

Abstracts of free papers presented at the annual meeting of the Obstetric Anaesthetists' Association, Sheffield, 7-8 June, 2007

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001 Cost effectiveness of using a cell saver in a large obstetric unit

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Introduction: Following the recent publication by the National Institute for Health and Clinical Excellence (NICE) on intraoperative red cell salvage in obstetrics,¹ we have examined what the financial impact of using a Cell Saver would be in our unit.

Methods: All patients who required blood transfusion following caesarean section from April 2002 to April 2003 were identified. Data relating to the volume of blood lost were gathered. The volume of blood that could have been salvaged was estimated based on a maximum recovery rate of 25% (personal communication from Haemonetics). We assumed an average blood-bank unit size of 350 mL at a cost of £130.52 per unit.²

We used three different scenarios to estimate the cost of using the cell saver: (i) collecting blood in all women but only returning it to those who required a transfusion, (ii) collecting and returning blood only to those who had required a transfusion and (iii) collecting and returning blood only to those who had required a transfusion in theatre. The initial price of the cell saver, its subsequent maintenance and staff training were included in the costing.

Results: 1276 caesarean sections were identified. The overall transfusion rate was 5.3%. Blood loss ranged from <500 to >3000 mL. Overall 68 women received 204 units of blood at a cost of £26 748.48. For scenario (i) 61 units of blood would have been returned to patients at a cost of £32 399 and a saving of £8019; for scenario (ii) 61 units of blood would have been returned at a cost of £5657.60 and a saving of £8019 and for scenario (iii) 35 units of blood would have been returned to patients at a cost of £2080 and a saving of £4587.

Conclusion: With carefully targeted use the cell saver may save money on obstetric units. Such savings are likely to increase with the rising cost of donated blood.

References

1. NICE Guidelines 2005. Cell Salvage and Obstetric Anaesthesia. www.nice.org.uk
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002 Prophylactic bilateral internal iliac artery catheterisation for control of haemorrhage during elective caesarean section for grade 4 anterior placenta praevia: a series of 6 cases

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Introduction: Patients with grade 4 anterior placenta praevia are at high risk of life-threatening haemorrhage during caesarean section. Contralateral selective catheterisation of the anterior division of the internal iliac arteries by a radiologist before caesarean section allows occlusion or embolisation of the arteries if necessary. We describe six patients with grade 4 anterior placenta praevia for elective caesarean section.

Case report: Three patients underwent combined spinal-epidural anaesthesia (CSE) as the sole anaesthetic technique for caesarean section. CSE was performed before radiological intervention. In one patient balloon inflation and embolisation were required. Three patients underwent general anaesthesia with prior cannulation of the internal iliac arteries. Two of these patients required balloon inflation and one subsequently proceeded to hysterectomy because of coexistent placenta accreta. Maximum blood loss in the series was 4L as determined by clinical methods. There was no long-term morbidity.

Patient	Anaesthetic	Balloon inflation	Embolisation	Blood loss (mL)
1	GA	No	No	1000
2	GA	Yes	No	1500
3	GA	Yes	No	4000
4	CSE	Yes	Yes	4000
5	CSE	No	No	800
6	CSE	No	No	250

Conclusion: In our case series intraoperative blood loss varied considerably between patients. Previous studies have shown advantages in prophylactic internal iliac artery balloon inflation rather than emergency intervention when bleeding becomes uncontrollable.^{1,2} A randomised study is needed to determine whether the type of anaesthetic and internal iliac artery balloon occlusion have a significant relationships with perioperative blood loss in these patients.

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1. Mitty HA, Sterling KM, Alvarez M, Gendler R. Obstetric hemorrhage: prophylactic and emergency arterial catheterization and embolotherapy. *Radiology* 1993; 188: 183-7.
2. Sundaram R, Brown AG, Koteeswaran SK and Urquhart G. Anaesthetic implications of uterine artery embolisation in management of massive obstetric haemorrhage. *Anaesthesia* 2006; 61: 248-52.

003 Determination of the dose-response relationship of spinal bupivacaine, levobupivacaine and ropivacaine, combined with sufentanil, during anaesthesia for caesarean section

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Introduction: Ropivacaine (R) and levobupivacaine (L) are less toxic and produce less motor block than bupivacaine (B). Reduced toxicity and increased motor-sensory separation must be evaluated in the light of the relative potency of the drugs. Recently, the full dose-response relation of R, L and B was described during intrathecal labour analgesia.¹ R and L were found to be less potent than B. In labour, many factors influence pain intensity. The response to surgery might better allow investigators to describe the dose-response relationship. This study determines the dose-response relationship of spinal L, R and B when used to achieve surgical anaesthesia for caesarean section.

Methodology: Following ethics committee approval and written consent, 450 term patients with singleton pregnancies undergoing elective caesarean section were included in a blinded, randomised trial. Combined spinal-epidural anaesthesia was performed using intrathecal L, B or R in doses of 5.0, 6.25, 7.5, 8.75, 10 or 11.25 mg, always combined with sufentanil 2.5 µg. Patients were defined responders to anaesthesia if adequate anaesthesia was reached within 15 min and persisted for 60 min. Adequate anaesthesia was defined as insensitivity to cold up to T2 and no need for anaesthetic supplementation. Patient demographics, obstetrical data, haemodynamics, maternal and fetal side effects and pain scores were noted. Group-specific dose-response curves were constructed using a probit regression model. ED50 and ED95 were calculated. A logistic regression model was used to check the sensitivity of the results and a likelihood-ratio test to compare the dose-response curves of L, R and B.

Results: see table:

	ED50 (mg) (95% CI)	ED95 (mg) (95% CI)
B	5.417 (4.398-6.028)	8.633 (7.876-10.104)
L	7.246 (6.145-8.064)	13.277 (11.584-17.102)
R	7.512 (6.743-8.178)	12.328 (11.077-14.706)

B was significantly more potent than L and R, whilst R and L were of similar potency.

Discussion: Based on the present dose-response study, intrathecal L and R, combined with sufentanil, are less potent than B when used for anaesthesia during caesarean section. R and L are of similar potency.

Reference

- 1 Van de Velde M, Dreelinck R, Dubois J, et al. Determination of the full dose-response relation of intrathecal bupivacaine, levobupivacaine, and ropivacaine, combined with sufentanil, for labor analgesia. *Anesthesiology* 2007; 106: 149-56.

004 Carbonated lidocaine v. levobupivacaine for extending epidural analgesia for emergency caesarean section

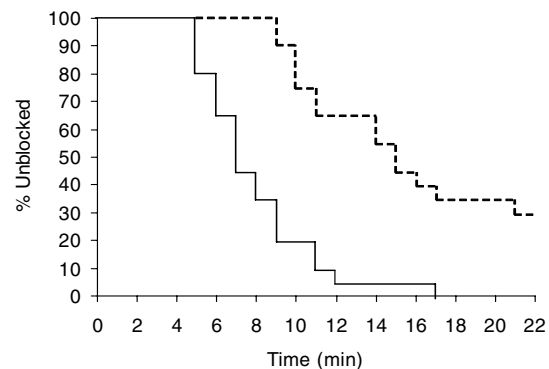
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Introduction: Lidocaine is often used to speed the onset of block when extending epidural analgesia in labour for emergency caesarean section (CS),¹ though supporting data are few. We compared our standard solution, 0.5% levobupivacaine (LB), with a lidocaine-bicarbonate-adrenaline mixture (LBA) in this situation.

Methods: After written consent, women in labour with PCEA requiring CS were randomly assigned to receive 20 mL of LB or LBA (final concentrations 1.8% lidocaine, 0.76% sodium bicarbonate and 1:200,000 adrenaline) over 3 min. Speed of onset (touch to T5) was assessed every 2 min. Supplementation, intra-operative pain, sedation and other side effects, and neonatal outcomes were noted. Data were analysed using a sequential analysis technique (primary outcome speed of onset), with analysis every 40 patients. Other data were compared with Mann-Whitney, Fisher's exact and unpaired t tests, with significance taken as $P < 0.05$.

Results: The first interim analysis indicated the study should stop, with median (IQR [range]) onset times (from the end of injection) of 14 (10-17 [9->31]) min for LB and 7 (6-9 [5-17]) min for LBA ($P = 0.00004$; Fig.). There was a trend towards more pre- and intra-operative supplementation with LB (4 + 6 patients respectively) than LBA (0 + 3 patients respectively) but this was not significant. All other outcomes were similar in the groups although there was a trend towards more sedation with LBA ($P = 0.07$).

Fig. Survival curves for LB (dotted) and LBA (solid).



Conclusion: Our study suggests a halving in onset time with LBA over LB, though one must also consider the possibility of adverse effects, e.g. increased sedation, that sequential analysis may not reveal, and also the risks from mixing drugs in the emergency situation.

Reference

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005 Intrathecal initiation of labour analgesia using fentanyl or diamorphine: is more always better?

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Introduction: Previous work has shown that diamorphine/bupivacaine intrathecal initiation of CSE analgesia in labour has a longer duration of action than fentanyl/bupivacaine.¹ We have used the same protocol to investigate if this effect is dose-dependant.

Methods: Following ethics committee approval, 81 women in labour were recruited and randomised to group F (bupivacaine 2.5 mg + fentanyl 25 µg, n=28), group LD (bupivacaine 2.5 mg + diamorphine 250 µg, n=29) or group HD (bupivacaine 2.5 mg + diamorphine 500 µg, n=24). The times to first comfortable contraction (T1) and first top-up (T2) were recorded by an independent midwife. Maternal hypotension, fetal bradycardia and pruritus were noted and treated if appropriate. At 30 min post injection proprioception and lower limb power were assessed.

Results: The three groups were demographically similar. Eleven patients were withdrawn due to delivery (5) or inadequate block (6) (F=1+1, LD= 3+3, HD=1+2). The results are tabulated below:

	Group F n= 26	Group LD n= 23	Group HD n= 21
T1 min (mean ± SD)	8.4 ± 5.8	7.8 ± 4.9	9.9 ± 6.4
T2 min (mean ± SD)	93 ± 30	121 ± 65*	113 ± 30**
Pruritus (%)	58	26*	43
Fetal bradycardia (%)	19	9	5
Mat. hypotension (%)	4	4	0
Proprioception (n) (fail=0, 1-3, ≥4/8)	26,0,0**	23,0,0***	18,2,1
Modified Bromage (n) (score=0,1,2,3)	25,0,1,0**	19,3,1,0	14,4,2,1

Significant difference ($P < 0.05$): *F vs LD, **F vs HD, *** LD vs HD

Conclusions: The use of diamorphine 250 µg as the opioid component of intrathecal labour analgesia is clearly preferable to fentanyl 25 µg in terms of duration of action and pruritus reduction. This benefit is not enhanced by increasing the diamorphine dose, and a higher dose may decrease a mother's ability to ambulate safely should she so desire.

Reference

- Vaughan DJA, Ahmad N, Lillywhite NK, Lewis N, Thomas D, Robinson PN. Choice of opioid for initiation of combined spinal epidural analgesia in labour – fentanyl or diamorphine. *Br J Anaesth* 2001; 86: 567-9.

006 The hypotensive and fetal heart rate response to low-dose epidurals: analysis of a randomised trial dataset

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Introduction: Regional analgesia is frequently used for labour analgesia. Low-dose techniques reduce vaginal operative deliveries with no reduction in pain relief.¹ Currently, routine electronic fetal monitoring is recommended by NICE following all regional blocks in labour, due to the risk of hypotension and fetal distress associated with sympathetic block.²

Objective: To compare the rates of hypotension (>20% fall from baseline or to <100 mmHg systolic) and abnormal fetal heart rate patterns following low-dose combined spinal (CSE) and low-dose infusion (LDI), with epidural boluses of 0.25% bupivacaine alone ('traditional').

Methods: Data from the COMET trial (of these three epidural techniques randomised in 1054 patients) were analysed to compare incidence of hypotension and abnormal fetal heart (FH) rates (predefined endpoints) following each technique until delivery. Maternal blood pressures were recorded every 5 min following the block for 30 min, and half hourly throughout labour.

Results: Abnormal FH rates were reported significantly more frequently in the traditional than in either of the other groups (table). Significantly more women in the traditional than in the LDI arm had episodes of hypotension. This was not so for traditional vs CSE groups.

	Traditional	LDI	CSE
Abnormal FH*	65/353 (18.4%)	28/350 (8.0%)	42/351 (12.0%)
Hypotension §	115/349 (33%)	82/337 (24%)	92/342 (27%)

* traditional vs LDI: χ^2 18.9, $P < 0.001$; traditional vs CSE: χ^2 5.7, $P < 0.02$; § traditional vs LDI: χ^2 6.2, $P < 0.02$

Conclusion: Low-dose techniques are associated with a lower incidence of abnormal fetal heart rate patterns and maternal hypotension than traditional epidurals. These techniques may reduce fetal distress, but the prevalence of abnormal fetal heart rate changes may not be reduced sufficiently to preclude the need for continuous electronic fetal monitoring in these women.

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007 Combined spinal epidural analgesia during labour: is a prophylactic intravenous crystalloid fluid load required to prevent hypotension?

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Introduction: Intravenous crystalloids were considered essential to prevent maternal hypotension following epidural labour analgesia.¹ Recent evidence however suggests that with low-dose epidural analgesia, this is not the case.² The effect of omitting crystalloid pre-loading before combined spinal-epidural (CSE) analgesia has never been evaluated. The present trial was designed to investigate if the incidence of hypotension is increased if a fluid load is omitted before CSE.

Methodology: Following ethics committee approval and written consent, 150 parturients in labour were included in this double-blind, randomised trial. All received CSE analgesia using intrathecal ropivacaine 4.375 mg with sufentanil 1.875 µg. In the F group, 75 patients received 1 L i.v. of Ringer's solution less than 5 min before initiation of analgesia. In the NF-group no i.v. fluids were given. The primary outcome was incidence of hypotension, defined as a decrease in systolic pressure (SP) below 80% of baseline or a decrease below 90 mmHg. Maternal blood pressure and heart rate were followed every minute for 10 min and every 2 min for a further 20 min. Demographic data, obstetric data, fetal heart rate and neonatal outcome were recorded. Statistical analysis consisted of repeated measures ANOVA with post hoc testing when appropriate. Categorical data were analysed using χ^2 and Fisher's exact test. $P < 0.05$ was considered significant.

Results: No differences between the groups in demographic or baseline obstetric data existed. No differences in pain intensity or pain relief were observed. The two groups had similar haemodynamic reactions to CSE analgesia (Table). Neonatal outcome was good in both groups.

	F group (n=75)	NF group (n=75)
Lowest SP (mmHg)	104 ± 11	108 ± 11
Max decrease SP (%)	16 ± 9	15 ± 9
Incidence of hypotension (%)	15	11

Conclusion: The results of the present trial indicate that crystalloid fluid pre-loading has no benefit in terms of maternal haemodynamic stability following CSE labour analgesia.

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008 Maternal cardiac output changes after crystalloid or colloid cohydration following spinal anaesthesia for elective caesarean section

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Introduction: Crystalloid cohydration combined with a phenylephrine (P) infusion reduces hypotension during spinal anaesthesia for caesarean section (CS).¹ To investigate if substituting colloid for crystalloid further improved cardiovascular stability, we compared compound sodium lactate (CSL) vs. 6% w/v hydroxyethyl starch (HES) cohydration combined with P, and quantified changes in systolic pressure (SP), cardiac output (CO) and P use.

Method: In this randomised double-blind study, 60 elective CS patients received rapid cohydration with 1 L of either CSL (N=30) or HES (N=30) over 5 min at spinal injection (SI) followed immediately by a P infusion (100 µg/min) titrated to maintain baseline SP (bSP) until delivery. We recorded HR, SP, P usage, block ht, nausea and vomiting scores (NV) and fetal data. A suprasternal Doppler monitor measured CO and stroke volume (SV) as well as corrected flow time (FTc) and peak velocity (PV), measures of venous return and contractility respectively before SI and every 5 min for 20 min after SI before surgery. Statistical analysis included RMANOVA ($P < 0.05$).

Results: Maternal characteristics, CO parameters (table), HR, NV, umbilical cord gases and Apgar scores were similar. There were no significant differences in episodes of hypotension (SP<80% bSP; $P=0.17$) or hypertension (SP>120% bSP; $P=0.14$). The mean (SD) total P dose needed to maintain bSP did not differ: 1.17 mg (0.41) vs. 1.08mg (0.39); CSL vs. HES.

	Gp	Base	5 min	10 min	15 min	20 min
CO L/min	CSL	5.43 (0.79)	6.21* (1.24)	5.76 (1.23)	5.41 (0.98)	5.36 (1.06)
	HES	5.00 (0.84)	6.22* (1.37)	5.66* (1.38)	5.52 (1.34)	5.45 (1.08)
SV mL	CSL	66.4 (11.6)	77.7* (10.5)	76.5* (11.4)	76.1* (12.2)	75.9* (14.7)
	HES	62.2 (9.7)	75.6* (13.0)	74.7* (15.2)	76.3* (14.3)	74.4* (11.2)
PV cm/s	CSL	97.7 (9.8)	103.3 (10.2)	98.8 (9.6)	99.3 (10.8)	99.2 (9.3)
	HES	92.9 (8.8)	102.0* (14.2)	100.3* (12.6)	100.1* (13.2)	98.9 (9.4)
FTc ms	CSL	384.3 (39.7)	420.0* (47.6)	421.4* (35.0)	402.9 (29.1)	400.4 (31.4)
	HES	380.3 (18.4)	416.0* (26.4)	408.2* (35.4)	402.9* (33.4)	397.9* (25.9)

Data are mean (SD); * $P < 0.05$ compared to baseline *within* group

Conclusion: Rapid cohydration with HES, combined with P, offers no advantages over CSL in maintaining cardiovascular stability and preventing hypotension.

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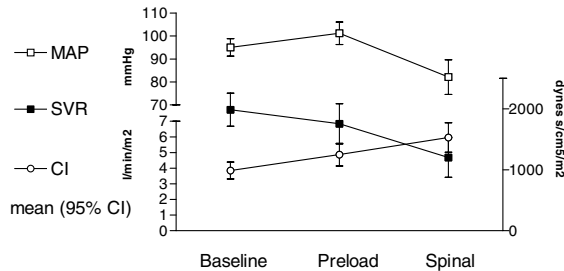
O09 Effects of crystalloid preload and spinal anaesthesia for caesarean section on maternal haemodynamics using LiDCOplus system

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Introduction: Non-invasive blood pressure monitoring during spinal anaesthesia gives the anaesthetist no information about underlying changes in systemic vascular resistance index (SVRI) or cardiac index (CI). Lithium dilution haemodynamic monitoring is new to obstetric anaesthesia. It uses pulse power analysis to provide continuous cardiac output monitoring with minimal discomfort to the patient.

Methods: 21 healthy pregnant women were recruited for monitoring before elective caesarean section at term. Calibration was performed using a 0.3-mmol lithium chloride bolus. When haemodynamic parameters had remained stable for 5 min, baseline data were recorded. A 2-L fluid preload of Hartmann's solution was given over 10 min followed by intrathecal 0.5% hyperbaric bupivacaine 2.5 mL with diamorphine 0.3 mg. The anaesthetist used arterial pressure during surgery but remained blinded to LiDCO data. Variables were analysed using Wilcoxon signed rank test.

Results: Cardiac index increased by 26% after fluid preload ($P < 0.0001$) and by a further 25% after onset of spinal anaesthesia ($P < 0.01$). This was associated with a 12% ($P < 0.01$) and 31% ($P < 0.0001$) drop in SVRI respectively (figure).



Conclusion: An effective fluid preload must produce a significant rise in cardiac output to prevent spinal induced hypotension.¹ The LiDCOplus monitoring system confirmed that we had achieved a true preload with a rapid infusion of crystalloid. This increase in cardiac output was sustained after the onset of spinal anaesthesia. We recommend the use of continuous cardiac output monitoring in future studies comparing different volume preloading techniques.

Reference

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O10 Hypotension following low-dose combined spinal-epidural anaesthesia for caesarean section: left lateral versus supine tilted position

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Introduction: Hypotension following spinal anaesthesia for elective caesarean section is common. Previous studies have shown there may be an advantage in establishing the block in the full lateral compared to the supine tilt position.¹ This study was designed to see if the same advantage were true after low-dose combined spinal-epidural (CSE) anaesthesia.

Method: After ethics approval and written informed consent, 71 ASA 1 and 2 patients undergoing elective caesarean section were recruited. A standard 10-mL/kg preload of Hartmann's solution and CSE (intrathecal 0.5% hyperbaric bupivacaine 1.6 mL, fentanyl 20 µg and morphine 100 µg) was given in the sitting position. The mothers were then allocated to the full left lateral or supine 15° tilt position. Demographic data, ephedrine use, episodes of hypotension and block characteristics were recorded. Continuous variables were analysed using student's t test. Nominal or ordinal variables were analysed using χ^2 test and Mann-Whitney U test. $P < 0.05$ was considered statistically significant.

Results: Demographic data were similar in the two groups. Hypotension was recorded whilst in the study position and overall from CSE insertion to delivery of the baby. Data are expressed as n (%) or n (IQR).

	Left lateral n = 35	Supine tilt n = 36	P
Hypotension			
in study position	26 (74)	22 (61)	0.235
overall	35 (100)	30 (83)	0.025
Total ephedrine (mg)	18 (12-18)	12 (6-18)	0.355
Epidural top-ups:			
No. needing top-up	24 (69)	14 (41.2)	0.023
No. of top-ups	1 (0-2)	0 (0-1)	0.046

Conclusion: Hypotensive episodes were equally common in the lateral and supine tilt position whilst in the study position and more common in the lateral position overall. The epidural had to supplement the spinal block more often in the lateral position. We cannot recommend the use of the lateral position for low-dose CSE during routine elective caesarean section.

Reference

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011 Effect of intravenous phenylephrine or ephedrine on the ED50 of intrathecal bupivacaine with fentanyl for caesarean section

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Introduction: Prophylactic infusion of phenylephrine (P) to prevent hypotension at caesarean section decreases the rostral spread of intrathecal levobupivacaine by a median of two dermatomes compared to ephedrine (E).¹ However the doses of vasopressor used may not have been equivalent.² The aim of this study was to determine the ED50 of intrathecal bupivacaine required to achieve a block to the xiphisternum in patients undergoing caesarean section when P or E are used equivalently to prevent hypotension.

Methods: After ethical approval, 51 women having combined spinal-epidural anaesthesia in the sitting position for caesarean section were randomised in two groups to receive either P (1 µg/mL) or E (90 µg/mL). Patients received varying doses of hyperbaric bupivacaine (testing interval 1 mg) with fentanyl 25 µg using a double-blinded, up-down sequential allocation design. Prophylactic vasopressor infusions were started with the intrathecal injection at a rate of 1000 mL/h. Effective doses were defined as anaesthesia to touch with ethyl chloride spray to the xiphisternum bilaterally within 20 min. Ineffective doses were topped up via the epidural catheter before surgery. Heart rate (HR) and systolic pressure (SP) were measured each minute until delivery. Results are presented as mean, ratio, SD and 95% CI, with $P < 0.05$ defined as significant.

Results: Maternal characteristics were similar. SP equivalence (E:P ratio 1.04, 0.95–1.12) was achieved and HR was significantly ($P=0.0048$) slower with P. Bupivacaine ED50 (E:P ratio 1.01, 0.84–1.24) and UApH were similar in the two groups.

Group	ED50 (mg)	HR (beats/min)	UApH
P	7.6 (6.2-9.1)	82 (12.2)	7.26 (0.06)
E	7.7 (6.9-8.5)	95 (8.5)	7.22 (0.10)

Conclusion: At pressor equivalence of P and E, the ED50s of intrathecal bupivacaine are similar.

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012 Acid-base balance in an obstetric population: establishing a normal range

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Introduction: It is known that acid-base balance is affected by the physiological changes of pregnancy. Acid-base balance is an important measurement in intensive care and acute admissions to predict adverse patient outcome and direct therapy.¹ We wished to establish normal ranges in pregnancy to aid the rational approach to resuscitating the sick parturient.

Method: After local ethics committee approval, 100 well antenatal and 100 well labouring women were recruited. The labouring group did not have epidurals, which have been shown previously to reduce maternal acidosis.² Maternal venous blood gases were collected at the time of routine cannulation. Patient demographics and the stage of labour were documented.

Result: see table

	pH	Base excess
Antenatal group		
28-34 weeks	7.38 ± 0.05 (7.24-7.53)	-1.68 ± 1.81 (-8.2 to 1.8)
35-41 weeks	7.39 ± 0.05 (7.29-7.50)	-2.65 ± 1.71 (-6.2 to 0.6)
Labouring group		
Cervix < 7 cm	7.42 ± 0.06 (7.31-7.56)	-5.37 ± 1.64 (-10 to -2)
7-10 cm	7.42 ± 0.07 (7.29-7.56)	-6.82 ± 2.01 (-13 to -2)

Data are mean ± SD (range)

Conclusion: Arterial and venous acid-base balance correlate well³ and because of the large number of routine cannulations, we have been able to establish a normal range for well antenatal and labouring women. Base excess falls with increasing gestation and with progress in the first stage of labour. The standard deviation is large with a surprising range. Maternal pH varies from alkalotic to acidotic because of the importance of the respiratory component maintaining neutrality with such a marked reduction in buffering capacity. We feel that these data will be a useful adjunct when assessing and establishing treatment in the sick parturient.

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O13 Does eating during labour influence obstetric outcome?

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Introduction: A "nil by mouth" policy has traditionally been practised during labour as prophylaxis against pulmonary aspiration. Meanwhile, an increasingly liberal attitude towards allowing women to eat during labour is observed in the UK. We performed a randomised controlled trial to investigate the effect of feeding in labour on obstetric and neonatal outcome.

Method: 2426 primiparous women in labour at term (≥ 36 weeks gestation), ≥ 18 years old, singleton, cephalic presentation, < 6 cm cervical dilatation and without significant medical complications were randomised to feeding (F) or water only (W) group. A subgroup of participants (152) was asked to answer a post-partum questionnaire to evaluate the influence of food intake during childbirth on the level of maternal satisfaction towards labour. The primary outcome was spontaneous vaginal delivery (SVD) rate. Length of labour, instrumental delivery rate, caesarean section rate, augmentation of labour, incidence of vomiting, Apgar scores and need for admission to the neonatal unit were also evaluated. The study had 90% power to detect a 5% change in spontaneous vaginal delivery rate and a 10% change in the length of labour.

Results: There was no difference in the SVD rate (44% in both groups). No significant difference was observed with respect to duration of labour (698 min (F) vs. 718 min (W), $P=0.21$), incidence of vomiting (once only: 18% (F) vs. 17% (W), RR, 1.08; 95% CI 0.9-1.3, $P=0.42$; more than once: 17% in both groups). Medical interventions and neonatal outcome were also similar in the two groups. However, women in the eating group rated their experience better because of eating ($P < 0.001$).

Conclusion: Light dietary intake during labour did not influence labour or neonatal outcome in low-risk mothers. Nevertheless, women who ate felt their labour experience was better. Low-risk women should be allowed to eat a light diet in labour should they desire, provided there are no risk factors suggesting the need for general anaesthesia.

O14 Cardiac maternal deaths: missing data in the CEMACH/CEMD reports over 30 years

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Introduction: Maternal deaths due to cardiac disease have increased in the last 30 years.¹ The prevalence of maternal cardiac disease is associated with older age and multiparity, while gestation and mode of delivery may be useful indicators of the myocardial stress placed on a mother with cardiac disease. Our impression is that such data are increasingly omitted from the CEMD/CEMACH reports, even as summary data, because of concerns over confidentiality. Our aim was to identify cardiac deaths where such data were omitted from CEMD/CEMACH reports over the last 30 years.

Methods: All cardiac deaths contained within the CEMD/CEMACH reports 1973-2002 were analysed and those in which age, parity, gestation or mode of delivery were missing were identified.

Results: The proportion of cardiac deaths in which important data were not presented has been variable over the 30-year study period but has increased for all items studied since 1979-81 (Figure).

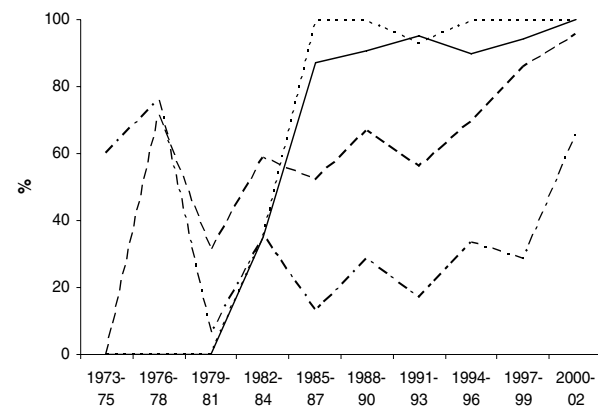


Figure. Proportion of cardiac deaths in the CEMD/CEMACH reports 1973-2002 in which age (dotted line), parity (solid line), gestation (dashes) or mode of delivery (dots/dashes) were not given.

Conclusion: There has been an increasing trend for age, parity, gestation and mode of delivery to be omitted from the details of cardiac cases presented in the CEMD/CEMACH reports. However, we consider such data as useful baseline information for analysing trends in maternal deaths due to cardiac disease, and believe that their inclusion within summary data would not compromise individuals' confidentiality, while improving the information offered to affected women during counselling and assisting their risk assessment.

Reference

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O15 A blinded study of the sensitivity of epidural catheter aspiration in identifying intrathecal epidural catheter placement

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Introduction: Clinically significant intrathecal administration of local anaesthetic occurs in about 0.1% of epidurals in UK obstetric practice.¹ Aspiration of the epidural catheter is advocated as a test for excluding intrathecal placement and reducing the incidence of this complication. The sensitivity and optimal method of performing this simple test have not been studied.

Methods: 16- and 18-gauge epidural catheters were passed into a box and 'epidural' or 'intrathecal' placement randomly simulated within the box by the study investigator. Intrathecal placement was simulated by placing the catheter tip into a 10-cm column of Hartmann's solution, epidural placement by digitally occluding the catheter side-eyes. Study participants (practising anaesthetists, n=25) were blinded to catheter placement and asked to perform a series of catheter aspiration tests; firstly, simulating their current practice before top-up for caesarean section, and secondly using empty 2, 5, 10 and 20-mL syringes. Three intrathecal and epidural placements were randomly simulated for each catheter gauge and syringe volume combination. Results are reported as mean sensitivity (% correctly identified intrathecal placements) \pm SD.

Results: Of study participants, 86% routinely performed epidural catheter aspiration before administering local anaesthetic, 70% used a 20-mL syringe containing local anaesthetic for this test before epidural top-up for caesarean section. Based on current practice, the sensitivity of epidural catheter aspiration in correctly determining intrathecal placement was significantly higher using a 16-gauge catheter (16 gauge: $81 \pm 26\%$ vs 18 gauge: $44 \pm 33\%$, $P < 0.001$, unpaired t test). There was a significant difference in test sensitivity using different volume syringes, with an empty 2-mL syringe the most sensitive and 20 mL the least. This pattern was observed using both 16-gauge (2 mL: $97 \pm 13\%$, 5 mL: $90 \pm 27\%$, 10 mL: $83 \pm 30\%$, 20 mL: $73 \pm 27\%$, $P < 0.05$, ANOVA) and 18-gauge catheters (2 mL: $73 \pm 27\%$, 5 mL: $60 \pm 40\%$, 10 mL: $57 \pm 33\%$, 20 mL: $30 \pm 26\%$, $P < 0.001$, ANOVA).

Conclusion: The sensitivity of epidural catheter aspiration in identifying intrathecal placement is strikingly dependent on both catheter gauge and volume of syringe used. A 2-mL syringe and 16-gauge catheter provide the greatest sensitivity, a 20-mL syringe and 18-gauge catheter the least. These data suggest a 2-mL syringe should be used routinely for this test.

Reference

- Jenkins J G. Complications of obstetric epidurals: an audit of 10 817 cases. *Int J Obstet Anesth* 1998; 7: 280-1.

O16 Stability of adrenaline in pH-adjusted lidocaine

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Introduction: Addition of bicarbonate speeds the onset of epidural lidocaine for emergency caesarean section.¹ Adrenaline is often added to this mixture to reduce toxicity and prolong the block.² However, adrenaline degrades completely 24 h after mixing,³ but there are no data for < 24 h. We studied the degradation of adrenaline at intervals after combining the three ingredients.

Method: We prepared three syringes as follows: 2 mL of 8.4% sodium bicarbonate was added to 20 mL of lidocaine; 2 mL of this mixture was discarded and 0.1 mL of 1:1000 adrenaline added. The solution was stored at 24°C, unprotected from ambient artificial light. Adrenaline and lidocaine were assayed by high-performance liquid chromatography with ultraviolet detection at 0, 2, 4, 6 and 20 h. Results were analysed with repeated measures ANOVA, $P < 0.05$ indicating statistical significance.

Results: Adrenaline concentrations in the bicarbonated mixture significantly decreased ($P < 0.0001$) as shown below. Lidocaine concentrations were unchanged.

Table. Mean \pm SD decrease in adrenaline concentration (as proportion of initial) at intervals after preparation.

0 h	0%
2 h	$4.1 \pm 0.6\%$
4 h	$12.4 \pm 2.1\%$
6 h	$27 \pm 3.6\%$
20 h	100%

Conclusion: Anecdotal enquiries suggest that anaesthetists who use pH-adjusted lidocaine/adrenaline for epidural top-ups commonly prepare the mixture well in advance of its use, despite a lack of data about its stability between 0 and 24 h. Our study suggests that this practice is inadvisable, especially if the mixture is kept in bright light and/or higher temperatures, when faster degradation would be expected (let alone issues over sterility). However, if kept away from bright light and at 24°C or lower, our results suggest that over 90% of the adrenaline is still present within the first 2 h of preparation.

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O17 Obstetric workload of non-obstetric consultant anaesthetists: a national OAA-approved survey

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Introduction: Obstetric anaesthesia is one of the core topics in anaesthesia agreed by the Union of European Medical Specialists and forms part of consultant appraisal. Consultant anaesthetists with no regular daytime obstetric sessions often cover obstetric emergencies on call. With the reduction in trainees' working hours, trainees are likely to call for senior help more often.¹ This is likely to have an impact on the on-call activities of non-obstetric anaesthetic consultants. This survey was done to assess the magnitude of this issue, the scale and variety of on-call work and their CME activities.

Methods: A postal questionnaire (OAA-approved) was sent to all non-obstetric anaesthetic consultants (<1 obstetric session per week) who cover obstetric anaesthesia on call. We asked about the pattern and reasons for their out-of-hours activity in obstetrics in a one-year period, their level of comfort in providing obstetric cover, CME activities and their inclination for a dedicated obstetric anaesthetic team.

Results and Discussion: Overall hospital response rate was 74.9% (176/235) with individual consultant response rate of 60% (729/1215).

Comfortable in covering obstetrics on-call: yes (65%), no (15.5%), not sure (19.5%). Willingness for a dedicated obstetric team: yes (34.8%), no (42.5%), not sure (22.7%). Average number of times called in by trainees: 2.4/year (40% without prior discussion). Reasons: advice (26.3%), caesarean section general anaesthesia (15.3%), caesarean section spinal (13.3%), labour analgesia (10.4%), caesarean section epidural (4.4%), other (30.3%). Problems requiring consultant presence included difficult spinal/epidural (18.6%), haemorrhage (13.4%), 2nd theatre (10.7%), preeclampsia (6.7%) and need for critical care (6.4%). CME activities undertaken: occasional sessions (43%), conferences (36%), study days (26%), courses (8%), others (24%), none (12%). Desired CME included: sessions (48.3%), none required (27.8%), other (11.8%) e.g. audit, local updates, protocols and mortality and morbidity meetings. 54.6% of consultants had not covered daytime obstetrics in the previous year and a further 25.8% had not had any supernumerary session.

Conclusion: Significant proportion (35%) of non-obstetric anaesthetic consultants are not comfortable covering maternity when they are on-call and 80% had not accessed supernumerary sessions as recommended by OAA/AAGBI.

Reference

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O18 Publication of papers arising from abstracts presented at OAA annual meetings 1994-2004

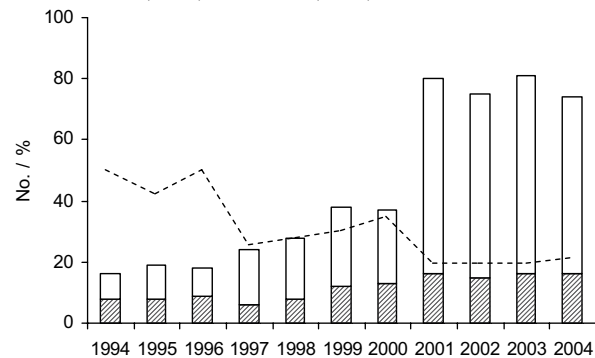
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Introduction: Previous studies of abstracts presented at anaesthetic meetings have shown that the proportion published as full papers within 3 years of presentation fell from 40-50% in 1985 to 20-45% in 1996.^{1,2} We wished to see whether there was a similar trend in abstracts presented to the OAA over the last decade.

Methods: We identified all abstracts presented at OAA annual meetings, 1994-2004, listed in back issues of IJOA, and searched PUBMED for the first two authors' names. If no publication was found the third/last author's name was used as a search term. We compared the content of any paper found within three years of presentation with that of the original abstract, and counted the total number of abstracts and those published as full papers.

Results: The number of abstracts presented has risen markedly over the decade (Fig.) though the proportion published as full papers within three years (dotted line) fell (clear: total no. presented; shaded: no. published). Most papers were published in IJOA (32%), Anaesthesia (32%) and BJA (16%).



Discussion: The rising number of abstracts presented and falling proportion published are in common with other anaesthetic meetings.^{1,2} Possible reasons include: submission of more abstracts unsuitable for publication (e.g. surveys/audits), falling quality of abstracts, lower thresholds for their acceptance at meetings, greater difficulty writing up/submitting them as papers, rising journal rejection rates, or increasing numbers of journals unlisted in PUBMED. The number of abstracts presented in 2005 and 2006 was 69 and 80 respectively, suggesting a plateau since 2001; it will be interesting to see whether the publication rate also remains constant.

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P01 Multimodal analgesia for caesarean section does not need intrathecal diamorphine

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Introduction: We audited analgesia after caesarean section against national analgesia and monitoring standards.¹ NICE² has made a grade-A recommendation that women should be offered neuraxial diamorphine. We decided to assess whether this was necessary.

Method: Our standard post-caesarean analgesia is oral co-codamol 8/500 two tablets four times a day regularly, rectal diclofenac 100 mg every 16 h as required (in practice used for morning mobilisation), oral morphine 10 mg up to 50 mg in 12 h as needed and i.m. morphine 15 mg every 3 h as rescue. The first rectal and i.m. doses are administered in recovery. The maximum oral morphine dose acts as a trigger for rescue i.m. analgesia. Fentanyl is the sole neuraxial opioid we use, at a dose of 25 µg. After audit registration we examined the case notes of 136 patients (130 regional and six general anaesthetics). We needed an audit sample of 130 cases to achieve 90% confidence in a result of $\pm 5\%$. We recorded pain scores at 5-min intervals in recovery; pain score monitoring was continued by the ward midwife. We used a four-point verbal numeric scale (0-3); a score of ≤ 1 was considered equivalent to a score of < 3 on a visual analogue scale, as recommended.

Results: We excluded four patients with diclofenac sensitivity; 116/132 patients (88%) were prescribed the standard regime; 11 of these were prescribed additional analgesia. Diclofenac was prescribed in 125/132 cases (95%) and administered in 122/125 (98%). The median numbers of co-codamol, diclofenac and oral morphine doses used were close to the maximum; for i.m. morphine in the first 24 h it was one out of a maximum eight doses. Post-recovery pain scores were documented in only 74 cases; 70/74 (95%) had pain scores of ≤ 1 .

Conclusions: Compliance with prescription and administration guidelines is high. The use of diclofenac is very close to the 100% standard.¹ The use of i.m. morphine is low, thereby minimising potential needle-stick injury and painful injections. Pain score recording was inadequate, but when recorded the RCoA standard was met. We question the NICE guideline requiring the offer of neuraxial diamorphine for caesarean section, which is based on research comparing this against on-demand medication.³ Administering regular multimodal analgesia produces good analgesia.

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P02 How painful is epidural insertion? What mothers think

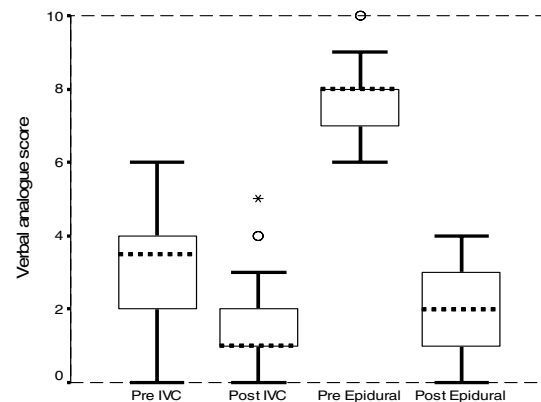
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Background: The process of labour and delivery is stressful for any women and this may be compounded by fear of needles. This study was designed to compare the perception of pain¹ before and after i.v. cannulation (IVC) and epidural needle insertion.

Methods: Thirty primiparous women with no previous experience of epidural/spinal anaesthesia were recruited. An information sheet providing study details and the pain scoring system (verbal numeric scale, 0: no pain, 10: worst pain) were given to women. Informed consent was obtained following which women were asked to document the amount of pain they expected to experience during IVC and epidural needle insertion. Similarly post-procedure they were asked to document the pain score after the actual experience.

Results: The median anticipated pain score [range] pre-procedure was 3.5 [0-6] for IVC and 8.0 [6-10] for epidural needle insertion. Post-procedure the median [range] pain score for IVC and epidural needle insertion were 1.0 [0-5] and 2.0 [0-4] respectively. This was statistically significant using Wilcoxon signed ranks test ($P < 0.001$), hence women found both procedures to be less painful than they had expected. Further, they had expected epidural insertion to be more painful than IVC ($P < 0.001$) but there was no significant difference between pain scores after the procedures ($P > 0.0125$). (Bonferroni correction applied, significance taken as $P < 0.0125$)



Conclusion: Expectant mothers anticipated epidural needle insertion to be more painful than IVC. However this was not true following the actual experience.

Reference

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P03 An audit of maternal nausea and vomiting following a change from phenylephrine boluses to an infusion

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Introduction: Phenylephrine has been shown to be preferable to ephedrine to combat maternal hypotension following spinal anaesthesia.¹ In our institution phenylephrine is given as 20-40 µg boluses. In published research using phenylephrine infusions the quoted rates of hypotension and nausea were less than our experience. We decided therefore to introduce an infusion protocol and audit hypotension and nausea incidence before and after the change in practice.

Methods: Following confirmation that ethical approval was not required, a two-stage prospective audit was undertaken. For 5 weeks all elective caesarean sections undertaken using regional anaesthesia in ASA 1 and 2 patients were audited. Blood pressure was measured every minute and corrected with phenylephrine 20-40 µg boluses as required. Nausea was scored as none, nausea or vomiting. Maternal satisfaction was based on a visual analogue scale 0-10. A previously published protocol was then instituted running a 100-µg/mL phenylephrine infusion at 0-40 mL/h to maintain blood pressure at the starting level.² Another 5-week period was then audited. Statistical analysis was performed using students t test, χ^2 and Mann-Whitney U test.

Results: These are shown in the table. There were no significant differences in intrathecal dose or block height between the groups.

	Bolus group (n=55)	Infusion group (n=51)	P
Phenylephrine dose	90.2 ± 73.1 µg	1257 ± 540 µg	<0.001
Apgar score			
1 minute	9 [6-9]	9 [5-9]	NS
5 minute	10 [9-10]	10 [9-10]	NS
Largest fall in MAP (mmHg)	30.1 ± 14.7	25.1 ± 12.3	<0.05
Vagolytic needed (n)	5	16	<0.01
Nausea (n)	19	9	<0.01
Vomiting (n)	13	4	<0.01
Satisfaction	10 [6-10]	10 [7-10]	<0.05

Data are n, mean ± SD or median [range]

Conclusion: An infusion regime reduces the degree of hypotension and the incidence of nausea and vomiting in elective caesarean sections. This is at the expense of higher doses of phenylephrine and vagolytics.

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P04 Temperature loss during elective caesarean section under spinal anaesthesia

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Introduction: Hypothermia due to heat loss under anaesthesia is associated with shivering, an increase in wound infection and breakdown, coagulopathy, myocardial ischaemia and arrhythmias, and decreased drug metabolism with prolonged duration of action. Regional blockade prevents the plateau phase seen in hypothermia during general anaesthesia by preventing vasoconstriction in the legs. Elective caesarean section is routinely performed under spinal anaesthesia. This audit was conducted to investigate the incidence of hypothermia during elective caesarean section under spinal anaesthesia, and to identify whether there is a need for routine use of warming techniques.

Methods: Verbal consent for tympanic temperature measurement was obtained from patients presenting for elective caesarean section. Temperature was recorded on arrival in theatre, at the end of surgery and 30 min after arrival in the recovery room. The same thermometer was used for all patients. All patients underwent spinal anaesthesia with 0.5% hyperbaric bupivacaine. The volume injected, the type and dose of opioid and the specific management of anaesthesia were according to clinicians' preferences.

Results: Of the 50 patients audited, temperature fell in 98%, and hypothermia (<36°C) occurred in 46%. The mean ±SD temperature drop at end of surgery was 1.0 ± 0.4°C with a body temperature range of 35.1-37.5°C. Temperature continued to fall in recovery in 10% of patients despite passive rewarming. No significant difference in temperature drop was detected between groups receiving different doses of bupivacaine, or different dose or type of intrathecal opioid. Temperature loss did not correlate with duration of surgery, fluid volume infused, or shivering.

Conclusion: Patients are at risk of hypothermia during caesarean section. Active warming and the use of warmed i.v. fluids should be considered. Further research is indicated.

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P05 Chemical burns and pressure sores in obstetric anaesthesia: a retrospective audit

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Introduction: Several cases of skin damage following epidural labour analgesia in our unit prompted a detailed evaluation of this previously under-reported phenomenon in healthy parturients.¹ Our aim was to elucidate contributing factors with a view to decreasing the incidence of skin damage.

Method: We performed a retrospective audit of case notes of parturients who had chemical burns or pressure sores identified from risk management reporting between January 2001 and March 2006. Midwifery, obstetric and anaesthetic records were assessed. Data were collected on relevant aspects of labour, delivery, epidural analgesia, diagnosis and management of skin lesions.

Results: 17 cases were identified, all of whom received epidural analgesia with intermittent boluses of 0.1% bupivacaine + fentanyl 2 µg/mL during labour; 82% were over age 35. All epidurals were placed in the sitting position using 0.5% chlorhexidine in 70% denatured ethanol B for skin preparation. The mean total duration of labour was 840 min (range 448-1335 min). Mean duration of active second stage of labour was 84 min (range 3-197 min), 11/17 had instrumental deliveries (4/11 performed in theatre). One parturient had an emergency caesarean section for failure to progress. As documented, only 12% mobilised out of bed and 65% had their positions changed. Average time between epidural placement and diagnosis of skin damage was 501 min (range 70-1560 min). Skin damage was exclusively over the buttock area; 15/17 required referral to the tissue viability nurse or plastic surgery. All cases were managed conservatively.

Diagnosis	Chemical burn	Pressure sore	Unspecified
Grade 1	4	8	0
Grade 2	2	0	3

Data are number of patients

Conclusion: The aetiology of chemical burns and pressure sores is probably multi-factorial. The principal factors appear to be the use of alcoholic chlorhexidine skin preparation and a long labour in an older group of patients. Prolonged pressure secondary to instrumental delivery and decreased mobility due to epidural analgesia may also contribute. Better data collection is required both locally and nationally to elucidate the incidence of this complication. We recommend informing patients when obtaining consent for regional anaesthesia, encouraging mobilisation and sparing use of chlorhexidine skin preparation.

Reference

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P06 Complications associated with combined spinal-epidural vs spinal anaesthesia for caesarean section

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Introduction: Combined spinal-epidural (CSE) is a well established technique for providing anaesthesia for caesarean section in the UK.¹ The reliability of the spinal block with the flexibility of the epidural, enabling it to be extended or prolonged, has made CSE the technique of choice for *de novo* caesarean sections. On the other hand it potentially exposes the patient to more complications than either alone. These include inadequacy and failure of the spinal component.²

Method: We retrospectively analysed the data in our obstetric anaesthetic database relating to all *de novo* regional anaesthetics for caesarean section between the years 2001-2006. We reviewed complications associated with the two procedures.

Results: During this period there were 2412 *de novo* regional anaesthetics for caesarean section. Of these 1550 (64.2%) had CSE and 862 (35.7%) had single-shot spinals. All received bupivacaine 10 mg and diamorphine 250 µg intrathecally.

	Spinals (n=862)	CSE (n=1550)
Paraesthesia	16 (1.8%)	88 (5.7%)
High block	3 (0.3%)	23 (1.5%)
Bloody tap	1 (0.1%)	55 (3.5%)
Hypotension	37 (4.3%)	124 (8.0%)
Incomplete block	13 (1.5%)	54 (3.5%)
Conversion to GA	32 (3.7%)	35 (2.3%)

Discussion: The complication rate for CSEs was 39.9% compared to 31.8% for spinals. All complications except conversion to GA were commoner in the CSE group. Compared to 54 (3.5%) in the CSE group, only 13 (1.5%) in the spinals had inadequate analgesia from the subarachnoid block; 35 CSEs (2.3%) were converted to GA compared with 32 spinals (3.7%).

CSE has proved to be a versatile technique and definitely has a place in obstetric anaesthesia, but its use should be tailored to the individual case and the risks and benefits considered rather than using it routinely.

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P07 Complications of regional techniques for obstetric analgesia and anaesthesia

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Introduction: There is understandable interest in the incidence of complications following placement of regional blocks in obstetric patients.^{1,2}

Method: Ethical approval was deemed unnecessary for this project. Our obstetric anaesthesia database was searched from 2003-2006 inclusive. Information regarding type of block, indication for insertion, difficulties during insertion and post procedure follow-up was retrieved. Data were analysed using SPSS v15.0.

Results: We retrieved data for 11942 women who had a total of 13276 regional blocks. The table displays incidences of complications.

	CSE	Spinal	Epidural	Total
n	3477	1946	7853	13276
Dural puncture with needle	38	4	68	110 (0.8%)
Dural puncture with catheter	12	0	20	32 (0.2%)
Spinal failure	210	85	0	295 (5.4%)
Epidural failure	193	0	783	976 (8.6%)
Paraesthesia	137	25	481	643 (4.8%)
Neurological symptoms	31	23	115	169 (1.3%)
Headache	121	46	150	317 (2.4%)
PDPH	51	13	80	144 (1.1%)
Epidural blood patch	30	6	59	95 (0.7%)

Conclusion: Our unit is a teaching tertiary referral centre. Our incidences of complications are broadly in line with published data and as such we feel that we provide a safe service despite a high turn-over of trainee anaesthetists.

References

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P08 Increasing dural tap rate: is this a national trend?

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Introduction: It is well recognised that the incidence of dural puncture is greater when the anaesthetist is less experienced at epidural insertion.¹ We report our dural tap incidence over the last five years, relating it to recent changes in trainee working hours and caseload.

Method: Data on the incidence of post-partum headaches are routinely collected in our unit each year, including information regarding anaesthetic technique, grade and experience of the anaesthetist. We compared our data from July 2005 to July 2006, with similar data from three previous 12-month periods. The number of epidural blood patches and the role of spinal catheters in the management of dural tap were also evaluated.

Results:

Year	2001-2	2002-3	2003-4	2005-6
Dural puncture rate (%)	1.1	1.0	1.15	2.8
Epi. blood patch (%)	0.35	0.6	0.8	0.9
Epidurals before obs module (n)	n/k	n/k	100 (10-250)	20 (0-30)
Epidurals 3/12 obs module (n)	n/k	n/k	30 (20-40)	15 (10-30)
Working hours per week	72	72	58	56

Data are n, percent or median (range)

In addition, data from 2005-6 show that, following dural tap, the incidence of headache is 40% if a spinal catheter is inserted, compared to 83% when the epidural catheter is re-sited at another level.

Discussion: We have witnessed an alarming rise in our dural puncture rate during the last year, which at 2.8% greatly exceeds the accepted standard for best practice of <1%.² This has happened at a time when there has been increased consultant presence on the labour ward. Following the introduction of shift-style work patterns and reduced working hours, trainees perform fewer epidurals during training modules and therefore take longer to gain the required skills. We observed a reduction in our incidence of headache if a spinal catheter is inserted at the time of dural puncture.

Conclusion: We need to focus on new methods of training in epidural insertion techniques if this current trend is to return to an acceptable level again.

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2. Royal College of Anaesthetists. Raising the standard: a compendium of audit recipes (second edition 2006); *Obstetric services* 8.12: 174-5.

P09 Past history of PDPH and spinal anaesthesia

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Introduction: Concerns have been raised over whether a past history of post dural puncture headache (PDPH) increases the risk of PDPH after single-shot spinal anaesthesia with a 25-gauge pencil-point needle.¹ We report our experience of six such patients who underwent caesarean section under spinal anaesthesia. All spinals were performed easily with a 25-gauge pencil-point needle.

Case 1: A 34-year-old gave a history of severe PDPH for 3 weeks following lumbar puncture six years ago. She again developed a severe PDPH. She was offered, but declined, a blood patch. Her symptoms resolved after 3 weeks with simple analgesics.

Case 2: A 29-year-old had had epidural analgesia for labour two years previously, that was complicated by a recognised dural tap. She developed a PDPH and was treated with a blood patch. She again developed a PDPH that was also treated with a blood patch.

Case 3: A 27-year-old had had epidural analgesia 4 years previously for labour, that was complicated by an unrecognised dural tap and a severe PDPH for 16 days before resolving spontaneously. She again developed a mild PDPH. Her symptoms resolved after a week with simple analgesic

Case 4: A 31-year-old gave a history of severe PDPH for 4 weeks following lumbar puncture 4 years previously. She again developed symptoms of moderate PDPH that resolved after 2 weeks with simple analgesic.

Case 5: A 29-year-old had had epidural analgesia for labour 4 years previously, that was complicated by a recognised dural tap. She developed a PDPH and was treated with a blood patch. She again developed a mild PDPH. Her symptoms resolved after a week.

Case 6: A 27-year-old had had epidural analgesia for labour 2 years previously, complicated by an unrecognised dural tap and a severe PDPH for a period of 4 months before resolving spontaneously. She again developed a moderate PDPH. Her symptoms resolved after a week with simple analgesics.

Discussion: Our incidence of PDPH with a 25-gauge needle is 0.33% (8/2400). Patients with a history of PDPH may be at greater risk because of adhesions between arachnoid and dura following an inflammatory response. Any further puncture of this dura increases the risk of CSF leak because the hole in the dura is aligned to a hole in the arachnoid.²

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P10 Subarachnoid haemorrhage following dural puncture: case report

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Introduction: Intracranial haemorrhage is an important cause of maternal morbidity and mortality and it is important to consider it in the differential diagnosis of post dural puncture headache.

Case report: A previously fit and well 18-year-old primigravida presented in labour and requested epidural analgesia. Following two unsuccessful attempts at siting an epidural, the dura was punctured. Several further unsuccessful attempts were made before a normal delivery.

The patient was followed up for 36 h in which period her only symptom was neck stiffness controlled with simple analgesia. She was discharged home with midwifery support.

Nine hours later she was readmitted with sudden onset pain in her jaw radiating to her neck and increased neck stiffness. She then developed a severe throbbing frontal headache and vomited once. She remained afebrile with a normal white count. On further examination her Glasgow coma scale (GCS) was 15 with no neurological signs. She was admitted overnight and given regular analgesia. Next morning she became unrousable with a GCS of 7 and small sluggishly reacting pupils. She was intubated and transferred to ITU. A CT scan demonstrated an extensive subarachnoid haemorrhage, marked ventricular dilatation and hydrocephalus. Her clotting studies were normal. She was transferred to the regional neurosurgical unit where an intraventricular drain was sited. A CT angiogram was performed which did not reveal an aneurysm. Transcranial Dopplers demonstrated mild/moderate vasospasm.

Following insertion of the intraventricular drain, her GCS improved rapidly and she was extubated. Two repeat angiograms were performed neither of which revealed an aneurysm. The patient was discharged several weeks later with no residual neurological deficit.

Discussion: Intracranial haemorrhage following dural puncture is very rare,¹ and far less common than subdural haematoma, but must be considered in any differential of dural puncture headache. Investigation and treatment must be initiated early if there is any clinical suspicion, to maximise neurological recovery.

Reference

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P11 Paraparesis following spinal anaesthesia for elective caesarean section: a case report

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Introduction: We present a case of paraparesis associated with acute cauda-equina syndrome following haemorrhage in a previously undiagnosed lumbar endypomoma after spinal anaesthesia, a rare condition.¹

Case history: A 26-year-old woman with an uneventful twin pregnancy and a medical history of lower back pain without any neurological symptoms (using co-codamol p.r.n.) and normal platelet counts preoperatively, presented for elective caesarean section. After multiple failed attempts at L3/4, a spinal block was successfully achieved at L4/5, using hyperbaric bupivacaine and fentanyl. On day 3 the patient started complaining of lower back pain, which required supplemental morphine. On day 4 the pain suddenly worsened and an orthopaedic opinion was sought. Altered sensations on the right lower limb and retention of urine were noted, with a differential diagnosis of lumbar disc disease or spinal haematoma. MRI scan was suggested if further neurological deterioration occurred. The patient was still in severe pain on day 6, and for the first time urinary incontinence, loss of anal sphincter tone and absence of deep tendon reflexes on the right side were discovered. Cauda equina syndrome was diagnosed. As no emergency scanning facilities were available, the MRI scan was done next day and reported as epidural haematoma extending from L1-L4 with a small extension at S2. A decompression laminectomy was performed but no epidural haematoma was found. There was no improvement in the severity of pain and neurological deficit post-op. On day 9 as the patient was still in severe pain a repeat MRI scan was performed. The neurosurgeon diagnosed a spinal tumour and operated for lumbar endypomoma the next day, which resulted in improved motor and sensory function, although residual atonic bladder and bowel dysfunction persisted.

Conclusion: Intradural tumours of the cauda equina and conal region, being highly vascular, are prone to iatrogenic haemorrhage. Thus in patients presenting with neurological symptoms preoperatively, both spinal and epidural anaesthesia should be avoided unless a mass has been excluded radiologically. The severity of neurological complications can be reduced by having a high index of suspicion and lowering the threshold for radiological investigation and intervention through setting up of a departmental guideline.

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P12 Monitoring of mother and fetus before and during regional analgesia: comparison of three different UK teaching hospitals

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Introduction: Maternal and fetal monitoring during labour epidural analgesia is essential as hypotension could result in maternal and fetal compromise. This audit examines to what extent the Royal College of Anaesthetist guidelines¹ were followed in three different teaching hospital in UK.

Methods: The records of 140 mothers were audited and the monitoring methods recorded as in the table. Other aspects audited included the presence of anaesthetist or trained midwife near the patient, whether the blood pressure was monitored every 5 min for 20 min for every top-up and whether bladder function was noted.

	Wales	London	Yorkshire
<i>Maternal parameters:</i>			
30 min before epidural			
Blood pressure	85%	88%	100%
Heart rate	80%	66%	100%
After epidural until delivery			
Blood pressure	100%	100%	100%
Heart rate	100%	100%	100%
Blood pressure monitored according to Royal college/local policy	0%	46%	99%
Documentation of urinary retention	2.5%	8%	18%
<i>Fetal parameters:</i>			
Doppler	12.5%	6%	28%
CTG/STAN	87.5%	94%	72%

Results: All mothers had either a trained midwife or an anaesthetists nearby until delivery of the baby. While bladder documentation in all the three hospitals was inadequate, regular bladder emptying appeared to be part of policy in all three hospital. All the mothers were monitored with Doppler or CTG before and during epidural analgesia.

Conclusion: This audit emphasises that there is a need to improve monitoring and documentation of bladder care.²

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P13 Fetal ST analysis in labour: implications for anaesthetic management

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Introduction: Where there are cardiographic (CTG) changes, ST waveform analysis provides detailed information about the severity of the stress and the STAN® clinical guidelines provide recommendations for clinical action.

Aim: To identify the incidence of emergency caesarean section and mode of anaesthesia when STAN® monitoring is used.

Methods: Prospective data collection of mode of delivery and anaesthesia from November 2005 to December 2006.

Results:

	STAN used	STAN not used
Total labourers	153 (4%)	3288 (96%)
Emergency caesarean section		
under spinal	16/66 (24.2%)	300/570 (52.6%)
under epidural	41/66 (62.1%)	167/570 (29.3%)
under GA	9/66 (13.6%)	103/570 (18.1%)

In the STAN group, 4/9 general anaesthetics (GA) were required despite an epidural catheter in situ: three for failed epidural top-ups (8/103 in non STAN group). Although small numbers, a higher proportion of STAN mothers required immediate delivery under GA (5/153, 3.3% versus 62/3288, 1.9%).

Conclusion: The incidence of emergency caesarean section in the STAN group was 43.1% compared to 17.3% in the remainder. Consequently STAN mothers had a 5.9% versus 3.1% chance of GA despite a lower GA rate for emergency caesarean section. The decision to use STAN monitoring also identifies mothers at increased risk of immediate delivery under GA. Improving our epidural anaesthesia could reduce the number of GAs required and their associated risks.

Recommendation: The anaesthetist should be informed when STAN monitoring is instituted in suspected fetal distress to aid early anaesthetic assessment and informed consent.

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P14 Fetal heart rate monitoring following spinal anesthesia is important for anesthetic management before cesarean section

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Introduction: In our hospital we routinely monitor fetal heart rate (FHR) during the placement of spinal anesthesia for all patients undergoing emergency or non-emergency cesarean section. The aim of our study was to determine the frequency and significance of FHR decelerations without persistent maternal hypotension during this monitoring period.

Method: After institutional review board approval we reviewed the charts of 521 women from January 2005 to December 2006 with term singleton pregnancy for emergency or non-emergency cesarean section. All received combined spinal-epidural anesthesia in the lateral position using intrathecal 0.5% isobaric bupivacaine or 2% isobaric lidocaine with preservative-free morphine. External FHR monitoring was performed using MT320 (TOITU, Tokyo) and non-invasive maternal arm blood pressure was monitored by BP-508 (COLIN, Komaki) every 2 min. FHR monitoring continued until just before surgical preparation. All patients received intravenous fluid during spinal placement. When the maternal systolic pressure decreased to <100 mmHg, standard maneuvers of rapid i.v. crystalloid administration, supplemental maternal oxygen administration and immediate i.v. bolus of ephedrine were carried out. We defined persistent maternal hypotension as maternal blood pressure less than 80 mmHg lasting for 5 min and FHR deceleration as <100 beats/min.

Results: FHR deceleration occurred in 9 cases (1.7%) without persistent maternal hypotension. In 8 of these 9 cases, concurrent uterine contraction was confirmed. One case was a low-birth-weight infant. Newborn scores were all normal.

Conclusion: FHR deceleration can occur without persistent maternal hypotension following spinal anesthesia for cesarean section. Uterine contraction secondary to spinal anesthesia, maternal anxiety and intrathecal opioid use may contribute to sudden changes in FHR. Our study supports the clinical practice of FHR monitoring during cesarean section, as maternal arm blood pressure is not a sufficient index of fetal well-being.

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P15 Audit of intrauterine fetal resuscitation before caesarean section for fetal compromise

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Introduction: Intrauterine fetal resuscitation (IUF) measures can improve oxygen delivery to a compromised fetus and may reverse hypoxia and acidosis.¹ In cases of emergency caesarean section for fetal distress, the application of IUF measures may allow extra time for anaesthetic preparation, a lower rate of general anaesthesia (GA) and improved neonatal condition.

Method: Consecutive caesarean sections for fetal distress performed over a three-month period (Feb-Apr 2006) were audited. Local IUF guidelines require lateral maternal position, oxygen therapy, i.v. fluid bolus and tocolysis. The anaesthetist documented details of the measures in use when first meeting the patient after the decision for caesarean section had been made, anaesthetic type, urgency category and Apgar scores.

Results: 90 caesarean sections for fetal compromise were performed in the three-month period.

	Cat 1	Cat 2	Total
	25 (%)	65 (%)	90 (%)
Lateral position	18 (72)	39 (60)	57 (64)
Oxygen	22 (88)	26 (40)	48 (52)
Fluid bolus	22 (88)	62 (95)	84 (94)
Tocolysis	15 (60)	24 (37)	39 (44)
All four measures	10 (40)	8 (12)	18 (20)
GA	3 (12)	3 (5)	6 (7)

Babies whose mothers had GA were significantly more likely to have low Apgar scores at 1 and 5 min. ($P=0.025$, $P=0.034$; Fisher's exact test)

Conclusions: Basic IUF manoeuvres are not being rigorously applied in our unit despite having guidelines in place. Our finding that low Apgar scores occur more frequently with GA than regional anaesthesia concurs with previous data.² Our GA rate compares favourably with the national rate of 65% (Category 1) and 13% (Category 2).³

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P16 Prospective randomised study of external cephalic version for breech presentation at term in nulliparous women: spinal analgesia versus no analgesia

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Introduction: Breech presenting fetuses are delivered by caesarean section. Among nulliparae the success rate of external cephalic version (ECV) is only 30%.¹ Spinal analgesia may increase the ECV success rate.² The study aim was to compare ECV with and without spinal analgesia in a nulliparous population.

Methods: Prospective randomised controlled ethically approved study performed in a tertiary referral centre. Nulliparous term women requesting ECV for breech presentation received spinal analgesia (bupivacaine 7.5 mg) or no analgesia before ECV. Inclusion of 35 women per group would detect a 10% difference in ECV success rate with an 80% power and two-sided 5% significance level. Primary outcome was successful conversion to vertex presentation.

Results: Seventy-four women were enrolled and seventy analysed (36 spinal, 34 no analgesia). The groups were similar for gestational age, amniotic fluid index and maternal weight ($P=0.821$, 0.229 and 0.991 respectively). ECV was successful among 24/36 women with spinal analgesia (66.7%) versus 11/34 (32.4%) without ($P=0.004$). ECV with spinal analgesia was less painful (visual analogue scores (0-10) 1.76 ± 2.74 versus 6.84 ± 3.08 without, $P<0.0001$). There were no cases of placental abruption or fetal distress.

Conclusion: Spinal analgesia significantly increases the success rate of ECV in nulliparae allowing a normal vaginal delivery to be achieved.

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P17 Four-year prospective audits (2003-2006) of general anaesthesia and conversion of regional to general anaesthesia for caesarean section

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Introduction: Anaesthetic-related maternal deaths have largely been attributed to general anaesthesia (GA). Since the mid-1980s anaesthetic-related mortality has improved, mainly from increased use of regional anaesthesia (RA). A six-year (1997-2002) retrospective audit in our unit showed a 9.4% conversion rate to GA for emergency caesarean sections. The recommended standards¹ for conversion are <1% for elective and <3% for emergency cases (Grades 1-3). To improve our conversion rate we undertook a prospective audit for all caesarean sections requiring GA (2003-2006).

Method: Data collected: grade/reason for caesarean section, details of in-situ epidurals (insertion level, catheter length in space, function in labour), anaesthesia given (technique, details of top-up drugs, was the top-up started in room/theatre), block height and testing modality, time of GA and whether given before/after delivery. The last two items included data on fetal resuscitation measures when appropriate (use of tilt, oxygen, fluids, terbutaline).

Results: For the audit periods a total of 1722 caesarean sections were carried out. Of these 1147 were grades 1/2 (66.6%), 1531 under RA (88.9%): 886 spinals (51.5%), 34 epidurals (2%), 101 CSEs (5.9%), 510 labour epidural top-ups (29.6%), 134 GA (7.8%) and 57 RA to GA conversions (3.3%).

		2003	2004	2005	2006
RA %	Elective	93.9	94.7	96.9	98.5
	Emergency	82.4	84.1	87.9	88.3
RA to GA %	Elective	0.0	1.6	2.5	0.0
	Emergency	7.7	5.3	3.6	2.9

The reasons for conversion included: inadequate catheter length in epidural space, known poorly functioning labour epidural which was not re-sited, inadequate local anaesthetic top-up dose/time for onset/block testing, and not using an opioid with the local anaesthetic. These issues were highlighted with each audit presentation. Fetal resuscitation measures were either poorly recorded or not performed for grade 1 caesarean section.

Conclusion: The RA rates in our unit meet the recommended standards of >95% for elective and >85% for emergency cases.¹ Conversion rates to GA in emergency cases have improved and are close to the standards of <1% for elective and <3% for emergency cases. Fetal resuscitation appears to be inadequate and may reduce the time available for RA in difficult cases.

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P18 Types of anaesthesia for grade 1 and 2 caesarean sections in 2006

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Introduction: In the UK the anaesthetic-related maternal death rate has improved. This has been sustained since the 1985-1987 triennium, running at <5 per 1 000 000 maternities. The improvement is largely due to increased use of regional anaesthesia (RA). The recommended standards¹ for the type of anaesthesia for emergency caesarean section are >85% under RA, and <3% conversion of RA to general anaesthesia (GA). For the standards "emergency" combines grades 1-3, although the situations covered by each grade are fairly diverse. We audited how closely our department conforms to these standards for grade 1 ('immediate threat to the life of the woman or fetus') and grade 2 ('maternal or fetal compromise that is not immediately life-threatening').

Method: Data were collected from the obstetric anaesthesia database and an ongoing audit of the reasons for GA in caesarean section.

Results: In 2006, there were 565 caesarean sections.

Grade	1		2	
Of total CS	114	20.2%	238	42.1%
RA	77	67.5%	226	95%
GA	32	28.1%	4	1.7%
RA to GA	5	4.4%	8	3.4%

Indications for GA included: acute fetal compromise, maternal haemorrhage/sepsis, failed ventouse and failed RA (pain/technical). Four grade 1 conversions to GA were inadequate epidural top-ups and one a failed spinal. There were four inadequate epidural top-ups, three failed spinals and one failure of both methods in the grade 2 cases.

Discussion: The results show a marked difference between the two grades with respect to the recommended audit standards. This may be because the standard is not specific for grade 1 cases, and perhaps a new appropriate standard needs to be defined. A decision-to-delivery interval of <30 min is recommended as an audit standard by NICE, although they acknowledge that there is limited research to support this time.² However, the clinical negligence scheme for trusts uses this 'target' as part of the criteria for the coverage of maternity services. Inadvertent pressure in order to meet this 'target' may lead to the administration of unnecessary GA. It might be better to concentrate on optimising fetal and maternal well-being rather than on a specific time limit.

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P19 Emergency caesarean section under general anaesthesia: can it be avoided?

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Introduction: General anaesthesia (GA) for caesarean section is associated with increased maternal risk.¹ The RCOG² suggests a decision-to-delivery time for category 1 caesarean section (threat to life of mother or fetus) of <30min and a GA may be the appropriate anaesthetic. We reviewed our category 1 GAs to establish if the requests were appropriate and if earlier involvement of the anaesthetist was possible.

Method: From our anaesthetic maternity database March to October 2006, 40 patients had GA purely for category 1 caesarean section. All 40 notes were reviewed and 20 were complete enough to perform a comprehensive analysis. These 20 cases were anonymised and the cardiocotographs (CTGs), patient history, intrapartum progress and seniority of the attending obstetrician, but not the neonatal outcomes data, were given to two or more consultant obstetricians to independently suggest their management plan. Clinical incident forms reporting poor neonatal outcome from the same time period were also reviewed.

Results: In the opinion of the consultant obstetricians 4/20 cases required GA, which was reflected in the lowest cord pH values in 3/4 of the entire group. In these four cases the CTG abnormalities had occurred rapidly and the anaesthetist had been called and attended appropriately; 6/20 cases were felt not to require operative intervention at all and the remaining 10 could have safely received a rapid regional technique. The consultant obstetricians, on review of the neonatal data, verified their decisions. The majority, 16/20 occurred out of hours. 17/20 requests for GA were made by year 4/5 SpR, one by a year 1/3 SpR and two by consultants. The two GA decisions made by consultants were upheld during review. There were no poor neonatal outcomes during this time attributed to regional anaesthesia.

Conclusion: The majority of GAs were inappropriate and out of hours. GA is a relatively rare event and because of increased day-time cover by consultant obstetric and anaesthetic staff in our unit, are now almost entirely given out of hours and by unsupervised anaesthetic trainees. These findings have major anaesthetic training implications.

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P20 Fasting in elective caesarean section

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Introduction: Prolonged pre-operative fasting aims to reduce the volume and acidity of the stomach contents in order to minimise the risk of regurgitation and aspiration of gastric contents during surgery. Recent developments have encouraged a more liberal preoperative fluid regimen. Shorter period of fluid fasting reduce postoperative nausea and vomiting.^{1,2} Carbohydrate administration prevents the catabolic response to fasting, so patients experience less hunger, thirst and anxiety.³ In 2002 an audit in our unit of 32 women having elective caesarean sections showed a majority (approximately a third) fasting since midnight, and none from 2-4 h. Following that, new guidelines were issued encouraging women to abstain from drinking for only 2 h pre-operatively. This audit was conducted to assess how effective the new guidelines were in encouraging parturients to do so.

Method: 35 patients were recruited. Audit forms inquiring about time of last 'proper' drink (more than half a glass) and time at which anaesthesia started, were completed by the attending anaesthetist. The data were collected, analysed and compared to the previous audit. The data were subdivided in two-hourly intervals starting from 2 h to >12 h.

Results: Time of last 'proper' drink

Hours	2002	2006
0-2	0	0
2-4	0	7
4-6	2	4
6-8	2	3
8-10	9	1
10-12	9	6
>12	10	14
TOTAL	32	35

Conclusion: 20% of our women have a drink less than 4 h before elective caesarean section. More than half still fast more than 10 h. More education is needed to encourage our women to have a drink of clear fluid on the morning of surgery.

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P21 General anaesthesia for caesarean section: are intubation problems on the increase?

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Introduction: General anaesthesia (GA) is associated with increased maternal morbidity and mortality.¹ The most recent CEMACH report suggests an increased number of direct anaesthetic deaths, all associated with GA and most related to airway and intubation problems.² Concerns have been raised before about the effect of decreasing experience and training on this life-threatening complication of general anaesthesia. We therefore aimed to establish the GA rates for elective and emergency caesarean section, the indications for GA, conversion rates from regional anaesthesia (RA) to GA and complication rates for GA, particularly relating to intubation.

Methods: All patients who had caesarean sections under GA in 2005 were identified. Notes were requested and data collected. Rates were compared with RCOA standards.³

Results: 1097 caesarean sections were performed in 2005 (45% elective, 55% emergency); 92 (8.4%) were under GA.

	Our rate	RCOA
GA for elective CS	1.8%	<5%
GA for emergency CS	13.8%	<15%
Elective conversion rate	0.8%	<1%
Emergency conversion rate	4.6%	<3%
Difficult intubation rate	1:15	1:30
Failed intubation rate	1:46	1:250

The overall failure rate for spinal anaesthesia was 1.5% and for epidural anaesthesia 3.1%.

Conclusions: This audit has highlighted two areas of concern currently being addressed in our unit: a high conversion rate for emergency caesarean section and a high difficult and failed intubation rate. We could find no definite reason for the high conversion rate although 6/29 patients were morbidly obese. Both failed intubations occurred out of hours in high-risk patients where GA was considered the only option, and were attended by consultants of considerable experience. We suggest that success in achieving minimal rates of GA for elective caesarean section contributes towards decreased training and experience in managing intubation problems across all grades of anaesthetists. We speculate also that selection bias in the GA group with an increasingly obese obstetric population may contribute towards difficulties with intubation.

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P22 Failed intubation: the tip of the iceberg

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Introduction: The fundamental principal of obstetric anaesthesia remains: avoid a general anaesthetic whenever possible, because of the well recognised associated morbidity and mortality.

Aim: To identify the number of intubations in obstetric patients associated with difficulties.

Methods: Data sources include routinely collected data from the Hospital Information System (HIS) and routine prospective audit data collected at the time of anaesthesia, from 1998 to 2006. Details of failed intubations were also recorded. Intubations could be described as easy, difficult (repeated attempts grade II or higher laryngoscopy view) or failed.

Results: During this time period 814 general anaesthetics were given. There were four failed intubations all of which were for fetal distress and all mothers were woken up. In one case a consultant anaesthetist was present at induction. Two proceeded to spinal anaesthesia uneventfully. One was re-anaesthetised with a consultant anaesthetist present. There were no adverse outcomes for these babies. The 4th had vaginal bleeding and hypotension associated with profound fetal distress. The baby died and emergency caesarean section was carried out under general anaesthesia following awake fibre-optic intubation. Vasa praevia was diagnosed as the cause of fetal distress and death.

There were 442/814 completed audit forms recording degree of difficulty at successful intubation. Difficult intubation was recorded in 21/442. In 5/21, a consultant anaesthetist was present at induction.

No mother suffered complications from the failed or difficult intubation.

Conclusion: Although failed intubation was low at 4/814 (0.5%), a further 21 mothers in this series were at risk of severe hypoxia and/or aspiration at general anaesthesia for caesarean section. Immediate management, most often before help arrives, is the key to successful outcome, emphasising the need to train junior anaesthetists in difficult airway management and rehearse failed intubation drills.

P23 Spinal, single-shot epidural or general anaesthesia for caesarean delivery

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Introduction: Regional anaesthesia is widely considered the technique of choice for caesarean section,¹ but general anaesthesia is also the choice of many anaesthetists. In this study, we compare spinal, epidural and general anaesthesia. The study was performed in two clinics in different counties.

Method: After local ethics committee approval and written informed consent, we included 120 pregnant women, in at ≥ 36 weeks of gestation with a singleton fetus, ASA I-II, age 18-40 years old, who were to undergo elective caesarean section. All women were premedicated with i.v. ranitidine 50 mg and metoclopramide 10 mg. They were divided in three groups, 40 patients for each group. Group I (spinal anaesthesia: SP) with bupivacaine and fentanyl, group II (epidural anaesthesia: EP) with bupivacaine and morphine and group III (general anaesthesia: GA) with continuous infusion of propofol and remifentanyl. The time from the start of anaesthesia to surgical incision, episodes of hypotension, ephedrine consumption, intraoperative discomfort at delivery, nausea and vomiting, Apgar score and postoperative pain were measured.

Results: Women in the SP group had more hypotensive episodes than in the EP or GA groups (78% vs 53% vs 34%; $P < 0.05$) and more ephedrine consumption than the EP group with a large individual variability (30.1 ± 20.4 mg vs 15.23 ± 13.8 mg; $P < 0.01$), without any difference in the Apgar score between the three groups. The SP group required less onset time (10.5 ± 6.7 min. vs 35.9 ± 17.3 min; $P < 0.01$) and had less intraoperative discomfort. Fewer needed supplementation with analgesic and sedative drugs (7.7% vs 32% vs 72%; $P < 0.05$); or vomited (3% vs 22% the GA group ($P < 0.05$)).

Conclusion: With the described pharmacological and technical approach, spinal anaesthesia was more suitable than single-shot epidural technique or general anaesthesia for caesarean section.

Reference

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P24 Effects of gender and pregnancy on ED50 for motor block with intrathecal bupivacaine

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Introduction: It is commonly believed that pregnancy enhances the sensitivity of nerves to local anaesthetics and decreases anaesthetic requirements during regional anaesthesia¹ but this has been not confirmed by recent findings.² We investigated whether pregnancy and gender might affect the requirement for spinal bupivacaine, by determining the intrathecal ED50 for motor block using up-down sequential allocation.

Method: After ethical approval and informed consent, we enrolled 90 healthy patients less than 40 years old, divided in three groups of 30 subjects each: male and female patients undergoing elective lower limb surgery and parturients undergoing elective caesarean section. We used the spinal component of the CSE technique to perform the study and thereafter the epidural catheter to establish surgical anaesthesia. The initial dose of bupivacaine was 4 mg and the testing interval was 1 mg. Subsequent doses were determined by the outcome in the previous patient using up-down sequential allocation. Efficacy was determined by the occurrence of any motor block in either lower limb (modified Bromage and hip motor function scale) within 5 min after the spinal injection. Median effective doses were estimated using probit regression.

Results: There were significant ($P=0.001$) differences in ED50 values for motor block (Table).

	ED50/Ratio	95%CI	P value
Male (mg)	7.4	6.2-8.8	
Female (mg)	5.1	4.3-6.1	
Pregnant (mg)	3.4	2.8-4.0	
Male:Female	1.45	1.13-1.86	0.011
Female:Pregnant	1.52	1.18-1.95	0.011
Male:Pregnant	2.20	1.71-2.94	<0.01

Conclusions: The intrathecal bupivacaine ED50 for motor block was significantly reduced in term pregnant women and was greater in males than in females. This study confirms that local anaesthetic requirements differ in pregnancy.

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P25 Training declines in obstetric general anaesthesia

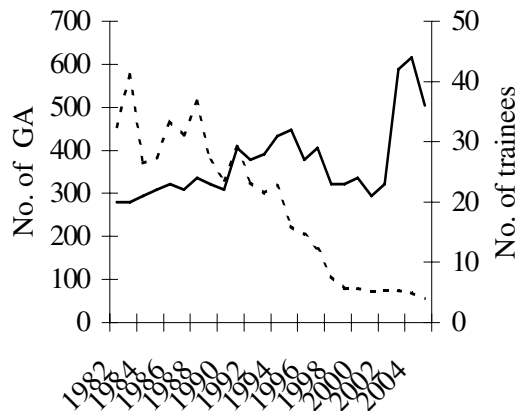
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Introduction: We aimed to update previously published data on training in obstetric general anaesthesia between 1982 and 1998 because of an impression that training opportunities have worsened following the implementation of the 'New Deal' in 2000 and the European Working Time Directive in 2004.¹

Methods: Data were collated retrospectively from prospective audit completed at St James's University Hospital, Leeds between 1982 and 2005. Data collected included total number and timing of general anaesthetics given per year, grade of anaesthetist giving the anaesthetic and number of trainee anaesthetists on the obstetric unit.

Results: The number of trainees in obstetric anaesthesia compared with the annual number of general anaesthetics is shown by year in figure 1.



----- No. of GA ——— No. of trainees

The number of general anaesthetics fell from 108 in 1998 to 55 in 2005. The number of trainees increased from 23 in 1998 to 36 in 2005. In 1998 the mean number of obstetric general anaesthetics given per trainee was four. In 2005 this had fallen to one per trainee. The number of training opportunities in obstetric general anaesthesia had also fallen. In 1998 the average number of general anaesthetics per trainee occurring between 08:00 and 18:00 on week days (when consultant obstetric anaesthetists were available) was 1.5. This fell to 0.3 in 2005.

Conclusion: Since 1998 training opportunities in general anaesthesia for caesarean section have continued to decline.

Reference

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P26 A comparison of different solutions for volume preloading: prevention of hypotension during epidural anaesthesia for caesarean section

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Introduction: Effective prevention of hypotension during epidural anaesthesia may significantly reduce maternal and neonatal morbidity and mortality.¹ The aim of this study was to compare the effect of colloid and crystalloid solutions on maternal haemodynamics and neonatal outcome after epidural anaesthesia.

Method: After local ethics committee approval, 86 healthy term women awaiting elective caesarean section under epidural anaesthesia were recruited for this randomised double-blind study. All patients were randomly allocated to receive either a combination of saline 300 mL with modified gelatin solution 500 mL (Gelofusine®, B.Braun) or the same volume of pure saline solution. We compared blood pressure dynamics in each group. Epidural anaesthesia was managed identically in the two groups by anaesthesiologists who were unaware of the type of fluid administered. Anaesthesia was induced at L1-2 interspace using an 18-gauge needle. After a 20-mL epidural injection of 0.75% ropivacaine (Naropine® Astra Zeneka) the blood pressure was measured at 1-min intervals. Neonatal outcome was assessed using Apgar score. Cardiotocography was regularly performed until the start of surgery. Student's t test was used for statistical analysis. $P < 0.04$ was considered significant.

Results: Neonatal outcome was good and similar in the two groups. Statistical analysis showed no significant difference between groups in arterial pressure recorded before anaesthesia (stage I), 20 min after epidural injection (stage II) and after the end of surgery (stage III). The results are presented in the table.

Stage	Group	SP (mmHg)	DP (mmHg)	MAP (mmHg)
I	colloid	124,2±1,9	77,7±1,8	92,8±1,8
	crystalloid	125,2±1,5	76,5±1,7	92,4±1,6
II	colloid	102,8±2,3	56,4±2,7	71,2±2,5
	crystalloid	102,3±2,7	53,7±2,8	70,6±2,6
III	colloid	109,5±1,3	65,4±1,7	79,5±1,5
	crystalloid	108,7±1,7	63,5±1,7	78,3±1,4

SP – systolic pressure, DP – diastolic pressure, MAP – mean arterial pressure.

Conclusion: The type of fluid used for pre-infusion does not affect the dynamics of maternal arterial pressure. The infusion of saline solution can be considered to be a reasonable choice for preload during epidural anaesthesia for caesarean section.

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P27 A survey of pre-loading and vasopressor use during regional anaesthesia for caesarean section

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Introduction: Hypotension during caesarean section under regional anaesthesia has traditionally been managed by measures such as fluid pre-loading, positioning of the patient and the use of vasopressors. A survey conducted in 1999 showed that 95% of UK consultants used ephedrine as the sole vasoconstrictor.¹ Recent data support the use of α agonists to maintain maternal blood pressure, which reduces the incidence and severity of fetal acidosis compared to ephedrine.² The aim of this survey was to ascertain whether there has been a change in UK clinical practice with regard to the use of vasopressors during regional anaesthesia for caesarean section.

Methods: After approval by the Obstetric Anaesthetists' Association, 1162 questionnaires were mailed to consultant members in the UK. A stamped addressed envelope was included. The survey contained questions relating to the clinicians' usual practice regarding vasopressor use and fluid pre-loading for a straightforward caesarean section under regional anaesthesia. Mode and timing of vasopressor administration and the method by which the vasopressor is titrated to blood pressure were also recorded.

Results: 872 completed forms were returned (75% response rate). Fluid pre-loading is used by 76% of responders, almost exclusively with crystalloid (97%). As a first line vasopressor 51% use phenylephrine, 42% use ephedrine and 6% use metaraminol. Ephedrine is the only vasopressor used by 9% of responders. Vasopressors are administered via bolus by 54% and as infusions by 46% of responders. Of the latter, vasopressor is added to i.v fluids by 71% versus a dedicated line by 29%. Vasopressors are started prophylactically by 47% of responders. Opinions are divided regarding which preoperative blood pressure to use as baseline and at what percentage of this baseline the blood pressure should be maintained.

Conclusion: There has been a change in practice since 1999 with a large increase in use of α agonists. Fluid pre-loading practice remains similar. Vasopressor infusions are increasingly popular but regimes vary markedly. Consensus is lacking regarding the titration of vasopressor to blood pressure.

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P28 Caesarean section for placenta praevia: are we practising evidence-based medicine?

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Introduction: Traditionally, patients with placenta praevia undergoing caesarean section have been managed with general anaesthesia. Regional techniques were thought to carry the risk of intraoperative conversion to general anaesthesia due to lengthy surgery, as well as symptomatic hypotension secondary to haemorrhage. However, recent evidence¹⁻³ has demonstrated a very low conversion rate to general anaesthesia and a reduction in blood loss with regional techniques. Indeed NICE guidelines⁴ suggest that regional anaesthesia should be the preferred technique. The purpose of this audit was to determine the 5-year trend in anaesthetic management of caesarean section for placenta praevia in our unit and identify the mean length of surgery, the conversion rate from regional to general anaesthesia, and any significant difference in blood loss between the two techniques.

Methods: We searched our unit's obstetric database for women with a diagnosis of placenta praevia who underwent caesarean section between 01/01/00 and 31/12/04. This generated 118 cases, of which 22 were not traceable, four were miscoded, three had insufficient information, and two had been transferred from another hospital postoperatively. A total of 87 patient notes were therefore reviewed.

Results: A trend of increasing use of regional anaesthesia over the 5-year period was demonstrated.

Year	2000	2001	2002	2003	2004
Regional (%)	13	29.5	37.5	59	68

There were no conversions to general anaesthesia. The mean length of surgery was 48 min (range 30-90). The mean blood loss was 697 mL (regional) and 956 mL (general). A χ^2 test revealed this difference to be insignificant.

Conclusions: In our series, even the longest recorded surgical time of 90 min is still acceptable for regional anaesthesia. The trend in reduced blood loss in the regional group might have been significant with a larger sample size. This audit shows increased use of regional anaesthesia amongst anaesthetists in our unit and concurs with existing evidence¹⁻³ that it should be the preferred technique for caesarean section in patients with placenta praevia.

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P29 Haemodynamic changes associated with spinal anaesthesia for caesarean section in severe preeclampsia

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Introduction: Most previous studies have used heart rate (HR) and blood pressure as surrogate markers of cardiac output (CO) changes during spinal anaesthesia for caesarean section in severe preeclampsia (PE). This study used a continuous, beat-by-beat monitor of CO in order to characterise the response to SA in this high-risk group of patients.

Methods: Ten patients with severe PE scheduled for urgent caesarean section under spinal anaesthesia consented to an observational study. Haemodynamic measurements consisted of HR, continuous mean arterial blood pressure (MAP), stroke volume (SV) and CO, obtained using a calibrated LiDCO plus™ monitor.¹ Systemic vascular resistance (SVR) was derived. Absolute changes in cardiac output in response to spinal anaesthesia and to phenylephrine, administered in response to target blood pressure changes, were recorded. The response to delivery and to i.v. oxytocin 2.5 units administered over 30 s, and haemodynamics at recovery from spinal anaesthesia, were also documented. Data were analysed using ANOVA for repeated measures with LSD post-hoc testing.

Results: Haemodynamic values were averaged for defined time intervals (TI): baseline measurements (1), sitting (2), spinal (3), supine (4), left lateral tilt (5), skin incision (6), uterine incision (7), delivery (8), peak oxytocin effect (9), end of surgery (10) and recovery from spinal anaesthesia (11). CO at (9) differed significantly from that at other TIs. MAP and SVR from (5)-(10) were significantly lower than at other TIs. HR was higher at (3), (4) and (9). At (9) CO and HR were higher, and SVR lower than at all other TIs. Six patients received phenylephrine, of whom four required one dose (50 µg) antepartum, and four received 50-150 µg postpartum. Phenylephrine 50-100 µg boluses restored MAP to target values, and did not significantly change CO. At recovery, no haemodynamic parameters differed significantly from baseline values.

Conclusion: Ten patients with severe PE receiving spinal anaesthesia for caesarean section were haemodynamically stable. Phenylephrine restored MAP, but did not increase CO. Oxytocin caused transient marked hypotension, a decrease in SVR, an increase in HR, and an increase in CO. SV was well maintained at recovery.

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P30 Successful use of recombinant factor VIIa in the treatment of life-threatening postpartum haemorrhage in a Jehovah's Witness patient

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Introduction: Postpartum haemorrhage (PPH) is a major cause of maternal and fetal morbidity and mortality. In addition, Jehovah's Witnesses (JW) are at a 44-fold increased risk of maternal death as a result of obstetric haemorrhage.¹ Several case reports now document the use of recombinant factor VIIa (rVIIa) in severe PPH where conventional treatment methods were ineffective, but this is the first report of its use in the management of life threatening PPH in a JW.

Case Report: A 32-year-old 62-kg parturient who had had five previous normal deliveries, with a 27/40-week twin pregnancy with a grade 4 placenta praevia was admitted to labour ward with painless PV bleeding of approximately 500 mL. On admission her haemoglobin (Hb) was 11.8 g/dL and platelets $166 \times 10^9/L$ with normal clotting. At this point she restated her belief as a JW and was not willing to receive any donated blood products, even in a life-threatening situation. However, she was happy for rVIIa to be used if required. Following four hours of observation there was additional sudden haemorrhage of approximately 900 mL. After resuscitation with 2 L of i.v. fluid she was transferred to the operating theatre for emergency caesarean section, which was conducted under general anaesthesia with invasive blood pressure monitoring, and she was delivered of live twins. Despite the early use of oxytocin, ergometrine, misoprostol and intrauterine carbaprost, and a well-placed B-Lynch suture, the uterus remained boggy, so the decision was made to proceed to total hysterectomy. Despite this adequate haemostasis was still not achieved, with generalised pelvic ooze and an ongoing intraoperative 2-L blood loss. Hb was 6.0 g/dL, platelets $89 \times 10^9/L$, PT 15 s, APTT 39 s and fibrinogen 2 g/dL. Total i.v. fluid administration was 4500 mL. After haematology consultation, rVIIa 100 µg/kg was administered. Within 15 min haemostasis was achieved (with coagulation parameters corrected to PT 9 s and APTT 26 s) and surgical closure performed. Haemodynamic stability was present, so she was extubated 1 h later and nursed on the delivery suite. She was discharged on oral iron at postpartum day 6.

Discussion: The numerous recent case reports in the use of rVIIa in PPH have highlighted the importance of this 'off label' treatment in instances where conventional therapy has been ineffective. However all of these cases involved the use of some, and in most cases massive, transfusion. This case illustrates that rVIIa can be used successfully in a JW patient in severe PPH without the need for donated blood products.

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P31 Prophylactic uterine artery balloon occlusion and embolisation in placenta percreta

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Introduction: The 2000-2002 triennial CEMACH report identified haemorrhage as the second leading cause of direct maternal death and recommended consideration of uterine artery embolisation in the management of obstetric haemorrhage.¹ Arterial embolisation has been used successfully both prophylactically and for emergency obstetric haemorrhage.² We report our experience of its prophylactic use for elective caesarean section in a woman with placenta percreta.

Case Report: A 31-year-old G7 P4 patient was found on routine ultrasound scanning to have an anterior grade 4 placenta praevia. Her obstetric history included one emergency and three elective caesarean sections, all under spinal anaesthesia. Due to the high risk of an invasive placenta accreta, increta or percreta she was referred to the regional centre for elective caesarean section and tubal ligation with involvement of an interventional radiologist. The delivery was expedited at 36 weeks due to preeclampsia and a falling platelet count. The caesarean section was performed in the interventional radiology suite. While awake, intravenous access and invasive monitoring were established. A pool of platelets was administered for a platelet count of $68 \times 10^9/L$. The radiologist then inserted bilateral uterine artery balloons. General anaesthesia was induced. The balloons were inflated before incision of the uterus. After delivery of a live infant, the uterine arteries were embolised because of bleeding from the placental bed and a small area of adherent placenta. Initially bleeding was reasonably well controlled. Despite this, uterotonics and good uterine contraction, hysterectomy was required because of ongoing blood loss. Total estimated blood loss was 4000 mL. She received an 8-unit blood transfusion, 4 units of FFP and a further unit of platelets in addition to crystalloid and colloid resuscitation. Histology revealed placenta percreta.

Discussion: Although hysterectomy was not avoided, blood loss and subsequent transfusions were reduced by uterine artery balloon occlusion before uterine incision and subsequent uterine artery embolisation. While haemorrhage was initially controlled after embolisation, blood loss continued, probably due to an extensive collateral blood supply.

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P32 Massive obstetric haemorrhage: moving upstream into the aorta

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Introduction: Multi-disciplinary management of predicted massive obstetric haemorrhage may include interventional radiology,^{1,2} recombinant factor VIIa and red cell salvage. We present four patients who required this approach, with particular emphasis on a case during which an aortic occlusion balloon was employed to limit otherwise uncontrollable haemorrhage.

Case reports: Four women were managed according to pre-operative plans formulated by the multi-disciplinary team. Two patients had placenta percreta (one with bladder invasion) and two had grade 4 placenta praevia with histories of previous caesarean sections. Delivery in all cases was by elective caesarean section performed at 31-35 weeks gestation. Pre-operatively, under local anaesthesia, all patients had bilateral uterine artery balloon catheters inserted and guide-wires placed in the aorta (to facilitate rapid insertion of an aortic occlusion balloon if required). In cases 2, 3 and 4 the uterine artery balloons were inflated before uterine incision. This had minimal effect on fetal performance at birth but substantially reduced the blood loss from patients 2 and 3. Cases 1, 3 and 4 also required thrombogenic embolisation to control bleeding. Despite these measures case 4 continued to bleed. An aortic occlusion balloon was inflated for two intra-operative periods (20 and 25 min) to facilitate surgical control of bleeding. Intra-operative blood losses were 15 L, 1.5 L, 6.5 L and 15 L. Blood products used ranged from 0-30 units red cell concentrate, 0-20 units FFP, 0-10 units cryoprecipitate and 0-8 units platelets. Case 4 also had 1.5 L of salvaged red cells. Cases 1 and 4 required abdominal and pelvic packing for 24-48 h. Recombinant factor VIIa was also required in both of these patients in a final attempt to achieve successful haemostasis. All four patients were admitted electively to the intensive care unit postoperatively.

Discussion: A multidisciplinary approach to the management of predicted massive obstetric haemorrhage has resulted in satisfactory outcomes for all the mothers and babies in our series. Case 4 emphasises the value of aortic balloon occlusion in extremis and is, as far as we are aware, the first report of this application in predicted massive obstetric haemorrhage.

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P33 Survey of cell-salvage use in obstetrics in the UK

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Introduction: Donor blood is a scarce and expensive resource, and transfusion is not without risk.¹ CEMACH² and NICE³ have stated that cell salvage should be considered in major obstetric haemorrhage.

Method: A postal survey of cell-salvage use in obstetrics of all consultant-led Scottish maternity units, followed by an identical OAA-approved survey to all other units across the UK, in 2005-6.

Results: 227 units were surveyed, 176 replied (78% response); 112 units (64%) use cell salvage in their hospital in any speciality, but only 67 of the 112 (55%) use it in obstetrics (38% of total).

These 67 units together performed 119 successful episodes of obstetric cell salvage in the previous year and 63 episodes of cell-salvage set-up without processing blood. There is great variation in the use of cell salvage between units; 31 of the 67 had not used cell salvage at all the previous year. Of the 36 (54%) that had, 13 had used it only once, with only six using it >8 times.

Lack of training is perceived as the single biggest barrier to its use (Table 1). Only 51 units (79%) have formal training programmes. Sharing a cell-salvage machine kept distant to the maternity unit is another obstacle. Safety concerns feature less, as amniotic fluid embolism is realised not necessarily to be due to transfer of fetal material to the mother.⁴

Table 1: Perceived barriers to use of cell salvage in obstetrics in units where a cell saver was available in their hospital. More than one reason could be stated per unit.

Lack of training	48%
Safety concerns	10%
Geographical	14%
Financial constraints	5%
Lack of sufficient cases	8%

Only 28 units (43%) audit their use of cell salvage, with half of these only informally collecting data.

Conclusion: Cell salvage is slowly gaining momentum in obstetrics units but many barriers, especially lack of training, prevent more uptake of the technique.

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P34 Triggers for transfusion for vaginal and caesarean deliveries

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Introduction: Blood products have become increasingly scarce and their harmful effects are well recognised. Inappropriate transfusions continue to be given, despite growing evidence of their dangers.¹ The purpose of this study was to identify trigger factors for and appropriateness of transfusion after guidelines had been introduced.

Methodology: We carried out a retrospective audit of blood bank records from Jan 2004 to April 2006. The notes of 103 patient who received blood transfusions during this period were available to us. Data collected were: mode of delivery, blood loss, i.v. fluids given, triggers for transfusion, place of transfusion and whether patients were symptomatic (heart rate >100 beats/min and systolic pressure <90 mmHg).

Results: Mean maternal age was 26.1 years; 38 women had caesarean sections, 53 had vaginal deliveries and 12 instrumental deliveries. Thirty patients (29.6%) had inappropriate transfusions (given <500 mL fluid before blood transfusion) and 43.7% of these were asymptomatic. Interestingly all these were vaginal deliveries where anaesthetists were not directly involved in their care.

Table. Triggers for transfusion

Trigger factor	Vaginal delivery		Caesarean section	
	lab. suite	ward	lab. suite	Ward
Haemoglobin < 7 g/dL				
Symptomatic	29	9	21	4
Asymptomatic	3	5	0	0
Ongoing bleed	-	-	-	-
Haemoglobin > 7 g/dL				
Symptomatic	4	5	0	2
Asymptomatic	5	3	8	2
Ongoing bleed	2	0	1	0

Discussion: Inappropriate transfusions continued to be given due to inadequate resuscitation before transfusion and not accepting a haemoglobin trigger threshold of <7 g/dL.

Conclusion: We conclude that review of parturients before transfusion, focussing on fluid resuscitation, accepting a haemoglobin <7 g/dL as a trigger for transfusion, with compulsory auditing of transfusion practice, could reduce the use of transfusion.

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P35 Changing patterns in obstetric haemorrhage: experience of a London DGH

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Introduction: Obstetric haemorrhage is the leading cause of maternal mortality worldwide and the second most common cause of direct maternal death in the UK. It is also a significant cause of obstetric morbidity. We aimed to assess the pattern of obstetric haemorrhage in our unit over the last ten years.

Methods: The obstetric anaesthetic audit records for the last 10 years were examined.

Results: In 1995 hypertensive disease of pregnancy was the leading cause of admission of obstetric patients to the intensive therapy unit (ITU). In 2005 it was haemorrhage (table).

Year	1995	2005
Deliveries	3462	4845
ITU admissions	7	20
Postpartum haemorrhage	2	18*
Pregnancy-induced hypertension	5	2

* $P \leq 0.01$, χ^2 test.

Conclusion Obstetric haemorrhage associated with significant morbidity appears to have increased over the last ten years at Northwick Park Hospital. Discussions with other obstetric units in London suggest that Northwick Park is not alone in this experience. The rise in caesarean section rates is likely to have contributed to this but other factors should also be considered. Other factors that may have contributed to this include:

- 1) The changing demographics of the women who book at Northwick Park Hospital.
- 2) Changes in the management of labour. Abandoning the policy of active management of labour¹ has not necessarily been associated with a concomitant reduction in the use of oxytocic drugs.
- 3) Changes in training of junior doctors. A possible impact of changes in training on the management of obstetric haemorrhage has been alluded to in the last confidential enquiry into maternal deaths.²

Anticipated reports from the forthcoming Confidential Enquiry into Maternal and Child Health (triennial report, due December 2007) and the UK Obstetric Surveillance System (UKOSS) peri-partum hysterectomy project may provide further information about a changing pattern of obstetric haemorrhage in the UK.

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P36 Ethnicity and post-partum haemorrhage

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Introduction: Northwick Park Hospital (NPH) had 4620 deliveries in 2006. There were 426 instances of postpartum haemorrhage (defined as a blood loss of more than 600 mL). Previously we have shown that ethnicity has an influence on mode of delivery and caesarean section rate.¹ The current study was undertaken to ascertain if ethnicity had an influence on the incidence of postpartum haemorrhage.

Method: Data were collected for all deliveries over a three-month period where there was a postpartum blood loss of >600 mL requiring medical and/or surgical intervention. We also recorded the mothers' ethnicity, parity, mode of delivery and the stated reason for haemorrhage.

The St Mary's Maternity Information System (SMMIS) has been used in our hospital since 1987 and we used data from this to find the ethnic group of all mothers delivering in our hospital in 2006. There were 13 different racial classifications which were combined into four groups: Caucasian, Asian and Oriental, Black Caribbean and Black African. The ethnicity data from our audit was compared to the SMMIS data and χ^2 test was applied to assess whether there was any difference in ethnicity between the patients who suffered postpartum haemorrhage and all mothers delivering in 2006.

Results: We collected data for 111 mothers. Of these, 11 had a blood loss >2000 mL. There was no significant effect of ethnicity on the incidence of postpartum haemorrhage in our study and the population delivering at NPH ($\chi^2 = 2.479$, $P=0.479$)

Conclusion: Although ethnicity has an effect on mode of delivery and epidural rate, there was no association with an increased incidence of postpartum haemorrhage in the major ethnic groups of our population

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P37 Reducing risk in an ethnic minority: a retrospective observational study

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Introduction: In 1996 we found that Asian women received relatively more general anaesthesia for caesarean section than Caucasian women.¹ Belonging to an ethnic minority and general anaesthesia are both risk factors for maternal mortality. By 2002, there had been little change and we sought to change the culture and reduce risk.

Methods: We reviewed the anaesthetic records of all combined emergency and elective caesarean sections from 2002-2005. The charts require an entry for ethnic group. Omissions were allocated by name recognition when possible. Orientals were counted as Asians. Caucasian and Afro-Caribbean were combined. Data were analysed using Fisher's exact and χ^2 trend.

Results: The percentage of Asians receiving general anaesthesia for caesarean section has significantly declined from 12.1% in 2002 to 3.7% in 2005 ($P < 0.05$). No significant trend with time was noted in other groups. In 2002 Asians received more general anaesthetics than Caucasian women ($P < 0.05$). By 2005 there was no significant difference between the groups (Fig. 1).

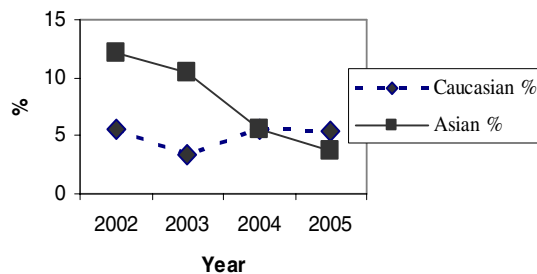


Fig. 1. Trends in the proportion of women receiving general anaesthesia for caesarean section.

Conclusion: Ethnic differences in the use of general anaesthesia for caesarean section have disappeared between 2002 and 2005. This was probably in response to peer group pressure applied after 2002.

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P38 Are we being called? An audit of anaesthetic referral for pre-assessment of high-risk mothers

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Introduction: In general, pregnant mothers represent a young, healthy subset of the population. However, a minority pose a significant anaesthetic risk. At present we rely on ad hoc referrals from both obstetric and midwifery teams to direct our pre-assessment. The Confidential Enquiry into Maternal and Child Health¹ and the Royal College of Anaesthetists² both identify obstetric pre-assessment as an area for improvement. This audit aims to quantify the incidence of potentially high-risk cases within the local obstetric population and to assess the effectiveness of our current system.

Method: Pre-assessment referral criteria were drawn up following a regional e-mail survey. Our sample population comprised all mothers who delivered locally during June 2005. Any patients fulfilling our criteria underwent retrospective case-note review.

Results: 268 mothers delivered during the audit period (annual confinement 2850); 22 of these (8%) fulfilled pre-assessment criteria (7 cardiovascular, 1 respiratory, 4 neurological, 2 musculo-skeletal, 2 haematological, 2 anaesthetic, 4 allergy). Only two (9%) had a record of anaesthetic involvement before admission to the labour ward. Seven others had undergone obstetric review (due to co-morbidity) but were not thought to merit anaesthetic input. Of the 268 deliveries, 34% ultimately required anaesthetic intervention. None suffered anaesthetic complication and all mothers and neonates were discharged in good health.

Discussion: Anaesthetic input was lacking in over 90% of potentially high-risk cases. Simple case-note review would have been sufficient for 50% of these patients. A further 30% could have been assessed by telephone, with only the remaining 20% requiring more detailed input.

Conclusions: During June 2005, <10% of our potentially high-risk mothers were referred for anaesthetic review. Although there were no documented anaesthetic complications, can it be good practice to be so devolved from the pre-assessment process? Current recommendations and common sense would suggest not. We are therefore formally implementing our newly defined referral criteria.

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P39 Review of analgesia and pain scores in substance-misusing women requiring caesarean section

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Introduction: Pain management in drug-dependent patients may be problematic.¹ We had local concerns that women with substance misuse were having inadequate pain relief. We carried out a retrospective review of such women undergoing caesarean section to establish if there were any problems with postoperative analgesia.

Method: Notes were requested for all 26 women known to the substance-misuse midwife who presented for caesarean section between 1 April 2004 and 31 March 2006. A standard dataset was recorded.

Results: Twenty-one sets of notes were retrieved. The percentages of patients abusing different drugs were: heroin 76.2%, cocaine 23.8%, alcohol 19% and amphetamines 9.6%. Benzodiazepines and cannabis were misused by one patient (4.8%) each. All 16 women who used heroin were on a replacement regimen of methadone (13) buprenorphine (2) or a naltrexone implant (1). All those on replacement regimens received these drugs perioperatively.

The anaesthetic techniques used for caesarean section were intrathecal (12) epidural top-up (4), combined spinal-epidural (1) and general anaesthesia (4). In all cases intrathecal anaesthesia was combined with diamorphine 300 µg.

Postoperatively all women received regular oral paracetamol, and 19 received oral diclofenac regularly. Most women had the standard subcutaneous regimen of diamorphine or morphine and required 5-40 mg (mean 19.4 mg) or 10-70 mg (mean 38.3 mg) respectively. Based on previous audit data these figures are approximately twice the averages for our unit. The individual with the naltrexone implant had combined spinal-epidural anaesthesia and a plain bupivacaine epidural was run postoperatively.

Of the pain scores that were recorded, the majority of women (57%) had no pain, 29% experienced mild pain and only 14% suffered with moderate pain.

Conclusion: There is no evidence of a significant pain problem amongst women misusing drugs who present for caesarean section. They all received their replacement drugs and the majority were managed well with standard analgesic and anaesthetic protocols. The requirement for parenteral opioids was greater than normal. We would advocate the continuation of this method of management.

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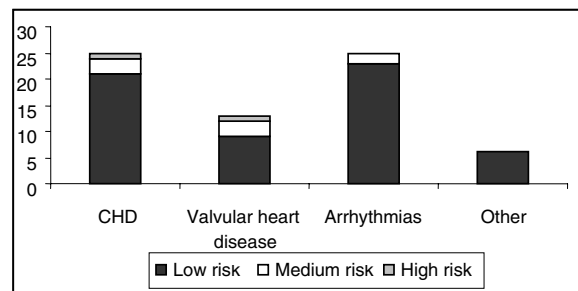
P40 Management and outcome of parturients with cardiac disease: a one year retrospective survey

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Introduction: Death from cardiac disease remains a common cause of maternal mortality.¹ Despite advances in medical care, mortality from congenital heart disease (CHD) has not declined. Early referral to tertiary centres and multidisciplinary involvement has been recommended by these reports over many years. Local experience in other units has also supported this.²

Methods: Parturients with cardiac disease who booked during the year 2005-2006 in a tertiary referral centre were identified from the local database. These were divided into groups according to aetiology of disease and then further subdivided into low, medium and high risk.³ The records were hand searched for the following: appropriate referral to a multidisciplinary team; management plan clearly documented in the notes and followed on admission; maternal and fetal outcome.

Results: There were 150 women with cardiac disease highlighted at the time of booking. These were divided as follows: innocent murmurs (n=75), arrhythmias (n=25), CHD (n=25), valvular heart disease (n=13), other (n=6), unknown (n=6). All medium and high risk women were referred appropriately. A management plan was clearly documented in the notes and followed at the time of admission in all women across all risk groups. There were no maternal or fetal deaths or morbidity in this cohort. The figure shows the distribution of risk groups.



Discussion: Our results confirm the importance of a multidisciplinary team approach in the management of patients with known cardiac disease. We accept that the numbers we present are small, but we believe the results to be valid.

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P41 Is there a role for enoximone in the management of pregnant women with dilated cardiomyopathy?

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Introduction: Cardiomyopathy is an important cause of maternal cardiac disease, responsible for 8 of the 44 cardiac deaths in 2000-2002.¹ These two cases describe the use of enoximone in severe dilated cardiomyopathy. Enoximone acts mainly by inhibiting phosphodiesterase III. It increases stroke volume index to a similar degree as dobutamine but it causes less tachycardia.²

Case report 1: A 29-year-old G3P2, presented at 38 weeks with a history of collapse. Echocardiography (echo) showed a dilated left ventricle (LV) with an ejection fraction (EF) <20%. Caesarean section was performed on the same day. A combined spinal-epidural (CSE) was sited using spinal hyperbaric 0.5% bupivacaine 2 mL. The arterial pressure dropped from 140/90 to 95/40 mmHg and the central venous pressure (CVP) increased from 2 to 10 mmHg. The arterial pressure responded temporarily to phenylephrine 50 µg and metaraminol 1 mg. A further drop (systolic <70 mmHg) responded to a 7.5-mg bolus of enoximone and a 5.0-mg/h infusion was started. The arterial pressure increased to 105/60 mmHg and the CVP dropped to 5 mmHg. No further vasoconstrictors were required. The heart rate was constant at 85 beats/min. The infusion was gradually tailed and she was transferred to the intensive care unit (ICU).

Case report 2: A 36-year-old G2P1 presented at 30 weeks' gestation with shortness of breath. Echo showed LV dilatation with EF 10-15%. A caesarean section was performed the next day. A CSE was sited. Spinal hyperbaric 0.5% bupivacaine 1 mL and fentanyl 25 µg were used. Phenylephrine 1 mg/h and enoximone 5 mg/h were infused. The epidural was topped up with fentanyl 75 µg and 0.5% levobupivacaine, total 13 mL. The arterial pressure fell from 125/95 to 98/72 mmHg and the CVP increased from 20 to 30 mmHg. Increasing the enoximone (10 mg/h) and phenylephrine (3 mg/h) infusions restored the arterial pressure to 110/75 mmHg and reduced the CVP to 20 mmHg. The heart rate remained constant at 105 beats/min. The infusions were gradually tailed off and she was transferred to ICU.

Discussion: In cases of severe dilated cardiomyopathy, an inotrope with vasodilating properties is desirable. In our cases, the reduced CVP with a rise in arterial pressure suggests improved cardiac function. Enoximone is useful as it causes less tachycardia than other inodilators.

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P42 Use of vasopressin during caesarean section in parturients with idiopathic pulmonary artery hypertension

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Introduction: Reports from animal models¹ and the non-obstetric population suggest that arginine vasopressin (aVP) may have differential effects on the systemic and pulmonary circulations, making it suitable to treat systemic hypotension in patients with idiopathic pulmonary artery hypertension (IPAH). We present the use of aVP to treat severe hypotension in two women with IPAH during caesarean section.

Case 1 presented at 27 weeks with newly diagnosed IPAH. Functional impairment was New York Heart Association (NYHA) class 4, but improved with i.v. prostacyclin to NYHA class 3. She underwent caesarean section at 28 weeks under general anaesthesia. Immediately after delivery she became hypotensive (79/55 mmHg) with a 7-mmHg increase in right atrial pressure (RAP=22 mmHg) and a 3-mmHg increase in mean pulmonary arterial pressure (mPAP=59 mmHg). Her blood pressure did not respond to treatment with metaraminol, noradrenaline or dobutamine. The acute rise in mPAP was also unresponsive to nebulised iloprost and an increase in rate of i.v. prostacyclin infusion. Following a 0.5-unit i.v. bolus of aVP, there was a rapid increase in arterial pressure (120/86 mmHg) but no increase in RAP or mPAP.

Case 2 had known IPAH treated with bosentan and sildenafil, but deteriorated in pregnancy and required i.v. prostacyclin. Caesarean section was performed at 28 weeks using an incremental CSE anaesthetic technique. Again profound hypotension (68/40 mmHg) and an 8-mmHg increase in RAP (26 mmHg) occurred immediately post partum. This responded poorly to i.v. boluses of phenylephrine and inhaled nitric oxide (iNO). On commencing an i.v. infusion of aVP (0.08 units/min), her blood pressure improved (110/62 mmHg) with no increase in RAP.

Outcome: Patient 1 was extubated 5 days postpartum and 6 months later is stable with NYHA Class 2 symptoms. Patient 2 was weaned from i.v. aVP and iNO over the following 48 h, but suffered a cardiorespiratory arrest on day 6 postpartum following an intra-abdominal bleed.

Conclusion: aVP appeared to be effective rescue therapy for systemic hypotension associated with right heart failure in the cases presented. Its use should be considered in parturients with IPAH undergoing caesarean section.

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P43 The use of oxytocin in parturients with cardiac disease: a case series

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Introduction: The cardiovascular effects of tachycardia and hypotension following i.v. oxytocin at delivery have been well demonstrated.¹ The use of oxytocin in parturients with cardiac disease is therefore controversial. We present a series of six women with a broad spectrum of cardiac disease who received i.v. infusions of oxytocin at delivery.

Cases: All patients were managed antenatally by a multidisciplinary team. Patients 1 and 2 had mitral stenosis (MS) and vaginal deliveries. Patient 3 had MS and was delivered by elective caesarean section at term. Patient 4 developed peripartum cardiomyopathy and had a category II caesarean section at 30 weeks. Patient 5 had idiopathic pulmonary arterial hypertension and required delivery by caesarean section at 28 weeks. Patient 6 had known Ehlers Danlos syndrome and presented with an aortic dissection at 30 weeks, requiring emergency caesarean section. All patients had slow, incremental combined spinal-epidural anaesthesia, except patient 2 who declined analgesia for labour and patient 6 who received general anaesthesia. Oxytocin, 5 units in normal saline 50 mL, was administered i.v. over 30 min immediately post partum in all cases.

Results: Heart rate (HR: beats/min), mean arterial pressure (MAP: mmHg) and central venous pressure (CVP: cm H₂O) were monitored over this time period (Table). Baseline values are observations recorded at knife-to-skin time for caesarean section and immediately before the second stage of labour for vaginal delivery.

Cases	HR / MAP / CVP			
	Baseline	5 min	15 min	30 min
1	64/85/4	89/102/4	72/98/2	67/102/3
2	70/68/-	69/71/-	69/77/-	71/63/-
3	63/83/4	75/93/6	62/85/7	55/78/5
4	125/73/8	130/72/5	131/72/4	125/80/5
5	80/67/18	82/49/26	84/78/26	81/84/25
6	80/65/-	86/65/-	81/64/-	83/63/-

None of the women in the series developed uterine atony or had significant post-partum blood loss.

Conclusion: Haemorrhage and subsequent hypovolaemia are not well tolerated by patients with limited cardiac reserve. From our case series, 5 units of oxytocin infused i.v. over 30 min may maintain haemodynamic stability whilst still effectively preventing uterine atony and postpartum haemorrhage.

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P44 Assessment of pneumonia severity in pregnancy

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Introduction: Both the British (BTS) and American (ATS) Thoracic Societies have proposed criteria to assess the severity of pneumonia in non-pregnant patients.^{1,2} We decided to apply these criteria retrospectively to pregnant patients with pneumonia in our unit who had required high dependency (HD) care or invasive ventilatory support.

Methods: The labour suite HD admission records were examined retrospectively for diagnoses of pneumonia over a three-year period starting January 2004. Case notes were then reviewed. If pneumonia was the diagnosis, features of the case matching the BTS or ATS criteria (Table) were sought.

Results: During the three-year period there were 16297 deliveries. Eight potential patients were identified from HD records. Notes were available for six, five of whom had pneumonia requiring admission to HD. The other had acute respiratory distress syndrome secondary to gram-negative sepsis and was excluded. The frequency with which BTS and ATS criteria were fulfilled by each of the five patients is shown in the table.

BTS	Criteria met	ATS	Criteria met
Confusion	0/5	Major criteria	
Diastolic pressure <60 mmHg	2/5	Septic shock	1/5
Respiratory rate >30/min	3/5	Mechanical ventilation	2/5
Urea >7 mmol/L	0/5	Minor criteria	
Bilateral CXR changes	2/5	Systolic BP <90mmHg	2/5
SpO ₂ <92%/PO ₂ <8 kPa	5/5	Multilobar CXR changes	2/5
		PaO ₂ (mmHg)/FiO ₂ <250	4/5

Two of the five patients required invasive ventilation. Both had three BTS, and two minor and one major ATS criteria. The other three patients had 1, 2 and 3 BTS and 0, 1 and 3 ATS minor criteria respectively.

Conclusion: In this small sample of pregnant patients with pneumonia requiring HD admission, it appears that the most frequently occurring indicators of severity are SpO₂ <92%/PO₂ <8 kPa and PaO₂(mmHg)/FiO₂ <250. Baseline respiratory rate, blood pressure and urea change in pregnancy and perhaps the stated criteria are less sensitive markers of pneumonia severity during pregnancy. In our sample the need for mechanical ventilation did not always coincide with the presence of an increased number of ATS or BTS criteria.

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P45 Uterotonics and pulmonary oedema: is there a link?

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Introduction: We had noticed an increased rate of severe post-partum haemorrhage (PPH) particularly associated with pulmonary oedema requiring admission to ICU for post-partum mechanical ventilation. Carboprost tromethamine (HEMABATE™) is known to increase pulmonary vascular resistance¹ and is increasingly used in the early management of resistant uterine atony. We wished to determine the factors that may contribute to PPH and pulmonary oedema.

Method: The case notes of all PPH admissions to ICU (n=12: May 2004–May 2006) and a sample of admissions to obstetric HDU (n=6: November 2005–May 2006) were reviewed. A root-cause analysis was performed to examine the management, focusing on uterotonics, blood products and fluid balance. The cases were classified into PPH from primary uterine atony and PPH from a surgical cause (lacerations, placenta previa) with evidence of pulmonary oedema.

Results: Patients had a mean age of 30.7 years (range 23-43) and mean BMI of 24 kg/m² (19-36). Those with pulmonary oedema were not especially small.

	Units transfused	Carboprost dose (mg)	Fluid balance Mean (range)
Pulmonary oedema ITU n=4	11 (4-20)	1.125 (0-1.5)	+2052 mL (1240-2640)
No pulmonary oedema ITU n=8	9.5 (4-20)	0.375 (0-1.5)	+2947 mL (1500-4550)
No pulmonary oedema Labour ward n=6	3 (0-6)	0.375 (0-0.75)	+1183 mL (-250-2110)

Data are median (range) unless otherwise stated

All patients who developed pulmonary oedema had a primary diagnosis of uterine atony and had received three times as much carboprost, had a lower positive fluid balance and similar transfusion requirements compared to the other ICU group, although one mother received only excessive doses of ergometrine. Asian women were over-represented in ICU admissions (28% v 5% of our obstetric population), particularly in the group with pulmonary oedema (75%).

Conclusion: Pulmonary oedema is a worrying feature of PPH and in our population was associated with primary uterine atony, uterotonics and Asian ethnicity. The use of carboprost in large doses may be an associated factor. Extreme care and early diagnosis of pulmonary oedema are required in managing these mothers.

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P46 Arnold-Chiari malformation and childbirth

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Introduction: Childbirth presents potential problems for the patient with Arnold-Chiari malformation type 1 (ACM1) but there appears to be no consensus on the optimum care of these patients. Caesarean delivery has been advocated as safer than vaginal delivery. The recommended choices of analgesia for vaginal delivery, or anaesthesia for caesarean delivery, have included epidural, spinal and general anaesthesia. We report our experience of two births to a patient with ACM1 together with a review of a further 50 births found in a full literature search.

Case report: A 38-year-old presented for delivery in her second pregnancy requesting a planned caesarean section under epidural anaesthesia. Three years earlier, in her first labour, she developed a placental abruption and was delivered by emergency caesarean section with spinal anaesthesia. A few weeks after discharge she had been diagnosed with ACMI after a CT scan. In the second pregnancy she chose a planned caesarean section with epidural anaesthesia. We agreed to use epidural anaesthesia after a clear explanation that there was a risk of dural puncture, in the order of 1%, which could acutely exacerbate her neurological symptoms. The planned delivery was accomplished without any complications and she went home after four days. Her ACM1 symptoms remain and she is undergoing further neurosurgical evaluation.

Discussion and review: Our patient's symptoms attributed to her ACM1 first appeared after spinal anaesthesia. We were reluctant to use epidural anaesthesia for her second delivery but were persuaded by the patient because of her past negative experiences with general anaesthesia. A full review of the literature identified a further 50 deliveries in 32 mothers. There were no reports of complications with either vaginal or caesarean delivery. Thirty-one patients had an anaesthetic intervention. Seven patients received general anaesthesia without problems. Seventeen patients had epidural analgesia or anaesthesia without problems except for one patient who had an accidental dural puncture, with subsequent development of neurological symptoms. Spinal anaesthesia was used in seven patients and in two caused persistent symptoms that led to the diagnosis of ACM1 being made.

Conclusion: General anaesthesia is safe but is only an option for caesarean delivery. Spinal anaesthesia is not the method of choice since it would appear to have the potential to precipitate neurological symptoms. An epidural block is safe providing the dura is not punctured. In deciding to use epidural analgesia in a patient with ACM1 the benefits and risk must be carefully evaluated.

P47 National survey of anaesthetic assessment of pregnant women with increased body mass index

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Introduction: In 2002 CEMACH issued the following guideline: "Obese pregnant women (BMI > 35) are at greater risk from anaesthesia and should be referred to the anaesthetist early." We sought to establish if, and how, obstetric units nationally were interpreting and implementing this guideline and the implications imposed by this.

Method: A postal survey, approved by the OAA, was sent to lead obstetric anaesthetists in all units in the UK. Questions focussed on whether parturients with BMI >35 kg/m² were currently referred to anaesthetists, any changes in this practice following CEMACH 2002 and the factors determining this decision. We also looked at the mode of referral, where assessed and by whom and at what gestation they were referred.

Results: The questionnaire return rate was 71.3%.

50.6% (82/162) of responding units continued not to refer women with BMI >35 kg/m² to anaesthetists after the CEMACH 2002 recommendation. These were mainly larger units (> 4000 deliveries).

20.1% of units started referring BMI >35 kg/m² after CEMACH 2002 and these tended to be smaller units (<2000 deliveries); 12.6% units ceased to refer women with BMI >35 kg/m² since CEMACH 2002. Many of these had increased the BMI threshold to >40 kg/m².

Units of all sizes cited time as the main impediment to referring these women (55.8%) but over 46.2% of lead clinicians in larger units felt referral was not useful unless there were other risk factors. In smaller units only 11.5% of those thought this to be the case.

Larger units saw 50% of referrals in formal anaesthetic clinics. In smaller units women were usually seen by individual arrangement with a consultant anaesthetist. 12.8% of larger units produced an information leaflet explaining risks.

Conclusion: Nationally there is poor compliance with the CEMACH 2002 recommendation, which is open to wide interpretation; 67% of units do not routinely refer parturients BMI >35 kg/m². Larger units in particular appear to have raised the threshold at which they refer women largely because of lack of time available to see this large and increasing group of women.

Many lead clinicians felt a threshold of >40 kg/m² (some suggested BMI >45) would be clinically more relevant providing there was no other co-morbidity.

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P48 Critically ill obstetric patients treated in an obstetric intensive care unit

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Introduction: A number of studies have been published on the obstetric care of patients in intensive care units (ICU), but very few data have been collected about obstetric admissions in Italy. Our retrospective longitudinal observational study is based on an eight-year period (1998-2005) of maternal admissions in the obstetric intensive care unit our hospital (a tertiary care university center specialized in obstetrical and gynecological care), with the aim of determining the incidence, causes and outcome of these admissions.

Method: We collected data from 1st January 1998 to 31st December 2005: total number of deliveries, total number of obstetric admissions to ICU and causes of admission, co-morbidities, maternal deaths and their causes, age, incidence of multiple pregnancies, type of delivery, severity score, parity, gestation, weight before pregnancy and weight gain. Data analysis: statistics index (mean, median and mode), index of variability (frequency distribution, Q1-Q3).

Results: Total deliveries: 65 879. Total admissions to ICU: 1101; principal cause of admission: severe preeclampsia 41%, HELLP 18.5%, severe hemorrhage 11.8%, pregravid disorders 10.1%, sepsis 3.8%, eclampsia 3.5%, pregnancy-related coagulopathy 2.8%. Maternal deaths: 0.72% of admissions; causes of maternal death: hemorrhagic shock, DIC, cerebral thrombosis, sepsis, acute cardiac failure, massive pulmonary embolism. Incidence of multiple pregnancies: 2.3%; type of delivery: 91% caesarean section. Parity: 92% of eclampsia group, 74% of severe preeclampsia, 77% of HELLP syndrome, 49.8% of DIC and hemorrhagic disorders were nulliparous. Weight gain: 84% of women with severe preeclampsia, 50% with eclampsia, 77% with HELLP syndrome, 67% with DIC gained more than 10 kg at 37 weeks (43% gained more than 15 kg).

Conclusions: Maternal age did not appear to be linked with any specific obstetric disorder. Nulliparous women are over-represented. The number of maternal deaths was very low: 0.72% (lower than mortality indicated in international literature: 2.3-7.5%¹). Emphasis on early detection of maternal problems and a prompt admission in a specialized ICU (1.7% of deliveries instead of 0.2% as reported in literature) can significantly reduce pregnancy-related maternal deaths.

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P49 CSE in morbidly obese parturients

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Introduction: Morbidly obese parturients pose an anaesthetic challenge for both neuraxial and general anaesthesia. Concerns have been raised over not only the technical challenges of regional techniques but also the doses that are safe.¹ It has been shown on MRI scanning that in obese patients the cerebrospinal fluid volume is smaller than in comparable non-obese patients.²

Method: A prospective observational study was carried out on morbidly obese parturients who had caesarean sections under combined spinal-epidural (CSE) with hyperbaric bupivacaine 12.5 mg and fentanyl 25 µg intrathecally in the sitting position. A 16-gauge Tuohy needle with a 27-gauge spinal needle were used. Data were collected prospectively using a standardized form. Demographic data included body mass index (BMI), age and ASA status. CSE details including technical difficulties, level of epidural placement, depth of the epidural space, height of block to cold sensation and complications.

Results: Fifty-one patients were recruited, mean (range) height: 1.57 m (1.50–1.72), weight: 110.7 kg (88–144), BMI: 44.91 kg/m² (36.1–57.8), depth of epidural space: 7.41 cm (6–12), number of attempts: 2.4 (1–6). The median level of block height was T4 (range T5–T3). All patients had successful anaesthesia without needing an epidural top-up. There were seven dural taps, three of which needed epidural blood patch. The long 16-gauge Tuohy needle was used on 18 patients (36%).

Conclusion: In this prospective study, no procedures were complicated by high spinal block and all women received adequate anaesthesia. In our experience, the standard dose of spinal anaesthesia is safe and effective in morbidly obese parturients. A dose reduction is not required and unnecessarily exposes patients to the possibility of inadequate sensory block, and therefore to either surgical delay or the risk of general anaesthesia.

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P50 Preparation of midwives for high risk care: viewpoint of the midwife

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Introduction: Guidelines state that high dependency care should be available on or near the delivery suite, staff appropriately trained for high dependency care should be available 24 h per day and anaesthetists should contribute to the education/ update of midwives and should help organise and participate in regular multidisciplinary ‘fire drills’ of emergency situations including haemorrhage and collapse. Accordingly, in our hospital, a ‘critical care course for midwives’ was initiated and is being conducted twice a year by the patient at risk service (PARS), nurses and anaesthetists.

Method: This survey was conducted to assess training requirements, by asking the midwives in our unit to anonymously complete a tick-box questionnaire. We collected 36 completed forms and assimilated the data.

Results:

Respiratory	0	1	2
O ₂ mask set-up	14%	5%	81%
Ventimask set-up	29%	17%	54%
Ambu bag use	15%	17%	68%
Pulse oximetry	17%	5%	78%
Cardiovascular	0	1	2
Perform ECG	69%	10%	21%
Interpret basic ECG	69%	28%	3%
Basic life support	50%	44%	6%
Use of CVP	13%	10%	77%
Procedures/equipment	0	1	2
Cannulation/blood draw	22%	5%	73%
Blood warming devices	50%	33%	17%
Body warming devices	47%	39%	14%
Haemacue	40%	30%	30%
Scenario management	0	1	2
Preeclampsia/eclampsia	6%	22%	72%
Severe infection	13%	10%	77%
Major haemorrhage	11%	17%	72%
Thromboembolism	13%	28%	59%

0: no experience/ needs further training

1: able to perform supervised

2: able to perform unsupervised

Conclusion: It is our responsibility, as anaesthetists, to develop a clinically appropriate programme for midwives, which focuses on a multi-professional approaches to the care and management of women identified as having a pregnancy at high risk so that women have access to appropriate and sensitive care of the highest quality.

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P51 Patient-controlled epidural analgesia for labour: is anaesthetic and midwifery workload reduced?

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Introduction: Patient-controlled epidural analgesia (PCEA) for labour is an effective and reliable method of providing analgesia,¹ which results in high levels of patient satisfaction.^{1,2} It may also be associated with a reduction in anaesthetic and midwifery workload, due to a reduced need for manual top-ups and anaesthetic call back.³ We performed an impact study during a transition period in Birmingham Women's Hospital, when the standard epidural technique was changed from low-dose infusion to PCEA.

Method: Data on 100 labour epidurals were collected prospectively between May and July 2006, including 50 low-dose infusions immediately before the change in policy and 50 PCEA immediately after. For each woman, the number of manual 10-mL top-ups using either the standard solution of 0.1% bupivacaine with fentanyl 2 µg/mL or 0.25% bupivacaine was recorded as were any problems that occurred. We also collected demographic data and mode of delivery.

Results: The two groups were well matched for gravidity, parity and cervical dilatation at the time the epidural was sited. A statistically significant reduction in manual top-ups was required in the PCEA group ($P<0.001$), with no significant difference in the rate of spontaneous vaginal delivery ($P<0.05$).

Total number of top-ups given in labour	Low-dose infusion	PCEA
0	14	32
1	12	11
2-5	22	6
>5	2	1

Conclusion: PCEA is associated with a significantly reduced requirement for manual top-ups compared with continuous infusion during labour and therefore significantly reduces healthcare provider workload, without adversely effecting the outcome of labour.

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P52 The use of obstetric patient-controlled epidural analgesia: a survey of labour wards across the UK

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Introduction: Patient-controlled epidural analgesia (PCEA) is a relatively new method of maintaining labour analgesia. PCEA during labour appears to be safe for mother and fetus whilst offering some benefits over continuous epidural infusions.¹ Regimes for PCEA are numerous, involving different drugs, bolus volumes, bolus intervals and the use of a background infusion. We wished to document the current regimes in use within the UK and to identify the common problems that arise in the use of PCEA. The purpose of the survey was to learn from the experiences of other obstetric units before implementing our own PCEA regime.

Methods: A literature search on the use of PCEA in labour was carried out. A questionnaire was then devised, examining specifically the use of PCEA regimes and monitoring. Furthermore, advantages and disadvantages of PCEA usage were assessed. Following a consultation process with the Obstetric Anaesthetists' Association (OAA), an OAA-approved questionnaire was sent to 231 lead obstetric anaesthetists in the UK.

Results: In total 175 questionnaires were returned, giving a response rate of 76%. Only a fifth of the responding departments were using a PCEA regime at any time. Although methods of monitoring appeared relatively universal, the regimes showed significant diversity. Increases in patient satisfaction were noted, as were a reduction in the volume of epidural solution and anaesthetic workload.

Amongst the remaining 138 units, the most common reasons for not employing such methods were lack of proof of its benefits and cost of implementation. Fourteen departments had previously used PCEA and have now stopped. The reasons for this are varied, but lack of apparent benefit and technical difficulties were the modal answers. Three of these units reported increased anaesthetic workload as a significant factor.

Conclusion: PCEA appears to be a safe means of administering labour analgesia, although there remains widespread scepticism regarding its benefits. A wide range of regimes are employed throughout the UK suggesting the need for research into the most efficacious technique. The use of PCEA may not suit all patients or obstetric units.

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P53 Discontinuing epidurals in the late stages of labour: a survey among midwives in the North West of UK

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Introduction: There is no convincing evidence to show that discontinuing epidurals in late labour reduces the incidence of instrumental delivery or caesarean section.¹ Not all labour epidurals are, however, continued until completion of the third stage of labour, contrary to NICE guidelines.² We aimed to find the current practice in the North West region of UK.

Methods: The survey was carried out at five institutions in the North West, three teaching hospitals and two District General Hospitals (DGHs). Midwives were asked to complete a questionnaire. Data included midwives' experience (years), epidural management in late labour and reason for discontinuing.

Results and Discussion:

Institution	1	2	3	4	5
Teaching hospital	No	No	Yes	Yes	Yes
Response rate %	76.5	61	61.3	63.5	56.3
Discontinuation rate %	50	50	11.6	10.6	17.5

The overall response rate was 62% (209/335).

The experience of the midwives who discontinued the epidural was: <2 years (32.5%), 2-5 years (18.6%), 6-10 years (14%) and >10 years (34.8%). Reasons for discontinuation were: 'helps in pushing' (56.5%), reduced instrumental/caesarean delivery (36.2%), taught by seniors (4.3%) and others (2.8%). The majority of midwives admitted they discontinue epidurals at full cervical dilatation. Despite the lack of convincing evidence for discontinuing epidurals in late labour, the practice is commonplace in some institutions. We found that DGH midwives are 3 to 5 times more likely to discontinue epidurals than teaching hospital midwives. The experience of the midwives did not correlate with the practice of discontinuation.

Conclusion: We found that up to 50% of midwives discontinue epidurals in late labour, irrespective of their level of experience. This is in contrast to the NICE guideline,² that states that once established, the epidural should be continued until the end of the third stage of labour. We need to increase awareness among midwives about current guidelines and best practice.

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P54 Epidural top-ups for second stage of labour: a survey of midwifery practice in our unit

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Introduction: The practice of denying pain relief to the parturient in the second stage of labour by withholding epidural top-ups in order to facilitate delivery is difficult to justify. During follow-up of patients who had labour epidurals in our maternity unit, we encountered patients who had experienced pain during delivery of their baby. We discovered that, contrary to our hospital guidelines, many patients hadn't been given a top-up for the second stage. We therefore conducted a survey among the midwives in our maternity unit to find out how many did, or did not, prefer to give epidural top-ups for the second stage of labour and explored reasons for their chosen preference.

Method: A questionnaire was handed to all the midwives in our unit. The following questions were asked: (1) Do you give epidural top-ups for the second stage? (2) If not, what are your reasons for withholding top-ups? (3) Do you prefer to use Entonox instead of epidurals for the second stage?

Results: We collected 58 forms. Of those, 28 (48%) said that they do not give top-ups for second stage. Their reasons were given as: prolonged second stage 19/28 (68%); decreased ability to push 15/28 (53%); and increased instrumental delivery rate 19/28 (68%). Twenty of these midwives (71%) preferred to use Entonox instead of epidural top-ups for second stage.

Thirty midwives (52%) give top-ups for second stage, none of whom thought that it prolonged the second stage. Of these midwives, four (13%) thought that top-ups in second stage decreased the ability to push and eight (27%) thought that they increased the rate of instrumental delivery. Despite this, they choose to give top-ups for second stage.

Conclusion: Nearly half the midwives in our unit do not top up for the second stage of labour. Women request epidurals for the purpose of analgesia alone and the recurrence of severe pain after a period of adequate analgesia is contrary to the purpose of the analgesia in the first place.¹ We need to convince our midwives to adhere to our hospital guidelines in order to provide more complete labour pain relief. We need to focus on this issue in our midwifery epidural training classes and aim to re-audit the impact of such training in the future.

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P55 Indices of deprivation, perceived pain and epidural uptake in primiparous women undergoing induction of labour

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Introduction: Social deprivation is associated with poor fetal and maternal outcome.¹ Deprivation category [DEPCAT] scores have traditionally underpinned area-based studies of social deprivation. While DEPCAT scores have been replaced by the Index Of Multiple Deprivation [IMD],² the relationship between DEPCAT and IMD scores or the Standard Occupation Score [SOC2000] (an indirect measure of household income and hence social deprivation), have not been assessed.³

Method: We aimed to determine the relationship between: (1) DEPCAT and the Scottish Index Of Multiple Deprivation [SIMD]; (2) DEPCAT and SIMD scores with both maternal and paternal SOC2000 scores. After obtaining local research ethics approval, DEPCAT and SIMD scores were obtained using the residential postcode sectors of 100 primiparous women undergoing induction of labour. Maternal and paternal occupations and corresponding SOC2000 scores were also noted. Results were correlated with perceived pain and analgesic epidural uptake during labour.

Results: Of the 58 residential areas classified as heterogeneous by DEPCAT scores, 14 (24.1%) were reclassified as less deprived while 15 (25.8%) were reclassified as highly deprived. Patients living in three (7.1%) of the 42 postcodes traditionally classified as low or high deprivation were reclassified as heterogeneous by SIMD. Paternal SOC2000 scores showed a more significant negative correlation with SIMD scores [$r=-0.655$] than maternal SOC2000 scores [$r=-0.401$]. Women residing in areas classified as deprived by SIMD perceived more pain during labour [$P=0.049$] but their epidural uptake rate was 17.1% less other women.

Conclusions: The newly established SIMD provides a more accurate assessment of area-based deprivation than traditional DEPCAT scores. This finding has important implications for previous epidemiological studies based on DEPCAT scores alone. Paternal occupation correlates well with area-based measures of deprivation and may be a useful indicator of parturients who require increased antenatal and postnatal support. Socially deprived women need to be engaged in antenatal care and made aware of analgesic options during labour.

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P56 Does social deprivation affect epidural requests?

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Introduction: Social deprivation is known to have a profound effect on health and likelihood to seek medical intervention.¹ We aimed to investigate whether requests for labour epidural analgesia were linked to social deprivation by using the DEPCAT score. The DEPCAT score, which depends on the postcode, is an area-based measure of deprivation in Scotland and is a composite score based on unemployment, social class, overcrowding and non-car ownership.²

Methods: Data for the period 1st December 2005 to November 30th 2006 were analysed retrospectively. Using the unit database patients who had labour epidurals were identified and the postcode noted. Patients with obstetric indications for epidural analgesia were excluded. All vaginal deliveries without epidural analgesia were also identified. For each DEPCAT score 1-7 the number of deliveries was calculated, as was the proportion of mothers who requested an epidural. χ^2 was used to identify statistical differences between groups; the correlation coefficient was also calculated.

Results: In the year studied the total number of deliveries was 5445, 1456 had epidurals. Obstetric indication were present in 51 cases, which were excluded. 1958 women delivered vaginally without epidurals. Of the 3363 cases studied, no DEPCAT score was available for 692 (20.6%). The table shows the final numbers of vaginal deliveries studied and epidural rate grouped by DEPCAT score (1 is the most affluent).

DEPCAT	1	2	3	4	5	6	7
Total deliveries	12	126	233	555	274	280	1191
Epidural rate (%)	58	40.5	48.1*	46.5*	42.7	41.1	40.1

* significant vs DEPCAT 7 ($P<0.05$)

The overall epidural rate in DEPCAT 1-4 added together was significantly greater than DEPCAT 5-7 together ($P<0.025$). The correlation coefficient was -0.70 suggesting that the epidural rate did decrease as deprivation increased.

Conclusion: Based on DEPCAT scores, 43.8% of the patients delivering vaginally in our unit come from the most deprived areas in Scotland. Our initial work suggests that deprived patients request epidural analgesia significantly less. Further work needs to be done to establish why, or if, there are confounding factors.

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P57 Audit of pain relief in labour: how informed are pregnant women of ethnic minority origin attending the maternity unit of a district general hospital?

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Introduction: Luton and Dunstable NHS Trust serves a large population of which 28% are of ethnic minority origin. It has been shown that in these groups the ability to speak English is lower for women than men and is much poorer for those born outside the UK.¹

Objectives: To discover the variety of languages spoken by women attending the delivery suite and whether they had attended antenatal classes and received information on pain relief in labour before admission.

Standards: The standards were taken from the OAA/AAGBI Guidelines for Obstetric Services 2005. Our standards for this audit were that 100% of women should have antenatal access to information about pain relief in labour, preferably in their own language.

Methodology: Two groups of 30 women, each of parity 2 or less, were included. Group A were women whose first language was not English and whose understanding of English was poor or non-existent. Group B were the same as group A but native English speakers. A questionnaire was completed for each woman on the postnatal ward.

Results: There were 27 and 30 women in groups A and B respectively. In group A 30% spoke Urdu, 22% Polish, 11% Punjabi, 11% Bengali, 11% Shona, 7% Arabic, 3.5% Greek and 3.5% Chichewa. Only 37% of group A felt they could understand and speak English well.

Percentage of women in group:	A	B
Attended antenatal clinic	41	83
Had information about pain relief in labour	59	96
Had information about epidurals	52	90
Had information about risks of epidurals	48	87
Would like more information about pain relief in labour	67	27

Conclusions: Only 59% of group A achieved our standards compared to 96% of group B. In general women in group A were less well informed and would have liked more information. The OAA provides leaflets in 19 different languages on their website. As a result of our audit, leaflets in appropriate languages are now available in the antenatal clinic.

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P58 Service review of intrathecal anaesthesia for caesarean section following epidural analgesia in labour

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Introduction: We wished to develop local guidelines for intrathecal anaesthesia for patients who have had epidural analgesia in labour. In order to inform our decision-making we looked at cases in our unit where this set of circumstances had arisen among patients presenting for caesarean section. We also wished to establish local practice, how successful it was and the incidence of side effects.

Method: A total of 30 cases in which intrathecal anaesthesia had been used for caesarean section following epidural analgesia in labour were identified from our database. The case notes were retrieved and a standard dataset recorded from each. In ten cases (group 1) an unsuccessful attempt was made to top up the epidural with 0.5% bupivacaine. In the remaining 20 patients (group 2) epidural top-up was not attempted.

Results: The number (%) of epidurals working well before theatre was 2 (20%) for group 1 and 6 (30%) for group 2. The mean (\pm standard deviation) doses of intrathecal hyperbaric bupivacaine (mg) were 11.75 \pm 1.24 (group 1) and 10.7 \pm 1.34 (group 2) ($P=0.054$, t test). Three patients in group 1 and one in group 2 had a block height of T2 or higher. The high blocks were symptomatic only in group 1 patients (refractory hypotension, tingling hands or breathing difficulties).

Conclusion: The incidence of poorly working epidurals for labour was high in those patients who eventually require intrathecal anaesthesia for caesarean section. Our data indicate that high blocks are more likely when intrathecal anaesthesia is instituted soon after an epidural bolus. Our findings are consistent with published work.¹ Our results also suggest that it is preferable to use intrathecal anaesthesia rather than trying to top up a poorly working epidural for caesarean section.

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P59 Adequacy of anaesthesia for caesarean section after unsuccessful instrumental vaginal delivery

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Introduction: A proportion of instrumental vaginal deliveries (IVDs) attempted in the operating theatre fail, necessitating caesarean section. A Royal College of Obstetricians and Gynaecologists "green top" guideline has recommended that the conversion rate should be audited.¹ Our aim was to ascertain [1] how often caesarean section was required and [2] how often anaesthesia, initially provided for IVD, proved adequate for caesarean section.

Method: Audit committee approval was obtained for this study, carried out during a three-month period on two sites. Duty anaesthetists completed data collection forms during attempted IVD in theatre. The forms documented decision-to-delivery interval, delivery method, type and adequacy of anaesthesia and need for supplementation or general anaesthesia (GA).

Results: Data were collected from 98 of 104 women (94.2%) for whom a decision to attempt IVD was made. On arrival in theatre, 12 cases proceeded straight to caesarean section. GA was required in two of these due to failed epidural top-up. In a further 14 cases, caesarean section was necessary after failed IVD. These women were anaesthetised using regional techniques. Two epidural top-ups required supplementation: one received intravenous ketamine, the other i.v. opioid and inhaled sevoflurane.

Anaesthetic techniques for successful IVD were epidural top-up (56.9%), spinal (38.9%), GA (1.4%, patient preference) and pudendal nerve block (3.8%). The median block height for regional anaesthesia was T4 bilaterally to cold. Decision-to-delivery intervals varied from 15 to 150 min (mean 48).

Conclusion: Conversion to caesarean section was necessary in 26 of the 98 cases (26.5%). Regional anaesthesia proved adequate in most, but supplementation or conversion to GA was required in 30.8% of cases undertaken with epidural top-up. In a UK national survey, the conversion rate for epidural anaesthesia for caesarean section was 7.1%.² Instrumental vaginal delivery in theatre demands anaesthesia that will suffice for caesarean section.

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P60 Audit of remifentanil patient-controlled analgesia for labour

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Introduction: Remifentanil patient-controlled analgesia (PCA) has been introduced to our unit following a recent feasibility study.¹ It is currently being used in approximately 100 mothers each month. An audit of 104 consecutive mothers was undertaken setting the standard that all mothers should be satisfied with the analgesia they receive and that maternal and neonatal adverse effects should be in keeping with those published by Volikas et al.²

Method: We undertook a prospective questionnaire-based audit of the use of remifentanil PCA in labour. The survey was completed by the midwife looking after the mother. It assessed maternal satisfaction and adverse effects in both mother and neonate.

Results: 95% of all mothers were either satisfied or very satisfied with remifentanil PCA in labour. Primigravid mothers were the most likely group to want to use remifentanil PCA in a subsequent labour. Only 5% of mothers felt the PCA was inadequate or were very dissatisfied. The most common maternal adverse effect was nausea and vomiting, which was experienced by 36% of mothers. Severe adverse effects such as over-sedation and transient desaturation to SpO₂ below 90% were experienced in 14% and 6% respectively. The rate of conversion to epidural analgesia was 9%. Neonatal adverse effects were acceptable. The incidence of non-reassuring CTG was low and all Apgar scores were greater than 8 at 5 min.

Conclusion: Remifentanil PCA for labour is an effective form of analgesia with few neonatal adverse effects and high maternal satisfaction. Issues with over-sedation and desaturation highlight the need for adequate training, awareness of possible complications and monitoring of mothers.

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P61 Prospective audit of the impact of a new obstetric anaesthesia chart on record keeping

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Introduction: Contemporaneous, clear note keeping is required to facilitate communication with colleagues and withstand potential medico-legal scrutiny. In our institution, a district general hospital with 2800 deliveries per annum, we have found it difficult to meet the published standards for obstetric anaesthesia record keeping.¹ We therefore elected to compare prospectively the documentation of regional anaesthesia/analgesia (RA) in parturients before and after the introduction of a new obstetric anaesthetic chart containing prompts and tick boxes.

Methods: Anaesthetic charts from 93 consecutive parturients before the introduction of the new chart were audited; and a further 93 following its introduction. Data were collected to assess the groups for comparability. For each chart we noted whether or not the following had been recorded: grade of anaesthetist, named consultant, consent for RA and details of RA insertion. For caesarean sections we noted testing of RA and intraoperative timings, usage of minimum monitoring and a record of the presence or absence of complications at the end.

Results: The two groups were similar in maternal age, time of day, mode of delivery and urgency if caesarean section, anaesthetic intervention and grade of anaesthetist and thus were suitable for comparison. Data were analysed using the χ^2 test. The new chart showed statistically significant improvements in recording of the grade of anaesthetist and named consultant ($P<0.001$); discussion of specific RA complications ($P<0.01$); recording the presence or absence of RA insertion pain/paraesthesia ($P<0.01$) and of complications ($P<0.05$). At caesarean section, recording of time of skin incision and use of minimum monitoring also improved ($P<0.05$). However, the recording on the new chart of vertebral interspace, use of asepsis, gown, mask, gloves and hat (GMGH) and subcutaneous local anaesthetic at RA insertion were all significantly decreased (all $P<0.01$) despite there being prompts for asepsis and vertebral interspace on the new chart.

Conclusion: We demonstrated improvements but also unexpected negative effects of a new anaesthetic chart on note keeping. We recommend that other units audit the introduction of any new anaesthetic chart to ensure that there are not unintended deleterious effects on record keeping.

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P62 Comparison of obstetric anaesthesia study populations with a tertiary referral obstetric population

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Introduction: Evidence-based medicine has become a major driving force in current medical practice. However, clinical expertise is required to determine whether external evidence applies to individual patients.¹ We aimed to compare the study populations in applicable randomised controlled studies (RCTs) with the actual patient population in our service.

Methods: We retrospectively examined all deliveries recorded in the two most recently completed unit birth register books (2006). Parameters recorded were: age, parity, gestation and whether it was a singleton pregnancy. We subdivided the groups into vaginal and caesarean deliveries and noted whether the caesareans was elective or emergency. All RCTs published in the International Journal of Obstetric Anaesthesia from January 2004 to October 2006 were identified. Inclusion and exclusion criteria regarding age, parity, gestation and multiple pregnancies were noted. Trials were compared to the appropriate patient group above. We calculated for each trial the percentage of patients in our unit who would meet the stated inclusion criteria.

Results: There were 3289 deliveries in our sample (7 months 19 days total) equating to an annual delivery rate of 5689. The caesarean section rate was 28.2%, 37% of which were elective. Thirteen RCTs were identified. The percentages of patients in our population who met the stated inclusion criteria for entry to each trial were as follows. For the six labouring women trials the mean was 72.9% (range 40.9% to 99.4%). For the seven caesarean section trials the mean was 36% (range 33.6% to 37%), primarily because the trials only studied elective operations and the majority in our unit were emergencies.

Conclusion: Whilst there must be inclusion and exclusion criteria in rigid RCTs we have shown that the demographics of study populations can be very different from those of a "real" population. Our comparison only included four parameters and it is likely that including others such as ASA status and co-morbidity would have further reduced the applicability of trial data to our patients. Our study confirms that care must be taken in extrapolating data from RCTs to one's own patient population.

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P63 Obstetric high dependency facilities: a survey of current practice

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Introduction: An obstetric high dependency unit (HDU) offers continuity of care, keeps the baby and the mother together and reduces the number of intensive care referrals. Peripartum HDU care is commonly required, whilst intensive care admissions from maternity units can vary from 0.26% up to 3.1% of all deliveries.¹ This survey aimed to explore current obstetric HDU facilities across the UK and compare current facilities with a previous survey.²

Method: An OAA survey was sent out in September 06 to 228 maternity units in the UK. The response rate was 73.6% (n=168).

Results: Of the 168 units, 66 (39.2%) had dedicated HDU beds. Of the remaining 102 units, 95 (93.1%) could provide temporary HDU facilities whilst seven (6.8%) could not provide HDU facilities, but had an onsite intensive care unit. Facilities varied enormously from basic oxygen therapy and non-invasive monitoring to a full range of invasive monitoring.

Table. Staffing in obstetric HDUs across the UK

	Midwife	ITU nurse	Midwife with ITU training	Other
Dedicated HDU	23 (34.8)	2 (3)	41 (62.1)	
Temporary HDU	46 (48.4)	23 (24.2)	23 (24.2)	3 (3.1)
Overall	69 (42.8)	25 (15.5)	64 (39.7)	3 (1.86)

Data are n (%)

Conclusions: Dedicated obstetric HDU provision has remained unchanged in the UK (39% cf 41% over the last 10 years²). The majority of units can provide temporary HDU facilities. Staffing of HDU is variable with more than a third looked after by midwives with no specific training. The increasing number of direct entry midwives with no general medical and surgical training will increase the problem of the appropriate staff to care for the sick parturient.

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P64 Ramadan: a survey of staff attitudes to fasting during pregnancy

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Introduction: Fasting during Ramadan is compulsory for people of the Muslim faith. Within our unit many Muslim women choose to fast whilst pregnant. Our maternity unit has 4000 deliveries per annum; approximately 60% are of Muslim faith. During the Ramadan season in 2006 there were 370 deliveries, of which 217 (57%) were Muslim and 58 (13%) were diagnosed with gestational diabetes. During the combined anaesthetic obstetric antenatal clinic we noticed that many pregnant women were fasting during Ramadan. However there was no formal process amongst the NHS staff to document the practice or advise these women. There is limited literature on NHS staff attitudes and beliefs on this important subject.

Methods: 50 multi professionals in our maternity unit were interviewed one to one during December 2006. Data were collected on belief, attitude and knowledge on fasting whilst pregnant during Ramadan.

Results:

- Maternity staff aware that pregnant women do 90% fast during Ramadan
- Believe fasting harms pregnant mother 62%
- Believe fasting harms fetus 56%
- Are against low-risk mothers fasting 54%
- Are against high-risk mothers fasting 88%
- Unaware of days/hours of Ramadan fasting 52%
- Believe staff of non-Muslim faith should not give advice on fasting 14%
- Muslim staff involved in survey 34%

Conclusion: 90% of staff interviewed are aware that fasting occurs, although 52% did not understand what is involved in the fasting process. Very strong opinions were expressed during interview, but none of the staff were aware of how many pregnant women actually fasted during Ramadan 2006. Good practice should involve maternity staff formally enquiring about fasting and giving appropriate advice. This is part of a series of surveys on staff and patients. We intend to develop and implement guidelines before Ramadan 2007 on evidence that is currently available. We intend to re-audit the impact of this guideline on attitudes, beliefs and knowledge of staff and patients within our multicultural maternity unit.

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P65 Obstetric epidurals: not just inserted at night!

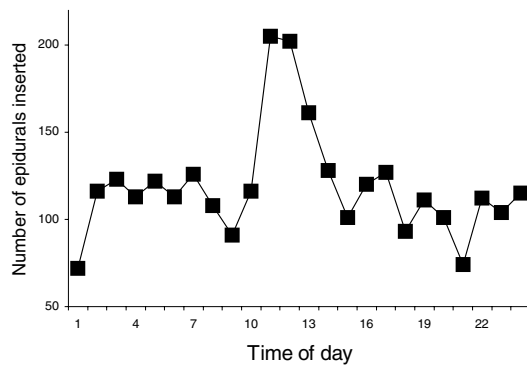
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Introduction: Our hospital offers a 24-hour epidural service. As part of ongoing resource planning, our study was conducted to establish at what time of day obstetric epidurals were inserted. No previous published data exist on this topic. Our null hypothesis was that the time of day did not affect the number of epidurals inserted. If peaks of activity were found to occur, more staffing might be needed at these times.

Method: In our unit, information about every obstetric epidural inserted is entered into a computer database for patient follow-up and audit purposes. From this database the time of every epidural inserted from 1st January 2003 to 31st December 2005 was obtained. The time of day for each epidural was then noted on a tally chart, giving the number inserted each hour for the three-year period.

Results: The number of epidurals inserted in 2003, 2004 and 2005 were 888, 940, and 1026 respectively. The number of epidurals inserted each hour during the study period was plotted. See figure:



Using the mean number of epidurals inserted per hour as the expected number, χ^2 analysis of the data produced a *P* value of <0.001.

Conclusion: The overall number of epidurals inserted increased each year. More epidurals are inserted between 10 am and 1 pm than at any other time. Fewer epidurals are inserted between 8 and 9 am, 5 and 6 pm, 8 and 9 pm and midnight to 1 am. More activity occurs in the morning, therefore allocating additional anaesthetists to the delivery suite at this time may provide a better service to patients.

P66 Maternal expectations and experiences of labour analgesia: an observational study

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Introduction: More women receive epidurals for labour pain than initially plan them.¹ The aim of this study was to determine whether this unplanned intervention impacts on childbirth satisfaction.

Method: After ethics approval, all women who had planned a normal vaginal delivery and who had delivered in the labour ward or midwife-led birthing centre in our unit were approached. Subjects were asked by an independent researcher if they had wanted an epidural, reasons why not and to rank their satisfaction with epidural analgesia (1-4) and childbirth experience (1-4) where 1= not at all satisfied and 4= very satisfied. The study was powered to achieve a significant number who received an unplanned epidural.

Results: 153 women were recruited with a mean age of 31 years. Median labour number was 1 (range 1 to 10), labour was induced in 31% and mean duration of labour was 14 h. The majority (64%) had a spontaneous vaginal delivery, 21% emergency caesarean section, 11% ventouse and 4% forceps. The commonest reason women did not want epidural analgesia was fear of complications (62%). Thirty-one women (20% of the study group) had epidural analgesia for labour but had not planned to antenatally. This group (no-yes) had a significantly lower satisfaction with the overall childbirth experience than women who did not plan nor had an epidural (no-no) (Fischers, *P*= 0.002).

Satisfaction	Observed		Total	Expected	
	no-no	no-yes		no-no	no-yes
1	1	1	2	1.2	.8
2	1	3	4	2.5	1.5
3	8	14	22	13.6	8.4
4	40	13	53	32.7	20.3
Total	50	31	81	50	31

There was no difference in satisfaction with epidural analgesia between groups (Fischers, *P*=1.0) and no other maternal or birth factors had a significant relationship to overall satisfaction (labour number *P*=0.651, mode of delivery *P*=0.499, length of labour *P*=0.113).

Conclusion: Women who have epidural analgesia who do not want it antenatally are less satisfied with their childbirth experience. Better antenatal education on epidural complications might improve this.

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P67 Maternal satisfaction and knowledge about epidural analgesia: a phone call survey

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Introduction: Epidural analgesia is a frequent practice in labour analgesia, being one of the most effective and commonly used techniques.¹ In order to assess maternal satisfaction and knowledge regarding epidural analgesia, a telephone survey was conducted.

Method: During a three-month period a telephone survey was conducted by an anaesthesiologist, addressing patients 30 to 40 days after delivery. Patients who had been given epidural analgesia were included if they were over 18 years of age, ASA I or II and delivered vaginally. The patients were questioned about their previous knowledge of epidural analgesia, doubts and questions, pain relief, satisfaction and expectations.

Results: From a total of 465 births during this period, 30% were excluded due to caesarean delivery. Seventy eight percent of patients who had vaginal deliveries were included in our study. We had, from a total of 181 questioned women, a 72.1% response rate to the phone questionnaire. All the patients surveyed had already heard about epidural analgesia, but only 35% requested it on admission; the others accepted epidural analgesia proposed by the midwife. Ninety percent had no doubts about this technique and only 8% asked for further explanations. Total or adequate pain relief was documented in 94% of the patients, and 96% reported being entirely satisfied about epidural analgesia. Only 5% would not repeat this technique for pain relief, the main reason being the desire to manage delivery without it.

Conclusion: All the parturients had already heard about epidural analgesia, but only a minor percentage requested it initially. We believe that the majority of women accept epidural analgesia even without consistent knowledge of the technique. Despite the high satisfaction level achieved, a lot of effort in education and information of the possibilities for labour analgesia is needed.

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P68 What do women want? An audit of antenatal information on analgesia for labour

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Introduction: We are concerned that inadequate antenatal information may mean that some women do not consider epidurals as an option for analgesia in labour. The OAA/AAGBI guidelines suggest that as many women as possible should be informed antenatally about analgesic options in labour.¹ The OAA leaflet is distributed to all women when booking for maternity care at KCH.

Method: We conducted an audit to ascertain what type of analgesia women were considering before labour, what type of analgesia they actually received and how they had accessed information antenatally. Women were interviewed using a standardised questionnaire on the first or second post partum day. All women interviewed delivered vaginally.

Results: 74 women were interviewed; 28 (38%) had considered epidural analgesia as an option and 46 (62%) had not considered it an option. In the event, 19 (26%) had epidural analgesia. Of these, 13 (68%) had considered epidural analgesia before going into labour, and six (32%) had not. Of these six, none recalled receiving information from a recognised anaesthetic source (OAA leaflet/discussion with an anaesthetist). The women who had considered epidural analgesia as an option had accessed more information modalities antenatally. Of the 74 women in the audit, 20 (27%) recalled receiving the OAA leaflet. Of those, only nine had considered epidural analgesia as an option. The commonest information modality accessed was antenatal classes (45%) and the least commonly used source was the internet (9%).

Conclusions: We are concerned that fully 46 (62%) of the women in this audit did not consider epidural analgesia to be an option in labour. Women who access less information are less likely to consider epidural analgesia as an option. This is important, as a third of women having epidural analgesia in labour did not consider it as an option beforehand. This disconnection between the expectation and the reality of childbirth may be a factor contributing to the dissatisfaction experienced by some women. Perhaps we should consider using more frequently used sources such as antenatal classes to disseminate information.

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P69 Why obstetric epidural blocks occasionally fail: results from the Australian epidurogram study

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Introduction: Unfortunately, there is a recognized failure rate for epidural blocks in parturients. There has been no previous large-scale study of the causes for epidural failure, both in labour and at caesarean section.

Method: Over the last 15 years, we have completed 164 epidurogram studies, following ethics committee approval and informed patient consent. Cases of failed block at caesarean section were considered to be those with an inadequate block 30 min after insertion or top-up, and those requiring rescue general anaesthesia or heavy sedation during surgery. Failed block in labour was defined as an unsatisfactory block during the first stage, which could not be corrected by withdrawing the catheter (three lateral eyes) by 1 cm and administering additional doses of local anaesthetic and opioid. Anaesthetists were requested, where possible, to leave the 'failed' catheter in place for later study and insert a second catheter in an adjacent interspace for pain relief. A 10-mL epidural injection of contrast and radiographic screening were performed after 3-48 h post partum.

Results: 105 cases of failed block (63 in labour, 42 at the time of surgery) were investigated, with the following results:

1. A septum: 40 (38%), unilateral or patchy blocks
2. Scoliosis: 14 (13%), mostly unilateral blocks
3. Catheter escape: 12 (11%), minimal pain relief
4. Extravasation of contrast to skin: 9 (9%)
5. Reduced vertical spread of contrast: 8 (8%)
6. Subdural injection (secondary)¹: 6 (6%)
7. Misplaced catheters: 3 (3%), i.v. or paravertebral
8. Post-surgical adhesions: 2 (2%)
9. No obvious cause: 11 (10%), normal contrast spread

Conclusion: An obstructive septum was found to be the commonest cause of block failure, as in our previous work,² with scoliosis also being a significant factor. The scoliosis, of which the patients often had no prior knowledge, was usually of a very minor degree, but sufficient to produce many predominantly unilateral blocks. Scoliosis also appeared to play a part in about 1 in 3 cases of catheter escape through an intervertebral foramen. The addition of a second epidural catheter and further dosing was almost invariably successful in overcoming a failed block and was without adverse incident.

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P70 Fruits of our labour: a novel epidural simulator

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Introduction: Lumbar epidural blockade is commonly performed by trainee anaesthetists who first experience the feel of loss of resistance on patients. Epidural simulators exist,^{1,2} but these have limited availability and are expensive. There is anecdotal evidence of fruit being used for the purpose of simulation.³ We carried out a blinded study to ascertain which commonly available fruits could best simulate the feel of loss of resistance.

Method: We constructed a wooden box with four sections into which a banana, an orange, a melon and a kiwi were inserted. Each fruit was covered by an opaque membrane. Fifty anaesthetists used their normal epidural technique on each fruit and ranked the fruits for realism on a visual analogue scale (0 mm= completely unrealistic, 100 mm= indistinguishable from patient). We compared the scores for each fruit using a general linear model in Minitab (v14). The significance level was 5%. Fruits were compared using the Bonferroni correction factor.

Results: There were significantly different levels of realism between the fruits. The banana was most realistic (mean VAS= 63 mm). The melon came second (52 mm), followed by the kiwi (44 mm) and the orange (39 mm).

Discussion: The level of realism offered by a banana compares favourably with a complex force-feedback system.² The banana is a very cheap makeshift epidural simulator which could be used to teach novice anaesthetists the feel of loss of resistance.

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P71 Evaluation of three methods of determining the L3-4 lumbar interspace using MR imaging

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Introduction: It has been demonstrated that unintentional high placement of spinal needles may lead to spinal cord damage and permanent neurological injury.¹ In a previous study,² only 29% of anaesthetists were able to identify a marked lumbar interspace correctly, with most thinking they were lower than they actually were. The aim of our study was to evaluate three different landmark methods to help correctly identify the 3-4 lumbar interspace and stay below the conus in patients undergoing routine lumbar magnetic resonance imaging.

Method: Following local ethics committee approval, 122 patients undergoing lumbar MR imaging were recruited. Anaesthetists of varying experience were asked to mark the L3-4 interspace using Tuffier's line or counting up from L5-S1 junction with the patient sitting on a firm bed with feet on a stool. An additional mark by a second anaesthetist was made two-thirds of the way down the back from C7 to the bed. Oil capsules were taped to the skin, which appeared as bright dots on the scan and were interpreted by a neuroradiologist.

Result: The conus terminated at the body of T12 in 32.7%, L1 in 62.2% and L2 in 4.9%.

Tuffier's line: 73% of anaesthetists marked the L3-4 interspace accurately using this landmark; 15.3% marked one space above and 3.8% marked two spaces above; 7.6% marked one or two spaces below.

Count up from L5-S1 junction: 50% of anaesthetists accurately marked the L3-4 interspace using this landmark; 38% were one space above and 2% were two spaces above; 10% were one or two spaces below.

Two-thirds down the back: This measurement corresponded to the following interspaces.

T12-L1	L1-L2	L2-3	L3-4
1.6%	31.1%	58.1%	9%

All anaesthetists were able to identify the interspace below this line and were well away from the conus.

Conclusion: Using an interspace below the two-thirds line from C7 to the bed for a spinal injection would have avoided the conus medullaris in all 122 patients. We feel that using this simple additional measurement in conjunction with Tuffier's line would increase safety.

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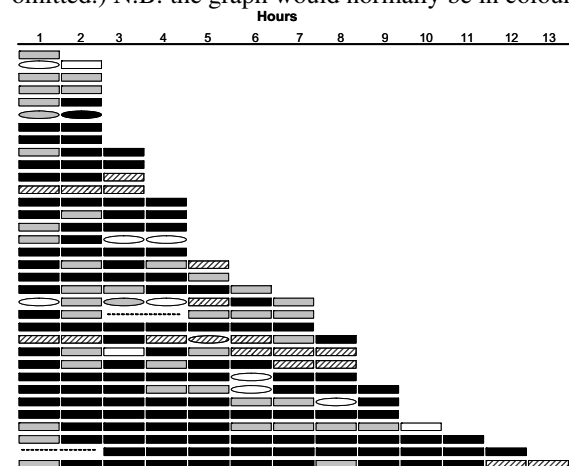
P72 Graphical presentation of labour analgesia

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Introduction: Traditionally, reports of labour analgesia use pain scores or the proportion of women achieving a set level of comfort over time.^{1,2} However, such methods omit individual responses and other relevant data e.g. side effects, intervention, etc. We present a new method for presenting regional analgesia over time.

Method: We conducted two recent audits of epidural analgesia, following changes in our standard regimen from bolus top-ups to PCEA and from high to low background infusion. We found traditional methods of presentation useful for descriptive summary statistics but inadequate for presenting the courses of individual women. We designed a graphical format in which hourly epochs were represented according to the quality of analgesia, motor block and intervention, using colour and shape to indicate each aspect.

Results: A sample graph is shown below, each row representing a different patient. Rectangles: analgesia (black: good; grey: moderate; white: poor); ovals: anaesthetist called; stripes: motor block; dotted line: missing data (for clarity, other details e.g. mode of delivery and volume of epidural solution used are omitted.) N.B: the graph would normally be in colour.



Conclusion: We have found the graphs easier to follow and present to multidisciplinary teams, and the amount of information conveyed greater, than with previous methods of presentation. The template can be easily drawn using standard presentation software (e.g. PowerPoint) and modified as required to represent other forms of continuous qualitative data. We have adopted this method as our standard when conducting audits of this type. Whether it has a place in routine clinical care/record keeping remains to be seen.

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P73 When to start a caesarean section after an epidural top-up: touch to T5, cold to T4, or something else?

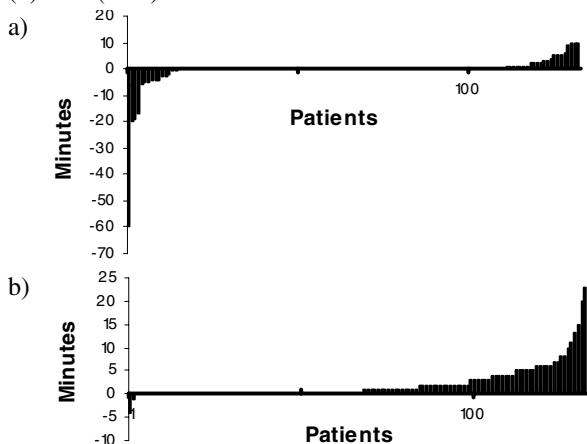
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Introduction: Touch to T5 has been suggested as the minimum level for caesarean section under regional anaesthesia, though cold to T4 is also widely used.¹ We compared the time taken to reach both levels with the time to achieve subjective readiness for surgery.

Methods: We analysed data from two previous studies of epidural top-up for emergency caesarean section^{2,3} in which times to T5 (touch; TT5), T4 (cold; TT4) and subjective readiness, deemed by the anaesthetist (TR) were recorded from the end of the top-up.

Results: Data from 133 patients were analysed. TR was the same as TT5 in 72% of patients, with 11% deemed ready before the block reached T5 to touch and 17% only ready after TT5; 49% of patients were deemed ready only after the block reached T4 to cold (Figure).

Figure: Difference between TR and (a) TT5 (touch) and (b) TT4 (cold).



Conclusion: Our results suggest that anaesthetists in our unit do not rely on TT4 to indicate readiness for surgery to start. Although TT5 equated with readiness in most cases, in 28% it did not, suggesting that other aspects of the case exert important influences. These may include motor block, urgency, efficacy of analgesia in labour and response(s) of the individual patient, although we were not able to assess these in this study. It would be interesting to investigate further which factors did make anaesthetists judge patients to be ready for surgery.

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P74 Obstetric continuous spinal analgesia/ anaesthesia: a survey of UK practice

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Introduction: Continuous spinal analgesia and anaesthesia (CSA) is "a technique of producing and maintaining spinal [analgesia and] anaesthesia with small doses of local anaesthetic which are injected into the subarachnoid space via an indwelling catheter."¹ The use of CSA macrocatheters in obstetrics, after accidental dural puncture, is now well established (a 1993 survey of UK practice showed <5% of units used CSA in these circumstances, rising to 59% in 2003), but little work beyond case reports has examined the use of intentional CSA (macro or microcatheter) placement within the obstetric cohort. This survey set out to establish the prevalence of CSA use in UK obstetric units, the circumstances in which CSA is used, the success rates and the complication rates of CSA.

Method: An OAA-approved postal survey was distributed to all 230 consultant-led UK obstetric anaesthetic units in August 2006. Lead clinicians completed the survey on behalf of their departments. A second, repeat survey was distributed to non-responders two months later.

Results: We received responses from 207/230 units (90%); a CSA technique had been used in 12 of 207 obstetric units (5.8%) during the previous three years. Total number of CSAs performed was 87 (range 1-25), of which 83 (95%) were for caesarean section alone, whilst three were for labour analgesia only and one for both. Six units used a catheter-over-needle technique, three used a catheter-through-needle technique and three had used both methods; all were microcatheters (<25 gauge). Mean length of intrathecal catheter in-space was 3.4 cm (1.5 – 4.5 cm).

Indications for CSA use were:

- Cardiovascular disease 42 (48.3%)
- Respiratory disease 2 (2.3%)
- Obesity 8 (9.2%)
- Previous spinal surgery 3 (3.5%)
- Placenta praevia 10 (11.5%)
- Musculoskeletal abnormality 22 (25.3%)

A success rate of 81 of 87 (93.1%) was reported, with a PDPH rate of 4 of 81 (4.9%). There were no recorded incidences of other complications.

Only four of 12 units employ a labour ward protocol for the use of CSA.

Conclusion: CSA is currently used in 6% of UK obstetric units. All uses were for high-risk cases. In this survey a PDPH rate of 4.9% was reported. No other complications were identified.

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P75 Spinal catheters in obstetric anaesthesia: experience from two tertiary centres

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Introduction: Spinal catheters allow high quality intrathecal analgesia and anaesthesia to be delivered incrementally. The theoretical advantage over combined spinal-epidural techniques is the greater control of titration afforded by the rapid onset of the increments. However, spinal catheters have a troubled past,¹ and are unfamiliar to most obstetric anaesthetists. We present the early experience from two units where spinal catheters are used for complex parturients, in particular those with severe cardiac disease.

Methods: Notes of all parturients who had spinal catheters sited in the last five years in two tertiary obstetric units were reviewed. Indications, efficacy, cardiovascular stability and complications were recorded.

Results: A total of 43 (20 Kendall Cospan 22-gauge Sprotte/28-gauge catheters and 23 Braun Spinocath 24-gauge) spinal catheters were used from 2000-2006.

Number	Labour/caesarean section	Indication
30	caesarean section	Cardiac disease
6	caesarean section	Long op/prev failed RA
2	caesarean section	Extreme short stature
2	caesarean section	Obesity
1	labour	Harrington rods
1	labour	Cystic fibrosis
1	labour	Cardiac disease

Of the 43 cases, two developed PDPH and required blood patching (1 Kendall, 1 Braun), but both received two dural punctures. Four failures occurred, three due to difficulty threading the catheter, the other due to inadequate blockade. Intravenous supplementation was used in 19% of cases. Paraesthesia during catheterisation occurred in 12% with no neurological sequelae. Of the cardiac cases, which included the highest risk patients in our practice, haemodynamic stability was impressive. A cardiomyopathy patient experienced vasovagal syncope without sequelae.

Conclusion: In our view, the excellent control of block height and haemodynamics justifies the relatively high rate of technical problems listed above. These problems are becoming rarer as our experience grows, further improving the balance between pros and cons with this technique. We encourage other units to pool experience of relatively infrequent cases and techniques.

Reference

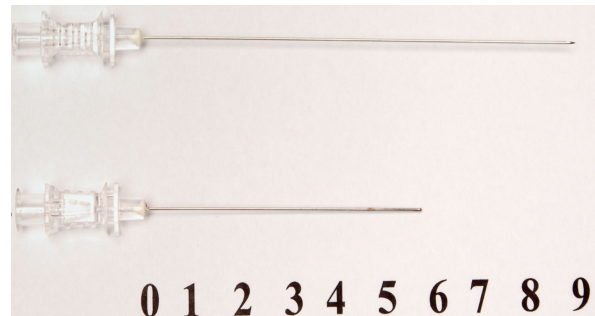
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P76 Spinal needle, stylet and Euler buckling

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Introduction: Spinal anaesthesia is usually straightforward and effective with well-recognised complications. Severe deformations and indeed breakage of spinal needles have been reported in the past,^{1,2} although the literature is sparse with respect to the causes of such breakage.³

Case report: We report a case of spinal needle breakage (Fig. 1) during anaesthesia for caesarean section, when the needle was advanced without the stylet in situ.



Discussion: Little if any literature addresses the role of the stylet in the performance of spinal anaesthesia. Given that in this case the spinal needle was advanced without the stylet in place, the question arises whether this contributed to needle breakage. This is a question of structural mechanics; which is less likely to break: a needle with a stylet inserted or a needle without a stylet inserted?

This question can be addressed by a modification of the Euler beam theory. It can be demonstrated that the stylet provides structural integrity to the needle preventing buckling and breakage. Therefore the needle should not be advanced without the stylet in place. Such instructions should be added to spinal needle packaging to reduce the chance of needle breakage.

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P77 Ultrasound-supported epidural catheterisation for emergency labour analgesia

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Introduction: In our hospital labour ward (>2500 labours per year), we do not provide analgesia on maternal request, or before labour. We provide analgesia (epidural 98%, i.v. opioids 2%) only if there is evidence of complicated labour. These interventions are carried out in an emergency situation in non-scheduled, un-assessed, exhausted women at any stage of labour. We intended to evaluate safety and effectiveness of an ultrasound-supported technique for epidural catheter placement in these situations.

Methods: We used an ultrasound-supported technique in 69 women positioned according to necessity (sitting position 61%, lateral 39%). With ultrasound we detected the chosen intervertebral space starting from L5-S1 and measured the distance from skin to epidural space. Then, scanning in paramedian longitudinal approach with an angle of 10°, we introduced the Tuohy needle using loss of resistance to saline. For ultrasound imaging we used a TITAN™ ESAOTE equipped with a 5-2 MHz curved array probe.

Results: During 2006, we placed 69 ultrasound-guided epidural catheters (28% of total emergency placement). Epidural analgesia for labour was successful in all women. In six cases (8.7%) we met some difficulties (bone contact), promptly solved at the second attempt. There was no correlation between difficulty and body mass index (BMI). The mean \pm SD BMI was 29.9 ± 6.3 kg/m².

	Number (%)	2 nd attempt
BMI < 35 kg/m ²	58 (84.1%)	8.6%
BMI \geq 35 kg/m ²	11 (15.9%)	9.1%

The epidural space was found at the same mean depth as that measured with ultrasound in all cases (5.8 ± 1.44 cm). No complications (dural puncture, epidural vascular injury, neurological problems) were observed.

Conclusions: Our preliminary results seem to meet safety needs for emergency labour epidural analgesia. The precision of epidural space distance measurement and real-time visualisation facilitate epidural catheter placement.

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P78 Variation in the relative position of the conus medullaris in the neutral and lateral decubitus flexed positions of the lumbar spine in healthy females: a magnetic resonance imaging study

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Introduction: Following case reports of damage to the conus medullaris associated with spinal anaesthesia, there is increasing concern about practising safe spinal analgesia among obstetric anaesthetists.¹ The position of the conus can be altered at post mortem by altering the degree of flexion of the spine.^{3,4} Fettes et al.⁴ recently studied movement of the conus on flexion using an open MRI system. This is relevant as spinal anaesthesia is usually sited in the sitting or lateral flexed position.

Methodology: Following central ethics and research committee approval, 20 healthy female volunteers of reproductive age were recruited. A pilot study demonstrated poor localisation of the conus using an open MRI scanner. We used a high field strength closed MRI Sigma 1.5T HD Excite scanner. All volunteers were scanned in the neutral and left lateral decubitus flexed position. A four-channel torso coil was wrapped around the volunteers in the left lateral flexed position to identify the position of the end of the conus medullaris. The angle of flexion was also measured. The parameters were sagittal T2, TR2320, TE125, ETL17. The MRI images were then examined by a single radiologist blinded to subject identity.

Results: The conus moved cephalad in 12 volunteers in the lateral flexed position, caudad in four and remained the same in four. There was clinically significant cephalad movement in three volunteers, judged to be 2/3 of the vertebral body. Using the binomial test for one proportion with a 95% CI, flexion does not cause significant movement in 62% to 97% of the study population.

Discussion: The flexed position was limited due to the closed MRI, but we felt it mimicked limited flexion of the lumbar spine in the third trimester of pregnancy. The conus medullaris moved cephalad in the majority of cases in relation to the vertebral column in the lateral decubitus flexed position. In women in the third trimester, it is difficult to flex the spine adequately, so flexion cannot be relied upon to confer extra protection against spinal cord damage during dural puncture.

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P79 Desperately seeking caesarean: search terms used by anaesthetists when searching electronic databases

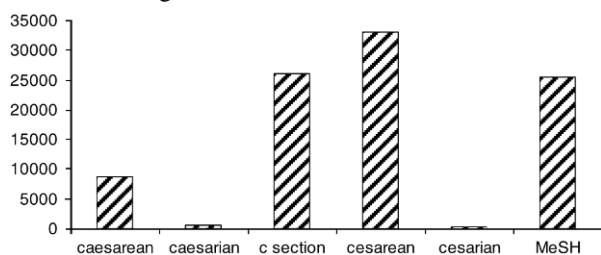
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Introduction: Electronic literature databases are key resources for training, research and clinical practice, but the hit rate for relevant articles depends greatly on the searcher's experience.¹ We surveyed anaesthetic trainees' use of search terms/tools for caesarean section and the influence their choice might have on the results.

Methods: Twenty-five trainees (all SpR) in the region were contacted either by telephone or in person and asked in confidence which term, and which search tool, they would use if seeking articles on caesarean section. We then entered the terms into the most commonly used search tools to see if the number of hits differed.

Results: All 25 trainees agreed to take part. The search tools used were Google (52% [4% Google Scholar]), PubMed (32%), both Google and PubMed (8%), and Ovid/HILO (8%). The search terms used were 'caesarean section' (32%), 'caesarian section' (28%), 'c section' (24%), 'cesarean section' (12%) and 'cesarian section' (4%). Only one (4%) used Medical Subject Heading (MeSH) terms, the others (96%) using free text. All trainees would use more than one term depending on the results of the first search, though this was not in a consistent pattern. The number of hits using Google with the different search terms ranged from 1,030,000 to 409,000,000, and using Google Scholar from 11,700 to 3,080,000. The number of articles identified using PubMed are shown below.



Conclusion: There are wide differences in the ways that anaesthetic trainees search electronic databases for published articles. Unless they have access to more experienced searchers or can be taught better skills themselves, or unless the search tools can compensate for poor searching by linking related terms more efficiently, this situation is unlikely to improve. Indeed, with increasing numbers of articles published each year, we suspect that searching for publications will become increasingly desperate and inefficient.

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P80 Synchronisation of maternity unit wall clocks

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Introduction: Anaesthesia and obstetrics are both time-critical specialities. For clinical, medico-legal and audit purposes it is very important that the documentation of time keeping is accurate. This is critical for grade 1 caesarean sections with the aim of safe delivery of the baby usually within 30 min.¹ To assess the synchronisation of the wall clocks in our maternity unit, we carried out the following audit. The proposed standard was for 100% agreement between clocks.

Method: The theatre wall clock was used as the reference clock. Data were recorded for location of wall clock, time displayed and concurrent time on the reference clock, and the difference between standard time and the theatre clock.

Results: Time differences of up to 10 min were found between clocks. Only six out of 26 clocks (23.1%) displayed the same time as the theatre clock. This increased to 17 out of 26 (65.4%) when allowing one minute's leeway between clocks. The theatre clock was found to be 2 min behind standard time.

Discussion: Accurate time keeping is a very simple but important aspect of the care of our patients. All clocks should be synchronised for accuracy of documentation. This audit shows that only about two-thirds of the clocks in our maternity unit are synchronised to within 1 min. This can lead to error in documentation. It is possible that even when decision-to-delivery is recorded as within 30 min, some emergency caesarean sections may in fact take longer. In other cases where the room clock is slower than the theatre, there may be undue pressure to expedite delivery. This may potentially lead to unnecessary administration of general anaesthesia when a regional technique would have been adequate. Any audits of patient care within the maternity unit that rely on timings may not represent the true standards of care. There are obvious medico-legal implications with the recording of times in patients' notes.

Conclusion: We recommend that the theatre wall clock is set to standard time and is used as the reference clock to set all other maternity unit wall clocks. Synchronisation should also be checked monthly. Serious consideration should be made to purchase radio-controlled wall clocks, which are relatively inexpensive (<£8 each). Only the wall clocks should be used when documenting in patients' notes. The audit should be repeated in six months, and include other important equipment e.g. monitors and epidural pumps. Other units may wish to check the accuracy of their own maternity unit's clocks.

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P81 Audit of clocks, watches and timepieces on the delivery suite

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Introduction: Within obstetrics and obstetric anaesthesia much attention is paid to timing of events around emergency caesarean section. A 30-min standard for decision to delivery time for emergency caesarean section for fetal distress has been set.¹ The implication is that failure to meet this standard represents suboptimal or even negligent care.² A difference of opinion between two members of staff over the time of decision to operate for a category 1 caesarean section led to this audit of the times held by timepieces over one weekend on the delivery suite and antenatal ward.

Method: A watch was synchronised to British Summer Time.³ All available timepieces were checked against the control watch and all staff (anaesthetists, obstetricians, midwives and ODPs) working daytime shifts on the delivery suite over the weekend September 23rd/24th 2006 were asked for the time on their watches and these times were also compared to the control time. Times were recorded as +/- minutes (fast or slow respectively) with respect to the control watch.

Results: A total of 39 watches, clocks and monitors that record time were available for analysis. The mean time difference from the control watch was +0.35 min and the standard deviation 1.95 min. The most striking difference was the distribution of times on the cardiotocograph (CTG) monitors, being 7 min.

Discussion: CTG monitors give a printed recording of time. If the two CTG monitors showing the extremes of times are used consecutively in a labouring woman with signs of fetal distress, before and after transfer to theatre for a category 1 caesarean section, 7 min can be effectively lost from the 30-min standard and perceived delays can occur. This could have medicolegal implications.

Conclusion: Different monitors print different times. Anaesthetists were reminded of the need to record timings of events according to the Royal College of Anaesthetists recommendations.⁴

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P82 Levels of care in obstetrics (LOCOBS): level the playing (or paying) field

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Introduction: In 2002 the *Intensive Care Society* (ICS) defined four levels of care for adult hospitalised patients.¹ These definitions excluded care in obstetric areas. The aim of this study was to quantify and apply levels of care for obstetric patients (LOCOBS).

Methods: LOCOBS stratified obstetric patients into levels of care analogous to ICS definitions: level 0= routine obstetric care; level 1= requiring more supervision or monitoring; level 2= requiring intensive monitoring and/or support of one organ system; level 3= requiring advanced airway support alone or support of two or more organ systems. LOCOBS was assessed prospectively on all admissions to labour ward from 0000h 1 June 2006 to 1200h 7 July 2006 (36.5 days - 10% of a year). Data collected included: time on labour ward, admission category (antenatal, delivery or postnatal), reasons for admission and LOCOBS. Data are presented as frequencies or percentages with 95% confidence interval (CI). Analyses included expanded Fisher's and binomial exact distributions with $P < 0.05$ as significant.

Results: There were 696 admissions with significant ($P < 0.0001$) variability in LOCOBS and admission category with delivery having significantly ($P < 0.0001$) higher LOCOBS.

Table. Frequency (%) of LOCOBS with admission category

LOCOBS	0	1	2	3	Total
Antenatal	318	33	0	0	351 (50)
Delivery	102	207	17	2	328 (47)
Postnatal	14	1	2	0	17 (2)
Total	434 (62)	241 (35)	19 (2.7)	2 (0.3)	696 (100)

Conclusion: Using LOCOBS, 3.0% (95% CI 1.9-4.6, n=21) of admissions to labour ward required critical care. However, antenatal women are admitted to our labour ward and represent over 50% of admissions. Excluding these implies that 6.1% (95% CI 3.8-9.2) of delivery admissions required critical care. It has been estimated that 1% of deliveries are likely to need "high dependency" care.² Our study, using a classification similar to that of the ICS, indicates that the true proportion of obstetric patients needing this care is significantly ($P = 0.0012$) higher. LOCOBS may have implications for service and resource management and may be useful as an audit tool to help establish realistic tariffs for *Payment By Results*.

References

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