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Original Research Article

The effect of preventive measures to reduce the decision to delivery interval in women undergoing emergency caesarean section

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ABSTRACT

Background: Time interval between the decision to perform an emergency caesarean (ES) section and the actual delivery is known as decision delivery interval (DDI). A third phase delay in the delivery of emergency obstetric care is caused by prolonged DDI. In an effort to reduce maternal morbidity and neonatal morbidity and mortality, it is essential to implement interventions designed to reduce DDI.
Methods: This study was carried out to reduce DDI by setting benchmarks for all categories according to Royal College of Obstetricians and Gynaecologists (RCOG) guidelines 2010, in our setup. The study carried out in 2 phases; first phase was a pilot study comprising of 143 women who underwent ES section. The deviation in DDI with possible causes were noted. The benchmarks were set to 8%, 30% and 20% for categories 1, 2, and 3 respectively. Corrective actions were taken including both hospital and patient causes for delay and were discussed at each level. Second phase included total 460 women from January to December 2021 and evaluated for DDI.
Results: Out of 460, 87 (18.91%) women had deviated from the set DDI. The percentages in individual categories 1, 2 and 3 were 17.22%, 30.50%, and 29.50%, respectively. The deviation percentage of DDI in category 2, was achieved as per benchmark set in a pilot study, however, it was not achieved for other categories.
Conclusions: Since the result that was obtained didn't reach the set deviation percentage, we have observed that achieved deviation cannot be further reduced as our clinical setup is a teaching institute.

Keywords: Emergency cesarean section, Decision-to-delivery interval, Deviation percentage

INTRODUCTION

The aim to reduce the decision to delivery time in an emergency caesarean section mainly is to reduce both the neonatal and maternal morbidity and mortality. The majority of the adverse perinatal outcomes occurred in low-resource settings in developing countries, and the majority could have been avoided.[1,2]

Preventing these adverse perinatal outcomes is frequently time-sensitive; however, demand for prompt intervention in these settings can exceed capacity. Despite global initiatives to improve, increasing obstetrical resource availability in developing countries remains a significant challenge.[3] Research has shown that the risk of adverse perinatal outcomes is related to service delivery factors such as anesthesia and obstetric staff working patterns.[4,5]

The decision-to-delivery (DDI) interval of an emergency caesarean section is one aspect of service provision that has the potential to influence perinatal outcome.[6] An emergency caesarean section is a type of surgical procedure used when the fetus or woman's life is in danger necessitating urgent delivery.[7] The American College of Obstetricians and Gynecologists (ACOG) and the Royal College of Obstetricians and Gynecologists (RCOG) both recommend that DDI in an emergency caesarean delivery be within 30 minutes.[8,9] The 30-minute rule was

established by expert consensus without any acknowledgement of supporting research. There is no evidence that the 30-minute rule improves maternal or fetal outcomes.[10]

Furthermore, while it is widely agreed that the DDI should be kept to the shortest time possible, there are currently no context-appropriate targets in place to reduce negative outcomes in low and medium human development index countries.[11] Many factors have been reported to influence DDI, including team readiness, team communication, operating room availability, and the severity of fetal-maternal complications.[12]

Previous research has shown that good preparation, such as locating the operating room near the delivery room, having obstetricians and anesthesiologists available, and having an effective teamwork environment, can reduce DDI. In developed countries, approximately 40–65% of cases diagnosed with fetal distress met the recommended 30-minute goal.[13-16]

Meanwhile, in developing countries, the achievement has been reported to be between 0% and 20%.[17-19] Keeping this in mind, the primary goal of this study was to determine the DDI for emergency caesarean delivery as well as the causes of delay. The findings of the pilot study were used to establish a standard for deviation percentages based on emergency caesarean section categories. The findings can be interpreted as an audit and a subjective evaluation of the current management's performance in providing for this group of women in the institution. The data would also help the care team identify the cause of the delay and its barriers, allowing them to improve the quality of care provided to these patients.

Table 1: RCOG 2010 guidelines on indications of emergency caesarean section.

Categories	Indications
Category 1: decision to delivery time <30 min	Fetal distress/persistent fetal bradycardia, cord prolapse, severe placental abruption, antepartum hemorrhage with maternal hypovolemia, uterine rupture and scar dehiscence, failed instrumental delivery with fetal distress
Category 2: decision to delivery time 30-45 min	Antepartum hemorrhage without maternal hypovolemia, failed induction of labor, abnormal Doppler, non-reassuring CTG
Category 3: decision to delivery time 45-75 min	Previous LSCS in labor, CPD, breech in early labor
Category 4: decision to delivery time >75 min	Elective LSCS, malpresentations, multiple pregnancy with first twin cephalic, LSCS on demand

Aim of the study

The aim of the study was to reduce the deviation percentage in each category of emergency caesarean section.

Objectives

The objectives of the study were: to assess all patients' categories undergoing emergency caesarean section, to assess the decision to delivery time, to assess the causes for delay, and to reduce the deviation percentage.

METHODS

Inclusion criteria

IPD patients undergoing emergency caesarean section were included in the study.

Exclusion criteria

All elective caesarean sections were excluded.

Present prospective cross-sectional study was done in department of obstetrics and gynecology, Bharati Vidyapeeth (DTU) Medical College, Hospital and Research Centre, Pune. The study was conducted in two phases. In the first phase, a pilot study involving 143 patients was conducted over a three-month period to determine the benchmark percentage values for emergency caesarean sections between the months of September 2020 and December 2020. The results of the pilot study were used in the study's second phase, and it was carried out during the period of 1 year (January 2021-December 2021) with the intention of achieving the benchmark deviation percentage.

The action plan to lower the deviation percentage was created following the first phase of the study, the pilot study, using those values as the baseline. Meetings with anesthesiologists, the laboratory in charge, and the operation theatre staff were held to discuss areas for improvement in order to lower the percentage of deviations in each category and the causes of deviation.

The second phase of the study involved all 385 women who underwent emergency caesarean section in the year 2021. All the women were treated during labor in accordance with the institutional clinical protocol. Based on the available clinical data for each patient, the attending staff decided on an emergency caesarean delivery. The attending anesthesiologist chose the anesthetic techniques for the caesarean delivery.

The decision, entry into the operating room, skin incision, and delivery component process times from the DDI were all recorded and examined. The potential causes of the delay were also noted and classified as either hospital- or patient-related and were analysed.[20]

RESULTS

The present study was conducted to find out the deviation percentage among the women who underwent emergency caesarean section, in 2 phases. The first phase, the pilot study was conducted evaluating 143 women who underwent emergency caesarean section, for the period of 3 months.

The baseline clinical characteristics of these women in pilot study are shown in Table 2.

Table 2: Baseline clinical characteristics of the pilot study population (n=143).

Characteristics	Frequency	Percentage
Gravida		
Primi	60	41.96
Multi	83	58.04
Apgar		
1 min <7	32	22.37
5 min <7	29	20.28
NICU admission		
Yes	24	16.78
No	119	83.22

The women as defined by RCOG guidelines, were divided into four categories, shown in Table 3. Out of a total of 143 pregnant women, most women belonged to category 4 (56, (39.16%)), followed by category one, category 3 (34, (23.77%) each), and category 2 (19, (13.28%)). Out of a total of 143, 20 were reported to be deviated for DDI. No deviation was reported in category 4. There were 4, 7, and 9 women reported with deviation in DDI in categories 1, 2, and 3 respectively. Therefore, the deviation percentages were calculated to be 11.76, 36.84, and 26.47% for categories 1, 2, and 3 respectively.

Table 3: Distribution of pregnant women underwent emergency caesarean section with deviation in decision to delivery in the pilot study.

Category (mins)	Total	%	Deviation (n)	Deviation (%)
Category 1 (<30)	34	23.77	4	11.76
Category 2 (30-45)	19	13.28	7	36.84
Category 3 (45-75)	34	23.77	9	26.47
Category 4 (>75)	56	39.16	0	0

Among 20 women with deviations in DDI, various hospital and patient causes were reported. The list is presented in Table 4. The hospital related causes were related to the department of anaesthesia, laboratory, and OT staff. Patient-related causes included delay in consent, NBM, NICU counselling, and to avoid extremely high risk in the night if the patient was not bleeding.

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Table 4: The hospital and patient related causes for deviation in decision to delivery interval.

Causes	Frequency	%
Hospital causes		
Delay in laboratory report	2	10
Delay in spinal anesthesia	2	10
Delay in preparation for OT	2	10
Delay in shifting	2	10
Difficult delivery due to second stage labour	1	5
Patient causes		
Delay in consent	5	25
NBM	7	35
Very high-risk case not to be taken in night if patient is not bleeding	1	5
NICU counselling	3	15

After a pilot study, the benchmarks were set according to the findings. The benchmark for category one was set to reduce 8% from 11.76%. For category 2 the benchmark was set to 30% from 36.84%, while for category 3 the benchmark of 20% was set from 26.47%. The deviation percentage of the pilot study and benchmarks set for one year to reduce the division percentage are shown in Table 5.

Table 5: The planned benchmark for second part of the study as per categories.

Objec-tive	Decision to delivery interval (mins)	Deviation % of pilot study (%)	Benchmark to be achieved in next 12 months
1	Category 1 (<30)	11.76	8
2	Category 2 (30-45)	36.84	30
3	Category 3 (45-75)	26.47	20

After setting the benchmark, the meetings were held with the department of anesthesiology, the laboratory, and the OT staff. The opportunities for improvement were planned as per the deviation percentage in each category and the reason for the division. For the next year, a total of 460

pregnant women who underwent emergency caesarean section were evaluated for deviations in delivery interval. The percentages were calculated for each category and compared with the benchmark set. A total of 87 pregnant women were found to be deviated for DDI, with percentages of 14.9%, 30%, and 24%, respectively, 22 belonging to categories 1, 35, and 30 to categories 2 and 3. As per the benchmark set according to the pilot study, there was some reduction reported in deviation percent for category 2, but it was not changed for categories one and three. The distribution of pregnant women as per categories and deviation in delivery time with respective percentages is shown in Table 6.

Table 6: Deviation % for emergency caesarean sections of 1 year compared to benchmark from pilot study.

Category (mins)	Total	Deviation (n)	Deviation (%)	Bench-mark
Category 1 (<30)	147	22	14.9	8
Category 2 (30-45)	115	35	30	30
Category 3 (45-75)	123	30	24	20
Total	385	87		

DISCUSSION

In 1989, the committee on professional standards of the American College of Obstetricians and Gynecologists (ACOG) declared that hospitals offering obstetric services should be able to start a caesarean delivery within 30 minutes of the decision to perform the procedure.[21] The same was recommended in more recent (2011; National Institute of Clinical Excellence [NICE], UK) guidelines with additional categories in accordance with DDI.[22]

Obstetricians and anesthesiologists have both invested a lot of time in studying how to enforce a perfect time limit to reduce CS-related morbidity. Obstetric units must routinely audit their DDI in order to comply with the most recent NICE 2011 guidelines.[23]

The current study was conducted in order to decrease DDI among pregnant women who underwent emergency caesarean sections in a tertiary care teaching hospital in Pune. A pilot study was initially carried out to determine the baseline for improvement, which was set to 8% from 11.76% for category 1, 30% from 36.84% for category 2, and 20% from 26.47% for category 3. Several delays were reported and mentioned in the pilot study, including meetings with the staff of the relevant departments, including the anesthesia, laboratory, and OT staff.

In the pilot study, the deviation in DDI was reported in 13.99% of the total cases evaluated. Fetal distress (18.18%) was the most common indication for cesarean section, followed by previous LSCS (16.08%), the patient's or a relative's request (10.49%), and preeclampsia (6.29%). 24 neonates had to be admitted to the NICU. Immediately after birth and five minutes later, respectively, 22.37% and 20.28% of neonates had combined moderate and severely depressed Apgar scores.

According to Gupta et al, the majority of cases (55.2%) fell into category 2, which was followed by category 1 (42.4%) and category 3 (2.4%).[23] The primary indications for emergency C/S reported by Ayele et al were non-reassuring fetal heart rate patterns (NRFHRP) 123 (24.1%) and cephalopelvic disproportionate (CPD) 80 (15.7%), followed by failed induction 78 (15.3%) and prolapsed umbilical cord.[24] More than three-fourths of the participants had a DDI of more than 30 minutes.

In the present study 10% of cases were reported to have been delayed due to a delay in spinal anesthesia. The procedures are initially carried out by the junior residents and are then taken over by the senior residents, causing a delay, according to the observation made for this delay. Incorrect patient positioning and drug batch usage are two additional causes of spinal anesthesia delays. 10% of cases from the pilot study had prolonged DDI similar to anesthesia because of a delay in lab reports. The improper training of MPWs and the delay in lab sample acceptance, processing primarily at night, were 2 significant observations that were made. Transporting the sample to the lab was discovered to be a significant factor in the delay of DDI. The most frequent cause of DDI delays, or 20% of caesarean cases, was OT, with frequent causes including that the OT trolly to shift the patients is not ready, that MPWs are not properly trained to shift the patient on an urgent basis, and that the OT instrument trolly is frequently not set.

Similar causes were cited by Gupta et al, with the most frequent causes being anesthesia-related issues, lack of resources, and delays in moving patients to the operating room.[23] Ayele et al claim that the availability of materials, timing of the decision, type of anesthesia, the time between the decision and the anesthesia, experience of the surgeons, and experience of the anesthetists all significantly impacted the degree of dissection (DDI).[24] According to Helmy et al, the main causes of delay were moving the women into the operating room and beginning the anesthetic.[13]

Other delays listed by different authors included waiting for consent; waiting to move women to the operating room; waiting for staff to become available due to another CS; and waiting because different members of the medical staff had different perceptions of how urgent the situation was.[11,13,16,25] The necessity of preparing labor wards for emergency surgery is highlighted by operating suite bottlenecks and wait times for transfers to the OT.[26]

We discussed these issues with the in-charges of anesthesia, laboratory, and OT in order to improve the DDI, and an action plan was discussed. The presence of a

faculty member and one third-year junior resident in the operating room (OT) during a case of caesarean section with fetal distress was part of the anesthetic action plan. The nursing staff and OT MPWs received training on spinal anesthesia positioning. According to the laboratory action plan, it was decided to label urgent samples separately (in green), to discuss discrepancies in results with the lab's manager, and to focus communication between the two departments on this issue. Additionally, for the OT staff, issues were discussed with the OT and sisters incharge, and the OT and ward incharges were given suggestions. All the incharge sisters were given instructions to hold frequent meetings with MPW employees and staff nurses to enhance the aforementioned actions.

After the aforementioned issues were set, the second phase of the study, was carried from January 2021 to December 2021. A total of 460 pregnant women who had emergency caesarean sections during this time were assessed for DDI. The deviation in DDI reported among categories 1 to 3, which was present in 87 cases (18.91%). For categories 1 (11.76%), 2 (36.4%), and 3 (26.47%), respectively, we expected the deviation percentages to be reduced to 8, 30, and 20%, but no change in the deviation percentage was noted for categories 1 (14.9%) and 3 (24%). While category 2 saw improvement in the deviation percentage (30%).

The limitation of our study is that as it is done in an institute based setting the set benchmark couldn't be achieved, but through the result we have set our own benchmark and were consistent with the same.

CONCLUSION

The present study, by setting a benchmark as per the outcomes of the pilot study, tried to reduce the DDI, in our setup in a tertiary care teaching hospital. The reasons for the deviation in DDI were related mostly to anesthesia, laboratory, and OT staff, and after improvement, no change in deviation percentage was reported for category 1 and 3, while the target was achieved for category 2. The reason for this might be that the values reported in a pilot study may be the lowest possible achievable deviation percentage for our setup.

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