block T10-T5</td>
</tr>
<tr>
<td>57 (100)</td>
</tr>
<tr>
<td>Lowest recorded block T10-T5</td>
</tr>
<tr>
<td>38 (66)</td>
</tr>
<tr>
<td>Patients requiring additional top up boluses</td>
</tr>
<tr>
<td>41 (72)</td>
</tr>
</tbody>
</table>

Discussion
During the audit period, despite not achieving the targeted 100% standard, the majority of labour epidurals objectively provided a good sensory block level. Importantly for our department, we noted that introducing a standardised loading dose regime did not appear to reduce the quality of the epidural analgesia and was associated with a 19% reduction in top up bolus requirements. The purpose of introducing a standardised loading dose via the pump was to promote a culture of reducing disconnections of the epidural solution delivery system. Although rare, abscess formation complicates around 0.2–3.7 per 100 000 obstetric epidurals [1] and the consequences may be devastating. Frequent disconnections may result in hub colonisation [2] which could be a source for introduction of infection. Our audit results have supported a change which may help to improve the safety of our labour epidurals.

References

Perioperative temperature management: blowing hot and cold?

S. Wythe and H. Richardson
Tameside General Hospital, Ashton Under Lyne

Hypothermia complicates anaesthesia [1]. When anaesthetised, patients are not only at risk of losing heat, but are unable to generate or conserve heat by shivering or vasconstriction. Wound infections [2], blood loss and prolonged hospital stays [3] are made more likely when anaesthetised patients are cold. In order to prevent such adverse events, standards for perioperative temperature management are stipulated by the National Institute for Health and Care Excellence (NICE) [4] and the Royal College of Anaesthetists (RCoA) [5] against which local practice can be audited.

Methods
Using a proforma published by the RCoA and adapted for local use, anonymous data regarding perioperative temperature management were collected for cases at Tameside General Hospital on 14/5/14 – 16/5/14. Information such as patients’ age and ASA classification, type and length of surgery and anaesthesia, pre-, intra- and post-operative temperature measurements and perioperative warming techniques were obtained. Data were then audited against ten recommended outcomes published by the RCoA.

Results
-Data for 37 patients were collected.
-None of the ten outcomes were fully achieved for more than 50% of patients.
-Major failings (achieved for <30% of patients) included:

  → Two blankets for transfer to theatre (22%)
  → Temperature recorded every 30 min intraoperatively (3%)
  → Temperature recorded in anaesthetic room before induction (0%)
  → Active warming of ‘at risk’ patients (0%)

Discussion
National guidelines for the management of peri-operative temperature are poorly followed. Barriers to their implementation include the lack of a locally discussed and agreed policy, no specific space on theatre documentation for pre-operative temperature measurement, shortage of equipment and poor awareness of the importance of active warming strategies. It is also important to note that observer bias can play a significant role in masking shortcomings and should be kept in mind when interpreting results. A number of recommendations have been made to the anaesthetic department and re-audit is planned for 6 months time.

Acknowledgements
We would like to thank Dr. David Chambers, Dr. Laura Talbot and the Tameside General Hospital Department of Anaesthesia.

References
Intra-operative temperature management: an audit and quality improvement project

X. Zhang, L. Wong and J. Harris
Department of Anaesthesia and Intensive Care, Northwick Park Hospital, Harrow, London

Inadvertent hypothermia in the peri-operative period is associated with increased morbidity and prolonged recovery. This quality improvement project aims to (i) assess temperature measurement and management in the intra-operative period according to the NICE guideline [1] and (ii) improve temperature management using multidisciplinary interventions.

Methods
Adult patients undergoing routine and emergency operations under general and regional anaesthesia in two district general hospitals, Northwick Park and Central Middlesex Hospitals, were included. Anaesthetic records were reviewed to document patient demographics, co-morbidities, types of surgery, urgency of surgery, documentation of temperature in the intra-operative period, use of external warming device and use of fluid warmer. In addition, knowledge of theatre staff including anaesthetists, nurses, operating department practitioners, physicians’ assistants was assessed using a written quiz. Knowledge gaps and factors which hindered appropriate temperature management were corrected by a series of Plan, Do, Study, Act (PDSA) cycles. This involved multi-disciplinary discussions in clinical governance meetings, improved provision and maintenance of thermometers, and educational materials. Pre and post-interventions data were obtained in September 2013 and June 2014. Data were compared using Fisher’s exact tests.

Results
There were 104 and 100 patients included in the pre and post-intervention periods, respectively. The median age was 51 years and 45% (93/204) were men. Operations included were general, vascular, ENT, maxillo-facial, urology, gynaecology, orthopaedics and ophthalmology, of which 18% (36/204) were emergency operations. Documentation of temperature on anaesthetic record prior to induction (1% vs 14%, p < 0.001, pre vs post-interventions) and during anaesthesia (26% vs 38%, p = 0.05) were improved after interventions. Use of fluid warmer (32% vs 40%, p = 0.09) showed an increasing trend while use of external warmer remained unchanged (58% vs 56%, p = 1). Staff knowledge of location of thermometers showed an increasing trend (73% vs 87%, p = 0.13). Prevalence of inadvertent hypothermia was low before (3%, 3/104) and after (2%, 2/100) the interventions.

Discussion
Increased awareness of the importance of temperature management has led to improvement in temperature documentation and use of fluid warmers. This was associated with a low incidence of inadvertent hypothermia. Using a multi-disciplinary approach with multiple PDSA cycles has improved temperature management of a wide spectrum of surgical patients in the intra-operative period.

Reference

Improving safety of epidural top-ups in the delivery room

L. Bisht,1 J. Willers,2 S. Mohamed,3 C. Bygrave1 and C. Jenkins1
1Worthing Hospital, 2Worthing

Recently we had an occurrence of a high block after an epidural top-up in the delivery room. On route to theatre the bed became stuck in the door due to intravenous fluid tubing and CTG leads getting entangled in the wheels. Respiratory compromise occurred at this time, and the immediate lack of available resuscitation equipment forced the anaesthetist to use mouth-to-mouth respiration until the obstruction was cleared. The problem was resolved at theatre and the baby delivered by caesarean section with both mother and infant well.

This issue was discussed at the departmental M&M meeting and action was taken to prevent an incident like this from happening again.

Methods
The debrief identified three possible areas for improvement: requesting the provision of drip stands that attach to the bed to prevent wheel entanglement, equipping every delivery room with the items necessary to manage epidural complications and thirdly introducing an epidural complication scenario in the PRACTical Obstetric Multi-Professional Training (PROMPT) Course at our Trust.

Results
Drip stands have been requested through normal channels and the simulation lead at our hospital (an obstetric anaesthetic consultant) has devised a scenario for the next PROMPT course. An epidural complication pack has been assembled with the aim to have the necessary treatments available in every delivery room. After discussion within the Anaesthetic department about what was needed the following were included: An adult ambu bag and mask, size 3 guedel airway and a size 3 i-gel LMA to address immediate respiratory compromise in the event of a high block if there is a delay in getting intubation equipment. Prefilled syringe of ephedrine and atropine as treatment for hypotension and 500 ml of Intralipid with a giving set, three-way tap and 50 ml syringe for bolusing to reverse local anaesthetic toxicity. Midwives and anaesthetists working in labour ward were informed of the availability of these treatment modalities. A regular audit of the availability of the package has been started.

Discussion
A sudden catastrophic epidural complication can have disastrous consequences [1]. Current guidelines pertaining to epidural top-up in emergency LSCS will transfer problems from theatre to the delivery room and it would be a good idea to try and make it a safer place [2]. As the range of problems is small it is possible to have emergency treatments available in every delivery room at low cost. This project is easily transferable to any anaesthetic department as it only utilises stock which every hospital should have and does not involve setting up new protocols and structures.

References
Introduction of a theatre status board to improve theatre efficiency in a university teaching hospital

J. Brand and D. Murray
Department of Anaesthetics, James Cook University Hospital, Middlesbrough

Operating theatre efficiency is an increasingly important facet of clinical care at both local and National levels, especially in times of financial constraint. National efforts to improve theatre efficiency are in place with notable examples being ‘The Productive Operating Theatre’ [1]. This project aimed to streamline and improve the efficiency of our theatre complex through the use of a status board designed to improve communication and share information between members of the theatre team.

Methods
We designed and implemented a status board, situated at a focal point within the theatre complex that provided staff with information on nine areas associated with theatre delays. For example: ITU and ward bed availability, theatre staffing, equipment/radiology problems and issues with sterile services. The board was updated three times daily at 0800, 1200 and 1700 by the theatre coordinator. The status of each area was indicated using a RAG (Red, Amber, Green) rating to flag up problem areas, alongside a point of contact for each area. This allowed proactive steps to be taken to reduce the impact of problem areas on theatre efficiency. All information regarding the board, its workings and operation was disseminated to all staff working within the theatre complex.

Results
A random selection of theatre staff were surveyed about the status board on a single day, 2 months after the boards introduction, the results of which are displayed in Table 1. Free text comments were also encouraged.

Discussion
This project is still in its developmental stages and is subject to refinement on the basis of this survey. Free text comments supported the need for an electronic version with real-time updates, and an escalation policy. The next step is to investigate opportunities for a real-time electronic system. This will also allow a quantitative analysis of the impact of the status board on theatre efficiency. We are also developing an escalation policy to aid hospital managers in the proactive management of problems affecting theatre efficiency.

Table 1 Survey results divided according to individual survey question. Percentages of ‘yes’ responses shown, with number of responses in parentheses.

<table>
<thead>
<tr>
<th>Question Content</th>
<th>Operating Department Practitioners (% yes (n))</th>
<th>Theatre Coordinators (% yes (n))</th>
<th>Consultant Anaesthetists (% yes (n))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 21</td>
<td>n = 3</td>
<td>n = 8</td>
</tr>
<tr>
<td>Are you aware of the status board?</td>
<td>100 (21)</td>
<td>100 (3)</td>
<td>100 (8)</td>
</tr>
<tr>
<td>Have you used the status board?</td>
<td>100 (21)</td>
<td>100 (3)</td>
<td>100 (8)</td>
</tr>
<tr>
<td>Has the status board improved your list efficiency?</td>
<td>14 (3)</td>
<td>67 (2)</td>
<td>13 (1)</td>
</tr>
<tr>
<td>Has the status board highlighted problems with postoperative beds?</td>
<td>57 (12)</td>
<td>100 (3)</td>
<td>25 (2)</td>
</tr>
<tr>
<td>Has the status board highlighted problems with radiology/equipment?</td>
<td>52 (11)</td>
<td>100 (3)</td>
<td>13 (1)</td>
</tr>
<tr>
<td>Has the status board highlighted problems with staffing?</td>
<td>38 (8)</td>
<td>67 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Has the board improved inter-departmental communication?</td>
<td>43 (9)</td>
<td>100 (3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Do you think the status board is useful?</td>
<td>62 (13)</td>
<td>100 (3)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Reference
Implementation of SBAR tool to improve patient handover to recovery staff

N. Cassells and B. Vowles
Dumfries and Galloway Royal Infirmary

The safe journey of a patient through the perioperative period is dependent on good communication and effective handover between staff. The SBAR tool has been widely implemented to improve the consistency of handover and enhance continuity of care [1]. The Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain & Ireland state the importance of a formal handover to recovery staff [2, 3]. We believe a handover tool may help overcome some of the factors impeding appropriate handover and improve patient safety. We aimed to review our handover practice and develop a formal tool to aid all staff in a safe and effective recovery handover.

Methods

Working with our recovery nurses we comprised a list of information essential for a safe and effective handover. An initial audit assessed the handover of eight pieces of information and subjectively assessed the satisfaction of recovery staff of the handover process. This data was used to increase awareness with anaesthetists and recovery staff. A second audit was recently performed, objectively assessing the handover of 15 pieces of information. This second audit was carried out by a senior recovery nurse over the course of a day.

Results

Table 1 includes data from both audits and shows the percentage that each piece of information was communicated during handover.

<table>
<thead>
<tr>
<th>Information audited</th>
<th>Percentage communicated at handover</th>
<th>Information audited</th>
<th>Percentage communicated at handover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic</td>
<td>100</td>
<td>Anaesthetic given</td>
<td>100</td>
</tr>
<tr>
<td>Operation stated</td>
<td>93</td>
<td>Operation stated</td>
<td>100</td>
</tr>
<tr>
<td>Analgesia prescribed</td>
<td>93</td>
<td>Analgesia given</td>
<td>100</td>
</tr>
<tr>
<td>Antiemetic prescribed</td>
<td>93</td>
<td>Invasive monitoring</td>
<td>100</td>
</tr>
<tr>
<td>Intraoperative events</td>
<td>90</td>
<td>Drug history</td>
<td>91</td>
</tr>
<tr>
<td>Nurse satisfaction</td>
<td>70</td>
<td>Patient name</td>
<td>91</td>
</tr>
<tr>
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<td>Fluids given</td>
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<td>Antiemetics prescribed</td>
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<td>Fluids required</td>
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<tr>
<td>Surgical concerns</td>
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<td>Antiemetics prescribed</td>
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<td>Allergies</td>
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<td>Surgical concerns</td>
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</tr>
<tr>
<td>Target vitals</td>
<td></td>
<td>Allergies</td>
<td>33</td>
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</tbody>
</table>

Discussion

Our results highlight that despite an attempt to raise awareness, important information is still being omitted during recovery handover. The initial audit also shows that the level of distraction during handover was high and a number of handovers were felt to be sub-standard. We have developed a handover tool using the SBAR format, which provides a structure and highlights key moments in the handover process to ensure maximum safety and efficiency of information transfer. A ‘stop and focus’ headline ensures safe patient transfer is complete and both anaesthetist and recovery nurse are ready and free from distraction. A prompt for ‘final check’ prior to the anaesthetist leaving recovery aims to ensure both parties are happy with information communicated. Our SBAR tool is printed and laminated above each recovery bay and all staff have been trained in its use. The postoperative anaesthetic handover is a vital part of our daily duties and essential to patient care. We believe our handover tool can improve patient safety in our department. We plan to extend our interest of safe handovers nationally by sending a survey to anaesthetic departments in the UK to gather information on their guidelines and see if there is a future for the SBAR handover.

References

2. The Royal College of Anaesthetists. Guidelines for the provision of anaesthetic services 2014.
Improving intensive care handover: development and implementation of a standard operating procedure

A. Green, R. Grimaldi, R. van der Most, D. Hinge, R. Galloway and J. Pateman
Brighton and Sussex University Hospitals NHS trust

Analysis of intensive care critical incident reports from January to July 2013 showed 13% related to communication and clinical handover issues, perceived by staff as under-reported. This, along with our own clinical experience, highlighted that handover of level three patients from the emergency department (ED), theatres and wards to intensive care was unstructured and missing vital information, consequently impacting on patient safety and continuity of care. Lessons from the WHO [1] and Formula One [2–4] on how teams complete elaborate tasks under time pressure with little error inspired us to develop a Standard Operating Procedure (SOP) for intensive care handover.

Methods

A multi-disciplinary team (MDT) of anaesthetists, intensivists, emergency doctors and critical care nurses developed a SOP, outlining a 7-step approach to handover. During the development we filmed a simulated handover of an intubated poly-trauma patient (actor) ‘before’ and ‘after’ the SOP. Through this clinical scenario we were able to make crucial modifications to the SOP. An A4 sheet was produced outlining the SOP, with a structured handover sheet on the reverse, outlining the background and management of the patient. This can then be filed in the patient’s notes for future reference.

Results

The 7-Step SOP has been adopted as Trust protocol and introduced on September 2, 2013. It has received positive feedback and is currently being modified for use in level 2 patient transfers and in other departments of the hospital, including paediatrics. In addition, the handover simulation film has been used as a teaching tool for anaesthetic trainee and intensive care teaching sessions, the Sussex Critical Care Network Transfer course and at clinical governance meetings. Following SOP implementation, through re-analysis of incident reports and staff satisfaction surveys, we hope to show an improvement in quality of care, by a reduction in incident reports and increase in staff satisfaction.

Discussion

We aim to demonstrate that a structured handover can improve patient safety and quality of care, increasing staff confidence and satisfaction. In order to establish a SOP in practice, the multi-disciplinary team must be represented for both its development and implementation. In addition, we believe that simulation is invaluable when testing the practical application of a new process and when filmed is a powerful educational tool.

References


Emergency tracheostomy management training for dental trainees

A. Hutchinson and S. Monks
North Manchester General Hospital

It is well documented that there have been multiple deaths due to tracheostomy emergencies. NAP4 found a high number of adverse events concerning emergency tracheostomy management with death in up to 50% of patients in critical care areas after tracheostomy displacement. Data from NAP4 does not include ward level patients, but after emergencies in the region which have led to injury and even death, we felt that training of ward staff has been neglected, and that these potential first responders should be given training in emergency tracheostomy and laryngectomy management whilst awaiting expert airway assistance [1,2].

Methods

After discussion with a maxillo-facial consultant at our trust we discovered that dental trainees do not receive formal training, so we devised a training day during their weekly formal teaching. The training we implemented consisted of a session in a simulation suite, beginning with observation of a tracheostomy emergency scenario and its management. We then gave formal lectures covering definitions of tracheostomy and laryngectomy, explanation of the National Tracheostomy Safety Project (NTSP) bedhead signs and a thorough run through of the NTSP emergency management algorithms. For the final part of the day we introduced them to all of the different tracheostomy tubes in our trust including inner tubes, caps and other related equipment so that they became familiar with handling these devices and gave them the opportunity to go through the initial stages of each algorithm in real time.

Results

We undertook a pre-course questionnaire, which identified a lack of understanding around tracheostomies and laryngectomies, no formal training in this area, a lack of confidence in dealing with emergencies and a perceived need for such training. 50% of those questioned had been called to a tracheostomy emergency whilst 100% said that they were not confident dealing with such emergencies. It is worth noting that this questionnaire was carried out after the trainees had been in post for 7 months signifying a potential patient safety issue. The post course questionnaires revealed a greater understanding and improved confidence in dealing with these emergencies. All participants stated that they would recommend the course to colleagues and all demonstrated an increase in their confidence. We have now rolled the course out across all of the foundation doctors in our hospital with the first course due to run in September 2014.

Discussion

It is clear from our initial investigations that training is lacking in dental foundation trainees. From the results of this initial phase we aim to devise a deanery-wide training programme.

References

Measurement of epidural insertion pressures in labouring women of varying body mass indices and imaging of the lumbar spine to develop a high-fidelity epidural simulator for training

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1University Hospital Southampton, 2Poole Hospital NIS Foundation Trust, 3School of Design, Computing & Engineering, Bournemouth University

To create high-fidelity epidural simulators it is important to incorporate in-vivo epidural pressures [1]. This study presents the results of insertion pressures as a Tuohy needle is advanced through to the epidural space on a porcine cadaver followed by a clinical trial of labouring women of varying BMI. The aim is to use these measured epidural pressures together with ultrasound and MRI images for the development of a novel epidural simulator to aid training and reduce morbidity.

Methods
Ethics approval granted. A saddle cut of a pig was obtained within 24 h of slaughter. Pressure measurement using a 16G Tuohy needle (Smiths Medical plc) required use of a three-way tap, a pressure transducer (Kimal plc) and a custom designed wireless transmitter and receiver, which allowed remote monitoring of epidural pressures. Following full informed consent, the clinical trial involved measurement of epidural pressures in 4 groups of labouring women (5 per group) falling within four specific BMI categories (Table 1). Ultrasound images of the lumbar region were obtained before the pressure measurements and an MRI lumbar spine was performed within 72 hrs post-delivery.

Results
The maximum porcine epidural pressure peak ranged from 470 to 500 mmHg (62.7–66.7 kPa) equivalent to peak force of 11.1–11.8 N prior to entering the epidural space. The maximum maternal epidural pressure ranged from 450 to 530 mmHg (60.0–70.6 kPa). This equates to force of 10.6–12.3 N. Epidural pressure tracings by different operators demonstrate individual properties dependent on technique.

Discussion
This study demonstrated that mean maternal epidural pressures reduce with increasing BMIs. The measured pressures with US and MRI images will be incorporated into a novel epidural simulator currently under development. Individual pressure tracings can be used to refine the epidural technique improving efficacy and safety. From a team of anaesthetists, radiologists and partnership with Bournemouth University’s School of Design, Engineering and Computing, we have combined our clinical experience with cutting-edge technology and Smart Computer Design. Bournemouth University has an international reputation for computer graphics and design with numerous successful projects in the scientific and commercial environment. Indeed, one innovative aspect has been the development of a wireless transmitter and receiver to detect and send the signals from the pressure transducer.

Table 1 Epidural pressure readings for the BMI groups.

<table>
<thead>
<tr>
<th>Body mass index group</th>
<th>Highest mean pressure (mmHg)</th>
<th>Lowest mean pressure (mmHg)</th>
<th>Mean (mmHg) (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–24.9</td>
<td>530</td>
<td>385</td>
<td>461 (46.9)</td>
</tr>
<tr>
<td>25–34.9</td>
<td>520</td>
<td>320</td>
<td>430 (79.7)</td>
</tr>
<tr>
<td>35–44.9</td>
<td>510</td>
<td>285</td>
<td>415 (101.2)</td>
</tr>
<tr>
<td>&gt; 45</td>
<td>450</td>
<td>280</td>
<td>376 (71.3)</td>
</tr>
</tbody>
</table>

Acknowledgements
We are grateful for a major project grant from the OAA in support of this trial.

References

Declaration of interests
This abstract has been previously presented at the Obstetric Anaesthetists’ Association 2014 annual summer meeting. We were also finalists for the Patient Safety and Care Awards 2013 in the ‘Technology and IT to improve patient safety’ category.

Heavy weight champions – staff knowledge on maximum safe weight limits

L. Mackie and J. Mitchell
University Hospital Ayr

We surveyed theatre staff to test their knowledge of weight limits of commonly used theatre tables and ward beds for high BMI patients in University Hospital Ayr. Sixty-two staff, including ODPs, nursing staff, surgeons and anaesthetists were surveyed.

Methods
Staff members were asked to give the recommended safe working load for ward beds (Eleganza), bariatric ward beds (Bartram aurum), ICU beds (Totalcare), ICU transfer trolley (CCT six-P), main theatre trolley (Alphamaquet 1150), bariatric theatre trolley (Maquet Alphammaxx) and day surgery trolley (Portsmouth Surgical Equipment QA2). The data was analysed to produce a box and whisker plot and the number of answers within 10% of the correct value calculated.

Results
The results showed a large variation in the estimation of weight limit with an average of only 15% of answers being within 10% of the correct weight (ward bed 9.7%; bariatric bed 3.2%; ICU bed 29%; transfer trolley 8%; theatre trolley 17.7%; bariatric theatre trolley 1.6%; DSU trolley 35.5%). The majority of staff underestimated the safe working load for most of the equipment. The exception to this was the weight of the day surgery trolleys where 56.5% of people overestimated the maximum weight.

Discussion
The obese patient presents the anaesthetist and theatre team with a number of challenges, including the safe transport, moving and handling of these patients. Current guidelines recommend that every operating table, trolley and bed should be labelled with its maximum weight, and specialist equipment for obese patients should be available with at least one theatre trolley and an appropriate number of critical care beds be equipped for the morbidly obese [1]. The most pertinent point from our study from a safety perspective was the number of staff who were not aware of the maximum safe working load for the day surgery trolley, with over half overestimating the maximum weight limit. This highlights that even though BMI alone is not a factor to limit access to day surgery [2], it is important to have appropriate theatre equipment for higher weight patients in the ambulatory environment. As a result of our study we have created a document that is easily accessible and clearly highlights the correct weight limits for theatre trolleys and ward beds. We also now ensure our high BMI patients are anaesthetised in our main theatre suite, which is adjacent to our DSU complex, where a bariatric table and additional specialised theatre equipment is readily available.

![Figure 1: Box and whisker plot demonstrating the median and interquartile ranges of answers given and their relationship to manufacturers specified safe working load of each piece of equipment surveyed.](image)

References
Validation and evaluation of a new tool to improve safety of local anaesthetic use

A. Milne, E. McIlroy, K. Kaur and S. West
University College Hospital, London

Medication errors are the second most common cause of adverse incidents in anaesthetic practice [1]. In a survey of over 4 million anaesthetics, local anaesthetic (LA) toxicity accounted for 15.8% of cardiac arrests associated with anaesthesia [2]. We evaluated a novel technique for reducing this risk; a recently published nomogram for calculation of maximum volume of LA that can be safely administered [3].

Methods
A questionnaire was produced asking anaesthetists to calculate maximum volumes they would give in scenarios with varying weight, age and LA agent. For each scenario candidates were asked to use their usual method followed by the nomogram, which was adapted to local practice. They were then asked to evaluate the nomogram. Volumes were compared to ideal answers produced by a local expert. Data were stored in Excel and analysed using Medcalc.

Results
Of the 20 anaesthetists surveyed, most were consultants and most used mental arithmetic to calculate maximum volumes. Use of the nomogram led to significantly less discrepancy between volumes administered compared to expert opinion and to less variability in dosing. Both methods produced volumes that correlated significantly with the expert’s volumes, however the nomogram correlated more closely than the standard method. The majority of anaesthetists found the nomogram a valuable, easy to use tool. Most felt it improved patient safety and would incorporate it into practice if available (Table 1).

| Seniority* | CT1-2 | 10 (2) |
| Standard Method* | ST3-4 | 10 (2) |
| | ST5-7 | 35 (7) |
| | Consultant | 45 (9) |
| | Mental Arithmetic | 65 (13) |
| | Calculator | 20 (4) |
| Mean Difference (ml) | Variable | 15 (3) |
| | Standard | 8.7 (2.8) |
| | Nomogram | 2.3 (2.2) |
| | Pearson’s Correlation | Nomogram r² = 0.89 (p < 0.0001) |
| | Value of Nomogram (0–10)‡ | 8 (6–8) |
| | Ease of Use (0–10)‡ | 9 (8–9) |
| | Improves Patient Safety?* | Yes 80 (16) |
| | Would Use if Available* | Yes 65 (13) |
| | No | 20 (4) |
| | Undecided | 10 (2) |

Table 1 Results of survey and analysis of volume calculation exercise.

Discussion
The nomogram is a practical, well accepted tool with considerable potential to improve patient safety. We are in the process of producing laminated copies for distribution to other specialties, including surgery and emergency medicine.

References

Proficiency in difficult airway rescue techniques is essential for all anaesthetists; in addition these skills must be maintained with regular training updates [1]. With increasing pressures on time, study leave allowances and budgets, it can be difficult to attend formal training courses and workshops. To address this issue we have designed a programme of practical airway training that was brought to the members of our department during their standard working day, with the aim of training junior anaesthetists and updating the skills of more senior members of staff.

Methods
A theatre trolley was laid out with airway manikins and airway rescue technique equipment, plus a pot of tea and tin of homemade chocolate brownies. Two anaesthetists took the trolley to each anaesthetic room in our theatre complex on three separate afternoons. The first anaesthetist took over the care of the patient in the operating theatre. This allowed the anaesthetist working in that theatre to attend a 15 min one-to-one teaching session in the anaesthetic room; which was run by the second ‘tea trolley’ anaesthetist. A different topic was covered in each session:

1. Front of neck emergency airway access: needle cricothyroidotomy and surgical airway
2. Asleep fibreoptic intubation using a supraglottic airway as a conduit
3. Awake fibreoptic intubation: practicing the ‘ski run’ for negotiating the bronchoscope through the nose and larynx and revising the equipment requirements.

Participants completed feedback using a Likert scale to rate their confidence in airway techniques before and after training.

<table>
<thead>
<tr>
<th></th>
<th>Rated as Confident Before Training (%) of participants</th>
<th>Rated as Confident After Training (%) of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle cricothyroidotomy (Ravussin™)</td>
<td>38</td>
<td>100</td>
</tr>
<tr>
<td>Needle cricothyroidotomy (Melker™)</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td>Surgical airway</td>
<td>13</td>
<td>88</td>
</tr>
<tr>
<td>Asleep fibreoptic intubation</td>
<td>44</td>
<td>100</td>
</tr>
<tr>
<td>Awake fibreoptic intubation</td>
<td>*</td>
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</tbody>
</table>

There was overwhelming support for the ‘tea trolley’ approach: 100% of participants rated it as very useful.

Discussion
We believe that this novel training approach will significantly improve the safety of patients in our hospital for no additional cost. It requires minimal manpower to run, minimal time commitment from participants and only basic airway training equipment. We believe that it is a sustainable model which is 100% transferable to other anaesthetic departments. We have found that it is also transferable to other areas within the hospital: a similar ‘managing sepsis in obstetric patients’ programme is now in place and has run four sessions to date with similar success.

References

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Epidural asepsis: potential contamination comparing two techniques when drawing up normal saline

B. Parker,* M. Wee,² M. Onofrei,² M. Stewart,² N. Wee² and S. Hill²
¹West Hertfordshire Hospital NHS Trust, ²Poole Hospital NHS Foundation Trust

Infectious complications associated with central neuraxial blockade (CNB) have potentially devastating consequences including meningitis, paralysis and even death [1]. The reported incidence of epidural abscess after CNB varies from 1:1000 to 1:100 000 [2]. A national survey of prevention of infection in obstetric CNB in the UK in 2009 showed a 99% use of gown, gloves and sterile drape, 87% use of surgical caps and 91% use of face masks [3]. However, there is no consensus about the aseptic technique of drawing up saline. The aim of this study is to see if there is a difference in contamination when drawing up saline with a needle directly from the ampoule (needle technique [NT]) or from a sterile tray after being expressed by an assistant (tray technique [TT]).

Methods

Ethics approval was sought and not required. Women in active labour consented for the study to be undertaken in their labour rooms. A pilot study in a laboratory setting indicated that 0/5 and 3/5 grew commensals from epidural saline samples taken via the needle technique [NT] and tray technique [TT] respectively. This informed a sample size calculation for a study in a clinical setting, where we assumed 5% using the NT and 35% using the TT lead to contamination. To detect this difference at the 5% significance level with 90% power 55 samples per group were required (i.e. 110 in total). Computer generated randomisation allocated technique. The anaesthetist used a standard aseptic technique, including hand washing with chlorhexidine or iodine, surgical hat, mask, gown and sterile gloves. In a labour room environment 20 ml saline was drawn up either via a sterile needle or from a sterile tray where the assistant had expressed saline and 10 ml saline was inoculated into each of the aerobic and anaerobic culture bottles.

Results

Six out of 55 saline samples from the NT and 13/55 from the TT grew commensals respectively. These were skin flora including coagulase negative staphylococci, streptococci viridans and micrococcus luteus. Two-sided Fisher’s exact test gave a p = 0.129 which is not statistically significant.

Discussion

Although the results are not statistically significant, there is a tendency for more contamination using the expression of saline into the epidural tray. The clinical implication of these finding are unknown but may be significant in immunocompromised patients. Saline is also used in other procedures such as central line insertion where the results may have wider clinical influence. We recommend the needle technique and wearing of clean gloves by the assistant to reduce the incidence of contamination.

References


Arterial line damping; are we actually measuring blood pressure?

W. Rook, J. Turner, J. Cook and T. Clutton-Brock
University of Birmingham

Methods

It is vital that invasive blood pressure measurement is accurate. Accuracy is determined, in part, by the damping and resonance characteristics of the arterial line system. This is especially important when treating systolic blood pressure, as damping predominantly effects this measurement. We used the fast-flush method [1, 2] to calculate the coefficient of damping (CoD) of the arterial blood pressure measurement circuit in 154 patients in the critical care unit of a large tertiary hospital. The fast flush method involves calculating the ratio of the decaying oscillations observed in the arterial waveform following a flush with a high pressure fluid. Where no oscillations were present, the CoD was defined as ≥ 1.0. Further, we recorded anonymised patient data, including diagnosis, site and type of arterial catheter, duration the catheter had been placed for, and haemodynamic support the patient was receiving. Optimal damping was defined as CoD = 0.4–0.8, with < 0.4 indicating underdamping.

Results

56 patients had arterial lines with a CoD ≥ 1 (critical damping). Of the 98 further patients, the CoD was 0.35 ± 0.2 (mean ± SD; underdamping). 68 patients had arterial lines with a CoD < 0.4. There were no statistically significant relationships between CoD and duration the line had been in situ, the site of the catheter, or with the degree of haemodynamic support the patients were receiving.

Discussion

To the authors knowledge this is the first time the damping characteristics of a large cohort of critical care patients has been measured. Of concern, only 30 of 154 arterial lines had damping coefficients compatible with accurate measurement of arterial blood pressure. This is of significant safety concern for patients in whom arterial blood pressure requires tight control and treatment, and inaccurate measurement may result in treatments which cause harm. This study highlights the need for the development of national standards and guidelines for invasive blood pressure measurement, to ensure safe monitoring and treatment. Interestingly, this study did not elucidate the factors which are associated with poor damping, and further study will seek to address this. Further study is also required to assess the impact of poor damping characteristics on clinical care and outcomes.

References

Continuous pressure waveform monitoring during central line placement

A. Walsh,1 L. Goosen,2 J. Willers,2 R. Albertyn,2 D. Uncles2 and T. Malley1
1 Worthing Hospital, 2 Worthing Hospital, West Sussex

A recent case of inadvertent arterial central line insertion (IAI) despite the use of ultrasound (US) at our hospital highlighted the need to ascertain guide wire position prior to vessel dilation. To determine whether this was a technological or training issue, we showed that it is impossible to distinguish clinically between arterial or venous pressure by observing leakage around the inserted needle with guidewire in situ (GIS) [1]. US location of GIS is not always possible in plane due to anatomical reasons, and out of plane the guidewire shaft may be mistaken for the tip which instead is within an artery. We realised that objective pressure measurement is necessary to establish the position of the needle tip with GIS. It is possible to transduce the vessel pressure before guidewire insertion through the back of a Raulerson syringe, but that does not guarantee the needle location with GIS. ‘There’s many a slip between the cup and lip’, and post-transducing needle tip migration might even be more likely with extra steps. Cannulating the vessel with a soft catheter and transducing prior to passing a guide wire was impractical.

Methods
A literature search was undertaken to determine whether any solutions to this issue had been found. We discovered that in the United States, it is relatively common practice to attach a pressure transducer to the introducing needle to confirm a venous pressure with GIS pre-dilatation and line insertion [2]. Although the kit was not part of CVC insertion sets, the use of a T-piece connector in between the introducer needle and a Raulerson syringe was described as a substitute. A similar device available to us (Vygon extension set with male Luer-lock ‘T’ connector and female Luer-lock with Bionector) was assessed using a custom built vascular simulator [3]: We confirmed that it is possible to continuously measure the pressure waveform with GIS and quantify the amount of pressure change with GIS.

Results
After demonstrating this concept to our department it was adopted as standard protocol within our ITU. Since then there have been no reported cases of IAI, nor have there been any noted procedural difficulties or complications. Anecdotal feedback from trainees was that improved confidence engendered by assurance of CVC position more than compensated for the extra procedural step.

Discussion
Continuous pressure waveform monitoring using our proposed CVC technique with inexpensive, easily available and non-bulky equipment could reduce the risk of IAI and feasibly save lives. We feel that this is something that could be adopted by departments throughout the UK.

References

Audit of the introduction of 2% hyperbaric prilocaine (Prilotekal) into a DGH Day Surgery Unit: a successful quality improvement project

M. Milsom,1 S. Sherliker1 and A. Wilkins2
1 Harrogate District Foundation Trust, 2 Leeds Teaching Hospitals

The British Association of Day Surgery states that the ‘wider use of spinal anaesthesia in day surgery is advantageous to the patient and contributes to the efficient use of limited health care resources’. The advantages of neuraxial block for selected patients (high BMI, difficult airway) are well known with spinal anaesthesia also providing excellent early postoperative analgesia, reducing the requirement for opioids and their side effects. An audit of 28 bupivacaine spinals done on day surgery unit (DSU) patients in 2012 showed an unplanned admission rate of 57% due to residual anaesthetic block (weakness or urinary retention). Hyperbaric 2% prilocaine, was introduced to Harrogate District Foundation Trust in 2013 alongside a day case spinal education programme for anaesthetists in order to reduce the number of unplanned admissions resulting from residual spinal anaesthesia block.

Methods
We conducted a retrospective re-audit of department practice, assessing whether the introduction of the shorter acting 2% hyperbaric prilocaine reduced the unplanned admission rate when compared to our initial audit. All day surgery patients receiving a spinal anaesthesia between Nov 2013 and Feb 2014 were identified via our theatre management system and the notes audited using a standardised proforma. The data was analysed and a comparison made to our original audit.

Results
Twenty spinal anaesthetics in DSU patients were performed during the re-audit period. Hyperbaric prilocaine accounted for 75% of the spinals performed. Again, the majority of patients underwent orthopaedic or general surgery. Five (25%) of the patients had unplanned admissions due to residual block, compared to 57% in the 2012 audit. There were no reported adverse reactions associated with the use of hyperbaric prilocaine.

Discussion
The introduction of hyperbaric prilocaine led to a change in practice, accounting for 75% of the day-case spinals performed. There was only 1 spinal (5%) performed that contained opiates, compared to 60% in the 2012 audit. This audit demonstrates that the introduction of hyperbaric prilocaine has prevented approximately 18 overnight admissions per year; a better quality service for patients and an estimated cost saving of over £4500. This could be improved further with better list planning; 3 patients requiring admission had their spinal anaesthetic after 3 pm, affording too little time for the block to resolve before the day surgery unit closed. An additional benefit also has arisen from the associated shorter discharge times by permitting more efficient use of valuable day surgery unit ward space.

Acknowledgements
B Stearn

References
An audit on the use of High Flow Nasal Oxygen (HFNO) therapy for pre-oxygenation, to reduce the risk of desaturation and making emergency management of airway safer in the anaesthetic and critical care environments

G. Wijewardena, M. Marinyaselvam, N. English and P. Young
The Queen Elizabeth Hospital Kings Lynn NHS Foundation Trust

The goal of pre-oxygenation in Emergency Airway Management (EAM) is to provide an oxygen reservoir during periods of hypoventilation and apnoea [1, 2]. It extends the duration of safe apnoea [1]. There is a risk of desaturation during tracheal intubation in patients with primary lung disease, high metabolic demands, anaemia, poor respiratory drive and aspiration risk [1, 2]. Maintaining adequate oxygenation during EAM is important for patient safety. Hypoxia will predispose patients to arrhythmias, hemodynamic instability, hypoxic brain injury, and death [1]. The conventional technique of pre-oxygenation has limitations as compared to the new technique of HFNO therapy [1]. HFNO is a novel way of delivering warmed and humidified oxygen, through special nasal cannulae [3]. We believe that using HFNO for pre-oxygenation and peri-intubation oxygenation can provide continuous oxygenation throughout EAM. The purpose of this audit was to compare the standard technique of pre-oxygenation with HFNO therapy in EAM in adults.

Methods
Staff on the intensive care unit and in the emergency theatre were asked to use the HFNO system on patients for pre-oxygenation and during intubation. All involved were trained in the use of HFNO system. The maximum saturations (SpO₂) after pre-oxygenation, the lowest SpO₂ during intubation, the time taken to intubate, grade of intubation and the experience of the clinician were recorded in both HFNO therapy and the standard technique for comparison.

Results
Data for 26 intubations using the HFNO therapy and 10 intubations using the conventional technique were collected. The grade of intubations ranged from I to III and reasons for intubation included, hypoxia due to Type I respiratory failure, sepsis, reduced GCS, emergency surgery on the morbidly obese. In the HFNO therapy group, the drop in SpO₂ from pre-oxygenation to lowest recorded level during intubation was between 0 and 6%, with one exception, which was a patient with a grade III laryngoscopy where the time taken to intubation was 2.44 min and the SpO₂ drop, was 33%. Another case in this group required 5 attempts to intubate lasting 7 min and had a 0% SpO₂ drop. During standard technique the drop in SpO₂ ranged from 0 to 15%.

Discussion
With the exception of 1 patient, our data shows a comparatively lower SpO₂ drop in the HFNO therapy group when compared with the standard group. This illustrates that HFNO can increase the safe apnoea time. By maintaining oxygen saturation levels, HFNO reduces the risk of desaturation during EAM in high risk patients. Dead space washout, apnoeic oxygenation, improving lung compliance and distending pressure are some of the mechanisms of action of HFNO [2, 3, 4]. We believe using HFNO therapy for pre-oxygenation can make intubation safer than the conventional method.

References

101 palpations: remake of an audit ultrasonically verifying obstetric spinal needle insertion level against estimation by landmark to close the audit loop

J. Willers
Worthing Hospital

In 2008 the first study comparing obstetric spinal needle level insertion estimation by landmark palpation with level verified by ultrasound (US) was published in the BJA [1]. This was closely followed by the first British audit of 101 insertion/estimation comparison levels at our institution in 2010 [2], where we have been doing regular individual audits for 5 years. It was decided to repeat the audit after a 4-year interval to see if there was any change in needle level placement and estimation.

Methods
Patients (n = 101) were followed up post obstetric neuraxial blocks. After being consented, patients were positioned as for the original procedure. Level of insertion was identified by the puncture mark on the skin. Patients without clarity of either insertion or estimation levels were excluded from the audit. US was used to identify the intervertebral level by counting up from the sacrum. This was done by one anaesthetist (the author) with > 10 years experience in spinal US who was involved in about 65% of the patients in the original audit and trained all the participants. Data collected included: neuraxial block type, predicted level at insertion, patient position at insertion, BMI at 36 weeks and grade of anaesthetist. The results were analysed and compared to results retrieved from the previous study (which is shown in brackets).

Table 1 Comparison of predicted and US determined needle insertion levels.

<table>
<thead>
<tr>
<th>Actual level</th>
<th>L1/2</th>
<th>L2/3</th>
<th>L3/4</th>
<th>L4/5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2/3</td>
<td>0 (0)</td>
<td>4 (3)</td>
<td>3 (1)</td>
<td>1 (0)</td>
<td>8 (4)</td>
</tr>
<tr>
<td>L3/4</td>
<td>0 (1)</td>
<td>25 (16)</td>
<td>47 (51)</td>
<td>14 (12)</td>
<td>86 (80)</td>
</tr>
<tr>
<td>L4/5</td>
<td>0 (0)</td>
<td>0 (2)</td>
<td>1 (7)</td>
<td>6 (8)</td>
<td>7 (17)</td>
</tr>
<tr>
<td>Total</td>
<td>0 (1)</td>
<td>29 (21)</td>
<td>51 (59)</td>
<td>21 (20)</td>
<td>101 (101)</td>
</tr>
</tbody>
</table>

Results
For 57 (62) patients there was agreement between clinical prediction and US assessment of intervertebral level (C/US). 26 (26) patients had a neuraxial block at least one space above that clinically predicted and 18 (13) patients had a neuraxial block below that clinically predicted (Table 1).

C/US was seen in 46–58% (29–57%) patients undergoing spinal block, 10–52% (30–67%) patients undergoing epidural block and 1–33% (3–60%) patients undergoing CSE block. The percentage of subdural neuraxial blocks inserted above L3/4 was 29% n = 17 (17.9% n = 10). C/US in patients with BMI < 30 53% n = 24 was 71% (n = 25) and with BMI > 35 57% n = 16 (44% n = 8).

Discussion
There has been no significant total change in C/US. We are getting better at estimation in obese patients, but worse in the non obese. Insertions above L3/4 stayed the same, but the incidence of subdural punctures increased. Although we tend to think we are good at locating where the bone is buried with palpation, we have nearly as much chance of barking up the wrong tree as being spot-on. Maybe it is time to stop being dogmatic about our ability to determine vertebral levels by landmarks and learn some new tricks (US)?

References