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Cesarean rates in a Chilean public hospital and the use of a new prioritization criteria: The relevance index

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Abstract

Aim: Cesarean section rates are increasing worldwide and Robson's classification system allows a practical approach to study this phenomenon. C-section in Chile has been indicated as unexpectedly high, with important variability within the country and payment systems. The aim was to report our data using Robson's system and the evolution of local C-section rate in a public hospital during a 9-year period.

Methods: Retrospective analysis (2005–April 2014), in a metropolitan hospital in Santiago. All deliveries were classified into Robson groups. Time changes were analyzed with Pearson's correlation. P value <0.05 was considered significant. A 'relevance index' (RI) for each group was calculated as 100 × C-S rate × relative contribution.

Results: The overall C-section rate increased from 24 to 27% ($P < 0.05$) in 53 571 deliveries, with a greater increase in groups 1 (nulliparous, single, term cephalic, spontaneous labor), 3 (multiparous, single, no previous C-S, term cephalic, spontaneous labor) and 4 (multiparous, single, no previous C-S, term cephalic, induced or no labor). Despite no increase in Group 5 (women with one or more previous C-S) this group had the highest RI (20.3), which defined priority for intervention over others.

Conclusion: C-S rate was lower than that reported in other centers from Chile and Latin America. Robson's classification and the RI allowed prioritization. Although increase in groups 1, 3 and 4, group 5 needs attention because of stronger impact on overall C-S rate. This analysis allowed to define how to lower C-S rate in our institution.

Key words: breech, cesarean section, CS indication, Robson classification.

Introduction

Cesarean section (C-S) is the most common operation in the world. The C-S rate in Chile has been a matter of discussion, particularly because of economical differences within the country.[1] As many middle-income country, it is expected to have high-end medical care and low-budget public facilities. It has been reported that public and private institutions had a contrasting C-S rate of 22% and 60%.[2] The overall C-S rate in the country had increased from 27% in 1986 to 38% in 1994,[3] mainly due to the proportion of women delivering in the private system. More recent data published in 2012 report 30.7%.[4] Some Chilean researchers support that the higher rate in Latin America is mainly due to a different clinical approach to vaginal delivery,[5] but this heterogeneity is seen in developed countries as well.[6] It seems that the difference in C-S rate depends on local clinical practice,[7] rather than ethnic or other biological determinants. The main objective of this study is to report the local C-S rate in our public hospital and study their change

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over time, using the Robson Classification System. The information will be relevant for other institutions to compare and stimulate their work in lowering C-S rates.

Robson published a classification system that groups women with similar clinical conditions, mutually exclusive and highly reliable. These conditions are parity (nulli/multi), previous uterine C-S (no or yes), labor (spontaneous or other), lie at delivery, multiple and preterm birth. Robson's classification does not aim to declare the indication, but to cluster women with similar conditions, and refer the rate within the group. The classification has been used either to compare institutions or changes over time. In this system, women are not classified based on the indication of the C-S. Instead, Robson proposed to group pregnant women to compare C-S rate. This may be the first long-term analysis from a large single institution in Chile.[8,9]

Methods

This is a retrospective analysis of all deliveries in Padre Hurtado Hospital in Santiago, Chile from May 2005 to April 2014. This is a public hospital, with two certified obstetricians always present in house, being part of Universidad del Desarrollo for undergraduate medical school and gynecology residency program. Peridural is used in more than 90% of cases. Midwives are committed to attend normal deliveries. There is a neonatal intensive care, with certified neonatologist. All indications were registered by the surgeon in the delivery database, and retrospectively analyzed for this study. The delivery database has specific fields that allow proper analysis, these are: 'labor', either absent, spontaneous or induced, and 'C-S reason', from which a fixed list of possible indications is offered. For the analysis, the following information was reviewed: maternal age, parity, gestational age at delivery, fetal presentation, previous cesarean section, use of forceps. All cases were classified into the 10 Robson groups (Table 1). The cesarean section rate and the relative proportion of each group to the universe were analyzed. Time-related changes were studied with Pearson's test. $P < 0.05$ was considered significant. Medcalc v13 was used for calculations.

A relevance index (RI) for each group was calculated as a product of the relative contribution to the CS rate with the group's C-S rate, multiplied by 100. This was defined to estimate the importance of each group to the overall C-S rate, in terms of contribution and rate. For each group, the effect of one fourth (25%) C-S rate decrease on the overall C-S rate was calculated.

Table 1 Robson's classification

Group	Definition
1	Nulliparous, single, term cephalic, spontaneous labor
2	Nulliparous, single, term cephalic, induced or no labor
3	Multiparous, single, no previous C-S, term cephalic, spontaneous labor
4	Multiparous, single, no previous C-S, term cephalic, induced or no labor
5	Multiparous, single, term, cephalic, with previous C-S
6	Nulliparous in breech
7	Multiparous in breech
8	Multiple pregnancy
9	Transverse
10	Preterm delivery (≤36)

The study was approved by the Padre Hurtado Hospital research board. The protocol was not presented to the institutional ethic board as all data were treated anonymously. No written consent was requested as data were obtained from hospital databases and not from personal files.

Results

Table 1 presents Robson's classification and Table 2 describes the population in a 9-year period of Padre Hurtado Hospital. Interestingly, there were a high proportion of women in the 16–19 years group, roughly 20%, similar to Peru[10] and Brazil.[11]

The relative and absolute contribution of each group is described in Table 3. The RI was calculated as a product of the group's relative contribution to the CS with the C-S rate then multiplied by 100. This index allows the comparison of groups in terms of importance and priority, which is the main objective of any classification system. Groups 1, 3 and 4 had significant increase in C-S rates during the 9-year period. The overall rate increased from 24 to 27%, with a greater increase in groups 1, 3 and 4 (Pearson's correlation $P < 0.05$ for each). Nevertheless, group 5 had the highest RI. This information leads to the conclusion that a one quarter reduction of C-S in group 5 may produce the highest reduction in the

Table 2 Population description *n* (%)

Maternal age (y)	
13–15	1120 (2.1%)
16–19	10 542 (19.7%)
20–35	36 751 (68.6%)
36–39	3497 (6.5%)
40–50	1549 (2.9%)
Incomplete data	117 (0.2%)
Parity (*n*)	
0	22 929 (42.8%)
1	16 369 (30.6%)
2	9091 (17%)
3 or more	5182 (9.7%)
Gestational age at delivery (weeks)	
20–23	168 (0.3%)
24–28	309 (0.6%)
29–32	612 (1.1%)
33–36	4583 (8.6%)
37–41	47 859 (89.3%)
42–44	40 (0.1%)
Uterine scar (previous C-S, *n*)	
0	45 753 (85.4%)
1	5786 (10.8%)
2	1555 (2.9%)
3	413 (0.8%)
4	58 (0.1%)
5 or more	6 (0.01%)
Maternal diseases	
Chronic hypertension	1585 (2.9%)
Pre-eclampsia	2917 (5.4%)
Cholestasis	1260 (2.3%)
Gestational diabetes	3125 (5.8%)
Tobacco	572 (1%)
Drug abuse	339 (0.6%)
Alcohol	63 (0.1%)

overall C-S rate, up to 1.93%. This group had the highest effect on the global C-S rate. The rest of the groups remained stable, without significant changes over time. Also, this potential reduction may be achieved with a smaller number of women subject to interventions, lowering clinical efforts.

Table 4 presents classical indications of C-S, number of cases per indication, relative contribution to C-S, absolute contribution to C-S and Pearson's correlation for the eight most common indications. Significant increase was found for 'no progression of labor', '1 previous C-S and no labor', 'abnormal fetal heart rate type 3' and 'suspicious fetal heart rate type 2'.

Figure 1 represents the C-S rate and relative contribution to the overall number of C-S. Groups 6, 7, 8 and 9 had very high C-S rates, but a low contribution to the population. Group 5 had the next highest C-S rate, and the highest contribution to the population. This is represented as the highest RI.

Table 3 Cesarean section rate by Robson's groups

Group	C-S rate	Cesarean/vaginal	*n*	Group contribution	Relative Contribution to C-S	Absolute contribution to C-S	Relevance index		Effect of 1/4 reduction	Increase in 9 years (Pearson correlation of CS rates)
							RI	Rank		
all	26.11%	13 986/39585	53 571							r = 0.8457, 95% CI: 0.4141 to 0.9668, **P = 0.0041**
g1	13.60%	1986/12620	14 606	27.26%	14.20%	3.7%	1.93	9	0.93%	r = 0.8071, 95% CI: 0.3082 to 0.9578, **P = 0.0085**
g2	39.29%	2143/3312	5455	10.18%	15.32%	4.0%	6.02	2	1.00%	r = 0.6575, 95 % CI: −0.01184 to 0.9199, *P* = 0.0543
g3	4.73%	750/15100	15 850	29.59%	5.36%	1.4%	0.25	10	0.35%	r = 0.6893, 95% CI: 0.04645 to 0.9284, **P = 0.0400**
g4	25.04%	1146/3430	4576	8.54%	8.19%	2.1%	2.05	6	0.53%	r = 0.7287, 95% CI: 0.1250 to 0.9386, **P = 0.0260**
g5	67.73%	4198/2000	6198	11.57%	30.02%	7.8%	20.33	1	1.96%	r = 0.4832, 95% CI: −0.2665 to 0.8686, *P* = 0.1877
g6	92.15%	552/47	599	1.12%	3.95%	1.0%	3.64	5	0.26%	r = −0.2988, 95% CI: −0.8035 to 0.4558, *P* = 0.4348
g7	92.29%	718/60	778	1.45%	5.13%	1.3%	4.74	4	0.34%	r = 0.04966, 95% CI: −0.6354 to 0.6910, *P* = 0.8990
g8	73.95%	352/124	476	0.89%	2.52%	0.7%	1.86	7	0.16%	r = 0.4126, 95% CI: −0.3464 to 0.8452, *P* = 0.2697
g9	99.02%	202/2	204	0.38%	1.44%	0.4%	1.43	8	0.09%	r = 0.2582, 95% CI: −0.4899 to 0.7873, *P* = 0,5024
g10	40.15%	1939/2890	4829	9.01%	13.86%	3.6%	5.57	3	0.90%	r = −0.2067, 95% CI: −0.7657 to 0.5302, *P* = 0.5936

The bold values represent *P* <0.01. CI, confidence interval; CS, caesarean section; RI, relevance index.

Table 4 Classical C-Section indications in Padre Hurtado Hospital

N deliveries	9 years 53 571	2005 6515	2006 6235	2007 6230	2008 6042	2009 6183	2010 6112	2011 5554	2012 5319	2013 5381	Rel cont	Abs cont	R	*P*	IC
N C-S	13 986	1595	1503	1586	1517	1675	1689	1536	1427	1458					
No progression of labor	2638	294	264	269	267	296	337	302	287	322	18.9%	4.92%	0.911	**$P = 0.0006$**	0.62 to 0.98
Two or more C-S	1940	254	233	222	231	208	196	206	215	175	13.9%	3.62%	−0.309	$P = 0.4178$	−0.80 to 0.44
1 previous C-S and no labor	1758	195	182	168	197	229	208	194	194	191	12.6%	3.28%	0.794	**$P = 0.0106$**	0.27 to 0.95
Breech	1435	173	161	172	152	154	175	162	127	159	10.3%	2.68%	0.286	$P = 0.4554$	−0.46 to 0.79
Abnormal Fetal Heart Rate (FHR) tracing (type 3)	1392	316	236	205	136	154	87	84	97	77	10.0%	2.60%	−0.908	**$P = 0.0007$**	−0.98 to −0.61
Suspicious FHR trace/ persistant (type 2)	836		16	99	92	144	137	125	107	116	6.0%	1.56%	0.824	**$P = 0.0062$**	0.35 to 0.96
Fetal macrosomy (>4300 Estimated Fetal Weight (EFW))	618	51	71	82	67	61	79	74	64	69	4.4%	1.15%	0.605	$P = 0.0843$	−0.09 to 0.90
Failed induction (not able to reach 4 cm)	581	48	38	52	50	94	96	79	65	59	4.2%	1.08%	0.659	$P = 0.0532$	−0.008 to 0.92

The bold values represent $P < 0.01$.

The relative increase in each group is shown in Figure 2. C-S decreased in some groups (remained under the baseline).

Group 5, which represents women with one or more C-S scars, was analyzed into subgroups, by the number of previous scars. Those with only one previous C-S had 42% of vaginal birth, in contrast to those with two or more, who had over 99% C-S (Table 5). The C-S rate in the whole group was 67%.

Discussion

Our analysis show that the C-S increased in the last 9 years of observation but was much lower than the rates reported in other centers in Chile. The latest 2012 published article reported 30.7%.[4] Recent data from Peru, including over half a million women, reported a 27% rate.[10] The report from Brazil reveals 42.7% CS rate in public systems and 87.9% in private, reflecting how clinical decisions may change throughout different hospital settings. Data from Israel has also demonstrated that C-S rate and indications has changed throughout a 16-year observation period, although the authors did not classify by Robson groups.[12] These differences support that local factors are a determinant on C-S rates.

Local conditions that may explain this low C-S rate are the following: (i) doctors and midwives are available for delivery, during 24 h or 12 h shifts, that allow normal labor progression if decided. (ii) Labor inductions are limited to medical diseases. (iii) Relative young population. (iv) Doctors are expedited in forceps.

Some Robson's groups can be seen to have increased steadily: these are groups 1, 3 and 4. These are women without uterine scars, spontaneous or induced labor, who should represent the lowest C-S rates. In Table 4, the local indications for C-S are presented. From these, the lack of progression in the first stage of labor has been shown to be the leading cause of C-S, with a significant increase ($P < 0.05$).

The use of the RI allowed a prioritization not possible by other means. As in this study, groups 6, 7 and 9 have elevated CS rate, but they are not important in terms of quantity. Group 3 constitutes almost 30% of the population but the low CS rate makes this population irrelevant. In contrast, group 2 has almost 40% CS rate, and contributes to 10% of the population. Their relative contribution to CS rate is 15%. The RI ranked second within all groups. The RI highlights

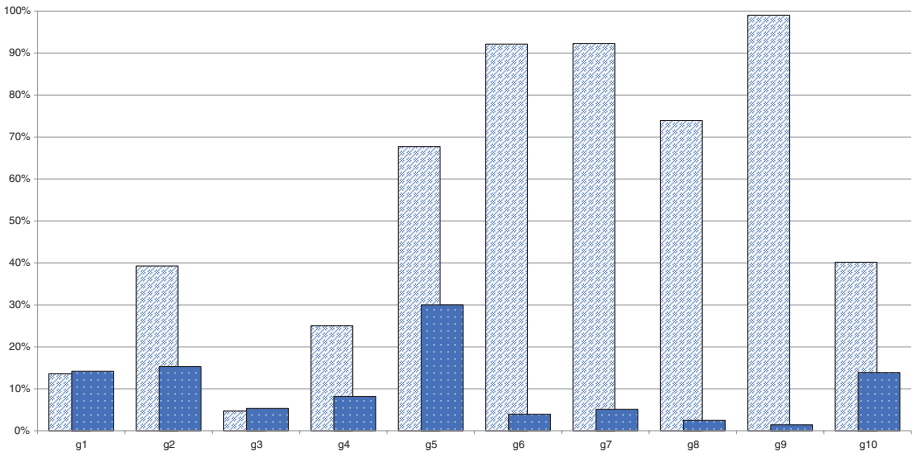

Figure 1 Cesarean section rate per group (white) and the relative contribution to the overall C-S rate (dark). Some groups have very high C-S rates, but contribute moderately to the overall C-S procedures, as they represent a small proportion of the population.

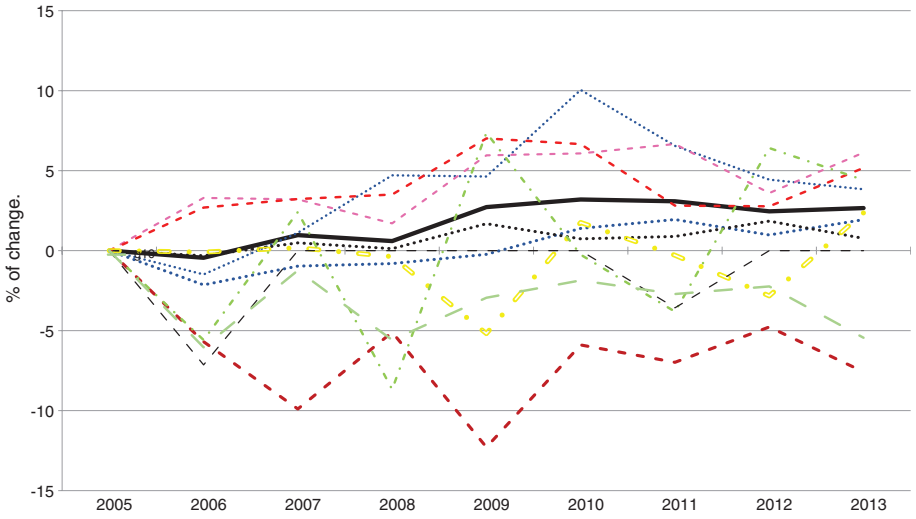

Figure 2 Percentage changes in C-S rate, in relation to the first year (2005). The lines represent the changes from the basal C-S rate through time. The overall C-S rate increased (continuous line). G6 and G10 had decreased in this 9-year period.

Table 5 Group 5 analysis by number of uterine scars

N uterine scars	*n*	Elective C-S	Emergency C-S	Vaginal	Forceps
1	4706	1439	1275	1610 (34%)	382 (8%)
2	1162	861	295	6 (<1%)	—
3	290	221	67	2 (<1%)	—
4	39	25	14	0 (0%)	—
5 or more	1	1	—	—	—

this group, that otherwise, would have not been of interest. At last, a clinical conduct change in high RI groups leads to a greater effect on the global CS rate, affecting a smaller size group. An index that combines the effect of the relative contribution to overall CS and the CS rate may express the importance of a group.

The relative contribution of each group to the overall CS rate may also be used for prioritization, alternatively to the Relevance Index. They are not similar and give different results. As mentioned, the relative contribution is the percentage of CS that the group represents to the complete CS quantity. This approach is simpler but does not consider the CS rate in the

group itself. In the present study, the RI and the relative contribution are concordant in prioritization for the first and second highest, but in the third highest relative contribution, which is Robson's group 1 (nulliparous, term, spontaneous labor), the RI is the 9th of 10. As a contrast, group 10 (all preterm deliveries), has similar relative contribution, and despite this, the RI is 3rd, much higher than that of group 1. The difference between group 1 and 10, having similar relative contribution, is the CS rate, which is 13.6% and 40.2%. This is due to the fact that RI considers the relative contribution and the CS rate together, in order to express an index that represents both parameters in a single number. Using RI rather than the relative contribution allow to prioritize group 10 rather than group 1.

In this study, the highest rates correspond to groups 6, 7 and 9, which are breech and transverse lie pregnancies. These groups represent a low fraction of the population. There are local recommendations to perform C-S in these women, as in most hospitals worldwide. A second observation is that low rates do not represent good medical practice in all Robson groups. Particularly, breech presentation deserves particular attention. Although it seems to be a nonmodifiable indication of C-S, external cephalic version (ECV) is feasible and recommended by the American College of Obstetricians and Gynecologists (ACOG).[13] At the moment, it is not possible to demonstrate the effect of intervention for breech lies with Robson classification. For example, those women treated with ECV cannot be identified correctly, as groups 6 and 7 only include women that delivered in breech. ECV would add women to groups 1 to 4, without decreasing the rate in groups 6 and 7.

Furthermore, ECV is possibly one of the few effective procedures to reduce C-S. The Term Breech Trial showed higher complications with vaginal delivery versus elective C-S in breech pregnancies.[14] The reported success rate of ECV was 60%,[15] that will certainly reduce the C-S in cases with malpresentation. In our data, a theorical 50% ECV success in groups 6 and 7 would have produced a 1.2% reduction in the overall C-S rate, which is considerable. Therefore, any institution aiming to lower C-S rates should include an ECV protocol. Also, the Robson groups 6, 7 and 9 should include women who delivered in breech o transverse lie, and those who attempted ECV.

Previous uterine scar is an important issue to address. In our data, group 5 represents 11.57% of the population with a 67% C-S rate. The RI is the highest, giving the maximum priority of intervention within the groups. Unfortunately, the Robson classification does not differentiate women with one or more previous C-S. The expected C-S rate is different when women have one or more scar, as vaginal birth after cesarean (VBAC) is recommended for those with only one previous scar by ACOG.[16] The expected vaginal delivery rate in women with one scar is around 60 to 80%,[17] much higher than in our population – 42% (Table 5). The effect of elevating the VBAC from 42 to 84% would lower the rate to 35% in the group. Such changes in C-S rates may benefit the overall C-S rate significantly. The Canadian Society of Obstetrics and Gynecology recommended a sub classification of group 5, depending on labor, such as spontaneous, induced or no labor.[18] In a recent review[19] of all studies considering Robson's classifications and suggestions, group 5 received the most proposals for modification. A total of 22 from 73 articles cited recommended modifications in group 5, addressing the following points: C-S before or after labor onset; one or more previous scars; and presence or absence of previous vaginal delivery. In our opinion, group 5 should be sub classified into 'one previous' and 'two or more' scars, as this is the determinant factor in allowing a trial of labor.

The strength of the data presented is the low rate of missing information. The delivery database was built as part of a clinical process that was reviewed every day, therefore, indications and data are checked continuously. Obligatory fields were labor, number of previous C-S, reason for C-S. A potential weakness is the inappropriate register by the operator, nevertheless, this should be low, as the documents from which this analysis was performed has clinical and medicolegal value. The documents created from the database are used for audits whenever there is adverse outcome. The database is filled by the first operator in most of the cases.

The observation of long-term changes in C-S rate is necessary in any institution or country. Concordantly, the multi-country survey by WHO analyzed the same 287 facilities from 21 countries in two periods, demonstrating an overall increase in the C-S rate from 26.4 to 31.2%, from 2004 to 2010.[20] Our data shows a much lower increase rate which warrants a long-term low C-S rate. As in most published papers, there is increasing use of C-S for women worldwide. Robson's classification was used in our institution and helped to visualize that some groups

are increasing their rates over others. This finding is in accordance to what is published, despite local conditions has not changed importantly. The use of the RI showed important to define priority within groups.

Disclosure

There are no conflicts of interest in any author. The Corresponding author, Dr. Masami Yamamoto, moved to Clinica Universidad de los Andes in 2017.

References

1. Bossert T, Leisewitz T. Innovation and change in the Chilean Health System. *N Engl J Med* 2016; **374**: 1–5.
2. Angeja ACE, Washington AE, Vargas JE, Gomez R, Rojas I, Caughey AB. Chilean women's preferences regarding mode of delivery: Which do they prefer and why? *BJOG* 2006; **113**: 1253–1258.
3. Murray FS, Pradenas FS. Cesarean birth trends in Chile, 1986 to 1994. *Birth* 1997; **24**: 258–263.
4. Gibbons L, Belizan JM, Lauer JA, Betran AP, Merialdi M, Althabe F. Inequities in the use of cesarean section deliveries in the world. *Am J Obstet Gynecol* 2012 Apr; **206**: 331. e1–331.e19.
5. Guzman E, Ludmir J, De Francesco M. High cesarean section rates in Latin America, a reflection of a different approach to labor? *Open Journal of Obstetrics and Gynecology* 2015; **5**: 433–435.
6. Caceres IA, Arcaya M, Declercq E *et al*. Hospital differences in cesarean deliveries in Massachusetts (US) 2004–2006: The case against case-mix artifact. *PLoS One* 2013; **8**: e57817. https://doi.org/10.1371/journal.pone.0057817.
7. Metz TD, Allshouse AA, Gilbert SA, Doyle R, Tong A, Carey JC. Variation in primary cesarean delivery rates by individual physician within a single-hospital laborist model. *Am J Obstet Gynecol* 2016 Apr; **214**: 531.e1–531.e6. https://doi.org/10.1016/j.ajog.2016.01.002.
8. Salinas H, Carmona S, Albornoz J *et al*. Se puede reducir el índice de cesarea? Experiencia del Hospital Clinico de la Universidad de Chile. *Rev Chil Obstet Ginecol* 2004; **69**: 8–13.
9. Vera C, Correa R, Neira J, Rioseco A, Poblete JA. Utilidad de la evaluación de 10 grupos clínicos obstétricos para la reducción de la tasa de cesarea en un hospital docente. *Rev Chile Obstet Ginecol* 2004; **69**: 219–226.
10. Tapia V, Betran AP, Gonzales G. Caesarean section in Peru: Analysis of trends using the Robson classification system. *PLoS One* 2016; **11**: e0148138. https://doi.org/10.1371/journal.pone.0148138.
11. Nakamura-Pereira M, Leal M, Esteves-Pereira A *et al*. Use of Robson classification to assess cesarean section rate in Brazil: The role of source of payment for childbirth. *Reproductive Health* 2012; **13** (Suppl 3): 128.
12. Lurie S, Shalev A, Sadan O, Golan A. The changing indications and rates of cesarean section in one academic center over a 16-year period (1997–2012).
13. External cephalic version. Practice Bulletin No161. American College of Obstetricians and Gynecologists. *Obstet Gynecol* 2016; **127**: e54–e61 Taiwan J Obstet Gynecol 2016 Aug;55(4): 499–502.
14. Hannah ME, Hannah WJ, Hewson SA, Hodnett ED, Saigal S, Willan AR. Planned caesarean section versus planned vaginal birth for breech presentation at term: A randomized multicenter trial. Term Breech Trial Collaborative Group. *Lancet* 2000; **356**: 1375–1383.
15. Hofmeyr GJ, Kulier R, West HM. External cephalic version for breech presentation at term. *Cochrane Database Syst Rev* 2015; **4**: CD000083. https://doi.org/10.1002/14651858.
16. Vaginal birth after previous cesarean delivery. Practice Bulletin N 115. American College of Obstetricians and Gynecologists. *Obstet Gynecol* 2010; **116**: 450–463.
17. Landon MF, Hauth JC, Leveno KJ *et al*.; National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. National Institute of Child Health and Human Development Maternal Fetal Medicine Units Network. *N Engl J Med* 2004; **351**: 2581–2589.
18. Faine D, Shepherd D; SPECIAL CONTRIBUTOR; MATERNAL FETAL MEDICINE COMMITTEE. Classification of caesarean sections in Canada: The modified Robson criteria. *J Obstet Gynecol Can* 2012; **34**: 976–979.
19. Betran AP, Vindevoghel N, Souza JP, Gulmezoglu AM, Torloni MR. Systematic review of the Robson classification for caesarean section: what works, doesn't work and how to improve it. *PLoS One* 2014; **9**: e97769. https://doi.org/10.1371/journal.pone.0097769.
20. Vogel J, Betran AP, Vindevoghel N *et al*. Use of the Robson classification to assess caesarean section trends in 21 countries: a secondary analysis of two WHO multicountry surveys. *Lancet Glob Health* 2015; **3**: e260–e270.