Lithuanian University of Health Sciences

Faculty of Medicine

Department of Gynecology and Obstetrics

Final Master Thesis

The Robson classification in use: Weaknesses and difficulties when working with the Robson classification system

Author: Luise Haag
Supervisor: Dr. Justina Kačerauskienė

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3. SUMMARY

Author's name: Luise Haag

Research title: The Robson classification in use: Weaknesses and difficulties when working with the Robson classification system.

Aim: The aim of this review is to evaluate difficulties and weaknesses of the Robson classification system reported by users.

Objectives: 1. To analyse what possible errors can occur when using the Robson classification.

2. To summarize limitations of the Robson classification system.

3. Collect strategies to improve the use of the Robson classification.

Methods: PubMed/ Medline, Access Medicine, Wiley Online Library, Cambridge journals online and the online library of the World Health Organisation were searched to find publications appropriate for this literature review. Key words used in the search are: "Robson classification", "Ten group classification", "disadvantages", "Cesarean section", "C-sections", "rates", "development", "difficulties". The PRISMA guidelines were followed to carry out this research.

Results: The Robson classification system is a tool for monitoring and comparing caesarean section rates which allows to develop strategies to lower surgery rates in certain groups of women. It has been implemented in many settings and seems to be a useful and well validated tool. By searching the sources mentioned above, 46 articles were initially identified. This review analyses 11 articles according to the weaknesses and difficulties when working with the Robson classification as they are reported by the authors and users of the classification.

Conclusion: To analyze subgroups without prior consideration of the 10 main groups might lead to wrong or incomplete results. Differences of definitions of the core variables as well as missing data can also result in wrong assignment to a group or even not classifying a woman at all. This can lead to an incomplete data set. The lack of variables in the Robson classification, that are relevant in clinical practice, is a limitation.
4. ACKNOWLEDGEMENT

I would like to thank Dr. Justina Kačerauskienė for her advice and help during this final master thesis.

5. CONFLICT OF INTEREST

The author reports no conflict of interest during this study.

6. PERMISSION ISSUED BY THE ETHICS COMMITTEE

Do not apply.
7. ABBREVIATIONS

WHO: World Health Organisation

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

CS: Caesarean section

8. TERMS

Nulliparous: Woman that has not given birth before

Multiparous: Woman that once or more than once has given birth before

Amniotomy: Artificial rupture of amniotic membranes
9. INTRODUCTION

Cesarean sections (CS) are a commonly performed surgery in our time. Even though the concept of removing a fetus through an abdominal incision seems to be quite old and to be part of many western and non-western cultures and even mythologies, it is only now, that with the help of modern surgical techniques and antibiotics, we are able to save maternal and fetal lives on a regular basis. As a cesarean section is a surgery, there are certain short term and long term risks associated with it, as there is with any surgery. A cesarean section would preferably only be performed if the natural birth would endanger the mother's or child's life. The 2015 study by J.Vogel et al., comparing the cesarean section rates of 21 countries from two World Health Organisation (WHO) surveys from 2004-2008 to the WHO survey from 2010-2011 shows an increase in all 21 countries except for Japan (1).

The high rates of CS that many developed and middle income countries observe stand in contrast with low rates in low income countries with limited resources. According to data from 2007 developed countries have a proportion of 21,1% of CS from all births whereas in least developed countries the rate is only 2% (2). The main reason for such uneven distribution and specific reason for the rise in CS rates in many countries stays unclear (3). The WHO considers the ideal rate of cesarean sections to be between 10% -15% (4). The idea is to have a classification system to help monitor and compare CS rates across hospitals, countries and continents and help understand where it is necessary to reduce CS rates. The classification should help to understand what groups of women undergo CS and give reason for rising trends. It should be applicable internationally, reliable, and verifiable, clinically relevant and consistent (5). After analyzing and understanding on who, when, how, why and where CS are performed it then becomes possible to implement strategies targeting high risk groups and then possibly reduce or increase CS rates in order to improve maternal and fetal well being (3).

The Robson classification is such a tool focusing on parity, gestational age, previous CS, onset of labour, fetal lie and presentation and number of fetuses. This forms 10 groups, shown in Table 1, that are mutually exclusive and totally inclusive. Every women coming to a hospital for delivery can be assigned to one of the groups. The women based characteristics needed for the Robson
classifications system are routinely collected worldwide. The 2011 systematic review by Torloni and colleagues compared 27 caesarian section classification systems and found the Robson system to be the most appropriate to compare surgery rates and to fulfill international and local needs (3). Using the Robson classification it is possible to form figures that allow monitoring and analysis of CS trends and developments within hospitals, countries and regions worldwide.

As of 2016 the Robson classification became a compulsory standard in all Lithuanian hospitals by ministerial order (6). Many studies have been performed to show a trend of increase or decrease in cesarean section rates using the Robson criteria and how its implementation might have helped to control the rates. It is a well validated system. (5)

A good example to see how the use of a monitoring system can work is Iceland. They started using the Robson classification as a basis for their cesarean section monitoring program in the year 2000. In the time from 2000 to 2011 the total cesarean section rate decreased from the highest to the lowest among the Nordic countries. This shows the good results that can be achieved by implementing a monitoring system. Those rapidly showing positive results might be attributed to the small population of Iceland but their experience leads to believe also other, larger populations can achieve similar results (7).

The use and benefits of Robson classification has been shown in many studies. They show that a system to classify and observe CS can help identify the group of women who need to be focused on in order to only perform CS on the women who really need it and subsequently lowering the rates.

The purpose of this review is to collect difficulties and weaknesses of the Robson classification (and therefore show why it works better or worse for some) that users have reported with the hope to improve the successful use of it.
10. AIM AND OBJECTIVE

Aim:

The aim of this review is to evaluate difficulties and weaknesses of the Robson classification system reported by users, so that with worldwide increasing implementations its quality of use can improve.

Objectives:

1. To analyse what possible errors can occur when using the Robson classification.
2. To summarize limitations of the Robson classification system.
3. Collect strategies to improve the use of the Robson classification.
11. RESEARCH METHODOLOGY OF LITERATURE REVIEW

This final Master Thesis is a literature review and was conducted following the protocol and report recommendations of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Statement.

Search strategy:

To find appropriate literature a systematic search was performed using the following databases: PubMed/ Medline and Access Medicine, Wiley Online Library, Cambridge journals online and relevant publications from the online library of the World Health Organization were hand searched. Key references from relevant articles were searched for additional material. The search strategy for finding appropriate articles included the following key words: "Robson classification", "Ten group classification", "disadvantages", "Cesarean section", "rates", "development", "difficulties".

Inclusion and exclusion criteria:

All study types were included in the search. Limits applying to the search were articles not written in the English language, articles to which only the abstracts were published and duplicates. The titles and abstracts of all identified citations were evaluated for eligibility. All eligible articles were analyzed in full text and searched for critique points on the experience when working with the Robson classification. Articles not mentioning any weaknesses and difficulties applying the Robson classification were excluded in the process since they do not answer to the aim and objectives of this review. 11 publications were identified, that answered to the aim and objectives of this literature review and where therefore included in this study. Figure 1 shows the process of literature search and selection according to inclusion and exclusion criteria.

All articles used in this literature review are from the year 2001 or newer, except one article from 1984 (Anderson, Determinants of the Increasing Caesarean Birth Rate (8)).
Screening and data extraction:

In the screening process the experiences of authors of the 11 identified articles were collected and analyzed for critique points. All limitations and weaknesses mentioned in the literature was collected and assigned to one or more of the 4 categories shown in Table 2.

Table 1 shows the 10 groups of the Robson classification and the women belonging to each group according to the following variables: parity, gestational age, previous CS, onset of labour, fetal lie and presentation and number of fetuses. The 10 Groups are carefully defined, mutually exclusive and totally inclusive. Therefore every pregnant woman can be assigned to only one of the 10 groups if all obstetrics parameters are collected.

Table 1. The 10 groups of the Robson classification

<table>
<thead>
<tr>
<th>Number of group</th>
<th>Women included</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1</strong></td>
<td>Nulliparous women with single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour</td>
</tr>
<tr>
<td><strong>Group 2</strong></td>
<td>Nulliparous women with single cephalic pregnancy, ≥37 weeks gestation who either had labour induced or were delivered by caesarean section before labour</td>
</tr>
<tr>
<td><strong>Group 3</strong></td>
<td>Multiparous women without a previous uterine scar, with single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour</td>
</tr>
<tr>
<td><strong>Group 4</strong></td>
<td>Multiparous women without a previous uterine scar, with single cephalic pregnancy, ≥37 weeks gestation who either had labour induced or were delivered by caesarean section before labour</td>
</tr>
<tr>
<td><strong>Group 5</strong></td>
<td>All multiparous women with at least one previous uterine scar, with single cephalic pregnancy, ≥37 weeks gestation</td>
</tr>
<tr>
<td><strong>Group 6</strong></td>
<td>All nulliparous women with a single breech pregnancy</td>
</tr>
<tr>
<td><strong>Group 7</strong></td>
<td>All multiparous women with a single breech pregnancy, including women with previous uterine scars</td>
</tr>
<tr>
<td><strong>Group 8</strong></td>
<td>All women with multiple pregnancies, including women with previous uterine scars</td>
</tr>
<tr>
<td><strong>Group 9</strong></td>
<td>All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars</td>
</tr>
<tr>
<td><strong>Group 10</strong></td>
<td>All women with a single cephalic pregnancy &lt;37 weeks gestation, including women with previous scars</td>
</tr>
</tbody>
</table>
Figure 1. Flow diagram for literature search and selection

Articles found by searching databases: 40

Articles found by analysis of references and online library of the WHO: 6

Articles to which inclusion and exclusion criteria were applied: 46

Articles excluded because of duplication, not in English language, only abstract available and after title and abstract screening: 21

Full text articles assessed for eligibility: 25

Excluded because does not mention points relevant to this study: 14

11 articles included
12. RESULTS

46 articles were identified in the initial search using the keywords mentioned above. After screening the abstracts and titles and application of the exclusion criteria 21 were excluded. Those were articles not written in the English language, only the abstracts available or duplications. 25 articles were potentially eligible for further evaluation and full text review. After the analysis of the full text articles 11 were included for data abstraction and inclusion in this literature review.

Of the 11 articles 1, the WHO implementation manual, mentioned the possible source for misinterpretation of data, when first analyzing a subgroup, before paying attention to the 10 main groups (9), 4 papers discuss the possibility of differences in definitions leading to misclassification (9)(10)(11)(12). 8 of the 11 articles discuss the problem of missing data leaving women unclassified, or making a Group X (7)(9)(10)(13)(14)(15)(16)(17). Missing variables are mentioned as a weakness of the Robson classification by 7 of the articles (3)(7)(10)(11)(13)(16)(17). Table 2 shows the corresponding articles.

Table 2 shows the corresponding articles.

### Table 2. Weaknesses and limitations mentioned by analyzed articles

<table>
<thead>
<tr>
<th>Weakness and limitation found by author</th>
<th>Author and Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checking subgroups before the main 10 groups</td>
<td>WHO Implementation manual (9)</td>
</tr>
<tr>
<td>Differences in definitions leading to misclassification</td>
<td>WHO Implementation manual (9), A. Betran et al. (10), D. Brennan et al. (11), Yadav et al. (12)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing data making an unclassifiable group</td>
<td>WHO Implementation manual (9), A. Betran et al. (10), S. Kelly et al. (13), A. Pyykönen et al. (7), E. Barcaite et al. (14), H. Litörp et al. (15), C. Schanz et al. (16), A. Lafitte et al. (17)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing variables</td>
<td>M. Torloni et al. (3), A. Pyykönen et al. (7), A. Betran et al. (10), S. Kelly et al. (13), C. Schanz et al. (16), D. Brennan et al. (11), A. Lafitte et al. (17)</td>
</tr>
</tbody>
</table>
13. DISCUSSION

13.1. Subgroups and merging groups

Many users of the Robson 10 group classification have found the need for a more detailed subdivision of certain groups. The goal of such subdivisions is to increase the uniformity and homogeneity within a group. This can be useful when planning clinical interventions in a specific subgroup (9). Subdivisions for some groups might turn out to be more meaningful than others.

A. Betrán et al. summarized in their 2014 review of 73 studies the subclassifications and merging of groups reported by the users of the Robson classification. Among the 58 studies that presented data using the classification 34 used the original 10 group classification with no changes like subgrouping or merging. 18 studies presented subgroups or additional groups and seven studies presented their data by using less than 10 groups by either focusing on fewer groups or combining groups. Table 3 shows the number of studies proposing each subdivision for each Robson group (10). This shows that there seems to be a need but also the possibility to adapt the basic Robson classification system for clinical use and the individual needs of physicians and scientists who are working with it. Table 3 also shows how too many subgroups may lead to confusion and how many different proposals for subgroups exist beside the 2 most commonly used ones, listed below.

Commonly there are subdivisions for the following groups in use; 2a/b and 4a/b was originally proposed by Robson in 2001 and have since been applied by many users (27 of 73 articles collected by A. Betrán et al. (10))

**Group 2:** Nulliparous women with single cephalic pregnancy, \( \geq 37 \) weeks gestation who either had labour induced or were delivered by caesarean section before labour
- 2a: Labour induced
- 2b: Pre-labour caesarian section
**Group 4**: Multiparous women without a previous uterine scar, with single cephalic pregnancy, $\geq 37$ weeks gestation who either had labour induced or were delivered by caesarean section before labour

4a: Labour induced

4b: Pre-labour caesarian section

Table 3. Obstetric characteristics of women included in each of the 10 groups of the classification; subdivisions proposed by the authors of the 73 included studies, and the number of studies proposing each subdivision by group of Robson.

(A. Betrán, N. Vindevoghel, J. Souza et al.)

<table>
<thead>
<tr>
<th>Group</th>
<th>Women included</th>
<th>Augmentation vs no augmentation</th>
<th>Spontaneous/induced CS before labour</th>
<th>With/without previous uterine scar</th>
<th>Previous vs no previous VD</th>
<th>One previous scar vs $\geq 1$ previous scar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nulliparous with single cephalic pregnancy, $\geq 37$ weeks gestation in spontaneous labour</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2*</td>
<td>Nulliparous with single cephalic pregnancy, $\geq 37$ weeks gestation who either had labour induced or were delivered by CS before labour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Multiparous without a previous uterine scar, with single cephalic pregnancy, $\geq 37$ weeks gestation in spontaneous labour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4*</td>
<td>Multiparous without a previous uterine scar, with single cephalic pregnancy, $\geq 37$ weeks gestation who either had labour induced or were delivered by CS before labour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>All multiparous with at least one previous uterine scar, with single cephalic pregnancy, $\geq 37$ weeks gestation</td>
<td>8*</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>All nulliparous women with a single breech pregnancy</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>All multiparous women with a single breech pregnancy including women with previous uterine scars</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>All women with multiple pregnancies including women with previous uterine scars</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>All women with a single cephalic pregnancy $&lt;37$ weeks gestation, including women with previous scars</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Often divided into 2a and 4a (inductions) and 2b and 4b (pre-labour CS): These were originally proposed by Robson in 2001 and have been used/proposed by 27 articles.

* This includes one article that proposed Trial of labour after CS (TOLAC) vs No TOLAC.

doi:10.1371/journal.pone.0097769.0001
The WHO warns in their implementation manual that analysis of a single subgroup by itself may be misleading if no attention is paid to what has been left out. They recommend for users to become accustomed to first analyzing the 10 groups before looking at subgroups, because otherwise data may be misinterpreted (9).

13.2 Differences in definitions

The definition of birth

The definition of "birth" may vary from country to country on factors of weight and gestational age of the fetus. This may be a reason for doctors to be confused about how to classify women in one of the 10 groups or categorize them falsely. A woman is classified in nulliparous if she has not given birth before or had a delivery that did not meet the definition of birth, which will make her part of the Robson groups 1, 2, or 6. Multiparous women have had a birth before, making them part of Robson group 3, 4, 5 or 7.

The WHO classifies a birth as any delivery of an infant >500g or ≥22 weeks, alive or dead, with or without malformations, by any route (9). Those values were also used by the Lithuanian health care providers (6).

Canada classified birth as all births (life and still birth) ≥ 20 weeks gestational age (13). Only births at 28 weeks or older of gestational age and a weight of the fetus of >1000g were included in the Robson report of the countries of Mali and Benin (16).

In the large 2014 review by A. Betrán et al. they found the following definitions of birth proposed by users of the Robson classification (10):

- Live birth and Stillbirths Gestational age ≥20 weeks
- Gestational age ≥23 weeks
- Birthweight >500 g
- Live births with birthweight >500 g
- Gestational age ≥20 weeks or birthweight >400 g
- Live birth and stillbirths gestational age ≥20 weeks and birthweight >400 g
- Gestational age ≥22 weeks or birthweight >500 g
- Live births gestational age ≥22 weeks and birthweight >500 g
**Definitions regarding labour**

Another definition which needs specifications seems to be the start of spontaneous labour. The WHO suggests, that an agreement is necessary on the definitions of when labour starts and the differences on induction of labour versus augmentation or acceleration (10). Spontaneous labour may be augmented or accelerated which may be misclassified as induction of labour if the differences and definitions are not clearly defined or are unclear to the practicing physician. Induction of labour is classified as use of any medication or amniotomy when labour has not started (11)(18)(19)(20). This difference will also shift the distribution of women between the groups.

In order to clarify the definitions of terms as beginning of labour, induction of labour, acceleration and augmentation, the WHO suggests, that each hospital writes a glossary with such definitions and adds them as a footnote to their Robson Report Table (9).

The WHO also explicitly defines in their implementation manual the term 'spontaneous labor' a woman who prior to her delivery was in spontaneous labor, including women receiving oxytocin or amniotomy for acceleration or augmentation after onset of labour. Induction is defined by a woman admitted to the ward who is not in labour and receives an induction. Means of induction include amniotomy, misoprostol, oxytocin, intracervical Foley balloon, laminaria and others(9).

Education and training is the key to collecting data but also to correctly identify and classifying fetal presentation and position which is done by midwives, physicians and other health care providers. They need to be able to correctly identify the difference between e.g. transverse lie and occiput transverse presentation so that a woman is not falsely classified in a wrong group (12)(11). Again, the WHO implementation manual offers clear definitions for fetal lie and presentation.

**13.3 Missing data and Group X**

Cases with one or more of the six core variables missing should be considered not classifiable (9). The six variables are parity, gestational age, previous CS, onset of labour, fetal lie and presentation and number of fetuses. This means that often cases are not included in the
Robson classification tables and statistics, because details have not been recorded and consequently make assignment to a group impossible. But instead of leaving out such cases, some users have found it useful to group such cases in 'Group 99' or 'Group X'. The size of this group might be a good indicator of the quality of information and the addition of this group to the Robson classification makes it 'totally inclusive' (10).

In the 2013 study by S. Kelly et al. examining Cesarean section rates in Canada using the Robson classification, it was not possible to classify 7.7% of all Cesarean sections into one of the 10 groups because of missing data elements (13).

A. Pyykönen et al. in their 2017 study comparing Cesarean section rates across the Nordic countries, were able to report only a very small group of women who were left unclassified due to missing data. The Group X (or in the study called R99) accounted only for 0.1-1.8% (7). This shows how well data collection and in consequence its classification seems to work in the Nordic countries.

The problem of possible misclassification and inaccurate collection of data was also mentioned in the study performed by the Department of Obstetrics and Gynaecology, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania in 2015. They emphasize on the importance of continuous educational assistance (14). Many studies do not use a Group 99 or Group X in their Robson tables and only mention the problem of unclassified cases due to missing data. But without exact numbers it is difficult to say how many percent these cases contribute to the complete case number. The quality of the data should not be taken for granted.

A problem discussed in the 2013 study by H. Litrop et. al. is the underreporting of information, e.g. induction of labour or missed previous cesarean sections leading to misclassification (15).

A study on CS rates in Mali and Benin from 2018 reports that often patient information was missing in hospital registries, though they were able to find more data in the patients files directly. When the gestational age was not noted in the documents, they classified a birth as term if the newborn weight was ≥ 2500g (16). This can be counted as an attempt to not leave cases out of the statistics completely because of the missing information, in this case gestational age. Instead an assumption is made, that a newborn with more than 2500g is born at term. This might be right in many cases and it is commendable to not simply exclude those cases, but they could also be placed in a Group X of 99 for more accuracy in the Robson report table.

A similar problem with data collection was reported in France by A. Lafitte et. al. where only
gestational age, fetal presentation, number of fetuses and previous CS were recorded in the hospital registries. Parity and onset of labour had to be collected separately from patient records (17). Data collection from different sources might increase the opportunity for human error.

In order to work with high quality data and avoid mistakes, it is important for staff to know the importance of complete data collection and also its accurate and timely recording. This can only be achieved by involving, informing and training hospital staff.

The WHO implementation manual requests the addition of the 'unclassifiable group' into the Robson report table as a footnote. Its size in absolute N (number) and % over total deliveries is important as it is an indication of the quality of the collected data. Also the analysis which are the exact variables missing in the cases will help to improve data collection in the future (9).

13.4 Missing variables

The Robson Classification is a women based classification with its core variables focusing on the state of the women and her pregnancy. It only takes into consideration parity, number of fetuses, gestational age, previous CS, onset of labour and fetal presentation. There are other classification systems that have different focuses. A big group is composed of indication based classifications that focus on the question 'why' a cesarean section was performed. M. Torloni et al. found 12 indication based systems of which the two most highly rated are Anderson's and Althabe (3).

Andersons classification has 5 groups (8): Previous CS, breech, dystocia, fetal distress and other. Althabe classification has 8 groups: Extreme emergency, previous CS, dystocia, intrapartum acute fetal distress, podalic presentation, maternal causes, fetal causes and other.

M Torloni et al. summarize the disadvantages of indication based classifications as follows: " a) poor/unclear definitions for some of the most common conditions that lead to CS (e.g. dystocia, fetal distress) and therefore questionable inter-rater reproducibility; b) categories not mutually exclusive, implying that there would need to be some kind of hierarchy guideline to classify cases with >1 primary indication; c) not being totally inclusive, unless an extensive list of indications is provided or an 'Other indications' category is created; and d) not be very useful to change clinical
practice, since most of the indications are not prospectively identifiable” M. Torloni et. al (3).

Classifications based on degree of urgency focus on when and how quickly a cesarean section is performed. The weak point of those classifications is summarized by M. Torloni et al as the lack of clear and unambiguous definitions for the categories which leads to a problematic and inaccurate reproducibility, comparability and interpretation depending on the person performing the rating. Also time intervals to delivery, which define each group, are not evidence based but subjective and might therefore also show differences between rating physicians. These types of classifications would have to be combined with others in order to provide useful amounts of information (3).

A. Betrán et al. write that many users criticize, that the basic Robson classification does not include other maternal and fetal factors that influence rates of cesarean sections (e.g. maternal age, preexisting conditions, BMI and complications)(7)(10).

They summarize the biggest critique point they found as "Identifies contributors to CS rate but not the reasons for performing a CS (indications) or explanations for differences"(10) Maternal age, BMI and other pre-existing conditions as well as complications will largely influence the rates of cesarean sections in clinical practice, yet they are not visible in the Robson report tables and how they played a role in the decision to perform cesarean sections. Conditions as eclampsia, intrauterine growth restriction, placenta previa and others can increase the contribution to groups 6 and 9 in case of non-vertex fetal presentation or twinship, although the CS was not performed due to that indication (17).

The study of Canadian cesarean sections criticized: "A limitation of the Robson method is that its primary purpose is to identify differences in CS rates across patient subgroups, but it does not provide an explanation for these differences or distinguish the specific reason for performing CS"(13).

A problem with women-based classifications is that they do not present why (indications) or when (degree of urgency) the CS was performed, which are also important aspects.(3)

C. Schantz et. al. criticizes in the 2018 study from Mali and Benin the missing variables of indication with the following example. The commonly as low risk for CS described groups 1-4 had relatively high CS rates in Mali and Benin. Eclampsia is common in Sub-Saharan countries
and might explain the high rates in this region (16). Since this is only an assumption proposed by the authors, more information would be needed to fully interpret rates among these groups.

It is clear, that no single classification suits every need of every health care professional as interests and objectives differ. It would be possible to combine existing classification systems for cesarean sections. That way more information could be combined and shown.

M. Torloni et. al. mention the possibility of a hybrid model based on the woman-characteristics system with added layers of urgency or indication based systems (3). No experiences with such a system has been reported and its effectiveness is unknown.

M. Robson, D. Brennan et. al. discuss in their 2009 study the possibility of subgroup analysis in the 10 group classification system of body mass index, advanced maternal age, race and socioeconomic influences. They conclude that this is more useful in a research context but not for the Robson classifications primary value of monitoring obstetric practices influencing rising CS rates. (11)

13. 5 Strengths and limitations

It is important to note, that the opinions featured in this work do not represent a universal view among scientists. It is a selection of reports that focuses on the weak aspects of a well established tool that has been validated and proven to work. A limitation of this work is that it is not exhaustive. The list of weaknesses and limitations is without any claim of completeness, as they include subjective experiences and opinions. Also more reports might exist, that have not been included in this work. Other authors might not run into the difficulties depicted here or have found a way to implement additional tools to work around limitations.

The strength of this review is its comprehensiveness compared to larger studies since it focuses on few but main points.

It would be desirable to see in further reviews different staff training techniques that have been performed and their results. More research can be done to see how more years of practice and experience in using the Robson classification will improve the quality of data.
14. CONCLUSION

1. Possible sources for errors during the use of Robson classification were found.
To analyze subgroups without prior consideration of the 10 main groups might lead to wrong or incomplete results.
Differences of definitions of the core variables can lead to incorrect assignment to a group or different distributions between the groups depending on the authors.
Missing data can lead to incorrect classification or to not classifying a group of women at all which will leave the dataset incomplete. Human error is a common contributor to incomplete data or incorrect classification. This is attributable to inexperience and lack of training.

2. Limitations of the Robson classification remarked by the users are the lack of certain variables that show relevance in clinical practice. Those are indication to perform surgery, its urgency and comorbidities of the women.

3. Strategies to help reduce likelihood of mistakes and improve successful use of the Robson classification are careful analysis of all 10 main groups before focusing on subgroups. Indicating definitions and cut-off values used to create a Robson report in a footnote prevents mistakes when comparing reports from different authors.
Summarizing non-classifiable women in a Group X or 99 contributes to quality of data.
Staff education and training can prevent missing data and incorrect classification. A combination of classification systems might provide more complete information but no experiences with it have been reported yet. Most problems noted by users of the Robson classification can be controlled by closely following the WHO recommendations published in the implementation manual(9).
15. REFERENCES


4. WHO Cesarean Section Rate, WHO reference number WHO/RHR/15.02 .Feb 2015


12. Yadav RG, Maitra N. Examining Cesarean Delivery Rates Using the Robson’s Ten-group


