Readmission following caesarean section: Outcomes for women in an Irish maternity hospital

Abstract

Background: Women who give birth by caesarean section are more likely to require readmission to hospital following birth compared to women who give birth vaginally.

Aims: To examine the reasons, management and outcomes for women readmitted to hospital following birth by caesarean section (CS).

Methods: A retrospective audit of maternity records was undertaken.

Findings: The total number of births for the period of data extraction was 8580, of which 2470 (28.79%) women gave birth by CS. A total of 107 women (4.33% of those who gave birth by CS) were readmitted to hospital between 1 August 2014 and 31 July 2015, of which 46 women (1.86%) were readmitted following elective CS and 61 (2.47%) following emergency CS. The average length of hospital stay was 2.64 and 4.61 nights, respectively, and the average timeline for readmission was 14.6 days following elective CS and 15.7 following emergency CS. The most common reason for readmission was wound infection, with the majority of women requiring analgesics (*n*=29, 63.05% following elective CS and *n*=51, 83.61% following emergency CS) and intravenous antibiotics (*n*=23, 50% following elective CS and *n*=34, 55.74% following emergency CS).

Conclusions: Abdominal wound infection is one of the most common reasons for readmission of women to hospital following birth by CS. These findings will make it easier to understand and identify women at risk of postpartum morbidity following birth by CS.

Keywords: Caesarean section, Hospital readmission, Wound infection

Clinical audit has been regarded as a valuable asset to examine existing practices with an aim to improve quality of health care in future (Johnston et al, 2000). Rising rates of caesarean section (CS), with no improvements in maternal and neonatal morbidity, are a global concern (Zeitlin et al, 2013), and there is considerable variation from one country to another (Macfarlane et al, 2016).

Readmission to hospital following birth is considered to be a key indicator of maternal health (Lydon-Rochelle et al, 2000) and has been listed as one of the top 10 maternity care core outcome measures in a multinational Delphi survey (Devane et al, 2007). Women giving birth by CS are more than twice as likely as those who give birth vaginally to require readmission to hospital within 30 days of birth, primarily due to wound complications (Lydon-Rochelle et al, 2000; Thompson et al, 2002). Readmission to hospital post-CS was estimated to increase the cost of health care by 13% compared to readmission following vaginal birth, in a study of 244 088 women in Massachusetts, USA (Declercq et al, 2007). Analysis of data from 900 108 births in Canada for the years 1997/98 and 2000/01 showed that birthing by CS was associated with a fivefold increase in cardiac arrest (1.9% versus 0.4%), a fourfold increase in wound haematoma (13.0% versus 2.7%), a threefold increase in infection (6.0% versus 2.1%) and haemorrhage resulting in hysterectomy (0.3% versus 0.1%), and a twofold increase in anaesthetic complications (5.3% versus 2.1%) (Liu et al, 2007). Increased maternal and neonatal morbidities are associated with emergency CS, as well as when CS is performed without any medical indication (Karlström et al, 2013). The total cost of 'excess' CS in 2008, worldwide, was estimated to be approximately 5.4 times the cost of the 'needed' procedures (Gibbons et al, 2010).

While CS can potentially have a positive impact for some women and babies (Turnbull et al, 1999; Walker et al, 2007; Hofmeyr et al, 2015), it must be remembered that, as a major surgical operation, it may have a negative impact on women and babies, influence the overall level of activity of the hospital and incur additional costs. The negative impact on women (for example,

Sunita Panda, clinical midwife manager, Coombe Women and Infants University Hospital; PhD student, School of Nursing and Midwifery, Trinity College Dublin, Ireland

Professor Cecily Begley, chair of Nursing and Midwifery, School of Nursing and Midwifery, Trinity College Dublin; visiting professor, Sahlgrenska Academy, University of Gothenburg, Sweden

Dr Deirdre Daly, assistant professor, School of Nursing and Midwifery, Trinity College Dublin, Ireland

spanda@tcd.ie

in terms of bonding with the newborn, general health, and disturbances in settling into a routine with the newborn) can be further affected by the increased number of readmissions to hospital following birth by CS. According to national data for the Republic of Ireland, the total number of CS procedures in 2014 was 19 545, of which the total number of reported puerperal complications following birth by CS was 3381 (17.3%) (Healthcare Pricing Office (HPO), 2015).

This paper reports on an audit conducted to investigate the reasons for readmission of women to one large maternity hospital in Ireland following birth by CS, and their outcomes in terms of length of hospital stay, investigative procedures and medication management carried out in hospital.

Aims

This study aimed to measure and describe the reasons for, and management and outcomes of, women being readmitted to one large maternity hospital following birth by elective and emergency CS. The objectives were:

- To ascertain the number of women readmitted to hospital following birth by elective and emergency CS
- To identify the reasons for readmission to hospital following birth by CS
- To describe the outcomes of readmission following birth by CS in terms of investigations, medication management and length of hospital stay.

Methods

Study design

An audit was conducted in a large Irish maternity hospital to measure and describe the reasons for, and management and outcomes of, women being readmitted to the hospital following birth by CS. The audit proposal was reviewed by the hospital's Research Ethics Committee (REC) and, as only anonymised data were used, REC approval was not required. Variables for data collection were agreed and anonymised data were downloaded from the hospital database for a 1-year period (1 August 2014 to 31 July 2015) with help and support from the IT department.

Setting

The Republic of Ireland has one of the highest birth rates in Europe, at 15% (HPO, 2014). The CS rates for 2013 in three maternity hospitals in Dublin, each with more than 8000 births per annum, were: 23.1% for National Maternity Hospital (Mahony, 2014); 28% for Coombe Women and Infants University Hospital (Sheehan, 2014); and 31% for Rotunda Hospital (Coulter-Smith, 2014).

Sample

The audit was conducted in August 2015, hence it was decided to abstract data for the 12 months preceding this to obtain the most recent information about reasons for readmission and management following birth by CS. The population included all women who gave birth by elective ($n=1288$) or emergency ($n=1182$) CS in the study site from 1 August 2014 to 31 July 2015. A total of 6110 women gave birth vaginally during the period of data extraction, of which 155 women were readmitted to the hospital, indicating a readmission rate of 2.54% following vaginal birth compared to a readmission rate of 4.33% following birth by CS. However, the aim of this audit was to focus on readmission of women following birth by CS, so women who had vaginal births during the data extraction period were excluded from the audit.

Data collection

Data collected included non-identifying sample characteristics, number of women readmitted to the hospital following elective and emergency CS, the reasons for readmissions, investigations conducted, medication management and clinical outcomes.

Data analysis

Data were analysed using descriptive statistics, with inferential tests used when appropriate.

Data abstracted from the hospital database included information about readmission to hospital and did not include any information about women who attended the hospital emergency department following birth by CS, which limited the findings of the audit to women who were admitted as inpatients only; this may be considered as a bias in this audit.

Results

Sample characteristics

A total of 2470 women birthed by CS (elective: $n=1288$; emergency: $n=1182$) during the 12-month period of the audit. Forty-six out of a total of 1288 women who had an elective CS were readmitted (3.57%), compared with 61 out of 1182 women who had emergency CS (5.16%), a non-significant difference (chi-square = 3.76, df = 1, $P=0.052$). The majority ($n=32$, 69.57% and $n=39$, 63.93%, respectively) self-referred and the remainder were referred by GPs, public health nurses, community midwives or other hospitals (*Table 1*). Women

Table 1. Referral route and reasons for readmission of women to hospital following birth by caesarean section

Variables	Elective caesarean section		Emergency caesarean section	
Total number of births	1288		1182	
Number of readmissions	46 (3.57% of total)		61 (5.16% of total)	
Details of readmission	***n***	**% of readmissions**	***n***	**% of readmissions**
Referred by				
Self	32	69.57	39	63.93
GP	3	6.52	8	13.11
Public health nurse	2	4.35	8	13.11
Other hospital	5	10.87	4	6.56
Community midwife	4	8.70	2	3.28
Reason for readmission				
Abdominal wound infection, pelvic haematoma, pelvic collection, sepsis and/or pyrexia of unknown origin	13	28.26	26	42.62
Hypertension	10	21.74	14	22.95
Breast infection, engorgement, abscess, follicular abscess	5	10.87	7	11.48
Chest infection, suspected pulmonary embolus	5	10.87	5	8.20
Other: headache, dural tap, Bartholin's cyst	3	6.52	1	1.64
Endometriosis, endometritis	2	4.35	1	1.64
Urinary tract infection, renal colic, urinary retention	2	4.35	1	1.64
Retained products of conception	1	2.17	1	1.64
Postpartum haemorrhage	1	2.17	1	1.64
Upper abdominal pain	1	2.17	1	1.64
Anxiety	1	2.17	0	0.00
Gastritis, peptic ulcer disease, hepatic collection	1	2.17	2	3.28
To stay with baby	1	2.17	0	0.00
Vomiting	0	0.00	1	1.64

were admitted at a mean of 14.61 days (SD=14.0) following elective CS and 15.68 days (SD=10.75) following emergency CS.

Reasons for readmission to the hospital

The most common reason for readmission in both groups was infection, including abdominal wound infection, pelvic haematoma, pelvic collection, sepsis and pyrexia of unknown origin ($n=13$, 28.26% (elective) compared with $n=26$, 42.62% (emergency)) (*Table 1*). The second commonest reason was hypertension following birth by CS ($n=10$, 21.74% *vs* $n=14$, 22.95%). Other reasons for readmission included breast infection, engorgement, abscess, chest infection, suspected pulmonary embolism, endometriosis, endometritis, urinary tract infection, renal colic, urinary retention, retained products of conception, postpartum haemorrhage, upper abdominal pain, gastritis, peptic ulcer disease, hepatic collection, headache, dural tap, Bartholin's cyst, anxiety and vomiting (*Table 1*).

Investigations and procedures performed during readmission to hospital

Almost all women had a full blood count performed ($n=42$, 91.30% (elective) and $n=58$, 95.08% (emergency)) and almost all had further

Table 2. Investigations and management of women during readmission following caesarean section

Variables	Elective caesarean section		Emergency caesarean section	
Total number of births	1288		1182	
Number of readmissions	46 (3.57% of total)		61 (5.16% of total)	
	n	% of readmissions	*n*	% of readmissions
Blood tests and investigations				
Full blood count	42	91.30	58	95.08
C-reactive protein	27	58.70	43	70.49
Urea and electrolytes/liver function test/lactates	26	56.52	36	59.02
Blood cultures	8	17.39	14	22.95
Coagulation profile	3	6.52	2	3.28
Blood grouping and/or cross-match	3	6.52	1	1.64
No tests	4	8.70	1	1.64
Tests and procedures				
High vaginal swab/Mid-stream urine/wound swab/ samples for culture and sensitivity	17	36.96	37	60.66
Ultrasound	7	15.22	10	16.39
Chest x-ray/electrocardiogram	5	10.87	5	8.20
Computed tomography pulmonary angiogram/ventilation/ perfusion lung scan (in general hospital)	4	8.70	4	6.56
Investigation for hypertension	4	8.70	2	3.28
Methicillin-resistant *Staphylococcus aureus* screening	2	4.35	2	3.28
Evacuation of retained products of conception	1	2.17	0	0.00
Drugs administered on admission				
Analgesic	29	63.04	51	83.61
Intravenous antibiotics	23	50.00	34	55.74
Antihypertensive	11	23.91	17	27.87
Anticoagulant	7	15.22	7	11.48
Oral/topical antibiotics	6	13.04	3	4.92
Intravenous fluids	3	6.52	9	14.75
Oxytocic	3	6.52	0	0.00
Iron supplementation	2	4.35	3	4.92
Antacid (ranitidine/Losec/antiemetic)	1	2.17	3	4.92
None	1	2.17	3	4.92
Drugs prescribed on discharge				
Antibiotic	26	56.52	35	57.38
Analgesic	13	28.26	22	36.07
Antihypertensive	8	17.39	15	24.59
None	7	15.22	4	6.56
Antacid (ranitidine/Losec/iron supplementation/Lexapro/ Eltroxin/Tamiflu/hydrocortisone)	4	8.70	7	11.48
Anticoagulant	1	2.17	1	1.64

blood tests (*Table 2*). A small number of women did not require any blood tests ($n=4$, 8.70% (elective) and $n=1$, 1.64% (emergency)). High vaginal swabs, mid-stream specimens of urine, or wound swabs were taken for culture and sensitivity tests from the majority of women ($n=17$, 36.96% (elective) and $n=37$, 60.66% (emergency)), and most had further tests such as chest x-ray

or ultrasound scan, computed tomography pulmonary angiogram, ventilation/perfusion lung scan, or electrocardiogram. This audit is limited to the description of investigations performed and does not involve analysis of the cost implications associated with these procedures.

Medication management during readmission to and discharge from hospital

Three women had no medications administered on readmission to hospital but the majority had analgesics ($n=29$, 63.04% (elective) and $n=51$, 83.61% (emergency)) and intravenous antibiotics ($n=23$, 50.00% (elective) and $n=34$, 55.74% (emergency)) administered. Eleven women had no medications prescribed on discharge, while the majority were prescribed oral antibiotics ($n=26$, 56.52% (elective) and $n=35$, 57.38% (emergency)) and oral analgesics ($n=13$, 28.26 (elective) and $n=22$, 36.07% (emergency)).

Timeline for readmission to the hospital

The average timeline for readmission of women following CS was 14.6 days following emergency CS, and 15.7 days following elective CS.

Length of stay in hospital during readmission

Length of hospital stay was calculated by subtracting the hospital readmission date from the discharge date. The mean length of time women stayed in hospital following readmission was 2.64 nights (SD = 2.24) for those who had elective CS and 4.61 nights (SD = 3.86) for those who had emergency CS; this difference was statistically significant ($t=3.0892$, $P<0.01$).

Discussion

The results of this audit show the reasons and outcomes for the 107 women (4.33% of the total number of women who gave birth by CS) readmitted to hospital following CS. Analysis indicates that the mean postnatal day at the time of readmission to the hospital was 14.6 days following elective and 15.7 days following emergency CS. A population-based cohort study from Canada using discharge data from 900 108 women reported an increased readmission of women to the hospital following CS (1.8%) compared to spontaneous vaginal births (1.5%) within 60 days after initial discharge (Liu et al, 2005). Similar findings were reported by Lydon-Rochelle et al (2000) in an American cohort, with an increased likelihood of 80% of readmission to hospital within 60 days following birth by CS compared to vaginal births.

The findings of this audit show that the most common reason for readmission of women to the hospital following birth by CS was infection or suspected sepsis (28–43%). Ade-Conde et al (2011) retrospectively reviewed 236 maternity records of women readmitted within 6 weeks postpartum during the 4-year period from 2005–08 and reported CS wound infection and pelvic collection (47.5%) to be the most common reasons for readmission following birth by CS. Lydon-Rochelle et al (2000), using data from 256 795 women obtained from the Washington State Birth Events Record Database, reported a 30-fold increased risk of readmission to hospital due to wound infection following CS. Similar findings have been reported by Declercq et al (2007) from analysis of hospital discharge records in Massachusetts from 1998 and 2003. The authors reported a 2.3 times increased risk of readmission to hospital within 30 days following planned primary CS compared to planned vaginal births. The main reasons for readmission following CS were wound complications (6.60 per 1000 births) and major puerperal infections (3.30 per 1000 births). These studies were conducted up to 15 years ago and it is possible that antibiotic regimes in other countries and in earlier times may have been different. The current practice on use of antibiotics in the study site involves intravenous administration of a single dose of cefuroxime 1.5 mg (from the cephalosporin group) during planned and emergency CS. More recent research from 14 sites in the UK found that 9.59% ($n=394$) of 4107 women undergoing CS developed an infection, with 5.84% of them ($n=23$) readmitted for treatment (Wloch et al, 2012).

Other reasons for readmission following CS in Declercq et al's (2007) study included genitourinary tract infection, inflammatory diseases of the uterus and postpartum haemorrhage. Some authors have also reported wound complications, venous thromboembolism and major puerperal infection to be the most common reasons for readmission to hospital postpartum (Liu et al, 2005). The current audit also found readmissions with a diagnosis of breast-related infection, gastritis, endometritis, urinary tract infections and pulmonary embolism. A population-based prospective cohort study in the Netherlands reported an increased risk of postpartum haemorrhage in the second birth for women who had emergency CS compared to those who had planned vaginal birth for their first birth (Kok et al, 2014).

In this audit, readmission resulted in an average hospital stay of 2.6–4.6 days, with women who

had undergone emergency CS requiring a longer stay. As postnatal costs in an Irish maternity unit have recently been estimated at €1196 per bed-day (Kenny et al, 2015), this means that the cost for readmission for complications post-CS is, on average, €4306 per woman. As almost all women required medication and laboratory investigations, further costs are incurred.

These results demonstrate that the rate of readmission of women for complications following CS was 4.33% of the total number of women who gave birth by CS. Frequently these issues remain unknown due to lack or limited availability of follow-up data on women's health after childbirth. What is also not known is the impact these health problems have on the women concerned. Kealy et al (2010), in a qualitative study with women within 12 months of giving birth by CS, found that women reported a range of health issues related to physical discomfort, pain, reduced mobility, abdominal wound problems, infection, vaginal bleeding and urinary incontinence. A survey with 971 primiparous women, aimed at determining the association between mode of birth and self-reported postpartum health at 7 weeks postpartum, found lower self-reported general health postpartum in women who had CS and assisted vaginal birth compared to women with unassisted vaginal birth. Some of these self-reported postpartum health indicators were related to physical functioning, mental health, general health perception, bodily pain, social functioning and daily activity (Lydon-Rochelle et al, 2001).

Conclusions and recommendations

Investigating and recording readmissions routinely can help identify the occurrence of maternal morbidities at different stages of the postnatal period. Such discussions may help create an awareness of health problems among women and encourage them to seek timely support to mitigate the severity of complications (Borders, 2006). This, in turn, can help health professionals look into better ways of preventing or managing these health problems promptly. This could improve women's overall health and wellbeing, prevent readmission to hospital and separation from their babies and families, and ultimately reduce costs to the health service.

Further research is needed to explore the occurrence of health problems at different postpartum time points to see if health service provision is adequate in meeting women's postpartum health needs. Ultimately, timely health service provision can, if not prevent, at least minimise some postpartum health problems. Future audits are required to examine the cost implications associated with management and care of women readmitted to hospital following birth by CS, and there is a need to compare the outcomes of women following vaginal births with birth by CS. In Ireland, along with many other countries, there is no connectivity between maternity hospital and primary/community care services and caregivers, so there is a need for health professionals to have further discussions about postpartum health with women in the early postpartum days, in order to mitigate complications. **BJM**

Key points

- Readmission following birth has implications for the health service, in terms of women's length of stay in hospital and management (investigations and treatment) during the period of readmission
- An audit was conducted using retrospective data from the hospital database of 107 women readmitted to a large Irish maternity hospital following birth by caesarean section (CS), to look into the reasons for readmission, management and outcomes for women
- Abdominal wound infection was one of the most common reasons for readmission of women ($n=13$, 28.26% (elective) compared with $n=26$, 42.62% (emergency))
- The majority of the women required analgesics ($n=29$, 63.04% (elective) and $n=51$, 83.61% (emergency)) and intravenous antibiotics ($n=23$, 50% (elective) and $n=34$, 55.74% (emergency)) during their hospital stays
- The mean length of hospital stay was 2.64 nights (SD = 2.24) following elective CS and 4.61 nights (SD = 3.86) following emergency CS
- The average timeline for readmission of women following CS was 14.6 days following emergency CS and 15.7 days following elective CS
- Future audits should explore the cost implications of hospital readmission following CS

***Conflict of interest**: The authors have declared no conflict of interest.*

Ade-Conde JA, Alabi O, Higgins S, Visvalingam G (2011) Maternal post natal hospital readmission-trends and association with mode of delivery. *Ir Med J* **104**(1): 17–20

Borders N (2006) After the afterbirth: a critical review of postpartum health relative to method of delivery. *J Midwifery Womens Health* **51**(4): 242–8

Coulter-Smith S (2014) *The Rotunda Hospital Dublin Clinical Report 2013*. http://tinyurl.com/jvfyrlb (accessed 11 April 2016)

Declercq E, Barger M, Cabral HJ, Evans SR, Kotelchuck M, Simon C, Weiss J, Heffner LJ (2007) Maternal outcomes associated with planned primary cesarean births compared with planned vaginal births. *Obstet Gynecol* **109**(3): 669–77

Devane D, Begley CM, Clarke M, Horey D, OBoyle C (2007) Evaluating maternity care: a core set of outcome measures. *Birth* **34**(2): 164–72

Gibbons L, Belizán JM, Lauer JA, Betrán AP, Merialdi M, Althabe F (2010) *The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage*. World Health Organization, Geneva

Healthcare Pricing Office (2014) *Perinatal Statistics Report 2013*. www.hse.ie/eng/services/publications/Perinatal_Statistics_Report_2013.pdf (accessed 11 April 2016)

Healthcare Pricing Office (2015) Hospital In patient Enquiry (HIPE) Statistics Reporter. www.hpo.ie (accessed 20 March 2016)

Hofmeyr GJ, Barrett JF, Crowther CA (2015) Planned caesarean section for women with a twin pregnancy. *Cochrane Database Syst Rev* **12**: CD006553. doi: 10.1002/14651858.CD006553.pub3

Johnston G, Crombie IK, Davies HT, Alder EM, Millard A (2000) Reviewing audit: barriers and facilitating factors for effective clinical audit. *Qual Health Care* **9**(1): 23–36

Karlström A, Lindgren H, Hildingsson I (2013) Maternal and infant outcome after caesarean section without recorded medical indication: findings from a Swedish case-control study. *BJOG* **120**(4): 479–86. doi: 10.1111/1471-0528.12129

Kealy MA, Small RE, Liamputtong P (2010) Recovery after caesarean birth: a qualitative study of women's accounts in Victoria, Australia. *BMC Pregnancy Childbirth* **10**: 47. doi: 10.1186/1471-2393-10-47

Kenny C, Devane D, Normand C, Clarke M, Howard A, Begley C (2015) A cost-comparison of midwife-led compared with consultant-led maternity care in Ireland (the MidU study). *Midwifery* **31**(11): 1032–8. doi: 10.1016/j.midw.2015.06.012

Kok N, Ruiter L, Hof M, Ravelli A, Mol BW, Pajkrt E, Kazemier B (2014) Risk of maternal and neonatal complications in subsequent pregnancy after planned caesarean section in a first birth, compared with emergency caesarean section: a nationwide comparative cohort study. *BJOG* **121**(2): 216–23. doi: 10.1111/1471-0528.12483

Liu S, Heaman M, Joseph KS, Liston RM, Huang L, Sauve R, Kramer MS (2005) Risk of maternal postpartum readmission associated with mode of delivery. *Obstet Gynecol* **105**(4): 836–42

Liu S, Liston RM, Joseph KS, Heaman M, Sauve R, Kramer MS (2007) Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term. *CMAJ* **176**(4): 455–60

Lydon-Rochelle M, Holt VL, Martin DP, Easterling TR (2000) Association between method of delivery and maternal rehospitalization. *JAMA* **283**(18): 2411–6

Lydon-Rochelle MT, Holt VL, Martin DP (2001) Delivery method and self-reported postpartum general health status among primiparous women. *Paediatr Perinat Epidemiol* **15**(3): 232–40

Macfarlane AJ, Blondel B, Mohangoo AD, Cuttini M, Nijhuis J, Novak Z, Ólafsdóttir HS, Zeitlin J (2016) Wide differences in mode of delivery within Europe: risk-stratified analyses of aggregated routine data from the Euro-Peristat study. *BJOG* **123**(4): 559–68. doi: 10.1111/1471-0528.13284

Mahony R (2014) *The National Maternity Hospital, Holles Street. Annual Report 2013*. http://tinyurl.com/hnhut63 (accessed 11 April 2016)

Sheehan S (2014) *Coombe Women and Infants University Hospital Annual Clinical Report 2014*. www.coombe.ie/index.php?nodeId=110 (accessed 11 April 2016)

Thompson JF, Roberts CL, Currie M, Ellwood DA (2002) Prevalence and persistence of health problems after childbirth: associations with parity and method of birth. *Birth* **29**(2): 83–94

Turnbull DA, Wilkinson C, Yaser A, Carty V, Svigos JM, Robinson JS (1999) Women's role and satisfaction in the decision to have a caesarean section. *Med J Aust* **170**(12): 580–3

Walker SP, McCarthy EA, Ugoni A, Lee A, Lim S, Permezel M (2007) Cesarean delivery or vaginal birth: a survey of patient and clinician thresholds. *Obstet Gynecol* **109**(1): 67–72

Wloch C, Wilson J, Lamagni T, Harrington P, Charlett A, Sheridan E (2012) Risk factors for surgical site infection following caesarean section in England: results from a multicentre cohort study. *BJOG* **119**(11): 1324–33. doi: 10.1111/j.1471-0528.2012.03452.x

Zeitlin J, Mohangoo A, Delnord M, eds. (2013) *European Perinatal Health Report. The health and care of pregnant women and babies in Europe in 2010*. www.europeristat.com/images/doc/Peristat%202013%20V2.pdf (accessed 11 April 2016)