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Increasing adherence to plotting e-partograph: a quality improvement project in a rural maternity hospital in India

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ABSTRACT

Abnormal prolonged labour and its effects are important contributors to maternal and perinatal mortality and morbidity worldwide. E-partograph is a modern tool for real-time computerised recording of labour data which improves maternal and neonatal outcome. The aim was to improve the rates of e-partograph plotting in all eligible women in the labour room from existing 30% to achieve 90% in 6 months through a quality improvement (QI) process.

A team of nurses, obstetricians, postgraduates and a data entry operator did a root cause analysis to identify the possible reasons for the drop in e-partograph plotting to 30%. The team used process flow mapping and fish bone analysis. Various change ideas were tested through sequential Plan-Do-Study-Act (PDSA) cycles to address the issues identified.

The interventions included training labour room staff, identification of eligible women and providing an additional computer and internet facility for plotting and assigning responsibility of plotting e-partographs. We implemented these interventions in five PDSA cycles and observed outcomes by using control charts. A set of process, output and outcome indicators were used to track if the changes made were leading to improvement.

The rate of e-partograph plotting increased from 30% to 93% over the study period of 6 months from August 2018 to January 2019. The result has been sustained since the last PDSA cycle. The maternal outcome included a decrease in obstructed and prolonged labour with its associated complications from 6.2% to 2.4%. The neonatal outcomes included a decrease in admissions in the neonatal intensive care unit for birth asphyxia from 8% to 3.4%. It can thus be concluded that a QI approach can help in improving adherence to e-partography plotting resulting in improved maternal health services in a rural maternity hospital in India.

INTRODUCTION

Problem description: this quality improvement (QI) project was implemented in the labour room of a mother–child wing of a rural tertiary care medical college of Wardha district in central India over a period of 6 months. Earlier the labour room staff used the WHO paper partographs to monitor labour. However, it was observed that it was not being done real time. In collaboration with Jeev Daya Foundation e-partography was introduced in the labour room monitoring protocol in November 2013. Under this project, a dedicated midwife was appointed for plotting the e-partographs. However, after the project was over and the nurse midwife was withdrawn, there was a sharp drop in percentage of women being monitored on e-partograph. We analysed the problem over a period of 2 weeks and found that e-partography was being done in only 30% of women. There was an urgent need to revive this practice of e-partography.

Mahatma Gandhi Institute of Medical Sciences is 800 bed rural tertiary medical college and hospital in Wardha district of Maharashtra, in central India. A 200 bedded Maternal and Child Health wing is run by the Obstetrics and Pediatrics departments of the Medical College. The hospital caters to approximately 5000–6000 deliveries annually, that is, 400–500 deliveries per month translating to 12–15 deliveries every day. There are two resident doctors and three staff nurses on duty in each 12-hour shift. It is a tertiary care institute and provides round the clock essential and emergency obstetric and newborn care services. The obstetric department doctors and nurses had not received any formal training in QI methods. A team from the Nationwide Quality of Care Network (NQOCN) trained and mentored a team of doctors and nurses on QI for multiple Quality Improvement projects. The four-step POCQI (Point of Care Quality Improvement) package developed by NQOCN and WHO SEARO (South East Asia Regional Office of WHO) which includes a Facilitator Manual[1] and Learner Manual[2] was used for the training. It presented a demystified and simple model of QI using data to identify quality gaps, analyse underlying causes and improve healthcare practices in their specific context with minimal requirement of additional resources. Meanwhile the Ministry of Health and Family Welfare, Government of India introduced the Labor room Quality Improvement Initiative (LaQshya) programme which focuses on improving the quality of care in labour rooms and obstetric operation theatres across public health facilities in India. Under LaQshya, improving the monitoring of labour by real-time plotting of partographs using POCQI methodology has been included in the QI cycle 1.[3]

Aligning to LaQshya programme and using POCQI methodology, the team identified a QI project to improve the rate of e-partograph plotting in all eligible patients in the labour room from existing 30% to more than 90% over a 6-month period through a QI process in the labour room of the Maternal Child Health Wing of Mahatma Gandhi Institute of Medical Sciences in Wardha, Maharashtra, in central India.

BACKGROUND

In 2017, worldwide 295 000 women died during and following pregnancy and childbirth, of these deaths 94% occurred in low-resource settings, and most could have been prevented.[4] With the global impetus toward universal health coverage, more women are choosing to give birth in health facilities; however, health outcomes will not improve unless service quality is assured.[5] WHO identifies monitoring of labour to guide timely, appropriate actions as a high-priority QI intervention.[6] Regular and timely monitoring of maternal and fetal parameters during labour is critically important to, identify complications and make clinical decision in a timely manner. The paper partograph is the most commonly available labour-monitoring tool, used by health professionals and recommended by WHO for active labour.[7] In many settings, skilled birth attendants (SBAs) complete partographs retrospectively for recordkeeping purposes.[8]

In Africa, e-Partogram use was associated with improvements in adherence to recommendations for routine labour care and a reduction in adverse fetal outcomes, with providers reporting adoptability without undue effort in Kenya.[9] In a feasibility and acceptability study in Tanzania qualitative findings revealed that SBAs felt the e-Partogram improved timeliness of care and supported decision-making.[10] These findings point to the e-Partogram's potential to improve the quality of care in resource-constrained labour and delivery settings. In India Alliance for Saving Mothers and Newborns was launched in 81 public health facilities across Rajasthan and Madhya Pradesh. It was perceived as helpful in managing patients and easier to complete than paper partographs, yet faced some of the most significant potential barriers related to patient urgency and shortage of staff and time.[11] The digital partograph DAKSH is a tablet-based application which was introduced at five primary healthcare centres in North Karnataka, India. It showed good acceptability of application among staff nurses. The auditory reminders to monitor labour vitals were found helpful.[12] In addition, the information on the e-partograph can be used to reassure the woman and her family about appropriate progress in labour, or explain abnormalities and potential interventions.

MEASUREMENT

A baseline assessment of the existing system in the labour room was done. Initial data collection was done for the evening shift only for a week to know the preintervention e-partograph plotting rates. At the end of every evening shift, a dedicated person assigned for the work reviewed and compiled the e-partograph plotting data, for completeness and correctness. The target population comprised all eligible women who were term singleton pregnancy with cephalic presentation having gestational age of at least 37 completed weeks. They were in spontaneous labour, had cervical dilatation in between 4 and 7 cm with no additional complications. High-risk pregnant women with antepartum haemorrhage, breech presentation, multiple pregnancies, premature labour (before 37 weeks) women with medical disorders and so on were excluded from the study. Women planned for elective caesarean section were also excluded from the study.

Case records of all women who delivered during that shift were examined and the number of women with plotted e-partographs in that shift was also noted. The team tracked the neonatal and maternal outcomes in these women. The data suggested that out of total eligible women in whom the e-partograph was plotted in only 30% of the eligible women. In order to meet our aim of improving the plotting of e-partograph in all eligible women, it was planned to gradually include deliveries in all shifts.

The process indicator was the proportion of eligible women in whom e-partograph was plotted. The numerator included the number of eligible women in active labour in whom e-partograph was plotted and the denominator included total number of eligible women in whom the e-partograph should have been plotted. The outcome was measured in terms of percentage of caesarean sections for prolonged labour in mother (if the action line exceeded 2 hours the birth was labelled as prolonged labour) and Neonatal Intensive Care Unit (NICU) admission for birth asphyxia in babies (Apgar1 4–7: mild/moderate birth asphyxia, Apgar1 <3: severe birth asphyxia according to the International Classification of Diseases (10th revision) at 1 min of age).

The numerator was the number of eligible women who underwent caesarean section for prolonged labour and the denominator was the total eligible women in whom partograph was plotted. In case of neonates the numerator was neonates admitted in NICU for asphyxia and denominator was all live births in eligible women.

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Figure 1 Fish bone analysis and process flow for analysis of problem.

DESIGN

The study followed the LaQshya guidelines for standardisation of intrapartum care introduced by Government of India.[13] A team of six healthcare providers was identified (QI team). The team met fortnightly to identify ways to improve e-partography plotting. The study was carried out in the following steps:

1. Forming a team of consultants, resident doctors, staff nurses posted in labour room, nurses trained in e-partography and data entry recorder.
2. Measuring baseline rates of e-partograph plotting in labour room in evening shift over a week.
3. Analysing possible reasons for poor compliance of e-partography in the labour room using root cause analysis (figure 1A,B).
4. Conducting multiple Plan-Do-Study-Act (PDSA) cycles to test change ideas identified by the team on small scale initially and then expanding to larger scale.
5. Descriptive statistics were used to describe baseline variables. Control charts were used to display and interpret the serial measurement of indicators and to study the impact of changes.

A brain storming session was conducted with the team. The various challenges identified by process flow chart and fish bone analysis (figure 1A,B) were:

1. Eligible women admitted to the labour room for delivery were missed by the staff nurse at 4 cm dilatation, when the e-partograph plotting should ideally start.
2. There was confusion on the responsibility for plotting the e-partograph—staff nurses or resident doctors on duty.
3. There was attrition in number of trained resident doctors, interns and nurses posted in labour room and many of those posted were not well versed in plotting the e-partograph.
4. There was only one computer in the labour room which was being used for entry of e-partography and other hospital data.
5. There were broad band internet connectivity issues.

STRATEGY

The QI team after analysing the challenges with the help of fish bone analysis and process flow chart, planned PDSA cycles to implement different change ideas. With this premise, a QI process was planned involving a series of PDSA cycles to improve the percentage plotting of partograph in eligible women.

PDSA cycles undertaken

PDSA cycle I: streamlining patient flow in labour room

The team spent one evening shift to understand the time taken between women entering the labour room to segregating them on the basis of stage of labour. It took approximately 1 hour for a senior resident doctor to examine a woman to determine her stage of labour and plan for mode of delivery. A triage area was set up in front of labour room where women were seen within 15 min of arrival and segregated into prelabour and active labour cases. They were admitted in the labour room and monitored accordingly. Women who were not in labour were segregated from women in latent phase. They were observed for onset of contractions so that their labour progress could be plotted timely with onset of active labour. Plotting of e-partograph at the end of 15 days improved to 35%.

PDSA cycle II: department policy plan and building awareness among healthcare providers

In order to improve it further, a policy plan regarding e-partograph plotting was formulated and circulated taking feedback from all categories of healthcare with the emphasis to identify eligible women for partograph plotting at the right time before delivery. It was observed that health workers sometimes missed identifying eligible parturient women for e-plotting of partographs. It was noted that at times the parturient would cross the stage of partograph plotting without the health worker realising it. Residents, in-charge staff nurses and nurses/midwives of labour room were taught how to identify and notify the eligible parturient women at the right time. For a woman who was in labour and fulfilled the eligibility criteria, the plotting of e-partograph was to be started on time. This cycle went on for 1 month and e-partograph plotting went up to 65%.

For the next 15 days, a fall in e-partography plotting was observed because there was sudden increase in the number of admissions in the labour ward. There was a shortage of healthcare workers in the neighbouring district hospital and our medical college hospital being the nearest referral centre had to cater to the increased admissions without a commensurate increase in the number of labour room staff. This resulted in a fall of 50% in the plotting of e-partographs. It was actually a double whammy for the hospital as some of the labour room staff took leave due to an important festival. This resulted in further decline to 42% of plotting e-partograph over the next month.

PDSA III: entrusting the responsibility of plotting

During the follow-up meetings it was observed that there was no designated person to take responsibility of filling the e-partograph. A meeting of labour room staff with the head of the department was arranged and staff nurses were entrusted the responsibility of plotting the e-partograph. It was realised that there was a shortage of staff nurses and resident doctors had too much clinical work making it difficult for them to fill the e-partograph for all eligible women. Interns and student nurses were involved in the process and trained to fill the e-partograph thus helping and complementing the labour room staff nurse on duty in plotting the e-partograph. Plotting of e-partograph went up to 65% at the end of PDSA III.

PDSA IV: teaching and training of newly recruited resident doctors and nurses in e-partograph plotting

A batch of new resident doctors joined the department. Staff nurses and midwives who were earlier trained in plotting e-partograph were transferred to other departments and were replaced by new staff nurses. It was observed that e-partographs were either filled incompletely or proper handover was not given to next staff nurse on change of shifts. To improve the e-partograph plotting an urgent exercise was taken up to teach and train e-partograph plotting to all the staff nurses, midwives and resident doctors posted in the labour room to ensure complete plotting of e-partographs in real time. At the end of PDSA IV plotting of e-partography went up to 74%.

PDSA V: arranging additional computer

Over the next 15 days the e-partograph plotting dropped to 70% probably because there was only single computer in labour room which was sometimes unavailable. Our hospital has computerised inpatient hospital information system and patient data and investigations have to be generated electronically. Hence, internet connection was installed in another computer in extended labour room and e-partograph software was uploaded in it. Since this involved permission and approval of the medical superintendent we approached our head of department who intervened and solved the issue. This reduced the chances of lapses in filling the partograph because an alternative computer was made available and over the next month the e-partograph plotting increased from 70% to 93%.

Biweekly audits were done by an intern and reported back to the e-partograph team to ensure that all the interventions were being implemented. Interns were added to the team as it was felt that more stake holders were required as QI progressed.

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.

RESULTS

In the baseline survey 30% e-partographs were being plotted.

After five PDSA cycles, the rate of e-partograph plotting increased from 30% to 93% over the period of 6 months. The result was sustained even after the last PDSA cycle, without any additional resources. The improvement in maternal outcome in terms of decrease in caesarean sections for prolonged labour went down from 6.2% to 2.4%. The improvement in neonatal outcomes in terms of decrease of admissions in neonatal intensive care for asphyxia (8%–3.4%) and neonatal mortality (2.2%–1%) was observed in live borns of participating mothers. There was no associated increase in intrapartum stillborn rate during the study period in these mothers.

The lower confidence level, median and the upper confidence levels were plotted for three different measures. The first one for the percentage plotting of e-partograph, second for the percentage of NICU admission, and the third one for the percentage of caesarean section. We also used the Anhϕj rules[14] to assess for special cause variation. Unusually long runs were calculated using the formula log2 (n)+3log2 (n)+3 while the unusually few crossings were calculated using the equation b (n−1, 0.5), where n is the number of observations and b is the lower prediction limit.

Figure 2 shows a control chart for the percentage plotting done for the e-partograph. The median percentage was found to be 59.00% with the lower confidence level of 30.71% and upper confidence level of 87.29%. The dots marked in red are falling beyond the limits of the control charts. The baseline assessment was lower than the lower limit of the confidence level while the endline assessment was higher than the upper limit of the confidence level. As per the Anhϕj rules, there was no special cause of variation in the data as the values for longest run remained lesser than the longer run max for our data and the number of crossings was equal to the crossings minimum value for our observations.

Figure 3A shows a control chart for the percentage of caesarean sections over the duration of study period. The median percentage was found to be 4.47% with the lower confidence level of 3.12% and upper confidence level of 5.83%. The dots marked in red are falling beyond the limits of the control charts. The baseline assessment was higher than the upper limit of the confidence level while the end-line percentage was lower than the lower limit for the confidence level. As per the Anhϕj rules, there was a special cause of variation in the data as though the values for longest run remained lesser than the longer run max for our data but the number of crossings were less than the crossings minimum value for our observations.

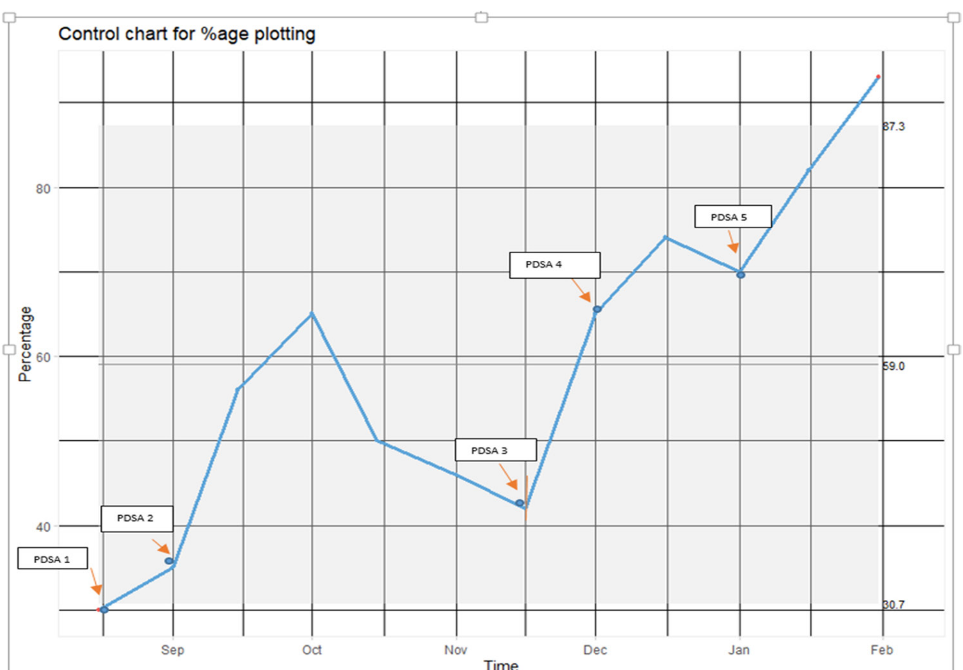
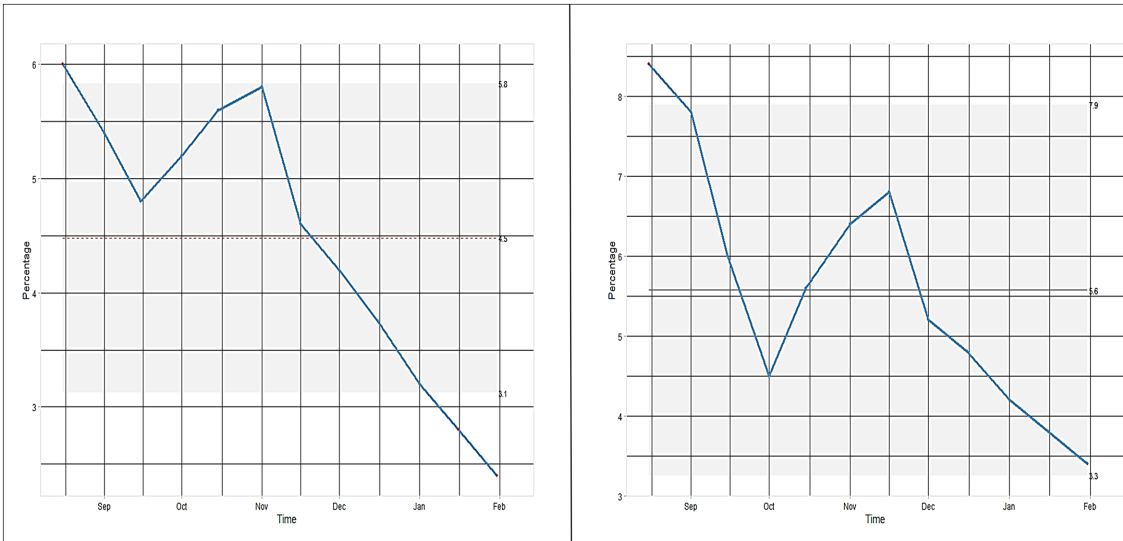


Figure 2 Control chart for percentage plotting of e-partograph. PDSA, Plan-Do-Study-Act.



A Control chart for percentage Caesarean section for prolonged labour

B Control chart for percentage NICU admission for asphyxia

Figure 3 Control chart for outcomes in participating mothers. NICU, Neonatal Intensive Care Unit.

Figure 3B shows a control chart for the percentage of NICU admissions for birth asphyxia over the duration of study period. The median percentage was found to be 5.57% with the lower confidence level of 3.25% and upper confidence level of 7.89%. The dots marked in red are falling beyond the limits of the control charts. The baseline assessment was higher than the upper limit of the confidence level while the endline assessment was within the bounds of the confidence level. As per the Anhϕj rules, there was no special cause of variation in the data.

The assessment for sustainability revealed that trend of improved e-partograph plotting remained around 90%. Information through meetings, observations and discussions helped the team to take decisions regarding the interventions. The data analysis guided the team for future interventions.

To ensure smooth running of system, new healthcare providers were oriented on the skills of plotting e-partograph as a tool for intrapartum monitoring at the time of their joining.

Lessons and limitations

WHO defines quality of care as 'the extent to which health care services provided to individuals and patient populations improve desired health outcomes. Health care needs to be safe, effective, timely, efficient, equitable, and people-centered'.[15] WHO's quality of care framework encompasses the provision of care (use of evidence-based practices) and the experience of care (communication with and support of the woman and her family).[16]

QI methods are being increasingly deployed in healthcare to support the delivery of high-quality patient care and improved patient outcomes. Safe Care, Saving Lives programme worked with 52 public and private hospitals and identified 20 evidence-based practices which would be expected to improve neonatal morbidity and mortality. In this study a 70% improvement in partograph use (from 10% to 17%) was documented; using QI and continuous quality improvement.[17]

PDSA provides a structured experimental learning approach to testing changes.[18] In this QI initiative, representatives of all stakeholders and frontline staff were involved right from the beginning. They brought out possible solutions from within themselves and tested them objectively on a small scale as a team, to learn about the challenges of implementation. This helped us tweak and adapt our approach to make it more acceptable and practically doable. The study is relevant to all health facilities where e-partograph is being used to monitor labour. The ideas described here do not require too many resources and may be easily tested in various health set-ups to achieve maximum plotting of e-partograph.

Our root cause analysis showed that poor e-partograph plotting was due to failure to identify eligible women. In majority of high load facilities, women come in early labour and by the time they are evaluated again for progress they are already in advanced first stage of labour. Resident doctors have to perform multiple tasks including clinical rounds, filling case sheets, sending blood samples to laboratory, conducting normal deliveries and shifting women for caesarean sections. Thus, involving staff nurses and interns in other job responsibilities and allowing them to assess women in labour improved compliance to plotting of e-partograph. This created a sense of team belonging and ownership which fosters enhanced participation towards change implementation.

Another learning was that though some of the labour room nurses had a fixed duty in labour rooms, there is a continuous process of change in labour room team due to change in postings of resident doctors, interns, in training nurses and replacement of labour room nurses. The responsibility of training the new healthcare providers was designated to the already trained labour room staff and it was ensured that this teaching and training was a continuous process incorporated in the intrapartum monitoring protocols.

One of the major limitations was that we did not compare caesarean section rates, birth asphyxia rates and NICU admission rates in non-participating women. A QI study should be kept simple so as not to overburden the team with collection of extensive data. Second, we could not determine whether it improves maternal and neonatal outcome as compared with paper partograph. Third, a confounding bias could have been introduced in the study. In order to plot the e-partograph the women were examined more frequently. This could have led to earlier detection of maternal and neonatal complications and corrective measures were probably taken earlier. Fourth, we could not collect qualitative data from healthcare workers to ascertain whether increase in patient load and attrition in trained staff could lead to decrease in the feasibility and acceptability of e-partograph. Fifth, availability of software, computers and internet connection can hinder practical scale up and cost-effectiveness can affect sustainability.

Rigorous evidence needs to be generated to prove that e-partograph can help in taking timely and appropriate clinical decisions during intrapartum care to improve maternal and neonatal outcome. More research is needed to affirm that QI methodology can be used to increase usage of e-partograph as a tool to improve intrapartum monitoring.

Finally, sustaining gains has been a significant challenge especially due to routine manpower attritions and busy workload seasons. As new recruits learnt to adapt to needs of the new environment, e-partograph plotting being one of many, compliance plunges. In our case local leadership proved instrumental at these times as their dedicated and reliable guiding presence, regular trainings and interactive feedbacks helped us to achieve sustainability. We could maintain the percentage of e-partography plotting of around 90% even after the project was over. The team continues to seek fresh inputs and feedbacks from new members to seek ways to address these limitations. The team felt motivated because of the impact this endeavour had on positive birthing experience for mothers which helped in sustaining it.

CONCLUSIONS

The present study suggests that QI principles are feasible and lead to improved rates of e-partograph plotting. It is a single-centre QI initiative done with the involvement of existing caregivers and executed without any external funding in the form of manpower or financial assistance, which suggests the importance of simple and feasible QI principles using team approach. We describe a successful QI effort to reduce adverse maternal and neonatal outcome in our mother–infant unit. In fact, under the Government of India and LaQshya initiative the first quality cycle emphasises on more than 90% plotting of partograph real time. This similar model can be replicated in health facilities across the country. Initially the healthcare workers can start plotting the paper partograph real time by adopting QI methodology. The government of India is taking efforts for launching the software as a pilot in teaching hospitals and then scale it up to the remotest health facility of India. Option of offline filling of e-partograph is the next step to sustain these practices. This practice has the potential to reduce unnecessary morbidity in mother and newborn and ensure a safe birthing experience for mother and a healthy baby for the family.

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