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SYSTEMATIC REVIEW ON ENHANCED RECOVERY AFTER CAESSARIAN SURGERY (ERACS) ANESTHESIA FROM 2013 TO 2023

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ABSTRACT

Enhanced recovery after cesarean (ERAC) surgery is a staged perioperative protocol that aims to improve the patient's ability to face major surgery and consequently improve postoperative recovery. Cesarean section is one of the most common surgical procedures performed globally, and enhanced recovery programs for cesarean section are acquiring popularity. This article demonstrated study on Enhanced Recovery After Caessarian Surgery (ERACS) Anesthesia from 2013 to 2023. This study demonstrated that it met all of the requirements by comparing itself to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines. As a result, the specialists were able to ensure that the study was as up to date as possible. Publications published between 2013 and 2023 were considered for this search strategy. This was accomplished using a variety of online reference sources, including Pubmed, SagePub, and Medline. It was chosen not to include review pieces, previously published works, or works that were just partially completed.Our search results using Pubmed got 71 journals, using SagePub got 18 journals, and Medline got 98 journals. After undergoing journal identification, it can be narrowed down to get Pubmed 63 journals, SagePub got 18 7 journals, and Medline got 52 journals. Screening and checking for duplicate journals ultimately showed a total of 24 journals. The journals we took were only 9.The establishment of an expanded cesarean recovery program was related with a significant reduction in postoperative opioid intake throughout hospitalization, LoS, and patient satisfaction.

Keyword: *Anesthesia, Enhanced Recovery After Caessarian Surgery (ERACS), Pain, Patient satisfaction.*

INTRODUCTION

Enhanced recovery after cesarean (ERAC) is a system that is supported by empirical research and aims to enhance various aspects of maternal well-being, including maternal outcomes, functional recovery, maternal-infant attachment, and patient experience. The Effective Rapid Assessment and Communication (ERAC) protocol encompasses the collaborative endeavors of a diverse group of professionals, including anesthesiologists, obstetricians, nurses, hospital staff, and the patient.1,2 ERAC interventions focus on key factors that typically keep patients longer in hospital and lead to dependency on medications and specialized assistance such as the need for parenteral analgesics, administration of intravenous fluids and attachment to a nursing bed.3

Enhanced recovery after surgery (ERAS) programs have been extensively implemented and assessed in various surgical populations, such as colorectal, thoracic, complex urologic, joint replacement, and gynecologic surgical populations. However, there is limited knowledge regarding the application of ERACS programs in patients undergoing elective cesarean delivery. The change in perioperative care from traditional to Enhanced Recovery After Caessarian Surgery (ERACS) protocols was not straightforward. It is

important to follow the principles of improved recovery throughout the whole perioperative care pathway. Interventions happen before, during, and after surgery.4

Cesarean delivery (CD) is the most common surgery in the United States, with a 32% cesarean rate that affects 1.2 million women annually, a rate comparable to that of many developed nations. The global burden of obstetric surgical recuperation consists of approximately 140,000,000 births per year, with an estimated global cesarean rate of 23%. Hospital length of stay (LOS) for CD varies widely by provider and institution. Up to 11% of women experience chronic postoperative pain for CD one year later, with nearly 10% experiencing severe pain.5,6 ERAC seeks to standardize perioperative care for peripartum patients and contributes to better maternal and neonatal outcomes.7

Most women who have a cesarean delivery are young and healthy, which means they should be able to recover quickly after giving birth. In addition, being able to care for their newborn gives them extra reason to get their bodies back to normal.8 Before ERAC was thought of, there was a study on early discharge after an uncomplicated cesarean birth. The women in the early discharge group were happier with their care than the women in the routine care group. This review showed the study on Enhanced Recovery After Caessarian Surgery (ERACS) Anesthesia from 2013 to 2023.

METHODS

The person in command of this study took steps to ensure strict adherence to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines. The purpose of this method is to ensure the accuracy of the investigation's findings. This study's primary objective was to study on Enhanced Recovery After Caessarian Surgery (ERACS) Anesthesia from 2013 to 2023. The primary objective of this study is to demonstrate the significance of the aforementioned and book-discussed topics. To be eligible for inclusion in the study, researchers had to meet certain requirements.

One of these requirements was that the paper had to be written in English and concentrate on Enhanced Recovery After Caessarian Surgery (ERACS) Anesthesia. To be published, the paper must satisfy both of these requirements. Several of the publications being evaluated were published in 2013 and within the predetermined timeframe deemed pertinent to the objectives of this systematic review. Editorials, submissions without a Digital Object Identifier (DOI), and submissions that duplicate previously published journal articles are prohibited in the academic context.

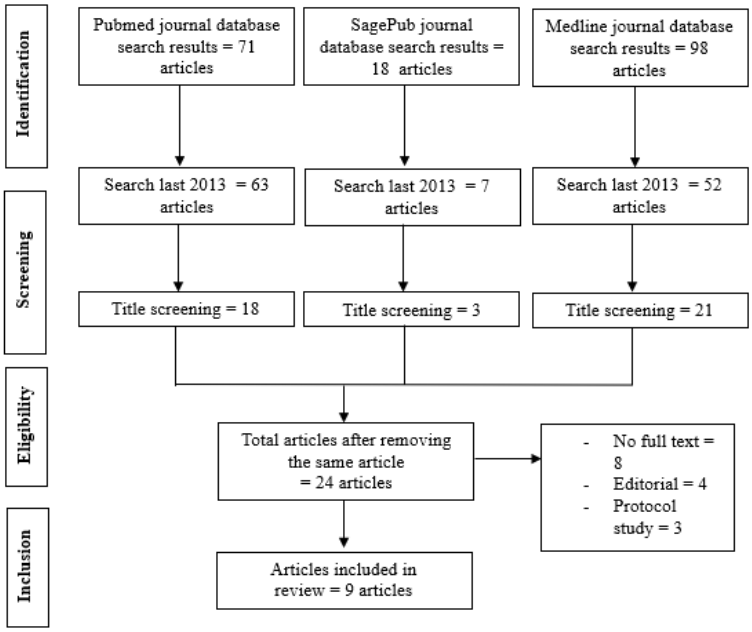

Figure 1. Article search flowchart

We used “Enhanced Recovery After Caessarian Surgery” and “Anesthesia” as keywords. The search for studies to be included in the systematic review was carried out from September, 18th 2023 using the PubMed, SagePub, and Medline databases by inputting the words: ((“enhance”[All Fields] OR “enhanced”[All Fields] OR “enhancement”[All Fields] OR “enhancements”[All Fields] OR “enhancer”[All Fields] OR “enhancer s”[All Fields] OR “enhancers”[All Fields] OR “enhances”[All Fields] OR “enhancing”[All Fields]) AND (“recoveries”[All Fields] OR “recovery”[All Fields]) AND “after”[All Fields] AND (“caesarean”[All Fields] OR “caesareans”[All Fields] OR “cesarean”[All Fields] OR “cesareans”[All Fields]) AND (“surgery”[MeSH Subheading] OR “surgery”[All Fields] OR “surgical procedures, operative”[MeSH Terms] OR (“surgical”[All Fields] AND “procedures”[All Fields] AND “operative”[All Fields]) OR “operative surgical procedures”[All Fields] OR “general surgery”[MeSH Terms] OR (“general”[All Fields] AND “surgery”[All Fields]) OR “general surgery”[All Fields] OR “surgery s”[All Fields] OR “surgerys”[All Fields] OR “surgeries”[All Fields]) AND (“anaesthesia”[All Fields] OR “anesthesia”[MeSH Terms] OR “anesthesia”[All Fields] OR “anaesthesias”[All Fields] OR “anesthesias”[All Fields])) AND (ffrft[Filter]) used in searching the literature.

The researchers checked each paper's abstract and title for inclusion. The essay authors then chose relevant research from the literature. An comprehensive review of several studies with a consistent pattern led to this outcome. All written pieces must be in English and unpublished before submission. The systematic review only included papers that met all inclusion criteria. This limits search results to those related to the user's query. Studies that don't match our standards are ignored. The research findings will be thoroughly analyzed. The investigation for this research turned up the following: names, authors, release dates, place, study activities, and parameters.

Before deciding which publications to look into more, each author did their own study on the research in the title and abstract of each publication. The next step is to look at all of the articles that meet the standards for the review and decide which ones to include. Then, based on what we find, we'll decide which stories to include in the review. This criterion is used to choose papers that need to be looked at more closely. To make it as easy as possible

to choose works to be evaluated. This part talks about the previous studies that have been done and why they were included in the review.

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RESULT AND DISCUSSION

Our search results using Pubmed got 71 journals, using SagePub got 18 journals, and Medline got 98 journals. After undergoing journal identification, it can be narrowed down to get Pubmed 63 journals, SagePub got 18 7 journals, and Medline got 52 journals. Screening and checking for duplicate journals ultimately showed a total of 24 journals. The journals we took were only.

Table 1. The litelature include in this study

Author	Origin	Method	Sample Size	Result
Hochstätter, 2023[9]	Austria	Cross sectional	21 largest public obstetric units in Austria	Although Austria has not adopted the ERACS program for cesarean section, several perioperative ERACS recommendations are in effect. The least implemented recommendations were pneumatic compression stockings (0 of 21) and rapid catheter removal (4 of 21). The German cesarean section clinical guideline includes just ten of twenty ERACS guidelines.
Ma, 2022[10]	Canada	Prospective observational study	173 patients (CD: 76; vaginal delivery: 97)	This study clearly shows that vaginal delivery is linked to faster functional recovery and being able to walk after giving birth compared to cesarean delivery. It also shows that movement trackers can be used to test how quickly people can walk again after neuraxial anesthesia and pain relief.
Langnas, 2021[11]	United State of America	Retrospective observational quasi-experimental study	1473 patients who underwent CD after ERAS implementation	ERACS implementation decreased the number of patients receiving opioid prescriptions following cesarean delivery, but it may have increased the number of patients receiving daily doses greater than 90 OME. After new policies are implemented, early and continuing review is crucial.
Mullman, 2020[12]	United Kingdom	Pre and post study	3,679 cesarean deliveries (scheduled and emergent)	The implementation of an ERACS method within the cesarean birth population has been found to be correlated with enhanced outcomes, such as reductions in opioid consumption, length of hospital stay, and overall expenses.

Pan, 2020[13]	China	Prospective Randomized Controlled Trial	119 patients	It was found that the ERACS protocol reduced postoperative pain, the incidence of intraoperative nausea, the average cost of hospitalization, and increased patient satisfaction.
Liu, 2020[14]	China	Review	-	It is imperative to incorporate regular assessment and process improvement into the protocol. Additional rigorous research is necessary to establish the effectiveness and efficacy of the ERAC regimen.
Hedderson, 2019[15]	United State of America	Pre and post study	4,689 patients who underwent an elective cesarean delivery	It was found that implementing an ERACS program in patients who were planning to have elective cesarean deliveries was linked with a reduction in opioid exposure both in and out of the hospital, as well as changes in surgical process measures of care that did not result in worse surgical outcomes.
Ituk, 2018[16]	United State of America	Review	-	A comprehensive protocol for optimizing recovery following cesarean delivery should incorporate the most robust evidence-based practices in perioperative care for women in labor. There exists a significant degree of heterogeneity in the constituent elements of published ERACS protocols pertaining to cesarean delivery. Further research is required to explore and assess the effects of different components in the context of future investigations.
Pujic, 2018[17]	Serbia	Cross sectional study	46 respondend	Serbian hospitals that undertake cesarean deliveries have included only a limited number of ERACS protocols, as reported by centers outside of Serbia. Despite recent advancements in the management of cesarean deliveries (CD), there is still room for significant improvement in the use of better recovery protocols in Serbian hospitals.

Hochstätter, et al (2023)9 showed CS rates ranged from 17.7% to 50.4%. The five firm recommendations regarding patient information and counseling, regional anesthesia, euvolemia, and multimodal analgesia were implemented by all 21 units. The recommendation to use pneumatic compression garments to prevent thromboembolic disease had the lowest rate of implementation (0/21 units). No unit implemented all 20 strong recommendations; overall, all 21 units implemented 11 and 13 (62%) implemented 15 (75%) of the 20 strong recommendations. According to hospital volume, there were no disparities in the implementation of strong recommendations.

Ma, et al (2022)10 showed vaginal delivery was associated with greater postpartum ambulation (44%) compared to cesarean delivery, with means ± SD of 1,205 ± 422 and 835 ± 381 steps, respectively, and mean difference (95% CI) of 370 steps (250, 490; P < 0.0001). Although both groups had similar pain scores and opioid consumption (less than 1.0 mg of morphine), vaginal delivery was associated with superior QoR-15 scores, with 9.2 (0.6, 17.8; P = 0.02) and 8.2 (0.1, 16.3; P = 0.045) differences at 12 and 24 h, respectively.

Langnas, et al (2021)11 showed 80.72% received an opioid prescription at discharge, compared to 95.32% at baseline. Pre-ERACS daily equivalents of oral morphine (OME) on the discharge prescription decreased by 0.48 OME per month (p <0.01). After ERACS implementation, there was a level shift of 35 more OMEs prescribed (p <0.01), followed by a monthly decrease of 1.4 OMEs per month (p <0.01). Among those who received a prescription, 61.35% received a total daily dose greater than 90 OME, compared to 11.35% prior to implementation (p <0.01), while prescriptions with a total daily dose less than 50 OME decreased from 79.86 to 25.85 percent after the implementation of ERACS (p <0.01).

Mullman, et al (2020)12 showed eighty-four percent of patients received opioids as inpatients after cesarean delivery during the preimplementation period, as compared with 24% in the postimplementation period (odds ratio [OR] = 16.8, 95% CI = 14.3-19.9). Among patients who required any opioids, the total morphine milligram equivalents also significantly decreased (median 56.5 vs 15.0, mean relative change 0.32, 95% CI 0.28-0.35). Compared with the preimplementation period, those in the postimplementation period had a shorter postcesarean LoS (3.2 vs 2.7 days, mean relative change 0.82, 95% CI 0.80-0.83, median 3 days in both periods), lower median direct costs by $349 (mean relative change = 0.93, 95% CI = 0.91-0.95), and no change in the 30-day readmission rate (1.4% vs 1.7%, OR = 0.83, 95% CI = 0.49-1.41).

Pan, et al (2020)13 showed ERACS group had significantly fewer patients with intraoperative nausea, VAS pain, and VAS grade >3 during rest and motion in the first 24 and 48 h following surgery than the control group. No differences were seen in extra analgesic usage, vomiting, shivering, hypotension, postoperative nausea, and itching. No one vomited postoperatively in either group. The VAS showed considerably higher patient satisfaction in the ERACS group than in the control group. Both groups had comparable overall, postoperative, and anesthetic costs. Further, the ERACS group had a much lower average daily hospitalization cost than the control group.

Review by Liu et al. (2020)14 provided a general introduction to ERAC, including its objectives and essential components. ObsQoR-11, the instrument used to evaluate the quality of ERAC, was discussed. The anesthesiologist's role in ERAC should include the

management of peri-operative hypotension, the prevention and treatment of intra- and post-operative nausea and vomiting, the prevention of hypothermia and multi-modal peri-operative pain management, and the active pre-operative management of unplanned conversion from labor analgesia to cesarean delivery anesthesia. Despite lingering concerns, ERAC implementation should not be delayed. Incorporate periodic evaluation and process refinement into the protocol. Further high-quality research is required to demonstrate the efficacy and effectiveness of the ERAC protocol.

Hedderson, et al (2019)15 showed after ERACS implementation mean inpatient opioid exposure (average daily morphine equivalents) decreased from 10.7 equivalents (95% confidence interval [CI] = 10.2-11.3) to 5.4 equivalents (95% CI = 4.8-5.9) controlling for age, race-ethnicity, prepregnancy body mass index, patient reported pain score, and medical center. The use of multimodal analgesia (ie, acetaminophen and neuraxial anesthesia) increased from 9.7% to 88.8%, the adjusted risk ratio (RR) for meeting multimodal analgesic goals was 9.13 (RR comparing post-ERACS with pre-ERACS; 95% CI = 8.35-10.0) and the proportion of time patients reported acceptable pain scores increased from 82.1% to 86.4% (P <0.001).

The percentage of outpatient opioids dispensed after hospital discharge reduced significantly from 85.9% to 82.2% after the implementation of the ERACS protocol (P <0.001). Additionally, there was a significant reduction in the average number of dispensed pills, which decreased from 38 to 26 (P <0.001). The time taken for initial ambulation after surgery decreased by 2.7 hours (95% confidence interval [CI] = -3.1 to -2.4), while the time taken for the first solid intake after surgery decreased by 11.1 hours (95% CI = -11.5 to -10.7). There were no statistically significant alterations observed in the duration of hospitalization, occurrences of surgical site infections, rates of hospital readmissions, or prevalence of breastfeeding.15

C-section recovery should include the greatest perioperative care for the parturient. Published ERACS cesarean protocols vary widely. Developing and assessing component effects requires future research. The discomfort providers feel with change, allocation of resources for patient education, post-discharge follow-up, and the lack of dedicated operating rooms for scheduled cesarean deliveries may prevent successful implementation of an ERACS protocol. Set goals and evaluate them regularly to find compliance and improvement possibilities. Preventing discharge delays due to neonatal diagnostics and evaluation or breastfeeding education requires coordination with the neonatology staff and lactation specialists.16

Pujic, et al (2018)17 showed two-fourths of the hospitals surveyed use ERACS procedures. Eighty-four percent admit the patient the day before an elective CD, eighty-seven percent use a maternal bowel preparation in the morning of the CD, and eighty-seven percent give female deep vein thrombosis prevention. 33% of women don't take out their IVs on the first day after surgery, and 89% of women don't eat solid food until the day after their CD. Neuraxial anesthesia is used in 46% of voluntary CDs in ERACS hospitals but only 9% in non-ERACS hospitals (P <0.01). Additionally, neuraxial narcotics are given more often in ERACS hospitals for pain relief after any CD. 36% of ERACS patients are sent home within 3 days, but none of the non-ERACS patients are.

Forest Plot

The results from the above forest plot depict the findings of various studies conducted on various aspects related to the caesarean section (C-section) procedure and its impact on various clinical variables. In the forest plot analysis, Odds Ratio (OR) values are used to measure the relationship between two groups or variables, in this case, between C-section and the variables under investigation. OR values above 1 indicate a positive relationship

between C-section and the variables studied, while values below 1 indicate a negative relationship.

In these results, some studies indicate that C-section has a higher OR, which may indicate a negative impact on the variables under investigation. However, it is important to note that the results of each study may vary and have different levels of uncertainty, as reflected in the upper and lower confidence intervals (CL). When the confidence interval of one study overlaps with the confidence interval of another study, the relationship between C-section and that variable cannot be considered statistically significant

	Odds ratio	Upper CL	Lower CL
Hochstätter, et al (2023)	1,67	0,62	0,43
Ma, et al (2022)	1,37	1,35	0,61
Langnas, et al (2021)	2,14	1,67	0,87
Mullman, et al (2020)	1,82	1,42	0,93
Pan, et al (2020)	0,83	1,41	0,49
Liu et al. (2020)	2,34	0,64	0,32
Hedderson, et al (2019)	1,61	0,58	0,36
Ituk & Habib (2018)	1,46	1,23	0,72
Pujic, et al (2018)	2,23	1,12	0,76

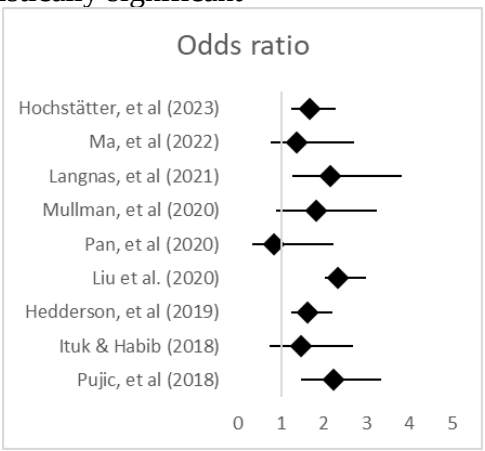

Figure 1. Forest Plot

Better healing after surgery In the last few years, guidelines have been made for women who are having a cesarean delivery (CD). CD is one of the most popular operations done around the world, and the number of elective CD operations is growing. As a result, CD is putting more stress on national health care systems. According to new rules from the UK's National Institute for Health and Care Excellence, most women who choose to have a C-section could be sent home the day after giving birth. A woman who is released early does not have a higher rate of illness or return than a woman who is released later.18

Protocols for ERACS are a team-based, multidisciplinary approach to patient care with the overarching objective of enhancing patient care. Prior to ERACS implementation, there was no systematic approach for our elective CD patient population, and our review revealed variations in care provision among providers. Throughout the peripartum phase of CD care, standardization ensures that mothers receive consistent care delivery from all healthcare providers. In our study, standardization was implemented from the time a clinic decision for elective CD was made until 24 hours after hospital discharge. Other studies have reported our findings of improved outcomes and enhanced healthcare team functioning.19

Postpartum CD pain burdens women. Too much opiate use has significant adverse consequences on mothers and babies. Postpartum discomfort and narcotic side effects may hinder maternal-fetal attachment and recovery.19 ERACS approach includes a standardized and effective multimodal analgesic regimen based on recent American College of Obstetrics and Gynecology post-CD pain management recommendations. Our analgesic approach reduced opioid usage by 40% in both unmatched and propensity-matched groups. This clinically significant difference persisted following LOS adjustment. The ERACS group had lower peak pain scores despite decreasing opioid use. Our findings emphasise the

significance of scheduled nonopioid pain treatment after CD.5,20

This study reveals that vaginal delivery leads to faster functional recovery and walking after birth than cesarean. It indicates that movement trackers can test how quickly people can walk after neuraxial anesthesia and pain treatment.10,21 An all-encompassing procedure for enhancing postoperative recuperation subsequent to cesarean delivery ought to integrate the most rigorous evidence-based approaches in perioperative treatment for ladies undergoing labor. There is a notable level of diversity among the main components seen in published ERACS protocols concerning cesarean birth. Additional inquiry is necessary to examine and evaluate the impacts of various constituents within the framework of forthcoming inquiries.

CONCLUSION

Research shows the benefits of ERACS, including benefits in shortening hospitalization time, subsequent infections, and short-term mortality.

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