

Optimizing Emergency Cesarean Section Response Times in Category I Fetal Distress: A Pharmacological Perspective

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ABSTRACT

Backgrounds: Cesarean section (CS) is a common procedure globally, often performed due to fetal distress, which requires delivery within 30 minutes. According to data from Airlangga University Hospital, the achievement rate of emergency CS is only 80-82%, this causes the activation of the obstetric operating room to increase the achievement of emergency CS <30 minutes. **Objective:** To improve the quality of service regarding response time emergency CS for fetal distress at Airlangga University Hospital. **Methods:** This retrospective descriptive study analyzed medical records of emergency CS cases due to fetal distress in the central surgical operating room in 2022 and the obstetric operating room in 2023. Total sampling was used, and data were tabulated using Microsoft Excel. **Results:** From the results of the study, in 2022, the number of cesarean deliveries was 699 patients, of which 22 patients of fetal distress (3.1%) underwent emergency CS in the operating room of the central surgical building from a total of 47 emergency CS (7.6%). In 2023, the number of CS was 631 patients, of which 23 patients with fetal distress (3.6%) underwent emergency CS in the obstetric operating room from a total of 58 emergency CS operations (9.1%). **Conclusion:** Data from 2023 indicate improved response times for emergency CS, with the dedicated obstetric operating room significantly enhancing service quality. **Keywords:** Response Time, Emergency CS, Fetal Distress, Activation Obstetric operating room.

INTRODUCTION

Cesarean section (SC) is one of the most frequently performed surgical procedures worldwide. The World Health Organization (WHO) recommends that the percentage of cesarean sections should be below 15% of all deliveries in a country. However, many countries still have cesarean rates exceeding 15%. This situation is concerning, as deliveries via cesarean section are associated with increased morbidity and mortality. Numerous reports worldwide indicate that the cesarean section rates have been rising year after year. Various factors contribute to the increasing rates of cesarean sections globally, including the use of advanced tools to detect Fetal Distress.¹

Fetal distress is a condition indicating that the fetus is lacking oxygen during pregnancy or labor, which can lead to damage to the fetus's organs, especially the brain. This situation prompts obstetricians and gynecologists to deliver the baby immediately. One of the fastest ways to deliver the baby is through a Cesarean section. To detect Fetal Distress, doctors typically monitor the fetal heart rate, observe reduced fetal movements, or identify the presence of meconium-stained amniotic fluid. The presence of meconium-stained fluid indicates fetal hypoxia and acidosis. Fetal hypoxia complicates 1% of deliveries and causes infant mortality in 0.5 per 1,000 pregnancies. This condition also leads to cerebral palsy in 1 per 1,000 pregnancies.^{1,2}

When a diagnosis of Fetal Distress is established, the fetus must be delivered immediately. A fetus experiencing Fetal Distress must be delivered within 30 minutes, including Category I cesarean sections, which are performed in emergencies

when there is a significant risk to the life of both the fetus and the mother. Fetal distress requiring immediate surgery often involves unstable fetal conditions, such as extremely fast or slow fetal heart rates or signs of oxygen deprivation. Timely intervention is crucial in these situations to reduce the risk of complications and improve fetal safety, as rapid action in performing a cesarean section can help prevent damage to vital organs. Data from the United Kingdom indicates that the response time can reach up to 30 minutes in emergency cesarean cases. Various factors can contribute to delays in response time, including difficulties in transferring the patient to the operating room, ineffective team coordination, and challenges in achieving effective anesthesia.^{1,2}

The findings above prompted the researcher to investigate the response time of emergency cesarean sections in the operating room of the central surgery building on the 7th floor, aiming to improve service quality at Airlangga University Hospital (RSUA). This led to the establishment of the obstetric operating room on the 5th floor at Airlangga University Hospital. This study is expected to provide an overview of the response time for emergency cesarean sections within Universitas Airlangga's environment and contribute to policy-making as well as to the body of scientific knowledge.

METHODS

This study is a descriptive study with retrospective data obtained from the medical records of patients who underwent emergency cesarean sections in the operating room of the central surgery building on the 7th floor in 2022 and the obstetric operating room on the 5th floor in 2023 at Airlangga University

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Hospital. The study sample consists of pregnant women experiencing Fetal Distress and undergoing emergency cesarean sections in the operating room of the central surgery building on the 7th floor in 2022 and the obstetric operating room on the 5th floor in 2023 at Airlangga University Hospital. The inclusion criteria include pregnant women who underwent emergency cesarean sections, with the procedures conducted in the operating room of the central surgery building on the 7th floor in 2022 and the obstetric operating room on the 5th floor in 2023 at Airlangga University Hospital, specifically for those with an indication of Fetal Distress. The exclusion criteria include pregnant women who delivered vaginally, those who underwent emergency cesarean sections without indications of Fetal Distress, and those with incomplete medical records. The sampling technique used was total sampling. The study variables include Gravida, the time from SC decision to operating room entry, the time from operating room entry to anesthesia, the time from anesthesia to incision, the time from incision to birth, and the response time. All data are measured on a ratio scale. Data analysis was conducted descriptively using Microsoft Excel.

RESULTS

A total of 22 patients underwent emergency cesarean sections in the operating room of the central surgery building on the 7th floor in 2022, and 23 patients underwent emergency cesarean sections in the obstetric operating room on the 5th floor in 2023. Below is the demographic profile of patients who underwent emergency cesarean sections in the operating room of the central surgery building on the 7th floor (2022) and the obstetric operating room on the 5th floor (2023).

In this study, it was found that the age of mothers undergoing emergency cesarean sections in both the operating room of the central surgery building on the 7th floor and the obstetric operating room on the 5th floor was predominantly between 26-30 years old, with 50% and 30.4% respectively. The patients in the central surgery operating room on the 7th floor were predominantly working mothers (63.6%), while those in the obstetric operating room on the 5th floor were mainly non-working mothers (87.0%). The APGAR score was predominantly between 7-9, with 54.5% of patients in the central surgery operating

Table 1. Demographic Data of Emergency Cesarean Sections in the Operating Room of the Central Surgery Building on the 7th Floor (2022) and the Obstetric Operating Room on the 5th Floor (2023).

Demographic Data	7th Floor Operating Room n (%)	5th Floor Operating Room n (%)
Age (years)		
16-20	2 (9.1)	1 (4.3)
21-25	2 (9.1)	6 (26.1)
26-30	11(50.0)	7 (30.4)
31-35	5 (22.7)	6 (26.1)
36-40	1 (4.5)	3 (13.0)
> 40	1 (4.5)	0 (0)
Occupation		
Employee	14 (63.6)	3 (13.0)
Not employee	8 (36.4)	20 (87.0)
APGAR Score		
1-3	2 (9.1)	4 (17.4)
4-6	8 (36.4)	9 (39.1)
7-9	12 (54.5)	10 (43.5)
Marital status		
Married	23 (100)	23 (100)
Not married	0 (0)	0 (0)
Education		
Elementary School	0 (0)	0 (0)
Junior High School	2 (9.1)	1 (4.3)
Senior High School	6 (27.3)	11 (47.8)
Bachelor's Degree	14 (63.6)	11(47.8)
Maternal Status		
Death	0 (0)	0 (0)
Alive	22 (100)	23 (100)
Baby status		
Death	1(4.5)	0 (0)
Life	21 (95.5)	23 (100)
Baby Care		
NICU	1 (4.5)	6 (26.1)
Non NICU	20 (90.9)	17 (73.9)
Amniotic Fluid		
Clear	14 (63.6)	15 (65.2)
Meconium	8 (36.4)	8 (34.8)
CPAP Breathing		
No	19 (86.4)	17 (73.9)
Yes	3 (13.6)	6 (26.1)
Total	22 (100)	23 (100)

Table 2. Profile of Mothers Undergoing Cesarean Section in the Operating Room of the Central Surgery Building, 7th Floor, RSUA.

No.	Code	The decision to enter the operating room (minutes)	Entering the operating room until anesthesia (minutes)	Anesthesia to incision (minutes)	Incision until the baby is born (minutes)	Response time (minutes)
	RN	10	7	16	5	38
	II	43	26	13	21	103
	D	25	25	11	7	68
	IP	24	26	3	5	58
	DW	30	53	2	5	90
	T	7	25	3	5	40
	I	30	85	15	5	135
	IT	5	13	12	8	38
	S	15	15	10	4	44
	UD	35	18	10	24	87
	L	5	5	8	12	30
	SR	10	23	4	3	40
	R	20	14	16	5	55
	FK	19	45	12	11	87
	RZ	23	20	11	5	59
	RCH	30	5	10	5	50
	NV	45	5	5	5	60
	PE	20	10	5	4	39
	FR	28	2	15	10	55
	FKW	30	15	15	5	65
	C	25	25	10	7	67
	E	40	17	8	9	74
Average		24	22	10	8	63

Table 3. Profile of Mothers Undergoing Emergency Cesarean Section in the Obstetric Operating Room, 5th Floor, RSUA.

No.	Code	The decision to enter the operating room (minutes)	Entering the operating room until anesthesia (minutes)	Anesthesia to incision (minutes)	Incision until the baby is born (minutes)	Response time (minutes)
	I	5	9	10	5	29
	IF	2	18	13	11	44
	EP	3	15	15	10	43
	A	5	10	10	3	28
	D	10	15	8	5	38
	FA	5	12	8	5	30
	IN	5	18	2	9	34
	OGS	5	25	2	3	35
	PM	5	15	10	6	36
	PW	10	13	10	8	41
	DF	2	25	7	3	37
	ENF	5	10	10	3	28
	PEF	5	20	5	3	33
	NQ	5	12	10	3	30
	RAS	5	5	7	3	20
	AM	4	16	6	3	29
	CM	5	5	13	5	28
	NS	10	5	15	15	45
	DAR	5	33	1	3	42
	EF	2	13	13	23	51
	AF	5	17	9	3	34
	BSN	20	20	7	3	50
	MS	5	8	10	5	28
Average		6	15	9	6	35

Table 4. Comparison of Response Times for Patients Undergoing Emergency Cesarean Sections in the Operating Room of the Central Surgery Building, 7th Floor (2022), and the Obstetric Operating Room, 5th Floor (2023).

Operating Room	The decision to enter the operating room (minutes)	Entering the operating room until anesthesia (minutes)	Anesthesia to incision (minutes)	Incision until the baby is born (minutes)	Response time (minutes)
7th Floor	24	22	10	8	63
5th Floor	6	15	9	6	35

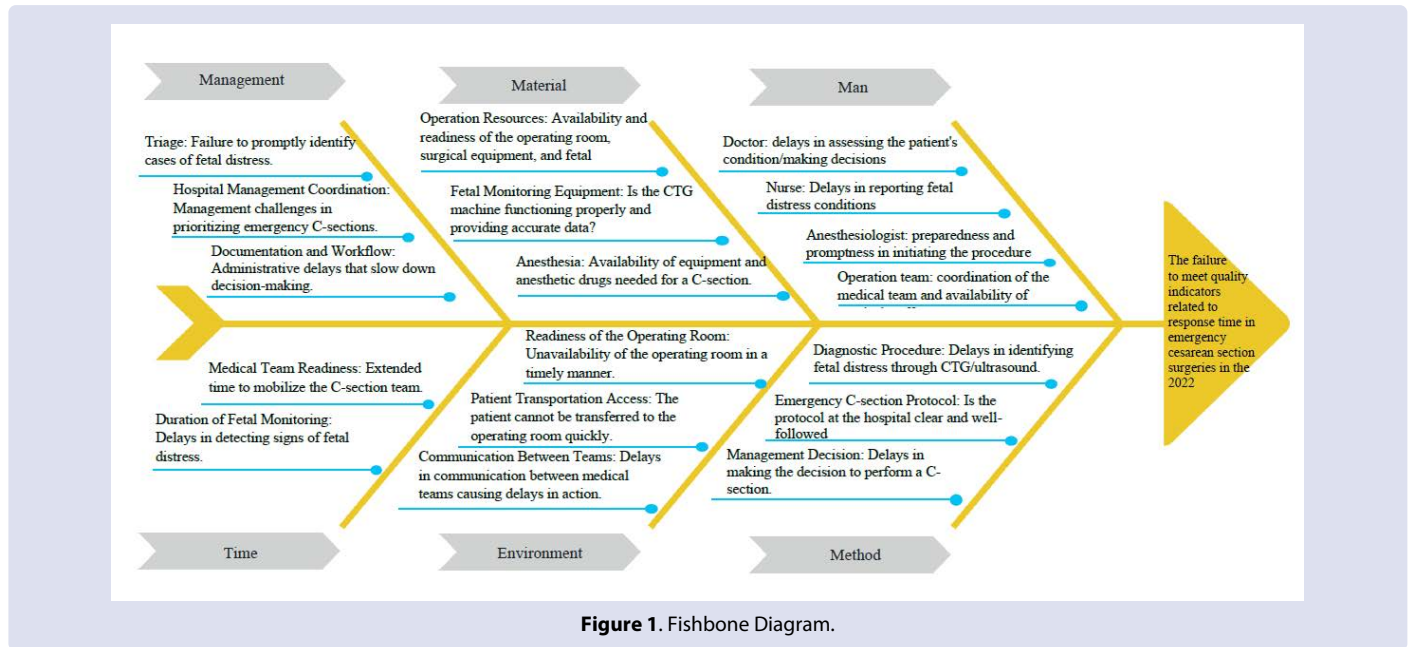


Figure 1. Fishbone Diagram.

room on the 7th floor and 43.5% in the obstetric operating room on the 5th floor. All patients in both groups were married (100%). Education level was dominated by those with a bachelor’s degree among patients in the central surgery operating room on the 7th floor (63.6%), whereas the patients in the obstetric operating room on the 5th floor were mostly high school graduates and those with a bachelor’s degree, each comprising 47.8%. All mothers were alive, while one neonatal death (4.5%) was recorded among the patients in the central surgery operating room on the 7th floor. Infant care was predominantly in the NICU, with 90.9% of cases in the central surgery operating room on the 7th floor and 73.9% in the obstetric operating room on the 5th floor. Clear amniotic fluid was predominant in both groups, with 63.6% of patients in the central surgery operating room on the 7th floor and 65.2% in the obstetric operating room on the 5th floor. Respiratory support in the form of CPAP was provided to 36.4% of the infants born in the central surgery operating room on the 7th floor and 26.1% in the obstetric operating room on the 5th floor.

Subsequently, the response time for patients undergoing emergency cesarean sections in the operating room of the central surgery building on the 7th floor (2022) and the obstetric operating room on the 5th floor (2023).

From the table above, a total of 22 patients underwent cesarean sections in the operating room of the central surgery building on the 7th floor during the 2022 period. The average time from the decision for cesarean section to entering the operating room was 24 minutes, the time from entering the operating room to anesthesia was an average of 22 minutes, from anesthesia to incision was 10 minutes, and from incision to birth was an average of 8 minutes. The average response time from the decision for cesarean to the birth of the baby was 63 minutes. The fastest response time recorded was 30 minutes, while the longest was 135 minutes. The ideal response time for Category I

emergency cesarean sections, which is 30 minutes, was achieved in only one patient (4.54%)

To improve quality and accelerate response time, in 2023, RSUA opened the obstetric operating room on the 5th floor specifically for maternal cases. A total of 23 Category I cesarean patients underwent surgery in this obstetric operating room on the 5th floor. The average time from the decision for cesarean to entering the operating room was 6 minutes, the time from entering the operating room to anesthesia averaged 15 minutes, from anesthesia to incision 9 minutes, and from incision to birth averaged 6 minutes. The average response time from the decision for cesarean to the birth of the baby was 35 minutes. The fastest response time recorded was 28 minutes, while the longest was 50 minutes. The ideal response time for Category I emergency cesarean sections of 30 minutes was achieved in 9 patients (39.1%).

DISCUSSION

The study results show that in 2022, there were 699 cesarean deliveries at Airlangga University Hospital Surabaya, with 22 patients (3.1%) undergoing emergency cesarean sections due to Fetal Distress in the operating room of the central surgery building on the 7th floor, out of a total of 47 emergency cesarean operations (7.6%). In 2023, there were 631 cesarean deliveries, with 23 patients (3.6%) undergoing emergency cesarean sections in the obstetric operating room on the 5th floor, out of a total of 58 emergency cesarean operations (9.1%). Research by Maskey et al. indicates that the most common indication for cesarean sections is Fetal Distress (28%), followed by a history of cesarean sections (18%) and other factors such as oligohydramnios and malpresentation.³ Another study by Dunn et al., (2016) and Temesgen et al. (2020) found that Fetal Distress is the primary indication for Category I emergency cesarean sections (58-61.8%), followed by breech presentation and other complications. Meanwhile, Grace et al.

reported that failure to progress in labor (46.5%) and uncertain fetal status (19%) were the leading causes of emergency cesarean sections.³

Fetal distress is an indication for emergency cesarean delivery classified as Category I. Category I cesarean deliveries must be performed as quickly as possible and, in most situations, within 30 minutes of the decision.⁴ The patient characteristics were dominated by younger age (26-30 years), working mothers (in 2022), and non-working mothers (in 2023). All patients were married, with the majority having a bachelor's degree (in 2022) and a high school or bachelor's degree (in 2023). A total of 7 patients (31.8%) undergoing emergency cesarean sections in the operating room of the central surgery building on the 7th floor in 2022 were primigravida, while 15 patients (68.1%) had a multigravida status. These findings align with the study by Sichundu et al., which showed that multigravida patients dominated the population of cesarean deliveries due to Fetal Distress, with 149 cases (56.9%) compared to 113 cases (43.1%) among primigravida patients (Sichundu, Siziya and Kumoyo, 2017). However, this contrasts with a previous study in Bangladesh, which found that more than half (54.6%) of women undergoing cesarean sections for Fetal Distress were primigravida.⁵ This condition may have implications for the obstetric course of patients, making them more vulnerable to complications related to uterine scarrings, such as placenta accreta, percreta, increta, repeat cesarean sections and other complications.

In the study, all mothers survived (100%). Mothers undergoing cesarean sections can experience various complications, such as blood loss, infections, or other surgical complications. A previous study involving 163 mothers who underwent Category I emergency cesarean sections found that 16 required transfusions, 10 developed fevers, 4 had wound infections, 2 underwent hysterectomies, 8 experienced estimated blood loss of more than 1000 ml, and 1 mother died. Among the 32 mothers with a response time under 30 minutes, 12 required transfusions, 8 developed fevers, 2 had wound infections, and 1 underwent a hysterectomy.⁶ In this study, no follow-up was conducted to assess long-term complications that might occur in the mothers.

In the study, an APGAR score of <7 was found in 45.5% of cesarean deliveries performed in the central surgery building's operating room in 2022, while in the obstetric operating room in 2023, it was 56.5%. CPAP-assisted breathing was required in 13.6% of cases in the central surgery building's operating room in 2022, and this slightly increased to 26.1% in the obstetric operating room in 2023. NICU care was needed for 4.5% of patients in the central surgery building's operating room in 2022, rising to 26.1% in the obstetric operating room in 2023. Neonatal deaths were recorded in 4.5% of cases in the central surgery building's operating room in 2022, whereas no neonatal deaths were recorded in the obstetric operating room in 2023

A study conducted by Grace et al. showed higher complications in the Category I cesarean section group ($p < 0.001$), including APGAR scores <7 at 1 minute (20.4% vs. 10.7%), APGAR scores <7 at 5 minutes (5.8% vs. 1.9%), umbilical artery pH <7.2 (23.7% vs. 9.1%), neonatal resuscitation (59.9% vs. 51.8%), NICU admission (9.8% vs. 2.5%), and seizures (0.8% vs. 0.3%).³ Neonates in the <30-minute group had significantly lower pH and base excess measurements at birth and required less intensive care.⁷ A response time of 75 minutes was significantly associated with worse fetomaternal outcomes in Category I emergency cesarean sections.⁸ Other research suggests that in life-threatening conditions, a quicker delivery can result in better fetomaternal outcomes.⁹ Another study found no relationship between response time and maternal outcomes, although there was an increase in events that worsened fetal prognosis.⁶ A study conducted in Indonesia at RS Sardjito Yogyakarta from 2012-2016 found that the response time for Category I cesarean sections did not affect perinatal outcomes.¹⁰ The presence of the operating doctor and anesthesiologist

plays a role in the decision-to-birth interval (DBI) during surgery. Delays are recorded if the anesthesiologist or operating doctor arrives after the patient has already arrived in the operating room.¹¹

In 2022, data from the Central Surgery Building Operating Room showed an average time from the decision for cesarean to entering the operating room of 24 minutes, from entering the operating room to anesthesia of 22 minutes, from anesthesia to incision of 10 minutes, from incision to birth of 8 minutes, and an overall average response time of 63 minutes. The longest average time was recorded from the decision for cesarean to entering the operating room. During the Category I emergency cesarean operations in 2022, which utilized the Central Surgery Building Operating Room on the 7th floor, only 1 patient (4.54%) was managed within 30 minutes. In 2023, data from the Obstetric Operating Room showed improvements, with an average time from the decision for cesarean to entering the operating room of 6 minutes (18 minutes faster than in 2022), from entering the operating room to anesthesia of 15 minutes (7 minutes faster than in 2022), from anesthesia to incision of 9 minutes (1 minute faster than in 2022), from incision to birth of 6 minutes (2 minutes faster than in 2022), and an overall average response time of 35 minutes (28 minutes faster than in 2022). The longest average time was from the decision to enter the operating room to anesthesia. During Category I emergency cesarean operations in 2023 using the Obstetric Operating Room on the 5th floor, 9 patients (39.1%) were managed within 30 minutes. The presented data indicate that the activation of the Obstetric Operating Room on the 5th floor significantly improved response times, although its relationship to neonatal and maternal outcomes has not yet been studied due to limited data.

A study conducted by Temesgen et al. in 2020 at the University of Gondar Hospital in Ethiopia, which examined response times for Category I emergency cesarean sections, found that only 19.6% of deliveries occurred within 30 minutes. The average time to decide on an emergency cesarean section was 42 ± 21.4 minutes, the average time from decision to arrival in the operating room was 21.58 ± 19.76 minutes, and the average time from arrival in the operating room to anesthesia was 11.5 ± 3.6 minutes.

A study conducted by Berguna and Basabih found that out of 19 studies, only 3 achieved a 30-minute response time for Category I emergency cesarean sections and 75 minutes for Category II. However, 17 studies indicated that response time did not affect maternal and neonatal outcomes. Factors contributing to not meeting the target response time included the unavailability of operating rooms, anesthesiologists, pediatricians, and insufficient numbers of nurses. Additionally, a lack of specialized training, the absence of standardized emergency cesarean section services, and limited space and facilities influenced maternal and neonatal outcomes.¹² Another factor contributing to a response time of more than 30 minutes is the lengthy process of transferring the patient to the operating room due to delays in preparation, patient transfer, and prolonged anesthesia and delivery time.¹³

Different response times were found in a study by Maducolil et al., where a response time within 30 minutes was achieved in 67% of cases.⁷ A study conducted in Japan from October to December 2021 on six patients undergoing Category I emergency cesarean sections found that all patients achieved a response time within 30 minutes, with an average time of 21 minutes. No maternal complications were reported, but there were two neonatal deaths, one on day 0 and the other on day 1 (stillbirth). Therefore, neonatal mortality may be influenced by other risk factors, such as gestational age.¹⁴ Previous studies have also found that response times under 30 minutes are most likely to be achieved when the indication has failed instrumental delivery. This may be due to the proximity of the delivery room to the operating room, facilitating the immediate transfer of the mother to the operating room.¹²

Good clinical practice, along with a well-prepared team and protocol, is essential to ensure that emergency cesarean sections are performed as quickly as possible. All hospitals that offer delivery services as part of their maternity care must have the appropriate staff and resources to perform safe and rapid Category I cesarean sections. If human resources in these services are still limited, a referral should be made immediately.¹⁵ Although there have been improvements in the service of Category I emergency cesarean sections with the activation of the obstetric operating room on the 5th floor, achieving a response time within 30 minutes remains a challenge. Therefore, it is necessary to evaluate the factors that may hinder emergency cesarean operations

Factors associated with the length of the interval from decision-making to the time of birth include the time needed to gather surgical instruments and anesthesia medications, the time required from decision-making until arrival in the operating room (including the transfer of the patient to the operating room, where the central surgery building's operating room on the 7th floor is not on the same floor as the delivery room), and the time needed from arrival in the operating room until the incision is made.

Other factors, such as a client's hesitation to give consent, the type of anesthesia used (patients with general anesthesia are more likely to have a faster response time compared to regional anesthesia), and even unplanned conversions to general anesthesia, can affect the response time. Additional factors include difficulties with intravenous access, waiting for lab results, and longer durations for surgeries performed during the day compared to those at night due to the use of the operating room for other elective procedures. Surgeons may face challenges before the baby is delivered, and there is often a lack of standardized procedures and preparation for surgery. The response time for Category I emergency cesarean sections in the central surgery building's operating room on the 7th floor is far from the ideal response time of 30 minutes. The average time from decision-making to entering the operating room is 24 minutes, from entering the operating room to anesthesia is 22 minutes, from anesthesia to incision is 10 minutes, and from incision to delivery is 8 minutes, with an overall average response time of 63 minutes. Therefore, the activation of the obstetric operating room on the 5th floor was implemented to improve the quality of emergency cesarean section services. This change has led to improvements, with the average time from decision-making to entering the operating room now at 6 minutes, from entering the operating room to anesthesia at 15 minutes, from anesthesia to incision at 9 minutes, and from incision to delivery at 6 minutes, resulting in an average response time of 35 minutes.

Several factors that can improve response time include having on-site obstetrics and gynecology doctors, the readiness of the operating room, a team prepared for surgical procedures, the use of standardized and straightforward protocols, and improvements in hospital infrastructure. The activation of the obstetric operating room is a strategic step aimed at enhancing the quality of healthcare services, particularly for maternal and infant care. This is important because using the same central surgery building for operating rooms can lead to overlaps with other elective cases.

The study found an improvement in quality with the acceleration of the response time for emergency cesarean operations due to the activation of the obstetric operating room on the 5th floor. Quality improvements were observed in the time from decision-making to entering the operating room, from entering the operating room to anesthesia, from anesthesia to incision, and from incision to the birth of the baby. The activation of the obstetric operating room itself is a strategic step aimed at enhancing the quality of healthcare services, especially for maternal and infant care. One of the most critical aspects of service quality is the response time for performing surgery, particularly in emergency cases such as cesarean sections. The activation of the obstetric operating

room is expected to reduce this time, thereby increasing the chances of safety for both mother and baby.

This activation involves optimizing human resources (medical personnel), medical equipment, and more efficient workflows and procedures. As a result, healthcare facilities can provide a faster and more accurate response time in handling emergency obstetric cases. The activation of the obstetric operating room also focuses on managing emergency cases that require immediate intervention. This includes the preparation of the operating room, readiness of the medical team, and patient flow management to ensure all aspects are ready when an emergency occurs. This activation involves not only implementation but also continuous evaluation and monitoring to ensure that service quality is continually improved. Reporting and data analysis are crucial parts of this process. The activation of the obstetric operating room requires good coordination between various related units, such as the emergency unit, delivery room, and operating room. This ensures that the workflow proceeds smoothly without any obstacles that could delay case management.

PDSA (Plan-Do-Study-Act) is a continuous improvement cycle approach commonly used in healthcare management to enhance processes and service outcomes. In the context of response time for emergency cesarean sections in fetal distress cases, the PDSA cycle can help analyze and improve the speed and effectiveness of the response. Here is the application of the PDSA cycle to improve the response time of emergency cesarean operations:

Change ideas	Establish an operating room on the same floor as the delivery room.
Plan	Create a dedicated obstetric operating team and ensure the obstetric operating room is on the same floor as the delivery room.
Do	Evaluate the response time for cesarean operations in the central surgery building's operating room and analyze the contributing factors.
Study	Evaluate the response time for emergency cesarean operations.
Action	Decide whether the creation of an operating room on the same floor as the delivery room meets the objective or if a new approach is needed.

Plan

- Objective: To improve the response time of emergency cesarean sections for Fetal Distress cases, making it faster and more effective.
- Problem Identification: There are delays in the execution of emergency cesarean sections for handling Fetal Distress, which can impact the health outcomes of the mother and baby.
- Initial Data: Gather data on the current response times (from the identification of Fetal Distress to the execution of the emergency cesarean section) and identify factors contributing to delays (e.g., coordination among medical teams, readiness of the operating room, clinical decisions, etc.).
- Response Time Target: Set an ideal maximum response time target for emergency cesarean sections in Fetal Distress cases (less than 30 minutes from diagnosis of Fetal Distress to the birth of the baby).
- Action Plan: Plan changes to address the causes of delays, such as enhancing training for medical teams for rapid detection and effective communication, improving the workflow in the operating room to ensure readiness for emergencies, clarifying communication protocols and immediate decision-making once Fetal Distress is identified, and creating an operating room on the same floor as the delivery room.

Do

- Implement the improvement plan at the designated time and begin applying the improvement steps.
- Team Training:** Conduct intensive training for doctors, nurses, and the surgical team on emergency cesarean section protocols and rapid response for Fetal Distress.
- Optimize Workflow:** Ensure that the operating room is always ready for emergency cases and review the patient transfer process from the ward to the operating room. If the operating room is frequently occupied by other surgical cases, consider establishing a dedicated obstetric operating room.
- Use of Technology:** Implement technology such as automatic alarms from CTG that trigger immediate notifications to the surgical team if signs of Fetal Distress are detected.
- Record Observations:** During the implementation of changes, collect data to assess whether the response time for emergency cesarean sections shows improvement.

Study

- Evaluate the results of the actions taken during the "Do" phase.
- Data Analysis:** Compare the response time data for cesarean sections before and after the changes. Has there been a significant reduction in response time? Were the changes made effective enough?
- Identify Barriers:** Analyze if any new or remaining obstacles in the emergency cesarean section process hinder achieving the target response time.
- Review Protocol:** Assess whether the changes made truly help accelerate response time without compromising quality or safety. Evaluasi hasil dari tindakan yang telah diambil selama fase "Do."

Act

- Take further action based on the results of the assessment.
- If Successful:** If the results are positive, standardize the changes throughout the hospital or related units. Make the new protocol a part of the standard procedure for handling Fetal Distress cases.
- If the Target Has Not Been Met:** If the results are still insufficient, revise the plan. For example, provide more training in specific areas (e.g., rapid decision-making), add other support tools such as regular simulations of emergency cesarean operations, and enhance team communication with new methods (e.g., an automatic notification system).

Repeat the Plan-Do-Study-Act (PDSA) cycle for continuous improvement until the optimal response time target is achieved. This cycle can be repeated continuously until all factors affecting the response time of emergency cesarean sections can be optimized.

CONCLUSION

The response time for emergency cesarean operations of less than 30 minutes has improved since the establishment of the obstetric operating room on the 5th floor. The operation of this obstetric operating room has significantly enhanced the response time quality for emergency cesarean sections. The improvement in response time is attributed to the proximity of the operating room and the delivery room being on the same floor, the availability of an anesthesiologist in the obstetric operating room, the readiness of surgical equipment, and the presence of well-trained medical personnel. The preparation of patients for the operating room after the cesarean decision and the time between entering the operating room and administering

anesthesia are two crucial phases that must be evaluated in emergency cesarean operations at Airlangga University Hospital Surabaya—both in the new obstetric operating room on the 5th floor and in the central surgery building's operating room on the 7th floor. This time interval can be improved through orientation, standardization, and increasing the experience of the new operating room staff. The addition of a new operating room is a positive effort to enhance the hospital's ability to serve patients. However, to improve service standards, regular research and audits are needed to identify the main issues in achieving the target response time at Airlangga University Hospital. Moreover, increasing the quantity of new facilities must be accompanied by improvements in quality, including standardizing the skills of personnel and the available equipment.

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DISCLOSURE

The authors stated that they have no conflicts of interest regarding this study.

AUTHORS' CONTRIBUTIONS

All authors contributed to data analysis, article preparation, and paper revision and have collectively assumed responsibility for all aspects of this work.

ETHICAL CONSIDERATION

Ethical committee approval for this study was obtained from the Airlangga University Hospital; the approval certificate number is 03/479/UN3.1.1/OBG/IX/2024.

DATA AVAILABILITY

The article contains all the necessary data to support the results; no supplementary source data is needed.

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