


# Enhanced Recovery after Surgery Protocol Implementation on Elective Cesarean Delivery: A Cross-sectional Study

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## ABSTRACT

**Aim and objective:** To estimate the outcomes of enhanced recovery after surgery (ERAS) protocol implementation in perioperative elective cesarean patients.

**Study design:** Cross-sectional study was conducted from January 2020 to December 2021 at a tertiary healthcare center. During the study period, ERAS protocol was implemented on elective cesarean deliveries at the study institution to find out the time to first ambulate, incidence of urinary retention, total intravenous (IV) fluids in the postoperative period, tolerability of early oral intake, hospital stay, readmissions for maternal cause, and the complications up to 30 days postpartum.

**Results:** In total, 150 cases were enrolled in the study. Six hours 23 minutes was the mean ambulation time, and all patients started ambulation within 10 hours of surgery. There were no cases of urinary retention. About 132 patients needed 1500 mL of IV fluids in the postoperative period. About 146 postoperative patients tolerated a 2-hour liquid diet. The postoperative length of stay was 3 days 3 hours with 11 cases of postoperative complications with 3 cases requiring readmission.

**Conclusion:** The implementation of ERAS protocols in elective cesarean delivery has shown favorable outcomes with minimal complications and readmission. Early resumption of oral feed was well-tolerated and led to a reduced need for IV fluids. Early removal of the catheter aided in early ambulation and without undue retention of urine. Early discharge is beneficial for the patient to reduce hospital-acquired infections and bed turnover in limited-bedded hospitals. Enhanced recovery after surgery protocol can be implemented in low-risk elective cases posted for cesarean delivery in Government hospitals.

**Keywords:** Ambulation, Cross-sectional study, Cesarean delivery, Enhanced recovery after surgery.

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## INTRODUCTION

Enhanced recovery after surgery is a standardized, perioperative care program that is now embedded firmly within multiple surgical disciplines that include colorectal, urologic, hepatobiliary surgery, and gynecologic surgeries.<sup>1,2</sup> Enhanced recovery after surgery guidelines for cesarean delivery perioperative care were published in the year 2018–2019 in the American Journal of Obstetrics and Gynecology.<sup>3–5</sup> Implementation of ERAS protocols for elective cesarean delivery is known to provide significant improvements in analgesic and postoperative recovery outcomes. These improvements in quality of care suggest ERAS protocols should be considered for elective cesarean delivery.<sup>6</sup> As cesarean delivery is the most common surgery performed, a study on ERAS Society protocol implementation in cesarean delivery cases becomes more essential as the studies conducted in different countries showed reduced cost and a reduced hospital stay with no or minimal adverse events.

The mission of ERAS society was to develop perioperative care and to improve recovery through research, education, audit, and implementation of evidence-based practice. Enhanced recovery after surgery was established as a global surgical quality improvement initiative which has resulted in both clinical improvement (reduction in length of stay, complications, and readmissions) and cost benefits to healthcare systems.<sup>1,2,7</sup>

Implementation of an ERAS protocol for women who had unplanned or planned cesarean deliveries was associated with significantly decreased postoperative length of stay and significant direct cost-savings per patient, without an increase in hospital readmissions.<sup>8</sup> Implementation and knowledge transfer will need

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multidisciplinary coordination in the preoperative, intraoperative, and postoperative phases, and therefore the development of a formalized ERAS guideline. There is an increasing body of evidence regarding ERAS protocol implementation for cesarean deliveries and reduced hospital stay and cost of care across several studies.<sup>9,10</sup>

According to the data from District Level Household Survey FRO 2005–2016 (DLHS-4), the overall rate of cesarean section delivery in 2005–2016 was 17.2% in India which had doubled from 8.5% in 2005–2006.<sup>11</sup> Enhanced recovery after surgery guidelines for cesarean delivery include preoperative components like patient education, preanesthetic medications, and oral carbohydrate supplementation. Intraoperative components include prophylactic antibiotics, IV fluids, active warming, regional anesthesia, cesarean

delivery techniques, and perioperative fluid management. Postoperative components include early oral intake, multimodal approach for prevention of nausea and vomiting, multimodal analgesia, early mobilization, early removal of urinary catheter, and audit of compliance and outcome.<sup>3-5</sup>

The ERAS society guidelines after cesarean delivery in the perioperative period have been implemented in Western countries and have shown benefits. With the increasing cesarean rates in the last decade, there is always a burden of postoperative patients in hospitals in a developing country like India. However, there are only a few studies in India with the implementation of ERAS guidelines. In this study, we tried to implement the elements and recommendations as per the ERAS society guidelines for cesarean delivery in the government setup and to find out to what extent ERAS protocol helped in improving perioperative care of the patient.

In this study, most of the elements of ERAS protocol were implemented and outcomes were noted as the time to first ambulate in the postoperative period, the incidence of retention of urine after early removal of urinary catheter, total IV fluid in the postoperative period, tolerability of early oral intake in the postoperative period, the length of hospital stay in the postoperative period, number of complications in the postoperative period, and those who require readmission.

**METHODS**

This is a cross-sectional study over a period of 18 months from January 2020 to June 2021 in the Department of Obstetrics and Gynecology, Postgraduate Institute, Yashwantrao Chavan Memorial Hospital, Pimpri, Pune. All data were retrieved and entered in a preformed structured pro forma. Enhanced recovery after surgery guidelines for cesarean delivery was implemented for all full-term pregnancies posted for elective cesarean delivery during this study period.

**Inclusion Criteria**

All full-term pregnancies posted for elective cesarean delivery.

**Exclusion Criteria**

All unscheduled or emergency cesarean deliveries and the patient who refused to give consent for the study.

The broad ERAS society cesarean delivery elements and recommendations (parts I-III) break down the surgical delivery process into a pathway that starts 30–60 minutes before skin incision, until hospital discharge, and presents a longer pathway that manages antenatal education, maternal comorbidities, and immediate neonatal needs at delivery.<sup>3-5</sup> ERAS guideline for perioperative care in cesarean delivery provides evidenced-based practice recommendations for preoperative (part I), intraoperative (part II), and postoperative (part III) phases and allows audit assessment and measurement of the desired outcomes. The ERAS

cesarean delivery guideline/pathway has created a pathway with 5 preoperative elements (8 recommendations), 4 intraoperative elements (9 recommendations), and 9 postoperative elements (11 recommendations).

The elements and recommendations were followed in this government tertiary institute, and outcomes are recorded. The data collected were analyzed using simple statistical measures like percentage and proportion. Descriptive statistical analysis was done.

**RESULTS**

This cross-sectional study was conducted on 150 women with term gestation. All women enrolled for the study were posted for elective cesarean delivery. All the enrolled participants were given care as per the recommendations of ERAS protocol.

Figure 1 shows that a total of 35 (23.33%) patients walked after 5 hours after surgery, 56 (37.33%) patients started walking after 6 hours of surgery, 41 (27.33%) started walking after 7 hours of surgery, 8 (5.33%) started walking after 8 hours of surgery, 4 (2.67%) ambulated after 9 hours of surgery, and the remaining 6 (4%) started walking after 10 hours of surgery with or without support after the removal of the urinary catheter. About 88% of patients started ambulation within 6–7 hours of surgery. All the patients in our study group started ambulation within 10 hours after surgery. The mean time to the first ambulation in the study group was 6 hours 23 minutes.

Table 1 shows in 124 (82.6%) cases, the urinary catheter was removed immediately after the cesarean delivery, and the patients were encouraged to ambulate and pass urine after 5 hours of surgery. In 26 (17.3%) cases, the urinary catheter was removed after 12 hours after surgery. About 60% of patients passed urine after 6 hours of surgery. There was no case of urinary retention.

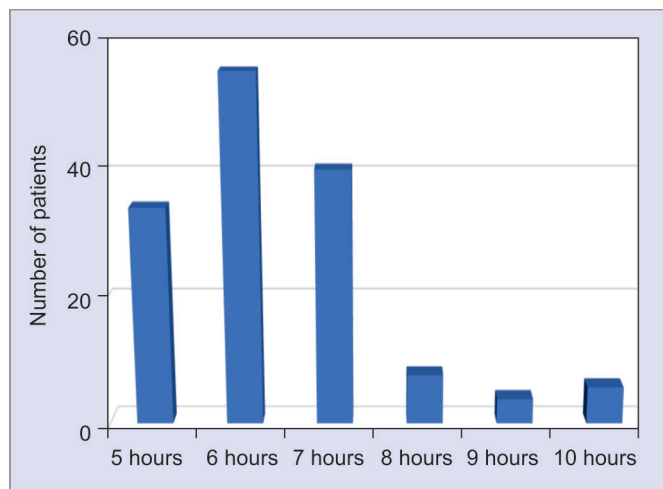
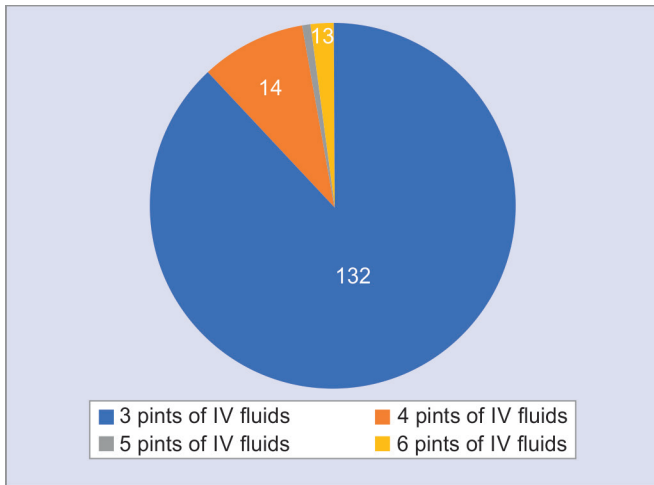


Fig. 1: Post-cesarean ambulation time

Table 1: Post-cesarean urinary drainage

	Removed immediately after cesarean delivery			Removed after 12 hours of cesarean delivery		
Number of cases	124 (82.6%)			26 (17.3%)		
Time to pass urine after surgery	5 hours	6 hours	7 hours	16 hours	17 hours	18 hours
Number of cases	37 (24.6%)	53 (35.3%)	34 (22.6%)	10 (6.6%)	9 (6%)	7 (4.6%)
Number of cases of urinary retention after removal of urinary catheter	0			0		





**Fig. 2:** Total number of postoperative intravenous fluids on day 0 and day 1

Figure 2 depicts that, among the patients enrolled, 132 (88%) patients needed 3 pints (500 mL each) of IV fluids, 14 (9.3%) patients needed 4 pints of IV fluids, 1 (0.66%) patient required 5 pints IV fluids, and 3 (2%) required 6 pints of IV fluids during the first 2 days of the postoperative period.

About 146 (97.33%) patients tolerated the early liquid diet which was started after 2 hours of surgery. About 2 (1.3%) patients had complaints of nausea and vomiting after 2-hour liquid diet, and 2 (1.3%) patients had abdominal distension. These 4 patients were kept nil by mouth for the next 24 hours, and a liquid diet was started after confirming the presence of bowel sounds.

Out of 146 patients who tolerated 2-hour liquid diet, 71 (47.33%) were started on soft diet on-demand after 4 hours of surgery, 58 mothers (38.66%) asked for soft diet after 5 hours after surgery, and 17 patients (11.3%) were started on soft diet after 6 hours of surgery. The mean time to start soft diet in the postoperative period was 4 hours 38 minutes. About 86% of the patients were started on soft diet after 5 hours of surgery.

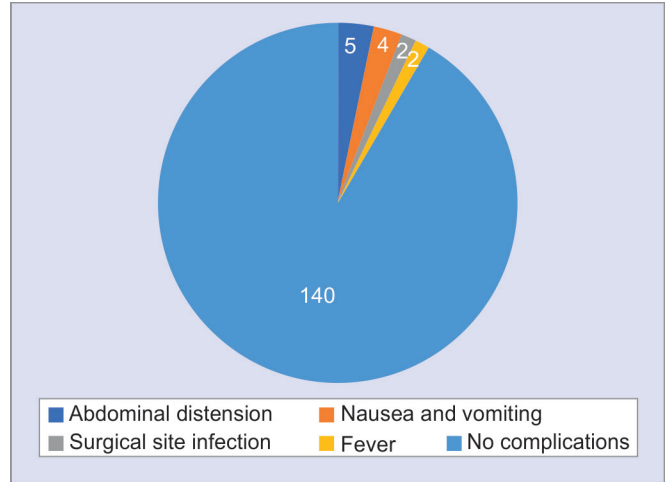
The 4 patients who did not tolerate 2-hour liquid diet were not started with early soft diet. About 141 (94%) patients tolerated early soft diet which was started after 6 hours of surgery. About 2 (1.3%) patients had complaints of nausea and vomiting after a soft diet, and 3 (2%) patients had abdominal distension after taking soft diet. These 5 patients were kept nil by mouth for the next 24 hours, and a liquid diet was started after confirming the presence of bowel sounds.

Table 2 shows that 132 (88%) patients were discharged on postoperative day 3 of lower segment cesarean section (LSCS), 17 (11.33%) of them stayed until postoperative day 4 of LSCS, and 1 (0.6%) patient stayed till the 5th postoperative day. The mean length of stay in the hospital was 3.126 days.

Figure 3 shows that 140 (93.33%) patients in the study group had no postoperative complications. Among all postoperative complications, abdominal distension/paralytic ileus was more common, with an incidence of 5 (3%). All five cases of paralytic ileus were managed conservatively, out of which four were discharged on day 4, and one of them was discharged on day 5. Postoperative nausea and vomiting were seen in 4 (2.6%) on day 0. Two cases had nausea and vomiting after starting 2-hour liquid diet, and the other 2 had nausea and vomiting after starting the soft diet. All four cases were managed conservatively. Out

**Table 2:** Length of stay in the hospital

Length of stay in the hospital in days	Number of patients
3 days	132
4 days	17
5 days	1



**Fig. 3:** Postoperative complications

of 4, who had postoperative nausea and vomiting, 2 had to stay a day longer in the hospital, whereas the other 2 patients were discharged on postoperative day 3. None of the patients had spinal headache.

About 2 (1.3%) patients were admitted for surgical site infection following which resuturing was done and discharged. Two patients out of 150, had fever after discharge of the patient. One of the patients had dengue viral fever for which, she was readmitted and was treated conservatively. The other patient had bilateral breast engorgement for which breast milk expression was advised and oral antibiotics were given on OPD basis.

## DISCUSSION

Enhanced recovery after surgery protocol was first introduced in colorectal surgery. It is a standardized, perioperative care program that is embedded firmly within multiple surgical disciplines that include colorectal, urologic, hepatobiliary, and gynecologic surgeries. Enhanced recovery after surgery has been shown to result in both clinical benefits like reduction in length of hospital stay, complications, readmissions, and health system benefits in terms of reduction in cost. In addition, the mother needs to recover earlier so that she can actively and individually take care of her newborn. This cross-sectional study on 150 women with term gestation was conducted with the aim of finding out whether the application of ERAS protocols in routine care after cesarean delivery gave the results as promised in the government hospital.

Out of 150 patients, for 124 (82.66%), the catheter was removed immediately after surgery, and for 26 (18.33%) women, the catheter was removed after 12 hours of surgery as per the surgeon's advice, according to intraoperative bladder adhesions. As per Liang et al., the incidence of postoperative urinary retention after cesarean delivery, where ERAS protocol was not followed, is around 7.4%.<sup>12</sup> However, in this study, none of the patients had complaints of

urinary retention and none needed catheterization. The use of spinal analgesia and the use of multimodal analgesia with non-opioid agents might have aided in this result in this study. When patients had the urge to pass urine for the first time after surgery after the removal of the urinary catheter is when they got out of bed and started ambulation, so early removal of urinary catheter acts as a stimulant for patients to ambulate early. A majority of 88% started ambulating within 6–7 hours of surgery with or without support for ambulation, with a mean time of duration for ambulation of 6 hours 23 minutes. In those who delayed, urinary catheter removal was planned and early ambulation was initiated by encouraging patients to ambulate with or without support for ambulation. In the pilot study conducted in Kerala by Mangala et al., the duration for ambulation in the ERAS group was  $17.3 \pm 4.47$  hours after surgery as the catheter was removed 12 hours after surgery.<sup>13</sup> In this study, early removal of Foleys catheter aided in lesser duration to the first ambulation as compared to the other studies. Basbug et al. opined that early removal of urinary catheters after cesarean delivery is associated with reduced mobilization time and hospital stay with no significant differences in terms of bacteriuria, urinary retention, dysuria, and first postoperative voiding,<sup>14</sup> which showed similar results in this study.

About 88% of patients needed only 3 pints of IV fluids (500 mL each) in the postoperative period, the rest 12% required 4–6 pints of IV fluids. The decrease in the use of IV fluids in the postoperative period aided in decreasing the risk of fluid overload, extravasation of fluids, and thrombophlebitis. Early oral intake of clear fluids and pulp-free juice after 2 hours of surgery aided in the reduction of the need for postoperative IV fluids.

About 2.6% of the patient had postoperative nausea and vomiting after early oral intake, similar to the study in Bhutan by Tamang and associates in 2021 (2.3%)<sup>15</sup> and China in 2020 by Pan et al. (3.6%).<sup>16</sup> Ogbadua and associates quoted that the incidence of paralytic ileus was 2.8%, where they had delayed feeding following uncomplicated CS under the subarachnoid block.<sup>17</sup> The same study reported that 3.9% of cases had paralytic ileus after ERAS protocol implementation. About 3% of the patient had abdominal distension in this study which was less than in the Ogbadua study.

1.3% was the incidence of surgical site infection post-cesarean delivery in this study in concordance with 2.4% incidence in a post-ERAS group of study in Bhutan by Tamang,<sup>15</sup> which is very much less with the meta-analysis done in 2016 by Martin and associates which reported as 9%.<sup>18</sup> Antibiotic prophylaxis and perioperative glucose control and skin preparation with chlorhexidine as per ERAS recommendations have aided lesser surgical site infections in our study.<sup>8,9</sup>

The mean duration of hospital stay is 3.126 days in this study. The length of stay in the study by Kleiman and associates was 2.5 days, which is less than this study.<sup>6</sup> A similar study conducted in Kerala in 2020 by Mangala and associates showed a much lesser LOS than this study which was 2.2 days.<sup>13</sup> In Thailand, in a similar study by Chantarasorn et al., the overall duration of the hospital stay was 3.3 days which is comparable to the present study.<sup>19</sup>

An early discharge from the hospital is one of the hallmarks of ERAS pathway adoption.<sup>15</sup> In this study, postoperative day 3 discharges after the ERAS protocol implementation were 88%, which were similar to Tamang (88%).<sup>15</sup> A study by Wrench et al. in their tertiary center also concluded that a greater proportion of patients discharged on day 1 can be achieved after the ERAS program without compromising the quality.<sup>20</sup>

## CONCLUSION

The implementation of ERAS protocols in elective cesarean delivery has shown favorable outcomes with minimal complications and readmission. The length of stay was less, with an average of 3 days. About 2% of the patients required readmission for maternal cause. About 7.3% of the patients had minor postoperative complications within 30 days of LSCS. Early resumption of oral feed was well-tolerated and leads to a reduced need for IV fluids. The decrease in the use of IV fluids in the postoperative period aided in decreasing the risk of fluid overload, extravasation of fluids, and thrombophlebitis. Early removal of catheter aided in early ambulation and without undue retention of urine. Early discharge is beneficial for the patient to reduce hospital-acquired infections and bed turnover in limited-bedded hospitals. In a government setting, early discharge should be encouraged only when the patient is staying within the reach of the hospital in case of any complication occurring in the postpartum period at home like postpartum hemorrhage, fever, eclampsia, etc.

ERAS protocol for cesarean delivery can be implemented in low-risk elective cases posted for cesarean delivery in Government hospitals. The findings of this study need to be confirmed on elderly gravidas, preterm, and emergency LSCS performed at government hospitals. However, comparison with cohort group with more number of samples by multicentric study or randomized control study conducted at government hospitals.

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