



## Caesarean section in term nulliparous women at Wellington Hospital in 2001: a regional audit

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### Abstract

**Aims** The aims of this audit were to determine the frequency of caesarean section (CS) in the Wellington region for term nulliparous women, to evaluate the local demographic and clinical factors associated with CS, and to assess the quality of clinical care.

**Methods** Nulliparous women with singleton live pregnancies and a gestational age  $\geq 36$  weeks who had a CS in Wellington Hospital during 1 January 2001 to 30 June 2001 were identified using a computerised database. The Hospital records were reviewed. Demographic and clinical factors associated with CS were analysed and assessed against standards from the literature.

**Results** A total of 743 women with a singleton live pregnancy  $\geq 36$  weeks delivered during the period. 209 women met the criteria and 201 files were available. The estimated corrected CS rate was 27%. Thirty-six women (5%, 36/743) had an elective CS, and 165 (22%, 165/743) had an emergency CS. Dystocia (48%), suspected fetal compromise (23%), and malpresentation (20%) represented the most common indications for CS. A significant proportion of CS were performed without meeting the standards.

**Conclusions** In term nulliparous women, the indications for CS and the compliance with recognised standards from the literature were very similar to those observed in other industrialised countries.

There is an increasing tendency to perform caesarean sections in most industrialised countries, although there are marked differences among countries in both the timing and the rate of increase in caesarean section (CS) rates.<sup>1</sup> The reasons for this global increase in caesarean sections are multiple and complex, and what constitutes a 'good indication' for a CS is clearly a matter of controversy. Greater customer expectations and choice, older maternal age, smaller family units, inadequate models of care, and fear of litigation represent some aspects of modern pregnancy care that have been associated with the increase in CS rate.<sup>2</sup>

In the USA, where the increase in CS rate was first observed, the CS rate reached 24% in 1990, then stabilised and even fell somewhat to 22% in 1999 following initiatives taken to stabilise or reduce the CS rate.<sup>3,4</sup> These initiatives have focuses on decreasing the rate of first CS and increasing the rate of vaginal deliveries after CS.<sup>2</sup> In New Zealand, the CS rate rose to 22.1% in 2001.<sup>5</sup>

In the year 2000, at Wellington Hospital, a tertiary referral centre, the local CS rate has reached 26.6% for all women, one of the highest in the country.

The aims of this audit were to determine the frequency of CS in the Wellington region for term nulliparous women, to evaluate the local demographic and clinical factors

associated with CS, and, to assess the quality of clinical care against agreed standards derived from published literature.

## Methods

Nulliparous women with a singleton live pregnancy with a gestational age  $\geq 36$  weeks (who delivered in Wellington Hospital during 1 January 2001 to 30 June 2001) were identified by Capital and Coast District Health Board's Perinatal Information Management System.

Data was extracted from the Perinatal Information Management System for women who delivered vaginally and directly from the hospital records of women who had a CS. The data included: maternal age, gestational age, induction of labour (IOL), epidural anaesthesia for women in labour, birthweight, neonatal outcome (live/stillborn), and the presence of severe asphyxia.

For women delivered by CS, ethnicity and indication for CS was also noted. Severe asphyxia was defined as evidence of metabolic acidosis in intrapartum fetal scalp blood, umbilical arterial cord, or on very early neonatal blood sample (pH  $< 7.00$  and base deficit  $> 12$  mmol/L) with early onset severe or moderate neonatal encephalopathy<sup>6</sup>.

Ethnicity was self-reported as defined by the Ministry of Health, and grouped as European/other, Maori, Pacific Island, or Asian. Caesarean section was classified as either an elective or an emergency intervention. Indications for CS were divided in the following categories: dystocia (including failure to progress during the latent phase of labour, failed IOL, failure to progress during the active phase of the first stage and during the second stage of labour), suspected fetal compromise, malpresentation, placenta praevia/antepartum haemorrhage, and 'other'.

An indicated CS was defined as a CS performed in the presence of at least one of the below-defined indications using a recognised standard from the literature. All cases where the clinical indication was not clearly documented (or the criteria for an indicated CS was not clearly met) were reviewed independently by two obstetricians, and classified either as either 'indicated' (one or both of the obstetricians found that a criteria for an indicated CS was met) or 'not indicated' at the time of the decision.

Considerations included a careful review of the partogram and notes describing the progress of labour and the nature and quality of obstetric intervention, records of clinical assessments, inspection of cardiocotograph (CTG), and the feasibility of fetal blood sampling (FBS). FBS was considered feasible if the cervix was  $\geq 4$ cm dilated.<sup>1</sup> For simplicity of assessment, time was rounded up to the nearest hour. If documented, the woman's request for a CS in the absence of a medical indication was recorded.

Malpresentation was a recognised indication for CS when the fetus was in breech, transverse, brow, or face presentation at the time of labour/delivery. Furthermore, when CS was performed for a breech presentation, it was noted whether external cephalic version (ECV) was offered or attempted prior to labour.<sup>7</sup>

Consensus criteria for dystocia (including failed labour induction, failure to progress during the latent phase, or first stage and second stage of labour) have not been clearly established.<sup>8-10</sup> However, one of the recognised auditable standards for failure to progress in labour is that oxytocin should be used in the management of nulliparous women with suspected failure to progress in labour prior to CS (*Standard 1*).<sup>11</sup>

To obtain a credible crude estimate of the lowest possible CS rate for dystocia, a pragmatic approach (taking account of the current maternity system in New Zealand) was used.

Three factors were taken into account.

- Firstly, the observation that many pregnant women do not wish to have a long labour and favour continuity of care during labour,
- Secondly, that most workers find shifts in excess of 12 hours unreasonable, and
- Thirdly that no independent midwives in Wellington work in large teams allowing rostered day/night duties.

Therefore, the least time stringent recognised standards of management of dystocia were chosen because they fit best with the current model of labour care. In this study, failed induction of labour and failure to progress during the latent phase of labour were defined as an indication for CS when despite ruptured membrane and 6 hours of oxytocin perfusion the cervix did not reach a dilatation  $> 3$ cm (*Standard 2*).<sup>10</sup>

The indication for CS for failure to progress during the active phase of labour was defined as failure to progress when there has been an arrest in dilatation, despite ruptured membranes and oxytocin infusion for over 4 hours (*Standard 3*).<sup>9</sup> Failure to progress in the second stage of labour was an indication for CS if the baby has not been delivered vaginally after 2 hours with oxytocin augmentation for some time during the second stage (*Standard 4*).<sup>10</sup>

Fetal compromise was a recognised indication for CS if the CTG was frankly pathological (including any combination of prolonged bradycardia, repetitive variable/late decelerations, tachycardia with reduced variability) or when a non-reassuring CTG was associated with either a fetal blood sample showing a pH <7.20 or a specific clinical situation (eg, placental abruption).<sup>12</sup> It was also established whether a cord pH result was available in the mother or infant's notes.<sup>1,12</sup>

For statistical analysis, Yates corrected test was used to evaluate discrete variables, and the Fisher exact test (two-tailed) was used when any cell contained an expected value of less than five. For normally distributed continuous variables, the Student t-test was used. P<0.05 was considered significant.

## Results

Between 1 January 2001 and 30 June 2001, 743 women at a gestational age  $\geq 36$  weeks (with a singleton live pregnancy) gave birth to their first infant at Wellington Hospital. This total includes 51 women who gave birth vaginally in two peripheral birthing units without facilities for CS.

Most women delivering at Wellington Women's Hospital were under the private care of their lead maternity carer (LMC), which include independent midwives, GP obstetricians, and specialist obstetricians. The majority of LMCs were independent midwives, and specialist team (SHO, registrar and/or specialist) consultation was required before any significant obstetric intervention.

Of those 743 women, 209 gave birth by CS, thus giving an uncorrected CS rate of about 28%. The number of first deliveries outside hospital settings during that period is unknown but is estimated to be low (~3%)<sup>5</sup>, thus giving an estimated minimum corrected CS rate for the Wellington region of about 27%. The hospital file of 8 women was not available, thus leaving a study population of 201 women for some of the data.

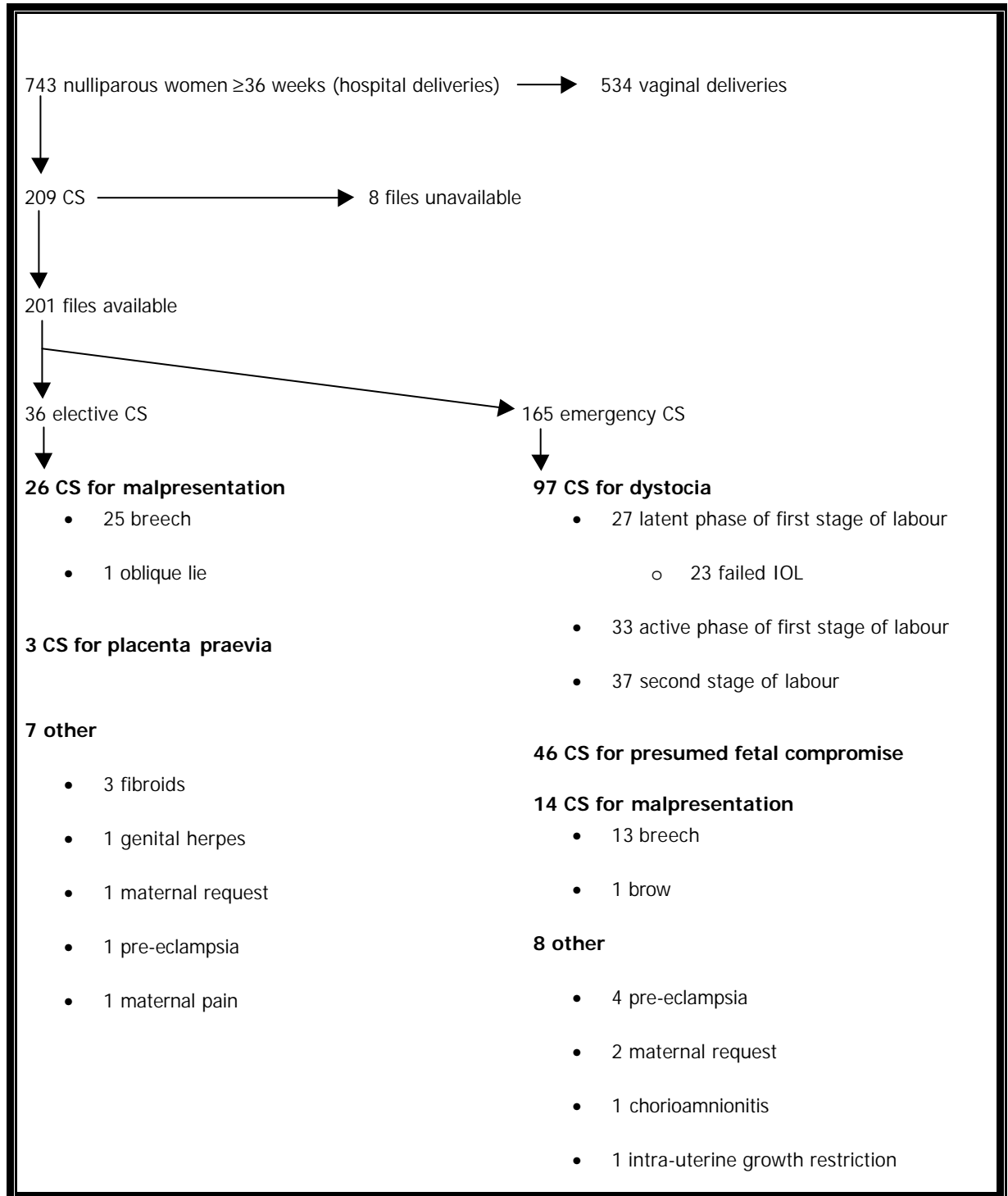
Ethnicity was reported as either European/other (75%), Maori (8%), Pacific Island (7%), or Asian (10%). There was no statistically significant difference in CS rate among women of different ethnicity. The epidural rate of all nulliparous women (expecting their first infant [elective CS excluded] with a gestation  $\geq 36$  weeks) was 67%. The women delivered by CS were statistically significantly older by an average of 2 years ( $30.8 \pm 5.8$  years versus  $28.7 \pm 5.6$  years) than women who gave birth vaginally.

Women aged  $\geq 40$  years were significantly more frequent in the CS group (10/209 versus 4/534, OR 6.66 [1.90–25.48]). The average gestational age at delivery was  $39.5 \pm 1.5$  weeks, and did not differ from women with a vaginal delivery. The proportion of women with a gestational age  $>41$  completed weeks was not a statistically different amount between the 2 groups. Induction of labour was significantly more frequent in the CS group (105/201 versus 177/534, OR 2.21 [1.56–3.11]).

Birthweight did not differ statistically between the 2 groups ( $3410 \pm 452$  g for the [CS] versus  $3477 \pm 582$  g [vaginal delivery]). Infants with a birthweight  $>4000$  g were

significantly more common in the CS group (32/209 versus 39/534, OR 2.11, 95% CI 1.35–3.88).

**Table 1: Indication for CS (caesarean section) deliveries**



**Table 2. CS (caesarean section) for dystocia**

<b>Standard</b>	<b>Number of cases</b>	<b>Percent</b>
<b>(1)</b> Oxytocin for failure to progress in labour (IOL excluded)	65/74	88%
<b>(2)</b> Duration of oxytocin infusion during latent phase of labour (including IOL)		
▪ <6 hours	3/21	14%
▪ ≥6 hours <9 hours	13/21	62%
▪ ≥9 hours <12 hours	4/21	19%
▪ ≥12 hours	1/21	5%
<b>(3)</b> Duration of oxytocin for failure to progress during established labour		
▪ no oxytocin	1/33	3%
▪ <4 hours or no oxytocin	17/33	52%
▪ ≥4 hours <6 hours	8/33	24%
▪ ≥6 hours <8 hours	8/33	24%
▪ ≥8 hours	1/33	3%
<b>(4)</b> Failure to progress in second stage of labour (duration of second stage + oxytocin for some time)		
▪ ≥2 hours	24/37	65%
▪ ≥3 hours	12/37	32%

Infants with a birthweight <2500 g were not statistically significantly more common in the CS group (10/209 versus 14/534). In the vaginal and CS birth groups, there were no stillbirths or infants with severe birth asphyxia. Table 1 shows the indications for CS in the study population.

Results for dystocia are shown in Table 2. Overall, 88% of women who failed to progress in labour (IOL excluded) received oxytocin (*Standard 1*). Among the 23 women who had an emergency CS for failed IOL, 6 had prostaglandins only; 4 had artificial rupture of the membranes (ARM) and received oxytocin; and 13 had prostaglandins, ARM, and oxytocin.

Standard 2 compliance for women with a CS for failed IOL (who received oxytocin) or with failure to progress during the latent phase of labour was 85%. Standard 3 compliance for women with a CS for failure to progress during the active phase of the first stage of labour was 48%. Among women with a CS for failure to progress during the second stage of labour, 78% (29/37) received oxytocin, 86% (32/37) had a second-stage duration =2 hours, and 32% had a second-stage duration = 3 hours (12/37). Compliance with standard 4 was 65%.

Overall, out of 46 women with a CS for suspected fetal compromise, 20 had a FBS of which 5 failed. Among the 15 women who had a FBS, 3 had a pH <7.20 before CS. Among the 26 women who did not have a FBS before CS for suspected fetal compromise, 3 declined to have the test; in 1 case, an immediate CS was indicated due to a severely pathological CTG; and 9 women were <4 cm dilated and therefore ineligible for a FBS.

Therefore, an attempt to obtain a FBS was made in 64% (23/36) of eligible women. After CS for suspected fetal compromise, a cord pH result was available in the notes of 78% of the women (36/46).

A total of 40 CS were performed for malpresentation, including 26 elective CS (25 breech, 1 oblique lie; 40/743, 5.3%) and 14 emergency CS (13 breech and 1 brow presentation). Out of the 38 women with a CS for breech presentation, 5 were thought to have a contraindication to ECV, 7 had an unsuccessful attempt at ECV, 1 was booked for an ECV, and 2 declined an ECV. No documentation about a discussion about ECV was found in 23 sets of notes. Compliance with the (ECV) standard was 33% (11/33).

## Discussion

This audit from Wellington Hospital, a tertiary referral centre, shows that the CS rate for primiparous women with a gestational age  $\geq 36$  weeks is about 27%. This rate is similar, although higher, to the rate (24%) published for England, Wales, and Northern Ireland in 2000–2001 in the National Sentinel Caesarean Section Audit Report (NSCSAR).<sup>1</sup>

As in other reports from the literature from various institutions and countries, dystocia (48%), suspected fetal compromise (23%), and malpresentation (20%) represented the most common indications for CS.<sup>1,2</sup> In line with other studies, an association with advanced maternal age ( $\geq 40$  years)<sup>13</sup>, large babies, and IOL<sup>14</sup> was also shown, but these factors were only found in a minority of women.

In a consensus statement from 1985, the World Health Organization (WHO) suggested that there were no additional health benefits associated with a CS rate above 10%–15%. However, a recent report looking at obstetric outcome data from three large free-standing hospitals in Dublin over a 22-year period showed a remarkably consistent association between an increasing CS rate and a falling mortality rate. Also, the hospital with the highest CS had consistently the lowest mortality rate.<sup>15</sup> Indeed, this has been the feeling of many obstetricians over the years.

Despite the WHO statement and CS being one of the most commonly performed major surgical interventions, there is, currently, no clear agreement of what constitutes a ‘good indication’ for CS. Instead, a multitude of objective and subjective factors (including personal values) are considered when the option of a CS is discussed with the woman in labour and her partner/support person(s).

Thus, several ‘reasonable’ standards derived from the literature have been chosen to assess the quality of clinical care received by Wellington women during the study period. These standards have been chosen because they are the most compatible with current practice, and are associated with a high rate of vaginal deliveries without compromising the health of the mother and infant.

For dystocia, most (88%) women in this study received oxytocin during established labour, similar to the NSCSAR audit (81%).<sup>1</sup> However, it appears that in about one-third of cases, this decision could potentially have been safely delayed, thus allowing opportunity for further progress.

The standards chosen for dystocia reflect either the treatment received (oxytocin), or both oxytocin and the time allowed for labour progression, and clearly do not take account of any other factors that may be pertinent at the time of the decision. Due to the design of this study, it was not always possible to identify accurately why a CS was performed at the time of the decision. However, it should be noted that the indication for CS was only rarely documented as a request from the women against professional advice.

One of the relevant factors in the management of labour dystocia is the presence and duration of ‘good quality’ uterine contractions, which is the determining factor to achieve a satisfactory progress in labour. Indeed, the use of oxytocin is only a surrogate marker for good contractions, and such assessment requires competent assessment during labour, and perhaps an intra-uterine pressure catheter.

Clearly, if there is an identified need to stabilise/decrease the CS rate for dystocia, strategies will need to focus on public education and on the model of care, acknowledging the fact that the current maternity system was clearly ineffective in limiting the increase in CS rates. Efforts at the level of each maternity unit are also required to optimise the diagnosis and management of slow progress in labour, keeping in mind that the hospital team has often only a limited input in the women’s global decision-making process, and in the management of dystocia, which starts many hours before the decision for CS.

Suspected fetal compromise was the indication for 23% of CS operations, and about two-thirds of eligible women were offered a FBS, which is higher than the NSCSAR result (44%),<sup>1</sup> probably because Wellington Hospital is a tertiary referral centre. Seventy-eight percent of women who had a CS carried out for presumed fetal

compromise had a documented cord pH result in the hospital file, which is similar to the NSCSAR result (82%).<sup>1</sup>

In many cases, women were not eligible for FBS because of lack of cervical dilatation, and in a significant proportion of eligible women, it was not offered. An alternative in selected cases may be the use of fetal scalp or vibroacoustic stimulation to check for fetal wellbeing.<sup>16,17</sup> Again, patient and LMC education as well as staff training (in technical aspects of FBS collection and handling) may increase the acceptability and success rate of FBS.

However, it is noteworthy that many CS were performed despite a reassuring pH result. Again, due to the study design, it was not possible to clearly identify the reasons for the decision to proceed with the CS. An important fact remains that the clinical decision is usually based on the likelihood of fetal acidosis and insult, which, in presence of a persistently non-reassuring CTG increases proportionally to the time taken to deliver the fetus.

It is currently not a New Zealand standard, even in large units, to have a dedicated fully staffed anaesthetic and obstetric team on site 24/24hours. This situation is likely to explain, at least partly, why FBS were not offered in all cases and why it was decided to proceed with a CS despite a reassuring FBS in the presence of a non-reassuring CTG rather than careful observation or performing a second FBS.

Almost all CS (95%) for malpresentation were due to breech presentation. With caesarean section being the currently favoured mode of delivery,<sup>18</sup> external cephalic version has become a recommended option and an auditable standard for the management of term breech.<sup>1,7</sup> This was offered in about one-third of eligible women, which is similar to the results of the NSCSAR audit.<sup>1</sup>

ECV was also commonly declined. Again, women and LMC education allowing timely identification of breech fetuses with referral to skilled ECV teams may have an impact on the number of CS performed for breech presentation.

In conclusion, this audit looking at the CS rate among women having their first baby in the Wellington region in 2001 shows that the CS rate, the indications for CS, and the compliance with recognised standards from the literature are very similar to the situation in other countries.

Dystocia, suspected fetal compromise, and malpresentation represent the most common indications for CS. Based on the result of this audit, it is estimated that better compliance with recognised standards could potentially allow a decrease in the CS rate from 27% to about 18%–22%. However, this process is likely (as overseas) to be long, complex and difficult. Therefore, significant changes in the current maternity system in New Zealand are probably required to efficiently address these difficulties.

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**Acknowledgements:** This summer student project was sponsored by The Wellington Medical Research Foundation. We thank Dr J Tuohy for reviewing relevant hospital files and for his expert opinion.

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