BMJ Open Quality

Observation of a quality improvement initiative to contextually adapt and use Robson classification in real time to collect data around CS delivery and to develop strategies to reduce CS rate

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To cite: Kumari P, Singh M, Sinha S, *et al*. Observation of a quality improvement initiative to contextually adapt and use Robson classification in real time to collect data around CS delivery and to develop strategies to reduce CS rate. *BMJ Open Quality* 2023;**12**:e002315. doi:10.1136/bmjoq-2023-002315

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjoq-2023-002315).

Received 9 February 2023
Accepted 23 May 2023

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ABSTRACT

The rising trend in caesarean section (CS) rate is a global concern and, in this hospital too, it rose from 21.5% in 2010 to 32.6% in 2018. The team followed the point of care quality improvement methodology and conducted a series of Plan–Do–Study–Act cycles to contextually modify and adapt Robson classification into the existing workflow to improve the process of documentation and data collection for CS in the first 6 months (January 2019–June 2019) and then to use these data to develop strategies to reduce CS rate below 30% in the next 18 months.

To evaluate the impact of developed strategies, the team plotted the data on Statistical Process Control (XmR) chart. The baseline mean CS rate was 32.6%. The team observed a shift in the CS rate data twice, between April 2020 and December 2020 and between August 2021 and February 2021 with the mean 27.8% and 28.9%, respectively. October 2021 onwards, the team also observed a sustained reduction in the CS rate in women undergoing CS who had one previous CS. The mean CS rate reduced from 94% to 86%.

The reductions in the CS rate were not sustained and followed by an increase again. The project highlighted the complexity of the factors related to CS delivery and the multidimensional barriers of sustaining the reduction in the CS rate. This is a well-sustained ongoing QI intervention and the team is further working on identifying the underlying factors to improve the efficacy of the interventions to sustain the reduction in the CS rate.

This hospital represents the general population of North India seeking care in public healthcare facilities. Therefore, despite being a single-centre study, the population served and interpretations drawn from this study are generalisable to other hospitals with similar settings.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The rising trend in caesarean section (CS) rate is a global concern and this is rising significantly over the past few decades.
⇒ The challenge is to keep CS rates low while maintaining safe outcomes for the mother and newborn.
⇒ Implementation of effective measures to lower the CS rate demands a thorough study of each case to identify the most frequent patient group undergoing this procedure.

WHAT THIS STUDY ADDS

⇒ The team followed the point of care quality improvement methodology to improve the documentation process around CS delivery and to use this data to develop strategies to reduce CS rate in the hospital.
⇒ The team incorporated the developed strategies into the daily practice and reduced CS rate in the hospital.
⇒ However, this project highlighted the complexity of the factors related to CS delivery and the barriers to sustain the reduction in the CS rate.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Despite being a single-centre study, the population served and interpretations drawn from this study are generalisable to other hospitals with similar settings. The lessons learnt can be used to develop further strategies to optimise and sustain the reduction in CS rate.

PROBLEM

Bhagwan Mahavir Hospital is a secondary care public sector hospital in New Delhi, India catering to a low-income and middle-income population. The average number of deliveries per month is 300. The hospital provides 24×7 labour room services. The pregnant women (PW) delivering at LR consists of both low-risk and high-risk pregnancy. One postgraduate senior resident (SR), one undergraduate junior resident (JR) doctor and two staff nurses (SN) in a shift provide all the services. These include labour monitoring, conducting vaginal and caesarean section (CS) delivery and other emergency operative services, and follow-up of mothers after delivery. The LR team keeps on changing due to rapid turnover of SR and

JR in the hospital. Consultant on duty takes the round of patients in LR in the morning and remains available in the hospital till 16:00 hours and on on-call till 9:00 hours next morning. This hospital has an emergency and an elective operation theatre, 10 bedded NICU adjacent to LR, a 12 bedded common ICU and a blood bank. There is no HDU and dedicated ICU for PW.

The rising trend in CS rate is a global concern and, in this hospital too, it rose from 21.5% in 2010 to 32.6% in 2018. This was much higher than the average for India (17.2%)[1 2] and the WHO recommendation on CS rate (10%–15%).[3] As the CS rate of this hospital was higher than the national average and WHO recommendation, the team decided to work on optimising the CS rate in this hospital. The team followed the point of care quality improvement (POCQI)[4] methodology to know the various factors contributing to the rising CS rate and to develop strategies to reduce unnecessary CS.

The team aimed to contextually modify and adapt Robson classification[5 6] to collect data for the number and indication of all CS done in the hospital in 6 months (January 2019–June 2019) and to use this data to develop strategies to reduce the CS rate below 30% in next18 months.

BACKGROUND

The CS rate is rising significantly over the past few decades. In India, the rate increased from 8.5% to 17.2% between 2005–2006 and 2015–2016.[1 2] WHO proposes that no improvement has been observed in maternal and neonatal outcomes in CS rates above 10%–15%.[3] However, no recommendation for a specific CS rate in a facility can be developed because of wide heterogenicity in the indications for CS, the availability of CS services and its utilisation.[3]

This potentially life-saving procedure is not without risk and might become life-threatening in the index or future pregnancies for both the mother and child. The challenge is to keep CS rates low while maintaining safe outcomes for the mother and newborn. Implementation of effective measures to lower the CS rate demands a thorough study of each case to identify the most frequent patient group undergoing this procedure.[7]

A systematic review comparing different classifications to study the most frequent patient group undergoing CS concluded that the Robson classification is optimal for monitoring CS.[8] WHO recommended it as a global standard tool for monitoring CS in 2017.[6]

The Robson classification[5 6] classifies all delivering women into 10 groups based on 5 basic obstetric characteristics; parity, number of fetuses, previous CS, onset of labour, gestational age and fetal presentation. Every pregnant woman admitted to deliver in the facility is classified into one of the 10 groups to compare the CS rate in each group (online supplemental file 1-Robson classification).

Robson classification has been used in many studies from developed and developing countries including South-East-Asia Region to analyse CS rate and its indications.[9–13] Most of the studies have used this classification retrospectively and collected data for a one-time analysis of rate and indications of CS. There are very few studies that have been done prospectively[13 14] to develop recommendations to improve CS practices. In this QI initiative, the team contextually modified and adapted the Robson classification to collect data on real time using the POCQI[4] methodology.

BASELINE MEASUREMENT

The team reviewed the CS-related records in the birth register and the operation theatre logbook. These registers had the record of numbers and indications for CS. However, indications were not categorised uniformly based on characteristics like parity, number of fetuses, previous CS, onset of labour, gestational age and fetal presentation. From these data, it was difficult to assess the common indications for CS, the group of PW undergoing most of the CS and to analyse the data to develop strategies to reduce unnecessary CS.

DESIGN

The department formed a QI team which included a consultant obstetrician, two postgraduate resident doctors and two SNs. The team members were directly involved in conducting and documenting the CS done in this hospital. The team decided first to focus on improving the documentation practice and data collection around the CS and then to analyse these data to develop strategies to reduce unnecessary CS. They analysed the problem of poor documentation around the process of CS with the help of process flow chart and fishbone analysis. On analysis, the team observed that there was no proper documentation practice to collect data for number and indication of each CS done, to categorise the indication of CS uniformly, to enlist the common indications for CS and to identify the group of women undergoing most of the CS and a departmental strategy to optimise CS rate. The team never did any clinical audit for indications of CS done in the hospital.

The team decided to contextually modify and adapt Robson classification into the existing workflow to improve the process of documentation and data collection for CS and then to use these data to develop strategies to reduce CS rate below 30%.

The Robson classification[5 6] classifies all PW admitted for delivery into 10 groups. The QI team referred to the Robson classification Implementation Manual[5] to understand the different groups of Robson classification and its use. The team oriented the doctors and staff working in the labour room and maternity operation theatre about this classification and its use. A copy of Robson classification was distributed for ready reference. The team made a form based on the Robson classification to collect data for the number and indication of CS done over the month

Table 1 Plan–Do–Study–Act (PDSA) cycles

	Plan	Do	Study	Act
PDSA-1 (2 January 2019–8 January 2019)	The SR on duty to categories all PW into 1 of the 10 Robson groups and to write the group no on case sheet. The SN on duty to note the group no for each delivery in the birth register. The consultant to check the completeness and correctness of group no on case sheet at the time of clinical rounds and again at the time of discharge of the patient.	For 1 week as planned A print out of Robson's ten groups classification was kept for ready reference.	At the end of the week the QI team reviewed this improvement process and observed that all PW delivered in that week were not correctly categorised into the ten groups. Some were misclassified and some were missed. On discussion the team felt that it might be because of the reason that the process and the concept was very new to the LR team.	The team decided to guide and supervise the LR team on this new process and to rectify any incorrect or missing data on the case sheet as a routine as the LR team keeps on changing. The team adapted and continued this process.
PDSA-2 (4 February 2019–10 February 2019)	To incorporate the Robson form into the doctor's duty report book to collect daily data for no of CS done in each group by the same team who performed the CS between 9:00 and 9:00 hours. The consultant obstetrician to supervise the data collection daily the following morning for its correctness and completeness and to get filled the missing data, if any.	For a week as planned. The consultant obstetrician in the team, oriented the postgraduate duty doctors about the form and the way to fill it.	Duty doctors found this additional step in their workflow convenient and not time-consuming but they had to refer to the Robson classification frequently. Some of the doctors missed the data entry in the Robson form which they completed next morning in the presence of the consultant. For the consultant obstetrician it was not taking much time to verify the data daily in the morning rather it provided an opportunity to discuss the process again and again. It helped in orienting the newly joined resident doctors and other doctors in the department to understand this new improvement process.	The team adopted and continued the same process for a month. At the end of the month, they had the record of all CS done daily in a month with proper categorisation into one of the ten groups according to Robson classification. Both the new processes were continued in a similar way. Gradually duty doctors were able to document the process more efficiently, had very few missing data and required minimal corrections.
PDSA-3 (6 April 2019–12 April 2019)	To fill the revised Robson form to mark the indication for CS in each group	For a week as planned.	The revised Robson form worked well and duty doctors found it easy to mention no of CS against the indication for CS. In case of any doubt, they discussed it in the following morning and completed the form. The consultant obstetrician supervised the whole process of data collection.	The team adopted the revised Robson form and continued the new processes for another 3 months.
PDSA-4 (July 2019)	To analyse the indication of emergency CS done in last 24 hours. To record the no of unnecessary CS in a month.	For a month as planned.	This intervention seemed effective and the team got to know the factors contributing to unnecessary CS delivery.	The team developed strategies to address these factors.
PDSA-5 (1 August 2019–7 August 2019)	To post one additional SR to support the LR team for conducting CS delivery and other emergency surgical procedures between 14:00 and 21:00 hours and to assist them as and when required.	For a week as planned.	This change idea worked very well. The SR on duty in LR had not to leave the LR for operative procedures and was present full time to monitor the labouring patient in LR. They felt supported in decision-making for mode of delivery in difficult situation. The other routine services were managed despite posting one SR for LR duty.	The team adopted this change idea and started posting an SR on 14:00–21:00 hours duty routinely.

LR, labour room; PW, pregnant women; SN, staff nurse; SR, senior resident.

and named it as 'Robson form' (online supplemental file 2).

STRATEGY

The QI team conducted a series of Plan–Do–Study–Act (PDSA) cycles (table 1) first to contextually modify and use Robson classification in real time for data collection and second to use this data to develop strategies to reduce the CS rate in the hospital.

It is an established practice in our hospital that an on-duty postgraduate resident doctor writes a duty report after a labour room shift duty. In the duty report, the duty

doctor summarises the work done in a shift. A consultant obstetrician checks and discusses this duty report daily the following morning. Other obstetricians and resident doctors are also present during the discussion. The team incorporated the the Robson form in the duty report. Through PDSA cycles 1–2, the QI team streamlined the process of documentation of number of CS done in each Robson group daily in the hospital.

At the end of 3 months, the team analysed the data for the quality of data collection, the type of population served by the hospital, the CS rate of each group and how each of the individual 10 groups contributed to the overall CS rate in this hospital with the help of Robson Interpretation table[15] (online supplemental file 3).

The team observed that the groups contributing most to overall CS were women with one previous CS (group 5.1) and women with first pregnancy (groups 1 and 2). Thus, the rate of both primary and repeat CS were high in the hospital. However, the indications for CS in these groups were not clear from the data collected in the Robson form. Knowing the indication for CS is the first prerequisite to develop any strategy to reduce CS delivery. Hence the team revised the Robson form (online supplemental file 4) and included common indications of CS in each group. They tested the feasibility of using this revised form in the PDSA-3 and then adopted.

At the end of the 6 months, the team had the data of all CS done in a month with proper categorisation and common indications of CS in each group. January 2019–March 2019 data were updated for indication of CS in each group with the record in case sheets. In these 6 months, the team contextually adapted the Robson classification and successfully achieved the aim to collect data for the number and indication of all CS done in the hospital. Newly recruited doctors and SN were oriented about this improvement process.

The team reviewed the monthly data for number and indication of CS. The most frequent indications for unplanned or emergency primary CS were suspected fetal distress, non-progress of labour (NPOL), cephalopelvic disproportion (CPD) and failed induction of labour (IOL). The common indication for repeat CS was planned or elective repeat CS and women not giving consent for trial of labour (TOL). Many of the indications for CS were medically indicated and done as planned CS.

In first step, the team decided to discuss the indication of unplanned CS done in the last 24 hours for its eligibility and correctness to identify unnecessary CS for 1 month in PDSA-4. In this PDSA, the team analysed the indication of emergency CS done in last 24 hours with respect to per operative findings and neonatal outcome for abnormal electronic fetal monitoring parameters suggesting fetal destress on cardiotocography (CTG), partograph findings for the indication of NPOL and prolonged labour, indications of repeat CS in women with previous one CS, TOL given or not in cases of CPD, eligibility of indication as failed IOL, and the number of CS and IOL done without consulting the consultant on duty. If all team members agreed to the indication of CS as justified in view of good fetomaternal outcome it was considered necessary. If any of the member found the indication unjustifiable the indication was considered unnecessary and avoidable. The team recorded the number of unnecessary CS month wise.

Majority of cases justified the indication of CS but at the same time the team felt some of the CS were done due to the fear of delivering a compromised baby in a busy labour room with limited human resource, not feeling confident in monitoring the labour in slow progress especially in cases of women with first pregnancy where labour takes longer time, not confident in instrument assisted delivery, doing CS for all breech presentations, fear of baby getting admitted in neonatal intensive care unit (NICU), limited availability of NICU beds in the hospital, unindicated and incomplete IOL, pregnant woman and their relative not willing to take slightest of maternal or fetal risk.

The team developed following strategies to address these issues:

- Resident doctors to involve consultant on duty mandatorily to take decision for IOL and CS.
- To formulate admission policy and to admit low-risk cases not before 40+3 weeks of gestation for delivery.
- To monitor labour by intermittent auscultation in low-risk cases and to use the CTG in high-risk cases only.
- Real-time charting of progress of labour and other parameters in partograph and to start the plotting only when woman goes into active labour.
- Judicious administration of oxytocin to augment labour.
- To allow the pregnant PW for TOL to go into the active labour before taking them for CS for failed TOL.
- To make departmental policy to induce low-risk patient not before 40+3 weeks and to individualise for high-risk patients.
- To review the indications for IOL to avoid unnecessary induction thereby CS for failed induction.
- To conduct training sessions on real-time partograph plotting, on fetal monitoring and CTG interpretation to avoid overdiagnosis of fetal distress, on instrument-assisted (forceps/vacuum) delivery and assisted breech vaginal delivery to reduce the rate of primary CS.
- To keep record of prolonged labour, scar rupture, neonatal resuscitation and stillbirth as balancing indicator.
- To involve the PW and their relatives in the counselling process and decision-making during antenatal visits and in LR.
- To present and discuss the monthly data with the team members.
- To post one additional doctor from the existing pool of doctors in LR between 14:00 and 21:00 hours to conduct CS and other emergency operations (PDSA-5).

As the another common group undergoing CS were the PW having previous one CS delivery; the team evaluated

the data collected in the modified Robson form for indications of repeat CS. The most common indication of repeat CS in women with previous one CS was elective/planned repeat CS (ERCS). Other indications were women not giving consent for TOL after CS (TOLAC) and failed TOL. Only a few women delivered vaginally after CS. To reduce the number of repeat CS the team emphasised on:

- To evaluate the PW with previous one CS delivery in the antenatal period for their eligibility for TOLAC.
- To counsel the eligible candidate for TOLAC in the antenatal visits and at the time of admission in LR to increase their willingness.
- To evaluate the indication of ERCS and failed TOLAC to avoid unnecessary repeat CS.
- To follow the strategies to minimise primary CS thereby the repeat CS in subsequent pregnancy.

The team incorporated these strategies into the daily practice to reduce CS rate in the hospital. Later the team also evaluated the indications for planned CS in the Robson classification and tried to optimise the CS rate in these groups wherever possible. The consultants assured the resident doctors in making a decision and in counselling the patient and their relatives in difficult situations.

Sustenance phase

QI team met regularly in the first week of every month with other members of the department to discuss the impact of developed strategies on CS rate and the way forward.

The SRs are collecting monthly data in the modified Robson Form and for unnecessary CS as per their duty roster. Additionally, they are collecting monthly data for instrumental delivery, VBAC, breech vaginal delivery, neonatal resuscitation, stillbirth and scar dehiscence/rupture as the balancing indicator. The data were entered in a Microsoft Excel spreadsheet for compilation, analysis and comparison. The team used tables and run charts to display and interpret the serial measurement of process and outcome indicators. The team used Statistical Process Control (XmR) chart[16–18] to assess the effects of revised clinical protocols on CS rate. They analysed the data whenever there was a shift in the mean.

The new doctors and staff joining the department were oriented about this improvement process at the earliest. The leaders at all levels were kept in the loop and informed since starting and no leaderships issues were encountered. October 2021 onwards the team is also participating in a collaboration of medical colleges and district hospital in their endeavour to develop strategies to optimise CS rate in Delhi using Robson classification.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, of this report. The objective of the study was to improve documentation and data collection practices, and data analysis to reduce unnecessary CS, and to provide quality care in the hospital.

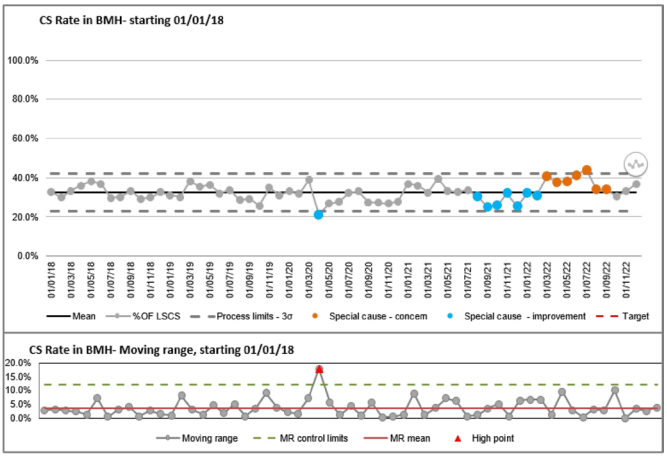

Figure 1 XmR chart for % women delivering via CS. BMH, Bhagwan Mahavir Hospital; CS, caesarean section.

RESULTS

The team started this project in January 2019 and since then collecting month-wise data for number and indication for CS in the Robson form and following the strategies to reduce the CS rate. As the data collection was real time and verified routinely the next morning, there were no missing or incomplete data.

To evaluate the impact of developed strategies, the team analysed the monthly data on total delivery, total CS delivery, CS rate in each group and balancing indicators (online supplemental file 5 table-2).

The team plotted the month-wise data for CS rate from January 2018 (baseline data) to December 2022 on an Statistical Process Control (XmR) chart.[16–18] The mean CS rate in 2018 was 32.6%. This was set as the baseline. The monthly CS rate went below 30% many times during this period. The lowest observed CS rate was 21%. The team observed a shift in the data twice, between April 2020 and December 2020 and between August 2021 and February 2021 with the mean 27.8% and 28.9%, respectively. However, these reductions in the CS rate were not sustained and followed by an increase again. The mean CS rate during the observation period was 32.5% (figure 1).

October 2021 onwards, the team also observed a sustained reduction/shift in the CS rate in women undergoing CS who had one previous CS (group 5.1). The mean CS rate reduced to 86% from 94% (figure 2).

There was no sustained reduction in CS rate in other groups. However, the number of avoidable CS decreased and number of VBAC, breech vaginal delivery, instrument assisted deliveries increased following the interventions. There were no significant changes in fresh stillbirth, neonatal resuscitation, scar rupture, maternal death, near miss and referral data.

LESSONS AND LIMITATIONS

This is a well-sustained ongoing and a challenging QI project. The team is working on this project since January 2019 without any additional cost or resources.

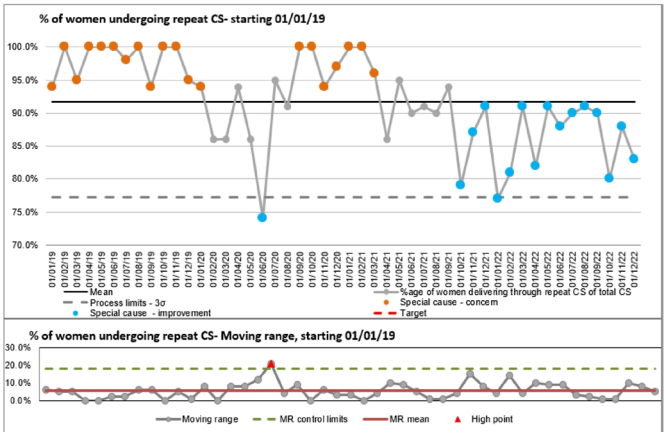

Figure 2 XmR chart for % women undergoing repeat CS. CS, caesarean section.

Robson classification is a global standard tool for monitoring CS. The team contextually modified this and improved the documentation process in the hospital successfully. Since Robson classification is not an audit of the appropriateness of indications for CS, the team designed a mechanism within the existing workflow for continuous clinical audit of indications for CS to achieve an optimum level of CS rate.

The team assessed monthly CS rate in the hospital, common indications for CS, CS rate of each group, most frequent patient group undergoing CS and how each of the individual 10 groups contributed to the overall CS rate using this classification. Based on the data, they developed and implemented strategies to reduce CS rate below 30%. Lacking a clear understanding of what might be a medically justifiable CS rate for this hospital the team picked a figure of 30% as a goal.

Following the implementation of the strategies, the team observed monthly CS rate below 30% many a times and a significant reduction twice in the observation period. There was 8% reduction in CS rate in women undergoing CS who had one previous CS (group 5.1) and well sustained until. The other groups did not show any sustained reduction. The number of avoidable CS decreased and number of VBAC, breech vaginal delivery, instrument assisted deliveries increased following the interventions.

The team achieved its aim to reduce the CS rate below 30% in first 18 months and thereafter too, but failed to sustain the achieved reduction. These reductions never met the recommended CS rate (10%–15%), and followed by an increase in the mean CS rate. The rise in CS rate corresponded with the changing LR team, joining of newly recruited fresh pass-out postgraduate SRs in the department, their variable clinical and surgical skills, changing demographic profile of the PW coming to the hospital, and increasing number of PW coming with previous one or two CS delivery.

The project highlighted the barriers of sustaining the reduction in the CS rate. This is a government run public sector hospital where CS delivery on demand and for profit is not done. The team evaluated each indication to avoid unnecessary CS in the hospital routinely. The new data collection and documentation process, and the developed strategies were in place throughout the observation period but the team observed variations in the CS rate. The mean CS rate remained quite high (mean 32.5%). The QI interventions to collect data for number and indications of CS accurately and implementing strategies to optimise CS rate did not work completely in this facility. The poor effect of these interventions in sustaining reduction in CS rate might be due to the complexity of the factors related to CS delivery. Identifying the underlying factors could improve the efficacy of these interventions to reduce the CS rate and to sustain it.

Worldwide, the frequency of CS continues to increase, and interventions to reduce unnecessary CS have shown little success. Many decisions to use CS are driven by the clinical or psychological needs of the mother or by the clinical needs of the baby, or by both. The team should evaluate all possible drivers for overuse of CS delivery which are related to PW, families, communities, the society, health professionals, healthcare systems, and the organisational design and cultures. Accordingly team should focus on developing interventions to target each driver. These interventions should be tailored to the local contexts and should address the concerns of women and health professionals and the limitations of the health facility.[19 20]

As a way forward to reduce the CS rate, the team is critically evaluating all drivers of overuse of CS and participating in a collaboration of medical colleges and district hospital of Delhi to work together to develop strategies to reduce CS rate. The team might learn from other facilities experience on reducing the CS rate and adapt those learnings in the hope to reduce the CS rate to less than a safe threshold value over a period of time ensuring good maternal and perinatal outcomes. Considering the rapid turnover of resident doctors and their variable skills the team is focusing on training the new residents and to use the available resources more efficiently. They are improving the counselling process to provide women and families a more meaningful medical dialogue and effective emotional support. The team has also started allowing birth companion in labour room. Presence of a birth companion during labour shortens the labour duration and reduces the likelihood of emergency caesarean delivery.[19] The team hopes that with time they will see positive results as aimed.

This hospital represents the general population of North India seeking care in public healthcare facilities. Therefore, despite being a single-centre study the population served and interpretations drawn from this study are generalisable to other hospitals with similar settings. The lessons learnt can be used in similar settings.

CONCLUSIONS

Rising CS rate is a major concern for both public and private sector hospitals globally. At the same time, reducing

the CS rate to an optimum level is very challenging. Underuse leads to maternal and perinatal mortality and morbidity. Conversely, overuse of CS has not shown benefits and can create harm. The factors causing the rise in CS rate are multidimensional requiring interventions at multiple levels. QI methodology provides an opportunity to improve health services at different level. The team hopes that the learnings from this QI intervention will lead them and other facilities to use CS services judicially ensuring good maternal and perinatal outcomes.

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Acknowledgements We acknowledge the contribution of the Nationwide Quality of Care Network (NQOCN), India for providing us training on POCQI methodology. We also acknowledge the mentoring support from NQOCN, India for conducting and sustaining this QI project, drafting the manuscript and for reviewing the manuscript before submission.

Contributors PK, MS and SS conceptualised the project and provided leadership to carry out this quality improvement work. PK, SS, PS, CM and SB were responsible for conduction of the improvement process and data collection. PK, PS, CM and SB were responsible for data collection and compilation. PK, MS and RR contributed in drafting of the manuscript. All authors revised it critically and approved the submission. MS and PK contributed in the data analysis and revision of the manuscript. All authors have approved the final version. PK, guarantor.

Funding Publication of this article is made open access with funding from the Nationwide Quality of Care Network.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This project was a quality improvement initiative designed to improve the service for patients. It was undertaken using improvement science methodology. The interventions made were designed to improve the documentation processes around caesarean section (CS) delivery in the hospital and to develop strategies to optimise CS rate.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

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