Caesarean section analysis using the Robson classification in two major hospitals in Victoria: an observational study

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Abstract

Background The global increase in caesarean section (CS) rates is concerning and a better understanding of this phenomenon can allow us to identify strategies to reduce it. Aims To determine the CS rate in two hospitals in Victoria-Australia, and analyse the contribution of specific obstetric population to changes in CS rates over time using the Robson classification. Materials and Methods Retrospective observational study of all women delivering at two hospitals in Victoria between July 2014 and June 2019. The overall CS rate, the size of each Robson group, the CS rate per group, and the absolute and relative contribution of each group to the overall CS rate were calculated. Additionally, trends over time and comparison between the two hospitals were also analysed. Results There were 7894 CS during the study period, giving an overall CS rate of 32.7%. The greatest contributor was Robson group 5 with 35.2%, followed by group 2 with 26.6% and lastly group 1 with 10.3%. Over the five-year period, CS rates at both hospitals increased 1.5% per year (95% CI: 0.1-2.9, p-value: 0.04) from 30.7% in 2015 to 36.0% in 2019. There were not major differences in the CS between the two hospitals. Conclusion The major groups contributing to our CS rate are groups 5, 2 and 1 and efforts aiming to reduce our CS rate should therefore target these groups. Strategies to reduce CS rates should include increasing the availability of VBAC, reviewing our protocols for IOL, and improving management and surveillance of labour.

Caesarean section analysis using the Robson classification in two major hospitals in Victoria: an observational study

Running title

Understanding CS rates using the Robson classification in Australia

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Abstract

Background

The global increase in caesarean section (CS) rates is concerning and a better understanding of this phenomenon can allow us to identify strategies to reduce it.

Objectives

To determine the CS rate in two hospitals of Eastern Health (EH) in Victoria-Australia, and analyse the contribution of specific obstetric population to changes in CS rates over time using the Robson classification.

Materials and Methods

Retrospective observational study of all women delivering at EH between July 2014 and June 2019. The overall CS rate, the size of each Robson group, the CS rate per group, and the absolute and relative contribution of each group to the overall CS rate were calculated. Additionally, trends over time and comparison between the two hospitals were also analysed.

Results

There were 7894 CS during the study period, giving an overall CS rate of 32.7%. The greatest contributor was Robson group 5 with 35.2%, followed by group 2 with 26.6% and lastly group 1 with 10.3%. Over the five-year period, CS rates at both hospitals increased 1.5% per year (95% CI: 0.1-2.9, p-value: 0.04) from 30.7% in 2015 to 36.0% in 2019. There were not major differences in the CS between the two hospitals.

Conclusion

The major groups contributing to our CS rate are groups 5, 2 and 1 and efforts aiming to reduce our CS rate should therefore target these groups. Strategies to reduce CS rates should include increasing the availability of VBAC, reviewing our protocols for IOL, and improving management and surveillance of labour.

Key words

Caesarean section, Robson classification, audit and feedback, organisational models, obstetric surgical procedures

Tweetable abstract

Strategies to reduce caesarean section rates using the Robson classification in Victoria-Australia

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Introduction

The global concern over increasing caesarean section (CS) rates in the last decades has led to a rise in efforts to understand the determinants and drivers of this phenomenon. The increase of non-medically indicated CS, the variation in clinical practices and the differences in women's risk profiles and expectations have all influenced the overall increase in global CS rates[1]. The long-term complications of CS and the associated unnecessary risk have been previously described[2-4].

Australia has the eighth highest CS rate out of the 34 countries belonging to the Organisation for Economic Co-operation and Development with a CS rate of 34 per 100 live births [5]. CS rates have been steadily increasing in Australia from 31% in 2007 to 35% in 2017 [5, 6]. This figure varies by state, from 37.8% in Western Australia to 31.5% in the Northern Territory; and by type of hospital, from 37.9% in the public sector to 47% in the private sector[6].

The comparison of CS rates between institutions using a standardized tool can lead to a better understanding of the problem[7]. Since 2015, the world health organization (WHO) has recommended the use of the Robson classification system as a global standard tool for assessing, monitoring and comparing CS rates[8]. The Robson classification has become widely utilised due to its simplicity and reproducibility. It classifies women into ten mutually exclusive groups depending on routinely collected information regarding the pregnancy [9]

see Box 1. However, the Robson classification does not specify indications for CS[10] and does not look in detail into the demographics and characteristics of women.

Box 1. The Robson ten-group classification system

1	Nulliparous, singleton, cephalic, >37w, in spontaneous labour
2	Nulliparous, singleton, cephalic, >37w, induce labour or CS before labour
2a	Nulliparous, singleton, cephalic, >37w, induce labour
2b	Nulliparous, singleton, cephalic, >37w, CS before labour
3	Multiparous (excluding previous CS), singleton, cephalic, >37w, in spontaneous labour
4	Multiparous (excluding previous CS), singleton, cephalic, >37w, induce labour or CS before labour
4a	Multiparous (excluding previous CS), singleton, cephalic, >37w, induce labour
4b	Multiparous (excluding previous CS), singleton, cephalic, >37w, CS before labour
5	Previous CS, singleton, cephalic, >37w
6	All nulliparous with a single breech
7	All multiparous with a single breech (including previous CS)
8	All multiple pregnancies (including previous CS)
9	All women with a single pregnancy in transverse or oblique lie (including previous CS)
10	All singleton, cephalic, <37w (including previous CS)

Although there have been several publications using the Robson classification in Australia, to our knowledge there are no previous studies in Victoria. It is important to publish more data to compare practices, to evaluate the extent to which CS rates in Australia are aligned with best practice and to benchmark strategies to reduce the CS rates in Australia. The aims of this study are to determine the overall CS rate in two hospitals of the Eastern Health (EH) network, and analyse the contribution of specific obstetric population to changes in CS rates over time by using the Robson classification.

The challenge is to maintain a reasonable low CS rate reflecting good access to quality health care and good medical practice while maintaining good perinatal outcomes, a challenge that only few countries have managed to achieve [11].

Materials and methods

We analysed all women delivering at EH, both at Box Hill Hospital (BHH) and Angliss Hospital (AH), between the 1st of July 2014 and the 30th of June 2019. Births included live births and still births of at least 400 grams birthweight or at least 20 weeks of gestation. Both BHH and AH are teaching hospitals with supervision and support from senior clinicians 24 hours and with theatre availability. According to the capability framework for Victorian maternities [12] BHH is a level 5 hospital with 2500 deliveries per year and AH is a level 4 hospital with 2200 deliveries per year.

Data for all mothers and babies was collected retrospectively using the Birthing Outcomes System (BOS), developed by Management Consultants and Technology Services, in which information is routinely collected for all women presenting to EH. BOS is a clinical information management system integrating pregnancy and perinatal data which is widely used in Victorian maternity services. Data in BOS was reviewed and extracted following EH protocols (available on request). Data extracted included all the variables needed to classify women into one of the ten Robson groups. When additional information was required for clarifications full medical records were reviewed.

To assess the quality and the coverage of our data, the obtained BOS data was cross-referenced with the national birth registry to make sure there were no missing cases. Additionally, as per the Robson implementation manual [9] we compared the number of CS and women in our data with the number of CS and women who delivered in the hospital and lastly, we assessed the size and the CS rate of group 9 looking for misclassified cases.

As per the recommended Robson approach, the overall CS rate (percentage of women delivered by CS), the size of each group, the CS rate per group, and the absolute and relative contribution of each group to the overall CS rate were calculated. We used linear regression to analyse the trend of CS rate over time at BHH an, AH individually and EH as whole. Additionally, we compared the trend between BHH and AH. A chi square test was used to determine the differences between hospitals in each of the Robson groups. Data were analysed in STATA 16.

This study was considered by the Office of Research and Ethics at EH (reference QA19/097) and was deemed to have met the criteria for an Audit or Quality Assurance activity, therefore as per the National Health and Medical Research Council there was no requirement for Human Research Ethics review.

Results

During the study period 7894 out of 24129 women that delivered at EH had a CS, giving an overall CS rate of 32.7% (31.8% in BHH and 33.8% in AH).

As shown in table 1, all women were classified into one of the Robson groups as per their pregnancy characteristics. The largest population that EH serves was composed by groups 1 and 2 (nulliparous women) at 39.9%, followed by groups 3 and 4 (multiparous women) at 37.7%. The size of group 5 was 13.4% and the size of groups 8 and 10 was 0.9% and 4.4% respectively.

When looking at the ratio of nulliparous women in spontaneous labour, group 1, versus nulliparous women who had labour induced or were delivered by CS before labour, group 2, we found it to be 1.1:1. We found a similar scenario when looking at the ratio of multiparous women in spontaneous labour, group 3, versus multiparous women who had labour induced or were delivered by CS before labour, group 4, with our ratio being 1.8:1.

The CS rates varied from 3.0% in group 3 to 93.1% in group 9. The greatest contributor to the overall CS rate was group 5. Women in this group had high CS rates in both hospitals (86.1% in BHH and 86.3% in AH) and comprised 35.2% of all women delivered by CS at EH (33.8% in BHH and 36.7% in AH). The second largest group was group 2, contributing 26.6% to the overall CS rate (27.7% in BHH and 25.3% in AH). When looking at the subdivision, group 2a was responsible for the majority of this with 20.5% of the relative contribution to all CS. The third largest group was group 1 contributing 10.3% to the overall CS rate at EH (Table 1).

Over the five-year period of the study, CS rates at both hospitals increased from 30.7% in 2015 to 36.0% in 2019 (Figure 1). The overall CS rate at EH increased 1.5% per year (95% CI: 0.1-2.9, p-value: 0.04) and was mainly due to the increase in the CS rate at BHH, which had an increase of 2.4% per year (95% CI: 0.9-3.8, p-value: 0.01). AH also showed an increase in the CS rate of 0.9% per year. However, this was not statistically significant (95%CI: 0.5-2.4, p-value: 0.1).

As shown in Table 2, the CS rates were similar within most of the Robson groups when comparing BHH and AH. There was only evidence of a difference in group 2a (p-value 0.04), group 3 (p-value 0.007) and group 10 (p-value 0.008). BHH had higher CS rate among multiparous women in spontaneous labour (group 3) and AH had higher CS in women <37 weeks gestation (group 10) and induced nulliparous women with >37w (group 2A).

On assessment, we found several indicators that our data is of high quality. The number of CS and women delivered in the hospital corresponds to the same number in our data. Additionally, when crosslinking our data with the national birth registry there were no missing cases. The size of group 9 was 0.2%, which is in line with the WHO recommendations of less than 1%, however the CS rate of group 9 was 93% and not 100% as it should be by convention (9). On a closer review of patient's records, two women were misclassified as transverse lie when they were actually compound presentations who had vaginal deliveries.

Discussion

Main Findings

In this study we found an overall CS rate of 32.7% at EH from 2014 to 2019, this is close to the national CS rate of 35% [6]. Group 5 had a relative contribution of 35.2%, making it the main contributor, followed by group 2 with a relative contribution of 26.6% and then group 1 with a relative contribution of 10.3%. These results are similar to other studies[11, 14, 15] and also similar to previous data from Australia [5]. The CS rate at EH increased 1.5% per year, from 30.7% in 2015 to 36.0% in 2019, mainly due to increase at BHH. This is the same scenario experienced by other institutions in Australia and in several other developed countries[11, 13]. This finding allows us to identify these as target groups for interventions aiming to reduce CS in our institutions.

In both hospitals, nulliparous women (groups 1 and 2 together), were the main population contributing to the overall CS rate accounting for just over a third of all CS cases. This finding is very important as woman's first birth experience has a profound influence on the method likely to be used in her next pregnancy [16].

Interventions aiming to reduce the CS rate in group 5 include increasing the availability of vaginal birth after CS (VBAC) but also reducing the CS rates in both groups 1 and 2. Women's decisions on mode of delivery after a CS are influenced by their previous birth experience and their current expectations. Antenatal counselling and education might be beneficial for this group to increase their awareness and perceptions about VBAC. Additionally, hospital policies and clinician perceptions towards VBAC are also key aspects to address [14].

The size of groups 1 and 2, (nulliparous women) are within the expected range of 35-42% as per the Robson guidelines [9] and previous papers [17], however, the size of groups 3 and 4, multiparous women, are slightly higher than the 30% recommended in the guideline, suggesting that we could be serving a population with higher fertility rates. The size of group 5 is relatively high and could indicate that we serve many women with previous CS, perhaps many of whom were in groups 1 or 2 in past years at our own institutions, although our current data does not allow us to explore this. Group 8 and 10 are both at the higher end of the expected size, which gives an indication that EH may serve a higher risk population. However, the details of the population variation and level of complexity of our population was not possible to capture by looking at the Robson classification alone.

Although the nulliparous distribution is within the expected range, we found a less than 2:1 ratio between the sizes of group 1 and 2, and groups 3 and 4. This suggests a high incidence of induction of labour and pre-labour CS in both nulliparous and multiparous women. Similar finding was reported by Robson in 2015 [17] and efforts to understand indications for induction of labour and pre-labour CS were suggested as a strategy to reduce CS rates.

Women who had Induction of labour, both nulliparous and multiparous, (groups 2a and 4a) had a high CS rate, which was due mostly to increased need for emergency CS. This finding is similar to what has been found in Queensland [16] and in the Nordic countries[11]. Improvement of surveillance and overall management of induction of labour, including the use of oxytocin and ripening agents are potential interventions to consider. Interestingly for group 4, although induction of labour was still common, the CS rate was much lower than for group 2 in our institutions, similar to results found in Queensland [16]. This suggests than perhaps inducing labour in multiparous women does not carry the same risk of CS as when inducing nulliparous women. However, we found differences in our CS rates in groups 2a, 3 and 10 between BHH and AH, suggesting that perhaps we need to provide slightly different strategies in each of our hospitals to reduce our overall CS rate at EH.

Other independent risk factors for CS have been described[18] and obstetric pathology like hypertensive disorders, diabetes, obesity and advance maternal age are also independent variables capable of influencing the CS rate. Other studies[1] have shown how ethnicity, specially being Asian-born, along with other maternal characteristics, were also associated with increased risk of CS. Therefore, variables such as BMI, maternal age, previous maternal comorbidities and pathologies and foetal compromise should be included when analysing this type of data. In addition, the type of population that EH serves seems to be more complex that captured by the Robson classification and gathering further data regarding their epidemiological and demographic

characteristics could help to better understand the CS rates and identify strategies to reduce it [11].

Strengths and Limitations

Our study provides data on CS in two institutions from Victoria. Our high-quality data allowed us to identify the Robson groups that contribute to our CS rate and provide a better understanding of our population. Our findings can be very beneficial not only for our institution but also for other Australian institutions as a baseline with which to compare and measure future interventions.

However, the population served by EH seems to be more complex, but data on demographic and epidemiological characteristics were not included in this study, making this difficult to quantify further. Additionally, medical indications for CS and maternal reasons for preferring a CS are not included in our analysis and could provide a better understanding of the situation. There are only a few papers published with Australia data, therefore we do not have a clear benchmark to compare our institution with. It will therefore be very beneficial to implement strategies aiming to reduce CS and keep monitoring or rates using the Robson classification to build understanding overtime.

Interpretation

The CS rate in our institution is very similar to the Australia national CS rate and it is increasing over time in line with global trends. The major groups contributing to our CS rate are groups 5, 2 and 1 and efforts aiming to reduce our CS rate should therefore target these groups. Strategies to reduce CS rates in our institution should include increasing the availability of VBAC, reviewing our policies and indications for IOL, especially in nulliparous women and improving management and surveillance of labour, all of which are strategies that have been suggested before[19]. Furthermore, other characteristics of our population should also be taken into consideration when planning strategies to reduce our CS rate. Finally, other proven strategies to reduce CS section rates could be implemented such as audit and feedback [20, 21] using the Robson classification to inform audit processes and progress over time.

Conclusion

Women who have had caesarean sections in the past are a very important determinant of the overall CS rates in the population. Strategies to reduce CS rates need to aim to reduce the first CS. Additionally, improvement of the selection of patients and indications for IOL and increased availability of VBAC will also reduce CS rates. Implementation of continue CS monitoring programs based on the Robson classification are needed.

Disclosure of interest

The authors have no conflict of interest.

Contribution to authorship

AM had a role in the conception of the study, planning, carrying out, analysing and writing up of the manuscript. CG had a role in overall supervision and reviewing the final manuscript.

Ethical approval

This study was approved on the 17th of September of 2019 by the Office of Research and Ethics at Eastern Health (reference QA19/097) and was deemed to have met the criteria for an Audit or Quality Assurance activity, therefore as per the National Health and Medical Research Council there was no requirement for Human Research Ethics review.

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`Table 1. CS rates at EH by Robson Classification from July 2014 to June 2019.docx` available at https://authorea.com/users/353298/articles/477255-caesarean-section-analysis-using-the-robson-classification-in-two-major-hospitals-in-victoria-an-observational-study

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`Table 2. CS rate difference between BHH and AH per Robson group from July 2014 to June 2019.docx` available at https://authorea.com/users/353298/articles/477255-caesarean-section-analysis-using-the-robson-classification-in-two-major-hospitals-in-victoria-an-observational-study