Abstracts

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SCIDUA: FRACTURED NECK OF FEMUR—WHY THEY DIE
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The Special Committee Investigating Deaths Under Anaesthesia (SCIDUA) received 192 case reports of patients with fractured neck of femur between 1984 and 2003 representing 2.27% of the 8454 cases reported in this period.

In 39 cases, insufficient data were available to enable the committee to reach a conclusion. Fifty-eight cases were excluded because death occurred after complete recovery from uneventful anaesthesia. In the Committee’s judgement anaesthesia made no contribution to the death of another 25 patients, which left 70 cases where anaesthesia contributed to the fatal outcome. There were 65 patients aged 58 to 98 years (22 males and 48 females). In the forty-one cases performed under general anaesthesia (GA), 29 were classified ASA III or IV whereas 19 out of 29 cases under regional anaesthesia (RA) were classified IIE or IIIE.

Deaths occurred intraoperatively in 13 cases under GA (32%), including five after cement insertion. Contributing factors included drug overdose, inadequate resuscitation and monitoring.

Twelve intraoperative deaths occurred under RA (41%), four after cement insertion. Contributing factors included drug overdose, profound hypotension (irreversible), inadequate resuscitation and monitoring. Factors contributing to the 28 postoperative deaths after GA included inadequate resuscitation and monitoring. Factors contributing to the 17 postoperative deaths after RA included inadequate resuscitation, drug overdose and profound hypotension. GA cases averaged three anaesthetic errors, whereas RA cases averaged four errors.

In conclusion, there are significant differences in outcomes for patients undergoing regional or general anaesthesia for internal fixation of fractured neck of femur.

98% VOLUNTARY INCIDENT REPORTING IN CLINICAL PRACTICE
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Introduction: Reliable critical incident reporting in health care has been notoriously difficult to achieve. In 2002 a personal professional monitoring program using personal digital assistants was introduced for ANZCA accredited anaesthetic trainees at the Geelong Hospital. This study examined the existing database to determine the true critical incident reporting rate by identifying adverse events in the case notes that were not electronically reported.

Materials and Methods: Ethics committee approval was granted for the data collection. The case notes of patients in whom no incident had been recorded were sampled to identify possible incidents that should have been reported via the personal digital assistant program. These were evaluated by one observer (LF) who had not contributed to the database. Notes were screened for preoperative, anaesthetic and recovery components to identify documented incidents that should have been electronically reported.

Results: Anaesthetic trainees at the Geelong Hospital logged 4441 cases. 157 were associated with a voluntarily reported incident giving a critical incident reporting rate of 3.54%. Of these 50% were “near miss” incidents where no patient harm occurred but trainees reported an incident. A sample of 200 case notes with no reported anaesthetic incident was screened for possible incidents. One incident was found in this sample. This gives an incident reporting rate of 98% (confidence limits 96.9—100%).

Discussion: The data from this study are both striking and encouraging. They indicate that ANZCA accredited anaesthetic registrars will report critical incidents occurring in their anaesthetic practice at the rate of 3.5%. Furthermore, the rate of critical incidents reported is likely to be as high as 98% of the actual number of critical incidents occurring. This is the highest rate of critical incident reporting that has been recorded in the medical or health care safety literature and represents a considerable advance on previous studies. The fact that approximately 50% of the critical incidents reported by ANZCA trainees had no or minor adverse patient outcome suggests that in a supportive and blame-free environment ANZCA accredited anaesthetic registrars have an extremely high level of voluntary reporting.

PROSPECTIVE RANDOMIZED EVALUATION OF THE EFFECTS OF COMBINING A SINGLE-INJECTION THORACIC PARAVERTEBRAL BLOCK WITH GENERAL ANAESTHESIA IN PATIENTS UNDERGOING MODIFIED RADICAL MASTECTOMY
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Aim: The aim of this study was to investigate the effects of combining a single-injection thoracic paravertebral block with general anaesthesia in patients undergoing modified radical mastectomy.

Methods: After obtaining ethical approval and written informed consent, 88 ASA I-II female patients undergoing modified radical mastectomy were randomized to receive a single-injection TPVB, with ropivacaine (2 mg/kg) and adrenaline 1:200 000 in a 20 ml volume, at the T3 level, prior to a standardized GA (GA+TPVB group, n=44) or GA alone (GA group, n=44). Postoperative analgesics included oral diclofenac and intramuscular morphine. Following outcome variables were recorded postoperatively (48h) by a research nurse blinded to the method of anaesthesia: pain score, analgesic requirement and bedside spirometry (FVC, FEV1 & PEFR).

Results: All TPVB’s were successful and there were no major complications. Pain score at rest (P=0.013) and on movement (P=0.019) was significantly lower in the GA+TPVB group in the...
recovery room, and at rest it was also lower in the GA+TPVB group at 24 (P=0.014), 36 (0.006) and 48 (P=0.012) hours after returning to the ward. The GA+TPVB group also required less morphine in the recovery room (P=0.002). Fewer patients in the GA+TPVB group required diclofenac for postoperative analgesia (P<0.05 at 48h). There was a comparable reduction in FVC (P<0.01) and FEV1 (P<0.01) on day 1 in both study groups. These parameters were still depressed on day 2 in the GA group, but a significant improvement was seen in the GA+TPVB group (P<0.001).

Conclusion: A single-injection TPVB reduces postoperative pain and analgesic requirements in patients undergoing MRM under GA. It also augments the recovery of postoperative respiratory function.

DEATHS REPORTED TO THE AUSTRALIAN INCIDENT MONITORING STUDY (1988-2003)
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Aims: Qualitative evaluation of self-reporting databases such as the Anaesthetic Incident Monitoring Study (AIMS) can provide important clinical information that can supplement more quantitative research. The aim of this study was to examine the AIMS database for cases where death was a reported outcome. The entire AIMS database was searched using the key word “death” as an outcome. All reports were read, validated and categorised using the same perioperative mortality classification system as employed by the Australian and New Zealand College of Anaesthetists. Where appropriate groups were compared using a t-test or chi-squared test.

Findings: Of the total database of 8088 reports, 143 had an outcome of death (1.8%). Most deaths occurred in ASA patients 4 and 5 (P=0.0001), in emergency patients (P<0.001), patients undergoing vascular surgery (P=0.0002) and patients undergoing surgery at night. Incidents detected in the post anaesthesia care unit were more likely to be associated with an outcome of death than when detected in other phases of the anaesthetic. Factors that contributed more significantly to an outcome of death included: inadequate preoperative evaluation and preparation (P<0.001), error of judgement (P<0.001), sick patient (P<0.001), inexperienced (P<0.0024), and unfamiliar environment (P=0.004).

Conclusion: Although anaesthesia related mortality remains low, important system based factors may reduce this rate further. Closers attention may have to be paid to those areas that have had less direct supervision by anaesthetists. Inadequate preoperative management has been cited in several mortality reports as a key issue to address, whilst postoperative care may also warrant closer review. If real improvements are to be made, anaesthetists need to take control of pre and postoperative care in an integrated, planned and sustainable manner.

A DEPRESSION OF BISPECTRAL INDEX WITH INTRATHECAL ADRENALINE DURING SPINAL ANAESTHESIA AND PROPOFOL SEDATION
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Purpose: Adrenaline added to local anaesthetic agents for spinal anaesthesia is frequently used to prolong the duration of anaesthesia. Epinephrine stimulates the α-1 adrenoceptor, and it is known that the α-2 adrenoceptor agonist has a central inhibitory effect. We investigated the effect of intrathecal adrenaline during propofol sedation with spinal anaesthesia using a Bispectral Index (BIS) monitor.

Methods: Twenty adult patients scheduled for spinal anaesthesia, were allocated to the control group (n=10) or adrenaline group (n=10). Patients in the control group received 14 mg of tetracaine, whereas the adrenaline group received 14 mg of tetracaine and 0.2 mg of adrenaline. Immediately after pinprick test, propofol was administered 0.5 mg.kg⁻¹ by infusion for initial dose, then continuously 2 mg.kg⁻¹.h⁻¹. BIS scores were recorded before subarachnoid block, and then every 5 min for 90 min after subarachnoid block.

Results: There were significant differences in the BIS score between the two groups at 45-55, 60-70 minutes after subarachnoid block.

Conclusion: Intrathecal adrenaline arguments the sedative effect of propofol during spinal anaesthesia.

“OILY STREAK” FORMATION ON ASPIRATION OF CEREBROSPINAL FLUID INTO THE LOCAL ANESTHETIC SOLUTION—ITS RELIABILITY IN IDENTIFYING SUBARACHNOID SPACE WHILE PERFORMING COMBINED SPINAL-EPIDURAL TECHNIQUE
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Aim: Use of normal saline (NS) during combined spinal-epidural is common for the loss-of-resistance technique. We observed that the subsequent identification of subarachnoid space might be misleading, as the NS used earlier may flow through the spinal needle before it enters subarachnoid space and may be mistaken for cerebrospinal fluid (CSF). The aim of this study was to determine the reliability of typical oily appearance of CSF on aspiration into local anesthetic (LA) solution for immediate distinction between CSF and NS while performing spinal block.

Methods: We observed in vitro that aspiration into hyperbaric 0.5% bupivacaine, both CSF and NS appeared oily and grossly similar in appearance. However, while CSF produced a clearly visible central and straight streak (longer on fast aspiration) that gradually moved upwards (Figure 1), NS produced a short hazy oily pattern that rapidly moved upwards without central streak formation (Figure 2). These observations were better appreciated from the side-view of a transparent syringe with naked eye. In a prospective blinded manner, twenty anaesthetists were asked to distinguish between CSF and NS in vitro by observing oily pattern produced by their aspiration through 26 gauge spinal needles into glass syringes.
A PROSPECTIVE AUDIT OF AWARENESS IN P AEDIATRIC ANAESTHESIA

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Background: In adult anaesthesia awareness is a recognised risk, while with children the topic has attracted only occasional attention. In 1973 an Australian study of 202 children found an incidence of awareness of 5%. Since then no large studies have been performed in children.

Aim: The aim of this audit was to determine of awareness in our paediatric practice.

Methods: This study was nested within a larger study of behavioural change after anaesthesia. This nesting reduced the emphasis placed on the awareness assessment and also allowed us to control for any subsequent behavioural change. In total 864 children aged 5 to 12 years were assessed for awareness. Awareness was assessed by interview on the day of the procedure and by return questionnaire on days 3 and 30. Reports of suspected cases were submitted to four independent assessors. If all four agreed, the case was classified as awareness.

Results: There were seven cases of awareness (an incidence of 0.8% with 95% CI 0.3% to 1.7%). Although small numbers limit the power of comparisons, children reporting awareness were not more likely to develop significant behavioural change (awareness 20%, non-awareness 16%). Only one child reported formal psychological referral. Compared to the non-aware children, the use of muscle relaxation and sedative premedication was no different in the awareness group. Aware children were more likely to dream (57% versus 11%, P < 0.0001).

Conclusion: Children are a high-risk group for awareness.

Reference
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EFFECTS OF HIGH-INSPIRED OXYGEN FRACTION DURING ELECTIVE CAESAREAN SECTION UNDER GENERAL ANAESTHESIA ON MATERNAL AND FETAL OXYGENATION AND LIPID PEROXIDATION

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Aim: We studied the effects of breathing three different FiO2 during general anaesthesia (GA) for elective caesarean section, using sevoflurane and nitrous oxide, adjusted to provide equivalent minimum alveolar concentration (MAC).

Methods: With ethics committee approval and informed consent, we randomized 39 ASA I-II parturients undergoing elective caesarean section under GA, to receive 30%, 50% or 100% oxygen until delivery. Baseline arterial blood was sampled from the mother before breathing oxygen and at delivery. Standard anaesthetic monitoring and care according to predetermined protocols was provided by a blinded anaesthetist. Oxygenation was quantified by co-oximetry and blood gas analysis; and free radical activity was quantified by assays for isoprostan and Tumblin’s T2 procedure. P < 0.05 was considered significant.

Results: Maternal and fetal demographics were similar in the three oxygen groups. At delivery, for umbilical venous blood, mean (SD) PO2 was greater in Group 100 (7.9 (4.3) kPa) compared with both Group 30 (3.8 (0.7) kPa) and Group 50 (4.5 (0.9) kPa), (P < 0.0001) and oxygen content was greater in Group 100 (17.6 (1.2) ml.dl-1V1) compared with both Group 30 (12.6 (3.1) ml.dl-1V1) and Group 50 (13.0 (2.0) ml.dl-1V1), (P < 0.0001). Maternal and umbilical Isoprostane levels and neonatal Apgar scores were similar.

Conclusions: Elective CS with GA using 100% oxygen may be beneficial by increasing fetal oxygenation, without increasing lipid peroxidation in the mother or baby.

MORPHINE FOR POST-CAESAREAN SECTION ANALGESIA: INTRATHECAL, EPIDURAL OR INTRavenous?

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Aims: Good analgesia is important after a caesarean section but there are no studies to date that compare intrathecal, epidural and intravenous patient-controlled analgesia (PCA) morphine for post-caesarean section analgesia. We reviewed the records of patients who had received these three different routes of morphine administration for post-caesarean analgesia to to evaluate the quality of analgesia and side-effects.

Findings: With approval of the Ethics Committee, we reviewed the data related to the mode of post-caesarean analgesia over a six-month period retrospectively. We included only patients who had received intrathecal morphine, epidural morphine or intravenous PCA morphine, with or without NSAIDs. The data were analysed using SPSS version 9.0. A total of 959 cases were collected.

Intrathecal morphine was the predominant method of post-caesarean analgesia. More patients in the intrathecal (76%) and epidural (80%) groups received NSAIDs than intravenous PCA (49%), P < 0.05. Intrathecal morphine group had a significantly lower pain score at rest (P < 0.001) and on movement (P < 0.05) when compared with intravenous PCA group. There was no differ-
ence in pain scores between epidural and intrathecal morphine. Within the intrathecal morphine group, patients who had received NSAIDs also registered lower pain scores at rest and on movement (P<0.05). There was no difference in the satisfaction scores among the three groups.

Conclusions: Our retrospective review revealed that the use of intrathecal and epidural morphine was associated with lower pain scores at rest and movement when compared with intravenous PCA without any severe side effects. The use of NSAIDs enhanced the efficacy of analgesia of intrathecal morphine.

A RANDOMIZED CONTROLLED TRIAL ON EARLY FEEDING AFTER ELECTIVE CAESAREAN DELIVERY UNDER REGIONAL ANAESTHESIA

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Aims: Previous studies on the safety and tolerability of early feeding post-caesarean delivery have been small and heterogeneous. We therefore undertook a larger prospective randomized controlled study assessing the incidence of nausea, vomiting, ileus symptoms, and hospital course of patients who were fed early.

Method: 200 parturients scheduled for elective caesarean delivery under regional anaesthesia were randomized into either the early-fed group (250 ml clear fruit juice within half hour of operation, and unlimited solid food thereafter) or the control group (clear feeds after six hours, advanced to solids as tolerated), n=100 each. Patients in active labour undergoing general anaesthesia or emergency caesarean for fetal distress were excluded. Statistical analysis was performed with Student’s t-test, Chi-square and Fisher’s Exact test.

Results: Both groups were similar in terms of parity, gestation, surgical duration, blood loss, urine output and fluids transused intra-operatively. The early-fed group had reduced time to first drink (0.86±0.6 vs 14.4±18.2h) and solid food intake (4.2±2.7 vs 20.0±6.8h), earlier passage of flatus (44.4±18.7 vs 65.6±25.4h), shorter duration of intravenous hydration (12.8±7.5 vs 22.4±5.8h), and earlier cannulae removal (20.5±6.7 vs 24.7±7.8h), all P<0.001. Early-fed mothers also mobilized (23.1±6.8 vs 27.4±7.6h), commenced breastfeeding (25.2±14.1 vs 38.8±21.8h), and were fit for discharge earlier (44.3±10.4 vs 62.0±12.7h) compared to the control group, all P<0.001. Both groups displayed no difference in mild ileus symptoms (3.1%) although earlier solid intake resulted in more nausea (10.2 vs 2%, P=0.033). Despite this, maternal satisfaction rated high in the early-fed group (90, range 80-100).

Conclusion: Early feeding post-caesarean delivery under regional anaesthesia is safe, well-tolerated and can lead to shorter hospitalization.

TARGET-CONTROLLED PROPOFOL REQUIREMENTS AT INDUCTION OF ANAESTHESIA: EFFECT OF REMIFENTANIL AND MIDAZOLAM

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Background and Objective: Target-controlled infusions (TCI) of anaesthetic agents have become increasingly available. They can involve the use of propofol in combination with an opioid or a benzodiazepine. The effect-site concentration of TCI propofol has been advocated as a method of estimating drug distribution. We investigated the influence of co-induction with TCI remifentanil and midazolam on effect-site propofol requirements at induction of anaesthesia using target-controlled infusions.

Methods: One hundred-and-sixty adult patients undergoing anaesthesia for laparoscopic abdominal surgery were randomly allocated to three treatment groups. Each group received induction of anaesthesia with different TCI techniques. One group was induced with TCI propofol alone; another received target-controlled propofol and TCI remifentanil (4 ng/ml); and the last received midazolam (0.02 mg/kg), target-controlled remifentanil (4 ng/ml) and target-controlled propofol. Computer simulation was used to calculate effect-site concentrations. We recorded propofol dose and effect-site concentration at loss of verbal response.

Results: The effect site concentration (Ce50) of propofol alone was 2.5 microgram/ml. This was reduced to 1.5 microgram/ml during co-induction with remifentanil and further reduced to 0.5 microgram/ml with midazolam premedication (P<0.001).

Conclusions: We conclude that co-induction with remifentanil alone or with midazolam can be used to reduce propofol doses at induction of anaesthesia using target-controlled infusions. We believe that using effect-site concentration may prove a useful tool in routine clinical practice.

EFFECTIVENESS OF BUPROPION AS AN AID TO STOPPING SMOKING BEFORE ELECTIVE SURGERY: A RANDOMIZED CONTROLLED TRIAL

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Background: Smoking is a risk factor for patients undergoing surgery. It is associated with respiratory complications and wound infection.1 Bupropion (Zyban®) may assist smoking cessation in patients awaiting elective surgery.

Methods: After gaining ethics approval and informed consent, we enrolled 47 patients from the elective surgery waiting list in a double-blind randomized controlled trial. Patients were allocated into one of two groups: active (bupropion) or placebo (identical appearance). The active drug, bupropion, was administered as a single daily dose of 150 mg for the first three days, and then 150 mg twice daily for the remainder of the seven-week trial period.

Results: Patients receiving bupropion had a lower daily cigarette consumption at the time of hospital admission, median (IQR) cigarettes per day: 6 (2-7) vs 15 (9-20), P=0.046. They also had a reduction in end-expired carbon monoxide (P=0.004), a known contaminant of cigarette smoke, and increased arterial oxygen saturation on pulse oximetry (P=0.011). They were more likely to have stopped smoking at the three week visit (P=0.036), but not at the six week visit (P=0.25).

Conclusions: We found that smokers waiting for elective surgery are more likely to reduce or stop smoking when treated with bupropion. A successful preoperative smoking cessation program targeting patients on a surgery waiting list has the potential to not only improve a patient’s health in the future, but also reduce perioperative complications in the short-term.

References
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HYPERTHYREOIDISM IN PATIENTS COMMENCED ON DEXAMETHASONE FOR CRANIOTOMY

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Hyperglycaemia should be avoided during neurosurgery to decrease the risk of neurological injury. Dexamethasone has been associated with elevated blood glucose during surgery.

This prospective study documented the blood glucose concentration changes for a period of 12 hours in 34 non-diabetic patients undergoing craniotomy, and compared the patients who received intraoperative dexamethasone (10 mg IV on induction and 4 mg IV 6 hours later) with or without preoperative dexamethasone to those who did not receive dexamethasone.

Blood glucose concentrations increased from the pre-induction value in all groups. Patients not on dexamethasone preoperatively but who were given it intra- and postoperatively, had the greatest peak blood glucose concentrations (11.0±2.0 mmol/l, mean±SD, P<0.01) when compared to patients who received no dexamethasone (7.8±2.1 mmol/l) or those who had been on dexamethasone preoperatively and continued it intraoperatively (8.5±1.2 mmol/l). The peak blood glucose concentrations in this group occurred 9±2 hours after induction of anesthesia.

We recommend that blood glucose concentration be monitored for at least 12 hours in non-diabetic patients having neurosurgery who are newly commenced on dexamethasone.

EFFECT OF AGE ON THE DEVELOPMENT OF MORPINE TOLERANCE

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Aim: In all age groups, there has been an increase in the use of opioids to treat chronic pain conditions, yet the impact of age on the development of opioid tolerance has not been comprehensively addressed. This study investigated the age-related differences in development of morphine tolerance in the rat and in a parallel study examined the rate of dose escalation of opioids in patients of various ages treated in a chronic pain clinic.

Method: Rats aged three weeks, three months, six months and one year were used in the study. Morphine 8 mg/kg was injected subcutaneously twice each day and its analgesic effect was tested twice daily until the development of tolerance. Clinic patients’ charts were reviewed retrospectively, grouped by age and nature of pain (neuropathic or nociceptive).

Results: Rats aged three weeks, three months, six months and one year developed tolerance on the 4th, 10th, 14th and 22nd days of morphine treatment, respectively. Over the first year of opioid therapy in the clinic, patients over 60 years of age escalated daily long-acting opioids at less than 50% the rate of patients under age 50. The most significant rate of opioid escalation was observed in young patients with non-neuropathic pain.

Conclusion: This study demonstrates that the development of tolerance to morphine is more rapid in younger rats than in older rats and that this is unlikely to be a result of differences in metabolism or clearance of the drug. In the clinic, other factors may influence the rate of dose escalation, but the results in humans were certainly consistent with the animal data.

COAGULATION ABNORMALITIES IN SURGICAL PATIENTS TAKING TRADITIONAL CHINESE MEDICINE

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Purpose of Study: There is increasing awareness that some traditional Chinese medicine (TCM) can potentially cause coagulation abnormalities. The aim of this preliminary study was to assess the incidence and association between traditional Chinese medicine and coagulation abnormalities.

Methodology: We studied prospectively a random sample of patients undergoing major elective surgery. All patients had preoperative haemostatic screening: international normalized ratio (INR), activated partial thromboplastin time (aPTT) and platelet count. The data on the use of TCM within the two weeks before surgery was obtained by a questionnaire. The normal reference ranges of the laboratory tests were used to define an abnormal result. Logistic regression was used to determine the factors associated with abnormal coagulation.

Results: Of the 164 patients, 53 (32%) were taking traditional Chinese medicine with known anticoagulation effects (prolonged INR and/or aPTT). The most commonly used were ginseng (19%) and ginger (12%). There was no association between ginseng and abnormal coagulation tests. After adjusting for liver disease, haematological disease, drugs (warfarin, nonsteroidal anti-inflammatory drugs, aspirin), patients taking ginger were five times (odds ratio 5.01, 95% confidence intervals 1.54 to 16.28) more likely than patients not taking ginger to have a prolonged INR (>1.10). There was one patient taking a traditional Chinese medicine prescription containing bai zhu (Atractylodis) and san leng (Sparganii) that may have caused a prolonged preoperative aPTT (43.5 seconds) which required a change in anaesthetic management.

Conclusion: Although patients frequently take traditional Chinese medicine with anticoagulation effects, the incidence of coagulation disorder requiring an intervention was low (0.6%, 95% confidence intervals 0.01% to 3.4%).

EVALUATION OF RESPONSE TIME AND ANESTHESIA FOR CRASH CAESAREAN SECTIONS — AN AUDIT OF A SINGAPORE HOSPITAL

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Aim: A protocol was implemented in KK Women’s and Children’s Hospital, to expedite extremely urgent caesarean sections. When a decision for a crash caesarean section was made, a public announcement system simultaneously activated the obstetricians, anaesthetists, neonatologists and nurses. Following implementation, we conducted an audit over a one-year period to evaluate the anaesthetist response time, decision to delivery interval (DDI) and the perinatal outcome of all crash caesarean sections.

Method: The attending anaesthetist recorded the decision to anesthesia time, type of anesthesia instituted and its complications, DDI and the perinatal outcome for all crash caesarean sections. The data was analysed using SPSS. Chi-squared tests, unpaired t-test and the Mann U Whitney test were used for the analysis of proportions, parametric and non parametric data, respectively.

Results: Of the 3629 caesarean sections carried out in our institution over the one year period, 98 cases of “crash” caesarean section were identified. The mean DDI was 7.6 minutes (SD) 2.9 with all deliveries made within 17 minutes. The mean decision to aneste-
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Anesthesia time was 3.6 minutes (SD) 3.0 with all the patients anesthetized within 10 minutes from the time decision for delivery was made. The mean cord blood pH was 7.22 (SD) 0.8. 90.4% received general anesthesia while the rest had successful epidural block extension. Both groups had similar DDI and perinatal outcome.

Conclusion: With a protocol in place, the DDI in our institution was under 30 minutes for all patients who needed a crash caesarean delivery. Both general anesthesia and extension of existing epidural block were acceptable modes of anesthesia for crash caesarean section with no significantly delay when the latter was used.

|                          | General anesthesia (n=71) | Epidural anesthesia (n=9) |
|--------------------------|---------------------------|---------------------------|
| Decision to anesthesia interval (min) | 3.6±2.1                  | 3.2±0.8                   |
| Decision to incision interval (min)    | 5.1±2.4                  | 5.7±1.1                   |
| Decision to delivery interval (min)     | 7.6±2.9                  | 8.3±2.2                   |
| Cord pH                           | 7.23±0.1                 | 7.22±0.06                 |
| Hypotension                       | 6/71 (8.5)               | 2/9 (22.2)                |
| Difficult airway                 | 1/71 (1.4)               | 0/9 (0)                   |

Table 1: Type of anesthesia for crash caesarean section over one year period in KKH

Data presented as mean±SD or proportions (%). No significant difference detected.