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Indications for caesarean sections and actions to prevent unnecessary caesareans

¹Mira Hansson Bittár, ²Paula da Silva Charvalho, ²Ylva Vladic Stjernholm

¹ Educational Programme in Medicine

² Department of Women's and Children's Health, Karolinska University Hospital and Karolinska Institutet, Stockholm, SE-171 76 Stockholm, Sweden

*Corresponding author(s): Ylva Vladic Stjernholm, Department of Women's and Children's Health, Karolinska University Hospital and Karolinska Institutet, Stockholm, SE-171 76 Stockholm, Sweden

Email: ylva.vladic-stjernholm@sll.se

Tel: 46-8-5177 0000

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ABSTRACT

Background: Indications for planned, urgent and immediate caesarean sections were analysed in order to suggest adequate actions to prevent unnecessary caesareans. **Study design:** Data were obtained from the Swedish Medical Birth Register, the Swedish Pregnancy Register, and from original obstetric records at a university hospital in Sweden between the early 1990s and 2015. **Results:** Caesarean section rate increased concomitantly with increasing labour induction and decreasing instrumental deliveries. Most of the planned caesareans in 2015 were carried out for psychosocial/non-medical reasons and the prevalence increased from 0.6% to 4.6% of all deliveries between the early 1990s and 2015 ($p < 0.001$). Secondary fear of vaginal delivery after a negative birth experience was reported by 60% of these women. Second most common indication of previous uterine scar (two or more caesareans, a transmural corporal incision or pathological placentation) increased from 1.2% to 2.3% ($p < 0.001$). Most of the urgent caesareans in 2015 were performed because of prolonged labour and the rate increased from 2.1% to 5.4% of all deliveries between the early 1990s and 2015 ($p < 0.001$). Second most common indication imminent foetal asphyxia accounted for 2.4% and 2.6% in the early 1990s and 2015 respectively ($p < 0.01$). **Conclusions:** Unnecessary urgent caesareans could be prevented through reduced labour induction, evidence-based management of labour, structured support during delivery, and by performing instrumental deliveries instead of caesareans. Such actions, taken together with systematic counseling and support during pregnancy would reduce planned caesareans for psychosocial/non-medical reasons, repeated caesareans or pathological placentation.

Keywords: Caesarean section; delivery; fear; instrumental delivery; labour induction

Key message: Urgent caesareans could be prevented through reduced labour induction, evidence-based management of labour, structured support during delivery, and by performing instrumental deliveries instead of caesareans. Such actions, taken together with systematic counseling and support during pregnancy would reduce planned caesareans for psychosocial/non-medical reasons, repeated caesareans or pathological placentation.

Abbreviations: Caesarean section (CS), cardiotocography (CTG), International Classification of Diseases (ICD)-10.

BACKGROUND

According to data from 150 countries, the worldwide caesarean section (CS) rate increased from 7% in 1990 to 19% in 2014 [1, 2]. Latin America and the Caribbean region reported the highest CS rate 42%, followed by North America 32%, Oceania 31%, Europe 25%, Asia 19% and Africa 7% [1]. The Swedish CS rate increased from 10% in the early 1990s to 17% in 2015 [3, 4]. The World Health Organization (WHO) states that caesareans are effective in saving maternal and infant lives only when they are required for medically indicated reasons and that CS rates higher than 10-15% at a population level are not associated with reduced maternal and newborn mortality rates [2]. The Robson classification system is suggested as a global standard and starting point for assessing and comparing CS rates [2, 5].

More than 90% of pregnant women claim that they want to give birth in a natural way [6]. In contrast, our results suggest that the majority of planned caesareans are carried out for psychosocial or non-medical reasons [7]. The prevalence of caesareans for non-medical reasons is difficult to estimate using administrative data and there are no randomised trials on the mode of delivery among women without a clear indication for CS [8, 9]. The national guidelines aiding obstetricians in decision-making procedures about caesareans for non-medical reasons have been introduced [10]. Knowledge of the indications for caesareans is a prerequisite in order to define adequate actions to prevent unnecessary caesareans.

MATERIAL AND METHODS

The aim of this study was to investigate indications for planned, urgent and immediate CS in order to suggest adequate actions to prevent unnecessary caesareans. Ethical approval was obtained from the Ethics Board for Medical Sciences in Stockholm on April 9, 2015, No 2014/255-31. It was initiated as a Medical Degree Project at Karolinska Institutet. Since retrospective data were analyzed on a group basis only, a statement on the consent for participation was not required. Data were obtained from the Swedish Medical Birth Register for 97% of deliveries 1992 – 2015 based on the WHO International Classification of Diseases (ICD)-10 and delivery charts [3] and from the Swedish Pregnancy Register for 75% of deliveries 2015 based on ICD-10 and delivery charts [4]. Approximately 10% of all deliveries and caesareans in Sweden take place at the Karolinska University Hospital.

Clinical data for all women who underwent caesarean sections at the Karolinska University Hospital Huddinge and Solna, Stockholm, Sweden between January 1-December 31, 1992, were collected from microfilmed obstetric records [7]. These data were compared with data obtained from electronic obstetric records between January 1 - December 31, 2005, and 2015 respectively. We decided to investigate original obstetric records to avoid incomplete or misleading information from administrative data based on ICD-10 only. The obstetric records were reviewed independently by two investigators. A subset of cases was reviewed repeatedly to assure accuracy.

The categorization of the planned caesareans was unchanged between the years studied. A psychosocial or non-medical reason was defined as the fear of vaginal birth or maternal request without any co-existing medical indication in women with a simplex cephalic pregnancy at a normal gestational age. Fear of vaginal birth was assessed by a midwife and by an obstetrician or a psychotherapist. The group previous uterine scar included women with two or more caesareans, a transmurular corporal incision or pathological placentation (placenta praevia and/or accreta), since the prevalence of pathological placentation is related to the number of previous caesareans [11]. One previous caesarean is not an indication for a planned CS in Sweden. Therefore, women requesting a CS in the absence of other indications

after one previous CS were referred to the group psychosocial/non-medical reasons. The maternal disease group are women with the severe cardiovascular disease, diabetes mellitus with organ complications, inflammatory bowel disease, malignancy etc. The group of previous sphincter injury are women with third or fourth-degree perineal lacerations, complicated by a re-operation or persistent sequelae. The foetal factor group are estimated weight more than 4500 g, severe foetal diseases or malformations. A narrow pelvis was a narrow pelvic outlet less than 29.5 cm and/or an interspinal measure of less than 8.0 cm, or a narrow pelvic inlet with a conjugata vera of less than 10 cm. Women with a previous CS in combination with a pelvic outlet of less than 30.5 cm but more than 29.5 cm were included in this group. Twin pregnancies with the first twin in a breech presentation were planned for CS.

Urgent caesareans were carried out within 30 min - 8 h, and immediate caesareans within 15 min because of an immediate threat to maternal or foetal health. The categorization of the urgent caesareans was unchanged between the years studied, except for the group preterm CS. Prolonged labour was a failure to progress for more than 3-4 h during the first stage of labour or more than 2-3 h during the second stage. Imminent foetal asphyxia was a pathological cardiotocography (CTG) registration or a pathological scalp-lactate sample. Maternal complications were severe preeclampsia, immunization, cholestasis of pregnancy etc. The group preterm caesareans were women with threatening preterm birth in combination with signs of urgent foetal distress and/or a breech presentation. These women were delivered by CS between 28+0 – 36+6 weeks in 1992, between 25+0 – 36+6 weeks in 2005, and between 23+0 – 36+6 weeks in 2015.

The continuous data were analyzed with one-way ANOVA. The categorical data were analyzed with Mann-Whitney U test. Statistical significance was set at a p-value less than 0.05.

RESULTS

The CS rate in Sweden and at our hospital increased concomitantly with increasing labour induction and decreasing instrumental deliveries between the early 1990s and 2015, as shown in Figure 1 and Table 1. The dominant Robson groups in Sweden and the Karolinska University Hospital 2015 were group 2, primiparous women with single cephalic pregnancy 37 weeks or more, who either had labour induced or were delivered by CS before labour, and group 5, multiparous women with single cephalic pregnancy 37 weeks or more and at least one previous uterine scar [4].

Most of the CS at our hospital in 2015 was carried out for prolonged labour, followed by the group's psychosocial/non-medical reasons, imminent foetal asphyxia, and previous uterine scar, as shown in Tables 2 and 3.

The majority of the planned caesareans were performed because of psychosocial/non-medical reasons as shown in Table 2. Such reasons increased continuously between the early 1990s and 2015. It was possible to quantify these reasons using ICD-10 in 2008, as shown in Figure 2. In 2015, 77% of the women who underwent caesareans for psychosocial/non-medical reasons were parous, 57% had undergone a previous CS, and 20% had a previous vaginal delivery. Secondary fear of vaginal delivery after a negative birth experience was reported by 60% (2.8% of all deliveries), primary fear of vaginal delivery by 34% (1.5%), whereas 5% (0.2%) was related to a pre-existing psychiatric health disorder such as severe depression, bipolar disease or an attention deficit disorder, and 1% (0.04%) was carried out on maternal request without further explanation. The rate of the second most common indication previous uterine scar increased between the early

1990s and 2015, whereas the third most common indication breech presentation or transverse lie decreased until 2015.

Prolonged labour was the most common indication for urgent CS 2015, as shown in Table 3. Prolonged labour was related to foetal malpresentation such as an occipital posterior presentation or asynclitism in 15% in all years studied. The rate of the second most common indication of imminent foetal asphyxia decreased between 2005 and 2015. The third most common indication for 2015 was preterm caesareans. Immediate caesareans due to an immediate threat to maternal or foetal health were performed in 0.9% of all deliveries (8% of non-planned caesareans) in 2015.

DISCUSSION

The main findings were that most of the caesareans at our hospital in 2015 were carried out for prolonged labour, followed by the group's psychosocial/non-medical reasons, imminent foetal asphyxia and previous uterine scar. The CS rate increased concomitantly with increasing labour induction and decreasing instrumental deliveries.

Strengths in this study were the high number of observations obtained from register data, and the high accuracy data from original obstetric records at a university hospital, collected by a limited group of investigators [3, 4]. Limitations were that only 10% of deliveries in Sweden take place at the Karolinska University Hospital. However, the Robson groups 2 and 5 were dominant both in Sweden and at our hospital 2015 [4]. Furthermore, secondary fear of vaginal delivery has increased in Sweden, which is in agreement with our findings [4].

The primary psychosocial/non-medical reason for planned caesareans, mostly secondary fear of vaginal delivery after a negative birth experience, emphasizes the importance of a positive first birth experience [6, 8, 9, 12]. In 2015, caesareans for psychosocial/non-medical reasons were carried out in 4.6% of all deliveries, where CS for secondary fear of vaginal delivery accounted for 60%. The rate of CS for these reasons increased despite existing guidelines aiding physicians in decision-making procedures about caesareans for non-medical reasons [10]. In Sweden 2015, 8% of pregnant women received extended support for fear of vaginal delivery, which has been estimated in 5–6% of pregnant women and in 11% if negative expectations are included in the definition [4, 6]. Fear of vaginal delivery is related to psychosocial burdens such as anxiety, depression, abuse, violence and a negative birth experience [6, 8, 9, 12]. Interestingly, 80% of women who experience obstetric complications neither consider the birth a negative overall experience nor develop a fear of vaginal delivery [12]. The discrimination between pregnancy-related anxiety and fear of vaginal delivery can be difficult since fear is assessed in different ways. An increasing amount of evidence show, that pregnancy-related anxiety is common and increasing towards impending parturition. Therefore, a standardized definition including an evidence-based scale for assessment of fear of vaginal delivery has been suggested [10, 13, 14]. Recommended systematic counseling and support for women fearing vaginal delivery include repeated meetings with a psychosocial team during pregnancy, objective information about benefits and risks related to different delivery modes including the influence on future reproductive health, support during delivery and planned follow-up after a negative birth experience [8, 9, 12, 14-19]. The attitudes among midwives and obstetricians influence patient's choice. It has been reported that a 'coping attitude' rather than an 'autonomy attitude' is strongly associated with a change in desire for CS in women fearing vaginal delivery [20].

The increasing rate of planned caesareans because of repeated CS or pathological placentation was interpreted as a result of the increasing CS rate [11]. Planned caesareans because of a breech presentation or transverse lie decreased when external versions were carried out at an earlier gestational age, which improved the success rate.

Prolonged labour was the most common indication for urgent caesareans in 2015, which was in accord with previous reports [21, 22]. The increasing CS rate was observed concomitantly with

increasing labour induction. Most inductions were carried out because of postterm pregnancy, prelabour rupture of the foetal membranes and hypertensive disease, which was in agreement with other reports [25]. In contrast to previous studies, we found that induced labour is a risk factor for urgent CS [22, 23]. The overall rate of urgent and emergency CS at our hospital in 2015 was 14% of all trials for vaginal delivery, whereas induced labour was followed by urgent CS in 30% [25]. Lack of support during delivery, high maternal age and high body mass index (BMI) are known risk factors for prolonged labour [15, 26-27]. The mean age among women who underwent urgent CS for prolonged labour at our hospital in 2015 was 32 years, as compared to 30 years among all delivering women in Sweden, and both groups had BMI 25 [4]. Contrary to the rising CS rate, the rate of instrumental deliveries decreased, which was in agreement with other studies [22, 23]. Approximately 99% of instrumental deliveries in Sweden are carried out with vacuum extraction, mostly because of the prolonged second stage of labour. Inadequate training in instrumental delivery skills among physicians could result in a reluctance to perform an instrumental delivery and a tendency to choose an urgent CS in situations with the prolonged second stage of labour or signs of imminent foetal asphyxia. This phenomenon may explain the decreasing instrumental delivery rate reported here, and strengthens the importance of systematic team training to obtain and maintain delivery skills [23, 24].

The decreasing rate of urgent caesareans because of imminent foetal asphyxia between 2005 and 2015 was perceived as an improved diagnostics of foetal distress following systematic team education on CTG monitoring and scalp-lactate sampling. The rate of neonatal asphyxia according to Apgar scores and umbilical blood gas values (data not shown) was not increased over the years studied [28].

The increasing rate of preterm caesareans until 2015 was observed after altered guidelines recommending referral of women with threatening preterm birth to a tertiary hospital at an earlier gestational age (22+0 weeks) and active management including urgent CS from 23+0 weeks. This development motivates long-term follow-up of maternal and child health since preterm caesareans between 24–33 weeks reduce neonatal mortality and morbidity only when performed because of urgent foetal distress or breech presentation [29]. Also, preterm caesareans more often require a high transverse incision than term caesareans, due to an inadequately developed lower uterine segment in preterm gestation. This technique increases the risk for pathological placentation and uterine rupture in subsequent pregnancies [30].

CONCLUSION

We conclude, that the unnecessary urgent caesareans attributed to prolonged labour and imminent foetal asphyxia could be prevented through reduced labour induction, evidence-based management of labour, structured support during delivery, and by performing instrumental deliveries instead of caesareans. This could be achieved through systematic theoretical education on labour progress and foetal monitoring as well as systematic team training to obtain and maintain delivery skills [18, 20, 22, 23, 24]. Such actions, taken together with systematic counseling and support during pregnancy would reduce planned caesareans for psychosocial/non-medical reasons, repeated caesareans or pathological placentation.

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Compliance with Ethical standards

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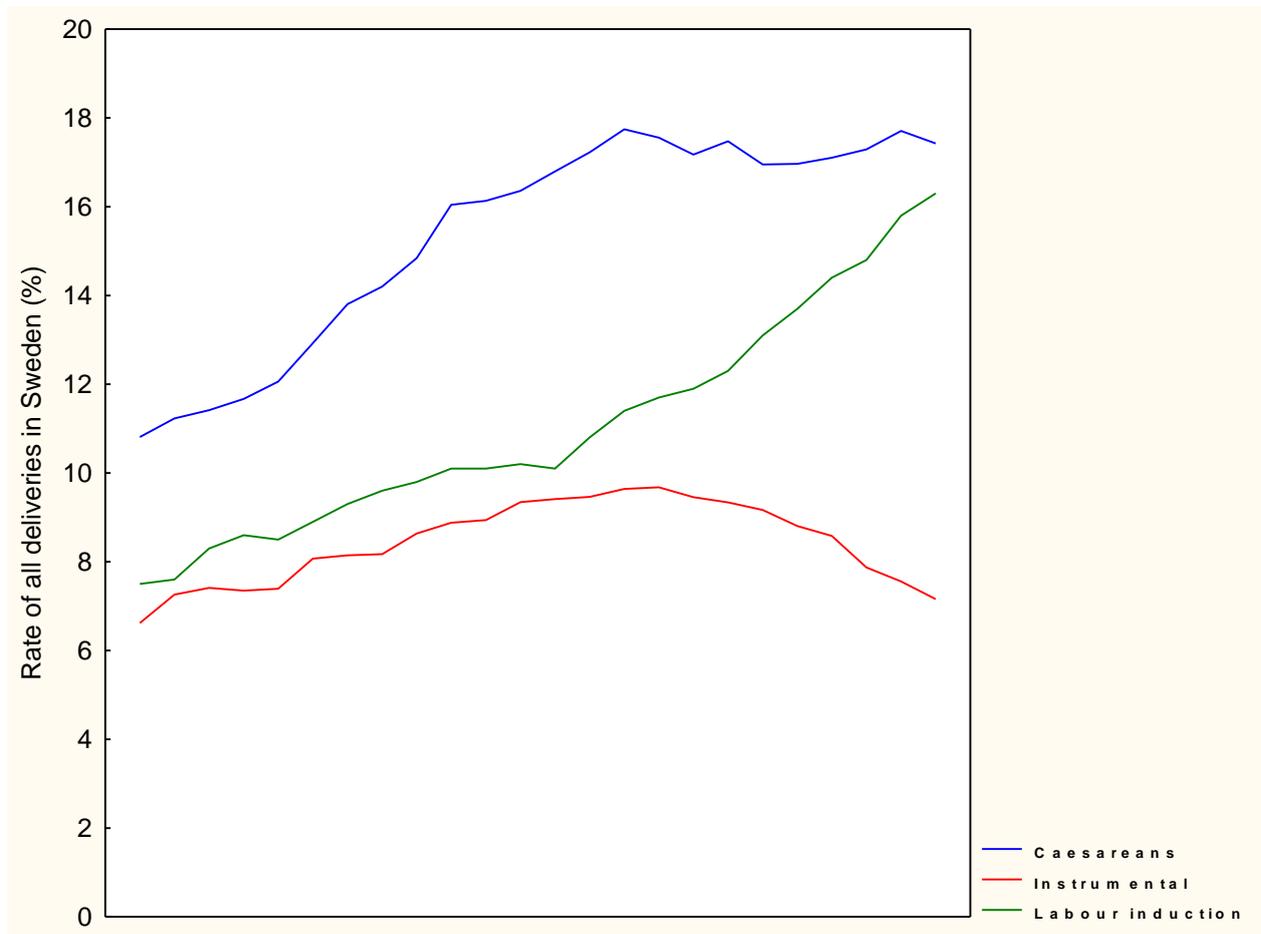
Disclosure of potential conflicts of interests: The authors Mira Hansson Bittár, Paula da Silva Charvalho and Ylva Vlacic Stjernholm declare no conflicts of interests.

Ethical approval: The study was approved by the Ethics Board for Medical Sciences in Stockholm April 9, 2015, No 2014/255-31.

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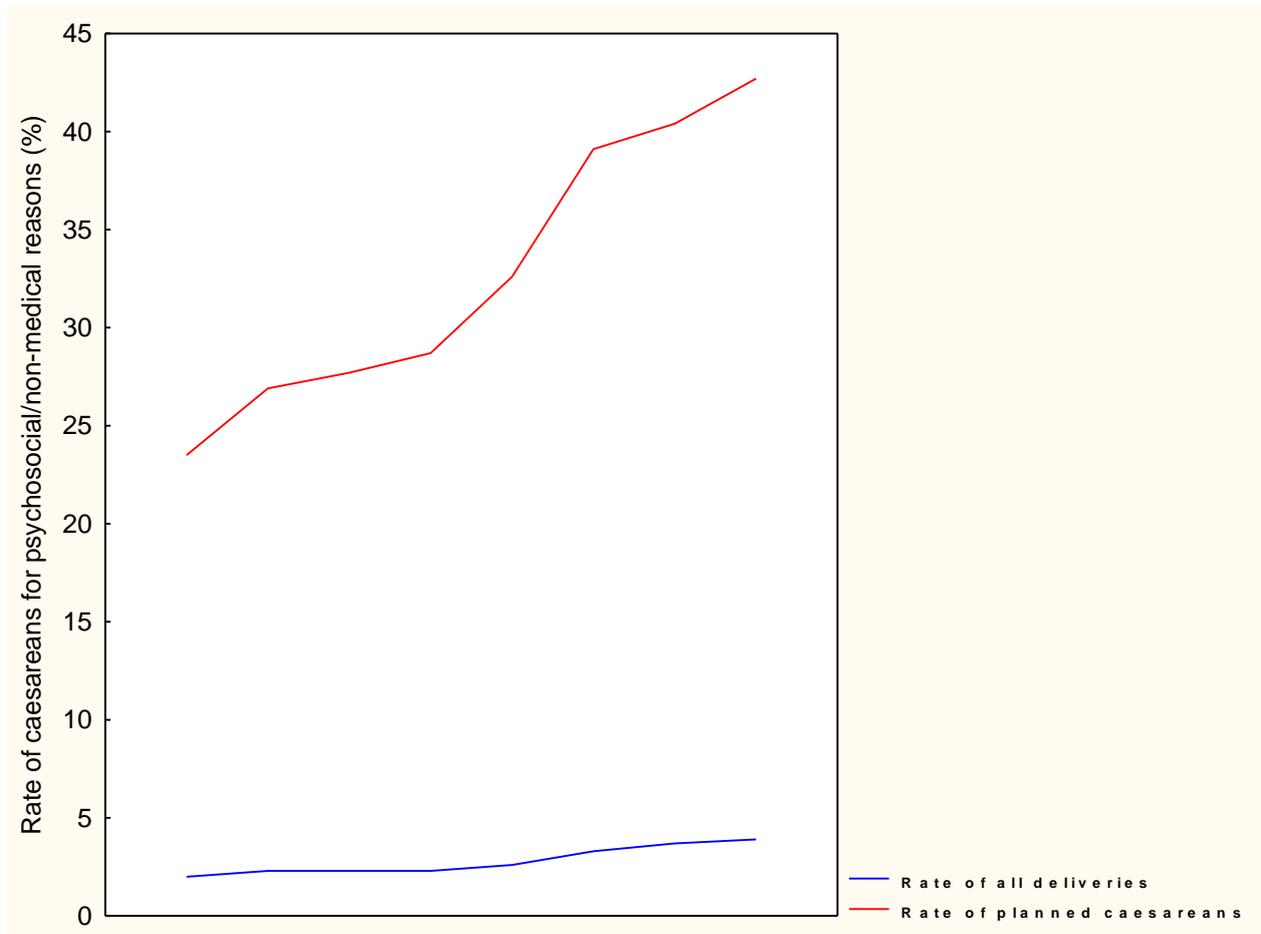
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Figure 1. Mode of delivery in Sweden 1992 – 2015.



Source: The Swedish Medical Birth Register [3].

Figure 2. Rate of caesareans for psychosocial/non-medical reasons 2008 – 2015.



Source: ICD-10 Karolinska University Hospital.

Table 1. Mode of delivery.

Year	1992	2005	2015
	n (%)	n (%)	n (%)
Sweden			
Deliveries	121 123	99 361	114 981
Caesareans	13 095 (10.8)	17 115 (17.2)	20 035 (17.4)
Karolinska University Hospital			
Deliveries ¹	8996 (7.4)	9831 (9.9)	7931 (7.9)
Labour induction	NA (6.0)	NA (17.0)	1730 (21.8)
Instrumental	NA (7.7)	NA (13.0)	593 (7.5)
Caesareans	1005 (11.4)	1962 (19.9)	1721 (21.7)
- planned	486 (5.4)	988 (10.0)	878 (11.1)
- urgent, immediate	519 (5.8)	974 (9.9)	843 (10.6)

Source: The Swedish Pregnancy Register [3] and ICD-10 Karolinska University Hospital. ¹Rate (%) of all deliveries in Sweden. NA, *not available*. Information NA about n=17 caesareans 1992.

Table 2. Indications for planned caesareans.

Year	Rate of all deliveries					Rate of planned			
	caesareans								
	1992 n (%)	2005 n (%)	2015 n (%)	p value 1992/2015	p value 2005/2015	1992 n (%)	2005 n (%)	2015 n (%)	p value 1992/2015
Psychosocial/non-medical (10.5)	(38.5)	(41.2)	51 (0.6)		380 (3.9)		362 (4.6)		< 0.001
Previous uterine scar (16.0)	(20.5)		111 (1.2)		158 (1.6)		180 (2.3)		< 0.001
Breech/transverse (21.4)	(13.2)		140 (1.6)		211 (2.1)		116 (1.5)		< 0.001
Previous sphincter injury (7.3)	(7.2)		7 (0.1)		72 (0.7)		63 (0.8)		< 0.001
Foetal factor (7.0)			7 (0.1)		31 (0.3)		62 (0.8)		< 0.001
Maternal disease (6.4)			34 (0.4)		81 (0.8)		56 (0.7)		< 0.001
Narrow pelvis (2.4)			98 (1.1)		29 (0.3)		21 (0.3)		< 0.001
Duplex (2.0)			31 (0.3)		25 (0.2)		18 (0.2)		NS
Triplex	7 (0.1)		1 (0.0)		1 (0.0)		NS		NS

Source: Obstetric records, Karolinska University Hospital.

Table 3. Indications for urgent and immediate caesareans.

Year	Rate of all deliveries				Rate of urgent and immediate caesareans					
	1992	2005	2015	p value	1992	2005	2015			
	n (%)	n (%)	n (%)	1992/2015	2005/2015	(%)	(%)	(%)		
Prolonged labour	192 (2.1)	449 (4.6)	432 (5.4)	< 0.001	< 0.001	(37.0)				
	(46.1)	(51.2)								
Imminent foetal asphyxia	218 (2.4)	435 (4.4)	203 (2.6)	< 0.01	< 0.001	(37.0)				
	(42.0)	(44.7)	(23.1)							
Preterm caesareans	19 (0.2)	12 (0.1)	130 (1.6)	< 0.001	< 0.001	(3.7)				
	(1.2)	(15.4)								
Maternal complication	85 (0.9)	76 (0.8)	75 (0.9)	NS	< 0.05	(16.4)				
	(7.8)	(8.9)								
Uterine rupture	5 (0.1)	2 (0.0)	3 (0.0)	NS	NS	(0.9)	(0.2)			
	(0.3)									

Source: Obstetric records, Karolinska University Hospital.