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Eras in cesarean section: A paradigm shift

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Abstract
Background: Caesarean section is a common surgical procedure that can have a significant impact on a woman's health and well-being. Traditional approaches to caesarean section often involve prolonged hospital stays, extended fasting, delayed mobilization, and conventional pain management, leading to longer hospital stays and higher complication rates. Enhanced Recovery after Surgery (ERAS) protocols, offer a multidisciplinary approach that includes preoperative counseling, optimized nutrition, multimodal analgesia, and early mobilization to expedite recovery and reduce complications and reduce the hospital stay. While ERAS has shown benefits in various surgical fields, its impact on Obstetrical surgeries remains less-explored.
Methods: This was A prospective comparative study which was conducted in the Department of Obstetrics and Gynecology at Sri Siddhartha Medical College and Hospital, Tumkur, during the period from January 2024 to August 2024, for period of 8 months among the women admitted and undergoing Scheduled caesarean sections in the department of OBG as per the inclusion and exclusion criteria after proper counselling and after getting their consent.
Interpretation: The ERAS group demonstrated a significantly shorter hospital stay compared to the traditional care group. Pain scores were seen to be lower in the ERAS group & postoperative complications were also reduced in the ERAS group. Leading to better patient satisfaction in ERAS as compared to Traditional Group.
Conclusion: Our study concludes that Implementation of ERAS resulted in significant reduction in hospital stay, proper pain management & reduced rate of complications without an increase in re-admissions.

Keywords: Caesarean section, enhanced recovery after surgery (ERAS), obstetrical surgery, postoperative complications, pain management

Introduction
Lower Segment Caesarean Section (LSCS) is a one of the most frequently performed surgery worldwide, often governed by traditional surgical protocols that emphasize conservative perioperative management. Enhanced recovery after surgery (ERAS) is a concept that is put forward by the ERAS ® society, which focuses mainly on bringing together a number of evidence-based aspects of perioperative care in order to assist in the acceleration of the healing process that occurs in patients following surgical procedures [1-3].
In addition to achieving a standardized approach to the management of the perioperative situation it also achieves a reproducible improvement in the quality of care [1]. In the initial research on ERAS procedures which was implemented in colorectal surgeries, improved patient outcomes were seen. Since then, ERAS procedures have been widely implemented in a variety of surgical specialties over the course of the years, and equivalent outcomes have been recorded, [5-8].
Despite the fact that the particular components of ERAS procedures differ from one surgical speciality to another and from one institution to another, it is essential to keep in mind that the core fundamentals remain similar. During the Preoperative, Intraoperative, and Postoperative phases of the surgical operation, this protocol entails interventions that take place simultaneously for an improved outcome. And as much as interventions are taken into consideration, some of the primary factors that contribute to a patient's delayed recovery from surgery and prolonged hospital stay are a lack of sufficient analgesia, a late return of bowel function, and delayed ambulation among other things and hence ERAS protocol will be mainly focusing on targeting these concerns for an Superior postoperative recovery [9-10].

In comparison to other specialties and treatments, the rate at which Obstetricians and their patients who are undergoing caesarean delivery have accepted ERAS has been comparatively slower than the rate at which other treatments have adopted it. Despite the fact that a number of centres in Europe have begun to implement these protocols in response to the increased demand that has been placed on maternity services, the adoption of ERAS protocols for Scheduled caesarean birth has recently begun to gain favor in India and other south Asian countries. This is the scenario despite the fact that, these perioperative therapies are supported by evidence.

Therefore, this study will be focusing on implementing ERAS protocols in patients undergoing Caesarean section, as it deserves to be taken into account to raise attention to these interventions so that they can be considered to provide an Overall Positive Perioperative result.

Aim: To evaluate and compare the Maternal outcomes of Enhanced Recovery After Surgery (ERAS) PROTOCOL versus traditional protocols in scheduled Caesarean section operations.

Objectives

To implement and assess enhanced recovery after surgery (ERAS) in one group of patients undergoing Caesarean sections.

To implement and assess traditional surgical care in another group of patients undergoing Caesarean sections.

To compare the maternal outcomes between the ERAS group and traditional care group on the following parameters:

- Length of hospital stay
- Pain management
- Post-operative Complication Rate

Materials & Methods: This study was A Prospective Comparative study conducted at Sri Siddhartha Medical College and Research Centre, Tumkur in the Department of Obstetrics and Gynaecology spanning for period of 08 months, from January 2024 to August 2024. The study recruited 102 patients from the Inpatient settings of the department, which includes only the women priorly admitted and undergoing Scheduled Caesarean section operations. These women were further divided, wherein 51 women were categorized as ERAS group and the other 51 women were categorized as Traditional group. All patients were selected as per the inclusion and exclusion criteria after undertaking complete history and performing a thorough clinical examination, and taking informed consent with proper counselling and after getting the approval of the Institutional Ethical Committee.

Inclusion Criteria

All women undergoing Scheduled Caesarean section with the following criteria fulfilled:

- Singleton pregnancy
- Patients within the Age group 20-40 years
- Patients who haven't undergone any prior surgery or intervention in the abdominal region
- Patients who have given valid informed consent.

Exclusion Criteria

- Patients with multiple gestation
- Emergency Caesarean section cases
- Patients with hemorrhagic diathesis.
- Patients with cardiac, pulmonary, hepatic (or) renal disorders.
- Patients not willing to participate in the research

Methodology

In this study Purposive sampling was done and 102 patients were recruited into the study after taking written informed consent, and they were divided into two groups:

Group A (ERAS) - n (51) – In whom ERAS protocol was followed

Group B (Control) – n (51) – In whom Traditional protocol of care was followed

ERAS protocol which will be Followed for group a of C -sect ion patients

Pre-operas Protocol	Intraoperas Protocol	Postoperas protocol
Patient adequately educated about the ERAS protocol	Prevent and treat spinal induced hypotension	Early oral intake followed, For liquids 6 hours post-op & For semi-solids 10-12 hours post-op
Limiting fasting intervals by allowing liquids until 6 hours before and solids until 8 hours before the surgery.	Maintenance of normothermia	Early urinary catheter removal within first 24 hrs post-op.
Carbohydrate loading drinks were given	Pre-op and Intra-op nausea and vomiting prophylaxis.	Early mobilization out of bed and attempted ambulation within the first 24 hrs post-op
	Optimal uterotonic administration.	Maternal and infant bonding by early ambulation & initiation of early breastmilk feeding.
	Multimodal analgesia.	

Traditional Protocol Which Will Be Followed For Group B of C -section patients

Pre op-standard Protocol	Intra op-standard protocol	Postop standard Protocol
1. No Patient education	No modes to prevent spinal induced hypotension	Oral intake only after 24 hours after post-op.
Prolonged fasting intervals for more than 24 hours.	No normothermia will be maintained.	Prolonged urinary catheter removal on post-op day 2-3
No preoperative carbohydrate loading.	No Pre-op and Intra-op nausea and vomiting prophylaxis.	Late mobilization out of bed after 24 to 36 hours.
	Uterotonic administration based on requirements only.	Maternal and infant bonding may be delayed due to delayed ambulation.
	5. Unimodal analgesia.	

After the two treatment modalities were utilized, the following parameters were compared:

1. Length of Hospital Stay
2. Pain management using VAS scoring
3. Post-operative Complications

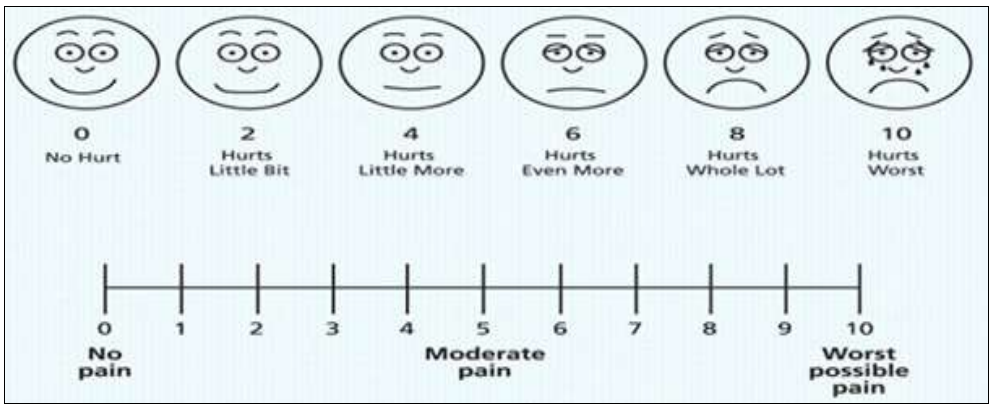
Length of The Hospital Stay: The length of hospital stay (LOS) is a critical measure in healthcare for several reasons, impacting patients, healthcare providers, and the overall healthcare system. Here are some of the key aspects of the same:

1. **Recovery and Outcomes:** The appropriate LOS ensures patients have adequate time to recover before discharge, reducing the risk of readmission and complications.
2. **Patient Satisfaction:** Shorter stays can enhance patient comfort and satisfaction, as many prefer recovering at home once it's safe.
3. **Infection Risk:** Prolonged stays can increase the risk of hospital-acquired infections (HAIs), making a balanced LOS crucial for patient safety.

- This parameter was assessed based on,
  - Date and time of admission
  - Date and time of discharge.

Pain Management: This was assessed using a VISUAL ANALOG SCORE (VAS) chart, where in a patient was handed over a VAS score chart and they were asked to evaluate their pain on it.

The Visual Analog Scale (VAS) is a common tool used to assess subjective experiences, such as pain intensity, that are difficult to measure directly. The VAS offers a quick, reliable, and easy-to-understand way for both patients and healthcare professionals to track changes in subjective experiences over time. In this study VAS scores of 12th hour post-op and VAS score of 24th hour was assessed and compared between the two groups.



VAS Scoring Chart

Post-Op Complications: Post-operative complications are significant in the healthcare context for their profound impact on patient outcomes, healthcare providers, and the broader healthcare system. These complications were assessed by post op history given by the patients and further examination and elicitation from the operating team.

And for statistical analysis the data was collected and entered in MS Excel sheet and Data analysis was done using SPSS version 21.0 software. Descriptive statistics like Proportion, Mean and Standard deviation were calculated. Chi-square test was used for qualitative variables.

Results

In this study majority of the women belonged to the age group of 26-30 years in both the groups, that is (43.1%), hence both the groups are comparable and about (33.3%) belonged to the age group of 31-35 years and about (21.6%) belonged to the age of years, and very few women about (2.0%) were above the age of 35 years (As shown in Table 1). This distribution indicates that majority of the women were among the younger age group, wherein the patients of this age group generally recover faster and are lesser prone to other comorbidities and have better pain management and their overall post-operative recovery is quicker.

Table 1: Age distribution among patients

Age (In years)	Group		Total	Chi-Square, P-Value
	Eras	Control		
21-25	9 (17.6%)	13 (25.5%)	22 (21.6%)	2.845, 0.416
26-30	22 (43.1%)	22 (43.1%)	44 (43.1%)	
31-35	18 (35.3%)	16 (31.4%)	34 (33.3%)	
36-40	2 (3.9%)	0 (0.0%)	2 (2.0%)	
Total	51	51	102	

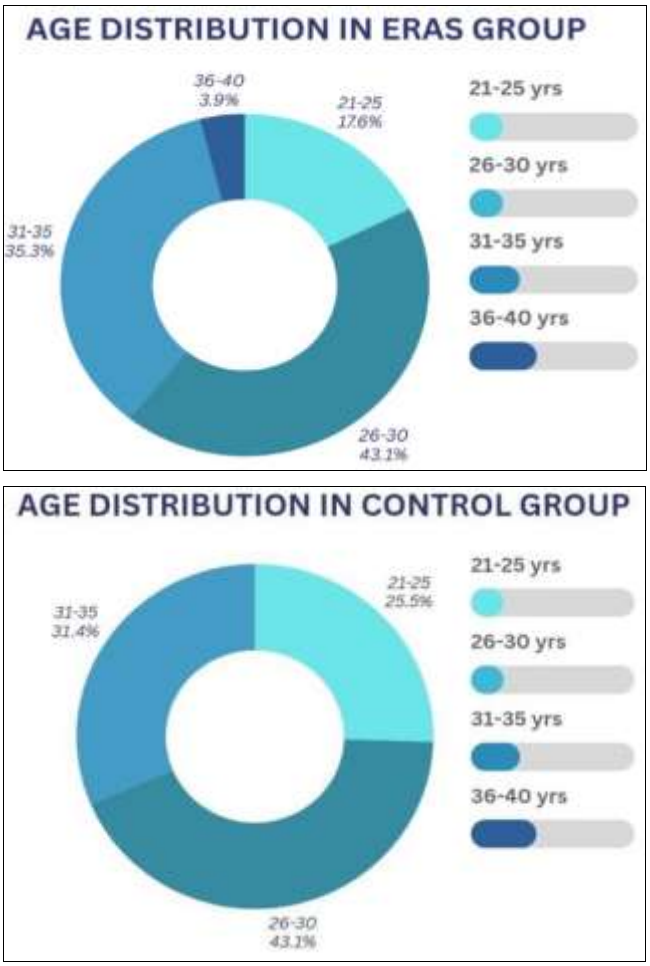


Fig 1: Age distribution in ERAS & Control group

In this study since all the patients underwent Scheduled C-section operations, they were admitted and discharged on elective basis, hence their Length of hospital stay is assessed in days. The mean DOS of ERAS group was (2.53 ± 1.06) days and DOS of control group was (5.18 ± 1.07) days. A two tailed t-test for independent samples (equal variances assumed) showed that the difference between DOS of ERAS and DOS of control with respect to the dependent variable was statistically significant, t value = -12.513 p = < 0.001.

Here since the p value is <0.001 and is less than 0.05, LENGTH OF HOSPITAL STAY (LOS) aka DURATION OF STAY (DOS) in ERAS group is Statistically Significant.

Table 2: Comparison of duration of stay in both groups.

	ERAS	Control	Total	t-value	P-value
Duration of stay	2.53±1.06	5.18±1.07	3.85±1.70	-12.513	<0.001

Fig 2: Duration of stay graph

The post-operative pain management was evaluated using VAS scoring and it was assessed in both the groups at 12th hour and 24th hour interval and it was seen that, 12TH hour VAS score of ERAS group was (4.20 + 0.87) and control was (7.59 +0.98) and 24th hour VAS score of ERAS group was (2.02 + 0.81) and control was (5.45 +0.90). A two tailed t-test for independent samples (Equal variances assumed) showed that the difference between VAS score 12th hourly-ERAS and VAS score 12TH hour- control with t value (-18.429) and p value is < 0.001.

A two tailed t-test for independent samples (Equal variances assumed) showed that the difference between VAS score 24th hourly – ERAS and VAS score 24th hour control with t value (-20.196) and p value is <0.001.

Therefore, p value in both the instances is <0.001, hence it is statistically significant and we can conclude that VAS of both 12th and 24th hour in ERAS is lesser than the control group.

Table 3: Comparison of VAS score of 12th and 24th hour among both groups

	ERAS	Control	Total	t-value	P-value
VAS Score 12th hour	4.20±0.87	7.59±0.98	5.89±1.94	-18.429	<0.001
VAS Score 24th hour	2.02±0.81	5.45±0.90	3.74±1.92	-20.196	<0.001

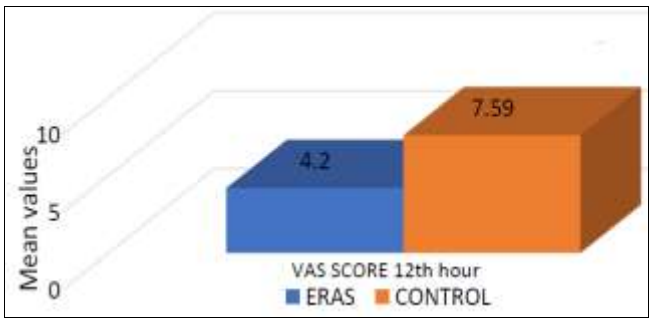


Fig 3: VAS score 12th hour graph

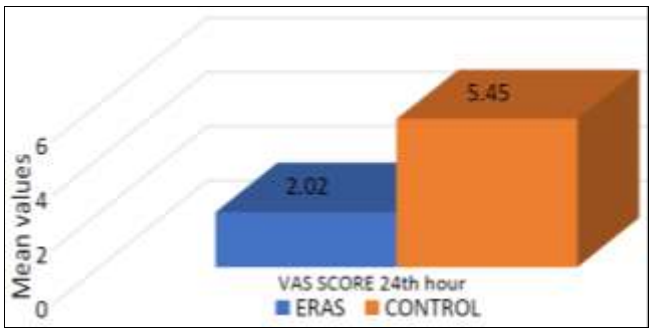


Fig 4: VAS score 24th hour graph

And finally, when considering the post-operative complications in both the groups, Hypotension in ERAS group was (0.0%) and in control group was (5.9%), Bleeding in ERAS was (2.0%) and in control was (5.9%), Wound infection in ERAS was (2.0%) and in control was (3.9%), Post-op nausea and vomiting in ERAS was (2.0%) and in control was (9.8%), Urinary retention in ERAS was (0.0%) and in CONTROL was (2.9%).

Overall, totally 3 patients in ERAS and 27 patients in control group had post op complications. Leading us to conclude that the p value is 0.034, hence it is significant enough to say that ERAS has lesser complications than Control group.

Table 4: Comparison of post op complications among both groups

Post op complications	Group		Total	Chi-Square, P- Value
	Eras	Control		
Hypotension	0 (0.0%)	5 (5.9%)	3 (2.9%)	12.036, 0.034
Bleeding	1 (2.0%)	5 (5.9%)	4 (3.9%)	
Wound infection	1 (2.0%)	3 (3.9%)	3 (2.9%)	
Post op nausea & vomiting	1 (2.0%)	9 (9.8%)	6 (5.9%)	
Urinary retention	0 (0.0%)	5 (5.9%)	3 (2.9%)	
No	48 (94.1%)	35 (68.6%)	83 (81.4%)	
Total	51 (100.0%)	51 (100.0%)	102 (100.0%)	

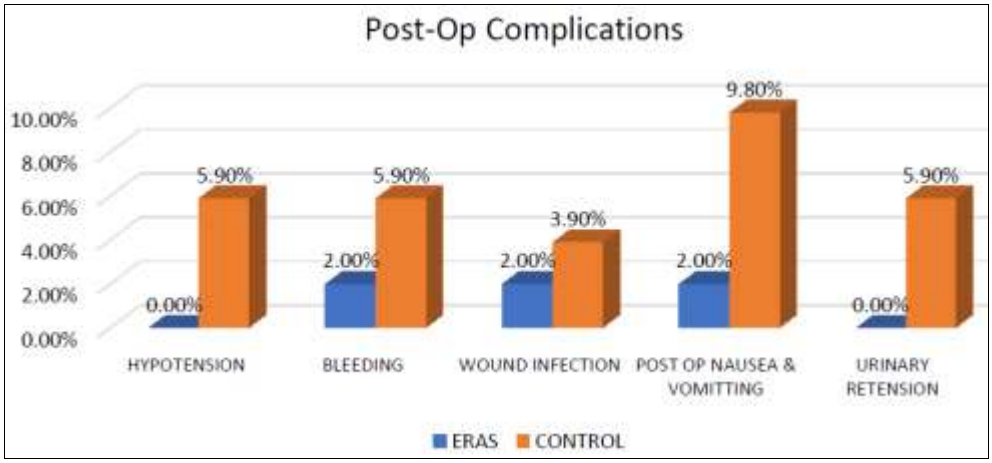


Fig 5: Post op complication graph

Discussion

Enhanced Recovery after Surgery (ERAS) is a global surgical quality improvement program that initially developed in colorectal surgery and has now spread to several disciplines, including Obstetrics and Gynaecological surgeries. ERAS guidelines are comprised of multidisciplinary, evidence-based recommendations that are implemented during the preoperative, intraoperative, and postoperative periods i.e. encompassing a complete Peri-Operative approach. These interventions encompass a wide range of topics, including patient education, anaesthetic choice, multimodal pain control, avoidance of unnecessary drains, maintenance of nutrition, and prevention of emesis. It has been demonstrated that the implementation of ERAS is related with significant improvements in clinical outcomes including duration of hospital stay, better pain management, reduced complications and very less readmissions and as well as better cost expenditure for the patients. The sustainability of ERAS in Colorectal surgeries was initially proven by Marx and colleagues in the year 2003. Since that time, more than thirty comparative studies and four recommendations have been published, which include major gynaecologic surgery, cytoreductive surgery, and vulvar/vaginal surgery. Despite the promising results, the implementation of ERAS in Obstetrical procedures like caesarean section faces several challenges.

It has been seen that improved results have been linked to increased compliance with ERAS recommendations, which has been has been attempted to establish in our study.

The amount of time spent in the hospital (Duration of stay) is a significant determinant of the outcome of employing ERAS, and it is also the most obvious measure of how quickly a patient is recovering. In the course of our study, we found that the duration of hospital stays and the duration of postoperative hospital stays in both groups were around (2.53±1.06) days in ERAS and (5.18±1.07) days in control group respectively. This indicated that there were substantial variations between the two groups. According to the findings of a number of studies, the implementation of the ERAS protocol has the potential to decrease the median length of hospital stay by thirty percent, or at least two days, in patients who are undergoing abdominal surgery. This reduction would occur without an increase in the likelihood of readmission (14-16). Through the utilization of ERAS in Caesarean deliveries, the postoperative length of stay was decreased by 0.5–1.5 days, which contributed to the overall reduction in the stay.

Certain other studies which shows similar outcomes as ours are, a study by Mullmann *et al*. noted that in those in the post implementation period had a shorter post-caesarean length of stay (3.2 vs 2.7 days, mean relative change 0.82, 95% CI 0.80–0.83, median 3 days in both periods), and no change in the 30-day readmission rate (11). In a study by Renaud *et al.*, the DOS was 2.73 days in ERAS group, while in the controls it was 3.88, the difference was significant at $p<0.001$. This was similar to the findings of our study.

In study by Eva M *et al*, DOS was 7.23 (5.68) in control group, while in the ERAS group it was 4.29 (2.78) days, with a significant difference. (p value 0.001)

However, the difference in the length of time spent in the hospital was not statistically significant in the study that was conducted by Pan *et al*. (17). There are a number of possible explanations for this. Additionally, the incidence of postoperative problems has been extremely low at our medical centre, which is a testament to the widespread use and rather mature nature of Caesarean deliveries (CD). Secondly, the duration of stay for CD has already been cut to the lowest possible level because to financial obligations such as insurance and payment systems. It may be difficult to reduce the length of stay much further.

Among the several surgical operations, post-CD pain intensity was found to be among the greatest, according to an examination of the severity of pain experienced after each of the surgeries. [12] ERAS has been demonstrated to be connected with better Post-operative pain control. This post-op pain was assessed during 2 periods using Visual analogue scale (VAS).

- 12th hour VAS Score
- 24th hour VAS Score

In the 12th hour VAS Score the ERAS group had mean value of 4.20±0.87 SD and the Control group had a mean value of 7.59±0.98 SD with a p value of <0.001 and was found to be significant

In the 24th hour VAS SCORE the ERAS group had a mean value of 2.02±0.81 SD and the control group had a mean value of 5.45±0.90 SD with a p value of <0.001 and hence it is statistically significant.

In Similar studies like ours, Geng *et al* the score in the pain dimension was higher in the Study group (32.1±3.0 vs. 31.0±3.2, P =0.033). Another study by Oliviera *et al* also showed significant difference in post-operative VAS scores of 24th hour was 1.86 $\pm$ 0.76 on hysterectomy patients, which established the same point as our study. A study by Fujimoto *et al* and colleagues demonstrated good improvement in quality of recovery or post-operative analgesia for patients received single-shot posterior quadratus lumborum blockade (QLB) after

surgery who underwent the ERAS protocol.
Hence, our study showed that implementation of ERAS protocol was yielding positive outcomes like reduced duration of hospital stay and better pain management and reduced complications, overall resulting in a enhanced patient satisfaction after discharge.

Conclusion

The implementation of Enhanced Recovery after Surgery (ERAS) protocols in caesarean section patients has demonstrated significant benefits in improving patient outcomes and reducing healthcare costs. By adopting a multidisciplinary approach that incorporates evidence-based practices, ERAS can optimize perioperative care and facilitate a faster recovery.

Key findings from this study include

- **Reduced length of stay:** ERAS protocols have been shown to significantly shorten the length of hospital stay for caesarean section patients, leading to improved patient satisfaction and reduced healthcare costs.
- **Improved pain management:** By implementing effective pain management strategies, ERAS can help reduce postoperative pain, leading to better patient comfort and faster recovery.
- **Reduced complications:** ERAS protocols have been associated with lower rates of postoperative complications, such as post op hypotension, post-op nausea and vomiting and quicker return to normal physiological functions which can improve patient outcomes and reduce healthcare costs.
- **Increased patient satisfaction:** Patients who undergo ERAS protocols often report higher levels of satisfaction with their care, which can lead to improved patient experiences and outcomes

While the implementation of ERAS may face challenges, such as variability in practice patterns and resistance to change, the benefits of this approach are clear. By addressing these challenges and implementing effective strategies, healthcare providers can optimize perioperative care and improve outcomes for cesarean section patients.
However, Future research should focus on Standardizing ERAS protocols to ensure consistent implementation across healthcare facilities. By continuing to investigate the benefits of ERAS and addressing the challenges associated with its implementation, healthcare providers can improve patient outcomes and enhance the overall quality of care for women undergoing caesarean section.

Conflict of Interest

Not available

Financial Support

Not available

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