JOURNAL LA BISECOMAN
VOL. 07, ISSUE 03 (616-636), 2026
DOI: 10.37899/journallabisecoman.v7i3.3133

ERACS in National Health Insurance: Clinical Benefits and Economic Challenges

Ageng Sunjoyo[1], Imronudin[1], Muzakar Isa[1]

[1]*Faculty of Medicine, Hospital Administration Magister Program, Universitas Muhammadiyah Surakarta (UMS), Surakarta, Indonesia*

**Corresponding Author: Ageng Sunjoyo*
Email: j508240023@student.ums.ac.id

Article Info

Article history:
Received 22 February 2026
Received in revised form 18 April 2026
Accepted 6 June 2026

Keywords:
Enhanced Recovery After Cesarean Section
Cesarean Delivery
National Health Insurance
Bpjs Kesehatan
Length Of Stay

JEL Classification:
I11, I13, I18, H51, D61

Abstract

Enhanced Recovery After Cesarean Section is a perioperative care pathway designed to improve maternal recovery and optimize healthcare resource utilization; however, its implementation within Indonesia's National Health Insurance system remains constrained by fixed reimbursement mechanisms. This systematic review aimed to evaluate the clinical and economic outcomes of Enhanced Recovery After Cesarean Section in the context of national health insurance and to assess its policy implications. A systematic review was conducted of 27 studies involving more than 9,000 cesarean deliveries, with analysis focusing on length of hospital stay, hospitalization costs, pain control, postoperative complications, opioid use, and patient satisfaction. The findings demonstrate that Enhanced Recovery After Cesarean Section consistently shortens hospital stay, improves postoperative pain control, reduces opioid consumption and complication rates, and enhances maternal satisfaction without increasing readmissions. Several studies also reported reductions in direct hospital costs, primarily driven by decreased length of stay. Despite these benefits, the fixed case-based reimbursement system limits financial incentives for hospitals, creating a mismatch between clinical efficiency and economic returns. In conclusion, Enhanced Recovery After Cesarean Section provides significant clinical and economic advantages but requires reimbursement reform and policy alignment to enable sustainable implementation within Indonesia's universal health coverage system.

Introduction

Indonesia's implementation of Universal Health Coverage through the Badan Penyelenggara Jaminan Sosial Kesehatan (BPJS Kesehatan) represents a major milestone in expanding access to healthcare services. However, the system's fixed reimbursement structure has placed increasing financial pressure on healthcare providers, particularly hospitals managing high-volume services. Low and uniform reimbursement rates compel hospitals to improve operational efficiency and reduce service costs to avoid structural financial deficits, making cost-effective clinical pathways a critical necessity within the national health insurance framework.

Cesarean section delivery is one of the most frequently performed surgical procedures worldwide and continues to increase in prevalence. Globally, approximately 21% of all births are now delivered by cesarean section, with a consistent upward trend across regions. Indonesia mirrors this pattern, with national survey and BPJS data demonstrating a steady rise in cesarean deliveries, in some settings exceeding vaginal births. This growing surgical volume amplifies the importance of efficient perioperative management, as cesarean section contributes

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

substantially to hospital workload, length of stay, and overall healthcare expenditure under BPJS Kesehatan.

In response to these challenges, the Enhanced Recovery After Cesarean Section (ERACS) protocol has emerged as a clinically effective strategy to optimize postoperative recovery while improving resource utilization. Adapted from the Enhanced Recovery After Surgery framework, ERACS is a standardized, multidisciplinary approach encompassing structured patient education, multimodal opioid-sparing analgesia, early oral intake, and early mobilization. International evidence consistently demonstrates that ERACS improves postoperative comfort, reduces complications, shortens hospital length of stay, and enhances maternal satisfaction. Importantly, these clinical benefits are accompanied by improved efficiency, positioning ERACS as a potentially valuable model for health systems operating under financial constraints.

Evidence from Indonesia further supports these findings. Local studies have reported significant reductions in length of stay and hospitalization costs among patients managed with ERACS compared to conventional perioperative care. These results suggest that ERACS could function as both a quality-improvement and cost-containment strategy within the BPJS system. Nevertheless, despite its demonstrated benefits, widespread and equitable implementation of ERACS in Indonesia remains limited.

The primary barrier lies in the BPJS reimbursement mechanism based on the Indonesian Case Base Groups system, which applies fixed tariffs for cesarean section regardless of actual length of stay or intensity of care. Hospitals implementing ERACS receive the same reimbursement as those providing conventional care, despite higher upfront investments in multidisciplinary training, protocol coordination, and multimodal analgesia. Furthermore, inconsistent coverage of essential analgesic agents and the absence of standardized national ERACS guidelines further undermine economic feasibility. The BPJS system also lacks granular quality indicators that capture patient-centered outcomes, resulting in under-recognition of ERACS's full clinical value. Cultural perceptions favoring prolonged hospitalization after cesarean delivery add another layer of complexity, highlighting the need for structured patient education to support early mobilization and discharge.

Taken together, these factors reveal a critical mismatch between an evidence-based, efficiency-oriented clinical protocol and a rigid financing framework. While international literature has firmly established the clinical effectiveness of ERACS, a policy-focused synthesis examining its clinical and economic implications within Indonesia's BPJS context remains limited. This systematic review aims to address this gap by evaluating the impact of ERACS on recovery outcomes and efficiency indicators, thereby informing evidence-based recommendations to align clinical best practices with national health financing policies.

Methods

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines, which were used to structure the review process and ensure methodological rigor and transparency (Page et al., 2021). The review was guided by the Population, Intervention, Comparison, and Outcome (PICO) framework to define a focused research question and support a systematic approach to study selection. The population included adult women undergoing cesarean delivery, the intervention was the Enhanced Recovery After Cesarean Section (ERACS) protocol, the comparison involved conventional perioperative care, and the outcomes assessed included length of hospital stay, hospital costs, postoperative pain, complications, and patient

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

satisfaction. The review involved systematic identification, screening, and extraction of eligible studies that met predefined inclusion criteria. Data from included articles were extracted and organized into structured tables for descriptive synthesis.

Search Strategy

A comprehensive literature search was conducted using four electronic databases: Cochrane Library, PubMed/Medline, PubMed Central (PMC), and Google Scholar. The search strategy employed Medical Subject Headings (MeSH) terms and relevant keywords related to cesarean delivery and enhanced recovery protocols, combined using Boolean operators (AND, OR). The search terms included combinations of: ("Enhanced Recovery After Cesarean Section" OR "Enhanced Recovery After Caesarean Section" OR ERACS OR "Enhanced Recovery After Surgery") AND ("Cesarean Section" OR "Caesarean Section" OR "C-section") AND ("Length of Stay" OR "Hospital Stay" OR "Postoperative Stay") AND ("Costs and Cost Analysis" OR "Hospital Costs" OR "Healthcare Costs" OR "Service Costs" OR "Drug Costs" OR "Medication Costs" OR "Pharmaceutical Costs"). The search was conducted in October 2025. Articles were limited to those published in English between 2020 and 2025. A manual search of reference lists from eligible studies was also performed using a snowballing approach to identify additional relevant publications.

Study Selection

Study selection was performed independently by two reviewers using a two-stage screening process. In the first stage, titles and abstracts were screened to identify potentially relevant studies. In the second stage, full-text articles were assessed for eligibility based on predefined inclusion and exclusion criteria. Any discrepancies between reviewers were resolved through discussion and consensus. If consensus could not be reached, a third reviewer was consulted to make the final decision. This process was conducted to minimize selection bias and ensure consistency in study inclusion.

Inclusion and Exclusion Criteria

This review included full-text original research articles involving adult female patients undergoing cesarean delivery managed with Enhanced Recovery After Cesarean Section protocols. Eligible study designs included cross-sectional, quasi-experimental, randomized controlled trials, cohort, and case-control studies that reported outcomes related to length of stay, hospitalization costs, service costs, or medication expenses. Articles not meeting these criteria, including literature reviews, editorials, letters to the editor, and opinion pieces, were excluded.

Eligibility Criteria

Studies were considered eligible if they were published between 2020 and 2025, written in English, and evaluated the implementation of ERACS in pregnant women undergoing cesarean section. Included studies were required to report at least one relevant outcome, namely length of hospital stay, hospitalization costs, service costs, or medication expenses.

Data Extraction and Collection

Data extraction was performed independently by two reviewers using a standardized data extraction form to ensure consistency and completeness. Extracted data included author name, year of publication, country, study design, sample size, and reported outcomes. The extracted data were cross-checked between reviewers to ensure accuracy. Any discrepancies were

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

resolved through discussion and consensus. The final dataset was compiled and organized using Microsoft Excel 365 (version 16.67, 2022).

Data Analysis

A narrative synthesis and descriptive table analysis were conducted to evaluate the clinical and economic benefits of ERACS within the context of the national health insurance era. The analysis focused on outcomes related to length of hospital stay, hospitalization costs, service costs, and medication expenses. In addition, practical recommendations for ERACS implementation were synthesized based on patterns observed across the included studies.

Result and Discussion

Study Selection

A total of 270 records were identified through searches of Google Scholar, Cochrane Library, PubMed, and Scopus. After removal of duplicate records (n=17) and studies excluded by automated database filters (n=46), 207 articles underwent title and abstract screening. Of these, 148 were excluded due to irrelevance to the study objectives. Full-text articles were sought for the remaining 59 studies, but 10 reports could not be retrieved. Eligibility assessment of 49 full-text articles resulted in the exclusion of 22 studies, including 15 that did not meet the required study design criteria and 7 that did not report relevant outcomes. Ultimately, 27 studies fulfilled all inclusion criteria and were included in the final systematic review (Gupta et al., 2022; Lashin et al., 2025; Gohar et al., 2023; Baluku et al., 2020; Mansour et al., 2025; Darwish et al., 2022; Teigen et al., 2020; Abilashini et al., 2025; Kanabar et al., 2024; Pan et al., 2020; Afreen et al., 2024; Combs et al., 2021; Mangala et al., 2021; Özdemir et al., 2025; van Niekerk et al., 2025; Mullman et al., 2020; Lester et al., 2020; Tamang et al., 2021; Walker et al., 2025; Pineyro et al., 2023; Mundhra et al., 2024; Kleiman et al., 2020; Manoghna et al., 2024; Sravani et al., 2023; Narkhede et al., 2023; Birchall et al., 2022; Tanner et al., 2021). The study selection process is summarized in the PRISMA flow diagram (Figure 1) (Page et al., 2021).

Characteristics of included studies

The 27 included studies were published between 2020 and 2025, with a total sample of 9,883 participants. Ten of the 27 articles were randomized controlled trials, nine were non-randomized or comparative observational studies, and eight were retrospective or pre–post cohort studies. The studies were conducted across three regions, including Asia, America, and Africa. Of all participants, 4,344 women were managed using Enhanced Recovery After Cesarean Section protocols, while 5,539 received conventional perioperative care (Table 1). This distribution indicates that the evidence base on ERACS is not limited to a single methodological approach, but includes both controlled experimental designs and real-world implementation studies. The inclusion of studies from different geographical and healthcare contexts also strengthens the relevance of the review, as ERACS has been examined in both high-resource and resource-limited settings. Moreover, the variation in study designs allows the review to capture different dimensions of ERACS implementation, including its effectiveness under controlled trial conditions, its feasibility in routine clinical practice, and its potential impact on maternal recovery outcomes across different hospital systems. Therefore, the diversity in study design, sample characteristics, and healthcare settings provides a broad representation of ERACS implementation across different resource contexts and allows a more comprehensive assessment of its potential clinical benefits compared with conventional perioperative care.

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

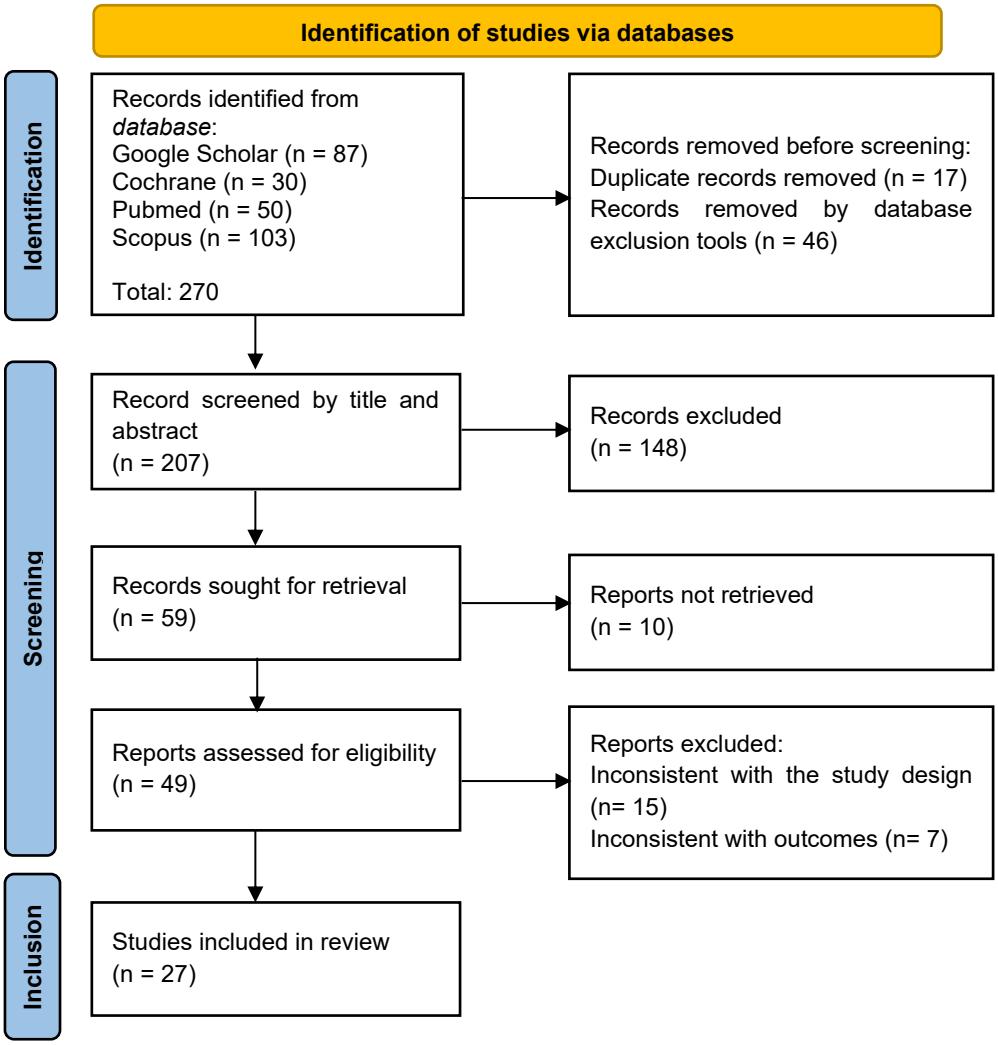

Figure 1. PRISMA diagram

Primary Outcomes

Length of Hospital Stay

Length of hospital stay was reported in all 27 studies. There were 22 studies (Lashin et al., 2025; Gohar et al., 2023; Baluku et al., 2020; Darwish et al., 2022; Teigen et al., 2020; Abilashini et al., 2025; Kanabar et al., 2024; Pan et al., 2020; Afreen et al., 2024; Combs et al., 2021; Özdemir et al., 2025; van Niekerk et al., 2025; Mullman et al., 2020; Lester et al., 2020; Walker et al., 2025; Mundhra et al., 2024; Kleiman et al., 2020; Manoghna et al., 2024; Sravani et al., 2023; Narkhede et al., 2023; Birchall et al., 2022; Tanner et al., 2021) investigating the total length of hospital stay, while 5 studies (Gupta et al., 2022; Mansour et al., 2025; Mangala et al., 2021; Tamang et al., 2021; Pineyro et al., 2023) reported the postoperative length of stay.

The majority of the studies demonstrated a statistically significant reduction in hospital stay for patients in the ERACS groups compared to those receiving conventional care ($p<0.05$). Notably, very strong evidence of reduction ($p<0.001$) was observed in numerous studies, such as Gupta et al., Baluku et al., Abilashini et al., Kanabar et al., Mullman et al., Pineyro et al., Kleiman et al., Sravani et al., and Tanner et al. However, five studies (Pan et al., van Niekerk et al., Lester et al., Walker et al., and Birchall et al.) showed no statistically significant difference ($p>0.05$) between two groups. One study by Narkhede et al. (2023) observed a

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

numerical reduction (72 hours vs. 96 hours) but did not provide measures of variance or statistical significance. Overall, the evidence consistently demonstrated that ERACS protocols are associated with shorter duration of hospitalization. While the duration varied across settings, ranging from brief stays of a few hours to several days, the implementation of ERACS resulted in a meaningful decrease in time to discharge compared with conventional perioperative care.

Table 1. Characteristics of included studies.

No	Author, (year) country	Title	Study design	Participant	Participants /controls
1	Gupta et al., (2022) India	Enhanced Recovery After Cesarean Protocol Versus Traditional Protocol in Elective Cesarean Section: A Prospective Observational Study	Prospective observational study	270	135/135
2	Lashin et al., (2025) Egypt	Enhanced Recovery after Elective Cesarean Section Delivery Protocol: A Randomized Controlled Clinical Trial	Randomized controlled trial	90	45/45
3	Gohar et al., (2023) Egypt	Effect of Implementing Enhanced Recovery After Surgery Pathway for Women Undergoing Cesarean Section on Maternal Outcomes and Satisfaction	Non-randomized controlled trial	80	40/40
4	Baluku et al., (2020) Uganda	A Randomized Controlled Trial of Enhanced Recovery After Surgery Versus Standard of Care Recovery for Emergency Cesarean Deliveries at Mbarara Hospital, Uganda	Randomized controlled trial	160	80/80
5	Mansour et al., (2025) Egypt	Empowering Mothers Through Enhanced Recovery After Cesarean Section (ERACS): A Comparative Study on Recovery Quality and Patient Satisfaction	Randomized controlled trial	106	53/53

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

6	Darwish et al., (2022) Egypt	Enhanced recovery after cesarean section (CS) versus conventional care in a lower middle-income country: a randomized controlled trial	Randomized controlled trial	300	150/150
7	Teigen et al., (2022) United State of America	Enhanced recovery after surgery at cesarean delivery to reduce postoperative length of stay: a randomized controlled trial	Randomized controlled trial	109	53/56
8	Abilashini et al., (2025) India	Maternal Outcomes Following Emergency Cesarean Delivery: Evaluating the Enhanced Recovery After Surgery Protocol in a Randomized Controlled Trial	Randomized controlled trial	100	50/50
9	Kanabar et al., (2024) India	Enhanced Recovery after Surgery Protocol Compliance Impact on Recovery after Cesarean Section in Primi Patients as Compared to Conventional Care	Randomized controlled trial	92	46/46
10	Pan J et al., (2020) China	The advantage of implementation of enhanced recovery after surgery (ERAS) in acute pain management during elective cesarean delivery: a prospective randomized controlled trial	Randomized-controlled prospective trial	216	112/104
11	Afreen et al., (2024) Pakistan	Enhanced recovery after caesarean section - an improved pathway than conventional care for reducing hospital stay	Prospective observational study	100	50/50
12	Combs et al., (2021) United	Enhanced recovery after caesarean: impact on postoperative opioid use and length of stay	Prospective observational study	850	455/395

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

	State of America				
13	Mangala et al., (2021) India	Enhanced recovery pathway as a tool in reducing post-operative hospital stay after caesarean section, compared to conventional care in COVID era - a pilot study	Prospective observational study	51	27/24
14	Özdemir et al., (2025) Turkiye	Effect of enhanced recovery after surgery (ERAS) protocol on maternal and fetal outcomes following elective cesarean section: an observational trial	Unblinded, non-randomized, observational cohort study	450	150/300
15	van Niekerk et al., (2025) South Africa	Evaluating the impact of an enhanced recovery programme on the Obstetric Quality-of-Recovery score (ObsQoR-10) after elective Caesarean section in a South African public hospital: a prospective before-after study	Prospective observational study	68	36/32
16	Mullman et al., (2020) United State of America	Improved Outcomes With an Enhanced Recovery Approach to Cesarean Delivery	Pre-post observational study	3679	1508/2171
17	Lester et al., (2020) United State of America	Impact of an enhanced recovery program for cesarean delivery on postoperative opioid use	Retrospective cohort study	574	122/452
18	Tamang et al., (2021) Bhutan	The successful implementation of the Enhanced Recovery After Surgery (ERAS) program among caesarean deliveries in Bhutan to reduce the	Pre-post retrospective cohort study	176	85/91

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

		postoperative length of hospital stay			
19	Walker et al., (2025) Canada	Implementation of enhanced recovery after surgery for caesarean delivery: a quality improvement initiative	Pre-post observational study	513	223/290
20	Pineyro et al., (2023) Mexico	Effect of the implementation of an enhanced recovery after surgery protocol (ERAS) in patients undergoing an elective cesarean section	Retrospective, comparative study	295	139/156
21	Mundhra et al., (2024) India	Effect of Enhanced Recovery after Surgery (ERAS) protocol on maternal outcomes following emergency caesarean delivery: A randomized controlled trial	Randomized controlled trial	142	71/71
22	Kleiman et al., (2020) United States of America	Evaluation of the impact of enhanced recovery after surgery protocol implementation on maternal outcomes following elective cesarean delivery	Pre-post observational study	357	161/196
23	Manoghna G et al., (2024) India	Enhanced recovery after surgery (eras) a multimodal perioperative care pathway in cesarean deliveries	Prospective observational study	300	150/150
24	Sravani P et al., (2023) India	Comparative study between eras protocol and conventional perioperative care in elective cesarean section patients in a tertiary care centre of eastern India	Prospective comparative observational study	200	100/100
25	Narkhede et al.,	Enhanced Recovery after Surgery Protocol Implementation on	Observational study	150	75/75

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

	(2023) India	Elective Cesarean Delivery: A Cross-sectional Study			
26	Birchall, C et al., (2022) United States of America	Enhanced recovery for cesarean delivery leads to no difference in length of stay, decreased opioid use and lower infection rates	Cohort study	339	170/169
27	Tanner, L et al., (2021) United States of America	Enhanced recovery after scheduled cesarean delivery: a prospective pre-post intervention study	Prospective pre-post intervention study	116	58/58

Table 2. Primary outcomes of included studies - Length of Stay (LOS)

No	Author (year)	Length of stay (hrs)		p-value
		ERACS	Non ERACS	
1	Gupta et al.[11]*	2.85 ± 0.5	5.25 ± 0.61	<0.0001
2	Lashin et al.[12]	5.5 ± 0.5 (5-6)	10 ± 1 (9-11)	0.018
3	Gohar et al.[13]	7.03±1.23	12.08±3.47	0.001
4	Baluku et al.[14]	43.6	62.1	<0.001
5	Mansour et al.[15]*	8.75±3.2	15.01±5.13	0.001
6	Darwish et al.[16]	12.1	17.8	0.001
7	Teigen et al.[17]	73.58 (71.08-76.62)	75.50 (72.86-76.84)	0.046
8	Abilashini et al.[18]	3.2±1.1	5.4±1.3	<0.001
9	Kanabar et al.[19]	63.934 ± 6.45	69.86 ± 2.81	<0.0001
10	Pan et al.[20]	4.67 ± 0.49	4.61 ± 0.64	0.412
11	Afreen et al.[21]	33.42 ± 7.74	61.30 ± 10.42	0.001
12	Combs et al.[22]	84.1 ± 18.2	85.6 ± 17.7	0.05
13	Mangala et al.[23]*	53.91 ± 10.80	77.71 ± 15.82	0.000
14	Özdemir et al.[24]	29.05 ± 2.54	30.48± 5.46	0.018
15	van Niekerk et al.[25]	48	48	0.156
16	Mullman et al.[26]	64.8 ± 19.2	76.8 ± 24.0	<0.001
17	Lester et al.[27]	81.37 ± 1.85	90.76 ± 2.25	0.085
18	Tamang et al.[28]*	51.7 ± 15.4	72.7 ± 13.4	0.00
19	Walker et al.[29]	49.40	49.72	0.427
20	Pineyro et al.[30]*	44.0 ± 5.4	50.2 ± 8.2	<0.001
21	Mundhra et al.[31]	127.7 ± 66.0	188.6 ± 168.2	0.006
22	Kleiman et al.[32]	60 ± 14.4	69.6 ± 26.4	<0.001
23	Manoghna et al.[33]	72	96	0.023

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

24	Sravani et al.[34]	54.00 ± 10.445	74.40 ± 13.430	<0.001
25	Narkhede et al.[35]	72	96	
26	Birchall et al.[36]	80.5 ± 22.9	82.3 ± 28	0.51
27	Tanner et al.[37]	59.1 ± 19.2	78.3 ± 27.8	<0.001

*Postoperative length of stay (h)

Hospital Cost

Only two of the included studies provided the data regarding the economic impact of ERACS implementation, both demonstrating a significant reduction in hospital cost (Table 3). Pan et al. (2020) reported a substantial decrease in average hospital costs, with the ERACS group incurring 1568.2 ± 303.8 RMB compared to 2140.4 ± 335.4 RMB in the conventional care group ($p<0.001$). Similarly, Mullman et al. (2020) analyzed direct cost and found that ERACS was associated with lower expenditures, reporting a median cost of $3,621 (1,995-56,569) compared to $3,970 (2,511-123,918) in the non-ERACS cohort ($p<0.001$). These findings provide strong evidence that the ERACS protocol is a cost-effective intervention that significantly reduces the financial burden of cesarean delivery.

Table 3. Primary outcomes of included studies - Hospital cost

No	Author (year)	Cost		p-value
		ERACS	Non ERACS	
1	Pan et al.[20] - Average hospital cost (RMB)	1568.2 ± 303.8	2140.4 ± 335.4	<0.001
2	Mullman et al.[26] - Direct cost ($)	3,621 (1,995-56,569)	3,970 (2,511-123,918)	<0.001

Secondary Outcomes

Postoperative Pain Management (VAS)

Pain intensity, as measured by the Visual Analog Scale (VAS), was significantly lower in the ERACS group across the majority of studies. Several studies (Gupta et al., 2022; Mansour et al., 2025; Kanabar et al., 2024) observed that the most pronounced reduction in pain occurred within the first 6 to 12 hours post-surgery ($p<0.001$). Afreen et al. (2024) reported significantly lower pain scores at both 10 and 20 hours. While some studies noted that pain levels became comparable between groups at the 24-hour mark, others studies, such as Mundhra et al. (2024) and Pineyro et al. (2023), continued to find statistically significant benefits for ERACS patients on the first postoperative day. Furthermore, the protocol led to a marked decrease in total opioid requirements, as evidenced by Mansour et al. (2025) and Birchall et al. (2022).

Postoperative Complications and Recovery Indicators

ERACS implementation was associated with lower incidence of common postoperative complications. Significant reductions in headache (Lashin et al., 2025; Baluku et al., 2020) and urinary retention (Gupta et al., 2022) were reported. Gastrointestinal recovery was faster in the ERACS group; Sravani et al. (2023) demonstrated a significantly earlier return of bowel sounds and passage of flatus, while Mansour et al. (2025) reported a 0% incidence of postoperative ileus compared to 17% in non-ERACS group. Although some studies showed similar rates of surgical site infection (SSI) and readmissions, Birchall et al. (2022) noted a significant decrease

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

in infection rates (5.3% vs 11.8%). Other benefits included a reduction in maternal hypotension (Gupta et al., 2022) and hypoglycemia (Özdemir et al., 2025).

Patient Satisfaction and Quality of Recovery

Patient satisfaction-centered outcomes strongly favored the ERACS protocol. Higher satisfaction scores were reported in multiple studies (Gohar et al., 2023; Darwish et al., 2022; Abilashini et al., 2025), with Mansour et al. (2025) finding that 81.1% of ERACS patients were satisfied compared to only 56.6% in the conventional care group. Quality of recovery was assessed via validated tools such as the ObsQoR-11T and QoR-15, was significantly improved in the ERACS cohorts (Özdemir et al., 2025; van Niekerk et al., 2025; Tanner et al., 2021). Additionally, the protocol appeared to increase breastfeeding success (Teigen et al., 2020; Afreen et al., 2024), further highlighting the holistic benefits of ERACS approach.

Table 4. Supporting indicators, including VAS, complications, and patient satisfaction (ERACS vs Non-ERACS) of the included studies.

No	Author (year)	VAS	Complications	Patient Satisfaction
1	Gupta et al., (2022)	Significantly lower in ERACS up to 8 hrs post op ($p<0.0001$); no difference at 12-24 hrs (>0.05)	Hypotension: 10% vs 40% ($p=0.0001$); Bradycardia: 4% vs 8% ($p=0.23$); Urinary retention: 6.56 ± 1.00 vs 62.68 ± 9.71 ($p<0.0001$)	Not reported
2	Lashin et al. (2025)	Not directly reported	Headache: 5.71% vs 37.14% ($p=0.001$); Nausea & vomiting: 2.85% vs 11.42% ($p=0.001$)	Not reported
3	Gohar et al., (2023)	Significantly lower in ERACS ($p<0.001$)	Not reported	Higher satisfaction in ERACS
4	Baluku et al., (2020)	Severe pain: 0% vs 13% ($p=0.001$)	Headache: 6.6% vs 30.4% ($p=0.001$); pruritus: 8.9% vs 1.5% ($p=0.023$)	Not reported
5	Mansour et al., (2025)	Significantly lower in ERACS at 0-12 hrs ($p=0.001$)	PONV: similar; Postoperative ileus: 0% vs 17% ($p=0.003$); Total opioid requirement: 1.98 ± 2.02 vs 7.56 ± 3.7 ($p=0.001$)	Satisfied: 81.1% vs 56.6% ($p=0.006$)
6	Darwish et al., (2022)	ERACS: significantly less pain immediately post-op and at discharge ($p=0.001$)	Post-op complications: none in ERACS vs 6 cases in non-ERACS (4 wound infections, 1 ileus, and 1 DVT)	Higher satisfaction in ERACS (very satisfied: 15.3% vs 0%; satisfied: 83.3% vs 16.7%)

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

7	Teigen et al., (2020)	Not reported	Post-op infection: 0% vs 3.33% (p=0.31); GI complication: 1.7% vs 11.7% (p=0.06); Wound complication: 0% vs 6.7% (p=0.14); Bleeding: 32.8% vs 33.3% (p=0.95); Postpartum depression: 6.9% vs 16.7% (p=0.11); Readmission: 0% vs 8.3% (p=0.10); Any complication: 34.5% vs 46.7% (p=0.17)	Breastfeeding success is higher in ERACS (67.2% vs 48.3%)
8	Abilashini et al., (2025)	Not reported	Post-op complications: ERACS (2) vs non-ERACS (8), p=0.03	Higher maternal satisfaction in ERACS (8.5 ± 1.2 vs 6.2 ± 1.7, p<0.001)
9	Kanabar et al., (2024)	Significantly lower at 6 hrs post-op (2.5 ± 1.16 vs 3.71 ± 1.86, p=0.0003); no difference at 24 hrs (p=0.117)	Not reported	Not reported
10	Pan et al., (2020)	Not reported	Nausea: 0.96% vs 3.57% (p=0.371); pruritus: 24.04% vs 25.00% (p=0.876)	Slightly higher in ERACS (8.42 ± 0.76 vs 8.12 ± 1.08, p=0.016)
11	Afreen et al., (2024)	Pain at 10 hrs: 4.99 ± 1.77 vs 6.66 ± 1.72 (p=0.000); pain at 20 hrs: 2.32 ± 1.15 vs 4.36 ± 1.71 (p=0.000)	Fever at 10 hrs: 1.08 ± 0.34 vs 1.12 ± 0.32 (p=0.278); urinary problems at 10 hrs: 1.08 ± 0.27 vs 1.24 ± 0.43 (p=0.000); nausea at 10 hrs: 1.08 ± 0.27 vs 1.22 ± 0.41 (p=0.000)	Breastfeeding success significantly higher in ERACS (2.02 ± 0.68 vs 2.82 ± 0.82, p=0.007)
12	Combs et al., (2021)	Not reported	No significant postoperative complications reported	No significant difference in aggregate satisfaction scores between pre- and post-ERAC implementation
13	Mangala et al., (2021)	Not reported	Not reported	Not reported

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

14	Özdemir et al., (2025)	VAS at 24 hrs in rest: 1.68 ± 1.59 vs 4.53 ± 2.22	Hypoglycemia: 0 vs 8 cases, p=0.019; PONV: lower vs higher, p=0.05 Significantly reduced postoperative nausea and vomiting in ERAS group.	The obstetric Quality-of-Recovery (ObsQoR) 11T Score: 93 (87-99) vs 82 (74-95), p<0.001
15	van Niekerk et al., (2025)	Pain from ObsQoR: 5 (3-6) vs 2 (1-4), p=0.01 Significantly less pain in ERAC group	Not reported	ObsQoR-10: 84 (76-87) vs 75 (66-78), p<0.001
16	Mullman et al., (2020)	Not reported	30-day readmission rate (%): 1.7 vs 1.4, p=0.562	Not reported
17	Lester et al., (2020)	Overall average pain score: 1.61 (0.13) vs 1.90 (0.07), p=0.37	30-day readmission rate (%): 2.68% vs 0.93%	Not reported
18	Tamang et al., (2021)	Not reported	Readmission (%): 3.6 vs 3.4, p=1.0; PONV (%): 2.4 vs 2.3, p=0.63; surgical site infection (%): 2.4 vs 3.4, p=0.63 No significant difference	Not reported
19	Walker et al., (2025)	VAS at 24 hrs: 3.00-4.00 vs 2.00, p<0.001	Maternal infectious morbidity, n (%): 8 (5.7%) vs 11 (3.8%), p=0.46-0.74	Patient satisfaction score: 178-179 vs 162-166, p<0.001
20	Pineyro et al., (2023)	Pain score at 24 hrs: 2.1 ± 1.2 vs 4.0 vs 1.3, p<0.001	Overall complications: 2.1% vs 2.6%, p=1.00; Hospital readmission: 0.7% vs 1.3%, p=1.00	Not reported
21	Mundhra et al., (2024)	Pain at rest on Day 0: 8.08 ± 1.09 vs 8.96 ± 1.01, p<0.0001; pain at rest on Day 1: 6.14 ± 0.85 vs 6.87 ± 1.05, p<0.0001	Spinal headache: 0 (0%) vs 2 (2.82%), p=0.496; Readmission within 30 days: 1 (1.41%) vs 0 (0%), p=1	Not reported
22	Kleiman et al., (2020)	Peak pain score: 7 (5-9) vs 8 (6-9), p=0.035	SSI, thrombo-embolic events, UTI, PPH, and readmission are similar between groups, p>0.05	Not reported

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

23	Manoghna G et al., (2024)	Not reported	Nausea and vomiting (4% vs 10%), UTI when compared in both groups 2% vs 10%, p value <0.001.	ERAS group had significantly greater levels of patient satisfaction (77% vs 70%, p<0.001)
24	Sravani P et al., (2023)	ERAS group perceived less pain compared to the conventional peri-operative hospital protocol group with a p-value <0.001	ERAS group had a significant decrease in the duration of appearance of 1st bowel sound (5.88±1.805 vs 7.83±1.99), the passage of flatus (16.39±1.803 vs 23.12±2.548), bowel movements (35.62±7.514 vs 53.56±7.588) with a p-value < 0.001	Not reported
25	Narkhede et al., (2023)	Not reported	Postoperative nausea and vomiting were seen in 4 (2.6%) on day 0. Fever after discharge: 2 patients (1.3%), surgical infections: 2 (1.3%)	Not reported
26	Birchall, C et al., (2022)	Not reported	Infection rates decreased significantly from 11.8% in the pre-intervention group to 5.3% in the post-intervention group, opioid use significantly decreased in the post-intervention cohort (5.1 vs 3.3, p value 0.04)	Not reported
27	Tanner, L et al., (2021)	No significant difference	Postoperative nausea and vomiting (PONV) two women in the ERAS group and five in the standard care group	QoR-15 score significantly higher in the post-ERAS group (119.5 vs 122.9, p ¼ .002

The findings of this systematic review are consistent with the growing international body of evidence supporting the effectiveness of Enhanced Recovery After Cesarean Section (ERACS) in improving postoperative recovery and maternal satisfaction. At the same time, they highlight

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

persistent challenges in translating these benefits into routine clinical practice within Indonesia's National Health Insurance system (BPJS Kesehatan). Limitations related to fixed reimbursement mechanisms, institutional readiness, and prevailing cultural perceptions regarding hospitalization duration continue to constrain the widespread and sustainable implementation of ERACS in BPJS-funded settings.

Across 27 studies involving more than 9,000 patients from high-, middle-, and low-income countries, ERACS consistently demonstrated superior clinical outcomes compared with conventional perioperative care. These included reductions in postoperative pain, shorter length of hospital stay (LOS), lower complication rates, reduced opioid consumption, and higher maternal satisfaction. Collectively, these outcomes underscore ERACS's capacity to improve recovery trajectories while optimizing resource utilization—an especially relevant advantage in healthcare systems operating under constrained financing models such as BPJS Kesehatan.

Reduction in LOS emerged as one of the most consistent and clinically meaningful outcomes. Multiple studies, including those by Gupta et al. (2022), Gohar et al. (2023), Darwish et al. (2022), and Mansour et al. (2025), reported statistically significant LOS reductions ranging from 4 to 24 hours among ERACS patients. These findings align with the meta-analysis by Sultan et al. (2021), which demonstrated a pooled LOS reduction approaching one full day. Accelerated discharge appears to result from the synergistic effects of multimodal analgesia, early feeding, and early mobilization. Nevertheless, some studies, such as those by Teigen et al. (2022) and Birchall et al. (2022) reported comparable LOS between ERACS and conventional care, suggesting that institutional discharge policies, patient education, and readiness criteria play a critical role in determining outcomes. Within the BPJS framework, shorter LOS should theoretically improve bed turnover and hospital efficiency; however, the fixed INA-CBGs reimbursement model limits the financial incentive to pursue earlier discharge, creating a paradox in which clinically efficient care does not necessarily yield economic advantage.

Pain control remains central to ERACS effectiveness. Studies by Gupta et al. (2022), Afreen et al. (2024), and Kanabar et al. (2024) consistently demonstrated lower visual analogue scale (VAS) scores during the first 8–12 postoperative hours, with comparable pain levels thereafter. This early analgesic benefit facilitates earlier mobilization and gastrointestinal recovery, contributing to shorter LOS and reduced opioid exposure. Additional findings from Mansour et al. (2025) and Darwish et al. (2022) showed lower rates of postoperative ileus and opioid consumption, reinforcing the role of multimodal analgesia as a cornerstone of ERACS. These results align with prior systematic reviews highlighting ERAS pathways' effectiveness in minimizing opioid use without compromising analgesia, an increasingly important consideration in obstetric anesthesia practice (Sultan et al., 2021; Puspitasari et al., 2024).

The reduction in postoperative complications further supports ERACS's clinical value. Studies from Egypt, India, and Uganda reported lower incidences of nausea, wound infection, hypotension, and urinary retention among ERACS patients, with occasional increases in mild pruritus related to spinal opioid use (Gupta et al., 2022; Lashin et al., 2024; Baluku et al., 2020). Importantly, none of the included studies demonstrated an increase in serious adverse events or readmission rates, confirming ERACS as a safe and feasible approach. In BPJS-funded hospitals, where complications can substantially increase costs and resource utilization, this safety profile is particularly relevant.

Patient satisfaction and quality of recovery were also consistently higher in ERACS groups (Gohar et al., 2023; Mansour et al., 2025; Abilashini et al., 2025), driven by improved comfort,

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

faster ambulation, and earlier initiation of breastfeeding. However, successful implementation depends heavily on institutional preparedness and patient education. In Indonesia, cultural perceptions equating longer hospitalization with better care remain a significant barrier. Addressing these perceptions through structured preoperative counseling and multidisciplinary engagement is essential to ensure patient acceptance and adherence.

Cost-related outcomes further highlight this tension. While Indonesian studies have reported cost reductions of 23–30% following ERACS adoption (Sadzali et al., 2024; Puspitasari et al., 2024), the integration of ERACS into the Indonesian healthcare landscape reveals a complex commercial dilemma. ERACS was initially popularized as a commercial strategy, a "premium" service designed to offset the financial pressure of low-reimbursement (cheap). Cesarean Section claims under the BPJS/National Health Insurance (JKN) system. By offering ERACS as a value-added commercial product, hospitals could generate the necessary revenue to remain financially viable. The current dilemma arises when ERACS is applied within the standard BPJS framework. If ERACS is "standardized" for all BPJS patients rather than kept as a commercial offering, the commercial purpose of generating higher revenue is no longer achieved. Under the fixed-rate INA-CBGs tariff, a hospital receives the same reimbursement regardless of whether the patient is discharged in 8 hours via ERACS or 3 days via conventional care. Consequently, the revenue remains stagnant while the hospital must still bear the upfront costs of ERACS, such as specialized multidisciplinary training and higher-cost opioid-sparing analgesia (Xu et al., 2025).

While ERACS is "economical" in terms of resource utilization (e.g., increased bed turnover), this does not translate into financial profit for the hospital under the current BPJS regulatory rigidity. Instead, the efficiency gain essentially "donates" bed capacity back to the system without covering the hospital's higher investment in specialized drugs and monitoring. This creates a paradox: a protocol that is cost-efficient for the healthcare system as a whole can be "financially restrictive" for the individual hospital that implements it.

Despite this revenue stagnation, the reduction in postoperative complications and improved pain control further support ERACS's clinical value. Studies consistently demonstrated lower VAS scores and lower rates of postoperative ileus, facilitating earlier mobilization (Gupta et al., 2022; Mansour et al., 2025). Furthermore, patient satisfaction and quality of recovery were also consistently higher in ERACS groups (Gohar et al., 2023; Abilashini et al., 2025). These positive aspects suggest that even if the commercial revenue goal is currently hindered, ERACS remains a critical necessity for modern maternal care.

Resolving this paradox requires policy-level intervention. Potential strategies include adjusting INA-CBGs' tariffs to account for actual LOS or introducing quality-based incentive payments (Agustina et al., 2019). Such reforms would align clinical effectiveness with financial sustainability, enabling ERACS to fulfill its dual role as a quality-improving and economically rational intervention. Overall, this review demonstrates that ERACS offers substantial clinical advantages; however, translating these into routine practice will require reconciling efficiency-driven care with appropriate reimbursement incentives.

Conclusion

This systematic review demonstrates that the Enhanced Recovery After Cesarean Section protocol improves postoperative outcomes by reducing length of hospital stay, postoperative pain, complications, and opioid use while increasing maternal satisfaction and healthcare efficiency. These findings confirm that ERACS offers both clinical and economic advantages compared with conventional perioperative care. However, its implementation within

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

Indonesia's national health insurance system is constrained by fixed case-based reimbursement, limited formulary coverage for multimodal analgesia, and the absence of standardized national guidelines, resulting in a misalignment between clinical efficiency and financial incentives. To support sustainable implementation, policy alignment is required through the development of national ERACS guidelines, reimbursement mechanisms that recognize efficiency gains, strengthened multidisciplinary training, and improved patient education to facilitate early recovery and discharge. Further standardized economic evaluations are needed to inform health policy decisions and ensure equitable integration of ERACS within Indonesia's universal health coverage system.

References

Abilashini, G. D., Rao, D. R., & Gnanasekaran, V. (2025). Maternal outcomes following emergency cesarean delivery: Evaluating the enhanced recovery after surgery protocol in a randomized controlled trial. *Journal of Pharmacy and Bioallied Sciences, 17*(Suppl. 2), S1849–S1851. https://doi.org/10.4103/jpbs.jpbs_540_25

Afreen, U., Karim Faisal, F. E., Khalid, M., Rao, Z., Mustafa, R., & Afreen, S. (2024). Enhanced recovery after caesarean section: An improved pathway than conventional care for reducing hospital stay. *Journal of Ayub Medical College Abbottabad, 36*(1), 50–55. https://doi.org/10.55519/JAMC-01-12522

Agustina, R., Dartanto, T., Sitompul, R., Susiloretni, K. A., Suparmi, Achadi, E. L., Taher, A., Wirawan, F., Sungkar, S., Sudarmono, P., Shankar, A. H., Thabrany, H., & Khusun, H. (2019). Universal health coverage in Indonesia: Concept, progress, and challenges. *The Lancet, 393*(10166), 75–102. https://doi.org/10.1016/S0140-6736(18)31647-7

Baluku, M., Bajunirwe, F., Ngonzi, J., Kiwanuka, J., & Ttendo, S. (2020). A randomized controlled trial of enhanced recovery after surgery versus standard of care recovery for emergency cesarean deliveries at Mbarara Hospital, Uganda. *Anesthesia & Analgesia, 130*(3), 769–776. https://doi.org/10.1213/ANE.0000000000004495

Birchall, C. L., Maines, J. L., Kunselman, A. R., Stetter, C. M., & Pauli, J. M. (2022). Enhanced recovery for cesarean delivery leads to no difference in length of stay, decreased opioid use and lower infection rates. *The Journal of Maternal-Fetal & Neonatal Medicine, 35*(26), 10253–10261. https://doi.org/10.1080/14767058.2022.2113512

Combs, C. A., Robinson, T., Mekis, C., Cooper, M., Adie, E., Ladwig-Scott, E., & Richards, J. (2021). Enhanced recovery after cesarean: Impact on postoperative opioid use and length of stay. *American Journal of Obstetrics and Gynecology, 224*(2), 237–239. https://doi.org/10.1016/j.ajog.2020.10.018

Darwish, A., Mustafa, M., Youness, E., & Al-Harazi, B. (2022). Enhanced recovery after cesarean section (CS) versus conventional care in a lower middle-income country: A randomized controlled trial. *Open Journal of Nursing, 12*, 831–841. https://doi.org/10.4236/ojn.2022.1212058

Gohar, I. E., Ali, H. S. I., & Shoukhba, N. S. M. (2023). Effect of implementing enhanced recovery after surgery pathway for women undergoing cesarean section on maternal outcomes and satisfaction. *Egyptian Journal of Health Care, 14*(4), 1561–1580. https://doi.org/10.21608/ejhc.2023.374873

Gupta, S., Gupta, A., Baghel, A. S., Sharma, K., Choudhary, S., & Choudhary, V. (2022). Enhanced recovery after cesarean protocol versus traditional protocol in elective

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

cesarean section: A prospective observational study. *Journal of Obstetric Anaesthesia and Critical Care, 12*(1), 28–33. https://doi.org/10.4103/JOACC.JOACC_16_22

Kanabar, H., Babariya, D. C., Desai, D., Shastri, A., & GMERS Medical College and Hospital. (2024). Enhanced recovery after surgery protocol compliance impact on recovery after cesarean section in primi patients as compared to conventional care. *International Journal of Current Pharmaceutical Review and Research, 16*(3), 145–149.

Kleiman, A. M., Chisholm, C. A., Dixon, A. J., Sariosek, B. M., Thiele, R. H., Hedrick, T. L., Carvalho, B., & Tiouririne, M. (2020). Evaluation of the impact of enhanced recovery after surgery protocol implementation on maternal outcomes following elective cesarean delivery. *International Journal of Obstetric Anesthesia, 43*, 39–46. https://doi.org/10.1016/j.ijoa.2019.08.004

Lashin, M., Salem, A., Basha, A., & Alkader, A. (2024). Enhanced recovery after elective cesarean section delivery protocol: A randomized controlled clinical trial. *Zagazig University Medical Journal*. https://doi.org/10.21608/zumj.2024.327294.3629

Lester, S. A., Kim, B., Tubinis, M. D., Morgan, C. J., & Powell, M. F. (2020). Impact of an enhanced recovery program for cesarean delivery on postoperative opioid use. *International Journal of Obstetric Anesthesia, 43*, 47–55. https://doi.org/10.1016/j.ijoa.2020.01.005

Lin, D., Zhang, C., & Shi, H. (2021). Effects of clinical pathways on cesarean sections in China: Length of stay and direct hospitalization cost based on meta-analysis of randomized controlled trials and controlled clinical trials. *International Journal of Environmental Research and Public Health, 18*(11), 5918.

Mangala, J. K., Remadevi, C., Loganathan, P., R. S., Gopukrishnan, & Vasudevan, A. (2021). Enhanced recovery pathway as a tool in reducing post-operative hospital stay after caesarean section, compared to conventional care in COVID era: A pilot study. *Journal of Obstetrics and Gynaecology of India, 71*(Suppl. 1), 12–17. https://doi.org/10.1007/s13224-021-01461-6

Manoghna, G., Moharana, R., Dash, S., Jena, P., & Rath, S. K. (2024). Enhanced recovery after surgery (ERAS): A multimodal perioperative care pathway in cesarean deliveries. *Indian Journal of Obstetrics and Gynecology Research, 11*(4), 617–620. https://doi.org/10.18231/j.ijogr.2024.111

Mansour, H., Mohamed, M., Youssef, I., & Abdelzaher, T. (2025). Empowering mothers through enhanced recovery after cesarean section (ERACS): A comparative study on recovery quality and patient satisfaction. *Egyptian Journal of Anaesthesia, 41*, 1–9. https://doi.org/10.21608/egja.2025.389683.1105

Mullman, L., Hilden, P., Goral, J., Gwacham, N., Tauro, C., Spinola, K., Rosales, K., Collier, S., Holmes, L., Maccione, J., Pitera, R., Miller, R., & Yodice, P. (2020). Improved outcomes with an enhanced recovery approach to cesarean delivery. *Obstetrics & Gynecology, 136*(4), 685–691. https://doi.org/10.1097/AOG.0000000000004023

Mundhra, R., Gupta, D. K., Bahadur, A., Kumar, A., & Kumar, R. (2024). Effect of enhanced recovery after surgery (ERAS) protocol on maternal outcomes following emergency caesarean delivery: A randomized controlled trial. *European Journal of Obstetrics & Gynecology and Reproductive Biology: X, 22*, 100295. https://doi.org/10.1016/j.eurox.2024.100295

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

Narkhede, H., Vipulachandra, Y., Bhanap, P., Karale, A., & Chavan, R. (2023). Enhanced recovery after surgery protocol implementation on elective cesarean delivery: A cross-sectional study. *Journal of South Asian Federation of Obstetrics and Gynaecology, 14*, 667–671. https://doi.org/10.5005/jp-journals-10006-2152

Özdemir, M. G., Gunaydin, B., Bayram, M., & Hirfanoglu, İ. M. (2025). Effect of enhanced recovery after surgery (ERAS) protocol on maternal and fetal outcomes following elective cesarean section: An observational trial. *BMC Pregnancy and Childbirth, 25*(1), 517. https://doi.org/10.1186/s12884-025-07583-3

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, n71.

Pan, J., Hei, Z., Li, L., Zhu, D., Hou, H., Wu, H., Gong, C., & Zhou, S. (2020). The advantage of implementation of enhanced recovery after surgery (ERAS) in acute pain management during elective cesarean delivery: A prospective randomized controlled trial. *Therapeutics and Clinical Risk Management, 16*, 369–378. https://doi.org/10.2147/TCRM.S244039

Pineyro, M. O. S., Villegas-Cruz, C., Hernandez-Bazaldua, M., Pineyro-Cantu, A., Gaston-Locsin, T., & Sordia-Hernandez, L. H. (2023). Effect of the implementation of an enhanced recovery after surgery protocol (ERAS) in patients undergoing an elective cesarean section. *Ginekologia Polska, 94*(2), 141–145. https://doi.org/10.5603/GP.a2023.0003

Puspitasari, C. D. C., Paripurna, Y., & Trianasari, N. (2024). Comparison of operating costs and LOS of cesarean section patients using ERACS and non-ERACS method. *Jurnal Jaminan Kesehatan Nasional, 4*(1), 1–12.

Puspitasari, C. D. C., Paripurna, Y., & Trianasari, N. (2024). Comparison of operating costs and LOS of cesarean section patients using ERACS and non-ERACS method. *Jurnal Jaminan Kesehatan Nasional, 4*(1), 1–12. https://doi.org/10.53756/jjkn.v4i1.142

Sadzali, A., & Rosa, E. M. (2024). Cost efficiency of cesarean section surgery with ERACS method compared to the conventional method. *Indonesia Journal of Biomedical Science, 18*, 16–19.

Sadzali, A., & Rosa, E. M. (2024). Cost efficiency of cesarean section surgery with ERACS method compared to the conventional method. *Indonesia Journal of Biomedical Science, 18*(1), 16–19. https://doi.org/10.15562/ijbs.v18i1.528

Sravani, P., Pravalina, R., Sahoo, G., & Pati, B. K. (2023). Comparative study between ERAS protocol and conventional perioperative care in elective cesarean section patients in a tertiary care centre of eastern India. *Journal of Public Health and Development, 21*(3), 94–106. https://doi.org/10.55131/jphd/2023/210308

Sultan, P., Sharawi, N., Blake, L., Habib, A. S., Brookfield, K. F., & Carvalho, B. (2021). Impact of enhanced recovery after cesarean delivery on maternal outcomes: A systematic review and meta-analysis. *Anaesthesia Critical Care & Pain Medicine, 40*, 100935. https://pubmed.ncbi.nlm.nih.gov/34390864/

Sultan, P., Sharawi, N., Blake, L., Habib, A. S., Brookfield, K. F., & Carvalho, B. (2021). Impact of enhanced recovery after cesarean delivery on maternal outcomes: A

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)

systematic review and meta-analysis. *Anaesthesia Critical Care & Pain Medicine, 40*(5), 100935. https://doi.org/10.1016/j.accpm.2021.100935

Tamang, T., Wangchuk, T., Zangmo, C., Wangmo, T., & Tshomo, K. (2021). The successful implementation of the Enhanced Recovery After Surgery (ERAS) program among caesarean deliveries in Bhutan to reduce the postoperative length of hospital stay. *BMC Pregnancy and Childbirth, 21*(1), 637. https://doi.org/10.1186/s12884-021-04105-9

Tanner, L. D., Chen, H. Y., Chauhan, S. P., Sibai, B. M., & Ghebremichael, S. J. (2021). Enhanced recovery after scheduled cesarean delivery: A prospective pre-post intervention study. *The Journal of Maternal-Fetal & Neonatal Medicine, 35*(25), 9170–9177. https://doi.org/10.1080/14767058.2021.2020237

Teigen, N. C., Sahasrabudhe, N., Doulaveris, G., Xie, X., Negassa, A., Bernstein, J., & Bernstein, P. S. (2020). Enhanced recovery after surgery at cesarean delivery to reduce postoperative length of stay: A randomized controlled trial. *American Journal of Obstetrics and Gynecology, 222*(4), 372.e1–372.e10. https://doi.org/10.1016/j.ajog.2019.10.009

van Niekerk, J. A., Kleyenstuber, T., & Jooma, Z. (2025). Evaluating the impact of an enhanced recovery programme on the Obstetric Quality-of-Recovery score (ObsQoR-10) after elective Caesarean section in a South African public hospital: A prospective before-after study. *BJA Open, 13*, 100373. https://doi.org/10.1016/j.bjao.2024.100373

Walker, M., Sobel, M., Siddiqi, N., Carvalho, J. C. A., Jahan, N., Santini, S., Watts, N., Dart, K., Wang, S., Huszti, E., & Thomas, J. (2025). Implementation of enhanced recovery after surgery for caesarean delivery: A quality improvement initiative. *BMJ Open Quality, 14*(3), e003391. https://doi.org/10.1136/bmjoq-2025-003391

Xu, Y., Zhong, M., & Li, S. (2025). Opioid-free anesthesia in enhanced recovery after surgery for gastrointestinal surgery: Current status, challenges, and prospects. *Frontiers in Pharmacology, 16*, 1662818. https://doi.org/10.3389/fphar.2025.1662818

ISSN 2721-0987 (Print), ISSN 2721-124X (Online)