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Abstracts of free papers presented at the annual meeting of the Obstetric Anaesthetists' Association, Belfast, 15 & 16 May 2008

(The presenter is underlined)

ORAL PRESENTATIONS

- O01** Does a 30° head-up position in term parturients increase functional residual capacity? Implications for general anaesthesia S5
R Hignett, R Fernando, A McGlennan, S McDonald, A Stewart, M Columb, T Adamou, P Dilworth
- O02** Estimation of blood haemoglobin concentration using the HemoCue® during caesarean section: the effect of sampling site S5
NA Richards, H Boyce, SM Yentis
- O03** Starvation before elective caesarean section causes significant changes in haemoglobin levels S6
M King, I Wrench, A Gupta
- O04** White cell counts in pregnancy in labouring and non-labouring mothers: reference values S6
R Sivasankar, A Kumar, R Baraz, RE Collis
- O05** Prevention of heat loss during caesarean section S7
LV McAuley, BH Heidemann
- O06** Intra-operative fluid warming in elective caesarean section: a blinded, randomised controlled trial S7
M Woolnough, J Allam, C Hemingway, M Cox, SM Yentis
- O07** Epidural analgesia, maternal temperature and IL-6 levels in labour: a pilot study S8
NA Richards, ZS Maharaullee, SM Yentis, PJ Steer
- O08** Effects and mechanisms of action of sildenafil in the fetoplacental circulation S8
C Maharaj, T Lynch, J Jarman, BD Higgins, N Flynn, JJ Morrisson, JG Laffey
- O09** The use of fibrinogen concentrate to rapidly correct hypofibrinogenaemia during obstetric haemorrhage S9
S Bell, PW Collins, RE Collis
- O10** Dose-dependent effects of phenylephrine for elective caesarean section under spinal anaesthesia: implications for the compromised fetus? S9
A Stewart, R Fernando, S McDonald, R Hignett, T Jones, M Columb, R Abdul-Kadir
- O11** Estimates of maternal risks of pregnancy for women with hereditary haemorrhagic telangiectasia: suggested approach for obstetric anaesthetic services S10
V Sodhi, B Lambert, A McCarthy, P Lasjaunias, J Jackson, M Sheppard, C Shovlin
- O12** Audit of remifentanyl PCA in 612 labouring women S10
P Hodgkinson, D Hughes
- O13** Does BMI influence degree of pelvic tilt produced by a wedge? S11
RL Hodgson, SM Kinsella, NL Harvey
- O14** Obstetric early warning scoring systems: an OAA-approved national postal survey S11
RDJ Swanton, S Al-Rawi, MYK Wee
- O15** Identifying high risk obstetric anaesthetic patients: a survey of UK practice S12
J Sivaprakasam, M Purva, I F Russell
- O16** Informed consent for epidural analgesia in labour: an OAA-approved national survey S12
J Middle, M Wee

POSTER PRESENTATIONS

- P01** Pain catastrophizing score and outcomes in labour S13
J Humphreys, I Lieberman, S Maguire, M Columb
- P02** Why are epidurals requested but not performed? S13
K Simpson, S Young, T Duggan
- P03** Inadvertent intravascular injection of epidural drugs in obstetrics S14
J Hodge, D Milne, M Dresner
- P04** Cardiac arrest following 15 mL of a low-dose mixture (0.1% levobupivacaine and 2 µg/mL fentanyl) for epidural top-up on a labour ward S14
E Denison Davies, D Radhakrishnan
- P05** A survey of fetal monitoring while establishing regional or general anaesthesia for caesarean section S15
E Fajemirokun, L Bandara, G O'Sullivan
- P06** Audit of intrauterine resuscitation measures in patients requiring category-1 caesarean section S15
E Vermani, CCA Smyth, S Mallaiah
- P07** Does the use of a lower lumbar interspace affect the quality of spinal anaesthesia for elective caesarean section? S16
JC Marriott, C Persad, PAS Moore

P08	A survey of anaesthetic practice for laser ablation in twin-twin transfusion in a tertiary obstetric unit <u>Y Poonawala</u> , C Persad, K Hasan	S16
P09	The use of early warning physiological scoring systems following caesarean section <u>G Browne</u> , D McAtamney, M Rogan	S17
P10	Variation in cerebral blood flow parameters during roll-over test as a predictor of preeclampsia <u>E Shifman</u> , A Ivshin, E Gumenuk, S Floka, Y Ermilov	S17
P11	Visual estimation of blood loss by staff on the maternity unit: audit and re-audit following an educational intervention N Love, <u>H Edgcombe</u> , P Walsh, S O'Neill, R Lovegrove, J Bird	S18
P12	Does accurate measurement of blood loss at caesarean section enable prediction of the postoperative fall in blood haemoglobin levels? A Gupta, <u>IJ Wrench</u> , MJ Feast, JD Alderson	S18
P13	Too pale to patch: does plasma haemoglobin concentration affect first-time success rate of epidural blood patches? <u>AM Hards</u> , IJ Wrench	S19
P14	Maternal knowledge of the risks of general anaesthesia in obstetrics <u>K Gough</u> , A Natarajan, PN Robinson, DN Lucas	S19
P15	Impact of the midwifery-led unit on provision of anaesthetic service in a large obstetric unit <u>R Baraz</u> , S Morris, R E Collis	S20
P16	Competencies of anaesthetic trainees on call for the labour ward <u>S Wray</u> , A Khader, H Bojahr, R Sashidharan	S20
P17	Obstetric anaesthesia in Belgium: the first nationwide survey of current practice <u>E Petre</u> , D Dylst, E Vandermeersch, M Van de Velde	S21
P18	Survey of trainee views on obstetric anaesthesia <u>P Tilakaratna</u> , B Krishnachetty, H Bojahr	S21
P19	An audit of medical staff awareness of the use and availability of Intralipid 20% according to recent AAGBI guidelines <u>S Thomas</u> , R Bajekal	S22
P20	An audit of awareness and the management of local anaesthetic toxicity using Intralipid in the delivery suite <u>J Dougherty</u> , N Syed, R Leighton	S22
P21	Audit of anaesthetist involvement in the maintenance of labour epidurals comparing continuous infusion with patient-controlled epidural analgesia <u>A Jenkins</u> , S Millar, CS Urquhart	S23
P22	Audit of maternal satisfaction, total drug doses, workload, obstetric and neonatal outcome following introduction of patient-controlled epidural analgesia C Barker, <u>S C Rowell</u> , J V Wilkinson, G Peters, J Collie	S23
P23	Use of analgesia by primiparous women during labour: correlation with antenatal class attendance <u>J Dolan</u> , S Young, J Kinsella	S24
P24	Anticipated and perceived pain scores in primiparous patients undergoing induction of labour: the influence of antenatal class attendance <u>J Dolan</u> , S Young, J Kinsella	S24
P25	Pain relief in the second stage of labour: room for improvement? <u>S Rathinam</u> , P Tilakaratna, F Plaat	S25
P26	Perineal pain after traumatic or instrumental vaginal delivery: an audit cycle <u>J Geoghegan</u> , P Snell, PAS Moore	S25
P27	National survey of the management of inadvertent epidural catheter disconnection in labour J Dedhia, E Hart, N Hickman, <u>S Jakkumpudi</u>	S26
P28	Epidural needle sizes in the UK and rest of the world <u>T Katawala</u> , SM Yentis	S26
P29	National postal survey of methods used to ensure asepsis whilst performing regional analgesia and anaesthesia in obstetrics <u>M Naik</u> , C Mannakkara, N Aravindhan	S27
P30	Infective markers and neuraxial blockade in the obstetric population: a postal survey <u>D Thorp-Jones</u> , RE Collis	S27
P31	Audit of perception and application of 15° left lateral table tilt for obstetric anaesthesia <u>A Combeer</u> , S Hawksley	S28
P32	It's leaning <i>how</i> much? <u>C Dowse</u> , SM Kinsella	S28
P33	Conversion and taps: the performance of a separate-space technique for elective caesarean section <u>J Linsell</u> , G Lyons	S29
P34	Paraesthesia or dysaesthesia accompanying dural puncture when performing combined spinal epidural (CSE) analgesia <u>T Lynch</u> , A Van den Berg, M Lone, K Rasheed, C Roche, T O Connor	S29

P35	Preparation times for pH-adjusted lidocaine/adrenaline epidural top-up mixture	S30
	<u>C Hemingway</u> , M Woolnough, N Richards, S Yentis	
P36	Record keeping for caesarean sections: a re-audit	S30
	<u>P Gorton</u> , I F Russell, M Purva, J Holland	
P37	Audit of transfer times to theatre after introducing an emergency caesarean section pathway	S31
	<u>J Sanders</u> , L Woodward, R Taylor, H Swales	
P38	Urgency of caesarean section categories: do we know what we are aiming for?	S31
	<u>H Akerman</u> , EM Read, J Eldridge	
P39	Conversion from regional to general anaesthesia for emergency and elective caesarean section	S32
	<u>PJW Reide</u> , J Durbridge, SM Yentis	
P40	General anaesthesia rate for caesarean sections and variation among the ethnic minority: audit over 12 months	S32
	<u>J Joseph</u> , C Laxton	
P41	Failed or difficult intubations and training opportunities for caesarean section under general anaesthesia: annual audit and re-audit	S33
	<u>I Ahmed</u> , V Patel, N Hickman	
P42	Using audit as a tool to redesign an anaesthetic chart	S33
	C Dowse, S Napier, D Seddon, NL Harvey	
P43	Uterine exteriorisation at caesarean section: a completed audit cycle	S34
	<u>M Georghiou</u> , CR Bedson, F Plaat	
P44	Audit of recovery standards for obstetric patients in five maternity units in the West of Scotland	S34
	C Barker, <u>J V Wilkinson</u> , S C Rowell, R O'Connor	
P45	Use of a high dependency unit on delivery suite	S35
	<u>A Kelkar</u> , E Hart	
P46	Introduction of transversus abdominis plane block for post caesarean section analgesia: a substitute or a supplement to patient-controlled opioids?	S35
	<u>FJ Emerantia Jacintha</u> , C Stewart, RJ Vickers	
P47	Postoperative patient-controlled analgesia monitoring: the thin end of the wedge?	S36
	<u>G Peters</u> , S Martin, C Barker, J Reid	
P48	An audit of self-medicated postoperative analgesic requirements after elective caesarean section comparing intrathecal fentanyl and diamorphine	S36
	C Ingram, <u>I Suri</u>	
P49	Working practices and theatre staffing of maternity units in England with 3000 to 5000 deliveries per year	S37
	<u>NA Mathew</u> , R Mohan, GS Chandan, CJDe Klerk	
P50	Obesity in obstetrics: an audit on the obesity alert system and patients' intrapartum course	S37
	<u>M Mok</u> , V Clark	
P51	Impact of increasing maternal obesity on anaesthetic service provision from 1998 to 2006	S38
	<u>R Vennila</u> , P Barclay	
P52	Prospective audit of the impact of obesity in an elective caesarean section population	S38
	<u>T Duggan</u> , A Simpson, R Ray	
P53	Saving Mothers' Lives: is CEMACH reaching the right people?	S39
	<u>A Moore-Gwyn</u> , SM Yentis, J Durbridge	
P54	Thromboembolism risk assessment: are we complacent?	S39
	<u>B Krishnachetty</u> , D S Sethi, R Sashidharan	
P55	Severe obstetric morbidity and the value of modified early obstetric warning scores	S40
	<u>S Wray</u> , P Ramanathan, M Jagadeesan, R Sashidharan	
P56	Estimate of incidence of cardiac disease in our obstetric population and retrospective audit of antenatal and intrapartum management of women with significant cardiac disease	S40
	<u>P Mackie</u> , S Pilkington, A Harris, S Walker	
P57	Central venous catheter insertion in the labour suite: ultrasound guided, or landmark technique?	S41
	<u>R Kearns</u> , S Young, E McGrady	
P58	Role of transoesophageal echocardiography and ventricular resynchronisation in perioperative management of severe peripartum cardiomyopathy	S41
	<u>A Ahmed-Nusrath</u> , S Francis, J Swanevelde	
P59	Anaesthesia for caesarean section in patients with Klippel-Feil syndrome: report of two cases	S42
	<u>A Ahmed-Nusrath</u> , A Kelkar, S Francis, M Mushambi	
P60	Uncorrected coarctation of the descending aorta in pregnancy complicated by preeclampsia: a case report	S42
	<u>H du Plessis</u> , G Peters, F Bryden	
P61	Life-threatening airway obstruction in an obstetric patient presenting to a non-obstetric acute hospital	S43
	<u>S Z Ali</u> , J Lynch, J Thompson, A Fahy	
P62	Postural orthostatic tachycardia syndrome in the puerperium : case report	S43
	<u>T Gough</u> , S Philip, D Radhakrishnan	

P63	Social demographics of non-English speaking parturients <u>J Dolan</u> , S Young, J Kinsella	S44
P64	Ethnic minority and teenage mothers: how informed are they about epidural associated risks? <u>I Ahmed</u> , P Slater, E Atoia, M Mushambi	S44
P65	Access to antenatal education in a multicultural inner city setting <u>P Babb</u> , H Bojahr	S45
P66	Trainees' experience starting obstetric anaesthesia on call <u>LC McGhee</u> , AM Holtham, D Mayne	S45
P67	Multidisciplinary team training: a high fidelity medical simulator for the delivery unit <u>A Surendran</u> , R Tandon, J McDougall	S46
P68	Big push to big units: Liverpool experience to 2007 <u>E Vermani</u> , T Wauchob	S46
P69	National survey of support and counselling after maternal death <u>S McCready</u> , R Russell	S47
P70	Practice of red blood cell transfusion in the immediate peripartum period on labour ward FN Fombon, <u>A Kelkar</u> , H Brooks	S47
P71	Is it practical to have a cell saver in the maternity theatre in a district general hospital? <u>SJ Mercer</u>	S48
P72	Estimating blood loss in caesarean sections: a guide to cell salvage? <u>A Surendran</u> , C Walsh, J Bamber	S48
P73	Investing in intra-operative cell salvage: experience of a Bristol teaching hospital <u>C Dowse</u> , I Gardner, C Laxton, M Scrutton	S49
P74	Introduction of cell salvage to a large obstetric unit: the first six months <u>R Broadley</u> , M King, I Wrench, R Spray, A Galimberti	S49
P75	Introducing cell salvage in obstetric practice: the first year's experience <u>A Dharmarajah</u> , R Bedson, F Plaat, W McSporrán	S50
P76	Effect of μ-OR A118G polymorphism on ED50 of epidural sufentanil <u>M Camorcia</u> , C Berritta, S Stirparo, A Farcomeni, G Capogna, R Landau, JL Blouin	S50
P77	Addition of small doses of morphine to intrathecal labor analgesia: a randomized controlled dose-finding study <u>A Hein</u> , P Rösblad, M Norman, B Tingåker, S Ryniak, G Dahlgren	S51
P78	Impact of introduction of remifentanil PCA for labour analgesia on epidural rate and obstetric outcome over a two-year period <u>N Gupta</u> , D Hill, D Hughes, N Wallace	S51
P79	Remifentanil is safe and effective for patient-controlled intravenous analgesia during labour: the results in 305 parturients <u>J Harbers</u> , A Drogtop, R van Ieperen	S52
P80	NHS Litigation Authority claims associated with caesarean sections <u>K Ashpole</u> , SM Yentis, S Scott, R Mihai, TM Cook	S52
P81	An audit of itch following intrathecal diamorphine for caesarean section <u>L Baird</u> , T Dunn	S53
P82	A prospective, double blinded randomised controlled trial of ephedrine infusions and ephedrine boluses during spinal anaesthesia for caesarean section <u>O Boswell</u> , J Eldridge, I Taylor, V Tucker	S53
P83	Regional survey of antibiotic prophylaxis for caesarean section <u>SP Singh</u> , UR Bapat, SP Rhodes	S54
P84	National survey of current UK practice for the preparation and storage of anaesthetic drugs for obstetric emergencies <u>J Stone</u> , L Fenner, T Christmas, B Maxwell	S54
P85	Frequency of regional anaesthesia in obstetric surgery: a one-year audit <u>V Kandic</u> , LJ Pejakov, G Marijanovic, N Trinic	S55
P86	A survey of anaesthetic management of category-1 caesarean sections <u>SM Kinsella</u> , B Walton, R Sashidharan, T Draycott	S55
P87	Why 100 mg of suxamethonium? <u>T Kathirgamanathan</u>	S56
P88	ROTEM® thromboelastometry and reference ranges in the third trimester of pregnancy <u>K Ashpole</u> , R Fernando, R Simons, M Columb	S56
P89	Uterine artery embolization in the operating theatre for severe postpartum haemorrhage <u>DP Giudicelli</u> , Ph Robert, S Ronze, V Julien, O Rondelet	S57
P90	Anaesthesia for parturients with mechanical heart valves: a case series <u>P Ramasamy</u> , K Von Klempner, F Walker, R Bell	S57
P91	Massive pulmonary thromboembolism in pregnancy: a case report <u>M Bartimeus</u> , T Allnatt, M Razzaque, H Bojahr	S58
P92	A prospective national study of acute fatty liver of pregnancy in the UK M Knight, <u>S Yentis</u> on behalf of UKOSS	S58

O01 Does a 30° head-up position in term parturients increase functional residual capacity?

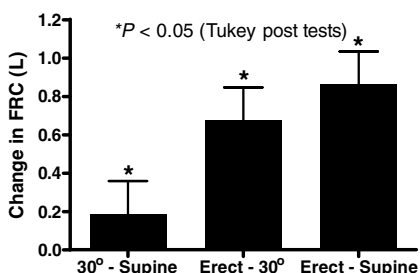
Implications for general anaesthesia

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Introduction: The triennial CEMACH reports consistently document direct anaesthetic deaths due to failed airway management when performing rapid sequence induction (RSI). Increased functional residual capacity (FRC) enhances oxygen reserves. It follows that a 30° head-up position may confer a safety benefit by increasing FRC. The aim was to conduct a crossover study to test the hypothesis that a 30° head-up position compared with supine, will significantly increase FRC.

Methods: After ethics approval, 22 term ASA 1 and 2 singleton parturients were studied. Factors influencing respiratory function were excluded including smoking, preeclampsia, booking BMI > 35 kg/m². FEV₁ and FVC were initially measured to exclude undiagnosed respiratory disease. Two values for FRC within 10% were obtained by helium dilution in the supine wedged, 30° head-up and sitting erect positions. Position order was randomised. Analyses included repeated measures ANOVA with Tukey-Kramer post-tests ($P < 0.05$).

Results: Complete data from 20 women, aged 32.1 years (SD 5.5) and height 164.2 cm (SD 6.5), were analysed. FRC varied significantly ($P < 0.0001$) with positions (Figure) and significantly ($P < 0.05$) increased from the supine to the 30° head-up position by 188 mL (95% CI 17 – 358).



Conclusion: O₂ consumption at rest in term parturients has been measured as 293-331 mL/min.¹ Our findings of an increase in FRC of 12.5% (188 mL) from the supine to 30° head-up position may provide additional time (at least 30 s perhaps) in which to secure the airway in term parturients undergoing RSI, before the onset of hypoxaemia. View at laryngoscopy may also be improved in this position.²

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2. Lee BJ, Kang JM, Kim DO. Laryngeal exposure during laryngoscopy is better in the 25° back-up position than in the supine position. *Br J Anaesth* 2007; 99: 581-6.

O02 Estimation of blood haemoglobin concentration using the HemoCue® during caesarean section: the effect of sampling site

NA Richards, H Boyce, SM Yentis

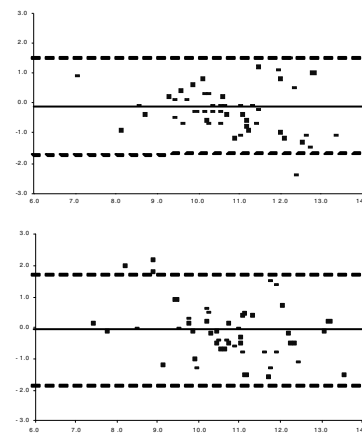
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Introduction: Haemoglobin concentration ([Hb]) measured using the HemoCue® is accurate for capillary and venous/arterial blood, provided the recommended sampling method is strictly observed.^{1,2} Yau *et al.*³ found that venous sample analysis using the HemoCue was useful during caesarean section (CS), but a capillary sample is often easier. The toe might be preferred to the thumb since it is numb during regional anaesthesia, but whether sampling at either site is accurate in this situation, given the cardiovascular effects of anaesthesia and/or pregnancy, is not known. We aimed to compare [Hb] values measured in venous and capillary samples (toe and thumb) during CS under regional anaesthesia.

Method: With ethics approval and written consent, 50 healthy women having CS under spinal/CSE anaesthesia were included. At the end of surgery, the great toe and thumb (non-i.v. fluid side) were lanced as recommended for a HemoCue reading. A venous blood sample was also taken and sent for formal [Hb] measurement (LAB) and also tested with the HemoCue. Bland-Altman analysis was applied to the [Hb] values.

Results: Bias (mean difference) and precision ($\pm 2SD$) were respectively 0.2 and (± 1.6) for LAB v. toe, 0.1 and (± 1.8) for LAB v. thumb (Figure), and 0.2 ± 1.6 LAB v. venous (not shown).¹

Figure. Bland-Altman plots of LAB v. toe (top) and LAB v. thumb (bottom) [Hb] measurements. The solid line indicates the mean difference (bias) and the dotted lines the precision (2SD)



Discussion: Our results confirm those of Yau *et al.*,³ that the HemoCue is accurate during CS when used with venous samples. Further, we conclude there is no compromise in accuracy if the thumb or anaesthetised toe is used for providing a capillary sample.

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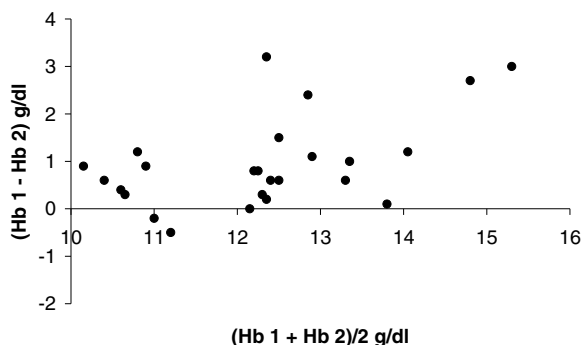
O03 Starvation before elective caesarean section causes significant changes in haemoglobin levels

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Introduction: Starvation for periods of 24 hours significantly increases haematocrit and blood viscosity.¹ We analysed data from a recent study in our unit² to see whether the short period of fasting before elective caesarean section resulted in significant haemo-concentration.

Methods: Thirty parturients presenting for elective caesarean section were recruited into an ethically approved study to assess the utility of the HemoCue® to measure haemoglobin levels in suction fluid in theatre. The HemoCue® system has been shown to be comparable in accuracy to laboratory measurement of haemoglobin concentration.³ Fasting was from midnight for morning surgery and 0600 for the afternoon. Venous haemoglobin levels were estimated by laboratory assay the day before and by HemoCue® on the day of surgery.

Results: The mean (SD) haemoglobin level was found to be on 1.05 (1) g/dL higher (range -0.5 to 3.5 g/dL) on the day of surgery than the preceding day ($P = 0.02$). Figure 1 represents the data as a Bland and Altman plot where Hb1 is the value on the day of surgery and Hb2 the day before.



Conclusion: Venous haemoglobin concentrations are significantly raised by preoperative starvation.

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O04 White cell counts in pregnancy in labouring and non-labouring mothers: reference values

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Introduction: Leucocytosis is common in pregnancy¹ and in labouring mothers and raises doubts about infection. Mothers may be denied epidural labour analgesia based on leucocytosis, so the presence of a reference range would help to clarify this issue.

Method: Following approval from the clinical audit department, the white cell counts (WCC) of 1000 mothers were analysed retrospectively; 500 had had blood taken the day before elective caesarean section (non-labouring) and 500 were in labour and had a routine blood count before epidural insertion. The WCC was not known before epidural insertion in the majority. The WCC at 12 and 32 weeks gestation for each mother was then found. The results were analysed using SPSS.

Results:

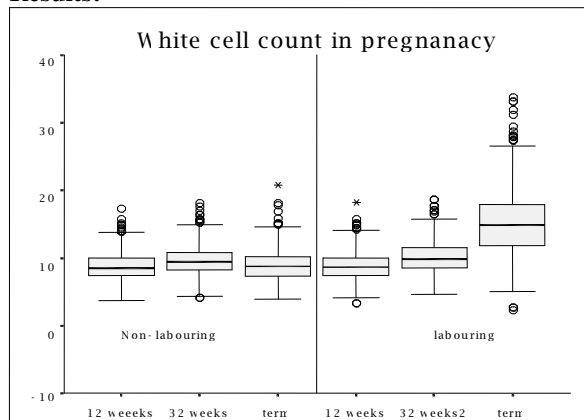


Figure: Median WCC; box: 25-75 interquartile range; whiskers 1.5 of interquartile range and outliers. The mean [standard deviation] WCC in the non-labouring group at 12, 32 weeks and term are 8.7[2], 9.6[2.1] and 8.9[2.2] $\times 10^9/L$ respectively, and in the labouring group 8.8[2.1], 10.1[2.4] and 15.3[5] $\times 10^9/L$ respectively; 15 labouring mothers had a WCC >2 SD from the mean and clinical notes were reviewed. In only one case was there suspicion of sepsis, but all cultures were negative.

Discussion: WCC increased in pregnancy, but not with gestation. The WCC increased considerably in labour. A laboratory reference range is given as 2SD around a population mean and the local WCC range is 4-10.5 $\times 10^9/L$. Our audit could be used as a reference range for pregnancy and labour. WCC values of 25 $\times 10^9/L$ or more without other signs of infection seem to be normal in our study population.

Reference

1. Edelstam G, Lowbeer C, Kral G, Gustafsson SA, Venge P. New reference values for routine blood samples and human neutrophilic lipocalin during third-trimester pregnancy. *Scan J Clin Lab Invest* 2001; 61: 583-92.

O05 Prevention of heat loss during caesarean section

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Introduction: Forty-eight percent of women undergoing elective caesarean section under spinal anaesthesia were found to become hypothermic ($<36^{\circ}\text{C}$).¹ This is primarily due to vasodilatation causing core-to-peripheral redistribution of body heat.² Hypothermia contributes to maternal morbidity. The objective of this study was to determine the efficacy of administering warmed i.v. fluids or using a forced warm air flow blanket (FWAFB) intraoperatively in preventing hypothermia.

Method: Following ethics committee approval and written consent, patients undergoing surgery under spinal anaesthesia were randomly allocated to one of three groups: group 1 (no intervention: control), group 2 (warmed i.v. fluids) or group 3 (FWAFB). The primary outcome variable was core body temperature measured with a tympanic thermometer. Morphometric and demographic characteristics were recorded for comparative purposes. Fisher's exact test was used testing for significant difference between the groups in the incidence of hypothermia. Other variables were analysed by ANOVA or underwent descriptive statistics.

Results: Hypothermia: control: 42%, FWAFB: 40%, warmed i.v. fluids: 17%. There is a clear trend, but statistical significance was not reached ($P < 0.43$).

Mean maximum temperature drop: 1.25°C (SD 0.5) FWAFB compared to 1°C in both the warmed fluids group (SD 0.5) and in the control group (SD 0.7).

Conclusion: The use of warmed i.v. fluids intraoperatively is the most effective method of preventing hypothermia in elective caesarean section. Using a FWAFB conferred no advantage over not actively preserving heat.

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2. Matsukawa T, Sessler DI, Christensen R, et al. Heat flow and distribution during epidural anesthesia. *Anesthesiology* 1995; 83: 961-7.

O06 Intra-operative fluid warming in elective caesarean section: a blinded, randomised controlled trial

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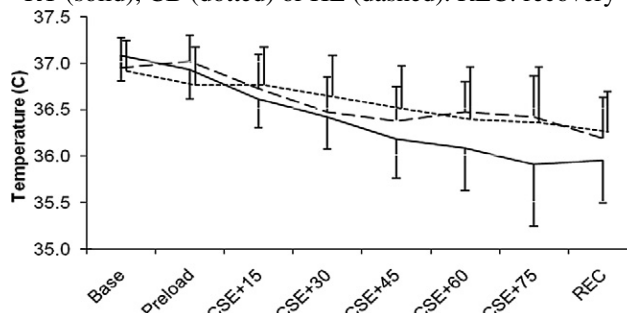
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Introduction: Intra-operative warming is routine for many operations but not caesarean section (CS), though it may reduce shivering and/or temperature drop during CS under epidural anaesthesia.^{1,2} We assessed the effect of warming i.v. fluids during elective CS under CSE.

Method: With REC approval and written consent, 75 women having elective CS were randomly assigned to receive all i.v. fluids at room temperature (RT), or heated in a cabinet set at 45°C (CB) or Hotline® fluid warmer (HL). After 10-mL/kg crystalloid preload, a CSE was performed (0.5% heavy bupivacaine 2.2-2.5 mL + diamorphine 300-400 μg). A blinded assessor recorded core and ambient temperatures, thermal comfort and shivering. Sample size was based on power analysis, with primary outcome core temperature at 60 min. $P < 0.05$ indicated significance.

Results: Patients' characteristics were similar and ambient temperature and humidity constant for any individual. Mean \pm SD volume of i.v. fluid given was also similar (1.9 \pm 0.5 L in RT, 2.1 \pm 0.6 L in CB and 2.0 \pm 0.9 L in HL). Maternal temperature fell in all groups but the drop was greatest in group RT ($P = 0.015$; Fig.). More women felt cold in group RT (8 (32%); CB 3 (12%); HL 1 (4%); $P = 0.02$) but the incidence of shivering was similar (11 (44%), 9 (36%) and 7 (28%) respectively). Apgar scores and cord gases were similar.

Figure. Mean (SD) core temperature vs. time in groups RT (solid), CB (dotted) or HL (dashed). REC: recovery



Discussion: We found that warming i.v. fluids reduces the fall in maternal temperature and improves thermal comfort but does not affect shivering. Warming i.v. fluids should be considered in elective CS, especially for longer cases, but using pre-warmed fluids is as efficient as (and cheaper than) using a Hotline.

Acknowledgement: Hotline sets were kindly provided by Smiths Medical International Ltd.

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O07 Epidural analgesia, maternal temperature and IL-6 levels in labour: a pilot study

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Introduction: Epidural analgesia in labour is associated with a rise in maternal and fetal temperature,¹ although the mechanism is unclear. One hypothesis is that the epidural causes an inflammatory response since the temperature increase is associated with a rise in IL-6 levels.² Another theory is that there is increased heat production from the contracting uterus and reduced heat loss due to reduced sweating and panting secondary to the epidural, in which case the IL-6 increase may be a secondary response to this. Our aim was to investigate the association between the rise in IL-6, the increase in maternal temperature, and epidural analgesia in labour.

Method: After ethics committee approval and written consent, 30 women in labour with epidural analgesia were randomly assigned to: (i) standard care, (ii) cooling with wet towels and a fan or (iii) as for (ii) plus a neck warmer (previous unpublished work in this unit suggested that neck coolers resulted in a paradoxical increase in women's temperature, possibly via a central thermogenic response to cool blood perfusing the hypothalamus; bespoke neck warmers were thus investigated in this study for the reverse response). Hourly oral temperatures were recorded and blood samples taken at epidural insertion and delivery for IL-6 levels. Sample size was according to power analysis based on previous studies with the IL-6 response the primary outcome. Regression analysis was performed using SPSS.

Results: Mean (SD) maternal temperature rose by 0.69 (0.69)°C, 0.73 (0.40)°C and 0.44 (0.43)°C in groups i to iii respectively ($P > 0.05$). Temperature and maternal log IL-6 values at delivery were correlated for all the groups (r^2 0.194). Allowing for the rise in temperature, there was no significant additional correlation between duration of epidural and maternal log IL-6 values.

Discussion: Our findings are consistent with the hypothesis that the increase in IL-6 levels is secondary to the rise in temperature, and do not support the hypothesis that epidural analgesia initiates an inflammatory process. Although not significant, the neck warmer group showed the lowest rise in maternal temperature. Since the study was not powered to investigate this outcome, further work is required to investigate the efficacy of the neck warmer as a possible adjunct to peripheral cooling methods.

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O08 Effects and mechanisms of action of sildenafil in the feto-placental circulation

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Introduction: Sildenafil is an effective treatment for pulmonary arterial hypertension (PAH), and is increasingly used for PAH in pregnancy, a condition with a 50-60% maternal mortality and very poor fetal outcome.¹ The effect of sildenafil on the feto-placental circulation is not known. This study examined the effects and mechanisms of action of sildenafil, in isolated human chorionic plate arterial rings.

Method: Following IRB approval, quadruplicate *ex vivo* human second generation chorionic plate arterial rings, biopsied from placentae after cesarean section or vaginal delivery, following healthy pregnancies, were used in all experiments. *Series I* examined the effects of sildenafil in rings pre-constricted with the thromboxane analogue U46619. *Series II* examined the potential for methylene blue, a direct cGMP inhibitor, to attenuate the vasodilation produced by sildenafil. *Series IIIa and b* determined whether the cGMP-dependent protein kinase blocker, Rp-8-Br-PET-cGMPS (3µM and 30µM respectively), attenuated the vasodilation produced by sildenafil. *Series IV* examined the potential for L-NAME, a non-specific nitric oxide synthase inhibitor, to attenuate the vasodilation produced by sildenafil. *Series V* examined the potential for sildenafil vasodilation to be mediated via alterations in NO sensitivity.

Results: Sildenafil produced dose-dependent vasodilatation of pre-constricted human chorionic plate arterial rings at concentrations $> 1 \times 10^{-8}$ M. Both methylene blue and Rp-8-Br-PET-cGMPS 30 µM significantly attenuated the vasodilation produced by sildenafil. Inhibition of NO production via blockade of nitric oxide synthase, using L-NAME, did not attenuate the vasodilator effects of sevoflurane. Sildenafil significantly enhanced the vasodilation produced by sodium nitroprusside, indicating that it increased vascular responsiveness to NO.

Discussion: Sildenafil is a vasodilator in the fetal-placental circulation. These findings may indicate a role for sildenafil in augmenting feto-placental blood flow in the setting of placental vascular insufficiency.

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O09 The use of fibrinogen concentrate to rapidly correct hypofibrinogenaemia during obstetric haemorrhage

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Introduction: Severe haemorrhage is a common complication of childbirth and is often associated with low fibrinogen levels. Fibrinogen concentrate reduces blood loss in animal models¹ and increases clot strength in volunteers.² Four cases of severe haemorrhage associated with hypofibrinogenaemia were treated in conjunction with modest doses of platelets and fresh frozen plasma (FFP). Clotting was rapidly normalised and severe haemorrhage controlled.

Cases: Three cases were associated with major abruption and intrauterine death. Fibrinogen levels were <0.5, 0.5 and 0.7 g/L with platelets <100×10⁹/L and increased aPTT, signifying DIC. In each case 2 g of fibrinogen concentrate were given combined with 4 units of FFP and 1 unit of platelets. In the second case a further 1 g of fibrinogen concentrate was infused. Blood loss was between 3 and 4 L and 4-6 units of blood were required. Fibrinogen levels rapidly increased to 1.6, 1.4 and 1.0. In conjunction with uterotonics and in one case a balloon tamponade, severe on-going haemorrhage was controlled.

In case 4, haemorrhage was due to uterine atony. Coagulopathy was dilutional and 3 g of fibrinogen concentrate, 4 units of FFP, 3 units of platelets and 8 units of blood reduced her APTT from 55 to 35 and fibrinogen levels increased from 1 to 1.7. Her condition stabilized at this point and she underwent uterine artery embolization. Later in the day she re-bled despite normal clotting and insertion of a balloon tamponade. Fibrinogen concentrate 2 g and rFVIIa 2.4 mg controlled the bleeding and prevented a hysterectomy.

Discussion: There are no previous reports of fibrinogen concentrate use in the obstetric literature and very few examples in general. Adequate fibrinogen is essential in the formation of stable clot and frequently remains low despite large volumes of FFP because of the relative paucity of fibrinogen in this product (0.15 g/unit). rFVIIa is ineffective if fibrinogen levels are low. The infusion of this small volume product rapidly corrects hypofibrinogenaemia and enables the other coagulation products to produce an effective clot.

Conclusion: Although anecdotal, these cases suggest that this product can be effective in controlling severe haemorrhage caused by hypofibrinogenaemia.

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O10 Dose-dependent effects of phenylephrine for elective caesarean section under spinal anaesthesia: implications for the compromised fetus?

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Introduction: Hypotension requiring vasopressors is frequent after spinal anaesthesia for caesarean section (CS). Various concentrations of phenylephrine (P) infusions have been used to improve maternal cardiovascular stability.¹ To investigate any dose-dependent effects of P on the mother and fetus, we compared three infusion regimens.

Method: In this randomized, double-blind study, 75 elective CS patients received 25-, 50- or 100-µg/min infusion of P to maintain maternal systolic blood pressure (SBP) until delivery after a standardised subarachnoid block (SAB). Heart rate (HR) and SBP were recorded every minute. A suprasternal Doppler monitor (SupraQ®) measured cardiac output (CO), stroke volume (SV) and other parameters, at baseline, and every 5 min for 20 min following SAB. Fetal cord blood gases measured fetal outcome. Analyses included ANCOVA, linear trend and Tukey post-tests ($P<0.05$).

Results: Patient data and cord gases were similar. Group 100 achieved SBP control closer to baseline, but required a significantly higher dose of P. SBP control was satisfactory in all groups. There were significant time- and dose-dependent reductions with P in HR and CO. SV remained stable throughout ($CO=HR\times SV$).

Group		Baseline	5 min	10 min	15 min	20 min
25 µg/mL (n=25)	CO (L/min)	5.1* (0.97)	5.4* (1.21)	4.7* (1.28)	4.7* (1.58)	4.8* [^] (1.29)
	HR (bpm)	78.58* (16.24)	82.2* (25.98)	72.0* (16.82)	72.0* (17.87)	70.6* [^] (14.08)
50 µg/min (n=25)	CO (L/min)	4.6* (0.80)	4.6* (1.18)	4.4* (1.36)	3.9* (1.11)	4.2* [^] (1.24)
	HR (bpm)	76.5* (13.06)	75.1* (17.88)	71.2* (17.82)	64.1* (10.24)	64.9* [^] (13.43)
100 µg/min (n=25)	CO (L/min)	5.1* (0.96)	5.0* (1.11)	4.3* (0.96)	4.2* (0.97)	4.0* [^] (0.82)
	HR (bpm)	79.6* (14.11)	71.1* (16.35)	63.9* (13.78)	62.5* (12.82)	58.1* [^] (8.27)

Data are mean (SD). * $P<0.05$ (linear trend fall with time within groups). [^] $P<0.05$ (linear trend with dose-dependency between groups)

Conclusion: As expected there were decreases in HR and CO with time. However, we also demonstrated a dose-dependent reduction in HR and CO, significant at 20 min, when CO and HR had fallen by more than 20% from baseline with 100 µg/min. Although no adverse outcomes were seen in our study of healthy subjects, this degree of reduction in maternal CO could have profound detrimental effects on the compromised fetus.

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O11 Estimates of maternal risks of pregnancy for women with hereditary haemorrhagic telangiectasia: suggested approach for obstetric anaesthetic services

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Introduction: Hereditary haemorrhagic telangiectasia (HHT) affects 1 in 5-8000 individuals and is associated with arteriovenous malformations (AVMs).¹ A recent study conducted at our institution, a tertiary referral centre for HHT, aimed to estimate rates and types of major complications of HHT in pregnancy, to guide management decisions.

Method: Outcomes of 262 pregnancies in 111 women with HHT and pulmonary AVMs (PAVMs), and 222 pregnancies in 86 HHT-affected first degree relatives were analysed. The main outcome measures were maternal death, haemoptysis, haemothorax and stroke.

Results: 13 women experienced life-threatening PAVM bleeds, strokes or myocardial infarction in pregnancy: 1.02% (95% confidence intervals 0.13, 1.92%) of pregnancies resulted in a major PAVM bleed; 1.24% (0.25, 2.23%) in stroke (not all were HHT-related); 1.00% (0.13, 1.92%) in maternal death. All deaths occurred in women previously considered well. Prior awareness of HHT or PAVM diagnosis was associated with improved survival in women experiencing a life-threatening event ($P=0.041$, Fisher's exact test).

Conclusions: Most HHT pregnancies proceed uneventfully. Rare major complications and improved survival outcome following prior recognition, indicate that all HHT pregnancies should be considered high-risk.

Recommendations: From our experience with these cases we developed a consultant-lead, multidisciplinary management plan for pregnant women with HHT. Pre-pregnancy, all HHT-affected women are screened and treated for PAVMs. Any haemoptysis during pregnancy is a potential medical emergency requiring immediate hospital attendance and may need urgent embolisation. We perform spinal MRI in the 3rd trimester to exclude spinal AVMs and thus permit regional analgesia/anaesthesia (RA). Cerebral MRI is only performed in women with neurological symptoms/signs or a family history of cerebral haemorrhage. If RA is contraindicated and caesarean section is necessary, a modified induction of general anaesthesia is used to attenuate the hypertensive response to intubation. All patients are given antibiotic prophylaxis for vaginal or operative delivery.

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O12 Audit of remifentanil PCA in 612 labouring women

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Introduction: Remifentanil has been offered routinely as an option for labour analgesia at our hospital following a feasibility study.¹ The safety profile of remifentanil in labour has been evaluated in a study by Volikas et al. and found to have acceptable side-effect profile for mothers and minimal effects on the neonate.²

Method: The hospital audit and governance committee approved the audit. The midwife responsible for the parturient completed a standard questionnaire. We adopted the results from Volikas et al. as standards. Additional standards included no oversedation or desaturation, no increase in nausea, <20% incidence of non-reassuring fetal heart rate changes, median neonatal Apgar scores at 1 and 5 min of 9 and all Apgar scores >8 at 5 min. Following discussion, it was agreed that significant desaturation would be <90%.

Results: Data were collected from 612 labouring women using patient-controlled (PCA) remifentanil; 85% of mothers were either satisfied or very satisfied with it; 77.3% described analgesia as either no pain or bearable pain; 84.5% of parturients used Entonox with remifentanil; 17.7% desaturated to SpO₂ <90%, of which 97.2% required oxygen therapy. Five parturients (0.8%) had to have their remifentanil stopped prematurely for persistent desaturation despite oxygen therapy. Fetal adverse effects were minimal with 15.2% of CTGs non-reassuring; 80.5% of neonates had Apgar scores of 8-9 at 1 min and 96.8% had Apgar scores of 8-9 at 5 min. No neonates required naloxone.

Discussion: This audit demonstrates that maternal satisfaction with and analgesia from remifentanil PCA remains high. The incidence of desaturation is similar to that previously shown with PCA opioid in labour³ and may be due in part to the use of continuous pulse oximetry allowing greater detection of desaturation, and the relatively high usage of Entonox with remifentanil. Episodes of desaturation appeared independent of sedation score and in almost all cases were corrected with supplemental oxygen. These data show that remifentanil PCA is a safe analgesic modality in labour provided adequate monitoring and protocols are established.

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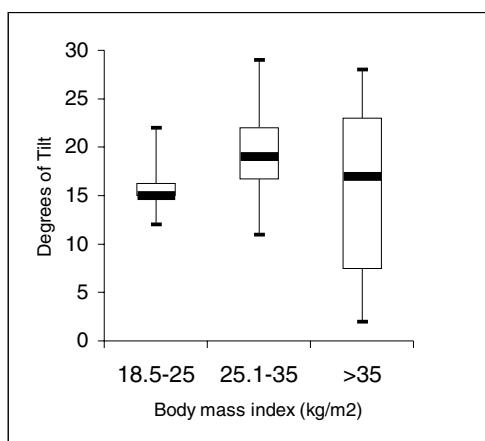
O13 Does BMI influence degree of pelvic tilt produced by a wedge?

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Introduction: The use of 15° tilt is standard practice when positioning a woman for caesarean section (CS). This may be performed by placing a wedge under her right hip. We investigated whether BMI affects the amount of pelvic tilt achieved when using a wedge.

Method: We recruited women due for category 3 or 4 CS at their preoperative anaesthetic visit. They were allocated to three groups according to their booking BMI (kg/m²): BMI 18.5-25, BMI 25.1-35 and BMI >35. Women were excluded if they booked later than the first trimester of pregnancy. Twenty women were recruited into each group. At CS, the pelvis was tilted using the wedge and the degree of pelvic tilt produced was measured using a protractor device.¹ Results were analysed using the Kruskal-Wallis test.

Results: Median, interquartile range and range are shown in the figure. There is a statistically significant difference between the median values (15, 19 and 17 respectively) of the three groups ($P=0.026$).



Discussion: The amount of pelvic tilt produced when using a wedge was most predictable in the BMI 18.5-25 group, suggesting that a wedge is a reliable alternative to table tilt. There was a broader range in the BMI 25.1-35 group, with a tendency for the women to be tilted more than the intended 15°, possibly due to the anatomical distribution of adipose tissue in this group. The BMI >35 group showed a wide range of tilt using the wedge. As it has been shown that BMI does not affect the tolerated left lateral tilt,² we suggest that table tilt is used for women with BMI >35 kg/m².

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O14 Obstetric early warning scoring systems: an OAA-approved national postal survey

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Introduction: Despite recommendations in the two most recent triennial CEMACH reports,^{1,2} and improvements in patient care using early warning systems (EWS) in the general adult population, no validated system currently exists for the obstetric population. Maternal peripartum deterioration manifests late due to initial compensation, and early recognition of problems is paramount. The physiological changes of pregnancy necessitate modification of EWS trigger values. We sought to obtain information about current practice and opinions regarding the value and implementability of a specific obstetric EWS in the UK.

Method: Following approval by the OAA, our questionnaire was sent to all 222 UK lead obstetric anaesthetists in November 2007. If a particular unit already runs an obstetric EWS they were encouraged to enclose details, and comments were welcomed from all.

Results: Response rate was 158/222 (71%), 26% of these were tertiary referral (TR) units, 74% were DGH units. Eight units (5%, 2 TR, 6 DGH) returned a copy of their obstetric-specific EWS, with varying degrees of modification of the non-obstetric EWS; 33% had an obstetric high dependency unit, although only half of these use any form of warning system. Median score for value of an obstetric EWS (range 0 not useful – 5 very useful) was 4/5, and 89% of units thought it would be possible to introduce a system. Although 96% of the hospitals already run an EWS for the non-obstetric population, only 26% thought this would be directly applicable to obstetric patients.

Discussion: It is a huge challenge to recognise and treat deteriorating parturients, particularly with a common wish not to overmedicalise the process. Overall there seems to be a desire amongst obstetric anaesthetists to introduce a system, and a feeling that it would be possible. For an obstetric EWS to be both sensitive and specific, it needs to incorporate triggers for sepsis, haemorrhage, thrombosis and hypertensive disease, whilst acknowledging the normal physiological changes of pregnancy, and must remain simple to use. Although it should not replace clinical intuition and multidisciplinary communication, it would provide increasingly inexperienced direct-entry midwives with a tool for seeking help. Those units who already use systems have not yet produced data on their efficacy, although the potential advantages of EWS in the general population are well documented.³ We have devised a possible system for universal consideration.

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O15 Identifying high risk obstetric anaesthetic patients: a survey of UK practice

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Introduction: We encounter an increasing number of high risk patients in obstetric anaesthesia practice. Patients need to be identified ante partum. The aim of this survey was to find out the different methods used to identify high risk obstetric patients in the UK and the methods used to disseminate this information to the medical and midwifery staff.

Method: This prospective survey was approved by the Obstetric Anaesthetists' Association (OAA— survey 70). Postal questionnaires were sent in April 2007 to the lead consultants of all the obstetric anaesthesia units in the UK listed with the OAA. The data was collected on the presence of a formal system of referral for “high risk” patients and the different methods that are used for referral, identification and documentation.

Results: A total of 229 questionnaires were posted and completed responses received from 173 units (response rate: 76%). Some 163 units (94%) had a formal system of identifying and referring “high risk” obstetric anaesthetic patients. Out of these 163 units, 61% had more than one system of referring high risk obstetric patients. The referral letter from the antenatal clinic was used most commonly (91%), followed by informal referral between colleagues (48%) and anaesthetic alert sticker (17%). Of the 163 units having a formal system of referral, 154 units (94%) routinely document anaesthetic management plans for these patients. In these 154 units, the commonest place for documenting the anaesthetic management plan was in the patients' case notes along with obstetric documentation (84%), followed by folder in the labour ward/ anaesthetic department (29%). Some 23% of 173 lead consultants were not happy with their present system of identifying and referring high risk mothers and 69% of them would consider adopting colour coded anaesthetic stickers on the front of patients' case notes as their alerting method.

Discussion: Our survey had a 76% response, and hence is a reasonable reflection of the practice of the majority of obstetric units in the UK. Although our survey shows that a very high proportion of units within UK have a formal method of identifying and referring high-risk patients, methods used vary widely with a potential for confusion, especially among trainee anaesthetists.

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O16 Informed consent for epidural analgesia in labour: an OAA-approved national survey

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Introduction: Anaesthetists are legally obliged to obtain informed consent before performing regional analgesia in labour. Women want to be informed of all the risks associated with epidural analgesia; non-disclosure of the serious risks is unacceptable.^{1,2} Written information of the risks involved improves recall and the information given to women to obtain informed consent.³ The aim of this national survey was to assess the practice within units in the UK regarding obtaining informed consent and documentation of risks discussed.

Method: An OAA-approved postal survey was distributed to 223 consultant-led UK obstetric anaesthesia units in September 2007. Lead clinicians completed the survey on behalf of their departments.

Results: The response rate was 161/223 (72%). In 7% of units written consent is obtained, and in 93% verbal consent, before epidural insertion. Verbal consent is documented in 98% units. The risks women are most frequently informed about are partially/not working epidural (97%), bad headache (96%), drop in blood pressure (79%) and temporary (70%) and permanent (72%) nerve damage. The risks women are least informed about are inadvertent intravenous injection (6%), total spinal (12%), meningitis (13%), epidural abscess/haematoma (20%) and paralysis (25%).

The risk quoted varied greatly between units, particularly for the more serious, yet catastrophic events. For example, the range of risks quoted for permanent nerve damage varied from 1 in ≤ 100 to 1 in a million; 35% of units use an epidural information card (EIC), stating the risks of an epidural in labour, although 68% of units do not document its use; 78% of units supported a standardised national OAA EIC for use in all obstetric units in the UK. With respect to informed consent, the NHS Litigation Authority recommends: “Careful and comprehensive warnings about all significant possible adverse outcomes must be given. These warnings must be recorded in the notes.”²

Conclusion: Verbal rather than written consent was predominant. A national standardised OAA EIC with documented risks to be shown to ALL women before consenting to epidural analgesia in labour would allow women to make a fully informed decision. Documentation of this in the patients' notes would provide medico-legal evidence of informed consent.

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P01 Pain catastrophizing score and outcomes in labour

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Introduction: The pain catastrophizing questionnaire was developed to assess the cognitive and emotional factors involved in pain experience.¹ It consists of 13 questions from which the pain catastrophizing score (PCS) is calculated. PCS has been validated and is positively correlated with an exaggerated response to painful stimuli.¹ The purpose of this study was to identify if antenatal PCS is associated with instrumental/operative delivery or use of epidural analgesia in labour.

Method: Following ethics approval, women attending 20-week anomaly scans were asked to complete the questionnaire. The PCS was calculated and subjects followed up 5 months later from the births register to obtain information about pain relief and the method of delivery. Data were analysed using Mann-Whitney *U* tests and logistic regression to identify significant independent predictor variables. Significance was defined as $P < 0.05$ (two-sided).

Results: One hundred and eighty questionnaires were completed. Elective caesarean sections ($n=15$) were excluded leaving 165 for analysis (Table). Obstetric intervention was required in 56 (34%) and epidural analgesia used in 64 (39%). PCS were similar ($P=0.85$) in women who had obstetric intervention to those with a normal vaginal delivery (NVD). There was a tendency to higher PCS in women with epidural analgesia ($P=0.12$). Logistic regression was used to identify significant independent predictors. For obstetric intervention; induction ($P=0.0044$) and primiparity ($P=0.030$) were significant, epidural analgesia was marginal ($P=0.057$) and PCS was confirmed as not significant ($P=0.70$). For epidural analgesia, PCS was significant ($P=0.049$) when controlling for other significant variables such as induction ($P=0.0092$) and primiparity ($P=0.016$).

Outcome	Frequency	Mean PCS	<i>P</i> value
NVD	Yes ($n=109$) v No ($n=56$)	14.3 v 14.6	0.85
Epidural	Yes ($n=64$) v No ($n=101$)	16.0 v 13.4	0.12

Discussion: We found no direct evidence that PCS influences the risk of obstetric intervention for delivery. The study had $\geq 81\%$ power to detect a difference in PCS ≥ 5 and $\geq 99\%$ power for a difference ≥ 10 in groups. However we did find PCS is a significant independent predictor of receiving epidural analgesia, although the effect size is small when compared to other factors such as induction and primiparity. There is debate as to whether epidural analgesia contributes to the risk of obstetric intervention. In this study the implication is that PCS may be indirectly involved.

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P02 Why are epidurals requested but not performed?

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Introduction: Within our department, which is a tertiary referral unit, there was a perceived increase in the number of epidurals for labour analgesia being requested but not performed. We set out to identify if this was a genuine observation, and to define the reasons for not complying with epidural requests. The quoted epidural rates in labour for the UK are around 25%, and the US 66%.¹ To our knowledge there are no nationally quoted figures for parturients who have requested epidural analgesia but not had it.

Method: We collected data retrospectively from the computerised maternity database that is used locally to record intervention rates, demographic and clinical information. Data were collected to compare differences in trends between 2001 and 2006. Specifically, we looked at: number of births, number of epidurals, number of epidurals requested but not performed and the documented reasons for their not being performed.

Results: see table:

Year	Births	Epidurals	Epidural rate %	Requested not performed %
2001	4389	1438	32.8	3.5
2006	5437	1450	26.7	6.3

The epidural rate had fallen between 2001 and 2006, although the number of epidurals being requested but not performed had increased from 3.5% of total deliveries to 6.3%.

Documented reasons for epidurals being requested but not performed were: no available anaesthetist (2001 11.6%, 2006 13.5%), medical contraindication to epidural insertion (2001 2.6%, 2006 4.1%), labour progressing too rapidly (2001 87.1%, 2006 74%), other non-specified reason (2001 14.8%, 2006 10.3%).

Discussion: An increase in the number of epidurals being requested but not performed was demonstrated. In most instances an epidural was not performed because labour was progressing too rapidly. Both non-availability of the anaesthetist and medical contraindications were relatively more important reasons in 2006 than in 2001. We feel that the reason for the anaesthetist not being available is likely to be increased time spent in theatre with operative deliveries. The rise in medical contraindications may reflect increasing maternal age and an increase in tertiary referrals of high risk patients to our unit.

Reference

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P03 Inadvertent intravascular injection of epidural drugs in obstetrics

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Introduction: There is no consensus on test doses for epidurals.¹ Two cases of convulsions due to inadvertent intravascular injection of epidural drugs (IIED) have occurred in our unit during 14,500 obstetric epidurals. We therefore performed a survey of the incidence of IIED and test dose strategies in the UK, and have reassessed our local policy.

Local test dose policy pre 2006: Obstetric epidural drug regimens used at our unit are below the toxic range.² We did not therefore perform a test for i.v. placement before 2006. Staff were taught to consider vascular cannulation whenever called to rescue a failing epidural, and then to precede any high dose top-up with a 1-mg/kg test of lidocaine.³ Failure to observe this logic and practice led to the two cases of convulsions.

Method and Results: We performed an OAA approved postal survey of all 211 UK maternity units during 2005-6. The response rate was 83%; 8% of units reported cases of IIED, 43% reported no cases, and 49% were unable to provide useful data. Only six cases of convulsions related to IIED were recorded in the whole survey from a total reported caseload of 366,308 epidurals; 28% of units gave a formal test dose designed to warn of IIED, but we argue that only 3% use a dose of sufficient sensitivity. Like us, most other units did not think their therapeutic doses reached the toxic range, so did not perform a formal test for intravascular placement. Although 95% of units used multi-orifice epidural catheters, only 2.3% effectively retested epidurals before giving potentially convulsant top-ups.

Discussion: Half of UK maternity units are unable to provide data on this topic. Reported cases of IIED came from only 11 units. We therefore strongly suspect gross under-reporting. The apparent UK incidence of convulsions caused by IIED of 1/61,051 is probably a significant underestimate, and *data collection must be improved*. Most test doses in our survey have no evidence base regarding sensitivity. Only lidocaine 1 mg/kg satisfies this.³ Logic demands that *this test be used before every potentially convulsant drug mixture* is given. This is the new policy at our unit, and one case of late vascular cannulation has since been identified which might have otherwise presented as a convulsion. National discussion of this topic is warranted.

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P04 Cardiac arrest following 15 mL of a low-dose mixture (0.1% levobupivacaine and 2 µg/mL fentanyl) for epidural top-up on a labour ward

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Introduction: In recent years, epidural top-ups by midwifery staff with low-dose mixtures using structured protocols has become routine in a large number of maternity units throughout the UK. In this report we describe how a term parturient suffered cardiovascular collapse and subsequent cardiac arrest after receiving a standard 15-mL epidural bolus of 0.1% levobupivacaine with fentanyl 2 µg/mL. To our knowledge this is the first case report of cardiac arrest following a low-dose epidural top-up.

Case: A 19-year-old at 39+6 weeks' gestation presented in established labour. She was of African origin, spoke little English and had had an antepartum haemorrhage 5 years earlier. Otherwise she was fit and well. An epidural was placed at second pass at the level of L3/4; the catheter was noted to be 9 cm at the skin. Initial top-up was uneventful. Augmentation of labour necessitated a second epidural top-up two hours later. Seven minutes after this 15-mL top-up the mother complained of heartburn and then stopped breathing. The arrest team was called and pulseless electrical activity was treated (no carotid pulse being felt). The mother's output returned after one cycle with CPR and 1 mg of adrenaline. Simultaneously a caesarean section was performed in the maternity room as part of resuscitation and due to severe profound fetal bradycardia on ultrasound. Eight minutes after cardiac arrest a live male infant was extracted with Apgar scores of 10 at 1 and 5 min. The epidural catheter at this time was noted to be 10 cm at the skin and tested positive for glucose. The mother was taken to ICU and extubated within 24 h.

Discussion: It seems likely that the epidural catheter migrated intrathecally and a subsequent total spinal resulted leading to a loss of cardiac output. In the literature studies have indicated an overall incidence of seven cardiac arrests for every 10 000 spinals (0.07%).¹ Having reviewed other accounts in the literature,² it does indeed seem possible that our patient suffered a total spinal with the doses given, though 15 mg of levobupivacaine is on the cusp of the lower end of the reported range. However, to suffer a cardiac arrest at these doses appears not to have been seen previously.

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P05 A survey of fetal monitoring while establishing regional or general anaesthesia for caesarean section

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Introduction: The National Institute for Health and Clinical Excellence (NICE) guidelines for intrapartum care recommend that continuous electronic fetal monitoring (cEFM) be instituted for at least 30 minutes during the establishment of regional analgesia (RA) in labour.¹ The implication of this is that RA in labour is considered to put the fetus at risk, whereas, if anything, the reverse is true. It could therefore be concluded that the ideal standard of care would be to use cEFM during the institution of RA for caesarean section (CS), where a larger dose of drugs might be expected to increase the risk. But there is no national guideline for cEFM before and during the development of RA for CS. This survey investigated the use of cEFM while establishing regional or general anaesthesia for CS.

Method: Following approval by the audit sub-committee of the Obstetric Anaesthetists' Association, questionnaires were sent to the lead clinicians of all obstetric units in the UK. The survey was conducted from April-June 2006 with follow-up questionnaires to non-responders. The data were entered on an Excel spreadsheet, and analysed.

Results: 239 questionnaires were sent out, and 206 (86.2%) were returned and evaluated.

The table below shows the use of EFM while waiting for regional anaesthesia to become established for CS.

	Elective CS		Emergency CS	
	Frequency	%	Frequency	%
All cases	66	32%	119	57.7%
High risk only	71	34.5%	69	33.5%
Never	57	27.7%	8	3.9%
Exclusion*	12	5.8%	10	4.9%

*Exclusion: Inadequate completion of questionnaire.

Discussion: Approximately 58% of anaesthetic units in the UK use cEFM while establishing RA for emergency CS. Approximately one third of those surveyed use cEFM in high risk cases only. NICE guidelines recommend cEFM to be employed during labour. It is arguably more important for cEFM to be used when larger doses of LA, which can cause profound effect on maternal haemodynamics and placental blood flow, are administered. Perhaps the time has come to formulate guidelines on the use of cEFM at caesarean section?

Reference

1. Intrapartum Care: Care of healthy women and their babies during childbirth. NICE clinical guideline 55. Section 1.5.12. September 2007.

P06 Audit of intrauterine resuscitation measures in patients requiring category-1 caesarean section

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Introduction: Although efficacy of intrauterine resuscitation (IUR) measures on fetal outcome is not proven, instituting IUR measures in patients needing category 1 section can result in important changes in patient management such as vaginal delivery instead of caesarean section or regional anaesthesia instead of general.¹ We audited 39 category-1 caesarean section patients to find out what IUR measures were being applied.

Method: No ethical approval was deemed necessary. Perioperative details were recorded on a proforma by the anaesthetist involved. These details included: indication for section; whether or not the parturient was on Syntocinon (if yes, the timing of turning it off); the position in which parturient was brought to theatre; on oxygen or not; any fast i.v. fluids given and any tocolysis used.

Results: In 21% of patients who were on Syntocinon, it was turned off in theatre; 5% patients were receiving oxygen. Position: 46% sitting, 30% supine, 20% left lateral and 3% right lateral. One patient had hypotension and fluid was only started in theatre. Four patients had abruptio or ?abruption but no fluid was started until the patient came to theatre. No patient was on tocolysis.

Discussion: Our results showed that even in our tertiary referral centre for obstetrics, we were poor in instituting IUR measures. The results have been presented in our hospital meeting and the need to institute these measures highlighted. We are planning to reaudit this.

Although there is minimal information on the efficacy of IUR interventions, in general they are not considered harmful, therefore these measures should be instituted in category-1 sections as long as they do not delay the delivery of the baby.²

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P07 Does the use of a lower lumbar interspace affect the quality of spinal anaesthesia for elective caesarean section?

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Introduction: The vast majority of elective caesarean sections are now performed under subarachnoid block, commonly using the L3/4 interspace.¹ The spinal cord can be damaged following spinal anaesthesia and a recent case series² highlighted not only the anatomical variation of the level of the conus medularis amongst the general population, but also the inability of anaesthetists to identify a specific lumbar interspace correctly.

The objective of this study was to determine whether the recommended change of practice² of selecting a perceived lower interspace (L4/5) would result in any significant changes in the qualities of the spinal block.

Method: Following ethics committee approval and written consent, 48 term patients undergoing elective caesarean section were included in this blinded, randomised trial. These women were anaesthetised using spinal block at a perceived level of either L3/4 or L4/5. Other than the level of needle insertion, all other aspects of the anaesthetic technique were standardised. The time taken to insert the spinal needle and for the block height to reach a level of T5 were recorded, along with the dosage of vasopressor required for each case. Patient satisfaction scores were documented on the first postoperative day.

Results:

	L3/4 (n=24)	L4/5 (n=24)
Mean ephedrine requirement (mg)	32.3	28.0
Time for insertion (min)	4.0	4.0
Time to T5 (min)	7.8	9.4
Time to delivery (min)	25.64	26.0
Duration of block (min)	154	164
Mean pain VAS	8.1	8.1
Mean satisfaction VAS	11.7	12.5

Conclusion: There were no significant differences between the groups in any of the parameters measured. We would therefore recommend the routine practice of selecting the L4/5 interspace for insertion of the spinal needle for elective caesarean section.

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P08 A survey of anaesthetic practice for laser ablation in twin-twin transfusion in a tertiary obstetric unit

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Introduction: Twin-twin transfusion syndrome is a rare complication of monochorionic and diamniotic twin pregnancies. The donor and recipient fetuses are exposed to differing volume loads from the placenta. Laser photocoagulation of chorionic plate vessels at the inter-twin membrane aims to treat the cause of the problem.¹

Method: In this retrospective survey of our anaesthetic practice for twin-twin laser ablation surgery, data were collected from the anaesthetic notes of 51 cases.

Results: Subarachnoid injection was the mode of anaesthesia used in 49 cases. The mean dose of 0.5% hyperbaric bupivacaine was 12.4 mg (2.48 mL) and the mean dose of fentanyl was 18.5 µg.

Bilateral sensory block height was T4 or higher in 33 cases. Two patients required rescue analgesia intraoperatively in the form of intravenous fentanyl; both had bilateral T4 block.

Hypotension and nausea and vomiting were the most common intraoperative complications; 38% of the cases of nausea and vomiting were not associated with hypotension.

Mean operative time was 55 min. Data regarding patient satisfaction was incomplete but those followed up were satisfied with their anaesthetic. Ten percent required an intraoperative anxiolytic agent.

Discussion: This survey has shown that using a regional technique with intrathecal doses similar to that used for caesarean section is adequate to maintain maternal comfort without any intraoperative fetal deaths.

The incidence of hypotension is comparable to that associated with spinal anaesthesia for caesarean section.² Data are inadequate to ascertain if this incidence is detrimental in cases of twin-twin transfusion.

Retrospective analysis of anaesthetic charts cannot distinguish between the prophylactic and therapeutic use of anti-emetic and anxiolytic drugs. Further prospective studies are required to determine the true incidence of anxiety and nausea and vomiting with this procedure.

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P09 The use of early warning physiological scoring systems following caesarean section

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Introduction: Early warning scores using physiological measurements were introduced to hospital practice to help identify critically ill patients or those who needed urgent medical intervention. The recent CEMACH report has highlighted the need for early warning scores of vital signs to help identify the seriously ill mother.¹

Method: The early warning scoring system used in our hospital, in non-obstetric postoperative surgical patients, is the Royal Advanced Warning (RAW) score. The patient's respiratory rate, SpO₂, temperature, systolic blood pressure, heart rate, level of consciousness and urine output are recorded. A score is allocated to each observation that lies outside the predetermined normal range. These observation scores are totalled to give the RAW score, which is used to trigger an intervention if needed. The aim of this audit was to pilot this RAW scoring system in women following caesarean section over a two-week period. This would enable us to assess the appropriateness of using the RAW score in obstetric patients.

Results: Thirty-eight completed early warning scoring charts were analysed (21 elective / 17 emergency caesarean section). The majority of patients (30) had observations lying outside the predetermined normal range. Four patients had RAW scores indicating medical intervention was required. None of the patients in the audit required medical intervention on clinical grounds at any time.

Discussion: From this audit, it was clear that adaptations to the pre-existing hospital early warning scoring system were required for use in the obstetric population. These adaptations include altering the normal range for maternal blood pressure and heart rate. Feedback from staff using the chart indicated the need to add scores for degree of proteinuria, per vaginam blood loss and assessment of uterine tone. Following this audit, an early warning scoring system has been devised, which is specifically designed for the obstetric population and is currently in routine use in our hospital.

Reference

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P10 Variation in cerebral blood flow parameters during roll-over test as a predictor of preeclampsia

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Introduction: Combination of digital wide-range neurosonography and transcranial energetic Doppler scan provides a possibility of effective monitoring of cerebral blood flow in pregnant women. The goal of this study was to analyse cerebral flow disturbances caused by roll-over test in pregnant patients with preeclampsia.

Method: Following ethics committee approval and written consent, 88 patients with severe preeclampsia (Group I), age of 17-32 years (mean age 26±4.6 years), and 90 patients with normal pregnancy (Group II), 3rd trimester, without significant co-morbid states, age of 19-34 years (mean age 25.9±4.2 years), were studied. Patients with the following features were excluded from both groups: potentially haemodynamically significant stenosis or occlusion of magistral arteries of head and basilar region, clinical features of congestive heart failure, arrhythmia. All patients underwent duplex scan of extracranial portions of brachiocephalic arteries with linear probe and transcranial duplex scan in the area of middle cerebral artery (MCA). By transtemporal approach in MCA M1 segment we determined peak systolic flow velocity (Vps), maximal end-diastolic velocity (Ved), time-adjusted maximal velocity (TAMX), brain flow index (BFI) and overshoot coefficient (OC). All cerebral blood-flow parameters were measured during roll-over test. Significance of difference in mean values between groups was estimated using Student's t test.

Results: See table (data are mean ± SDOM):

	Group I (n=88)	Group II (n=90)
Vps cm/s	73.76 ± 1.11*	104.83 ± 1.75
Ved cm/s	35.29 ± 0.39*	48.73 ± 1.09
TAMX cm/s	49.92 ± 0.40*	67.46 ± 1.38
BFI cm/s	22.15 ± 0.57**	40.20 ± 1.13
OC	1.38 ± 0.02***	1.06 ± 0.04

* $P < 0,0001$; ** $P < 0,001$; *** $P < 0,005$.

All cerebral flow values recorded during roll-over test in preeclamptic patients were significantly decreased in comparison with the same values in healthy pregnant women. These pathophysiological changes of cerebral haemodynamics were consistent with dopplerographic pattern of diminished perfusion and are typical for vascular segments located proximally to the zone of abnormally high haemodynamic resistance.

Discussion: The measurement of cerebral blood flow parameters during roll-over test may be considered as an effective method of prediction of severe preeclampsia in pregnant women.

P11 Visual estimation of blood loss by staff on the maternity unit: audit and re-audit following an educational intervention

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Introduction: Several studies have demonstrated the difficulty of accurate visual estimation of blood loss in the obstetric context.^{1,2} Such estimates remain important in predicting and diagnosing major obstetric haemorrhage as well as informing decisions to use blood products. We audited the accuracy of visual assessment of blood loss by obstetric, anaesthetic, midwifery and nursing staff on two maternity units.

Method: Over a two-week period, staff from two maternity units including anaesthetists, obstetricians, midwives and theatre staff were asked to complete a questionnaire based on pictures of known volumes of blood. The (local) standard against which we audited was that 80% of estimates should be accurate, where an 'accurate estimate' was defined as one within the range: actual volume \pm 20%. Simple educational posters were subsequently designed and displayed prominently in both units. Following their display the audit was repeated to assess whether the standard had improved as a result of the poster display. Analysis was undertaken using Pearson's χ^2 test, Mann-Whitney U test or analysis of variance, as appropriate.

Results: There were 118 (63 medical, 55 midwifery/nursing) responses in round 1 and 90 (51 medical, 39 midwifery/nursing) in round 2; 19.6% of estimates were accurate in round 1 and 45% in round 2: the overall accuracy of blood loss estimation improved from a median of 2/12 questions correct to 5/12 correct ($P < 0.001$). The deviation of the estimate from the true blood loss was significantly reduced in round 2 when compared to round 1. In round 1 medical staff had greater accuracy than midwifery/nursing staff, but there were no significant differences between these groups in round 2.

Conclusion: Accurate visual estimation of blood loss is difficult, but accuracy can be improved following introduction of a simple learning aid.

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P12 Does accurate measurement of blood loss at caesarean section enable prediction of the postoperative fall in blood haemoglobin levels?

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Introduction: We have recently reported the use of the HemoCue® photometer to measure the concentration of haemoglobin (Hb) in suction fluid obtained at elective caesarean section.¹ We have used the data generated by this study to assess whether accurate measurement of blood loss at caesarean section enables the prediction of the extent of postoperative fall in Hb levels. Such information could help determine which patients are likely to require postoperative blood transfusion.

Method: Following approval from the North Sheffield Ethics Committee, 30 women scheduled for uncomplicated elective caesarean section were recruited. Blood loss in the suction fluid was assessed by measuring Hb with the HemoCue® photometer. Total blood loss was calculated by adding swab weight. The fall in Hb was estimated from the formula:

$$\text{Predicted fall in blood Hb (g/dL)} = \frac{\text{preoperative Hb (g/dL)} \times \text{total blood loss (mL)}}{\text{total blood volume (mL)}}$$

(total blood volume was taken to be 94 mL/kg.²)

Results: According to the Bland and Altman plot for the predicted and actual fall in the Hb, bias (mean difference) and the limits of agreement were -0.96 mg/dL and -3.43 to 1.51 mg/dL respectively. There was a significant bias between predicted fall and actual fall in Hb with a P value of < 0.01 .

Discussion: Even with careful measurement of blood loss in theatre the fall in postoperative haemoglobin is not predicted accurately and is usually underestimated. It is likely that factors such as blood loss after surgery and fluid therapy also influence this figure.

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P13 Too pale to patch: does plasma haemoglobin concentration affect first-time success rate of epidural blood patches?

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Introduction: Epidural blood patch (EBP) has been the most effective treatment for post-dural puncture headache (PDPH) for over 40 years. Numerous studies have looked at the optimal time for patching and the volume of blood that should be used.¹ We hypothesised that blood injected with a lower concentration of haemoglobin would be less likely to be effective, so we reviewed our patient population to investigate this.

Methods: Departmental records were searched for cases of PDPH treated with EBP within the obstetric unit for the period January 2002 to December 2007. Hospital medical notes were then used to confirm post-partum plasma haemoglobin concentration, volume of autologous blood injected, time to EBP being performed and whether or not a single EBP was successful.

Results: Of 61 patients studied, 42 (65%) had persistent relief of symptoms after one EBP with a mean plasma haemoglobin concentration of 10.68 g/dL. This was not significantly different from that in patients requiring at least two patches to relieve symptoms where the value was 10.36 g/dL ($P = 0.51$; t test). Significantly more blood was injected where the EBP was successful first time (20.25 mL) compared to the rest (16.59 mL ($P = 0.005$; t test)). It was also noted that a significantly higher proportion of unsuccessful EBPs were undertaken on day 1: 44.4% (8/18) compared with 16.7% (7/42) of the successful group ($P = 0.007$; χ^2).

Conclusion: Post-partum plasma haemoglobin concentration is not a determining factor in the success of EBP in our patients. An injection of around 20 mL of autologous blood should be used if tolerated and patching in the first 24 h is less likely to be successful.

Reference

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P14 Maternal knowledge of the risks of general anaesthesia in obstetrics

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Introduction: A great deal of work has been done on investigating maternal knowledge and understanding of the risks of regional anaesthesia in obstetrics.¹ However the same is not true for general anaesthesia. We aimed to assess women's awareness of the potential risks of general anaesthesia in obstetrics and to identify how much information they want before consenting.

Method: Following local ethics committee approval and informed consent, 50 post-partum women were randomly selected irrespective of parity. They were given a questionnaire asking about their knowledge of the risks of general anaesthesia, their appreciation of levels of risk and what information they thought was necessary to make an informed decision.

Results: These are shown in the table

Risk	Number aware (%)
Difficult intubation	11 (22)
Aspiration	11 (22)
Awareness	25 (50)
Damage to teeth	8 (16)
Allergy	28 (56)
Malignant hyperpyrexia	7 (14)
Scoline apnoea	5 (10)
Postoperative nausea and vomiting	39 (78)
Desire for information	
All risks	12 (24)
Most risks	12 (24)
Some risks	26 (52)

Conclusion: Maternal knowledge of the risks of general anaesthesia in obstetrics is poor. Also it would appear that women wish to know more about the risks of general anaesthesia than is commonly offered.² The issue of consent in obstetric anaesthesia (regional and general) remains controversial. Much effort has been put into improving maternal knowledge of regional anaesthesia, however if this is not mirrored for general anaesthesia consent for anaesthesia in obstetrics will not be 'balanced'.

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P15 Impact of the midwifery-led unit on provision of anaesthetic service in a large obstetric unit

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Introduction: Midwifery-led units (MLUs) are intended to reduce the need for intensive monitoring during labour and therefore unnecessary intervention in accordance with the NICE guidelines.¹ This audit aims to identify the impact of a MLU service on anaesthetic interventions in a large city obstetric unit (5800 births/year). Two obstetric units were amalgamated into one consultant-led unit (CLU) and two MLUs in July 2005. One MLU is 7 miles from the CLU and the other is two floors from the CLU. Both MLUs have no anaesthetic input.

Method: Data including the number and type of anaesthetic procedures as well as methods and urgency of deliveries were collected. Data before the MLU initiative were collected over a 4-month period in 2002 and compared to data of similar duration in 2007. In both time periods, data were extracted from the hand recorded anaesthetic log book and checked against the electronic maternity database.

Results: The overall anaesthetic intervention rate fell from 51.6% in 2002 to 46.9% in 2007. The percentage of women requesting labour analgesia decreased from 30.4% in 2002 to 27.1% in 2007.

Year (Total deliveries in 4 months)	2002 (n=1673)	2007 (n=2061)
Anaesthetic intervention (%)	863 (51.6%)	966 (46.9%)
Labour analgesia (SVD)	30.4% (14.8%)	27.1% (11%)
Instrumental deliveries	6.6%	10.2%
Emergency CS (after labour analgesia)	9%	6%
Emergency CS (no labour analgesia)	7.6%	7.2%
Elective CS	9.6%	9.3%
Others	4.1%	3.3%

Conclusion: Although 30% of all women in 2007 started their labour and 20% delivered in the MLU, this has had only a small impact on reducing labour analgesia rates. The overall anaesthetic intervention rate has fallen by 5%. This is partly due to the reduction in labour analgesia and partly due to a small reduction in emergency caesarean section and anaesthesia for other procedures (e.g. perineal repair). The majority of women who required anaesthetic intervention continue to do so but the MLUs are a popular concept with clear management pathways for both patients and staff.

Reference

1. NICE guideline, Intrapartum care: management and delivery of care to women in labour. September 2007.

P16 Competencies of anaesthetic trainees on call for the labour ward.

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Introduction: As a result of Modernising Medical Careers (MMC), training is now competency-based rather than time-based. Second-year trainees (ST2s) in our region are covering obstetrics out of hours, provided that they meet the requirements as documented in the RCoA guidelines for ST1 and ST2 competencies.¹

Method: We conducted an email survey, sent to all 23 ST2s in our school of anaesthesia, on their experience and level of competence in obstetrics, as compared to the RCOA guidelines.

Results: 21/23 (91%) replied; 12/21 (57%) have been on call for the labour ward. The duration of directly supervised obstetric training before going on call was variable, from one week to 6 months. All had been formally assessed in performing a spinal or CSE for caesarean section before going on call for the first time, 8/12 (67%) were assessed in siting a labour epidural and providing general anaesthesia for caesarean section, but only 6/12 (50%) were formally assessed in topping up an epidural for caesarean section.

ST2 Responses	Yes	No
Did you feel confident to join the on-call rota?	7	5
Have you felt well supported out of hours?	12	0
Have you ever not received urgent help within 15 minutes when needed?	5	7
Have you performed any solo out-of-hours GA caesarean sections?	9	3
At present, do you feel confident to manage emergencies (e.g. eclampsia, haemorrhage) until senior help arrives?	10	2
Have you encountered any problems on the labour ward, as a result of your inexperience?	6	6

Since being on the on-call rota, further daytime supervision has been variable (occasional days to 3 months). In their opinion, problems such as failure of regional blocks and difficulty dealing with obstetricians and midwives were issues that might have been avoided had they been more senior. Most feel their training would benefit from more supervised daytime sessions.

Discussion: More than 50% of our ST2s are on-call for obstetrics. Within a single school of anaesthesia we have found that trainees have different lengths of training before going on-call, depending on the hospital. This is a reflection of current trends in MMC, where achieving competencies rather than the traditional time-based training is required, before going on call. However, the trainees themselves feel that despite achieving their necessary competencies, they would still benefit from more supervised time before going on call for the first time.

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P17 Obstetric anaesthesia in Belgium: the first nationwide survey of current practice

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Introduction: Limited data are available on obstetric anaesthesia (OBA) practice in Belgium. Two surveys on OBA practice in Flanders exist, but there is a paucity of data for the country.^{1,2} The present survey aimed to update and gather new information, as well as compile for the first time data for the whole of Belgium.

Methodology: In 2007, a questionnaire was sent to the directors of anaesthesia departments of 117 hospitals with an obstetric unit in Belgium. If no reply was received a reminder was sent. Finally, non-responders were contacted by phone.

Results: Out of 117 questionnaires, 116 replies were received (99.1% response rate), covering 117,712 deliveries for 2006. The caesarean section (CS) rate was 18.4% (5-34%). CS was usually performed in the main operating theatre. In 22 institutions, CS was performed in the labour and delivery ward (19%). In 31% of units planned CS received no acid aspiration prophylaxis, while for emergency CS acid aspiration prophylaxis was omitted in 49% of units. Single shot spinal accounted for 48% of anaesthetics given for CS, in 30% combined spinal epidural (CSE) was used, in 4% general anaesthesia was used, while epidural anaesthesia was used in 18% of CS. Hyperbaric bupivacaine in a dose between 6 and 12.5 mg was used for spinal or CSE anaesthesia, usually combined with intrathecal sufentanil (1.5-10 µg). Of those women having planned vaginal delivery, 65% received neuraxial analgesia. In 15 units (13%) CSE analgesia for labour was the standard, whilst it was used on indication in a further 34 units (29%). The local anaesthetic used for labour pain relief was ropivacaine in 81%, levobupivacaine in 14% and bupivacaine in 5% of units. In 88% of units an opioid (sufentanil exclusively) was added to the analgesic mixture.

Discussion: The present survey, with an excellent response rate, is the first to generate data for Belgium. Most CS are performed in the main operating theatre and >30% do not receive acid aspiration prophylaxis. The majority of women receive regional analgesia for labour with a growing number being CSEs. The new local anaesthetics have replaced bupivacaine.

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P18 Survey of trainee views on obstetric anaesthesia

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Introduction: We anecdotally found that anaesthesia trainees seemed to have strong likes and dislikes towards obstetric anaesthesia. We decided to explore this further with a view to promoting the positive findings and attempting to correct the negative, and thereby hopefully making obstetric anaesthesia a more desirable subspecialty to work in.

Method: We collected data by sending questionnaires to all trainees in our school of anaesthesia. The responses were kept anonymous. The respondent was asked to indicate his or her degree of liking for obstetric anaesthesia on a scale of 1 to 5. Space was provided for writing what they liked and disliked about obstetric anaesthesia.

Results: We collected 40 forms. On a scale of 1-5, where 1 = 'least like it' and 5 = 'like it most', the table below shows the number in each category:

Scale	1	2	3	4	5
Trainees n (%)	1 (2.5)	7 (17.5)	6 (15)	18 (45)	8 (20)

The most common aspects they liked were: (1) good epidurals are rewarding (18/40), (2) use of regional anaesthesia skills (15/40), (3) dealing with emergencies (6/40), (4) high turnover (5/40), (5) challenging high risk cases (4/40). The most common aspects they disliked were: (1) chaotic workplace (5/40), (2) poor team communication (8/40), (3) being an 'epidural technician' (9/40), (4) midwives (26/40). Regarding midwives, the following comments were commonly mentioned: (1) 'have inadequate knowledge,' (2) 'are uncooperative,' (3) 'are difficult to communicate with,' (4) 'are unaware of urgency.'

Conclusion: The majority of trainees like obstetric anaesthesia (scale 4-5) for a variety of reasons. However, the biggest aspect that trainees disliked about obstetric anaesthesia were midwives (66%). This should be investigated further and solutions found, since in a high risk and multidisciplinary environment such as a labour ward, it is vital for patient safety that there is good team work and communication.¹ Furthermore, better interdisciplinary cooperation between midwives and anaesthesia trainees will make obstetric anaesthesia a more desirable subspecialty to work in. We intend to conduct a survey among the midwives in our labour ward to explore the problem from their viewpoint. Combined information from our survey of anaesthesia trainees and midwives will help us to find mutually beneficial ways of improving team functioning.

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P19 An audit of medical staff awareness of the use and availability of Intralipid 20% according to recent AAGBI guidelines

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Introduction: The Royal Victoria Infirmary is a tertiary referral centre for obstetrics and attracts approximately 5200 deliveries per annum. Large doses of local anaesthetic are used routinely by trainee anaesthetists. *Intralipid* has been shown to reverse local anaesthetic-induced cardiac arrest in animal models and in human case reports.^{1,2} Its therapeutic potential has been highlighted by the National Patient Safety Agency.³ AAGBI guidelines have recently been published⁴ that state “*Intralipid* should be immediately available in all areas where potentially cardiotoxic doses of local anaesthetics are given, along with guidelines for its use.”

Method: A questionnaire was given to 31 anaesthetic trainees regarding the use of *Intralipid* in cardiac arrest following administration of a large dose of local anaesthetic. Seventeen of the trainees provided an obstetric anaesthetic service out of hours with distant supervision.

Results: see table:

Question asked	Answered correctly
Aware of use of <i>Intralipid</i> ?	28 (90%)
Aware of AAGBI guidelines?	22 (71%)
Guidelines seen at work?	4 (13%)
Where is <i>Intralipid</i> kept?	2 (6%)
What is the first dose?	9 (29%)
Should you report its use?	29 (94%)

Discussion: Despite recent AAGBI guidelines, knowledge regarding *Intralipid* was poor and few knew the correct dose of *Intralipid* or indeed where to find it. Guidelines are now attached to all anaesthetic machines and trainees have been further educated.

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P20 An audit of awareness and the management of local anaesthetic toxicity using Intralipid in the delivery suite

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Introduction: Lipid emulsion improves the success of resuscitation for cardiac arrest due to local anaesthetic (LA) overdose. This has been shown in animal models¹ and there is increasing evidence that this is also the case in humans.² As a consequence, *Intralipid* is available in many hospitals and labour wards. On the labour ward, doses of LA approaching and exceeding the maximum recommended are used in establishing epidural anaesthesia for caesarean section using an in situ catheter. Epidural catheters are often topped up in delivery rooms before moving to theatre. Despite best practice and the use of levobupivacaine, there is still a danger of inadvertent intravenous injection and consequent LA overdose. The standard set for this audit was that all members of the labour ward medical team should understand local anaesthetic toxicity, its management and the role of *Intralipid*.

Method: Questionnaires were handed out on labour ward and collected a few minutes later. They were distributed to a range of healthcare professionals including medical staff, midwives and theatre staff. Questions included selecting symptoms of LA toxicity from a list, selecting management options from a list (including *Intralipid*), where is it kept, when is it given, how is it given, dose, and where to find this information.

Results: A total of 49 forms were completed.

% Correct	MW	ODP	Anaes	OBS	Overall
Symptoms	49	70	88	55	62
Management	58	73	94	67	75
<i>Intralipid</i> ?	53	100	100	33	31
When?	52	100	83	17	19
Where?	16	43	55	8	13
How?	32	86	100	25	26
Initial Dose?	0	0	0	0	0
Information?	5.3	14	36	25	8

Discussion: There is good recognition and management of LA toxicity amongst the anaesthetic and theatre staff (ODP); this is poor in other groups. This also applies to *Intralipid* and its use. Generally knowledge of where *Intralipid* is kept and where dosing information is quickly available (with the drug or on cardiac arrest trolley) was low. Further education is required.

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P21 Audit of anaesthetist involvement in the maintenance of labour epidurals comparing continuous infusion with patient-controlled epidural analgesia

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Introduction: Previous studies have suggested that patients who use patient-controlled epidural analgesia (PCEA) in labour, may require fewer anaesthetist-administered top-ups than patients using continuous infusion (CI) epidurals.¹ Before introducing PCEA in our maternity unit, we audited the rate of anaesthetic interventions required in our standard CI epidurals. We then re-audited the anaesthetic workload following the introduction of PCEA.

Method: During the five-week period before the proposed introduction of PCEA to our labour ward, anaesthetic staff were asked to complete a simple proforma when siting a labour epidural. Information gathered included time of epidural siting, details of test dose, initiation dose, maintenance regime, time and dose of subsequent top-ups and interventions required for operative delivery. Time of delivery was recorded from the labour ward diary. One hundred percent completion was ensured by personal review of patient's notes. Following the introduction of PCEA, the audit was repeated for a period of six weeks.

Results: see table:

	number of patients	1 top-up	2 top-ups	3 top-ups	4 top-ups
CI	65	31 (47.7%)	10 (15.4%)	4 (6.2%)	1 (1.5%)
PCEA	82	8 (9.8%)	4 (4.9%)	0	0

Fewer patients receiving PCEA required one or more epidural top-ups during their labour compared with CI epidurals. The mean time from epidural insertion to delivery was no different between the two groups. Of interest, due to a simultaneous change in practice, the mean dose of local anaesthetic used for both test and initiation dose was lower in the PCEA group than in the CI group (test dose: levobupivacaine 8.1 v 13.2 mg; initiation dose: levobupivacaine 17.7 v 23.4 mg). Despite the lower initial doses, patients receiving PCEA required fewer subsequent interventions.

Discussion: Our results suggest that patient-controlled epidural analgesia results in a lower anaesthetic workload on the labour ward, compared with continuous infusion epidural techniques.

Reference

1. Van der Vyver M, Halpern S, Joseph G. Patient-controlled epidural analgesia versus continuous infusion for labour analgesia: a meta-analysis. *Br J Anaesth* 2002; 89: 459-65.

P22 Audit of maternal satisfaction, total drug doses, workload, obstetric and neonatal outcome following introduction of patient-controlled epidural analgesia

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Introduction: Meta-analysis has shown that patient-controlled epidural analgesia (PCEA) in labour necessitates fewer interventions than continuous epidural infusion (CEI) and a lower total dose of local anaesthetic, but no difference in patient satisfaction, delivery type or neonatal outcome.¹ These outcomes were audited before and after a planned introduction of PCEA in our obstetric unit.

Method: The CEI group received a standard infusion of 0.1% bupivacaine + fentanyl 2 µg/mL, 10-12 mL/h. The PCEA group could administer a 10-mL bolus of 0.1% bupivacaine + fentanyl 2 µg/mL, 30-min lockout with no background infusion. Casenotes of 100 patients who received CEI in labour and 100 who received PCEA were reviewed retrospectively. Only singleton pregnancies at term were included. The total number of anaesthetist top-ups and total dose of bupivacaine and fentanyl used were recorded. A satisfaction score was recorded on a 4- point scale, with a score of 1 indicating poor satisfaction, and a score of 4 indicating excellent satisfaction.

Results: see table:

	CEI (n=89)	PCEA (n=75)	P
Median bupivacaine dose (mg) (IQ range)	92.9 (66.1-117.3)	67.5 (52.5-90)	0.0002
Median fentanyl dose (µg) (IQ range)	208.0 (180-255)	180 (150-220)	0.0023
Patients needing top-up n (%)	52 (58.4)	11 (14.7)	<0.0001
Satisfaction score			NS
1-2 (%)	20	14.6	
3-4 (%)	80	85.4	
SVD (%)	37 (41.6)	29 (38.7)	
Instrumental, no TU	12 (13.4)	9 (12.0)	NS
Instrumental +TU	16 (18.0)	9 (12.0)	
Caesarean section	24 (27.0)	28 (37.3)	
Apgar score <8	(n=88)	(n=74)	
1 min	18.2%	12.2%	NS
5 min	2.3%	5.4%	NS

Conclusion: Introduction of PCEA for labour in our unit has resulted in significant reduction in bupivacaine and fentanyl doses and in anaesthetic workload, without compromising maternal satisfaction. There has been no significant change in mode of delivery or Apgar scores.

Reference

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P23 Use of analgesia by primiparous women during labour: correlation with antenatal class attendance

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Introduction: Antenatal class attendance is often encouraged to advise parturients about maternal issues including choice of pain relief during labour. Previous studies correlating analgesic uptake during labour and antenatal class attendance have reached different conclusions while many have been limited by the inclusion of multiparous patients.^{1,2} The aim of this study was to investigate the attendance at antenatal classes by primiparous patients alone and to determine if non-attendance influenced analgesic uptake.

Method: After obtaining local research ethics approval, the analgesic uptake during labour of 200 primiparous patients was investigated prospectively. Analgesic uptake by those women who attended all or no antenatal classes was then compared. Non-parametric and parametric data were analysed using the χ^2 test and student t test respectively.

Results: 102 (77%) of the 132 patients for whom complete data were available attended either all or no antenatal classes. Of these, 38 (29%) attended all their antenatal classes while 64 (48%) did not attend any. There was no significant difference between the two groups in use of Entonox ($P = 0.349$) or morphine administration ($P = 0.955$). Women who did not attend any antenatal classes were just as likely to request epidural anaesthesia as those who attended all their antenatal classes ($P = 0.898$)

Table: Analgesic uptake during labour and antenatal class attendance

Analgesia	No antenatal classes attended (% use of analgesia)	All antenatal classes attended (% use of analgesia)	P
Entonox	31/38 (81%)	47/64 (73%)	0.349
Morphine i.m.	21/38 (55%)	35/64 (64%)	0.955
Epidural	26/38 (68%)	43/64 (67%)	0.898

Conclusions: Antenatal class attendance remains poor with only 29% of parturients in this study attending all their classes. Non-attendance at antenatal classes does not influence the use of analgesia by primiparous patients during labour. Primiparous patients may rely on alternative sources of information to assist in making an informed decision concerning labour analgesia.

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P24 Anticipated and perceived pain scores in primiparous patients undergoing induction of labour: the influence of antenatal class attendance

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Introduction: Presently, 20% of pregnant women in the UK are estimated to undergo induction of labour¹. While the majority of expectant mothers anticipate the pain of labour to be severe there are few data on the relationship between anticipated and perceived pain during labour after induction of labour.²

Method: We aimed to determine the relationship between anticipated and perceived pain levels in primiparous women undergoing induction of labour. After obtaining local research ethics approval, 199 patients were asked to estimate their anticipated pain during labour using a visual analogue scale {VAS}, range 0-100 mm. A pain of score of ≥ 70 mm was regarded as significant.³ On the day after delivery these same patients, with the exception of those who underwent caesarean section, were asked to rate their overall perceived pain score. A difference between anticipated and perceived pain of ≥ 13 mm was regarded as significant.⁴ Results were correlated with antenatal class attendance.

Results: The median anticipated VAS score was 82 (range 34-100). A significant anticipated pain score was obtained in 133 patients (66.5%). Ninety patients who did not undergo operative delivery recorded their perceived VAS score [median 85; range 25-100]. From this latter group of patients, 27 (30%) and 18 (20%) significantly under- and overestimated their perceived pain respectively. There was no significant difference in antenatal class attendance between patients who were accurate predictors of labour pain, and those who were poor predictors ($P=0.465$).

Conclusions: These results confirm the findings of others that the majority of women rate the pain of labour highly.² However, in this study only 50% of patients accurately estimated the intensity of perceived pain. Approximately one third significantly underestimated the intensity of labour pain. Antenatal class attendance did not influence patients' expectations of pain during labour in this study.

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P25 Pain relief in the second stage of labour: room for improvement?

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Introduction: During routine follow-up of patients using regional analgesia for labour, we encountered mothers who had experienced pain during delivery of their baby but had not been given a top-up during the second stage. A previous audit of midwives revealed that the majority withheld second stage top-ups for fear of increased instrumental deliveries. We wished to discover from the women themselves the reasons they believed or were told for withholding top-ups in the second stage.

Method: Women who had received regional analgesia for labour were questioned about adequacy of pain relief during delivery. They were questioned about pain during delivery, requests for top-ups and reasons for not requesting analgesia. Additionally, the details of top-ups were obtained from medical records.

Results: We surveyed 82 mothers. Of these 22 (27 %) had experienced pain during the second stage of labour.

Table: Pain during second stage of labour

Pain	Nulliparous	Top-up given in second stage
Mild 9/22 (41%)	9/9 (100%)	1/9 (11%)
Mod 8/22 (36%)	6/8 (75%)	2/8 (25%)
Severe 5/22 (23%)	3/5 (60%)	1/5 (20%)

Of mothers who had pain, the majority did not have top-ups within 30 min of delivery. Eight of nine (89%) with mild pain and 5/8 (63%) with moderate pain did not actually ask for a top-up at all. Surprisingly, none with severe pain requested a top-up. The reasons given for not requesting top-ups included: fear of prolonging labour, decreased ability to push and increased instrumental delivery. One mother did not know that she could request a top-up and another found the pain acceptable.

Conclusion: A disappointingly large proportion (27%) of women with regional analgesia experience pain in the second stage. In this group, 82% had not even requested a top-up even though only one woman found the pain acceptable. In many cases this was due to misinformation about the effect of regional analgesia on the progress of labour.¹ We have instituted an education program for women and midwives to improve the quality of information available to women and encourage the provision of better analgesia in the second stage of labour.

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1. Anim-Somuah M, Smyth R, Howell C. Epidural versus non-epidural or no analgesia in labour. Cochrane Database of Systematic Reviews 2005.

P26 Perineal pain after traumatic or instrumental vaginal delivery: an audit cycle

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Introduction: Perineal pain following vaginal delivery is common.¹ It is more frequent and more severe with increased perineal trauma.¹ Perineal pain may impact on the mother and reduce her ability to breastfeed and care for her baby.² Trials have shown that NSAIDs are as effective as paracetamol and codeine for management of perineal pain but with fewer side effects.³ Anecdotal reports at our institution suggested that perineal pain was not well managed. An audit cycle was undertaken to see if this was the case, and whether the introduction of guidelines could improve outcomes.

Method:

The first audit (2003) and guideline introduction

The first perineal pain management audit performed in our hospital was in 2003 (98 women). It established that a significant number of women reported moderate to severe pain after traumatic or instrumental vaginal delivery and that analgesia was inconsistently prescribed and administered, resulting in poor maternal satisfaction. Following the audit, guidelines for the management of perineal pain were introduced. These applied to all women who had a perineal tear, episiotomy or instrumental delivery, with or without perineal repair.

The re-audit (2006)

The audit was repeated in 100 women in order to assess:

- The impact of the guidelines on the incidence of severe perineal pain
- Adherence to the guidelines
- Maternal satisfaction

Results: Comparing the first and second audits, the prescribing and administration of analgesia had increased. The incidence of severe pain on day 1 (21% vs. 15%) and day 2 (16% vs. 4%) had decreased and maternal satisfaction with pain management had improved (52% vs. 70%)

Conclusions: Implementation of guidelines for analgesia after traumatic vaginal delivery or instrumental vaginal delivery improved postnatal analgesia and maternal satisfaction.

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P27 National survey of the management of inadvertent epidural catheter disconnection in labour

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Introduction: Indwelling epidural catheters may occasionally become accidentally disconnected from the filter. Usually this results in the disconnected catheter lying on the patient's skin, clothing or bedclothes, all of which are potential sources of infection. The anaesthetist is then faced with the dilemma of either removing the catheter completely and reinserting it if necessary, or reconnecting it to a filter, possibly after cutting and/or cleaning the end of the catheter.

Methods: We sent questionnaires to all consultant-led obstetric units in UK with the aim to find out how anaesthetists manage witnessed (<10 min) and unwitnessed (≥10 min) epidural catheter disconnections. The questionnaire was sent to two consultants in each of the 203 consultant-led obstetric units.

Results: 228/406 replies were received (56%). The table shows the responses to the questionnaire. Only 18% of the units had a protocol to manage inadvertent epidural catheter disconnection.

	Witnessed disconnection	Unwitnessed disconnection
Reconnect	186 (46.15%)	82 (20.19%)
Do not reconnect	38 (9.3%)	142 (34.97%)
Depends	4 (0.98%)	4 (0.98%)
Clean and cut	95 (23.39%)	55 (13.54%)
Do not clean or cut	34 (8.37%)	8 (1.97%)

Discussion: Only one study has looked at the rate of bacterial migration along an epidural catheter filled with a preservative-free saline and fentanyl solution.¹ They found that 8 h after contamination, no bacteria were detected more than 20 cm from the contaminated end of the catheter as long as the fluid in the catheter was static. Our survey showed that there was lack of uniformity between various units in managing this problem. We recommend all units to have a protocol to manage epidural catheter disconnections. Efforts must be made to formulate a national protocol acceptable to all the units in UK.

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P28 Epidural needle sizes in the UK and rest of the world

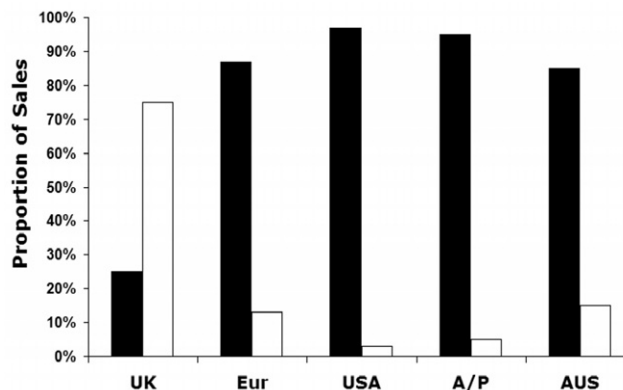
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Introduction: Anecdotal evidence suggests that 16-gauge Tuohy needles are the standard size used in the UK for obstetric analgesia and anaesthesia, but that smaller sizes are more commonly used overseas. Our aim was to investigate this suggestion further.

Method: We contacted two international manufacturers of epidural equipment and asked about sales of needles and packs in different regions of the world, and the UK in particular.

Results: One manufacturer did not respond but the other, B. Braun Melsungen AG (Melsungen, Germany), was able to provide global sales figures (Fig. 1). The company's estimated share of the worldwide market in epidural needles and packs is ~40%.

Figure 1. Sales of 18-gauge (black) and 16-gauge (white) epidural needles/packs in the UK and other regions of the world. Eur: rest of Europe; A/P: Asia/Pacific; AUS: Australia.



Discussion: The figures suggest a completely different pattern of use of epidural needle sizes in the UK to that in other countries. However, we have no information on the remaining 60% of the market share and furthermore, the figures are for all epidural sales, not only obstetrics. Despite this, the differences are so striking that we feel it is unlikely that a different pattern exists for other manufacturers; we also suggest that general sales/usage represents obstetrics, which constitutes a major (if not the major) area of use. Tuohy's original needle (used for spinal anaesthesia) was 15 gauge¹ and a landmark textbook from 1978 on epidural techniques² refers to sizes ranging from 15–22 gauge. We welcome suggestions from OAA members as to why and how modern practices, especially in the UK, have arisen.

Acknowledgement: We are grateful to Dr. Heike Fries and B. Braun for their assistance with this study.

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P29 National postal survey of methods used to ensure asepsis whilst performing regional analgesia and anaesthesia in obstetrics

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Introduction Asepsis and sterile precautions for regional techniques are vital to avoid serious neuraxial infections. The AAGBI publication (2002) *Infection Control in Anaesthesia* provides some guidance regarding aseptic technique. We decided to conduct a postal survey of obstetric anaesthetists to establish what they believed to be the essential minimal precautions required to ensure sterility.

Methods An OAA approved postal questionnaire which looked at commonly used aseptic techniques and variations was sent to all members in 2006. The questionnaire looked at several aspects of aseptic technique from hand-washing, attire, skin preparation, environment, rapid sequence spinal and complications.

Results The response rate was 50% (n=810); 36% were consultant anaesthetists. Regarding hand washing, 62% performed a full scrub before performing spinal compared to 54% for epidurals; 7% of responders would not remove jewellery and watches before procedures.

Attire	% of responders	
	Spinal	Epidural
Gown/gloves/hat/mask	73 (n=591)	67 (n=541)
Gown/gloves/hat	14 (n=115)	12 (n=101)
Gown/gloves/mask	2 (n=15)	6 (n=52)
Gown/mask/hat	3 (n=26)	1 (n=5)
Gown/gloves	3 (n=25)	11 (n=86)
Gloves	1 (n=5)	1 (n=9)
Hat/gloves	4 (n=33)	2 (n=14)

Twenty-five percent of responders restricted the number of individuals in the room when performing a spinal procedure; 142 responders performed rapid sequence spinals; 49 complications were noted

Conclusions Perceived minimal standards for aseptic techniques vary amongst those OAA members surveyed. Different methods are employed to ensure sterility when performing either epidurals or spinals.

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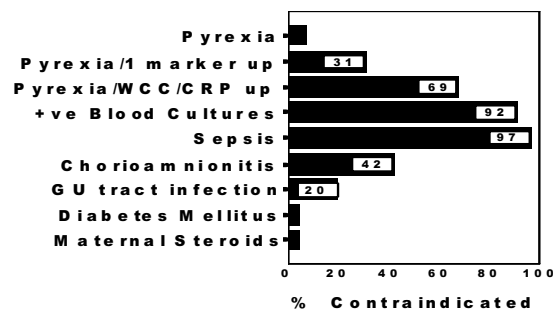
P30 Infective markers and neuraxial blockade in the obstetric population: a postal survey

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Introduction: Infective complications of neuraxial blockade are rare in obstetric anaesthesia but potentially catastrophic.¹ Infective markers increase caution when regional techniques are required. Lead obstetric anaesthetists were surveyed to determine current UK practice and to identify consensus in management.

Method: After OAA approval, a postal questionnaire was sent in September 2007 to 223 lead obstetric anaesthetists within the UK.

Results: 147/223 replied (66% response rate); 49% of responders thought that obstetric normal ranges for temperature, white blood cell count (WBC) or CRP were well defined. A maternal pyrexia >38°C and WBC >15×10⁹/L was considered significant. Potential contraindications to labour epidurals were:



52% would proceed if i.v. antibiotics had been given; 67% of this group considered the optimal time to be <1 h of epidural insertion; 40% would perform a spinal when an epidural was contraindicated. Of this subgroup, 29% considered this case-dependent, i.e. high risk of general anaesthesia. There were nine cases of infective complications in the last 3 years. There was no evidence of raised infective markers in seven cases.

Discussion: Only 50% of responders thought that normal ranges for temperature, WBC and CRP were well defined in labour and a WBC of 15×10⁹/L may be a conservative figure to cause concern.² Almost universally, responders thought sepsis or positive blood cultures were a contraindication to epidural insertion. Diabetes and steroid use in the obstetric population was not considered a major risk although diabetes is identified as a risk factor in non-obstetric cases of epidural abscess and only short term catheterisation (6 h) has been recommended.¹ More research is required to clarify many of these issues.

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P31 Audit of perception and application of 15° left lateral table tilt for obstetric anaesthesia

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Introduction: Fifteen degrees of left lateral table tilt at caesarean section is recommended to help reduce aortocaval compression and fetal acidaemia.¹ Aortocaval compression can be relieved in part by table tilt, insertion of a wedge or by manual uterine displacement. We audited the perception and application of table tilt amongst anaesthetists and ODPs covering the labour ward.

Method: Participants were asked what degree of table tilt was recommended for caesarean section. They were asked to tilt an empty operating table as they would for caesarean section. They were then shown what 15° tilt looked like, and were asked to reproduce this. Six weeks later they were asked to tilt the table to 15° again. Recordings were taken, with an angle measuring spirit level, at the initial attempt (A), after being shown 15° tilt (B) and at the 6 week follow-up (C) on closing the audit cycle.

Results: 28 participants completed the cycle. Median value given for recommended tilt was 30°. Greater than half of participants did not know the recommended degree of tilt.

Table showing degrees of table tilt applied. Values are degrees, mean ±SD. Analysis using two tailed t-test.

	A	B	C
Degrees	11.11 ± 3.23	13.68 ± 2.16*	14.21 ± 2.37†

* $P=0.00017$ vs. A; † $P=0.0000297$ vs. A

Discussion: Maternal cardiac output declines on moving from lateral to supine position.² Aortic compression can still be demonstrated up to 30°, IVC compression to 15°. Estimation of tilt is unreliable⁴ and we demonstrated a lack of knowledge of the amount of tilt to apply. Previous data have shown no improvement in application of table tilt over time,⁵ although we demonstrated an improvement in application of 15° tilt with training that was maintained in the short term.

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P32 It's leaning how much?

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Introduction: 15° left lateral tilt is used to reduce aortocaval compression at caesarean section.¹ Estimation of the angle of the table tilt is unreliable, being almost always overestimated.²

Method: We asked 10 members of staff from each of four groups (anaesthetic consultants, anaesthetic trainees, operating department practitioners and midwives) to independently estimate the angle of tilt of the Leaning Tower of Pisa from a photograph.



Figure 1. Leaning Tower of Pisa.³

Results: Estimated angle of tilt (degrees).

	Range	Mean (SD)
Anaesthetic consultants	8 – 15	10.5 +/- 2.1
Anaesthetic trainees	10 – 18	14.0 +/- 2.4
ODPs	4 – 30	12.4 +/- 9.9
Midwives	10 – 18	13.6 +/- 2.7

There was one estimate of 4°, three of 5°, and 36 of ≥8°.

Discussion: All groups overestimated the 5.5° tilt of the tower. Estimation of table tilt by anaesthetists is not dependent on obstetric anaesthetic experience,⁴ improves with education⁵ but degrades with time.⁵ Direct measurement of tilt angle may therefore be the most reliable method to ensure correct clinical application. The 'Tower of Pisa' might be useful to educate professionals about the difficulty of accurate estimation of angles.

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P33 Conversion and taps: the performance of a separate-space technique for elective caesarean section

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Introduction: The Royal College of Anaesthetists recommends a conversion rate of <1% from regional to general anaesthesia for elective caesarean section. Theoretically the use of combined spinal-epidural anaesthesia should result in a low rate of conversions to general anaesthesia. This study reports the experience of the use of a standardised separate space technique in a tertiary obstetric unit.

Method: The anaesthetic records of 3172 patients undergoing elective caesarean section between 1 January 1999 and 31 December 2007 at St. James's Hospital, Leeds were reviewed. A standardised approach to a double space CSE was used. Specific note was taken of failure of regional anaesthesia, inadvertent dural puncture and post dural puncture headache.

Results: General anaesthesia was required in 7 (0.22%) out of 3172 patients. There were 24 (0.76%) inadvertent dural punctures. Dural puncture with a 27-gauge pencilpoint spinal needle was responsible for eight headaches. In total eight patients (0.25%) required epidural blood patching. Of particular note five of the seven women requiring general anaesthesia were obese (BMI >35 kg/m²). The elective workload was shared by four consultants and trainees. The number of trainees increased from 23 in 1998 to 40 in 2007.

Discussion: The rate of conversion to general anaesthesia in elective sections during the period studied with this technique was 1 in 450. The failure rate would be lower for the non obese.

Conclusion: Combined spinal-epidural anaesthesia for elective caesarean section using a separate space technique is associated with low rates of failure, inadvertent dural puncture and post dural puncture headache.

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P34 Paraesthesia or dysaesthesia accompanying dural puncture when performing combined spinal epidural (CSE) analgesia

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Introduction: Combined spinal epidural (CSE) is the most advanced and effective method of providing rapid pain relief for labour and anaesthesia for caesarean sections. During insertion of the spinal needle through the dura, patients can experience abnormal unpleasant sensations, whose incidence is higher in CSE than in routine spinal anaesthesia, but varies between the techniques used.² Paraesthesia is described as "an abnormal sensation such as burning, pricking, tickling or tingling."³ The sensation is due to stimulation of dural nociceptive or pain fibres transmitted through the lumbar dorsal root ganglia.⁴

Method: After patient enrolment and consent, CSE was performed in the usual manner on 21 non-labouring patients (elective caesarean section) and 54 labouring women. Labouring women who had received pethidine or nitrous oxide within 10 min were excluded. On dural puncture, patients' experience was recorded by asking the question "did you feel anything?" The patient was also asked whether the feeling was normal or abnormal and unpleasant or not. Patient responses to dural puncture were compared using Fishers exact test.

Results: The sensation is abnormal rather than normal ($P<0.001$) and unpleasant rather than not-unpleasant ($P<0.001$). The difference between the rate of sensation in labouring versus non-labouring is 21 of 54 (38.88%) vs. 16 of 21 (76.19%; $P<0.025$).

Discussion: It has been shown in animal studies that spinal C-type nociceptive fibres can undergo long-term depression (LTD) through A δ nociceptive fibre stimulation.⁵ Pain due to uterine contractions and pelvic tissue stretching during labour decreases the pain of dural puncture in CSE in this group, probably through LTD. The widespread use of the word paraesthesia is incorrect and the term dysaesthesia should be used. Also, the higher incidence of dysaesthesia during CSE for elective caesarean section should be communicated to patients.

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P35 Preparation times for pH-adjusted lidocaine/adrenaline epidural top-up mixture

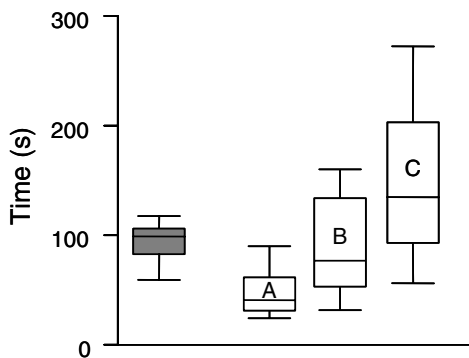
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Introduction: We have recently changed to the use of pH-adjusted lidocaine/adrenaline for epidural top-ups for emergency caesarean section (CS), following evidence of its short onset time.¹ Previous work has suggested that preparation of such mixtures may take up to 5 min, negating any potential time saving.² Our experience is that with practice, preparation times are greatly reduced. We measured the times taken to mix the above solution by anaesthetists in our unit.

Method: After written consent, 12 anaesthetists who regularly covered labour ward prepared the mixture on a single occasion, as for an emergency CS: (i) 2 mL NaHCO₃ 8.4% added to 20 mL lidocaine 2%; (ii) 2 mL of the resultant mixture discarded leaving 20 mL; (iii) 0.1 mL adrenaline 1:1000 added.¹ Time from the moment the first syringe packet was opened to when 20 mL of the mixture was ready to inject was measured.

Results: Four consultants and eight trainees participated. Preparation times are shown in the Figure.

Figure. Preparation times (shaded) for pH-adjusted lidocaine/adrenaline epidural top-up mixture (median/IQR/range). Times reported by Lucas *et al.*² are shown for comparison (A: bupivacaine, B: lidocaine/adrenaline, C: pH-adjusted bupivacaine/lidocaine/adrenaline).



Discussion: Preparation of the top-up mixture took under 2 min in all cases, approximately 1 min longer than drawing up plain bupivacaine in Lucas *et al.*'s study.² This is considerably less than the median 'saving' in onset time of ~7 min with the pH-adjusted mixture.¹ We conclude that the use of pH-adjusted lidocaine/adrenaline need not add excessive delay to preparation for emergency caesarean section, if anaesthetists are practised in its preparation.

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P36 Record keeping for caesarean sections. a re-audit

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Introduction: Documentation of intra-operative events during caesarean section (CS) is important. Pressure of time, oversight and lack of knowledge can result in inappropriate or inadequate information being recorded in medical records. A previous audit of anaesthetic records during CS in 2005 demonstrated poor documentation. Accordingly we redesigned our anaesthetic chart incorporating tick boxes, a dermatomal chart and written prompts with the intention of reducing the amount of freehand text entry required and improving documentation.

This audit was to assess if the redesigned anaesthetic forms had led to an improvement in documentation of: (a) the sensory block levels and time of testing before surgery; (b) the time of skin incision, uterine incision and delivery of the baby; (c) maternal comfort or pain during the surgery and any treatment offered.

Method: We conducted a prospective study of 100 CS (both elective and emergency) following the introduction of the new anaesthetic charts. The data were collected from the anaesthetic forms in the patients' notes. This was compared with the previous audit data from the 100 CS for the period January 2005 to April 2005.

Results: 100 new anaesthetic forms were reviewed. The results are as follows, with the previous (2005) results shown in brackets:

- 85% (37%) of the forms documented the sensory level of the block and 75% (37%) the time of the regional block testing.
- 97% (48%), 77% (6%), and 97% (43%) documented the timings of skin incision, uterine incision and delivery of baby respectively.
- 63% (18%) documented maternal comfort or pain during the surgery.

Discussion: The audit showed that documentation has improved in all three areas studied since the introduction of the new form. We feel this is a result of the changes made to the anaesthetic chart, which not only provides a prompt for the required data but also makes data entry easier. However there is room for further improvement.

P37 Audit of transfer times to theatre after introducing an emergency caesarean section pathway

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Introduction: Preparing a mother for urgent caesarean section (CS) is a complex multidisciplinary process. National guidelines recommend that the time from decision to delivery for CS with fetal compromise should not exceed 30 min.¹ In a recent audit of GA sections in our unit we failed to meet the standard of <3% conversion rate in emergency CS which includes regional anaesthetic for labour converted to GA for CS.² A prime cause was slow transfer of women to theatre not giving anaesthetists sufficient time to establish an adequate regional block. We looked at the actions necessary before transfer to theatre and developed a pathway with a check list charting actions that should be performed in advance of a decision for CS. This was subdivided into actions initially required for all (such as giving ranitidine, charting blood results and antibody status, removing jewellery and cosmetics) and further actions to be completed if CS deemed likely. This was to be completed for all women who were not low-risk defined as all women requiring a continuous CTG. Following its introduction for 6 months we performed an audit to determine whether the pathway was being used, how well it was being completed and the impact it had on reducing delays.

Method: Forty patients who had a category 2 CS between March and July 2007 were randomly sampled and their notes studied. Data were collected for each patient, including the reason for CS, whether the pathway was used and if so, if the relevant actions had been completed. The time taken from decision for CS to both arrival in theatre and to delivery was noted.

Results: The pathway was used in 55% of women.

Table:

	Mean (median) time from decision to arrival in theatre (min)	Percentage arriving in theatre within 5 min of decision
Using pathway	9.3 (6)	48%
Not using pathway	13.5 (11)	31%

Discussion: Use of the emergency CS pathway appears to shorten the time taken to arrive in theatre. This should allow anaesthetists more time to institute a regional block yet still allow delivery within 30 min. It appears to result in a calmer and more organised transfer and has been welcomed especially by more junior midwives. Uptake of the pathway needs to be increased by further midwife education.

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P38 Urgency of caesarean section categories: do we know what we are aiming for?

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Introduction: The category 1-4 caesarean section classification is based on a survey from 2000¹ and does not mention time limits. The OAA and AAGBI recommend that the urgency of caesarean section should be categorised by a system agreed locally,² and therefore each hospital in Wessex has its own individual guidelines. Trainees rotate annually and may not therefore know the classification of categories for caesarean section in their current hospital.

Method: A survey of Portsmouth's Maternity Services in 2006 showed only 22% correctly defined the trust guidelines and time to delivery limit for category 1 and 2 caesarean section.³ We asked anaesthetists, obstetricians and midwives throughout Wessex to define anonymously their current hospital's guidelines and their opinion on them.

Results: We received 167 responses from all eight obstetric departments in the Wessex region; 45% were from anaesthetists, 27% obstetricians and 28% midwives; 22% of our respondents were consultants (anaesthetists 12%, obstetricians 10%), 9% associate specialists (AS) and staff grades (SG), 29% SpRs, 12% STs 1-2, and 28% midwives. 54% correctly stated their hospital's time limits for a category 1 section and 43% for category 2, but only 36% knew the correct time limits for category 1 and 2.

Asked to rate 'excellent/ good/ satisfactory/ poor' for the classification system in their current hospital, 31% felt it was 'excellent' for the most urgent category, 44% 'good,' 17% 'satisfactory' and 4% 'poor.' For all other categories 6% felt their system was 'excellent,' 47% 'good,' 35% 'satisfactory' and 8% 'poor.'

Asked if the classification guidelines should be consistent on a national, regional or local level, 77% felt there should be consistent national guidelines, 11% regional and 12% local guidelines. Overall 84% felt that these guidelines should include time limits.

Conclusion: There is a high level of uncertainty amongst all levels of obstetricians, anaesthetists and midwives in Wessex regarding the meaning of each category and the time limits at their current hospital. A significant number would like to see consistent guidelines on a national or regional level with time limits attached to these guidelines.

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P39 Conversion from regional to general anaesthesia for emergency and elective caesarean section

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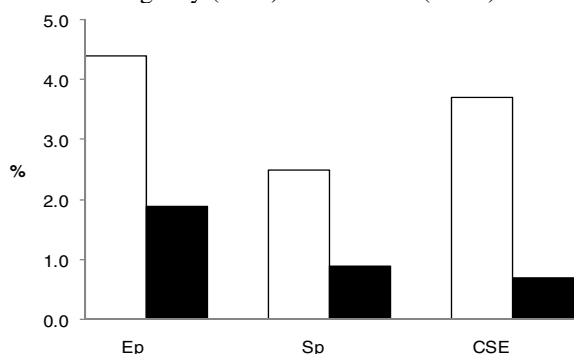
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Introduction: Previous reports have examined conversion rates from regional to general anaesthesia (GA) for caesarean section (CS), but either with small numbers or without separating the regional anaesthetic techniques^{1,2} or emergency/elective cases.³ We analysed data from our unit over a 6-year period, examining these details.

Method: We identified all cases of CS performed under GA preceded by regional anaesthesia for 2002-2007, from routine data collected prospectively on all obstetric anaesthetic interventions. Conversion rates for CS under epidural, spinal and combined spinal-epidural (CSE) anaesthesia were calculated from annual data on the numbers and indication of each technique performed.

Results: Out of 28,026 deliveries, 8767 (31.3%) were by CS with 542 (6.2%) under GA, of which 212 (39.1%) followed failure of a primary regional technique. Average conversion rates from regional to GA were 3.8% for emergency and 0.8% for elective CS; rates for the different techniques are shown in the Table.

Figure: Conversion rates to GA for epidural, spinal and CSE for emergency (clear) and elective (black) CS.



Discussion: Shibli and Russell's survey of 1997 found that conversion rates were least with CSE,³ though they did not differentiate between emergency/elective cases. Our data suggest a greater conversion rate with CSE than spinals for emergency cases but not for elective CS. This might be related to less available time in emergencies, or a higher risk of failure when performing the more complicated CSE technique in an urgent and stressful situation.

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P40 General anaesthesia rate for caesarean sections and variation among the ethnic minority: audit over 12 months

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Introduction: The reduction in general anaesthesia rate has contributed towards a reduction in maternal mortality and morbidity.² In 1996 studies found that Asian women received general anaesthesia for caesarean section more frequently than did Caucasian women¹. Previous studies have demonstrated that ethnic variation can be addressed in part by improved communication.

Method: Following audit committee approval we carried out a retrospective audit for 2006. Data were collected from an anaesthesia procedure book and hospital maternity database. Orientals and Afro-Caribbeans were also counted as ethnic minority. Data were compared with 2000 and analysed using χ^2 test.

Results: During 2006, there were 5631 deliveries and 1292 caesarean section; 83/1292 (6.4%) were done under general anaesthesia: 13/575 (2.2%) of elective and 9.62% (69/717) of emergency caesarean sections. There were 21 conversions to general anaesthesia from regional anaesthesia (2.2% for emergency and 0.8% for elective caesarean sections); only eight cases were converted to general anaesthesia intraoperatively There was no ethnic variation in rate of general anaesthesia during 2006 and an improvement since 2000 (Fig 1).

Percent of caesarean sections under general anaesthesia

	Emergency		Elective	
	2000	2006	2000	2006
Caucasian	11.1*	9.39	4.2	3.31
Ethnic minority	38.5*	11.24	22.2	3.23

*($P < 0.05$)

Discussion: Our general anaesthesia rates are within national guidelines with low conversion rates, particularly intraoperatively. The variation among ethnic minority groups has disappeared, which is reassuring and may reflect improved cultural integration.

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P41 Failed or difficult intubations and training opportunities for caesarean section under general anaesthesia: annual audit and re-audit

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Introduction: Difficult or failed intubation is the most frequent cause of death directly attributed to general anaesthesia (GA). Consequently, the need for adequate training in caesarean section (CS) performed under GA cannot be overemphasised.¹

Aim: (1) To determine the incidence of failed and difficult intubation and the efficiency of use of teaching opportunities. (2) To evaluate the quality of data that can be collected electronically.

Method: Data for 2004 were collected from case records, but for 2005 and 2006 from Euroking, an electronic database. Data retrieved included: GA CS undertaken during 2004, 2005 and 2006, grade of CS and anaesthetists, timing, problems experienced during intubation and whether teaching occurred.

Results: 78/772, 77/738 and 88/788 CS were performed under GA in 2004, 2005 and 2006 respectively; 56%, 52% and 41% of GA CS took place out of hours (1800-0800), as did all but two incidents; 5/7, 10/11 and 13/13 of elective GA CS were used for teaching but overall 40%, 67% and 87% of daytime cases were used for teaching during 2004, 2005 and 2006 respectively. A consultant or year 3-5 registrar (SR) was present during 77% (2005) and 81% (2006) of out of hours GA CS.

Table 1: Incidence of failed or difficult intubation

Incidents	2004	2005	2006	Cum'lative
Failed	1/78	0/77	2/88	3/243
intubation	(1.3%)	(0%)	(2.3%)	(1.2%)
Difficult	12/78	1/77	2/88	15/243
intubation	(15%)	(1.2%)	(2.3%)	(6.1%)

Discussion: The continued reduction in trainees' GA CS experience increases the risk of difficult and failed intubation. However, such risk can be minimized by regular auditing, increased senior anaesthetist presence and increased teaching. Realising that most incidents occurred out of hours, we managed to reduce out-of-hours CS numbers and, through changes in the rota, we have increased the out-of-hours presence of a SR for GA CS. We have made changes to Euroking, so that more detailed information regarding difficult intubation can be collected. Although we are achieving proposed targets of difficult intubation (1:30) and teaching on all elective GA CS,² we believe that *all* day-time GA CS can and should be used for teaching.

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P42 Using audit as a tool to redesign an anaesthetic chart

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Introduction: Documentation of accurate anaesthetic records is important for patient care, audit and medico-legal purposes.

Method: Sixty anaesthetic charts were audited using published documentation guidelines.¹ A new chart was trialled and a second audit carried out. Further changes were made and the improved chart was introduced, followed by a third audit.

Results: We looked at 36 points in each chart. Documentation improved from 65% to 72%, and then to 92%. Points to highlight are as follows:

Point	Old chart %	New chart %	Final chart %
Supervision	7	50	95
Medical history	72	88	92
Anaes history	67	83	93
Drug history	62	95	97
Block quality intraop	41	82	87
Initial epi dose	96	86	100
Epi top-up dose	90	80	100
Spinal/CSE dose	97	52	92

Discussion: Overall, documentation improved with the new charts. This was most marked for supervision, initially due to a prompt box and then to a change in culture, as trainees became aware of RCoA guidelines.² Documentation of patient history improved with the addition of prompts. Further improvements were then seen as familiarity with the chart increased over time. Significant improvement in documentation of intra-operative block quality followed the addition of a prompt box. This was only slightly improved by outlining the box in red. As has previously been predicted,³ we also found unintended deleterious effects, principally in documentation of epidural and spinal drug doses, the position of which were moved in the new chart. This improved dramatically following education and increased chart familiarity for epidural analgesia and the introduction of a more specific prompt for epidural top-ups and spinals/CSEs in theatre. In conclusion, the addition of prompts may not improve documentation adequately without education and cultural change. Also, completing the audit cycle can highlight unanticipated deleterious effects.

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P43 Uterine exteriorisation at caesarean section: a completed audit cycle

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Introduction: In 2005 an audit revealed that uterine exteriorisation was performed in 26% of caesarean sections (CS) in our unit,¹ despite guidelines recommending that this should not be done routinely.² We presented our results, (that exteriorisation was associated with increased pain, nausea and vomiting) to our obstetric colleagues and the NICE recommendations were included in the unit's guidelines. Two years later we re-audited to determine whether these interventions had resulted in any changes.

Method: All women undergoing CS under regional anaesthesia were included. The incidence of uterine exteriorisation (UE), intra-operative pain, nausea and vomiting, (N+V) were documented. In addition communication prior to UE, intraoperative blood loss and length of surgery were noted.

Results:

		2005 n=98	2007 n=176
Exteriorisation	n (%)	26 (26.5)	15 (8.5)
Pain	n (%)	7 (27)	4 (27)
N+V	n (%)	9 (35)	1 (7)
Anti-emetic	n (%)	9 (35)	3 (20)
Annual CS rate	(%)	35	34

In all cases the obstetrician forewarned the anaesthetist of UE. The mean intraoperative blood loss in these cases was 1086 mL and duration of surgery 80 min.

Conclusion: Our intervention seems to have led to a reduction in uterine exteriorisation. It is gratifying that the obstetricians now always inform us before UE. We cannot fully explain the reduction in nausea and vomiting but speculate that increased surgical awareness and a gentler touch might be factors.

The mean intraoperative blood loss and operation time was greater than expected reflecting the more complex nature of a CS that requires uterine exteriorisation.

This audit confirms that exteriorisation is associated with an increased incidence of pain and thus should only be undertaken when absolutely necessary and women should be warned that they may feel discomfort.

References

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P44 Audit of recovery standards for obstetric patients in five maternity units in the West of Scotland

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Introduction: Minimum standards for recovery facilities have been defined in a joint document from the Association of Anaesthetists of Great Britain and Ireland and the Obstetric Anaesthetists Association.¹ An audit was carried out to ensure these standards were being met in five obstetric units in the West of Scotland region.

Method: In each unit the recovery area was inspected to ensure standards for facilities and equipment were met. Ratio of beds to theatres was noted. Each bed space was examined for oxygen outlet, breathing system to deliver 100% oxygen, electrical sockets, pulse oximetry, non-invasive blood pressure (NIBP) measurement device, and suction. Each area was inspected for a defibrillator, and suction. Each area was inspected for a defibrillator, emergency drug box, intubation equipment, an effective emergency call system, ECG monitor, a thermometer and capnography. Over a one-week period in each unit all patients who had instrumental or caesarean section delivery in theatre were identified. Their notes were reviewed to ensure they had oxygen saturation, respiratory rate, heart rate, NIBP, conscious level, pain score, sensory level and blood loss measured and recorded at least every 15 min for the first 30 min they were in the recovery room.

Results: Two of the units in the audit did not have a dedicated recovery area. Of the other three units only two had the required ratio of at least two beds per theatre. All of the units had the required equipment in the recovery area. A total of 120 patients across the five units were audited. Only 10 patients (8.3%) met the audit standards. All of these patients were in the same maternity unit where 50% of the patients met the audit standard. Specifically, measurement of respiratory rate, pain scores, conscious level and sensory levels were often omitted in all the units.

Discussion: Although there was adequate equipment available across all the units, the majority of units do not have the recommended dedicated recovery area or capacity. Postoperative monitoring of obstetric patients was substandard in all the units audited. Staff education and unit guidelines may improve the postoperative care of parturients. When obstetric services are being organised recovery facilities should be given high priority and should meet national standards.

Reference

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P45 Use of a high dependency unit on delivery suite

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Introduction: Guidelines from the OAA and AAGBI emphasise the importance of appropriate facilities for antenatal and peripartum management of the sick obstetric patient.¹ We looked at the use of a one-bedded high dependency unit (HDU) on our delivery suite over a six-month period from June to November 2007. In our unit, twin deliveries are routinely managed in the HDU.

Method: A questionnaire was completed for all women needing HDU care for this period.

Results: 68 patients were admitted during the six-month period but complete data is available for only 63. The total number of deliveries during this time was 2075, making an admission rate of 3.27%. Eight patients (0.39% of deliveries) were admitted to ITU during the study period and six were discharged to our HDU. The table shows the reason for admission to HDU (some had multiple reasons). Nearly half (46%) were postoperative admissions and 70% were post partum. In 58%, the babies were delivered by emergency caesarean section. The HDU bed was already occupied in 9/63 cases (14%). These women then had HDU care in a normal delivery room. Invasive monitoring was used in 10% of women admitted; 61% stayed on HDU for <24 h and no patient stayed >72 h. Drug treatment of preeclampsia and management of post partum haemorrhage formed the mainstay of management; 25% of women received transfusion of blood and/ or blood products.

Table: Reason for HDU admission

Obstetric		Non-obstetric	
PPH	30 (41%)	Hypertension	4 (5%)
PET	19 (26%)	LRTI	3 (4%)
Twins	6 (8%)	SIRS	2 (3%)
APH	4 (5%)	DM	1 (1.5%)
HELLP	1 (1.5%)	Epilepsy	1 (1.5%)
Eclampsia	1 (1.5%)	Pulmonary oedema	1 (1.5%)

Discussion: The data show that our HDU use is higher than in other studies.² HDU is primarily used for observation of sick postoperative parturients and medical management of obstetric and non-obstetric complications. We have requested a second HDU room since 14% of HDU admissions had to be nursed in a labour ward room as the HDU room was occupied.

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P46 Introduction of transversus abdominis plane block for post caesarean section analgesia: a substitute or a supplement to patient-controlled opioids?

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Introduction: Adequate analgesia after caesarean section facilitates early ambulation and infant care and prevents venous thromboembolism. Though patient-controlled (PCA) i.v. opioids provide good analgesia, they are associated with unpleasant side effects and PCA equipment could be disadvantageous during ambulation. Encouraged by the results of recent studies demonstrating the analgesic potency of transversus abdominis plane (TAP) block in reducing opioid requirements, we introduced this block after elective caesarean section. An observational analysis was undertaken to evaluate the efficacy of TAP block in reducing opioid requirements and to investigate whether it should be used as a substitute or a supplement for i.v. PCA.

Methods: Routine anaesthetic practice for elective caesarean section at this unit involves a spinal anaesthetic with a combination of 0.5% hyperbaric bupivacaine and fentanyl, followed by multimodal postoperative analgesia comprising i.v. PCA morphine, for no longer than 24 h, regular co-codamol and diclofenac. Ultrasound-guided TAP block using 0.375% levobupivacaine (to a maximum dose of 150 mg) was added to the above regime when caesarean section was managed by one of the authors. Mean i.v. PCA morphine usage during the first 24 h in 20 consecutive women having TAP blocks (Group A) was compared with 20 consecutive women not having TAP blocks (Group B).

Results:

	Group A (n=20)	Group B (n=20)
24-h PCA morphine requirement (mg)	30 ± 7.07	59 ± 21.01

Data are Mean ± SD

In the first 24 h, TAP block reduced mean i.v. morphine requirement by 50% as shown in the table above. Mean pain (VAS) scores were 1.5 and 4 in groups A and B respectively.

Discussion: This observational study shows a reduction in total i.v. morphine usage and pain scores in patients having TAP blocks, demonstrating that it holds considerable promise in providing superior analgesia sufficient to substitute for i.v. PCA opioids after caesarean section under spinal anaesthesia.

Reference

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P47 Postoperative patient-controlled analgesia monitoring: the thin end of the wedge?

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Introduction: A drive to centralise maternity services as a result of the European Working Time Directive and a desire for consultant-lead units has resulted in larger units requiring more midwifery staff. In our unit, staff redeployment to a larger unit in November 2006 has reduced midwifery numbers in the wards by one third, but the annual delivery rate of 3500 and caesarean section rate of 30% have not fallen. We were concerned that overstretched staff might find it difficult to carry out postoperative monitoring in the busy wards. Our current postoperative analgesia is intrathecal fentanyl plus morphine patient-controlled analgesia (PCA), via a mechanical device, for up to 48 h. SpO₂, respiratory rate (RR), pain score, nausea and vomiting, sedation score and morphine consumption should be documented 4-hourly for the duration of PCA use. This audit was performed to examine the quality of PCA observations following caesarean section.

Method: Data were collected over two time periods in 2007 and compared to similar audits in 2003 and 2004. We recorded whether the specific PCA observation charts were completed appropriately.

Results:

	Dec 03 n=21	Dec 04 n=21	May 07 n=18	Dec 07 n=18
% PCA charts completed correctly	100	67	0	0

Absent RR and insufficient observation frequency accounted for the majority of incomplete charting. There were no adverse patient effects while using PCA.

Conclusion: Despite temporary benefit following staff education, there has been no sustained improvement in results during 2007, which confirms a marked deterioration in the quality of PCA monitoring.

Discussion: In the absence of patient compromise, it can be difficult to show reduction in the quality of patient care associated with reduction in staffing levels.

Recommendations: PCA morphine will be withdrawn at 12-24 h and oral morphine introduced to reduce the number of observations required and concentrate monitoring during peak patient use. There is also an initiative to incorporate PCA observations onto a new Early Warning System Chart (EWSC) to improve compliance and also to recruit more midwifery staff. Routine postoperative observations will be audited before the introduction of EWSC. A robust patient monitoring system by sufficient numbers of midwifery staff is essential for EWCS to succeed.

Reference

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P48 An audit of self-medicated postoperative analgesic requirements after elective caesarean section comparing intrathecal fentanyl and diamorphine

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Introduction: Good pain control after caesarean section increases mobility enabling mothers to care for their babies more easily and reduces the risk of thromboembolism. Intrathecal opioids reduce intraoperative discomfort. In randomised controlled trials only diamorphine has been shown to reduce the post operative analgesic requirement¹. We conducted this audit to see if diamorphine also reduced the self medicated analgesic requirements in our patients.

Method: A retrospective audit of 50 elective caesarean sections was performed. 25 received intrathecal fentanyl (dose 15–20 µg) and 25 received intrathecal diamorphine (dose 200–400 µg) combined with 0.5% heavy bupivacaine. The quantity of analgesia used over 48 hours postoperatively was collected from the casenotes. Morphine IM was administered by midwives. Oral paracetamol, ibuprofen and Oromorph were self medicated. Data was analysed statistically by means of an un-paired, double sided t test assuming populations of un-equal variance.

Results:

Table: Analgesia used in the first and second 24 h

	Total i.m. morphine (mg)	Total Oromorph (mg)	Total paracetamol (g)	Total ibuprofen (mg)
0-24 h				
Diamorphine (n=25)				
Mean	14.4	8	2.12	728
Fentanyl (n=25)				
Mean	23.6	14.8	3.08	1000
P	0.0042	0.0357	0.00179	0.139
24-48 h				
Diamorphine (n=25)				
Mean	0	13.2	2.68	1272
Fentanyl (n=25)				
Mean	0	14.2	2.68	1424
P	1	0.765	1	0.404

Discussion: Diamorphine significantly reduced the i.m. morphine and self-administered Oromorph and paracetamol requirements in the first 24 h post-operatively. Ibuprofen usage was also reduced in the first 24 h, but this was not statistically significant. No difference was seen between fentanyl and diamorphine after 24 h. We recommend the use of intrathecal diamorphine with self-medication of analgesics to provide optimal pain relief with minimised postoperative drug use.

Reference

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P49 Working practices and theatre staffing of maternity units in England with 3000 to 5000 deliveries per year

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Introduction: Ample recommendations and guidance for obstetric theatre and anaesthesia services exist.¹⁻³ Anecdotal opinion, however, suggests considerable variation in trusts throughout England where implementation of such guidelines could incur a financial burden. We conducted a telephone survey investigating the working practices and staffing levels for theatre and anaesthesia services in consultant-led obstetric units in District General Hospitals (DGHs) throughout England.

Method: From the published 2005-06 NHS maternity statistics for England, we included all 66 non-teaching DGHs in England with 3000 to 5000 deliveries/year. We contacted either the consultant anaesthetist or the midwife in/charge to complete the questionnaire.

Results: We received a response from 54 trusts (81.8%). Only 24 units (44%) had all 10 weekly sessions covered by a consultant anaesthetist. In 28% of hospitals the on-call anaesthetist for obstetrics also covered the intensive care unit (ICU); 72% of units had a separate scrub nurse for elective caesarean sections, whereas others used a midwife from the delivery suite. Only 57% had a separate scrub nurse for the out-of-hour units where midwives assisted in the obstetric theatre (43%), only 24% received mandatory training to scrub; 19 DGHs (35%) had a 24-h dedicated recovery nurse for obstetric theatre, the rest managing with the midwife from the delivery suite. Of the 35 units (64%) where a midwife recovered theatre patients, only 19 (54%) received mandatory training. All of the units had 24-h dedicated operating department practitioners (ODP) and only six units (11%) had non-resident ODPs.

Discussion: Our survey showed that more than 50% of the units do not have 10 consultant anaesthetist sessions covered as recommended.¹ Also significant numbers of on-call anaesthetists for obstetrics still covered ICU. The training of midwives to scrub for theatres and deliver postoperative recovery care is well below recommended standards.¹⁻³ Most trusts have resident ODPs for obstetrics. Shortages of resources may be the reason for our findings, but we strongly believe that this should not be dictating the standard of care. Improving safety for patients should be a priority.

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P50 Obesity in obstetrics: an audit on the obesity alert system and patients' intrapartum course

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Introduction: The prevalence of obesity continues to increase. In CEMACH 2003-2005, there were six direct deaths from anaesthesia, four had a body mass index (BMI) >35 kg/m² and two were morbidly obese with BMIs >40.¹ CEMACH has recommended obstetric units have a protocol for management of morbidly obese women, who should be referred for anaesthetic assessment and advice as part of their antenatal care. In our institution, all women with BMIs >35 at the time of booking are sent an anaesthetic alert sticker for the front of their obstetric case notes, which ensures that they are seen by anaesthetists on their arrival on the labour ward. All women with BMI >40 should be referred to the anaesthetic high risk clinic. Unless booked for an elective caesarean section (CS), we recommended all obese women have early epidural analgesia as they have an increased risk of operative delivery and we wish to avoid general anaesthesia. This audit aimed to assess our detection rate for the obese obstetric population and their intrapartum course.

Method: In June and July 2007, all postpartum women's BMI were noted and case notes of all women with BMI over 35 were reviewed retrospectively. Their clinical details, antenatal care, intrapartum course, outcomes and complications were recorded.

Results: 50 case notes were reviewed. *Antenatal care:* 68% had alert stickers; 17 had BMI over 40 (34%), but only nine had been seen in the anaesthetic antenatal clinic. *Intervention:* The overall rate of obstetric intervention was 72%; 20% had elective CS under spinal anaesthesia; 46% (23/50) had emergency CS; 21 had regional anaesthesia, one had general anaesthesia (GA) and one had a spinal but required conversion to GA; 4% had instrumental delivery under epidural; 30% (15/50) had SVD, of whom eight had no obstetric or anaesthetic intervention. Six had epidurals and one needed spinal anaesthesia for vaginal tear repair after SVD. The overall epidural rate was 48%. Of the 40 women who did not have elective CS, 24 had epidurals, 16 of these were inserted early (cervix <5 cm dilated).

Discussion: Our audit showed that the alert system for detecting the obese population at booking was sub-optimal and more should be done to increase their detection and referral rate to the anaesthetic antenatal clinic. This in turn should improve the early epidural rate which is necessary to avoid serious complications associated with GA in obese patients.²

References

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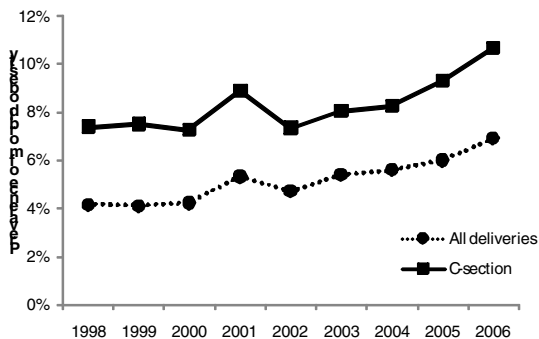
P51 Impact of increasing maternal obesity on anaesthetic service provision from 1998 to 2006

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Introduction: Increasing incidence of morbid obesity in pregnancy can cause particular difficulties for the obstetric anaesthetic service as such patients are less likely to have successful regional analgesia¹ and anaesthesia and are more likely to suffer intra- and post-operative complications of surgery.² This high-risk population requires senior anaesthetic referral and input, at the time when seamless training provides specialist trainees who are increasingly inexperienced. The primary aims of the study were to determine trends in maternal body mass index (BMI) at booking and the prevalence of morbid obesity in patients requiring anaesthetic services.

Methods: Following audit committee approval, data on 47,895 deliveries from January 1998 to December 2006 were collected from the Meditech Patient Information System in our trust.

Results: The prevalence of morbid obesity (BMI >35 kg/m²) at booking has increased significantly from 4.1% in 1998 to 6.9% in 2006. This prevalence is greater in those delivering by caesarean section, rising from 7.4% to 10.7%. Similarly, 7.8% of those receiving epidurals in labour were morbidly obese, up from 5.3% in 1998.



Conclusion: This study confirms our impression that morbid obesity now accounts for an increasing proportion of the obstetric anaesthetist's workload. These trends should be taken into consideration while planning obstetric anaesthesia services in the future and appropriate senior anaesthetic cover provided, together with the necessary equipment.

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P52 Prospective audit of the impact of obesity in an elective caesarean section population

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Introduction: In the recently published CEMACH report,¹ more than half the women who died were overweight or obese. In our hospital, an alarming number of patients scheduled for elective caesarean section are overweight or obese. We undertook a prospective audit to investigate the booking BMI of elective caesarean section patients within our service and accurately quantify the level of obesity.

Method: We conducted a prospective audit of casenotes of women who had elective caesarean section identified from the computerised theatre booking system between November 2006 and February 2007. Data were collected on age, booking body mass index (BMI), caesarean section indication, pregnancy and anaesthetic complications. The data were collated and stored as a Microsoft Excel database.

Results: 143 elective caesarean section patients were identified; mean age 32 years (range 20-47), mean BMI 28 kg/m² (range 18-52).

	Total	Overweight or obese
Elective caesarean section	143	105 (73%)
Indication:		
previous section	80 (56%)	58 (73%)
large or previously large baby	16 (11%)	14 (88%)
breech presentation	31 (22%)	19 (61%)
other	16 (11%)	14 (88%)
Pregnancy complications:		
Pregnancy-induced hypertension	15 (43%)	13 (87%)
Gestational diabetes	8 (23%)	8 (100%)
Large for dates baby	12 (34%)	10 (83%)
Anaesthetic complications:		
Multiple attempts at spinal	11 (55%)	11 (100%)
Failed spinal	3 (15%)	3 (100%)
Inadequate epidural	2 (10%)	2 (100%)
Paraesthesiae	2 (10%)	1 (50%)
Other	2 (10%)	2 (100%)

Data are n (% of total)

Discussion: Worryingly high numbers of overweight and obese women exist within our elective caesarean section population. The prevalence of maternal obesity puts existing resources under pressure and impacts on delivery of care and provision of services to all women. We now plan to do a larger prospective study of all booking BMIs across Lanarkshire and make recommendations as to how local services and resources can improve management of maternal obesity.

Reference

1. Saving Mothers Lives: reviewing maternal deaths to make motherhood safer (2003-2005).

P53 Saving Mothers' Lives: is CEMACH reaching the right people?

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Introduction: The Confidential Enquiries into Maternal and Child Health (CEMACH) is of relevance to many disciplines/specialties. Its latest report on maternal mortality¹ was launched in December 2007 at four meetings in the UK; our aim was to identify the proportional representation of these disciplines/specialties that attended.

Method: We contacted the CEMACH organisers and requested a list of attendees at the four UK meetings and their specialty. The numbers of each discipline/specialty in attendance were then recorded.

Results: A total of 1112 delegates attended the four meetings (Table).

Table. Number (proportion) of attendees of various disciplines attending the CEMACH launch in 2007.

Midwife	501 (45.1%)
Obstetrician	164 (14.7%)
Risk/ward/service manager	124 (11.2%)
Anaesthetist	110 (9.9%)
CEMACH	52 (4.7%)
Unspecified doctor	45 (4.0%)
Unspecified lecturer	25 (2.2%)
Public health/governmental	21 (1.9%)
Psychiatrist	17 (1.5%)
Exhibitor	15 (1.3%)
Nurse	13 (1.2%)
Other medical specialist	13* (1.2%)
Pathologist	8 (0.7%)
Not specified/other	4 (0.4%)

*including one GP and one emergency doctor

Discussion: It is likely that many of the managerial posts are occupied by midwives, bringing the proportion of midwives attending to over half. The numbers of doctors present are small by comparison, with obstetricians more likely to attend than anaesthetists. What is particularly concerning is the poor attendance from doctors in the acute sector (A&E and general practice), considering the standard care in this area highlighted in the recent report.¹ This might reflect a lack of interest, lack of awareness, poor access to the meeting, and/or a reliance on alternative routes of access e.g. the internet or other electronic format, written document, etc.

Reference

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P54 Thromboembolism risk assessment: are we complacent?

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Introduction: Thromboembolism continues to be the major direct cause of maternal deaths since the first triennial report in 1985-87.^{1,2} Despite the introduction of RCOG guidelines, deaths from thromboembolism during the antenatal period and after vaginal deliveries continues to remain high.^{2,3}

Method: As part of a biennial audit cycle, over a period of six weeks we prospectively audited all women delivering in our unit for the presence of risk factors and the use of thromboprophylaxis. The mothers were classified as low/medium risks for labour and moderate/high risk for caesareans according to RCOG risk assessment profiles.³ We compared the results with our previous audits in 2003 and 2005.⁴

Results: 460 women were reviewed during this period. The tables shows the proportion in each category given prophylaxis.

	2003	2005	2007
<i>Labour</i>			
Low risk	0/58 (0%)	2/17 (12%)	0/103 (0%)
Medium risk	8/21 (38%)	3/3 (100%)	13/23 (56%)
<i>Caesareans</i>	1999	2005	2007
Moderate risk	12/65 (18%)	21/21 (100%)	103/105 (98%)
High risk	3/21 (14%)	7/7 (100%)	1/1 (100%)

None of the women in the audit developed deep vein thrombosis or pulmonary embolus; 50.4% had one or more risk factors with 5.2% having a higher grade of risk, which would require LMWH prophylaxis.

Discussion: The last three reports recommended that *all* women should be screened for risk factors and a wider use of thromboprophylaxis should be considered. Although guidelines have been established in our unit, many at-risk women who delivered vaginally failed to receive prophylaxis. Our observations confirm and correlate with the findings of the recent CEMACH report. Developing guidelines alone will not improve practice. Re-audits, education, changes in attitudes and practice by members of staff is needed if outcomes are to be improved. All women are now to be assessed for risk and a flow chart for their management is being developed to improve care.

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P55 Severe obstetric morbidity and the value of modified early obstetric warning scores

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Introduction: The recognition of life-threatening illness is challenging in the obstetric patient, and this has led to the development of Modified Early Obstetric Warning Scores (MEOWS) to detect and allow earlier management of critical illness.¹

Method: We conducted a descriptive, retrospective case-notes review of all obstetric admissions to our intensive care unit (ICU) between January 2005 and December 2007. ICU admissions were compared with previously collected data for the years 2002 to 2004. MEOWS were retrospectively calculated for these women, 2 h before their ICU admission.

Results: The total deliveries during 2005-2007 were 12213, with no maternal deaths during this period. There were 35 obstetric admissions to the ICU, giving an incidence of 2.87/1000 deliveries. This had increased from 1.78/1000 deliveries for the period 2002-2004.

Reason for ICU Admission	2002-2004 n=20	2005-2007 n=35
Haemorrhage	6	18
Preeclampsia	7	5
Thromboembolism	0	1
Fatty liver	0	1
Cardiac	1	3
Neurological	2	0
Epilepsy	1	1
Renal	1	0
Sepsis	1	3
Pneumonia	0	1
Anaphylaxis	1	1
Phaeochromocytoma	0	1

MEOWS were calculated for 13 patients, with notably higher scores seen in women with preeclampsia and sepsis, 2 h before ICU admission but not in the women with haemorrhage.

Discussion: The admission rate to ICU from obstetrics has increased in our unit. Haemorrhage and preeclampsia remain the leading causes requiring admission. From our small sample, implementation of MEOWS may aid early recognition of developing critical illness in parturients with sepsis and preeclampsia. Patients with massive obstetric haemorrhage showed rapid deterioration before surgical intervention and subsequent ICU management, and MEOWS may not be so valuable in recognising their deterioration.

Reference

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P56 Estimate of incidence of cardiac disease in our obstetric population and retrospective audit of antenatal and intrapartum management of women with significant cardiac disease

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Introduction: The triennial (2003-2005) CEMACH report ("Saving Mothers' Lives") has identified cardiac disease as the leading cause of maternal death.^{1,2} Our aim was to determine the incidence of cardiac disease amongst our local obstetric population (approximately 5500 deliveries per annum) and retrospectively audit their antenatal and intrapartum care from 2001 to 2007. Audit standards are that all women with significant cardiac disease should be referred for preconceptual counselling, consultant led antenatal care at booking, multidisciplinary team management including referral to obstetric anaesthetic assessment clinic (OAAC), obstetric and anaesthetic teams should be informed of admission to labour ward and a clearly documented multidisciplinary management plan.

Method: From the database, 705 women were identified with a history of cardiac disease at booking. We estimated the incidence of *significant* cardiac disease using the UK High Risk Registry categories,³ compliance with audit standards and outcomes.

Results: There were 109 women with significant cardiac disease. We audited 41 of these; 3 (7%) received preconceptual counselling; 30 (73%) were seen in OAAC, on average at 25 weeks gestation; 27 (90%) of these were also reviewed by a cardiologist (six at a joint clinic). Multidisciplinary management plans were documented in 26 (63%). Anaesthetist was informed in only 7/17 admissions to labour ward. Eleven women (27%) were not seen in the OAAC but five of these had been reviewed by a cardiologist in pregnancy. Only 2/11 had clear labour management plans documented. Twelve women (29%) had antenatal admissions for cardiac reasons; two women (5%) suffered significant cardiac morbidity post partum.

Discussion: This study has shown that in our hospital not all women with significant cardiac disease are receiving recommended care. Communication is essential for multidisciplinary care of women with significant cardiac disease. We propose a multidisciplinary action plan to ensure accessible documentation of the agreed management.

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P57 Central venous catheter insertion in the labour suite: ultrasound guided, or landmark technique?

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Introduction: NICE¹ guidelines suggest that ultrasound guidance should be used for elective insertion of central venous catheters (CVCs), and should be considered in the emergency situation. The CEMACH report recommends that invasive monitoring is used more frequently than is current practice.² CVC insertion in the labour ward often provides additional challenges. In cases of haemorrhage and preeclampsia, patients may be coagulopathic and thrombocytopenic. There may be abnormal anatomy or central venous thrombus relating to previous insertions, while intravenous drug users may carry blood borne viruses. The left lateral tilt position and changes of anatomy with pregnancy may make the landmark method less useful. There is little information on the use of ultrasound guidance for CVC insertion in the labour ward environment.

Method: This was a three-month questionnaire-based prospective audit of routine practice in a teaching hospital maternity unit of approximately 5500 deliveries per annum. The local ethics committee confirmed that this audit design did not require ethical approval.

Results: Seven questionnaires were completed (100% compliance) giving an incidence of approximately one insertion for every 1375 deliveries. Ultrasound guidance was used in two cases (29%). The attending anaesthetist felt it would have been useful in three of the five other cases, in one of which no machine was available when requested. Four cases (57%) had factors that may have made insertion more challenging (coagulopathy/i.v. drug abuse/history of multiple previous CVC insertions). No complications were reported in any of the insertion attempts (landmark or ultrasound-guided) and six out of seven anaesthetists stated that they were most familiar with the landmark technique.

Discussion: In this audit, the majority of CVC insertions were by the landmark technique, with only a minority of anaesthetists being more familiar with the ultrasound technique. Our audit suggests that training and equipment availability were the two main barriers to ultrasound being used more frequently.

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P58 Role of transoesophageal echocardiography and ventricular resynchronisation in perioperative management of severe peripartum cardiomyopathy

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Introduction: Peripartum cardiomyopathy (PPCM) occurs in less than one in 4000 deliveries, but the mortality ranges from 50 to 85%.¹ We describe the use of cardiac resynchronisation using a biventricular pacemaker in a patient with severe PPCM and discuss the role of transoesophageal echocardiography (TOE) in guiding perioperative management.

Case report: A 29-year-old, G3 P2 patient was referred with history of persistent respiratory tract infection at 36 weeks of gestation. On examination, she was in cardiac failure and an urgent echocardiogram revealed severe left ventricular dysfunction with global hypokinesia and mitral and tricuspid regurgitation. The ejection fraction was 23% and end diastolic ventricular diameter was 5.27 cm. A diagnosis of PPCM was made after systematic exclusion of other causes. Attempts were made in the coronary care unit over the next 48 h to stabilise the patient on digoxin, spironolactone, frusemide and i.v. hydralazine infusion. The sudden onset of supraventricular tachycardia (220-240 beats/min), which failed to respond to treatment, expedited the decision to proceed with caesarean section. In the operating theatre full invasive monitoring and anaesthesia were established; synchronised cardioversion was attempted, but was unsuccessful. TOE was used to guide the use of inotropes (adrenaline and enoximone) and fluids. The baby was delivered 45 min after induction. The patient was stabilised in theatre over next 2 h with TOE guidance and subsequently transferred to the cardiac intensive care unit, where an intra-aortic balloon pump was inserted for persistent hypotension. A decision was made to insert a Guidant Contak Renewal TR2 CRT-P biventricular pacemaker because of persistent electrical and mechanical dyssynchrony on TOE. This resulted in significant improvement and inotropic support and balloon pump were weaned. On follow-up the functional state had improved, with reduction in left ventricular end diastolic volume, increase in cardiac output with good ventricular remodelling.

Discussion: Cardiac resynchronisation is well established in treatment of chronic heart failure. This report describes its use in acute decompensated heart failure. Resynchronisation improves cardiac muscle efficiency without increasing oxygen consumption. This is useful in improving functional state and can serve as a bridge to transplantation.

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P59 Anaesthesia for caesarean section in patients with Klippel-Feil syndrome: report of two cases

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Introduction: Klippel-Feil syndrome (KFS) is an autosomal dominant condition leading to abnormal fusion of cervical vertebrae. It may be associated with craniocervical-junction anomalies, scoliosis, cardiac and genitourinary abnormalities. We describe two different management strategies used for caesarean section (CS).

Case 1: A 28-year-old primipara presented for assessment before planned CS. The patient had KFS, congenital hydrocephalus, left recurrent laryngeal nerve palsy and progressive respiratory disease. She had undergone occipito-cervical fusion and corrective surgery for severe thoracolumbar scoliosis. During a previous anaesthetic emergency tracheostomy was needed. On examination, she was wheelchair-bound, had a short neck with no cervical extension and a thyromental distance of 1.5 cm. Continuous spinal anaesthesia was chosen to achieve a titratable block with haemodynamic stability.¹ Repeated attempts with the Spinocath (catheter over needle) were unsuccessful. It was then decided to use a Pajunk Intralong spinal needle and a 27-gauge microcatheter was threaded with ease. After the CS, resistance was felt on withdrawing the catheter, which was noted to have stretched to three times its original length.

Case 2: A 25-year-old patient with KFS who had an anterior placenta praevia and previous CS was booked for elective CS. She had severe scoliosis with significant back pain and was unable to lie flat due to dyspnoea. At the previous CS, spinal anaesthesia was extremely difficult and the patient complained of being unable to breathe. On examination, she had Mallampatti grade 4 with very poor neck extension. A general anaesthetic with oral awake fiberoptic intubation (AFI) was planned.² Local anaesthetic was administered with spray-as-you-go technique and cricothyroid puncture. After an uneventful operation, the patient was transferred to the intensive care unit and extubated.

Discussion: Patients with KFS present a major airway management dilemma. In the first case, a spinal catheter was chosen in order to allow incremental regional anaesthesia. However, in the second case because of the potential risk of bleeding, AFI was chosen to avoid having to give general anaesthesia intraoperatively in a patient with a very difficult airway.

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P60 Uncorrected coarctation of the descending aorta in pregnancy complicated by preeclampsia: a case report

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Introduction: Coarctation of the aorta (CoA) makes up 5-8% of congenital heart disease. The main cause of maternal mortality associated with CoA is aortic rupture or dissection, usually associated with hypertension. The most recent CEMACH report found that cardiac disease is the most common indirect cause of maternal death.¹ We present a case of CoA complicated by preeclampsia.

Case report: A 21-year-old primigravida with a known tight coarctation of the descending aorta (gradient 50 mm Hg) was referred to our unit. Blood pressure control had always been difficult before pregnancy, but during pregnancy better control was achieved with labetalol 200 mg b.d. Echocardiography reported a dilated left ventricle and mild to moderate aortic incompetence. Initially elective caesarean section under general anaesthesia at 37 weeks of gestation was planned. On arranged admission the day before delivery she was markedly hypertensive (180/100 mmHg) with 2+ proteinuria and generalised oedema. Preeclampsia was diagnosed. Despite repeated i.v. doses of labetalol and hydralazine she remained hypertensive, became dyspnoeic with increasing oxygen requirements and developed fetal bradycardias. Emergency caesarean section was performed. She had a modified rapid-sequence induction with propofol target-controlled infusion and remifentanyl followed by suxamethonium. Total intravenous anaesthesia was used for maintenance. Invasive blood pressure monitoring was established in the upper limb as her femoral pulses were not palpable. Intraoperatively hydralazine was discontinued and phenylephrine 20 µg was required. Postoperatively she received further i.v. hydralazine and fluid challenges for poor urine output and developed pulmonary oedema with type-1 respiratory failure. She was admitted to the intensive care unit for 3 days and made a good recovery after treatment with i.v. diuretics and nitrates. Positive pressure ventilation was not required. Further echocardiography revealed a coarctation gradient of 90 mmHg. After cardiac magnetic resonance she is now on the waiting list for stenting and balloon dilation of her CoA. On discharge her antihypertensive medications were labetalol 300 mg t.d.s. and frusemide 40 mg b.d.

Discussion: As far as we are aware this is the first case report of *uncorrected* CoA complicated by preeclampsia. This potentially disastrous combination could be recognised late as hypertension is a sequela of both conditions. Early communication between obstetric, anaesthetic and cardiology teams is crucial.

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P61 Life-threatening airway obstruction in an obstetric patient presenting to a non-obstetric acute hospital

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Case report: A 39-year-old woman presented seizing, in extreme respiratory distress with marked stridor, SpO₂ 54%, heart rate <40 beats/min, blood pressure 188/109 mmHg. She was at 38 weeks of gestation and of Congolese origin. Clinical examination demonstrated massive neck swelling.

Bag-mask ventilation was impossible so we proceeded rapidly to direct laryngoscopy, which demonstrated a grossly deviated larynx, but intubation was achieved relatively easily. She remained hypoxic with florid pulmonary oedema. Our differential diagnoses were eclampsia, negative-pressure pulmonary oedema, aspiration and peripartum cardiomyopathy. Emergency caesarean section was performed. Intra- and postoperatively inotropic support was required. She was transferred to the intensive care unit for cardiovascular and respiratory support. Urgent echo excluded peripartum cardiomyopathy. The pulmonary oedema resolved rapidly with diuresis. There were no further seizures.

When the patient had stabilised, CT brain and neck scans were performed demonstrating a right frontal meningioma and a 4-cm left-sided thyroid nodule with tracheal compression and deviation. A 360-g thyroid was removed at surgery with haemorrhage noted into the gland. The patient was extubated with no neurological deficit.

Conclusion: This is a case of life-threatening airway obstruction secondary to haemorrhage into a goitre, precipitated by fulminant preeclampsia. This case highlights the new challenges for non-obstetric acute hospitals as our population evolves.

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P62 Postural orthostatic tachycardia syndrome in the puerperium : case report

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Introduction: Postural orthostatic tachycardia syndrome (POTS) is a rare but important cause of dysautonomia which has considerable implications for the anaesthetist in the puerperium.¹

Case Report: A 26-year-old primigravida presented to the antenatal clinic having undergone preconceptual counselling following a diagnosis of POTS that had been made a year earlier at the Royal Brompton Hospital. She was taking labetalol and her booking blood pressure was 134/86 mmHg. Increased antenatal surveillance was planned with weekly blood pressure checks. At 20 weeks a fetal anomaly scan was normal but she was admitted with a blood pressure of 150/94 and mild proteinuria. Her creatinine and urate levels were slightly elevated and she was started on methyl dopa. Over the next several weeks her blood pressure remained labile and elective caesarean section was planned for 36 weeks. At this point she was referred to the high risk obstetric anaesthesia clinic. At 31 weeks she was readmitted with headaches, right upper quadrant pain, a blood pressure of 145/105 and a heart rate of 120 beats/min. She had one dose of nifedipine prescribed by the obstetricians for diastolic hypertension. Overnight her blood pressure dropped to 85/40 and her heart rate to 85. She was given ephedrine 6 mg and rapid i.v. Gelofusine which increased her blood pressure to 100/65. The CTG trace remained stable throughout. The decision was taken to perform emergency caesarean section under regional anaesthesia. To provide the most stable haemodynamic conditions, she was given graded combined spinal-epidural anaesthesia with full invasive monitoring. Hypotension was treated with the α agonist phenylephrine in reduced aliquots of 25 μ g. Following delivery of a healthy male infant the patient was transferred to the intensive care unit for observation. This was uneventful and she was subsequently discharged having restarted labetalol.

Discussion: POTS is most commonly considered to be a dysautonomia that prevents effective vasoconstriction following transition from supine to standing. This results in venous pooling in the lower limbs and a reduced cardiac output via decreased venous return with a compensatory tachycardia. Anaesthesia and analgesia in the obstetric setting commonly involve blockade of the sympathetic nervous system, which can exacerbate these changes. When combined with hypertensive disease of pregnancy, management can represent a significant challenge for the anaesthetist.

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P63 Social demographics of non-English speaking parturients

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Introduction: Social deprivation is associated with poor fetal and maternal outcome.¹ Non-English-speaking parturients also have poor outcomes of pregnancy including a higher maternal mortality.² The latest CEMACH report highlights the risks associated with the immigrant population.³ This study aimed to compare the social demographics of native English speakers with non-English speakers.

Method: The age and social deprivation status of 252 consecutive non-English speaking parturients attending a large maternity unit over an 18-month period between October 2005 and April 2007 was investigated. The data were compared with a sample of convenience of 200 patients who spoke English. The social deprivation status was derived from postcodes using the Scottish Index of Multiple Deprivation (SIMD).⁴ Deprivation was defined as a SIMD score of 1-3 inclusive. Extreme deprivation was defined as a SIMD score of 1, representing that lowest deprivation decile of the population with the highest level of poverty.

Results: There was no significant difference between the mean age of patients who could or who could not speak English (28.0 years [SD 6.2] v 27.5 years [SD 5.4], $P=0.389$ respectively). SIMD scores were unavailable for 15 English and 3 Non-English speaking patients respectively. Non-English speaking patients were more likely to be deprived ($P=0.001$).

Table: Deprivation status of English and Non-English Speaking Parturients.

English-speaking [n]	Deprived (%)	Extremely deprived (%)
Yes [185]	97 (52%)	57 (31%)
No [249]	217 (87%)	151 (61%)

Conclusions: Non-English speaking parturients are twice as likely to be extremely deprived compared to the general population. This combination of poverty and language barrier represents a significant challenge for obstetric anaesthetists. Although this group of patients represents a very small proportion of the total number of parturients (approximately 3% in this study) they represent a high risk obstetric population.^{2,3}

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P64 Ethnic minority and teenage mothers: how informed are they about epidural associated risks?

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Introduction: Mothers of ethnic minority (EM) origin often have limited ability to speak English¹ and have poor access to antenatal clinics (ANC).^{1,2} Teenage mothers may be reluctant to attend ANC.³ In a prospective audit, we evaluated the validity of informed consent for, and satisfaction with information provided about labour epidurals among EM and teenage mothers.

Method: Questionnaires were completed before epidural insertion and during the 24-h post-natal follow-up visit. Data collected included age, ethnicity, fluency in English, antenatal information about epidurals, associated risks (EAR) explained to and recalled by mothers post partum and their satisfaction with consent.

Results: 135 mothers who requested epidurals in labour were recruited over a 3-month period, but 23 mothers couldn't be followed up post partum and were excluded from data analysis. Ninety-three mothers (83%) were fluent in English; the majority of these were whites (72%). The groups within EM were: Asian 13%, black 10% and others 5%. EAR recalled by mothers before discussion with an anaesthetist and at the time of epidural insertion in the two groups (white and EM) included headache 33 and 13%, hypotension 14 and 9%, failure 22 and 19%, weakness in legs 26 and 9%, nerve injury 21 and 10%, paralysis 30 and 10%. Proportions of mothers, who attended ANC and received leaflets about EAR and were able to recall post partum, EAR discussed by anaesthetists, and their overall satisfaction with consent, are shown in the table:

EAR recalled	Mothers		Age group (years)		
	Whites n=81	EM n=31	< 20 n=17	20-30 n=58	>30 n=37
> 6	25%	13%	18%	24%	13%
5 to 6	41%	19%	29%	38%	30%
< 5	32%	61%	41%	34%	54%
None	2%	7%	6%	3%	3%
ANC	34%	20%	17%	31%	34%
Leaflets	72%	58%	47%	60%	67%
Satisfied	76%	61%	64%	71%	89%

Conclusion: In contrast to white and older mothers, EM and teenage mothers were less informed antenatally about EAR, were less likely to remember and recall them later, and were more dissatisfied with information provided before consenting for epidural. Our current practice of consent for this subgroup is not informed.

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P65 Access to antenatal education in a multicultural inner city setting

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Introduction: The OAA has published information leaflets on labour analgesia in several languages, but not in Bengali. Most hospitals also provide antenatal classes on the subject. Our hospital serves a multicultural population; the 2001 consensus described 33% of the population as Bangladeshi, with over 50% of our births to women of Bangladeshi origin.

Method: We asked women on the postnatal ward about their antenatal education in a structured questionnaire; 105 questionnaires were completed; 17 were disregarded due to incomplete information. Women who did not speak English completed the questionnaire with the help of a health advocate.

Results: See table.

	White British	Bangladeshi
Had anaesthetic intervention	53%	50%
Information leaflet received antenatally	75%	44%
Attended hospital antenatal classes	50%	31%
Happy with information	79%	52%
Aware epidurals sited by anaesthetists	78%	45%
Believed epidurals sited by midwives	14%	<1%

One percent of women who completed the questionnaire spoke only Bengali. Approximately half of all mothers would have liked to speak to an anaesthetist in person. Among those who spoke no English, 87% were unaware of who sites an epidural, compared with 52% among those who had a basic understanding of English.

Discussion: There is an urgent need to address the lack of antenatal education in the subset of women whose first language is not English. In our audit only 1% of women spoke no English; however we suspect that the incidence is much higher. A more formalized educational program needs to be established, including both written and interactive teaching. Antenatal information should be made more accessible to ethnic minorities perhaps by offering classes in other languages. The conclusions of this audit are reflective of the results of the 2007 Picker report¹. CEMACH² stresses the vulnerability of ethnic minorities, especially when combined with social deprivation, both of which are prevalent in inner city London.

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P66 Trainees' experience starting obstetric anaesthesia on call

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Introduction: Following the implementation of the European Working Time Directive, concern has been raised about training opportunities in obstetric anaesthesia.^{1,2}

Method: A questionnaire was sent out to all ST2 and ST3 trainees within the region. The survey consisted of 10 questions, divided into nature and format of obstetric training, aspects trainees felt could be improved, obstetric case numbers before going on call and experience of commonly encountered problems and emergencies.

Results: Cases with involvement in labour ward problems and emergencies such as preeclampsia, major haemorrhage, cord prolapse, high spinal and failed intubation, were few, with at least 90% of trainees having little or no experience of them before going on the on-call rota. This is reflected in the trainees' confidence in dealing with such cases (see table).

	Confident (%)	Unconfident (%)
Major haemorrhage	30	70
Preeclampsia	45	55
Morbid obesity	40	60
Cord prolapse	33	67
High spinal	50	50
Failed intubation	26	74

Discussion: The results of our survey show that anaesthetic trainees new to obstetric on call have limited or no experience in major obstetric emergencies and feel unconfident in managing such cases. The recent CEMACH report³ highlights the need for staff to be regularly trained in the management of obstetric emergencies. With less time spent on the labour wards, we feel that simulator training in obstetric emergencies is pertinent and as such, we are instituting a simulator-based training day for anaesthetic trainees in obstetric emergencies in our region.

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P67 Multidisciplinary team training: a high fidelity medical simulator for the delivery unit

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Introduction: Human error and system failure contribute to adverse outcomes in healthcare.¹ Simulator-based training has long been used for resource management in commercial and military aviation. In anaesthesia, crisis management courses were introduced in the 1990s.² The recent CEMACH report identifies lack of communication and teamwork as the main reason for human error on delivery units.³ We report on the development of a multidisciplinary obstetric crisis resource management (OCRM) course using a high fidelity medical simulator that aims to improve team performance and effective communication on the labour ward. The course involves lectures on crisis management followed by CEMACH report and six crisis scenarios with video feedback and debriefing.

Methods: Immediate impact of the course was evaluated from delegate feedback forms. We collected data from 10 courses conducted during 2005 to 2007.

Results: All 60 delegates (100%) returned completed feedback forms. Delegates included anaesthetists, obstetricians and midwives of all grades from different hospitals within and outside the region. Eighty percent rated the overall course to be excellent and said that it met their educational needs. More than 90% felt more confident to manage crisis situations; 90% rated the debriefing to be highly useful. Apart from overall course quality, there were positive comments on improved understanding of team working, leadership, delegation and effective communication.

Conclusion: Our experience suggests that obstetric crisis resource management training using high fidelity medical simulators can lead to perceived improvement in team working skills. We strongly feel that crisis training should be an integral part of professional development.

However, more definitive outcome measures are needed to prove the ultimate validity of this type of training.

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P68 Big push to big units: Liverpool experience to 2007

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Introduction: In 2007, the trend towards merging smaller obstetric units and creating fewer, larger maternity units continued across the United Kingdom. It is our understanding that some counties of Northern Ireland may have no maternity delivery units. At Liverpool Women's Hospital, "The Women's," we feel we are pioneering a trend to large units.

Method: Audit committee approval was obtained for review, collection and presentation of our data. These data are compared with NHS Maternity Statistics.¹

Results: Deliveries rose from 5812 before the services were merged in 2004, to 7868 in 2007. Anaesthetic rates declined from 42% to 39% around time of the merger in 2004, but recovered by 2006/7 to 42%. General anaesthesia fell from 7.5% in 2000 to 4.4% at the end of 2007. Epidural analgesia rates showed a downwards trend from 2000, but dipping from an overall 25% to 12.25% at the end of 2004. The rate has since increased to 18.5% by end 2007. Spinal anaesthesia rates against deliveries in 2000 were 12.1%, peaked in 2006 at around 25% and for 2007 are a little less at 22%. Caesarean section rates remain static from time of transfer at around 24%, having risen from 20% in 2000.

Discussion: The expected increased number of deliveries began before the transfer of services. We hope to increase consultant sessions to provide evening cover from 1700-2000, as interventional delivery rates remain busy in these hours. As a major tertiary referral centre a caesarean section rate of 24% is similar to national rates of 23.5%. This is in common with many large Northern units but well below S.E. England and many smaller local units.¹

The national rate of 33% having epidural, spinal, or general anaesthesia¹ should be compared to our rate of 42%. The dip at and after transfer was undoubtedly due to issues of midwifery staffing. Current national epidural rates overall, of 19% in 2005/6¹ compare with our rate of around 14% in the same period, reflecting reduced demand by midwives. Use of single-shot spinal anaesthesia flourished in this time at "The Women's", a national rate of 12% may be compared to one of 22% at our unit.

General anaesthesia rates of 6% compared to a national figure of 2% caused concern, but audit shows this is mostly driven by maternal request. The layout, staffing and structure of our two delivery suites, a midwifery-led and a Consultant unit are under internal review. A refurbishment program called "Big Push" is in progress.

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P69 National survey of support and counselling after maternal death

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Introduction: The 2000-2002 CEMACH report highlighted cases of maternal death where staff involved were not offered support or counselling. The report recommended that trusts make provision for the prompt offer of support and/or counselling for all staff involved in a maternal death. We sought to establish experience amongst obstetric anaesthetists.

Method: An OAA-approved postal questionnaire was sent to all UK consultant members. The survey aimed to determine personal experience of maternal death or other traumatic event, before establishing whether support was offered and then received. Awareness of local policies and experience of accessibility to support services was sought. We also aimed to assess current views on whether a formal mechanism of referral would be beneficial.

Results: The response rate was 706/1104 (64%); 247/701 respondents (35%) had experience of maternal death, while 291/701 (41%) had been involved in a maternal death or other traumatic event during the care of an obstetric patient. Of these 175/291 (60%) received no offer of support. Only 5% received details of further help available; 65% were unaware of potential sources of support. Of those who were offered support, most was from consultant colleagues; 19% would have liked more support at the time of the event. Formal counselling was received by only two respondents. In 49% of cases no debriefing session followed the incident. Of all respondents 69% were not aware of policies within their own trusts for provision of support following the death or serious injury of a patient, and only 18% felt that accessibility to these services was adequate; 55% felt departmental or trust policies for referral without obligation would be beneficial.

Discussion: An unexpected maternal death can be devastating for all involved. How we deal with the death of any patient is very individual, and not everyone will want to pursue formal counselling. However, considerable support may be needed if work performance becomes severely affected, as can occur in post traumatic stress disorder. This survey highlights a number of individuals who felt unsupported at the time of a maternal death or other traumatic event. This suggests many units are not meeting CEMACH recommendations. We consider that a formal structure for referral is needed within all units, which serves to offer confidential support and/or debriefing without obligation, and importantly to provide details of further sources of help might this be required.

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P70 Practice of red blood cell transfusion in the immediate peripartum period on labour ward

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Introduction: NICE¹ and the AAGBI² have issued guidelines for management of anaemia in pregnancy and transfusion of red cells respectively. Autologous blood is expensive and in short supply and transfusion is associated with serious complications. This was a retrospective study to review the practice of red cell transfusion on our labour ward in the period around the time of delivery.

Method: Following ethics committee approval, the hospital obstetric anaesthesia database (Euroking) identified 41 patients for 2005 and 2006 who received red cell transfusion in the immediate peripartum period. The following data were collected: mode of delivery, pre-delivery haemoglobin (Hb), estimated blood loss, pre- and post-transfusion Hb, documentation in notes and grade of most senior anaesthetist present.

Results: In all but one case, the recorded Hemocue or laboratory Hb was appropriate for a decision to begin blood transfusion. Five women who had pre-delivery Hb <10 g/dL were each transfused two units of red cells. None had estimated blood losses >1500 mL and two had estimated blood losses <1000 mL. Only six women had higher Hb post-transfusion than before delivery but 20 were transfused to Hb >10 g/dL. In 17 patients, the reason for transfusion was not documented. A consultant anaesthetist was always present when blood loss was more than 1600 mL.

Post-transfusion Hb (g/dL)	Number of women
<8.0	2
8.0-8.9	4
9.0-9.9	15
10.0-10.9	11
11.0-11.9	2
>12.0	7

Discussion: According to our data, the decision to begin blood transfusion was appropriate although the reason was not always documented in the notes. However the overall number of units of red blood cells transfused on our delivery suite could be reduced.

Conclusion: Unnecessary transfusions of red blood cells on our labour ward could be avoided by optimising the haemoglobin level before delivery in the community and accepting a lower target haemoglobin level once haemostasis has been achieved.

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P71 Is it practical to have a cell saver in the maternity theatre in a District General Hospital?

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Introduction: A recent review article¹ concluded that intra-operative cell salvage was the most useful blood conservation technique in the obstetric operating theatre. This technique is slowly gaining momentum and carefully targeted use may save money.² We looked at whether it would be practical to purchase a dedicated cell saver for use in the obstetric theatre in our hospital.

Method: We analysed retrospectively all patients who had suffered a blood loss of >2 L following caesarean section over a 4-year period (1 Jan 03-31 Dec 06) using data from the Meditech Patient Administration System.

Results: 39 patients were identified; caesarean section was performed as an emergency on 31 occasions (79%), 15 (38%) outside normal working hours. Regional anaesthesia was performed on 24 occasions (62%). Seven women (18%) who were transfused had formal haemoglobin measurements before transfusion (values 3.8-8.6 g/dL). A total of 181 units of packed red cells (PRC) were transfused over the 4 years. On nine occasions a large blood loss could have been predicted: placenta praevia (5), premature separation of placenta (2), placenta percreta (1), uterine rupture (1).

Discussion: Our study indicated that intra-operative cell salvage would have been useful on only 10 occasions per year. Cell salvage has recently been debated³ and we agreed that staff training and familiarity with equipment usage and purchase of initial hardware and disposables were major issues. Twenty-one percent of cases were elective and 40% occurred out of hours when staffing levels are reduced. A unit of packed red cells costs £130.52⁴ and would amount to an annual sum of £5906. An anaesthetist working alone in an isolated area would not wish the ODP to be distracted setting up equipment, so other theatre staff must be familiar with its use. Our analysis did not assess the time interval from decision to incision, but we identified nine occasions when the potential for major blood loss could have been identified and a cell saver proactively set up. With this in mind we do not intend to purchase a stand-alone cell saver at present. We look to promote better communication with the obstetric team so that women at high risk of post partum haemorrhage are identified early, to mobilise extra staff to set up the cell saver from main theatres.

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P72 Estimating blood loss in caesarean sections: a guide to cell salvage?

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Introduction: The use of intra-operative blood cell salvage in obstetric practice may reduce the need for homologous blood transfusion with associated risks.¹ Due to concerns about amniotic fluid contamination, it is common practice to collect blood for salvage after delivery of the baby. The purpose of this study was measure post-partum blood loss to provide guidance on how many women would potentially benefit from cell salvage during caesarean sections (CS).

Method: Data were collected prospectively on all CS over a six-month period in 2007. The local ethics committee confirmed that ethics approval was not required. Blood loss was recorded by standard volumetric (suction jar) and gravimetric (swab weight) methods. Separate suction sets were used before and after delivery of the baby. Total blood loss (with amniotic fluid contamination) was estimated by combining both suction bottles totals with swab weight.

Results: Complete data were collected for 619 out of 740 women (84%) who underwent CS during the six-month period. Total blood loss (Fig.1) and blood loss collected by suction post partum (Fig.2) are shown below. Blood loss collected post partum was >500 mL in 7% of women and >1000 mL in 1% of women.

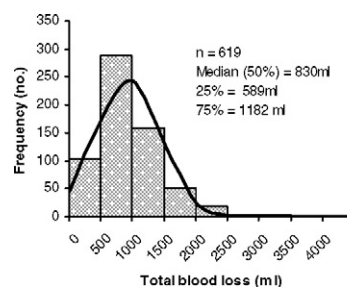


Fig 1. Total blood loss

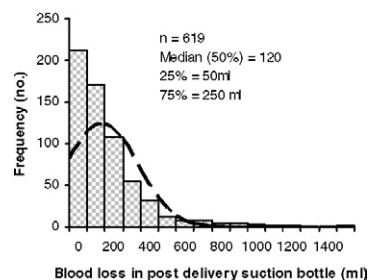


Fig 2. Blood collected post-partum

Conclusion: Very few women will have sufficient blood loss collected post-partum to justify routine use of cell salvage during CS.

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P73 Investing in intra-operative cell salvage: experience of a Bristol teaching hospital

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Introduction: Use of intra-operative cell salvage (IOCS) in obstetric anaesthesia is growing.¹ In the most recent Confidential Enquiry into Maternal and Child Health (2003-2005)² two women died declining blood products and the report again emphasised that IOCS should be available to women who refuse blood products on religious grounds. Press coverage of a recent maternal death in a woman declining blood suggests that units not providing the service may be at risk of litigation. Haemorrhage accounted for 11% of direct maternal deaths and 69% of cases of severe morbidity.² Transfusing homologous blood uses a resource that is scarce, hazardous and expensive. It has been suggested with carefully targeted use the cell saver may save money.³ Despite all of these factors our trust is reluctant to fund a new service unless the financial benefit is clear. St Michael's Hospital Bristol (over 5000 deliveries in 2007) has been using IOCS on a trial basis whilst preparing a bid for equipment.

Method: Data were collected each time IOCS was used by completion of a standard form starting in May 2007. Data regarding blood ordering and usage were obtained from the transfusion laboratory.

Results:

Indication	No. of cases	IOCS blood transfused	Banked blood transfused
Jehovah witness	5	No	No
Placenta praevia	5	Two cases	Both cases
Previous surgery	1	No	No

For the majority of cases only the suction/reservoir components were used. One case with an undiagnosed placenta praevia had 755 mL of IOCS blood returned; 211 units of red blood cells were transfused on our delivery suite last year costing £27,430; 484 units were issued but not transfused.

Discussion: 60% of the total disposable costs of IOCS were covered by the reduction in banked blood used for one patient. We need to target the use of IOCS to cases where blood is cross-matched but often not transfused. This is a valid spend to save argument that will help persuade our trust to invest in IOCS and enable us to improve patient care.

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P74 Introduction of cell salvage to a large obstetric unit: the first six months

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Introduction: The use of red cell salvage in obstetrics appears to be becoming more acceptable and has recently been reviewed by the National Institute of Health and Clinical Excellence (NICE).¹ We previously reported an assessment of the cost effectiveness of this technique.² We have recently introduced this technique to our obstetric unit (6500 deliveries per year). We wished to establish what impact the introduction of cell salvage had on our unit.

Methods: Cell salvage was introduced following an initial period of training and education. The list of indications for using cell salvage was placenta praevia, suspected placental abruption, multiple pregnancies, multiple repeat caesarean sections, previous history of post partum haemorrhage, refusal of blood transfusion, caesarean section at full dilatation, low preoperative haemoglobin and at discretion of theatre team. The anaesthetists completed audit forms for each case of use. The department of haematology in our hospital supplied information on blood transfusion requirements of patients who had been to theatre.

Results: The cell saver was used for 46 patients with an average (SD) blood loss of 877 (407) mL and a heterologous transfusion rate of 22% (10 cases). Blood was processed and returned in 19 cases of which nine were emergency (categories 1 to 3) and 10 elective. The volume (mean (range)) of blood returned was 390 (200-800) mL. Six of the patients (35%) given processed blood also received a heterologous transfusion. For all theatre activity during the 6-month introductory period, 66 patients were given 247 units of blood. This compares to 75 patients given 258 units in the same period the preceding year. There were no adverse reactions following the administration of processed blood. In terms of consumables used and units of heterologous blood saved there was an overall saving of £264 for the study period.

Conclusion: We have successfully introduced cell salvage to our unit at minimal cost and with no detrimental effects. More liberal use may be required to impact on the overall transfusion rate.

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P75 Introducing cell salvage in obstetric practice: the first year's experience

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Introduction: CEMACH confirms that obstetric haemorrhage remains a major cause of maternal mortality.¹ However, transfusion of allogenic blood carries multiple risk, and availability is decreasing.² NICE responded by advocating the use of IOCS (intra-operative cell salvage).³ We looked at the impact of newly acquired IOCS apparatus on allogenic blood transfusion requirements at our institution.

Method: All anaesthetists were requested to use cell salvage whenever significant haemorrhage was anticipated during elective (category 4) caesarean section. Following delivery, blood was collected but only processed once blood lost filled the 225-mL centrifugal bowl. Data were prospectively collected over one year, and allogenic blood transfusion requirements also recorded.

Results: see table:

Indication	Number of cases	Median EBL (Range) (mL)
Fibroids	5	700 (500-900)
Abnormal placentation	9	1000 (350-4000)
High risk multip	7	800 (100-1200)
Jehovah's witness	1	600
Atypical anti-bodies	1	500
Other	5	650 (100-7000)

Cell salvaged blood was collected in 26 cases (92.9%), and processed in two (7.1%). Allogenic blood was used in three cases, where insufficient blood was salvaged.

Conclusion: At our busy tertiary referral centre only 10.7% of high-risk patients actually required blood, but no patients benefited from IOCS. Technical difficulties and lack of familiarity with IOCS have thus remained obstacles to its use for much longer than anticipated. The implications for training and costs involved are discussed. (Allogenic and cell-salvaged blood costs £132 and £60 (for disposables) respectively).

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P76 Effect of μ -OR A118G polymorphism on ED50 of epidural sufentanil

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Introduction: Thirty per cent of obstetric patients presents the G variant of the μ -opioid receptor (μ OR) A118G polymorphism which decreases fentanyl requirement for labour analgesia.^{1,2} Our aim was to determine whether μ OR A118G genotype alters the ED₅₀ of epidural sufentanil for labour analgesia.

Method: After ethical approval and informed consent, 77 nulliparous women at 35 weeks of gestation were genotyped for μ OR A118G.² At request for analgesia, women were allocated to one of two groups (A: wild-type homozygotes A118; G: heterozygotes and homozygotes carrying the G118 allele) according to the up-down sequential allocation technique. Inclusion criteria were spontaneous onset of labour and cervical dilatation ≤ 4 cm. The starting dose of sufentanil was 21 μ g and the testing interval 1 μ g. Subsequent doses were determined by the response of the previous parturient. Efficacy was defined as a visual analogue pain score ≤ 10 mm on a 100-mm scale within 30 min. Parturients without analgesia at 30 min were defined as reject. Statistical analysis included Dixon and Massey and t-test; a *P* value < 0.05 was considered significant.

Results: Parturients carried heterozygotes/homozygotes G118 allele in 31.2% of cases. Twenty parturients were not admitted to the study due to caesarean section, protocol violations, patient withdrawal from study and absence of epidural request, leaving 57 to be included in the study (group A: n=33, group G: n=24). There were three rejects (two in group A and one in group G). The estimated ED₅₀ (95%CI) was 23.56 (22.0-24.23) μ g for group A (n=31) and 21.5 (20.86-22.35) μ g for group G (n=23) (*P*=0.002). The A:G ratio was 1.09 (95% CI: 1.04-1.15).

Discussion: We have demonstrated a slightly significant 1.09-fold potentiation of epidural sufentanil effect by μ OR A118G polymorphism. This genetic effect is significantly less than that previously reported with spinal fentanyl.² It may be that the action of sufentanil is less affected by polymorphism or that the epidural route is less influenced than the subarachnoid route by genetic variations.

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P77 Addition of small doses of morphine to intrathecal labor analgesia: a randomized controlled dose-finding study

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Introduction: Single-shot spinal analgesia for labor with combinations of bupivacaine and short-acting opioids is increasingly being used due to the relative simplicity of the method, the quick onset and profound analgesia without significant motor block. The limitation of the method is the short duration of action (90-120 min). Supplementation with intrathecal morphine 150 µg has however been shown to prolong analgesia substantially.¹ In order to establish the lowest dose of intrathecal morphine that prolongs the duration of labor analgesia significantly (>30 min) this study compares placebo with morphine 50 and 100 µg.

Method: Following ethics committee approval, oral and written patient consent, 90 ASA I-II nulliparous women were included in the study. A combined spinal-epidural was started on maternal request during established labor with a cervical dilation of 6 cm or less. The patients received intrathecal bupivacaine 1.25 mg and sufentanil 5 µg to which was added placebo, morphine 50 µg or morphine 100 µg according to randomization, in a double-blind fashion. Onset of analgesia was measured as the time from the intrathecal injection to VAS≤4 (scale 0-10) and the duration of analgesia as the time from the intrathecal injection to the return of VAS>4.

Results: See table. There were no statistically significant differences between the groups regarding demographic data, onset, duration, side effects, obstetric or neonatal outcome.

Morphine dose	0	50 µg	100 µg	**P
Onset (min) median (range)	5 (5-25)	10 (5-25)	5 (5-25)	0.66
Duration (min) median (range)	110 (60-240)	119 (60-203)	90 (50-210)	0.27

**Analyzed applying Log-rank tests stratified by center

Conclusion: Based on this study, there is no advantage in adding small doses (50-100 µg) of morphine to intrathecally given bupivacaine and sufentanil for labor analgesia.

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P78 Impact of introduction of remifentanil PCA for labour analgesia on epidural rate and obstetric outcome over a two-year period

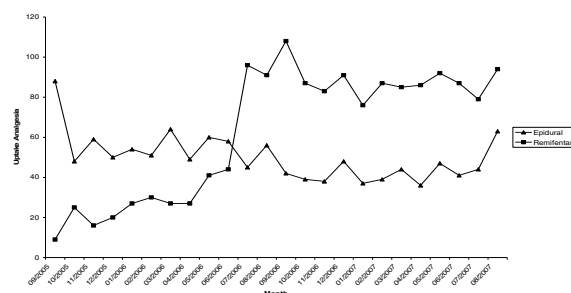
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Introduction: Remifentanil PCA has been routinely available for labour analgesia since Sept 2005 in our unit. We wished to establish its uptake rate and impact on obstetric outcome over the last two years compared with epidural and i.m. opioids.

Method: Following ethics and research governance approval, data on 5410 deliveries conducted in the Ulster Hospital from Sept 2005 to Aug 2007 were retrieved from the Northern Ireland Maternity System (NIMATS). Data collected included parity, induction rate, type of analgesia, duration of the stages of labour, mode of delivery, Apgar scores at 1 and 5 min and requirement for newborn resuscitation.

Results: Figure. Monthly epidural and remifentanil PCA rate



Over the two-year period, 1508 parturients (28%) opted to use remifentanil PCA and 1200 (22%) opted for epidural. Previously the epidural rate was 32%. The caesarean rate was 22% with epidural, 13% with remifentanil PCA and 13.5% with opioids. The normal delivery rate was 71% with remifentanil and 42% with epidural. Vacuum intervention was 31% with remifentanil as compared to 41% with opioids and 48% with epidural. Remifentanil uptake increased as parity increased. Average duration of first stage of labour was 9 h with epidural and 8 h with remifentanil. Average duration of second stage was 1 h with all analgesia types. The rate of conversion to epidural from remifentanil was 10%. Apgar scores were similar in all three groups. Bag and mask ventilation was required in 11% of neonates in the epidural group as compared to 6% with remifentanil.

Discussion: The introduction of remifentanil PCA has been associated with a reduced epidural rate and anaesthetic workload. Parturients who used remifentanil had a shorter first stage, were less likely to have an instrumental or operative delivery and twice as likely to have a normal delivery compared to epidural.

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P79 Remifentanyl is safe and effective for patient-controlled intravenous analgesia during labour: the results in 305 parturients

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Introduction: Remifentanyl, with its ultrashort elimination half-time (9.5 min.),¹ seems to be superior to meperidine for labour analgesia. It is used outside labour as an adjuvant for locoregional anaesthesia. A few small preliminary studies showed promising results, especially when a continuous infusion is combined with small bolus doses.^{2,3} Maternal depression was only seen when total doses of remifentanyl exceeded 500 µg/h. This descriptive study focussed on efficacy, safety and side effects in a large group of parturients.

Method: 305 parturients were given remifentanyl patient-controlled intravenous analgesia, when the remaining first stage of labour was expected to last <4 h. The schedule started with a continuous infusion of 80 µg/h, which could be increased after 30 min to 100 µg/h and was maximised by 120 µg/h. Bolus doses of 25 µg were allowed every 3 min.; therefore the maximum dose was limited to 495 µg/h. Maternal oxygen saturation and heart-rate were monitored continuously and blood pressure was measured every 5 min. Supplemental oxygen was administered if maternal saturation was <93% and hypotension was treated by volume loading with crystalloids. Efficacy of analgesia was measured in 211 parturients by visual analog scale after 1, 2 and 4 h.

Results: In 34 parturients the infusion exceeded 4 h (maximum 6 h). In 82% of parturients 80 µg/h was given, in 14% 100 µg/h and in 4% 120 µg/h; the infusion was never discontinued because of side effects. Oxygen was supplemented in 22 parturients and hypotension treated in nine.

Analgesia	VAS (Mean ± SD)	VAS >7
Before PCIA	8.5 (1.38)	75%
1 h after PCIA	5.8 (2.04)	21%
2 h after PCIA	6.2 (2.06)	26%
4 h after PCIA	6.4 (2.56)	37%

Delivery was spontaneous in 70% of parturients, ventouse extraction 16% and caesarean section 14%. There were no major maternal or fetal incidents. Two newborns showed Apgar scores of <7 after 5 min.

Conclusion: The dose regimen of remifentanyl PCIA in the present study leads to effective analgesia in labour without serious side effects.

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P80 NHS Litigation Authority claims associated with caesarean sections

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Introduction: The NHS Litigation Authority (NHSLA) is a special health authority responsible for managing negligence claims on behalf of the NHS in England.¹ The American Society of Anesthesiologists (ASA) closed claims project has identified major areas of financial loss and patient injury in the US,² but there has been no similar analysis in the UK.

Method: We requested data on all anaesthetic claims logged with the NHSLA from 1995 to 2007, from which we selected obstetric anaesthesia cases and from these, all claims specifically related to caesarean sections (CS).

Results: Of 242 obstetric cases, 128 (53%) were associated with CS; 89 (70%) were under regional and 27 (21%) under general anaesthesia (GA) and in 12 (9%) the type of anaesthesia was unclear. The cases were classified as shown in the Table.

Type of claim	No. (%)	Anaesthesia (R / G / U)*	Cost (£; median (range))†
Pain/awareness at CS	81 (63)	51 / 21 / 9	12,019 (0-184,346)
Nerve damage	13 (10)	13 / 0 / 0	4,431 (0-311,311)
Drug errors	11 (9)	10 / 1 / 0	5,962 (0-28,460)
Death	4 (3)	0 / 4 / 0	246,252 (0-430,094)
Back pain	4 (3)	4 / 0 / 0	0 (0)
Unclassifiable	5 (4)	3 / 0 / 2	6,810 (0-45,141)
Others	10 (8)	9 / 0 / 1	4,583 (0-582,111)

*R = regional; G = general, U = unclear

†zero indicates claim still open or closed without cost. Amounts include legal and other fees.

Discussion: Pain and awareness are overwhelmingly the major cause of claims associated with anaesthesia for CS in the NHS. Nerve damage has the greatest range of claim costs but a respiratory problem with a GA commanded the single largest award ('Others'). Information from the NHSLA is of interest but the limited clinical data available prevent detailed analysis that is provided by the ASA closed claim system.

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P81 An audit of itch following intrathecal diamorphine for caesarean section

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Introduction: Information is limited about incidence and treatment of itch following administration of intrathecal diamorphine for caesarean section although a few studies mention it as a side issue.¹ We decided to audit this in our own unit of approximately 5000 deliveries per year. A standard spinal technique was performed using 0.3 mg diamorphine and 0.5% heavy bupivacaine. Both elective and emergency caesarean section patients were included in the audit.

Method: The audit took place over a four-month period. Patient were visited by an anaesthetist 1-2 days post partum and asked about their experience of itch. The following scoring of severity of itch was used: grade 1: mild itch to grade 4: worst itch imaginable. It was also noted on the audit form whether they received any treatment and if this was effective. Again a numerical score was used for this: 1: very effective, 2: partly effective, 3: not effective.

Results: Ninety-one patients were audited; 63 had itch (69.2%), 25 grade 1, 19 grade 2, 16 grade 3 and three grade 4. Of the 63 patients with itch, 14 received treatment. (22.2%). Ten patients received i.v. naloxone in doses varying from 0.2 mg to 1.2 mg. Seven found this very effective, two partly effective and one ineffective. Four patients received chlorphenamine 4 mg orally. Two found this partly effective, two ineffective.

Discussion: Three points have been raised from this audit. Itch after intrathecal diamorphine is very common although most patients seem to experience mild to moderate itch. Of these patients only 22% received treatment. This treatment was not standardised. A further audit is required to establish why so few patients with itch are receiving treatment.

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P82 A prospective, double blinded randomised controlled trial of ephedrine infusions and ephedrine boluses during spinal anaesthesia for caesarean section

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Introduction: Prophylactic ephedrine reduces the incidence of hypotension, but previous comparisons between ephedrine infusions and boluses have not demonstrated significant differences.¹

Method: After ethics committee approval and written consent, 105 patients undergoing elective caesarean section were recruited. All patients were positioned left lateral and an intervention blood pressure (IBP) was calculated (the higher of 100 mmHg or 80% of the mean of three systolic [SBP] in the dependent arm). After 10 mL/kg Hartmann's solution, 2.5 mL 0.5% bupivacaine in 8% dextrose with diamorphine 250 µg was injected intrathecally. Patients were then turned supine with a left tilt. Patients were randomised to one of three groups. Group EI received a 1-mg/min ephedrine infusion from the time of injection of the spinal solution until uterine incision. Group EB received a 9-mg ephedrine bolus at the time of injection of the spinal solution. Group C received no prophylactic ephedrine.

If SBP fell below IBP, a 250-mL rescue bolus of normal saline and ephedrine 6 mg were given. If, after 2 min the SBP was still <IBP, a further 6-mg bolus of ephedrine was given. If, after a further 2 min, the SBP remained <IBP, another 250-mL bolus of saline with ephedrine 6 mg was given. This 4-min cycle would be repeated until the SBP was >IBP. The study continued until uterine incision. The time of hypotension, volume of rescue fluid, dose of rescue ephedrine, Apgar scores and cord gases were compared.

Results: There were significant differences between the three groups. The Kruskal Wallis test demonstrates that group EI had significantly less total time of hypotension ($P<0.0001$), less rescue fluid ($P<0.0001$) and less rescue ephedrine ($P<0.0001$), than either Group EB or Group C. There is marginal benefit to the Group EB compared to the Group C. The Apgar scores and fetal blood gas status were not significantly different between groups.

Discussion: While phenylephrine is associated with less fetal acidemia than ephedrine, this is not supported by all studies. Phenylephrine may cause maternal bradycardia. Therefore many anaesthetists continue to use ephedrine as their first-line drug for treating hypotension during regional anaesthesia for caesarean section. If ephedrine is to be used, this study supports the use of prophylactic ephedrine infusions to reduce the incidence of hypotension.

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P83 Regional survey of antibiotic prophylaxis for caesarean section

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Introduction: Infectious complications following caesarean delivery are an important cause of maternal morbidity leading to prolonged hospital admission.¹ A systematic review of antibiotic regimens for caesarean section demonstrated that single-dose ampicillin and first-generation cephalosporin were as effective as broad-spectrum penicillins, or second- or third-generation cephalosporins or combination regimens.² The National Institute for Health and Clinical Excellence (NICE) recommends a single dose of first-generation cephalosporin or ampicillin for women undergoing caesarean section.¹

Method: Via a postal survey the lead obstetric anaesthetists in the Anglian region were asked about antibiotics used for prophylaxis for caesarean section, doses, route, side effects and if a locally produced or national guideline was being followed.

Results: 100% response rate.

Hosp No	Antibiotic(s)	Dose	Guideline
1	Ceftriaxone	1 g i.v.	Local
2	Cefuroxime + Metronidazole	750 mg i.v. 1 g PR	Local/NICE
3,4,5,	Co-amoxiclav	1.2g i.v.	Local
6	a) Co-amoxiclav b) Cefuroxime+ Metronidazole	1.2 g i.v. 1.5 g i.v. 500 mg PR	NICE
7	Cefuroxime	750 mg i.v.	Local
8	Co-amoxiclav <u>If Allergic</u> Clindamycin + Gentamicin	1.2 g i.v. 900 mg i.v. 240 mg i.v.	Local (just published)
9	Cefradine <u>If allergic</u> Gentamicin	1 g i.v. 160 mg i.v.	Local (recent)

Two hospitals had recently changed the policy in response to cases of *C difficile* in obstetric patients (two cases Hosp 8), and non-obstetric patients (Hosp 9).

Discussion: The choice of antibiotic prophylaxis for caesarean section was variable; mostly based on local guidelines and at odds with NICE guidelines. We would draw attention to the grade-A evidence of the NICE guideline. However units should be monitoring prevailing organisms and resistance patterns. Although a cost analysis was not undertaken; using second- and third-generation cephalosporins or multiple regimens will increase the cost.

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P84 National survey of current UK practice for the preparation and storage of anaesthetic drugs for obstetric emergencies

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Introduction: Traditionally anaesthetic drugs for obstetrics are prepared as a contingency measure and stored until required for emergency use or until they 'expire' at a time predetermined by local guidelines. The sterility and efficacy of such drugs has been examined¹ and it has been suggested that the use of prefilled syringes would reduce wastage and potential drug errors, and provide readily available emergency drugs with long shelf lives and known efficacy.² We predicted that the mode of preparation and storage of these drugs would differ widely across the UK, so we conducted a national survey.

Method: With OAA approval (Survey Number 75, approved September 2007), a questionnaire was sent to the lead obstetric anaesthetist at each of the 223 maternity units in the UK. A covering letter and self-addressed envelope were included. Respondents were asked whether emergency drugs were routinely prepared in their unit, and if so which ones and by whom, or if prefilled syringes were used. We asked how frequently drugs were renewed, where they were stored, if units had written guidelines for emergency drug preparation and whether trainees were given training for this on starting work on the unit.

Results: The response rate was 74%; 89% of units routinely draw up emergency drugs, most commonly thiopentone and suxamethonium (100% stored in the refrigerator). Only 11% of units routinely use prefilled suxamethonium syringes, although a further 6% use them when available. Drugs are prepared by anaesthetists in over 80% of cases, by ODPs in 11% and by pharmacy less than 7% of the time. Drugs are changed every 24 h in 86% of units, weekly in 6%, every 48 h in 5%, and every 12 h in 3%; 40% of units have written guidelines for drug preparation and 55% said their trainees always received training.

Discussion: The majority of UK units routinely draw up emergency drugs and renew them every 24 hours. Implications regarding sterility remain controversial, but this still represents tremendous wastage and potential for drug error and impaired efficacy. We propose that nationwide introduction of prefilled syringes would improve safety and cost effectiveness.

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P85 Frequency of regional anaesthesia in obstetric surgery: a one-year audit

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Introduction: Regional anaesthesia has been accepted as a common practice in obstetric anaesthesia, especially for caesarean section, both emergency and elective.¹

Aim: To explore the role of regional anaesthesia for all gynaecological and obstetric procedures in our institution.

Method and material: This is a retrospective observational study during a one-year period (from September 2006 to September 2007). Data from anaesthetic records were taken for all gynaecological and obstetric procedures. In total 721 operations were performed, in women ages from 17 to 76 years.

Results: Of 721 operations (duration from 5 min to 5 h), 371 (51%) were caesarean sections, 323 (85.2%) emergency and 48 (14.8%) elective. Regional anaesthesia (spinal blockade) was applied in 56 patients, all for gynaecological procedures. No patients received regional anaesthesia for obstetric operations. General anaesthesia using orotracheal intubation was used in 644 patients (89.3%); mask anaesthesia was used in 21 cases.

Major complications were seen in 10 patients: there were two cases of serious bleeding followed by haemorrhagic shock after caesarean section, ending in hysterectomy; another eight patients needed massive blood transfusion due to intra-operative bleeding.

Conclusion: General anaesthesia only for obstetric procedures indicates lack of information and knowledge among both anaesthetists and obstetricians. More education is needed not only for doctors but also for patients, because many of them refuse regional anaesthesia, expressing their wish to be asleep during the procedure.

Reference

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P86 A survey of anaesthetic management of category 1 caesarean sections

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Introduction: The category-1 caesarean section (CS) carries greatest maternal and fetal risk. We surveyed anaesthetic and intrauterine resuscitation (IUR) practice as well as available guidelines in UK maternity units.

Method: The OAA provided contact details for lead anaesthetists in 245 maternity units, who were sent a questionnaire. There were 171 responses (70%).

Results: 139 units (81%) use the NICE four-point classification, 21 (12%) use a local alternative. Written guidelines for decision-delivery interval (DDI) are used for category 1 by 73 (99% of these ≤ 30 min), category 2 by 64 (38% ≤ 30 min), category 3 by 31 (55% ≤ 75 min). General anaesthesia (GA) is used in 4% (0-18%) [mean, range] of category 4, 15% (3-93%) of category 1-3 and 54% (6-100%) of category 1 CS. Ten respondents said GA is mandatory for category 1 or equivalent. Epidural top-up for category 1 is started in the room in 129 units and operating theatre in 12; 39 units have a specific guideline for epidural top-up in category-1 CS; 31 of the 129 units lacked a guideline for management of total spinal and 43 for local anaesthetic toxicity; 54 units do not have a dedicated anaesthetist. IUR guidelines are available in 63 units. Specific measures used include position change: 75, intravenous infusion: 62, oxygen: 68, tocolysis: 53, other: 12. Only two respondents use tocolysis to reduce normal (as opposed to hypertonic) uterine contractions.

Discussion: Most units use the NICE CS urgency classification,¹ though the NICE recommendations for DDI (≤ 30 min for categories 1 and 2, ≤ 75 min for category 3¹) for categories 2 and 3 are used by a minority only. Ninety-one percent of respondents to the question start epidural top-ups in the room for the most urgent CS compared to 80% of all emergency CS,² but 24-33% of units doing this do not have guidelines for managing complications of local anaesthetic misplacement.^{3,4} Twenty-seven percent of the smallest units (up to 2500 deliveries p.a.) had IUR guidelines compared to 50% of the largest (>4500 deliveries), despite having less favourable anaesthetic staffing levels and access to operating theatres.

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P87 Why 100 mg of suxamethonium?

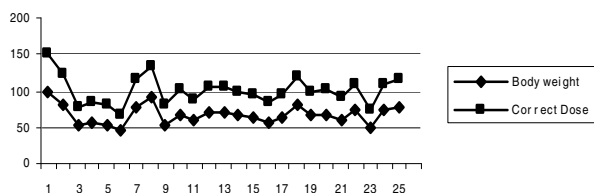
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Introduction: Suxamethonium administration is still the gold standard for producing paralysis during rapid sequence of induction of anaesthesia and endotracheal intubation.¹ The aim of this audit was to study the dose of suxamethonium used in each caesarean section under general anaesthesia in our maternity unit.

Method: Data on 25 consecutive patients requiring general anaesthesia for caesarean section were collected. The data included body weight, dose of suxamethonium and any difficulties during intubation.

Results: Body weights ranged from 45-100 kg. Each patient received 100 mg of suxamethonium irrespective of body weight. Four patients had problems during intubation, of whom two were obese. Eleven patients (44%) received inadequate doses of suxamethonium while nine (36%) received excessive doses and only five patients (20%) received the correct dose.



Discussion: The recommended dose for excellent intubating condition is 1.5 mg/kg;³ 80% of patients received either too much or too little. The number of overweight patients in maternity is rising.² This might further lead to difficulties in intubation. Training in airway management skills is becoming increasingly difficult as a result of the reduction of working hours. The recent CEMACH report highlighted obesity as an important factor in maternal death.⁴ With the increasing number of overweight patients it is time to draw suxamethonium in a 5-mL syringe and give the correct dose.

Conclusion: The correct dose of suxamethonium is rarely given. Guidelines for managing obese pregnant patients in line with the CEMACH recommendations should emphasise the importance of dose adjustment according to weight.

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P88 ROTEM® Thromboelastometry and reference ranges in the third trimester of pregnancy

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Introduction: Thromboelastography provides point-of-care patient assessment of the viscoelastic properties of whole blood clotting and can assist the clinician in haemostatic decision making.¹ Its use has been linked with a reduced use of blood products during surgery.² The ROTEM® thromboelastometer uses specific activators to enhance assessment of clot formation and evaluate clot constituents. The aim was to determine the ROTEM® 95% reference ranges for third-trimester parturients (group P) and to compare these with non-pregnant age-matched female controls (group C).

Method: Following ethics committee approval and informed consent, citrated blood was sampled from 120 healthy pregnant and non-pregnant women. Thromboelastometry was performed with specific activators to evaluate the extrinsic (EXTEM) and intrinsic (INTEM) systems, and the clotting factors alone after platelet inactivation (FIBTEM). The coagulation time (CT), clot formation time (CFT) and maximal clot firmness (MCF) were determined. Statistical analyses included Mann-Whitney *U* tests and percentiles for nonparametric distributions with $P < 0.05$ defined as significant.

Results: After exclusions, data from 54 parturients in each group were analysed. Parturients had significantly ($P < 0.01$) lower haemoglobin values and platelet counts. Despite this, thromboelastometry exhibited significant ($P < 0.001$) decreases in INTEM CT, CFT and EXTEM CFT. MCF values (INTEM, EXTEM and FIBTEM) were significantly ($P < 0.0001$) greater. Medians and reference ranges (2.5-97.5 percentiles) are in the Table.

Grp	Test	CT (s)	CFT (s)	MCF (mm)
P	I	140 (86-168)*	48 (33-108)*	71 (55-79)*
	E	47 (31-80)	50 (34-86)*	73 (66-92)*
	F	49 (20-95)	N/A	25 (15-38)*
C	I	151 (113-266)	54 (35-120)	64 (57-73)
	E	48 (30-91)	61 (37-104)	66 (53-74)
	F	48 (29-92)	N/A	17 (11-37)

I=INTEM, E=EXTEM, F=FIBTEM. * Significant versus controls.

Discussion: ROTEM® thromboelastometry clearly demonstrates the hypercoagulability of pregnancy. Reference ranges for ROTEM® may be useful in guiding care of the bleeding parturient on labour ward.

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P89 Uterine artery embolization in the operating theatre for severe postpartum haemorrhage

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Introduction: Severe postpartum haemorrhage (PPH) is the leading cause of obstetric mortality in France. This is mostly due to unadapted patient management. Uterine artery embolization forms part of the current standards of patient management. It is aimed primarily at haemodynamically stable patients who can be transferred to a vascular radiology unit.

Method: Our hospital is not equipped with an angiography suite. We have therefore researched, in collaboration with the radiology team, the viability of an embolization procedure in the operating theatre under image intensifier. This procedure includes a written and detailed protocol and a specific kit. This strategy necessitates the presence in theatre of obstetrician, radiologist, anaesthetist and surgeon.

Results: see table:

Patients	1	2	3	4	5	6
Parity	2	3	2	2	3	2
Delivery	VD	VB	CD	VB	CD	VD
Causes	Atony	Atony	Atony	Atony	Pl.prev	Atony
BP mmHg	58/	85/60	99/65	92/68	50/?	75/40
Plat ($\times 10^9/L$)	66	79	135	127	34	76
Fibrinogen (g/L)	<1	1.4	2.8	2.5	<1	1.7
RBC/FFP (units given)	6/4	3/6	6/4	6/4	13/8	6/4
Results	succes	succes	succes	succes	failure	succes

Discussion: Patient 5 needed a hysterectomy to stop the bleeding. Uterine embolization in theatre seems feasible within the framework of a rigorous pre-established procedure. This approach avoids transferring the patient out of theatre and makes it possible to perform embolization even in cases of extreme hemodynamic instability. This is the most effective treatment for PPH. In case of failure, albeit rare, surgical intervention can be undertaken without delay and probably in better surgical circumstances.

P90 Anaesthesia for parturients with mechanical heart valves: a case series

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Introduction: Cardiac disease in pregnancy continues to be the overall leading cause of maternal death in the UK.¹ Parturients with mechanical heart valves are a small and challenging cohort of high risk patients.

Cases: We present a series of nine women (ten deliveries) with mechanical heart valves who were managed by a specialist multidisciplinary team between December 2001 and September 2007. Ages ranged from 19-41 years. Patients were anticoagulated with low-molecular-weight heparin in early pregnancy to maintain post-dose anti-Xa level of 0.8-1.0 U/mL (aortic valves) and 1.0-1.2 U/mL (others). All were delivered by caesarean section (CS) under general anaesthesia (GA) because of anticoagulation except case 3 who received combined spinal-epidural anaesthesia. Three out of 10 were elective CS. A judicious 'standard' rapid sequence induction was used in all GAs except patient 5. Invasive monitoring was used for patients 3, 5 and 8. Patient 5 had significant cardiac compromise as a result of valve thrombosis and thus delivered in cardiac theatres. She was admitted to ITU postoperatively and required an emergency mitral valve replacement.

Case	Gestation at CS (weeks)	Mechanical valve	Pathology
1	38	Mitral	Rheumatic fever
2	35	Mitral	A-v septal defect
3	32	Atrioventricular valve in systemic RV	Transposition of the great arteries (TGA); Mustard repair
4	38	Atrioventricular valve in systemic RV	Congenitally corrected TGA
5	26	Mitral	A-v septal defect
6	33	Mitral+Aortic	Rheumatic fever
7	38	Mitral+Aortic	Rheumatic fever
8	37; 36	Aortic	Marfan Syndrome
9	32	Aortic	Truncus arteriosus

Perioperative morbidity: There were three antepartum and two postpartum haemorrhages. Cardiac complications included arrhythmias (4), pulmonary oedema and subsequent pneumonia (1) and non-fatal valve thrombosis (1). Neonatal outcomes were generally good although four neonates required neonatal unit care. There was one stillbirth.

Conclusion: There were significant obstetric and cardiac peripartum complications that had a direct impact on the mode of delivery and choice of anaesthetic technique. These high-risk women should be managed in a specialist centre with a dedicated multidisciplinary team.

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P91 Massive pulmonary thromboembolism in pregnancy: a case report

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Introduction: Thromboembolic disease has been the most common direct cause of death related to pregnancy for more than two decades.¹ We describe the successful multidisciplinary management of a patient with massive pulmonary embolism.

Case history: A 27-year-old, healthy multiparous woman at 35 weeks gestation presented with increasing shortness of breath, collapse at home but no chest pain. She was conscious on arrival, but tachycardic and tachypnoeic with cold peripheries and a raised jugular venous pressure. We suspected a pulmonary embolus and started intravenous unfractionated heparin immediately. The diagnosis was confirmed by echocardiogram and V/Q scan. After a meeting involving obstetric, anaesthetic, haematology, cardiology, interventional radiology and intensive care consultants it was decided to treat the PE actively by thrombolysis and thrombectomy and only deliver if she collapsed, as anaesthesia and surgery could be fatal in view of her right heart strain and anticoagulation. Pulmonary angiogram revealed a large saddle thrombus occluding the right pulmonary artery and occlusion to flow to most of her lungs. An IVC filter was inserted and thrombolysis achieved with i.v. infusion of recombinant tissue plasminogen activator (rt-PA). A mechanical thrombectomy was performed percutaneously. Within half an hour of the rt-PA infusion, her vital signs began to improve:

	Before rt-PA	After rt-PA
Heart rate per min	140	110
Systolic pressure mmHg	100	140
Respiratory rate per min	40	25
SpO ₂ on 15 L O ₂	92%	96%
CVP (cmH ₂ O)	22	12

The patient went to ITU afterwards on intravenous unfractionated heparin and then to the labour ward HDU after 24 h on therapeutic enoxaparin until delivery. Elective removal of the IVC filter after 15 days was followed by uneventful caesarean section under general anaesthesia at 38 weeks of gestation. She was discharged home 7 days post partum on warfarin.

Discussion: There is a high risk of death from massive pulmonary embolism during late third trimester. Early thrombolysis is safe and may be life-saving. Multidisciplinary management is vital to the successful treatment of these high risk patients.

Reference

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P92 A prospective national study of acute fatty liver of pregnancy in the UK

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Introduction: Acute fatty liver of pregnancy (AFLP) is a rare but potentially lethal condition of late pregnancy that may be part of a spectrum of disorders related to preeclampsia. Because the condition is rare, it is difficult to study and there has been no comprehensive national study of the epidemiology of this condition. The choice of anaesthesia for caesarean delivery is difficult, with the options of general anaesthesia (GA) which has a potentially negative effect on hepatic encephalopathy versus regional methods with increased risks of haematoma formation in the presence of coagulopathy. The aims of this study were to identify a national, population-based cohort of women with AFLP and describe their anaesthetic management and outcomes.

Method: Cases were collected between February 2005 and September 2006 through the monthly card mailing of the UK Obstetric Surveillance System (UKOSS) to nominated obstetric anaesthetists, obstetricians, midwives and risk managers in each UK hospital with a consultant-led maternity unit. A data collection form was subsequently sent to each clinician reporting a case.

Results: 100% of UK consultant-led obstetric units contributed data to the study; 57 cases of AFLP were identified in an estimated 1,132,964 maternities, representing an estimated incidence of 5.0 cases per 100,000 maternities (95% CI 3.8-6.5); 42 women (74%) were diagnosed antenatally, of whom 31 (73%) were delivered by caesarean section (CS), 21 in the presence of documented coagulopathy (Table).

Coagulopathy	CS n (% of total)	GA n (% of CS)
Present (n=28)	21 (75)	16 (76)
Absent (n=5)	4 (80)	2 (50)
Not recorded (n=9)	6 (67)	3 (50)

No women who had regional anaesthesia were reported to have had complications of the procedure, including five women who received regional anaesthesia in the presence of documented coagulopathy. Worsening encephalopathy was not noted in any of the women who had general anaesthesia.

Discussion: The majority of women with AFLP in this national cohort who were delivered by caesarean section had general anaesthesia. No complications of either regional or general anaesthesia were noted. However, over 20% of women did not have a documented test for coagulopathy performed before delivery and were potentially at risk of haemorrhagic complications of anaesthetic or delivery.