

## Research Article

# How to Decrease the Rate of Caesarean Section? A Retrospective Multicenter Intervention Study

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**Abstract**

**Objective:** Evaluate the caesarean section (CS) rate in 12 Belgian maternities in a first phase, conduct an audit of practices to determine ways of reducing the caesarean rate, and re-evaluate the CS rate in a second phase two years later.

**Methods:** A total of 1588 CS out of 8271 births during the first phase, and 1741 CS out of 8805 births during the second phase were analyzed. The CS was classified between absolute medical indications and relative indications, for which a vaginal birth could have been performed. We studied the global rate of CS, made a difference between absolute and relative indications and calculated the ratio between the rate of CS for relative indications and that of CS for absolute indications, reflecting the trend to practice it.

**Results:** In 2010, the mean CS was 19.2 %, with 26.5 % for relative indications and a trend to use CS ratio of 43.4%. In 2012, after auditing various centers, the mean CS rate was 19.8 %, with 30.3 % for relative indications and a trend to use CS ratio of 49.4%; but these results were not significantly different.

**Conclusion:** The CS rate is rising constantly. Breech presentation, previous caesarean sections, and twin pregnancies are the main relative indications that could be avoided for reducing this rate. Auditing may be helpful to improve the practice of the obstetricians, even if it doesn't change the overall CS rate with a 2 years interval. A 5 years delay should be done in order to see the long term effect of auditing.

**ABBREVIATIONS**

CS: Caesarean Section

**INTRODUCTION**

In 1985, the World Health Organization (WHO) established that countries with the lowest perinatal mortality rates worldwide displayed a caesarean section (CS) rate less than 10% and that there was no reason to have a CS rate higher than 15% [1,2]. Where are we now, 30 years later? The first Euro-Peristat study conducted in 2000 investigated data from the 15 countries that then made up the European Union. This study reported a CS rate ranging from 11.7 to 30.8%, along with a variable instrumental delivery rate from 4.9 to 15% [3]. The latest Euro-Peristat evaluation in 2010 confirmed a mean CS rate in Europe of 25.2%. The data for Belgium were divided into the three regions, with CS rates of 20.2% in Brussels-Capital, 20.9% in Wallonia, and 20.1% in Flanders, respectively [4].

A 2011 report by the Organization for Economic Co-operation and Development showed that the CS rate was constantly increasing, without any additional benefits with regard to maternal and infantile mortality and morbidity, while resulting

in increased maternal-fetal risks [5-8] increase in maternal morbidity and mortality compared with vaginal delivery, no decrease in neonatal/perinatal mortality, increase in neonatal respiratory distress and neonatology admissions, increase in placenta previa and abnormally invasive placenta (1/30 000 pregnancies in 1950, 1/533 pregnancies today), as well as uterine rupture [9]. In Belgium, whereas the CS rate is lower than that of the European average, one delivery in five occurs by CS, illustrating again that there remains a gap with regard to WHO guidelines. A 2006 study conducted by the Agence Inter Mutualiste, the Belgian common sickness funds agency pooled data from Belgian health insurers and documented a national increase in the CS rate of around 2% every 6 months between 2001 and 2008 [10,11]. Given this constant rise in the CS rate, we analyzed the CS rate in our hospital referral network and determined how it was possible to modify this rate.

**METHODS**

A large two-phase retrospective study was conducted. The first phase involved retrospectively all CS between January 1, 2010, and June 30, 2010, in 12 Belgian maternity hospitals affiliated with the Université Catholique de Louvain network in the

Brussels and Wallonia regions. We classified them into medically justified CS rate (absolute indication) and relative CS rate (births for which a vaginal delivery could have been performed). The classification was carried out as indicated in Table 1. For each CS birth meticulous data were collected to report in detail the circumstances of the CS according to its indication (Table 2):

- type of CS (planned, emergency, or during labor)
- primary and, if necessary, secondary indications for CS
- gravidity, parity, and past history of the pregnant patient
- number of previous CS
- gestational age (In Belgium, post-term is defined by a gestational age > 40 weeks of amenorrhea)

<b>Table 1: Indications for Caesarean Section.</b>
<b>A. Elective Caesarean Section</b>
1. Documented Feto-Pelvic Disproportion Fetal biparietal diameter > maternal pelvic / Estimated fetal weight of $\geq 4500\text{g}$
2. Chronic Fetal Hypoxia (pre-eclampsia, eclampsia, dysmaturity) + WLEIL*
3. Major Grade Placenta Previa
4. Pelvic Praevia Tumor (Fibroid, ...)
5. Extreme Prematurity + WLEIL* Gestational age < 32 weeks / Estimated fetal weight < 1500g
6. Malpresentations Breech presentation with contra-indication for a vaginal birth Abnormal pelvimetry related to fetal biparietal diameter or estimated weight, scarred uterus, contra-indication or inability to push in second stage, fetal extension of the neck or nuchal cord, placenta praevia Transverse presentation
7. Multiple Pregnancies 1 <sup>st</sup> fetus non cephalic, monoamniotic twins, higher order > 2 fetuses, scarred uterus .
8. Maternal Medical Complications + WLEIL*
9. Previous Traumatic Vaginal Birth With Neonatal Complications
10. Fetal Malformations Or Illness + WLEIL*
11. Previous Significant Uterine Surgery (Previous $\geq 2$ CS / myomectomy)
12. Abnormality Of The Genital Tract (Abdominal cerclage, previous complicated vaginal surgery)
13. Unfavorable Cervix Post-Term /With Prom And Breech Presentation / Scarred Cervix
<b>B. Emergency Caesarean Section</b>
1. Acute Fetal Distress
2. Fetopelvic Disproportion « Failure To Progress »
3. Dyskinetic Uterine Contractions Or Uterine Atony
4. Placenta Abruptio With Acute Fetal Distress
5. Failure Of Instrumental Delivery
6. Hellp Syndrome, Pre-Eclampsia + WLEIL*
7. Cervical Dystocia
8. Chorioamnionitis + WLEIL*
9. Abnormal Fetal Positions (forehead, face mento-posterior, ...)
* WLEIL : without likelihood of easy induction or labor

**Table 2: Collected Data**

Concerning pregnancy : Term of birth, particular events, multiple (Y/N), pelvimetry results if done, estimated fetal weight and biparietal diameter, spontaneous / induction / failed trial of labor, Bishop score, presentation, external version (Y/N), detailed CS indication and circumstances
Concerning patient: age, height, gynecological, medical and surgical history, number of previous CS, gravidity / parity.
Concerning newborn(s): Birth weight, Apgar score, cranial perimeter, neonatal unit admission (Y/N)

- whether it was a spontaneous labor or an induction in the event of a failed trial of labor
- fetal presentation, birth weight, and Apgar score of the infant
- type of fetal distress, if relevant
- duration of labor in the event of a failed trial of labor
- last vaginal examination during labor
- evaluation of the cardiotocogram
- performance or not of a pelvimetry and, if relevant, its results
- type of twin pregnancy, fetal presentation, and estimated fetal weights
- height of the patient
- in the event of breech presentation: type of breech, presence or absence of cord around the neck, fetal head flexion, as well as fetal biometry at the last ultrasound
- maternal laboratory results and amniotic fluid analysis in case of chorioamnionitis

CS was classified using a grid into absolute and relative CS indications in order to calculate the incidence for both the indications. After results analysis, a meeting was planned in each participating center and results collected were displayed anonymously. Each center was allowed to see its own results and could consider ways of reducing its CS rate, mainly by acting on relative indications.

The following recommendations were given:

- documented team discussion for each CS indication;
- reconsideration of vaginal breech births and vaginal births after one previous caesarean delivery
- presence of two obstetricians at those births more at risk (twin pregnancy, breech presentation, previous CS, ...)
- involvement of anesthetists and pediatricians.

The second phase of the study was conducted 2 years later, between January 1, 2012, and June 30, 2012. It included retrospectively data on CS indications in the same 12 centers included in the first study phase. Given the difficulties encountered during the study's first phase, data collection was computerized for the second phase. The second phase aimed to identify the effects on the CS rate of recommendations implemented in those centers.

CS deliveries were classified in the same way as in the first phase, and the two study phases were compared in order to evaluate any reduction in the rates of medically non-necessary CS.

Finally, after the two phases, we asked to all the maternity centers if they had changed their way of practice between phase 1 and phase 2 thanks to recommendations given by the audit. They could answer: yes, partially yes or no. If all the centers knew the results of the phase 1, anyone knew the result of the phase 2 before answering that question.

## STATISTICAL ANALYSIS

This is a retrospective multicenter two phase's study for which we use matched pairs. We used the JMP Pro (version 11) statistical program and used the Test T with matched pairs to know if there were some significant differences. Those differences were significant when P-value was under 0.05.

## RESULTS

In the first study phase, we observed in total 1588 deliveries CS out of a total of 8271 births across the 12 centers, resulting in a mean CS rate of 19.2%, in an interval from 13.2 to 33% (Table 3A). 73.5% of the CS was performed for absolute indications and 26.5% done for non-absolute indications could thus possibly be avoided. Most of these CS were indicated for breech presentation, relative fetopelvic disproportion and repeat CS. In the second phase, after conducting an audit in each center during which results of the first phase were presented, the absolute CS rate varied between 12% and 36.2%, with a mean rate of 19.8% (Table 3A) representing a slight increase compared with the first phase, while the number of CS was also higher (1741 births by CS) but there was no significantly difference between phase 1 and phase 2 for the absolute CS rate (Table 4). Although five out of 12 centers involved in the study had a decrease incidence of their absolute CS rate after the 2 years, only four centers managed to lower their rate of avoidable CS, which was the expected purpose of the audit. The mean rate of avoidable CS was also higher after the second phase than after the first (30.3 % versus 26.5 %) but this was not a significantly difference (Table 4).

A noteworthy result concerns the relationship between the CS rate for a relative indication and that for an absolute indication (Table 3D). Indeed, this rate can reflect the trend to resort to CS section. A low rate means that the indications for CS are better defined.

Half the centers enrolled in the study (centers 2, 4, 5, 7, 8, and 9) succeeded to reduce this ratio, thus achieving partially the goal of the audit. Four of these six centers were those that reduced their rate of CS for relative indications. Unfortunately the average trend to practice CS seems to have increased between the first and second phases of the study (43.4 versus 49.4). Even if there is no evidence of a significantly difference (Table 4) it showed that, despite our expectations, there was only a mild beneficial effect of the various audits conducted between the two phases. Maybe a long interval before reassessing the practice could be necessary to change significantly the CS incidence.

Finally, we asked to the 12 centers what was the supposed effect of the audit on their practice. 6 out of 12 maternity centers

answered there was a partially change in their management of the delivery, especially for pregnant patients with previous CS, breech presentation or twin pregnancy. On these 6 centers, 5 were those which reduced their rate of trend to resort to CS.

The limitations of this study are the following : while the number of centers involved in the study implemented a large sample of data with a total of 17 076 births, there was great disparity between the centers, some being smaller maternity centers, whereas others were large excellence centers with high-risk pregnancies more often associated with CS deliveries. There was also an incomplete encoding of available data, with probable shortcomings in the harmonization of birth files, as each maternity center follows its own protocols and its own way of keeping files. Then there was an operator-dependent results classification and possible medical staff changes during the 2-year interval between the two phases of the study. Finally the organizational culture of some teams does not allow to influence the medical strategies

## DISCUSSION

While the WHO recommends a maximum rate of CS of 15%, we reached a mean between 19.2 and 19.8% across the 12 Belgian maternity centers. The change in the CS rate is associated with a rise in the mean maternal age, leading to an increased incidence of high-risk pregnancies with gestational diabetes, hypertension, preeclampsia, use of assisted reproduction techniques associated with a higher incidence of multiple pregnancies [12,13]. Others factors such as the medico-legal concerns, fear of instrumental delivery, financial aspect, patient request for CS, safety feeling about CS also influence the decision to perform it. The sentence "once a CS, always a CS" also perpetuates the cohort of scarred uteri. The fall in maternal perinatal morbidity and mortality combined with the increased number of neonatal centers and the improved neonatal care that justify an increase in fetal indications for CS also explain why the rate of CS is rising. Whereas an increased national rate of CS reflects an inappropriate use of available resources and does not contribute to lowering maternal and perinatal mortality, a very low national rate of CS may be indicative of particularly limited access to healthcare [14]. Even if some "risk factors" for repeating a CS may exist, they account for only a small proportion of the caesarean rate [15-17]. Sociodemographic factors (such as maternal age or existence of "traditions" that are common to certain countries), socioeconomic factors (such as social class and distinction between public or private sectors) and clinical factors with presence of complications may lead to some different practices.

There are clinical situations in which CS is clearly indicated. However, CS could be avoided, thereby lowering its rate, in some cases of breech presentation, previous CS section, and twin pregnancy [18,19]. Finally, the changes in CS rate reflect an obvious lack of consensus with regards to improving practice. Monitoring the CS rate should be encouraged in each hospital, with internal and external audits and compared to national, European or worldwide registers. An active involvement of healthcare stakeholders like midwives, gynecologists, neonatologists, may improve strategies for a better clinical practice:

- routine referral for a second opinion prior to all CS

**Table 3:** Results.

Center	Phase 1 Corrected number of birth		Phase 2 Corrected number of CS		Global rate of cesareans		Number of CS with absolute indication		Number of CS with relative indication		% of CS with indication		% of CS with indication		CS rate of indication		CS rate of relative indication		Rate of indication	
	(n)	(n)	(n)	(n)	(%)	(%)	(n)	(n)	(n)	(n)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
n°	N		W = X+Y-Z		A = (X+Y) x100/N						X x100/W		Y x100/W		B = X x100/N		C = A-B		D = C x100/B	
1	874	971	233	270	26.6	27.8	212	233	21	37	90.9	86.3	9.1	13.7	24.3	24	2.3	3.8	9.5	15.8
2	1083	1190	169	182	15.9	15.3	143	152	26	30	84.6	83.5	15.4	16.5	13.2	12.8	2.7	2.5	20.4	19.7
3	903	886	129	155	14.5	17.5	109	113	20	42	84.5	72.9	15.5	27.1	12.1	12.8	2.4	4.7	19.8	37.2
4	700	707	118	120	16.8	17	93	102	25	18	78.8	85	21.2	15	13.3	14.4	3.5	2.5	26.3	17.6
5	822	862	95	145	13.2	16.8	67	108	28	37	70.5	74.5	29.5	25.5	8.2	12.5	5	4.3	61	34.3
6	1021	1305	199	266	20.9	20.4	151	156	48	110	75.9	58.6	24.1	41.4	14.8	12	6.1	8.4	41.2	70.5
7	395	460	83	108	23.7	23.5	58	68	25	40	69.9	63	30.1	37	14.7	14.8	9	8.7	61.2	58.8
8	569	555	108	113	19.4	20.4	71	90	37	23	65.7	79.6	34.3	20.4	12.5	16.2	6.9	4.1	55.2	25.6
9	679	613	106	115	16.5	18.8	67	81	39	34	63.2	70.4	36.8	29.6	9.9	13.2	6.6	5.5	66.6	42
10	206	171	68	53	33	36.2	42	22	26	31	61.8	41.5	38.2	58.5	20.4	15	12.6	21.2	61.8	140.9
11	309	366	54	44	17.4	12	36	26	18	18	66.7	59.1	33.3	40.9	11.7	7.1	5.7	4.9	48.7	69.2
12	641	704	156	155	25.1	22.1	108	96	48	59	69.2	61.9	30.8	38.1	16.8	13.7	8.3	8.4	49.4	61.5
Total Mean (n) (%)	8202	8790	1518	1726	19.2	19.8	1157	1247	361	479	73.5	72.2	26.5	30.3	14.1	14.3	5.9	6.6	43.4	49.4
Total (n)	8271	8805	1588	Total number of birth and CS before exclusion of the cases without known outcome details																

**Table 4:** Comparison between phase 1 (2010) and phase 2 (2012).

	Phase 1 (2010)	Phase 2 (2012)	P-value
Absolute rate of CS (%) (table 2, A)	19.2	19.8	0.6105
Percentage of CS with relative indication (%)	26.5	30.3	0.2272
Rate of relative/absolute indication (%) (Table 2, D)Trend to resort to CS	43.4	49.4	0.5021

-quality-of-care assessment by external auditors

-discussion in multidisciplinary staff of all cases of planned or completed CS

-active management of labor based on guidelines, for example those of the American Congress of Obstetricians and Gynecologists: early amniotomy, regular vaginal examination, and swift diagnosis of uterine inertia followed by initiation of oxytocin infusion;

-education of medical practitioners and patients on the maternal and fetal benefits of vaginal birth suggest that the WHO guidelines may need adjusting to the current healthcare context, we will complete this article by our final recommendation: CS as common practice should be avoided.

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