



Blood loss and blood transfusion at caesarean section: a prospective observational study covering 30 years



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ABSTRACT

Objective: Attitudes to acute blood loss and transfusion have changed during the last 40 years. This study observed the trends in blood loss and transfusion rates at caesarean section during that period to identify any trends between 1976 and 2006.

Study design: Prospective analysis of clinical notes of women delivered by caesarean sections in a major district hospital obstetric unit in the UK, delivering around 6000 annually during four 12-month periods every 10 years from 1976 to 2006. Details including demographic, pregnancy, delivery, blood loss, transfusion, and puerperal observations were recorded.

Results: 3222 of 22,998 women were delivered by caesarean section during the four study years, increasing from 7.2% in 1976 to 23.4% in 2006 ($P < 0.001$). The median recorded blood loss was 500 ml, which did not change significantly over the study years. The rate of excess blood loss however increased in low-risk cases in 2006 compared with 1996 ($P < 0.001$); this increase followed the recommended restricted intra-operative oxytocin dose. Transfusion rates declined significantly from 22% in 1976 to 4–5% in 1996 and 2006 ($P < 0.001$).

Conclusions: Median blood loss remained steady for each of the study years but with an increase in excess blood loss cases in the last study year compared with the two previous study years. The explanation for this is presently uncertain, but was possibly influenced by the 2001 recommendation for a reduced dose of oxytocin at delivery. Transfusion rates declined, probably precipitated by anxieties over infections associated blood products. There was no indication of increased morbidity with the reduced transfusion rates accessed by the surrogate of post-delivery discharge times.

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Introduction

Excess blood loss during childbirth has long been recognised as a major cause of maternal morbidity and mortality in many areas of the world [1]. Throughout the period of data collection for the Confidential Enquiries into Maternal Deaths in England and Wales since 1952, haemorrhage has been a major cause of death and remains so to the present time [2], with the widely held view that excess blood loss is more frequently associated with caesarean section than vaginal delivery [1,3]. Factors associated with increased blood loss at delivery have previously been identified and include multiple pregnancy, pre-eclampsia, pre-existing antepartum haemorrhage and high parity [4–7] and specifically

at caesarean section include general anaesthesia [8–10] and the classical (vertical) uterine incision [8].

During the 1970s, it was practice in many obstetric units in the United Kingdom to routinely cross-match two units of whole blood for all women undergoing caesarean section. During the 1980s there was an increasing awareness of the risks of transmission of infective agents through blood transfusion with a consequent reduced enthusiasm for blood replacement [11–13]. The present study was conducted prospectively to observe the frequency of excess blood loss at caesarean section and the frequency with which blood transfusion was given.

Materials and methods

The clinical records of all women delivered by caesarean section in the John Radcliffe Hospital, Oxford during 1976, 1986, 1996 and 2006 were reviewed following the patients' discharge from

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hospital after delivery but before clinical coding and relevant information recorded on datasheets. Local authorisation for access to medical records was obtained for this service evaluation/audit. This was part of a long-term study examining trends in indications for and morbidity of caesarean section and for the latter two study years, the response times for surgery [12,14–16]. The total numbers of women delivered annually and the number delivered by caesarean section from 1975 were recorded.

Data recorded for each woman delivered by caesarean section included the following for the present study: maternal age, maternal height and weight at booking for 1996 and 2006, parity, pregnancy gestation at delivery and plurality, indication for caesarean section whether antepartum or intrapartum, identification of placenta praevia, category of caesarean section according to the Royal College of Obstetricians and Gynaecologists (RCOG) for 2006 [17], grade of surgeon, anaesthesia for the operation, if at full cervical dilatation, neonatal birthweight, recorded operative blood loss, whether transfusion was given and the date of discharge from hospital. Recorded blood loss was that estimated by the surgeon, the surgical assistant, the scrub-nurse and the anaesthetist in consultation and was defined as 'low' if 500 ml or less, 'average' if between 501 and 1000 ml and 'excess' if >1000 ml; this categorisation accorded with that recommended by the Healthcare Commission [18].

Comparative statistics are presented using odds ratios (OR) together with their 95% confidence intervals (CI). Comparative tests used include Chi-squared tests for categorical and binary variables, one-way analysis of variance (ANOVA) and non-parametric equivalents for non-normal data, Fisher's Exact test and Chi square test with Yates's correction for trend. Figures were generated using GraphPad Prism version 3.0 (GraphPad Prism Software Incorporated, San Diego, CA).

Results

During the four study years, 22,998 women were delivered in the hospital of whom 3222 were by caesarean section as shown in Table 1. Fig. 1 illustrates the annual total hospital deliveries and those by caesarean section. The increasing proportion by caesarean section was statistically significant ($P < 0.001$), without change between the proportion performed antepartum or intrapartum. Three parous women underwent hysterectomy to manage otherwise uncontrollable uterine bleeding: two were intrapartum, one following very preterm labour and one associated with uterine rupture while the third was a planned antepartum caesarean section for placenta praevia.

Table 1 shows demographic details for each of the four study years indicating there was a trend towards older women delivering and increasing numbers of multiple pregnancies. It also shows the recorded blood loss for each of the study years. The fall in rate in excess blood loss (>1000 ml) was significant between 1976 and 1996 ($P < 0.001$), while the increase in 2006 was significant compared with 1986 ($P = 0.012$) and with 1996 ($P < 0.001$). Tables 2 and 3 show the influence of demographic, pregnancy and delivery variables upon blood loss. Multiple compared with singleton pregnancies, general compared with neuraxial anaesthesia and non-longitudinal compared with longitudinal fetal lie were factors associated with a significant increased risk of excess blood loss. There were 93 women in whom pre-eclampsia (including two with eclampsia) was listed as a factor in the decision for caesarean section. The proportion did not vary significantly with each of the study years. In none of the 90 women with an estimated blood loss was their excess haemorrhage. Intrapartum caesarean section was associated with an increased risk compared with the antepartum operation: antepartum caesarean section for 63 cases with

Table 1
Total deliveries, caesarean sections, recorded blood loss and discharge intervals for each of the study years.

Year	1976	1986	1996	2006	Total
Total delivered	4464	5707	5846	5998	22,015
Total CS (% all deliveries)	324 (7%)	595 (10%)	901 (15%)	1402 (23%)	3222
Parity (% CS deliveries)					
Nullipara	143 (44%)	262 (44%)	420 (47%)	659 (47%)	1484
Multipara	181 (56%)	333 (56%)	481 (53%)	743 (53%)	1738
Age (years)					
<20	28 (9%)	21 (4%)	20 (2%)	32 (2%)	101
20–29	197 (61%)	318 (53%)	328 (36%)	429 (31%)	1272
30–39	85 (26%)	234 (39%)	501 (56%)	808 (58%)	1628
40+	14 (4%)	22 (4%)	52 (6%)	133 (9%)	221
Plurality**					
Singleton	318 (98%)	571 (96%)	859 (95%)	1327 (95%)	3075
Multiple	6 (2%)	24 (4%)	42 (5%)	75 (5%)	147
Previous CS					
No	204 (63%)	386 (65%)	602 (67%)	880 (63%)	2072
Yes	120 (37%)	209 (35%)	299 (33%)	522 (37%)	1150
Gestation (weeks)					
<29	1 (0%)	9 (2%)	17 (2%)	24 (2%)	51
29–34	21 (6%)	48 (8%)	83 (9%)	97 (7%)	249
35–37	36 (11%)	74 (12%)	116 (13%)	189 (13%)	415
>37	266 (82%)	464 (78%)	685 (76%)	1092 (78%)	2507
Blood loss (ml)					
≤500 [low]	176 (54%)	356 (60%)	703 (78%)	770 (55%)	1993
501–1000 [average]	121 (37%)	183 (31%)	190 (21%)	542 (39%)	1031
>1000 [excess]	25 (8%)	15 (3%)	4 (0%)	75 (5%)	119
Not recorded	2 (1%)	41 (7%)	4 (0%)	15 (2%)	62
Median	500	500	500	500	3143
(IQR)	(500, 750)	(400, 600)	(400, 500)	(500, 650)	
CS-discharge (days)					
Median (IQR)	10 (9,10)	7 (6,8)	4 (4,5)	4 (3,5)	3207
Not recorded	8 (2%)	2 (0%)	0	5 (0%)	15

CS, caesarean section.

* $P < 0.0001$ Chi-squared for independence.

** $P < 0.009$ Chi-squared for trend.

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