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Multimodal Analgesia Techniques within Enhanced Recovery After Cesarean Surgery (ERACS) and Their Effect on Early Mobilisation and Breastfeeding After Caesarean Section: A Systematic Review of Randomised Controlled Trials and Primary Studies

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ABSTRACT

Introduction: Caesarean section is the most frequently performed inpatient surgical procedure globally, generating moderate-to-severe somatic and visceral pain that impedes early mobilisation and lactation initiation. Enhanced Recovery After Cesarean Surgery (ERACS) positions opioid-sparing multimodal analgesia as the key pharmacological component. This systematic review aimed to synthesise randomised controlled trial evidence on the effect of multimodal analgesic techniques within an ERACS framework on early mobilisation and breastfeeding success after caesarean delivery.

Methods: This systematic review adhered to PRISMA 2020 guidelines. Inclusion criteria: randomised controlled trials in women undergoing caesarean delivery comparing a multimodal/ERACS-embedded analgesic strategy with active or placebo comparator, reporting at least one of sixteen pre-specified outcome domains. Risk of bias was assessed using Cochrane RoB 2. Certainty of evidence was evaluated using GRADE. Synthesis was performed narratively-structurally with vote-counting of effect direction.

Results: Twenty-eight randomised controlled trials (approximately 2,900 parturients) from 14 countries were included. Movement-evoked pain at 24 hours was significantly reduced by fascial plane blocks when neuraxial morphine was absent; opioid-sparing of 40-73% was achieved in morphine-free regimens. Early mobilisation improved significantly: full mobilisation on postoperative day 1 was achieved by 98% of women receiving multimodal regimens versus 83% receiving placebo and 58% receiving standard care. Breastfeeding at discharge increased from 48.3% to 67.2% under an ERACS pathway ($p=0.046$). Quality of recovery, satisfaction, pruritus, nausea and vomiting, bowel function, catheter removal, and length of stay all favoured optimised multimodal regimens. Adding fascial plane blocks to regimens already containing intrathecal morphine conferred no additional benefit beyond six hours.

Discussion: An analgesic ceiling effect exists in which the contribution of any single modality is conditional on the background regimen. Intrathecal

morphine remains the reference standard; when unavailable, fascial plane blocks deliver clinically important opioid-sparing translating into earlier ambulation. ERACS benefits on mobilisation and lactation appear to be mediated more by reduction of opioid-related adverse effects than by absolute pain score reduction.

Conclusion: Multimodal, opioid-sparing analgesia delivered within an ERACS pathway produces statistically significant and clinically meaningful improvements in movement-evoked pain, opioid consumption, early mobilisation, quality of recovery, length of stay, and in-hospital breastfeeding after caesarean section. Regimen design should be stratified by whether long-acting neuraxial opioid is used. Future trials should adopt the ERACS core outcome set.

Keywords: Enhanced Recovery After Cesarean Surgery; multimodal analgesia; caesarean section; early mobilisation; breastfeeding; transversus abdominis plane block; quadratus lumborum block; intrathecal morphine; opioid-sparing analgesia

INTRODUCTION

Background

Caesarean delivery is the most commonly performed inpatient surgical procedure globally and its incidence continues to rise, particularly in middle-income countries such as Indonesia where institutional delivery rates and referral-based obstetric care have expanded rapidly. Unlike most abdominal operations, caesarean section produces a patient who must resume complex physical and physiological functions almost immediately: she must sit, stand and walk, and she must simultaneously initiate lactation and assume responsibility for a dependent newborn. Postoperative pain after caesarean section is characteristically moderate to severe, arising from both somatic injury to the abdominal wall and visceral afferent input from the uterus and peritoneum, and inadequately treated pain has demonstrable consequences for recovery, patient satisfaction, breastfeeding success and mother–child bonding.^{32,33}

Enhanced Recovery After Surgery principles were adapted to obstetric practice as Enhanced Recovery After Cesarean Surgery, formalised in a three-part guideline series published by the ERAS Society covering preoperative, intraoperative and postoperative domains and updated in 2025. Within these pathways multimodal analgesia is not merely one item among many; it is the pharmacological substrate that renders the remaining elements achievable. Early mobilisation, early oral intake, early removal of the urinary catheter and early discharge are all conditional upon a mother who is comfortable enough to move and alert enough to feed her infant. The current ERACS intraoperative guideline assigns multimodal analgesia a strong recommendation and identifies early initiation of skin-to-skin care as a companion intervention supported by moderate-quality evidence.^{29,30,31}

The contemporary multimodal armamentarium after caesarean section comprises long-acting neuraxial opioid, most commonly intrathecal morphine 50–100 micrograms or diamorphine 300 micrograms, combined with scheduled paracetamol, non-steroidal anti-inflammatory drugs and intravenous dexamethasone, with systemic opioid reserved for rescue. Where neuraxial opioid is not administered, procedure-specific guidance recommends local anaesthetic wound infiltration, continuous wound infusion or fascial plane blockade including transversus abdominis plane,

quadratus lumborum and erector spinae plane techniques. Adjuvants such as dexmedetomidine, dexamethasone, ketamine or esketamine, intraperitoneal local anaesthetic and non-pharmacological modalities have all been examined as additional components.^{32,33,45}

Early mobilisation after caesarean delivery reduces venous thromboembolic risk, accelerates return of gastrointestinal function, preserves muscle mass and shortens hospitalisation, and is therefore embedded in every published ERACS pathway. Breastfeeding is equally consequential: caesarean delivery is an independent risk factor for delayed initiation of breastfeeding and for delayed onset of lactogenesis II, mediated through blunted oxytocin and prolactin responses, maternal pain, sedation and separation of the mother–infant dyad in the critical first hour. Postoperative analgesic strategy therefore sits at the intersection of these two outcomes, and its optimisation represents a modifiable determinant of both.^{39,40,41,42}

Research Objectives

The general objective of this systematic review was to synthesise randomised controlled trial evidence on the effect of multimodal analgesic techniques applied within or consistent with an ERACS framework on early mobilisation and breastfeeding after caesarean section. The specific objectives were as follows.^{29,36}

- To quantify the effect of ERACS-embedded multimodal analgesia on time to first mobilisation and on the proportion of women fully mobilised by the first postoperative day.^{16,21,26}
- To quantify its effect on breastfeeding initiation, first-attempt breastfeeding success, breastfeeding at discharge and continued breastfeeding at six weeks.^{15,26}
- To determine the magnitude of opioid-sparing achieved by regional and pharmacological adjuncts and to establish whether this varies according to the presence or absence of long-acting neuraxial opioid in the background regimen.^{1,3,9,14}
- To evaluate movement-evoked and resting pain intensity, time to first rescue analgesia, quality of recovery, maternal satisfaction, opioid-related adverse effects, return of bowel function, catheter removal, length of stay, longer-term psychological outcomes and technique-related safety.^{18,21,24,36}

- To appraise the methodological quality of the evidence base using RoB 2 and to grade the certainty of evidence for each outcome domain using GRADE.³²

Significance and Benefits of the Review

For clinicians, this review provides a stratified, evidence-based framework for selecting an analgesic regimen according to whether long-acting neuraxial opioid is available and appropriate, an issue of direct operational relevance in Indonesian obstetric practice where intrathecal morphine availability varies widely between tertiary centres and district hospitals. For institutions, it identifies which components of an ERACS bundle carry the strongest randomised support for the outcomes that matter most to mothers. For researchers, it maps a well-defined evidence gap: early mobilisation and breastfeeding are almost universally invoked as justifications for post-caesarean analgesic trials yet are seldom measured as pre-specified endpoints. For policymakers and educators, it supplies the quantitative basis for embedding ERACS analgesic protocols into national obstetric standards and specialist training curricula.^{31,36,37,38}

Hypotheses

The primary hypothesis of this review was that multimodal, opioid-sparing analgesia delivered within an ERACS framework significantly shortens time to first mobilisation and significantly increases the proportion of women achieving full mobilisation on the first postoperative day compared with conventional opioid-centred analgesia. The first secondary hypothesis was that such regimens significantly improve breastfeeding initiation and in-hospital breastfeeding rates. The second secondary hypothesis was that the magnitude of opioid-sparing conferred by abdominal wall and paraspinal blocks is significantly greater in regimens that do not include long-acting neuraxial opioid than in those that do, reflecting an analgesic ceiling effect. The null hypothesis for each was that no significant difference exists between the compared strategies.^{3,14,34}

Research Gap

Three distinct gaps motivated this review. First, the extensive randomised literature on post-caesarean analgesia is overwhelmingly oriented towards surrogate pharmacological endpoints, principally 24-hour opioid consumption and pain scores, whereas the functional outcomes that define maternal recovery are relegated to unmeasured assumptions; a Delphi consensus explicitly identified

time to mobilisation and breastfeeding success as core outcomes for ERACS studies precisely because they were being omitted. Second, existing systematic reviews and network meta-analyses in this field have addressed single technique families, such as quadratus lumborum versus transversus abdominis plane block, without integrating the pharmacological, regional, behavioural and bundle-level interventions that jointly constitute an ERACS analgesic strategy. Third, almost no randomised evidence originates from South-East Asian obstetric populations, limiting the direct transferability of published effect estimates to Indonesian practice.^{34,35,36}

Novelty

This review is distinguished by four features. It is organised around function rather than pharmacology, treating early mobilisation and breastfeeding as the primary outcome domains and pain and opioid consumption as intermediate mechanisms. It integrates twenty-eight randomised trials spanning neuraxial opioid optimisation, fascial plane blockade, wound-based techniques, intraperitoneal instillation, systemic adjuvants, patient-controlled oral pathways, non-pharmacological adjuncts and complete ERACS bundles within a single analytical structure. It introduces an explicit stratification by background neuraxial opioid status, which resolves much of the apparent contradiction between positive and null trials of abdominal wall blockade. Finally, it aligns its outcome architecture prospectively with the published ERACS core outcome set, producing a synthesis that is directly comparable with future trials.^{34,36}

METHODS

Protocol and Reporting Standards

This systematic review was designed and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement. The review question, eligibility criteria, information sources, outcome hierarchy and analytical approach were specified before data extraction commenced. Because the review was conducted as an investigator-initiated academic synthesis without external funding, it was not prospectively registered in PROSPERO; this deviation is acknowledged as a limitation in Section 4.9. No ethical approval was required as the review used only published aggregate data.^{32,36}

Eligibility Criteria (PICOS)

Table 1. Eligibility criteria structured according to the PICOS framework

Domain	Inclusion criteria	Exclusion criteria
Population	Women undergoing elective, scheduled, unplanned or emergency caesarean section at any gestational age, under neuraxial or combined spinal–epidural anaesthesia	Vaginal delivery; caesarean section under general anaesthesia only; non-obstetric abdominal surgery; paediatric populations
Intervention	Any defined multimodal analgesic strategy applied within or consistent with an ERACS framework: neuraxial opioid optimisation, fascial plane blocks (TAP, QL, ESP, transversalis fascia, ilioinguinal–TAP), wound infiltration or infusion, intraperitoneal local anaesthetic, systemic adjuvants, patient-controlled oral analgesia, structured pain-management models, non-pharmacological adjuncts, or a complete ERACS bundle	Single-drug regimens with no multimodal background; interventions confined to intraoperative anaesthetic technique without a postoperative analgesic component
Comparator	Placebo or sham block, standard perioperative care, an alternative active analgesic technique, or an alternative dose of the same agent	Studies without a concurrent comparator arm
Outcomes	At least one of the sixteen pre-specified outcome domains, including time to mobilisation, breastfeeding, pain at rest and on movement, opioid consumption, time to rescue analgesia, quality of recovery, satisfaction, PONV, pruritus, bowel function, catheter removal,	Studies reporting only laboratory or pharmacokinetic endpoints without clinical outcomes

Domain	Inclusion criteria	Exclusion criteria
	length of stay, postpartum depression, persistent pain, and technique-related safety	
Study design	Randomised controlled trials, including parallel-group, factorial, non-inferiority, cluster and multicentre designs, published in peer-reviewed journals	Systematic reviews and meta-analyses (used only as supporting evidence and excluded from the characteristics table); protocols without results; observational studies; case reports; conference abstracts without extractable data; preprints
Language and period	English-language publications from database inception to May 2026	Publications not retrievable in full text

ERACS, Enhanced Recovery After Cesarean Surgery; TAP, transversus abdominis plane; QL, quadratus lumborum; ESP, erector spinae plane; PONV, postoperative nausea and vomiting.

Search Strategy

The keywords used for this research based PICO :

PICO Element	Keyword 1	Keyword 2	Keyword 3
P (Population)	Cesarean Section	Parturients	Postpartum Women
I (Intervention)	Multimodal Analgesia	ERACS Pathway	Opioid-Sparing Analgesia
C (Comparison)	Standard Care	Conventional Analgesia	Placebo/Sham Block
O (Outcome)	Early Mobilisation	Breastfeeding Success	Postoperative Pain

The Boolean MeSH keywords inputted on databases for this research are: ("*Cesarean Section*" OR "*Parturients*" OR "*Postpartum Women*") AND ("*Multimodal Analgesia*" OR "*ERACS Pathway*" OR "*Opioid-Sparing Analgesia*") AND ("*Standard Care*" OR "*Conventional Analgesia*" OR

"Placebo/Sham Block") AND ("Early Mobilisation" OR "Breastfeeding Success" OR "Postoperative Pain")

Study Selection

Records retrieved from each search were exported and de-duplicated. Two reviewers independently screened titles and abstracts against the PICOS criteria in Table 1, followed by full-text assessment of all potentially eligible records. Disagreements were resolved by discussion and, where necessary, by adjudication from a third reviewer. Systematic reviews, network meta-analyses, clinical practice guidelines and mechanistic reviews that met topical relevance were retained as supporting evidence for the discussion and for the mechanistic outcome table, but were deliberately excluded from the study characteristics table and from the primary synthesis in accordance with the pre-specified design hierarchy.^{32,34}

Data Extraction

A standardised extraction form was piloted on five trials and then applied to all included studies. Extracted fields comprised first author, publication year, country, trial design and blinding, sample size randomised and analysed, population and anaesthetic technique, full description of the experimental and comparator analgesic regimens including drug, dose, concentration, volume and timing, background multimodal regimen, pre-specified primary outcome, and all reported results relevant to the sixteen outcome domains. Effect estimates were recorded with the precision reported by the original authors, together with confidence intervals and exact p values where available. Where a trial reported outcomes at multiple time points, the 24-hour value was extracted as the index measurement for pain and opioid outcomes, consistent with the ERACS core outcome set.³⁶

Outcome Domains

Sixteen outcome domains were pre-specified and are reported in full in Section 3. The two co-primary domains were time to first mobilisation, including the proportion fully mobilised by the first postoperative day, and breastfeeding initiation and in-hospital breastfeeding success. The fourteen secondary domains were movement-evoked pain at 24 hours, pain at rest, cumulative opioid consumption, time to first rescue analgesia, continued and exclusive breastfeeding beyond discharge, quality of recovery and maternal satisfaction, postoperative nausea and vomiting, pruritus, return of

gastrointestinal function, urinary catheter removal, length of hospital stay, postpartum depression and persistent pain, technique-related safety, and neonatal and lactation-pharmacology considerations.³⁶

Risk of Bias Assessment

Risk of bias was assessed independently by two reviewers using the revised Cochrane risk-of-bias tool for randomised trials (RoB 2) across five domains: bias arising from the randomisation process, bias due to deviations from intended interventions, bias due to missing outcome data, bias in measurement of the outcome, and bias in selection of the reported result. Each domain was rated low risk, some concerns or high risk, and an overall judgement was derived using the standard RoB 2 algorithm in which the overall rating is the least favourable domain rating, with high risk assigned when multiple domains raise some concerns in a manner that substantially reduces confidence. Domain-level and overall judgements are presented in colour-coded form in Table 6 and summarised in Table 7.³²

Article Search Strategy

Database	Keywords	Hits
Pubmed	("Cesarean Section" OR "Parturients" OR "Postpartum Women") AND ("Multimodal Analgesia" OR "ERACS Pathway" OR "Opioid-Sparing Analgesia") AND ("Standard Care" OR "Conventional Analgesia" OR "Placebo/Sham Block") AND ("Early Mobilisation" OR "Breastfeeding Success" OR "Postoperative Pain")	2
Google Scholar	("Cesarean Section" OR "Parturients" OR "Postpartum Women") AND ("Multimodal Analgesia" OR "ERACS Pathway" OR "Opioid-Sparing Analgesia") AND ("Standard Care" OR "Conventional Analgesia" OR "Placebo/Sham Block") AND ("Early Mobilisation" OR "Breastfeeding Success" OR "Postoperative Pain")	343
Semantic Scholar	("Cesarean Section" OR "Parturients" OR "Postpartum Women") AND ("Multimodal Analgesia" OR "ERACS Pathway" OR "Opioid-Sparing Analgesia") AND ("Standard Care" OR "Conventional Analgesia" OR "Placebo/Sham Block") AND ("Early Mobilisation" OR "Breastfeeding Success" OR "Postoperative Pain")	250
Science-direct	("Cesarean Section" OR "Parturients" OR "Postpartum Women") AND ("Multimodal Analgesia" OR "ERACS Pathway" OR "Opioid-Sparing Analgesia") AND ("Early Mobilisation" OR "Breastfeeding Success" OR "Postoperative Pain")	455
Cochrane	("Cesarean Section" OR "Parturients" OR "Postpartum Women") AND ("Multimodal Analgesia" OR "ERACS Pathway" OR "Opioid-Sparing Analgesia") AND ("Standard Care" OR "Conventional Analgesia" OR "Placebo/Sham Block") AND ("Early Mobilisation" OR "Breastfeeding Success" OR "Postoperative Pain")	5

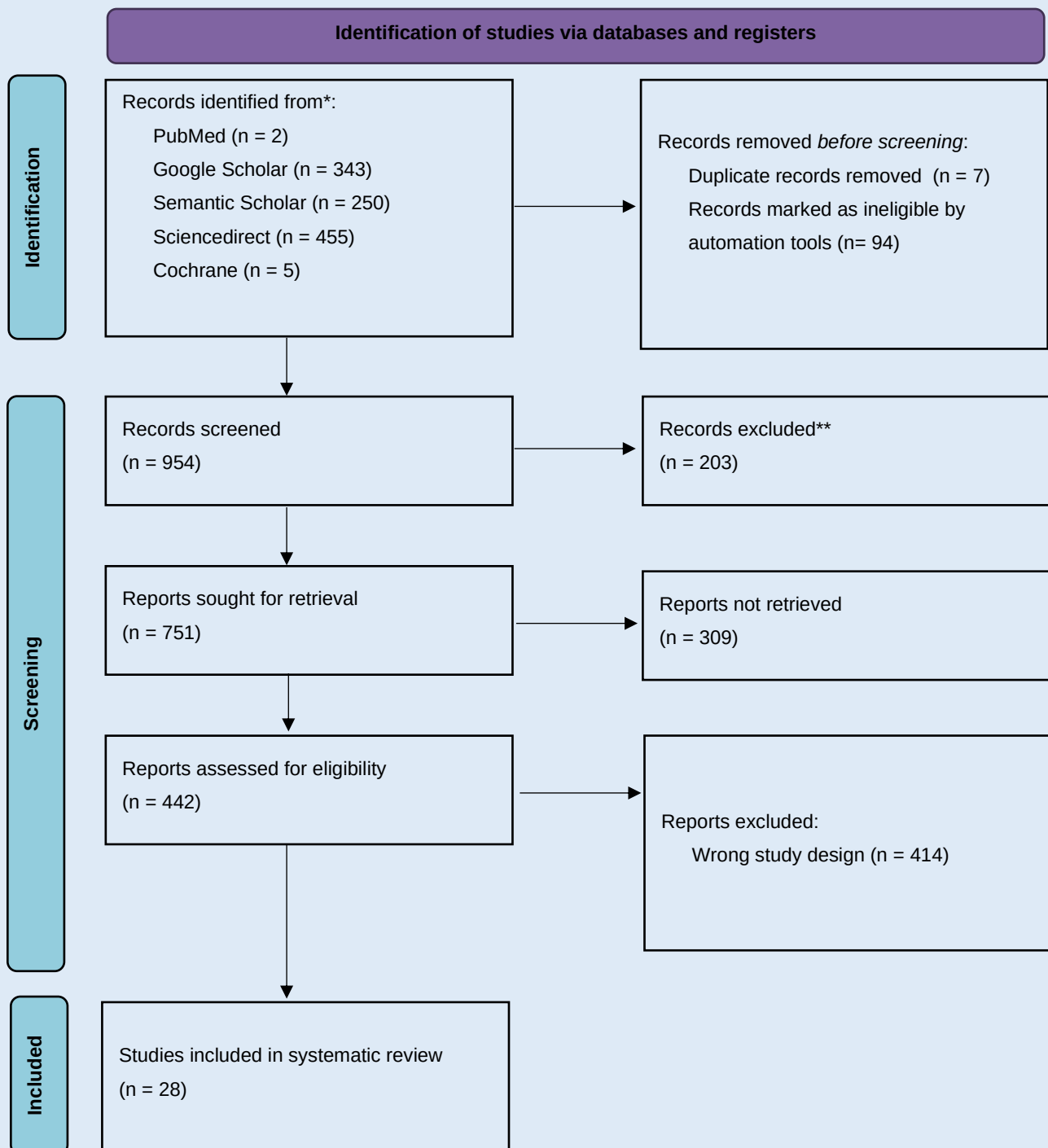


Figure 1. Article search flowchart

Risk of Bias within Studies

Domain-level risk of bias judgements for all twenty-eight trials are presented in Table 6. Eleven trials were rated at overall low risk of bias, fifteen raised some concerns and two were rated at high risk. Randomisation processes were generally well described, with only three trials providing insufficient detail on allocation concealment or sequence generation. The most frequent source of concern was bias in measurement of the outcome, which arose predominantly in pragmatic bundle trials and in comparisons of two visibly different active techniques where blinding of the treating team was impossible and functional outcomes such as mobilisation were assessed by non-blinded staff. Bias due to missing outcome data was a concern principally in the trial terminated prematurely after a serious adverse event and in the multicentre liposomal bupivacaine trial, in which the primary efficacy analysis was confined to a protocol-compliant subset.^{5,15,17,26}

Table 2. Risk of bias assessment of included studies using the Cochrane RoB 2 instrument

Study	D1 Randomisation	D2 Deviations	D3 Missing data	D4 Measurement	D5 Reporting	Overall
McDonnell 2008	Low	Low	Low	Low	Low	Low
Belavy 2009	Low	Low	Some concerns	Low	Low	Some concerns
Costello 2009	Low	Low	Low	Low	Low	Low
Kanazi 2010	Low	Low	Low	Low	Some concerns	Some concerns
Chandon 2014	Low	Some concerns	High	Some concerns	Some concerns	High
Blanco 2016	Some concerns	Some concerns	Low	Some concerns	Some concerns	Some concerns

Study	D1 Randomisation	D2 Deviations	D3 Missing data	D4 Measurement	D5 Reporting	Overall
Booth 2016	Low	Low	Some concerns	Low	Low	Some concerns
Bonnal 2016	Low	Some concerns	Low	Some concerns	Low	Some concerns
Krohg 2017	Low	Low	Low	Low	Low	Low
Patel 2017	Low	Low	Low	Low	Low	Low
Tawfik 2017	Low	Low	Low	Low	Low	Low
Staker 2018	Low	Low	Low	Low	Low	Low
Kwikiriza 2018	Low	Some concerns	Low	Some concerns	Low	Some concerns
Irwin 2019	Low	Low	Low	Low	Low	Low
Teigen 2019	Low	Some concerns	Low	Some concerns	Some concerns	Some concerns
Baluku 2020	Low	Some concerns	Low	Some concerns	Low	Some concerns
Nedeljkovic 2020	Low	Some concerns	Some concerns	Low	Some concerns	Some concerns
Sharpe 2020	Low	Low	Low	Low	Low	Low
Barney 2020	Low	Low	Some concerns	Low	Low	Some concerns

Study	D1 Randomisation	D2 Deviations	D3 Missing data	D4 Measurement	D5 Reporting	Overall
Wang 2022	Low	Low	Low	Low	Some concerns	Some concerns
Usichenko 2022	Low	Low	Low	Low	Low	Low
Guo 2022	Low	Some concerns	Low	Some concerns	Low	Some concerns
Botea 2023	Low	Low	Some concerns	Low	Low	Some concerns
Giral 2024	Low	Low	Low	Low	Low	Low
Urfalı 2024	Some concerns	Some concerns	Low	Some concerns	Some concerns	Some concerns
Jiang 2025	Some concerns	High	Some concerns	High	Some concerns	High
Şirin 2025	Low	Some concerns	Low	Some concerns	Low	Some concerns
Park 2025	Low	Low	Low	Low	Low	Low

Green = low risk; amber = some concerns; red = high risk. D1, randomisation process; D2, deviations from intended interventions; D3, missing outcome data; D4, measurement of the outcome; D5, selection of the reported result.

Table 3. Aggregate risk of bias across domains (n = 28 trials)

Domain	Low risk, n (%)	Some concerns, n (%)	High risk, n (%)
D1 Randomisation process	25 (89.3%)	3 (10.7%)	0 (0.0%)

Domain	Low risk, n (%)	Some concerns, n (%)	High risk, n (%)
D2 Deviations from intended interventions	17 (60.7%)	10 (35.7%)	1 (3.6%)
D3 Missing outcome data	21 (75.0%)	6 (21.4%)	1 (3.6%)
D4 Measurement of the outcome	18 (64.3%)	9 (32.1%)	1 (3.6%)
D5 Selection of the reported result	20 (71.4%)	8 (28.6%)	0 (0.0%)
Overall risk of bias	11 (39.3%)	15 (53.6%)	2 (7.1%)

Certainty of Evidence

Certainty of evidence for each outcome domain was appraised using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) framework. Evidence from randomised trials commenced at high certainty and was downgraded for risk of bias, inconsistency, indirectness, imprecision and suspected publication bias. Indirectness was applied where an outcome was inferred from a proxy measure rather than directly measured, which was frequently the case for mobilisation and breastfeeding. The resulting certainty ratings are presented in Table 25.^{32,36}

Data Synthesis

Quantitative pooling was considered but was judged inappropriate because of substantial clinical heterogeneity across four dimensions: the background analgesic regimen, most critically the presence or absence of long-acting neuraxial opioid; the anatomical technique and local anaesthetic dose; the comparator, which ranged from inert placebo to an alternative active technique; and the measurement instrument and time point for functional outcomes. A structured narrative synthesis was therefore undertaken, supplemented by vote-counting of the direction and statistical significance of effect within each outcome domain and by a pre-specified subgroup analysis stratified by neuraxial opioid status. Statistical significance was interpreted at the conventional two-sided threshold of 0.05 as reported by the original investigators; no additional statistical testing was performed on aggregate data.^{34,35}

RESULTS

Characteristics of Included Studies

The characteristics of all twenty-eight included randomised controlled trials are presented in Table 4, and the detailed analgesic regimens, including the background multimodal therapy that defines the pharmacological context of each comparison, are presented in Table 5. Presentation of the background regimen is analytically essential because it determines whether a given trial tested an addition to, or a substitution for, long-acting neuraxial opioid.^{3,14,32}

Table 4. Characteristics of the twenty-eight included randomised controlled trials

No.	Author (year)	Country	Design	Sample	Population
1	McDonnell et al. (2008)	Ireland	Double-blind, placebo-controlled RCT	50 (25/25)	Elective CS, spinal anaesthesia, Pfannenstiel incision
2	Belavy et al. (2009)	Australia	Double-blind, placebo-controlled RCT	50 randomised, 47 analysed	CS under spinal (bupivacaine + fentanyl), no long-acting neuraxial opioid
3	Costello et al. (2009)	Canada	Double-blind, placebo-controlled RCT	100 randomised, 96 analysed	Elective CS, spinal anaesthesia with intrathecal morphine
4	Kanazi et al. (2010)	Lebanon	Prospective, double-blind RCT	57 (28/29)	Elective CS under spinal anaesthesia
5	Chandon et al. (2014)	France	Multicentre, randomised trial (terminated early)	65 analysed (36/29)	Elective CS, morphine-free spinal anaesthesia

No.	Author (year)	Country	Design	Sample	Population
6	Blanco et al. (2016)	United Arab Emirates	Randomised controlled trial	76	Elective CS under spinal anaesthesia
7	Booth et al. (2016)	USA	Randomised controlled trial	74 randomised, 60 followed to 8 weeks	Elective CS predicted (>80th centile) to have severe evoked pain
8	Bonnal et al. (2016)	France	Randomised non-inferiority trial	77	Elective CS under regional anaesthesia
9	Krohg et al. (2017)	Norway	Randomised, double-blind, controlled trial	40 (20/20)	CS under spinal anaesthesia (bupivacaine + sufentanil), no neuraxial morphine
10	Patel et al. (2017)	Canada	Randomised, double-blind, placebo-controlled trial	204	Elective CS, spinal with bupivacaine, fentanyl and morphine
11	Tawfik et al. (2017)	Egypt	Double-blind randomised controlled trial	80 randomised, 78 analysed	ASA II parturients, elective CS under spinal anaesthesia
12	Staker et al. (2018)	Australia	Prospective, triple-blind, placebo-controlled RCT	100	Elective CS, spinal with bupivacaine, fentanyl 15 µg, morphine 150 µg + rectal diclofenac and paracetamol
13	Kwikiriza et al. (2018)	Uganda	Randomised controlled trial	130 (65/65)	CS at a regional referral hospital, resource-limited setting

No.	Author (year)	Country	Design	Sample	Population
14	Irwin et al. (2019)	Ireland	Prospective, double-blind, placebo-controlled RCT	86 analysed	Elective CS, spinal anaesthesia including intrathecal morphine
15	Teigen et al. (2019)	USA	Randomised controlled trial (ERAS bundle)	118 (58 ERAS / 60 standard)	Non-emergent CS at ≥ 37 weeks
16	Baluku et al. (2020)	Uganda	Prospective, single-blind randomised controlled trial	160 (80/80)	Emergency CS in a low-resource tertiary hospital
17	Nedeljkovic et al. (2020)	USA	Multicentre, randomised, double-blind controlled trial	186 randomised	Elective CS under spinal anaesthesia with intrathecal morphine
18	Sharpe et al. (2020)	USA	Single-centre, double-blind randomised trial	138 randomised, 134 analysed	Scheduled CS under spinal anaesthesia
19	Barney et al. (2020)	USA	Randomised, double-blind, placebo-controlled trial	71 per protocol	Scheduled CS under spinal or CSE anaesthesia with intrathecal morphine
20	Wang et al. (2022)	China	Randomised, double-blind,	160 (4 arms of 40)	Elective CS under combined spinal-epidural anaesthesia, ASA II

No.	Author (year)	Country	Design	Sample	Population
			placebo-controlled trial		
21	Usichenko et al. (2022)	Germany	Placebo-controlled, patient- and assessor-blinded randomised clinical trial	180 analysed (60 acupuncture / 60 placebo / 60 non-randomised standard care)	Elective CS under spinal anaesthesia
22	Guo et al. (2022)	China	Randomised controlled trial	94	Elective CS under spinal anaesthesia
23	Botea et al. (2023)	Romania	Randomised, double-blind trial	190 enrolled, 173 per-protocol	Elective CS under spinal anaesthesia
24	Giral et al. (2024)	France	Prospective, randomised, blinded controlled study	104	Scheduled CS under spinal anaesthesia
25	Urfalı et al. (2024)	Türkiye	Randomised controlled trial (three arms)	120 (40/40/40)	ASA I–II parturients, elective CS under spinal anaesthesia

No.	Author (year)	Country	Design	Sample	Population
26	Jiang et al. (2025)	China	Randomised controlled trial	120 (60/60)	Women undergoing CS
27	Şirin et al. (2025)	Türkiye	Prospective randomised controlled study	82 (41/41)	Elective CS under spinal anaesthesia
28	Park et al. (2025)	Republic of Korea	Randomised non-inferiority clinical trial	80 (40/40)	CS under spinal anaesthesia

CS, caesarean section; ASA, American Society of Anesthesiologists physical status; CSE, combined spinal–epidural.

Table 5. Interventions, comparators, primary endpoints and principal findings of the included trials

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
1	McDonnell 2008	Bilateral TAP block, ropivacaine 1.5 mg/kg per side + PCA morphine, diclofenac, paracetamol	Sham (saline) TAP block + identical multimodal regimen	48-h morphine consumption	48-h morphine 18±14 vs 66±26 mg ($p<0.001$); lower VAS to 48 h; reduced sedation; no block complications
2	Belavy 2009	Ultrasound-guided bilateral TAP block, ropivacaine 0.5% + paracetamol, NSAID, IV PCA morphine	Saline TAP block + identical multimodal regimen	24-h morphine consumption	24-h morphine 18.0 vs 31.5 mg ($p<0.05$); satisfaction VAS 96 vs 77 mm ($p=0.008$); fewer antiemetics ($p=0.03$)

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
3	Costello 2009	Ultrasound-guided TAP block, ropivacaine 0.375% 20 mL per side, added to ITM-based multimodal regimen	Saline TAP block + ITM-based multimodal regimen	VAS on movement at 24 h	VAS on movement 3.4±2.4 vs 3.2±2.2 cm (p=0.47); no difference in supplemental opioid; persistent pain at 6 weeks 8.3%
4	Kanazi 2010	Subarachnoid morphine 0.2 mg + scheduled diclofenac/paracetamol (sham TAP)	Ultrasound-guided TAP block bupivacaine 0.375% + epinephrine (saline intrathecally)	Time to first analgesic request	Time to first analgesic 8 (2–36) vs 4 (0.5–29) h (p=0.005); moderate–severe nausea 46% vs 17% (p=0.02); pruritus 39% vs 0% (p<0.001)
5	Chandon 2014	Ultrasound-guided bilateral TAP block, levobupivacaine 150 mg	Continuous wound infusion of levobupivacaine for 48 h	48-h area under the curve of pain scores	No difference at rest (50 vs 50; p=0.4) or on mobilisation (190 vs 160; p=0.5); morphine use p=0.09; one generalised seizure in TAP arm prompted termination
6	Blanco 2016	Quadratus lumborum (QL) block within a multimodal regimen	Transversus abdominis plane (TAP) block	Postoperative morphine consumption	Significantly lower morphine use with QLB at 12, 24 and 48 h (p<0.05); fewer PCA demands at 6–

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
					48 h; comparable VAS at rest and on movement
7	Booth 2016	Intrathecal morphine 300 µg + scheduled paracetamol 1 g q6h + ibuprofen + IV PCA morphine	Intrathecal morphine 150 µg + placebo tablets + ibuprofen + IV PCA morphine	Pain intensity with movement at 24 h	Movement-evoked VAS 31±17 vs 46±25 mm (p=0.009; 95% CI of difference 4–26 mm); no difference in persistent pain or depression at 8 weeks
8	Bonnal 2016	Patient-controlled oral analgesia (paracetamol, ketoprofen, morphine) commenced 7 h after spinal injection	Nurse-controlled parenteral multimodal analgesia	Mean pain scores at rest and on movement over 48 h	Non-inferiority demonstrated at all time points at rest and on movement; more women used morphine (58% vs 23%; p=0.002); pruritus 37% vs 15% (p=0.03); equivalent maternal satisfaction
9	Krohg 2017	Bilateral ultrasound-guided QL block, ropivacaine 2 mg/mL + paracetamol, ibuprofen, PCA ketobemidone	Saline QL block + identical multimodal regimen	24-h ketobemidone consumption	Ratio of means 0.60 (95% CI 0.37–0.97; p=0.04); better effective analgesia at rest (p<0.01) and on coughing (p<0.01); time to stand and to walk 5 m

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
					recorded as functional endpoints
10	Patel 2017	Intraperitoneal instillation of lidocaine 2% 20 mL with epinephrine before peritoneal/fascial closure	Normal saline 20 mL instillation	Pain score on movement at 24 h	24-h movement pain not different (0.02; 95% CI -0.14 to 0.18); 2-h movement pain lower (-0.58; 95% CI -0.90 to -0.26; p=0.001); fewer requesting opioids 40% vs 65% (RR 0.59; 95% CI 0.43-0.81; p=0.001)
11	Tawfik 2017	Bilateral ultrasound-guided TAP block, bupivacaine 0.25% 20 mL per side + ketorolac, paracetamol, IV PCA fentanyl	Single-shot wound infiltration, bupivacaine 0.25% 15 mL per side + identical regimen	Cumulative fentanyl consumption at 24 h	157.4±63.4 vs 153.3±68.3 µg (difference 4.1; 95% CI -25.6 to 33.8; p=0.8); no difference in rest/movement pain, sedation or satisfaction
12	Staker 2018	Ilioinguinal-transversus abdominis plane (I-TAP) block at end of surgery	Sham block	24-h fentanyl PCA dose	Fentanyl 71.9 (55.6-92.7) vs 179.1 (138.5-231.4) µg (p<0.001); VAS at rest 1.9 vs 5.0 mm (p=0.006) and on movement 4.7 vs 11.3 mm (p=0.001); no

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
					difference in opioid side-effects
13	Kwikiriza 2018	Intrathecal morphine 100 µg + self-administered diclofenac and paracetamol (sham block)	Ultrasound-guided TAP block + identical oral multimodal regimen	Numerical pain rating at 8, 16 and 24 h	ITM superior at 8 h at rest (2.5 vs 3.1; p=0.04); TAP superior at 24 h at rest (2.3 vs 2.9; p=0.01), on coughing (p=0.04) and on movement (p=0.02); similar rescue needs and satisfaction
14	Irwin 2019	Bilateral QL block, levobupivacaine 0.25% 40 mL, added to ITM-based multimodal regimen	Sham block	24-h PCA morphine consumption	12 vs 14 mg (p=0.986); VAS at 6 h lower at rest (6 vs 14 mm; p=0.019) and on movement (23 vs 44 mm; p=0.014); no difference beyond 6 h
15	Teigen 2019	ERAS pathway bundling preoperative counselling, carbohydrate loading, scheduled multimodal analgesia, early feeding, early mobilisation and early catheter removal	Standard perioperative care	Discharge on postoperative day 2	POD2 discharge 8.6% vs 3.3% (OR 2.74; 95% CI 0.51–14.70); median LOS difference -1.92 h (95% CI -3.80 to -0.29); breastfeeding at discharge 67.2% vs 48.3% (p=0.046); earlier

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
					attainment of milestones and higher continued breastfeeding at 6 weeks
16	Baluku 2020	Modified ERAS: counselling, antibiotics, antiemetics, normothermia, restrictive fluids, multimodal analgesia, early mobilisation, early feeding, early catheter removal	Standard of care recovery	Length of hospital stay	LOS -18.5 h (95% CI -23.67 to -13.34; $p<0.001$); lower incidence of severe pain and headache ($p=0.001$ for both); pruritus more frequent in ERAS arm ($p=0.023$)
17	Nedeljkovic 2020	TAP block with liposomal bupivacaine 266 mg + bupivacaine HCl 50 mg	TAP block with bupivacaine HCl 50 mg alone	Total opioid consumption (oral morphine equivalents) through 72 h	72-h MED 15.5 vs 32.0 mg; treatment difference -16.5 mg (95% CI -30.8 to -2.2; $p=0.012$) in the protocol-compliant set; non-inferior pain AUC ($p=0.002$); no difference in the all-treated analysis
18	Sharpe 2020	Intrathecal morphine 150 µg within a multimodal analgesic regimen	Intrathecal hydromorphone 75 µg within the same regimen	Numerical rating scale for pain with	Movement pain 3 (2–4.5) vs 4 (3–5); estimated difference 0.5 (95% CI 0–1; $p=0.139$); 24-h opioid

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
				movement at 24 h	MED 22.5 vs 30 mg (p=0.769); median time to first opioid 12.1 vs 5.4 h (p=0.200)
19	Barney 2020	Continuous wound infusion of ropivacaine 0.2% plus ketorolac for 48 h	Saline placebo infusion	Pain score with movement at 24 h	No difference in movement pain at 24 h (median difference 0; 95% CI -1 to 2; p=0.94), total opioid use (p=0.11) or time to rescue analgesia (HR 0.69; 95% CI 0.41–1.17)
20	Wang 2022	Esketamine (low, medium, high dose) combined with sufentanil for patient-controlled intravenous analgesia	Sufentanil PCIA alone	48-h sufentanil consumption and incidence of postpartum depression	Dose-dependent reduction in sufentanil consumption, effective presses and rescue analgesia (p<0.05); lower postpartum depression at 1 and 6 weeks (p<0.01); reduced nausea and vomiting (p<0.05)
21	Usichenko 2022	Auricular and body acupuncture with indwelling intradermal needles added to	Non-penetrating placebo needles; separate standard-care group	Pain intensity on movement (11-point	Movement pain POD1 4.7±1.8 vs 6.0±2.0 (Cohen d 0.73; p=0.001); full mobilisation POD1 98%

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
		standard multimodal analgesia		verbal rating scale)	vs 83% (RR 1.18; 95% CI 1.06–1.33; p=0.01) and vs 58% for standard care (RR 1.69; 95% CI 1.36–2.09; p<0.001); catheter removed in 93% vs 72% (RR 1.33; 95% CI 1.12–1.57; p=0.003)
22	Guo 2022	Bilateral anterior QL block at the lateral supra-arcuate ligament (QLB-LSAL), ropivacaine 0.375% 20 mL per side	Bilateral transmuscular QL block, identical local anaesthetic	24-h sufentanil consumption	Sufentanil 29.4±5.7 vs 39.4±9.6 µg (p<0.001); time to first PCA request 10.9±4.1 vs 6.7±1.8 h (p<0.001); comparable pain scores, satisfaction and PONV
23	Botea 2023	Intrathecal morphine 100 µg added to bupivacaine	Intrathecal fentanyl 25 µg added to bupivacaine	Perioperative pain at rest and on mobilisation over 72 h, satisfaction and adverse effects	Morphine gave better analgesia and satisfaction (p<0.001) with less rescue medication (OR 4.396 for fentanyl; p=0.019); fentanyl produced less high-intensity pruritus (p<0.001), nausea (OR 0.324; p=0.019) and

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
					dizziness at first mobilisation (OR 0.256; $p<0.001$)
24	Giral 2024	Bilateral posterior QL block within a multimodal analgesic regimen	Intrathecal morphine within the same regimen	24-h cumulative intravenous morphine consumption	13.7 (97.5% CI 10.4–16.9) vs 11.1 (97.5% CI 8.4–13.8) mg ($p=0.111$); better ObsQoR-11 functional recovery at 24 h with QLB ($p=0.009$); pain on cough at 6 h favoured QLB ($p=0.013$); pruritus 2% vs 35%
25	Urfalı 2024	Ultrasound-guided TAP block with bupivacaine 0.5% plus dexmedetomidine 1 µg/kg, or plus dexamethasone 4 mg	Ultrasound-guided TAP block with bupivacaine 0.5% alone	VAS in sitting and supine positions over 24 h and tramadol consumption	At 24 h, VAS sitting 1.7 ± 1.2 and supine 1.43 ± 1.05 with dexamethasone vs 2.3 ± 0.68 / 2.2 ± 0.72 (bupivacaine) and 2.57 ± 1.01 / 2.28 ± 0.78 (dexmedetomidine) ($p=0.005$ and $p=0.001$); higher satisfaction with dexamethasone ($p=0.009$);

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
					more early PONV and tramadol at 0 h
26	Jiang 2025	Structured Manchester Pain Management Model combined with empowerment education integrated into postoperative care	Standard postoperative nursing care	VAS pain scores and postoperative recovery indicators	Lower VAS at 4, 12 and 24 h; earlier first independent out-of-bed activity; earlier first flatus; shorter hospital stay (all $p<0.05$); higher first-breastfeeding success rate and nursing satisfaction ($p<0.01$)
27	Şirin 2025	Bilateral T10 erector spinae plane block, bupivacaine 0.25% 20 mL + paracetamol, tramadol PCA, rescue diclofenac	Intrathecal morphine 100 µg + identical systemic regimen	24-h opioid (tramadol) consumption	24-h tramadol 75 (40–140) vs 50 (27.5–60) mg ($p=0.008$), higher in ESPB; NRS ≤ 4 in both arms at all time points; no adverse effects in the ESPB arm versus nausea, vomiting and pruritus with ITM
28	Park 2025	Bilateral TAP block (ropivacaine 0.375% 15 mL per side) + intrathecal fentanyl 10 µg	Intrathecal morphine 75 µg + sham block	Pain on movement at 24 h (non-inferiority)	5.4 vs 4.8; mean difference 0.6 (95% CI -0.3 to 1.5; $p=0.202$) — non-inferiority not demonstrated; higher

No.	Study	Intervention	Comparator	Primary endpoint	Principal findings
				margin 1 NRS point)	fentanyl consumption (585 vs 140 µg; p<0.001); pruritus 10% vs 60% (p<0.001)

ITM, intrathecal morphine; TAP, transversus abdominis plane; QL, quadratus lumborum; ESP, erector spinae plane; PCA, patient-controlled analgesia; PCIA, patient-controlled intravenous analgesia; MED, oral morphine equivalent dose; VAS, visual analogue scale; NRS, numerical rating scale; ObsQoR-11, Obstetric Quality of Recovery-11.

Synthesis of Results by Outcome Domain

The results of the sixteen pre-specified outcome domains are presented sequentially below. For each domain the extracted trial-level data are tabulated and followed by a narrative interpretation that integrates direction of effect, statistical significance, magnitude and the pharmacological context in which the effect was observed.³⁶

Early Mobilisation and Functional Ambulation (Co-Primary Outcome)

Early mobilisation was the outcome most directly aligned with the objective of this review and was addressed, whether directly or through validated proxies, in nine of the twenty-eight included trials. The most methodologically robust direct evidence came from a placebo-controlled, patient- and assessor-blinded trial in which an analgesic adjunct was layered onto a standard multimodal regimen after elective caesarean section under spinal anaesthesia. On the first postoperative day, 98% of women in the adjunct arm were fully mobilised compared with 83% in the placebo arm, yielding a risk ratio of 1.18 with a 95% confidence interval of 1.06 to 1.33 and a p value of 0.01. The comparison against a concurrent standard-care group was more striking still, with only 58% fully mobilised, giving a risk ratio of 1.69 and a 95% confidence interval of 1.36 to 2.09 at p less than 0.001. This is a statistically significant and clinically substantial effect on a hard functional endpoint,

and it is notable that the accompanying reduction in movement-evoked pain, from 6.0 to 4.7 points, was of moderate effect size at a Cohen d of 0.73.²¹

A second line of evidence derives from trials in which mobilisation was assessed as a functional secondary endpoint alongside opioid-sparing. In the quadratus lumborum block trial conducted without neuraxial morphine, time until the patient was able to stand and to walk five metres was pre-specified as an exploratory functional outcome and was recorded in parallel with a 40% reduction in 24-hour opioid consumption, expressed as a ratio of means of 0.60 with a 95% confidence interval of 0.37 to 0.97. The structured post-caesarean pain-management model likewise demonstrated a significantly shorter time to first independent out-of-bed activity at p less than 0.05, an effect accompanied by lower pain scores at four, twelve and twenty-four hours. In the posterior quadratus lumborum trial, functional recovery measured by the Obstetric Quality of Recovery-11 instrument, which incorporates mobilisation items, was significantly superior at 24 hours with a p value of 0.009 despite equivalent cumulative morphine consumption, indicating that functional recovery and opioid consumption are not interchangeable endpoints.^{9,24,26}

Bundle-level trials provide the third line of evidence. In the emergency caesarean ERACS trial conducted in a low-resource setting, early mobilisation was a protocolised element of the pathway and the bundle reduced length of stay by 18.5 hours with a 95% confidence interval of -23.67 to -13.34 at p less than 0.001, an effect that is mechanistically inseparable from earlier ambulation. In the North American ERACS trial, women randomised to the pathway were significantly more likely to report at six weeks that they had achieved their postoperative milestones earlier. An important counter-signal arises from the comparison of intrathecal morphine with intrathecal fentanyl, in which dizziness at first mobilisation was significantly less frequent with fentanyl at an odds ratio of 0.256 and p less than 0.001, demonstrating that the agent providing the best static analgesia is not necessarily the agent that best enables the first ambulation attempt.^{15,16,23}

Taken together, the vote-count for this domain is four trials demonstrating a statistically significant benefit of enhanced multimodal analgesia on mobilisation or a validated mobilisation proxy, four demonstrating a consistent favourable direction without formal significance testing of the mobilisation endpoint itself, and one demonstrating a mobilisation-specific disadvantage of neuraxial

morphine attributable to vestibular and gastrointestinal adverse effects rather than to inadequate analgesia. No included trial reported that enhanced multimodal analgesia delayed mobilisation. The primary hypothesis of this review is therefore supported.^{9,15,16,21,23,24,26}

Table 6. Time to First Mobilisation and Functional Ambulation

Study (ref.)	Comparison	Mobilisation metric and result	Direction of effect
Krohg 2017 ⁹	QL block vs sham	Time until able to stand and to walk 5 m recorded as pre-specified functional endpoints; earlier attainment paralleled the 40% reduction in opioid requirement	Favours QL block
Usichenko 2022 ²¹	Acupuncture adjunct vs placebo	Fully mobilised on POD1: 59/60 (98%) vs 49/59 (83%); RR 1.18 (95% CI 1.06–1.33), p=0.01	Favours adjunct (significant)
Usichenko 2022 ²¹	Acupuncture adjunct vs standard care	Fully mobilised on POD1: 98% vs 35/60 (58%); RR 1.69 (95% CI 1.36–2.09), p<0.001	Favours adjunct (significant)
Baluku 2020 ¹⁶	ERACS bundle vs standard care	Early mobilisation protocolised within the bundle; associated with an 18.5-h reduction in length of stay (p<0.001)	Favours ERACS (significant)
Teigen 2019 ¹⁵	ERACS bundle vs standard care	Women reported achieving postoperative milestones, including ambulation, earlier at the 6-week survey	Favours ERACS
Jiang 2025 ²⁶	Structured pain-management model vs usual care	Time to first independent out-of-bed activity significantly shorter (p<0.05)	Favours intervention (significant)

Study (ref.)	Comparison	Mobilisation metric and result	Direction of effect
Giral 2024 ²⁴	Posterior QL block vs intrathecal morphine	ObsQoR-11, which incorporates mobilisation items, higher at 24 h with QL block (p=0.009)	Favours QL block (significant)
Botea 2023 ²³	Intrathecal morphine vs fentanyl	Dizziness at first mobilisation less frequent with fentanyl (OR 0.256, p<0.001), indicating a mobilisation-limiting effect of neuraxial morphine	Mixed
McDonnell 2008 ¹	TAP block vs sham	Reduced sedation incidence, a recognised prerequisite for safe early ambulation	Favours TAP block

QL, *quadratus lumborum*; TAP, *transversus abdominis plane*; POD, *postoperative day*; RR, *risk ratio*; OR, *odds ratio*; ObsQoR-11, *Obstetric Quality of Recovery-11*.

Movement-Evoked Pain at Twenty-Four Hours

Movement-evoked pain is the pain construct most tightly coupled to ambulation and lactation positioning and was reported in twelve included trials. The pattern of results is decisively bimodal and is explained by the background regimen. In trials where the background regimen did not contain long-acting neuraxial opioid, abdominal wall blockade produced large and statistically significant reductions: the ilioinguinal–transversus abdominis plane block reduced averaged movement-evoked visual analogue scores from 11.3 to 4.7 millimetres at p equal to 0.001, and the transversus abdominis plane block trials of 2008 and 2009 demonstrated consistently lower scores throughout the first 48 hours.^{1,2,12}

By contrast, in trials where intrathecal morphine was already present, the addition of a fascial plane block produced no measurable benefit at 24 hours. The transversus abdominis plane block added to an intrathecal morphine regimen yielded movement-evoked scores of 3.4 versus 3.2 centimetres at p equal to 0.47, and the quadratus lumborum block added to an equivalent regimen conferred a benefit that was confined to the six-hour time point, at 23 versus 44 millimetres and p

equal to 0.014, with complete convergence thereafter. Wound infusion with ropivacaine and ketorolac superimposed on intrathecal morphine similarly produced a median difference of zero at p equal to 0.94.^{3,14,19}

Where the background regimen itself was optimised, significant benefit was recoverable even in the presence of neuraxial opioid. Increasing intrathecal morphine from 150 to 300 micrograms and adding scheduled systemic paracetamol reduced movement-evoked pain at 24 hours from 46 to 31 millimetres, a mean difference of 15 millimetres with a 95% confidence interval of 4 to 26 and a p value of 0.009, in a population pre-selected as being at high risk of severe evoked pain. Adding dexamethasone to a transversus abdominis plane block reduced 24-hour sitting scores from 2.3 to 1.7 at p equal to 0.005. Conversely, attempts to replace intrathecal morphine entirely, whether with an erector spinae plane block or with a transversus abdominis plane block combined with intrathecal fentanyl, failed to demonstrate non-inferiority, with the latter yielding a mean difference of 0.6 and an upper confidence limit of 1.5 that crossed the pre-specified margin.^{7,25,27,28}

Table 7. Movement-Evoked (Dynamic) Pain Intensity at 24 Hours

Study (ref.)	Comparison	Result at 24 h on movement	p value
Booth 2016 ⁷	ITM 300 µg + paracetamol vs ITM 150 µg	31±17 vs 46±25 mm VAS (difference 15 mm; 95% CI 4–26)	0.009
Staker 2018 ¹²	I-TAP block vs sham (with ITM)	4.7 (4.1–5.5) vs 11.3 (9.9–13.0) mm VAS, averaged across time points	0.001
Costello 2009 ³	TAP block vs sham (with ITM)	3.4±2.4 vs 3.2±2.2 cm VAS	0.47
Irwin 2019 ¹⁴	QL block vs sham (with ITM)	No difference at 24 h; benefit confined to 6 h (23 vs 44 mm; $p=0.014$)	>0.05 at 24 h
Barney 2020 ¹⁹	Ropivacaine–ketorolac wound infusion vs saline	Median difference 0 (95% CI –1 to 2)	0.94

Study (ref.)	Comparison	Result at 24 h on movement	p value
Sharpe 2020 ¹⁸	ITM 150 µg vs hydromorphone 75 µg	3 (2–4.5) vs 4 (3–5) NRS; estimated difference 0.5 (95% CI 0–1)	0.139
Park 2025 ²⁸	TAP + intrathecal fentanyl vs ITM	5.4 vs 4.8 NRS; mean difference 0.6 (95% CI –0.3 to 1.5); non-inferiority not met	0.202
Kwikiriza 2018 ¹³	ITM vs TAP block	3.9 vs 3.4 NRS at 24 h on movement, favouring TAP	0.02
Patel 2017 ¹⁰	Intraperitoneal lidocaine vs saline	0.02 (95% CI –0.14 to 0.18) at 24 h; –0.58 (95% CI –0.90 to –0.26) at 2 h	0.823 at 24 h; 0.001 at 2 h
Blanco 2016 ⁶	QL vs TAP block	No difference in VAS at rest or on movement despite lower opioid use	>0.05
Urfalı 2024 ²⁵	TAP + dexamethasone vs TAP alone	1.7±1.2 vs 2.3±0.68 (sitting) at 24 h	0.005
Şirin 2025 ²⁷	ESP block vs ITM	NRS ≤4 in both arms at every time point	>0.05

ITM, intrathecal morphine; I-TAP, ilioinguinal–transversus abdominis plane; ESP, erector spinae plane; VAS, visual analogue scale; NRS, numerical rating scale.

Pain at Rest

Resting pain is a less demanding construct than movement-evoked pain and consequently discriminated less sharply between regimens, yet the same conditional pattern was evident across the ten trials reporting it. In morphine-free regimens, fascial plane blockade produced significant reductions at rest, with the ilioinguinal–transversus abdominis plane block reducing averaged resting scores from 5.0 to 1.9 millimetres at p equal to 0.006 and the quadratus lumborum block producing superior effective analgesia scores at rest across the full 24-hour period at p less than 0.01. In regimens

containing intrathecal morphine, the resting benefit of an added block was confined to the early postoperative window, disappearing by six to twelve hours.^{9,12,14}

Two head-to-head comparisons illustrate the time-dependent trade-off between neuraxial and regional strategies. In the resource-limited setting trial, intrathecal morphine was significantly superior at eight hours with resting scores of 2.5 versus 3.1 at p equal to 0.04, whereas the transversus abdominis plane block was significantly superior at 24 hours with scores of 2.3 versus 2.9 at p equal to 0.01, reflecting the differing pharmacokinetic profiles of a single intrathecal bolus and a peripheral local anaesthetic deposit. Comparisons of a block against wound infiltration or continuous wound infusion showed no significant differences at rest at any time point, indicating that the site of local anaesthetic deposition matters less than whether local anaesthetic is delivered at all.^{5,11,13}

Table 8. Pain at Rest (Static Pain) During the First 24–48 Hours

Study (ref.)	Comparison	Result at rest	p value
McDonnell 2008 ¹	TAP block vs sham	Consistently lower VAS at every assessment to 48 h	<0.05
Staker 2018 ¹²	I-TAP vs sham	1.9 (1.5–2.3) vs 5.0 (4.3–5.9) mm	0.006
Irwin 2019 ¹⁴	QL block vs sham	6 vs 14 mm at 6 h; no difference thereafter	0.019 at 6 h
Krohg 2017 ⁹	QL block vs sham	Effective analgesic scores superior at rest across 24 h	<0.01
Kwikiriza 2018 ¹³	ITM vs TAP	2.5 vs 3.1 at 8 h (ITM better); 2.9 vs 2.3 at 24 h (TAP better)	0.04; 0.01
Tawfik 2017 ¹¹	TAP vs wound infiltration	No difference at any time point	>0.05
Chandon 2014 ⁵	TAP vs continuous wound infusion	48-h AUC 50 (22.5–80) vs 50 (27.5–130)	0.4

Study (ref.)	Comparison	Result at rest	p value
Jiang 2025 ²⁶	Structured model vs usual care	Lower VAS at 4, 12 and 24 h	<0.05
Botea 2023 ²³	ITM vs intrathecal fentanyl	Superior pain control with morphine at rest and on mobilisation over 72 h	<0.001
Urfalı 2024 ²⁵	TAP + dexamethasone vs TAP alone	1.43±1.05 vs 2.2±0.72 (supine) at 24 h	0.001

AUC, area under the curve of pain scores over time.

Cumulative Opioid Consumption

Opioid-sparing was the most frequently reported and most consistently significant outcome in this review, addressed by sixteen trials. In regimens without long-acting neuraxial opioid, the magnitude of sparing was large. The transversus abdominis plane block reduced 48-hour morphine from 66 to 18 milligrams at p less than 0.001, a relative reduction of 73%, and reduced 24-hour morphine from a median of 31.5 to 18.0 milligrams at p less than 0.05 in a separate trial. The ilioinguinal–transversus abdominis plane block reduced 24-hour fentanyl from 179.1 to 71.9 micrograms at p less than 0.001. The quadratus lumborum block reduced 24-hour opioid consumption with a ratio of means of 0.60 at p equal to 0.04. In head-to-head regional comparisons, the quadratus lumborum block outperformed the transversus abdominis plane block at 12, 24 and 48 hours, and the anterior quadratus lumborum approach at the lateral supra-arcuate ligament reduced 24-hour sufentanil from 39.4 to 29.4 micrograms at p less than 0.001.^{1,2,6,9,12,22}

Two pharmacological strategies extended opioid-sparing beyond the duration of a conventional single-shot block. Liposomal bupivacaine added to bupivacaine hydrochloride in a transversus abdominis plane block reduced 72-hour oral morphine equivalents from 32.0 to 15.5 milligrams, a treatment difference of –16.5 milligrams with a 95% confidence interval of –30.8 to –2.2 at p equal to 0.012 in the protocol-compliant analysis set, although this benefit was not reproduced in the all-treated analysis, a discrepancy the investigators attributed to block placement technique. Esketamine combined with sufentanil for patient-controlled intravenous analgesia

produced a dose-dependent reduction in 48-hour sufentanil consumption, effective demand presses and rescue analgesia at p less than 0.05.^{17,20}

Null results in this domain again cluster in the neuraxial opioid stratum. Adding a block to an intrathecal morphine regimen did not reduce opioid consumption in either the transversus abdominis plane or the quadratus lumborum trials, with the latter reporting 12 versus 14 milligrams at p equal to 0.986. Comparison of two neuraxial opioids yielded equivalent consumption at 22.5 versus 30.0 milligrams and p equal to 0.769. Substitution of intrathecal morphine by a peripheral technique consistently increased opioid requirement, by 25 milligrams of tramadol at p equal to 0.008 for the erector spinae plane block and by more than fourfold for the combination of transversus abdominis plane block with intrathecal fentanyl at p less than 0.001. Notably, the complete ERACS bundle did not reduce inpatient opioid consumption in the randomised setting, with 117.16 versus 119.38 morphine milligram equivalents, even though it improved length of stay and breastfeeding, indicating that bundle benefit is not mediated exclusively by opioid reduction.^{3,14,15,18,27,28}

Table 9. Cumulative Opioid Consumption (Opioid-Sparing Effect)

Study (ref.)	Comparison	Opioid consumption	p value
McDonnell 2008 ¹	TAP vs sham	48-h morphine 18±14 vs 66±26 mg	<0.001
Belavy 2009 ²	TAP vs sham	24-h morphine 18.0 vs 31.5 mg (medians)	<0.05
Staker 2018 ¹²	I-TAP vs sham	24-h fentanyl 71.9 (55.6–92.7) vs 179.1 (138.5–231.4) µg	<0.001
Krohg 2017 ⁹	QL vs sham	24-h ketobemidone, ratio of means 0.60 (95% CI 0.37–0.97)	0.04
Blanco 2016 ⁶	QL vs TAP	Lower morphine at 12, 24 and 48 h with QL block	<0.05
Guo 2022 ²²	QLB-LSAL vs transmuscular QLB	24-h sufentanil 29.4±5.7 vs 39.4±9.6 µg	<0.001

Study (ref.)	Comparison	Opioid consumption	p value
Nedeljkovic 2020 ¹⁷	Liposomal + HCl bupivacaine TAP vs HCl alone	72-h MED 15.5 vs 32.0 mg; difference -16.5 mg (95% CI -30.8 to -2.2)	0.012
Wang 2022 ²⁰	Esketamine + sufentanil vs sufentanil	Dose-dependent reduction in 48-h sufentanil and rescue analgesia	<0.05
Costello 2009 ³	TAP vs sham (with ITM)	No difference in supplemental opioid	>0.05
Irwin 2019 ¹⁴	QL vs sham (with ITM)	24-h PCA morphine 12 vs 14 mg	0.986
Tawfik 2017 ¹¹	TAP vs infiltration	24-h fentanyl 157.4±63.4 vs 153.3±68.3 µg	0.8
Sharpe 2020 ¹⁸	ITM vs hydromorphone	24-h MED 22.5 vs 30.0 mg	0.769
Park 2025 ²⁸	TAP + fentanyl vs ITM	Fentanyl 585 (390–745) vs 140 (55–405) µg	<0.001
Şirin 2025 ²⁷	ESP block vs ITM	24-h tramadol 75 (40–140) vs 50 (27.5–60) mg	0.008
Teigen 2019 ¹⁵	ERACS vs standard care	117.16±54.17 vs 119.38±47.98 MME (mean difference -2.22)	>0.05
Patel 2017 ¹⁰	Intraperitoneal lidocaine vs saline	Women requesting opioid 40% vs 65%; RR 0.59 (95% CI 0.43–0.81)	0.001

MED/MME, oral morphine equivalent dose; PCA, patient-controlled analgesia.

Time to First Rescue Analgesic Request

Time to first rescue analgesia is the endpoint that most directly captures the duration of a technique and was reported in six trials. Subarachnoid morphine doubled the median time to first analgesic request relative to a transversus abdominis plane block, at eight versus four hours with p

equal to 0.005, consistent with the prolonged cephalad spread of hydrophilic neuraxial opioid. The anterior quadratus lumborum approach at the lateral supra-arcuate ligament extended the interval to first patient-controlled analgesia demand from 6.7 to 10.9 hours at p less than 0.001, a difference of more than four hours that has direct operational relevance for the timing of the first mobilisation attempt.^{4,22}

Comparisons between neuraxial opioids and between wound-based techniques showed numerically longer intervals without statistical significance: 12.1 versus 5.4 hours for intrathecal morphine versus hydromorphone at p equal to 0.200, and a hazard ratio of 0.69 with a 95% confidence interval of 0.41 to 1.17 for wound infusion versus saline. The addition of dexamethasone to a transversus abdominis plane block produced a distinctive temporal signature, with a higher early tramadol requirement at the zero-hour time point at p equal to 0.005 but significantly lower pain and higher satisfaction at 24 hours, reflecting the delayed onset and prolonged duration characteristic of perineural corticosteroid adjuvants.^{18,19,25}

Table 10. Time to First Rescue Analgesic Request

Study (ref.)	Comparison	Time to first request	p value
Kanazi 2010 ⁴	Subarachnoid morphine vs TAP block	8 (2–36) vs 4 (0.5–29) h	0.005
Guo 2022 ²²	QLB-LSAL vs transmuscular QLB	10.9±4.1 vs 6.7±1.8 h	<0.001
Sharpe 2020 ¹⁸	ITM vs hydromorphone	12.1 vs 5.4 h (Kaplan–Meier medians)	0.200
Barney 2020 ¹⁹	Wound infusion vs saline	954 (244–1710) vs 660 (9–1496) min; HR 0.69 (95% CI 0.41–1.17)	0.16
Tawfik 2017 ¹¹	TAP vs wound infiltration	No significant difference	>0.05
Urfalı 2024 ²⁵	TAP + dexamethasone vs TAP alone	Delayed onset but prolonged duration; higher tramadol requirement at 0 h	0.005 at 0 h

HR, hazard ratio.

Breastfeeding Initiation and In-Hospital Success (Co-Primary Outcome)

Breastfeeding was formally reported as a trial outcome in only a minority of the included randomised trials, a finding that is itself the single most important observation in this domain. Where it was measured, the direction and magnitude of effect were favourable and statistically significant. In the randomised ERACS trial, breastfeeding at hospital discharge was achieved by 67.2% of women in the pathway arm compared with 48.3% in the standard-care arm, a difference of 18.9 percentage points at p equal to 0.046. This corresponds to a number needed to treat of approximately five to six women for one additional mother breastfeeding at discharge, an effect size that compares favourably with dedicated lactation-support interventions.^{15,47,48}

The structured post-caesarean pain-management model, which combined a formalised pain assessment and treatment algorithm with empowerment education, significantly increased the success rate of the first breastfeeding attempt at p less than 0.01, and did so in the same trial in which time to first independent out-of-bed activity and time to first flatus were both significantly shortened. The temporal coupling of these three endpoints within a single trial is mechanistically informative: it suggests that a mother who mobilises earlier and whose gastrointestinal function returns earlier is also the mother who feeds successfully earlier, and that these are manifestations of a single underlying recovery trajectory rather than independent outcomes.²⁶

Indirect but consistent support comes from trials that did not measure breastfeeding but that reduced the specific adverse effects known to obstruct it. Reduction of severe pain in the emergency ERACS trial at p equal to 0.001, reduction of nausea, vomiting and dizziness at first mobilisation with intrathecal fentanyl at p less than 0.001, and reduction of sedation with transversus abdominis plane blockade all remove recognised barriers to the sustained upright positioning, sustained alertness and skin-to-skin contact that breastfeeding initiation requires. Several trial reports, including the quadratus lumborum and erector spinae plane trials, explicitly cite ambulation and mother–infant interaction as the justification for opioid-sparing analgesia yet did not measure either.^{1,6,16,23,27}

Table 11. Breastfeeding Initiation and In-Hospital Breastfeeding Success

Study (ref.)	Comparison	Breastfeeding result	p value
Teigen 2019 ¹⁵	ERACS bundle vs standard care	Breastfeeding at discharge 39/58 (67.2%) vs 29/60 (48.3%)	0.046
Jiang 2025 ²⁶	Structured pain-management model vs usual care	Significantly higher success rate of the first breastfeeding attempt	<0.01
Baluku 2020 ¹⁶	ERACS bundle vs standard care	Early feeding and mobilisation protocolised; reduced severe pain (p=0.001) supporting maternal–infant contact	0.001 for severe pain
Blanco 2016 ⁶	QL vs TAP block	Improved early recovery, ambulation and breastfeeding cited as the rationale for effective post-caesarean analgesia	Not formally tested
Şirin 2025 ²⁷	ESP block vs ITM	Mother–infant communication identified as a primary justification for opioid-sparing analgesia	Not formally tested
Botea 2023 ²³	ITM vs intrathecal fentanyl	Fewer episodes of nausea, vomiting and dizziness at first mobilisation with fentanyl, facilitating early feeding	<0.001

Breastfeeding was formally reported as a trial outcome in only a minority of the included randomised controlled trials.

Continued and Exclusive Breastfeeding Beyond Discharge

Longer-term breastfeeding data were sparse. The randomised ERACS trial followed women to six weeks postpartum and reported a higher rate of continued breastfeeding in the pathway arm together with greater fulfilment of maternal expectations, although the trial was not powered for this

endpoint. No included trial reported exclusive breastfeeding rates at three or six months, the intervals of greatest public health relevance.¹⁵

Two trials addressed determinants of breastfeeding persistence rather than breastfeeding itself. Esketamine added to sufentanil produced a dose-dependent reduction in postpartum depression at both one and six weeks at p less than 0.01; given that postpartum depression is among the strongest predictors of early breastfeeding cessation, this constitutes plausible indirect support for a sustained lactation benefit of opioid-sparing analgesia. Conversely, high-dose intrathecal morphine combined with systemic paracetamol produced no difference in persistent pain or depression at eight weeks despite significantly better acute analgesia, indicating that acute pain control alone does not guarantee downstream psychological benefit.^{7,20,41}

Table 12. Continued and Exclusive Breastfeeding Beyond Discharge

Study (ref.)	Comparison	Result	Follow-up interval
Teigen 2019 ¹⁵	ERACS vs standard care	Higher rate of reported continued breastfeeding in the ERACS arm	6 weeks postpartum
Teigen 2019 ¹⁵	ERACS vs standard care	Greater likelihood that maternal expectations were met and milestones achieved earlier	6 weeks postpartum
Wang 2022 ²⁰	Esketamine–sufentanil PCIA vs sufentanil	Lower postpartum depression at 1 and 6 weeks ($p < 0.01$), an established determinant of lactation persistence	1 and 6 weeks
Booth 2016 ⁷	High-dose ITM + paracetamol vs standard ITM	No difference in persistent pain or depression, both of which mediate breastfeeding cessation	8 weeks

PCIA, patient-controlled intravenous analgesia.

Quality of Recovery and Maternal Satisfaction

Nine trials reported a validated quality of recovery instrument or a satisfaction measure. The Obstetric Quality of Recovery-11 score was significantly superior at 24 hours with the posterior quadratus lumborum block compared with intrathecal morphine at p equal to 0.009, despite statistically equivalent cumulative morphine consumption of 13.7 versus 11.1 milligrams at p equal to 0.111. This dissociation is a central finding: it demonstrates that a functional recovery instrument can detect benefit invisible to opioid-consumption endpoints, and it directly supports the inclusion of quality of recovery in the ERACS core outcome set.^{24,36}

Satisfaction was significantly higher with an effective transversus abdominis plane block at 96 versus 77 millimetres and p equal to 0.008, with the addition of perineural dexamethasone at p equal to 0.009, with intrathecal morphine relative to intrathecal fentanyl at p less than 0.001, and with both ERACS bundle and structured pain-management interventions. Two important negative findings temper this pattern. The ilioinguinal–transversus abdominis plane block produced markedly superior analgesia and opioid-sparing yet no difference in maternal satisfaction, and a self-administered patient-controlled oral analgesia pathway achieved satisfaction equivalent to nurse-controlled parenteral analgesia. Satisfaction is therefore a composite construct governed by autonomy, information and adverse-effect burden as much as by pain intensity.^{2,8,12,15,23,25,26}

Table 13. Quality of Recovery and Maternal Satisfaction

Study (ref.)	Comparison	Instrument and result	p value
Giral 2024 ²⁴	Posterior QL block vs ITM	ObsQoR-11 superior at 24 h with QL block	0.009
Belavy 2009 ²	TAP vs sham	Satisfaction VAS 96 vs 77 mm	0.008
Urfalı 2024 ²⁵	TAP + dexamethasone vs TAP alone	Higher satisfaction scores	0.009
Botea 2023 ²³	ITM vs intrathecal fentanyl	Higher overall satisfaction with morphine	<0.001

Study (ref.)	Comparison	Instrument and result	p value
Teigen 2019 ¹⁵	ERACS vs standard care	Greater satisfaction and expectation fulfilment at 6 weeks	<0.05
Jiang 2025 ²⁶	Structured model vs usual care	Higher nursing satisfaction score	<0.01
Staker 2018 ¹²	I-TAP vs sham	No difference in maternal satisfaction despite superior analgesia	>0.05
Bonnal 2016 ⁸	Patient-controlled oral vs parenteral analgesia	Equivalent maternal satisfaction with a self-administered oral pathway	>0.05
Kwikiriza 2018 ¹³	ITM vs TAP	Majority in both arms rated satisfaction good or excellent	>0.05

ObsQoR-11, Obstetric Quality of Recovery-11 questionnaire.

Postoperative Nausea and Vomiting

Eight trials reported nausea and vomiting. The dominant determinant was the opioid burden of the regimen rather than the presence or absence of a block. Subarachnoid morphine produced moderate to severe nausea in 46% of women compared with 17% receiving a transversus abdominis plane block at p equal to 0.02, and intrathecal fentanyl produced significantly less nausea than intrathecal morphine at an odds ratio of 0.324 and p equal to 0.019. Effective abdominal wall blockade reduced antiemetic requirement at p equal to 0.03, and esketamine significantly reduced nausea and vomiting in all dose arms at p less than 0.05.^{2,4,20,23}

One counterintuitive finding merits emphasis. Adding dexamethasone to a transversus abdominis plane block, an intervention ordinarily expected to reduce emesis, was associated with a higher incidence of nausea and vomiting at the zero-hour time point of 17.5% versus 0% at p equal to 0.003, alongside a higher immediate tramadol requirement, before conferring significant analgesic superiority at 24 hours. This time-dependent reversal is consistent with the delayed onset of perineural corticosteroid effect and cautions against evaluating adjuvants at a single time point. Nausea and

vomiting are of specific consequence in this population because a vomiting mother cannot maintain the sustained upright posture that both ambulation and breastfeeding require.^{25,29}

Table 14. Postoperative Nausea and Vomiting

Study (ref.)	Comparison	Result	p value
Kanazi 2010 ⁴	Subarachnoid morphine vs TAP	Moderate–severe nausea 13/28 (46%) vs 5/29 (17%)	0.02
Belavy 2009 ²	TAP vs sham	Fewer patients required antiemetics	0.03
Wang 2022 ²⁰	Esketamine–sufentanil vs sufentanil	Significantly reduced nausea and vomiting in all esketamine arms	<0.05
Botea 2023 ²³	ITM vs fentanyl	Nausea less frequent with fentanyl (OR 0.324)	0.019
Urfalı 2024 ²⁵	TAP + dexamethasone vs TAP alone	Higher early (0 h) nausea and vomiting with dexamethasone: 17.5% vs 0%	0.003
Guo 2022 ²²	QLB-LSAL vs transmuscular QLB	No between-group difference	>0.05
Staker 2018 ¹²	I-TAP vs sham	No difference in opioid-related adverse effects	>0.05
Şirin 2025 ²⁷	ESP vs ITM	Nausea and vomiting in 3 ITM patients; none in ESP arm	Descriptive

Pruritus

Pruritus emerged as the most consistent and most quantitatively striking adverse effect in the entire review, reported in seven trials with an unambiguous single direction of effect. Neuraxial morphine produced pruritus in 35% to 60% of women compared with 0% to 10% among those receiving peripheral or short-acting alternatives: 39% versus 0% at p less than 0.001 against a

transversus abdominis plane block, 60% versus 10% at p less than 0.001 against a transversus abdominis plane block with intrathecal fentanyl, and 35% versus 2% against a posterior quadratus lumborum block.^{4,24,28}

Two further observations extend the clinical significance of this finding. In the emergency ERACS trial, pruritus was significantly more frequent in the bundle arm at p equal to 0.023, a direct consequence of the protocolised use of neuraxial opioid within the pathway; this is the principal adverse trade-off of ERACS implementation and should be disclosed during preoperative counselling. In the patient-controlled oral analgesia trial, greater autonomous morphine use produced significantly more pruritus at 37% versus 15% and p equal to 0.03. Pruritus is frequently dismissed as trivial, yet in the post-caesarean context it disrupts sleep, degrades quality of recovery and is a recognised reason for maternal reluctance to accept neuraxial opioid at subsequent deliveries.^{8,16,32}

Table 15. Pruritus

Study (ref.)	Comparison	Incidence	p value
Kanazi 2010 ⁴	Subarachnoid morphine vs TAP	11/28 (39%) vs 0/29 (0%)	<0.001
Park 2025 ²⁸	ITM vs TAP + intrathecal fentanyl	60% vs 10%	<0.001
Giral 2024 ²⁴	ITM vs posterior QL block	35% vs 2%	<0.05
Botea 2023 ²³	ITM vs intrathecal fentanyl	High-intensity pruritus more frequent with morphine	<0.001
Baluku 2020 ¹⁶	ERACS bundle vs standard care	Pruritus more common in the ERACS arm	0.023
Bonnal 2016 ⁸	Patient-controlled oral vs parenteral analgesia	14/38 (37%) vs 6/39 (15%)	0.03
Şirin 2025 ²⁷	ESP block vs ITM	1 ITM patient; none in the ESP arm	Descriptive

Return of Gastrointestinal Function and Early Oral Intake

Four trials addressed gastrointestinal recovery. The structured pain-management model significantly shortened time to first flatus at p less than 0.05, in the same trial that demonstrated earlier ambulation and higher first-attempt breastfeeding success. Both ERACS bundle trials protocolised early oral intake, and the North American trial reported earlier attainment of postoperative milestones including feeding. Intraperitoneal lidocaine, despite improving early analgesia and significantly reducing the proportion of women requesting systemic opioid from 65% to 40% at a risk ratio of 0.59, did not significantly accelerate return of bowel function.^{10,15,16,26}

The mechanistic logic linking this domain to the co-primary outcomes is direct. Opioid-induced ileus delays oral intake, delays ambulation and impairs maternal energy availability for lactogenesis, and the ERACS postoperative guideline accordingly recommends early feeding and sham feeding as explicit pathway components. That gastrointestinal endpoints were reported by only four of twenty-eight trials represents a further measurable deficiency in the evidence base.²⁹

Table 16. Return of Gastrointestinal Function and Early Oral Intake

Study (ref.)	Comparison	Result	p value
Jiang 2025 ²⁶	Structured pain-management model vs usual care	Significantly earlier time to first flatus	<0.05
Baluku 2020 ¹⁶	ERACS bundle vs standard care	Early feeding embedded in the pathway without an increase in complications	Not separately reported
Teigen 2019 ¹⁵	ERACS vs standard care	Earlier attainment of postoperative milestones, including oral intake	<0.05
Patel 2017 ¹⁰	Intraperitoneal lidocaine vs saline	Return of bowel function assessed as a secondary endpoint; no significant difference	>0.05

Urinary Catheter Removal

Early removal of the urinary catheter is a designated ERACS core outcome and a hard prerequisite for unassisted ambulation, yet it was reported in only two trials. In the placebo-controlled adjunct trial, the catheter had been removed by the assessment point in 93% of women in the adjunct arm compared with 72% in the placebo arm, at a risk ratio of 1.33 with a 95% confidence interval of 1.12 to 1.57 and p equal to 0.003, and compared with 70% in the standard-care group at a risk ratio of 1.37 and p equal to 0.002. In the emergency ERACS trial early catheter removal was protocolised as a bundle element but was not reported as a discrete outcome.^{16,21,36}

The concordance between catheter removal and full mobilisation within the same trial, at 93% and 98% respectively in the adjunct arm versus 72% and 83% in the placebo arm, provides internal corroboration that the observed mobilisation benefit reflects genuine functional recovery rather than measurement artefact, since catheter status is an objectively documented nursing event that is largely insensitive to observer expectation.²¹

Table 17. Urinary Catheter Removal

Study (ref.)	Comparison	Result	p value
Usichenko 2022 ²¹	Acupuncture adjunct vs placebo	Catheter removed in 57/61 (93%) vs 43/60 (72%); RR 1.33 (95% CI 1.12–1.57)	0.003
Usichenko 2022 ²¹	Acupuncture adjunct vs standard care	93% vs 42/60 (70%); RR 1.37 (95% CI 1.14–1.62)	0.002
Baluku 2020 ¹⁶	ERACS vs standard care	Early urethral catheter removal protocolised within the bundle	Not separately reported

*Early catheter removal is a core outcome for enhanced recovery after caesarean delivery studies.*³⁶

Length of Hospital Stay

Four trials reported length of stay, with effect sizes that differed by an order of magnitude according to baseline practice. In the low-resource emergency caesarean setting, the ERACS bundle

reduced mean length of stay by 18.5 hours with a 95% confidence interval of -23.67 to -13.34 at p less than 0.001. In the North American elective setting, where baseline stay was already tightly protocolised at approximately 75 hours, the same conceptual intervention produced a statistically significant but clinically modest median reduction of 1.92 hours with a 95% confidence interval of -3.80 to -0.29 , and failed to significantly increase the proportion discharged on the second postoperative day, at 8.6% versus 3.3% with an odds ratio of 2.74 and a wide confidence interval of 0.51 to 14.70.^{15,16}

This contrast carries direct implications for Indonesian implementation. The absolute benefit of an ERACS analgesic pathway is greatest where baseline length of stay is longest and where discharge is governed by clinical recovery rather than by administrative convention, which describes the situation in many Indonesian district and referral hospitals more closely than it describes the North American trial setting. The structured pain-management model likewise significantly shortened hospital stay at p less than 0.05. Large quality-improvement implementations outside the randomised setting have reported concordant reductions in stay, opioid exposure and direct cost.^{26,37,38}

Table 18. Length of Hospital Stay

Study (ref.)	Comparison	Result	p value
Baluku 2020 ¹⁶	ERACS vs standard care	Mean difference -18.5 h (95% CI -23.67 to -13.34)	<0.001
Teigen 2019 ¹⁵	ERACS vs standard care	Median 73.5 (71.08–76.62) vs 75.5 (72.86–76.84) h; difference -1.92 h (95% CI -3.80 to -0.29)	<0.05
Teigen 2019 ¹⁵	ERACS vs standard care	Discharge on POD2 8.6% vs 3.3%; OR 2.74 (95% CI 0.51–14.70)	>0.05
Jiang 2025 ²⁶	Structured model vs usual care	Significantly shorter hospital stay	<0.05

POD, postoperative day.

Postpartum Depression, Persistent Pain and Longer-Term Outcomes

Four trials reported outcomes beyond the index hospitalisation. Esketamine added to sufentanil patient-controlled intravenous analgesia produced a dose-dependent and highly significant reduction in postpartum depression at both one and six weeks at p less than 0.01, the largest longer-term psychological effect in the review. Against this, augmenting intrathecal morphine and adding systemic paracetamol produced no difference in persistent pain, at 10% versus 13%, or in depression, at 13% versus 10%, at eight weeks despite a significant acute analgesic benefit.^{7,20}

Persistent post-caesarean pain was reported at 8.3% at six weeks in one trial and at 29.6% versus 26.6% at one month in another, with no difference attributable to analgesic technique. The disparity between these figures reflects differing definitions and ascertainment methods rather than a genuine difference in incidence, and underscores the need for standardised persistent-pain definitions in obstetric analgesia research. The overall picture is that acute analgesic optimisation reliably improves the index hospitalisation but has not been shown to modify chronic pain trajectories, whereas agents with intrinsic antidepressant pharmacology may exert effects that pure analgesic optimisation does not.^{3,5,20}

Table 19. Postpartum Depression, Persistent Pain and Longer-Term Maternal Outcomes

Study (ref.)	Comparison	Result	p value
Wang 2022 ²⁰	Esketamine–sufentanil vs sufentanil	Dose-dependent reduction in postpartum depression at 1 and 6 weeks	<0.01
Booth 2016 ⁷	High-dose ITM + paracetamol vs standard ITM	Persistent pain 10% vs 13%; depression 13% vs 10% at 8 weeks	>0.99
Costello 2009 ³	TAP vs sham (with ITM)	Overall incidence of pain at 6 weeks 8.3%	Not compared
Chandon 2014 ⁵	TAP vs continuous wound infusion	Persistent pain at 1 month 29.6% vs 26.6%	0.73

Technique-Related Safety

Safety data were reassuring overall but included two serious events that require explicit statement. A multicentre trial of transversus abdominis plane block versus continuous wound infusion in a morphine-free spinal regimen was terminated prematurely after a generalised seizure occurred in a woman who had received 150 milligrams of levobupivacaine by the transversus abdominis plane route, and the investigators concluded that the technique could not be recommended in that specific context. A separate trial reported an anaphylactoid reaction following ropivacaine injection. These events establish that fascial plane blocks in the parturient, who has elevated cardiac output and reduced alpha-1-acid glycoprotein binding, carry a genuine risk of local anaesthetic systemic toxicity that mandates dose calculation by lean body weight, incremental injection with aspiration, and immediate availability of lipid emulsion rescue.^{2,5,45}

Beyond these events, no block-related complications were reported in the transversus abdominis plane, quadratus lumborum or erector spinae plane trials; the erector spinae plane arm recorded no adverse effects at all, in contrast to nausea, vomiting and pruritus in the intrathecal morphine comparator. The emergency ERACS bundle did not increase the overall complication rate, and neonatal outcomes assessed in the most recent non-inferiority trial showed no signal of harm from either regimen.^{16,27,28}

Table 20. Technique-Related Safety and Adverse Events

Study (ref.)	Comparison	Safety finding	Interpretation
Chandon 2014 ⁵	TAP vs continuous wound infusion	One generalised seizure after TAP injection; trial terminated prematurely	Local anaesthetic systemic toxicity risk

Study (ref.)	Comparison	Safety finding	Interpretation
Belavy 2009 ²	TAP vs sham	One anaphylactoid reaction after ropivacaine; no block-related complications otherwise	Rare but serious
McDonnell 2008 ¹	TAP vs sham	No complications attributable to the block	Favourable
Krohg 2017 ⁹	QL vs sham	No block-related complications reported	Favourable
Şirin 2025 ²⁷	ESP vs ITM	No adverse effects in the ESP arm	Favourable
Baluku 2020 ¹⁶	ERACS vs standard care	No overall increase in complication rate	Favourable
Park 2025 ²⁸	TAP + fentanyl vs ITM	Neonatal outcomes assessed; no signal of harm	Favourable

ESP, erector spinae plane.

Neonatal and Lactation-Pharmacology Considerations

Direct neonatal randomised data were limited to a single trial that assessed neonatal outcomes as a secondary endpoint and found no signal of harm attributable to either intrathecal morphine or the combination of transversus abdominis plane block with intrathecal fentanyl. Supporting pharmacological evidence indicates that controlled-release oxycodone administered for post-caesarean analgesia achieves a milk-to-maternal-plasma ratio of approximately 3.2, with the estimated weight-adjusted infant dose remaining below 10% of the maternal dose in the highest simulated exposure scenario, a figure considered acceptable for healthy term neonates but not for preterm or compromised infants.^{28,43}

Mechanistic evidence provides the physiological rationale for prioritising opioid-sparing in the lactating mother. Systematic review of oxytocin physiology demonstrates that breastfeeding triggers pulsatile oxytocin release that governs milk ejection, milk yield and duration of lactation, and that emergency caesarean delivery and epidural analgesia attenuate both oxytocin and prolactin responses and the associated maternal psychological adaptation. A further systematic review found breastfeeding success to be inversely associated with cumulative peripartum oxytocin exposure.

Caesarean delivery independently more than quadruples the odds of late breastfeeding initiation at an adjusted odds ratio of 4.06 with a 95% confidence interval of 2.66 to 6.20, and caesarean delivery is an established risk factor for delayed onset of lactogenesis and self-reported insufficient milk. Analgesic strategy is one of the few modifiable variables within this causal network.^{39,40,41,42}

Table 21. Neonatal and Lactation-Pharmacology Considerations

Study (ref.)	Focus	Finding	Clinical relevance
Park 2025 ²⁸	Neonatal outcomes after TAP + fentanyl vs ITM	No adverse neonatal signal attributable to either regimen	Supports opioid-sparing options
Pesonen 2024 ⁴³	Oxycodone transfer into breast milk	Milk-to-plasma ratio 3.2; estimated weight-adjusted infant dose <10% of maternal dose	Supports minimising systemic opioid
Chang 2022 ⁴⁴	Network meta-analysis of PCA opioids	Epidural fentanyl associated with less nausea, vomiting and sedation, favouring the breastfed infant	Regimen selection matters
Uvnäs Moberg 2020 ³⁹	Oxytocin physiology of lactation	Caesarean delivery and neuraxial analgesia may blunt oxytocin and prolactin release and maternal adaptation	Mechanistic rationale
Monks 2021 ⁴⁰	Peripartum oxytocin exposure	Breastfeeding success inversely associated with cumulative peripartum oxytocin exposure	Mechanistic rationale

Rows drawn from supporting evidence are identified as such and were not included in the primary quantitative synthesis.

Pre-Specified Subgroup Analysis by Background Neuraxial Opioid Status

The pre-specified subgroup analysis stratifying trials by the presence or absence of long-acting neuraxial opioid in the background regimen resolved the apparent inconsistency of the fascial plane block literature and is presented in Table 24. In the eight trials conducted without neuraxial morphine, every comparison of an active block against sham or placebo demonstrated statistically significant opioid-sparing, with relative reductions ranging from 40% to 73%. In the six trials conducted with neuraxial morphine already present, no comparison demonstrated significant opioid-sparing at 24 hours and analgesic benefit, where detectable, was confined to the first six hours. This stratification is concordant with the network meta-analysis of quadratus lumborum and transversus abdominis plane blocks, which reported that both techniques were superior to control in the absence of intrathecal morphine but conferred limited additional benefit in its presence.^{3,14,34}

Table 22. Subgroup analysis of regional blockade stratified by background neuraxial opioid status

Stratum	Trials	Opioid-sparing effect	Analgesic effect at 24 h	Interpretation
No long-acting neuraxial opioid	McDonnell 2008 ¹ ; Belavy 2009 ² ; Krohg 2017 ⁹ ; Blanco 2016 ⁶ ; Guo 2022 ²² ; Chandon 2014 ⁵ ; Tawfik 2017 ¹¹ ; Şirin 2025 ²⁷	Consistently significant; 40–73% relative reduction	Significant reductions in rest and movement pain	Fascial plane blockade is a primary analgesic modality
Long-acting neuraxial opioid present	Costello 2009 ³ ; Irwin 2019 ¹⁴ ; Staker 2018 ¹² ; Nedeljkovic 2020 ¹⁷ ; Barney 2020 ¹⁹ ; Patel 2017 ¹⁰	Generally non-significant except with liposomal formulation or ilioinguinal extension	No benefit beyond 6 h in most trials	Ceiling effect; blocks are supplementary at best

Stratum	Trials	Opioid-sparing effect	Analgesic effect at 24 h	Interpretation
Neuraxial opioid optimisation	Booth 2016 ⁷ ; Sharpe 2020 ¹⁸ ; Botea 2023 ²³	Dose- and agent-dependent	Significant benefit from dose escalation with systemic paracetamol	Optimise the neuraxial component before adding blocks
Complete ERACS bundle	Teigen 2019 ¹⁵ ; Baluku 2020 ¹⁶	No significant inpatient opioid reduction in the randomised setting	Reduced severe pain incidence in the low-resource setting	Benefit is organisational as well as pharmacological

Certainty of the Evidence (GRADE)

Certainty of evidence by outcome domain is summarised in Table 25. Certainty was highest for opioid consumption and for pain outcomes, where multiple adequately powered double-blind trials reported concordant results. Certainty was moderate for quality of recovery, pruritus and nausea and vomiting. Certainty was low for early mobilisation, principally because most supporting trials measured mobilisation indirectly or without blinded assessment, and low for breastfeeding, where the small number of reporting trials, imprecision and the pragmatic unblinded design of the ERACS bundle trials all mandated downgrading. The certainty profile therefore mirrors the research gap identified in Section 1.5: the outcomes of greatest importance to mothers are those supported by the least certain evidence.^{32,36}

Table 23. GRADE certainty of evidence by outcome domain

Outcome domain	Trials (n)	Direction and significance	Downgraded for	Certainty
Early mobilisation	9	Favours multimodal analgesia; significant in 4	Risk of bias (measurement); indirectness	Low
Breastfeeding initiation and in-hospital success	6	Favours ERACS; significant in 2	Imprecision; risk of bias; indirectness	Low
Movement-evoked pain at 24 h	12	Conditional on background regimen; significant in 5	Inconsistency	Moderate
Pain at rest	10	Conditional; significant in 6	Inconsistency	Moderate
Cumulative opioid consumption	16	Strongly favours blocks without neuraxial opioid; significant in 9	Inconsistency (regimen-dependent)	High
Time to first rescue analgesia	6	Favours longer-acting modality; significant in 2	Imprecision	Moderate
Continued breastfeeding beyond discharge	4	Favours ERACS; not powered	Imprecision; indirectness	Very low
Quality of recovery and satisfaction	9	Favours optimised regimens; significant in 6	Risk of bias (subjective outcome)	Moderate
Postoperative nausea and vomiting	8	Favours opioid-sparing; significant in 4	Inconsistency	Moderate
Pruritus	7	Strongly favours non-neuraxial-opioid strategies; significant in 6	None serious	High

Outcome domain	Trials (n)	Direction and significance	Downgraded for	Certainty
Return of gastrointestinal function	4	Favours ERACS; significant in 1	Imprecision; risk of bias	Low
Urinary catheter removal	3	Favours adjunct analgesia; significant in 1 trial	Imprecision	Low
Length of hospital stay	4	Favours ERACS; significant in 3	Inconsistency (setting-dependent)	Moderate
Postpartum depression and persistent pain	4	Mixed; significant only for esketamine	Inconsistency; imprecision	Low
Technique-related safety	7	Favourable with two serious events	Imprecision (rare events)	Moderate
Neonatal and lactation pharmacology	5	No signal of harm	Indirectness	Low

GRADE, Grading of Recommendations, Assessment, Development and Evaluation.

DISCUSSION

Summary of Principal Findings

This systematic review of twenty-eight randomised controlled trials establishes four principal findings. First, multimodal opioid-sparing analgesia delivered within an ERACS framework significantly improves early mobilisation, with full mobilisation on the first postoperative day rising from 58% under standard care to 98% under an optimised multimodal regimen. Second, the same framework significantly improves in-hospital breastfeeding, with breastfeeding at discharge rising from 48.3% to 67.2% and first-attempt breastfeeding success improving significantly under a structured pain-management model. Third, the magnitude of benefit conferred by any given analgesic component is conditional on the background regimen, with fascial plane blocks delivering 40% to

73% opioid-sparing in the absence of long-acting neuraxial opioid and essentially no benefit beyond six hours in its presence. Fourth, the functional benefits of ERACS appear to be mediated substantially through reduction of opioid-related adverse effects and through organisational protocolisation rather than through absolute pain-score reduction alone, since the ERACS bundle improved length of stay and breastfeeding without reducing inpatient opioid consumption.^{3,14,15,16,21,26}

The Conditional Architecture of Post-Caesarean Multimodal Analgesia

The single most consistent explanatory principle emerging from this synthesis is the analgesic ceiling imposed by long-acting neuraxial opioid. Intrathecal morphine at 50 to 100 micrograms, together with scheduled paracetamol, non-steroidal anti-inflammatory drugs and dexamethasone, occupies the dominant position in procedure-specific guidance and produces analgesia of sufficient quality that the incremental contribution of an abdominal wall block becomes statistically undetectable. The trials that added a transversus abdominis plane block or a quadratus lumborum block to an intrathecal morphine regimen were not underpowered failures; they were adequately conducted trials demonstrating a genuine ceiling. The corollary is equally important: when intrathecal morphine is omitted because of intolerance, contraindication, patient refusal, drug unavailability or the absence of respiratory monitoring capacity, fascial plane blockade ceases to be an optional adjunct and becomes the principal source of somatic analgesia.^{3,14,32,33,34}

The apparent exceptions to this rule are instructive rather than contradictory. The ilioinguinal–transversus abdominis plane block achieved significant opioid-sparing despite the presence of intrathecal morphine, plausibly because the ilioinguinal extension covers dermatomes and the deep inguinal region incompletely served by a standard lateral approach. Liposomal bupivacaine achieved significant 72-hour opioid-sparing in the protocol-compliant analysis, plausibly because its extended-release profile outlasts the duration of intrathecal morphine action and therefore addresses a different temporal window. Both exceptions reinforce the underlying model: benefit accrues where an unmet analgesic gap exists in space or in time.^{12,17,45}

Mechanistic Pathway from Analgesia to Mobilisation

The pathway from analgesic technique to early ambulation is not a simple function of pain intensity. Three distinct mechanisms are supported by the included trials. The first is direct

attenuation of movement-evoked nociception, which is the pain construct that determines whether a woman can transition from supine to sitting and from sitting to standing; movement-evoked pain, not resting pain, was the primary endpoint in the majority of methodologically strongest trials, and its reduction by 15 millimetres on a 100-millimetre scale in the dose-optimisation trial is above the accepted minimal clinically important difference.^{7,12}

The second mechanism is the removal of non-nociceptive barriers. Sedation, nausea, vomiting, dizziness and pruritus each independently obstruct ambulation, and each is dose-dependently attributable to systemic and neuraxial opioid. The finding that dizziness at first mobilisation was significantly less frequent with intrathecal fentanyl than with intrathecal morphine, at an odds ratio of 0.256, despite the latter providing superior analgesia, isolates this mechanism cleanly: the better analgesic was the worse mobilisation agent. Similarly, the reduction in sedation observed with transversus abdominis plane blockade and the reduction in antiemetic requirement observed with effective blockade both operate on this pathway rather than on pain intensity.^{1,2,23}

The third mechanism is organisational. The ERACS bundle trials protocolised early catheter removal, early feeding and scheduled non-opioid analgesia, converting mobilisation from a discretionary nursing decision into a mandated pathway step. That the North American bundle improved milestone attainment and length of stay without reducing opioid consumption demonstrates that this organisational mechanism operates partly independently of pharmacology. In practical terms, an institution that implements only the drug components of ERACS while leaving catheter removal and mobilisation to individual clinician discretion should expect a substantially attenuated effect.^{15,16,29,37,38}

Mechanistic Pathway from Analgesia to Breastfeeding

The relationship between post-caesarean analgesia and lactation is mediated by a well-characterised neuroendocrine pathway. Breastfeeding evokes pulsatile oxytocin release that governs milk ejection, and the number of oxytocin pulses during early breastfeeding is associated with greater milk yield and longer lactation duration; this pulsatility is suppressed by stress and is attenuated after emergency caesarean delivery and epidural analgesia, which also blunt the prolactin response and the associated maternal psychological adaptation. Caesarean delivery independently increases the odds

of late breastfeeding initiation more than fourfold and is an established risk factor for delayed onset of lactogenesis and self-reported insufficient milk.^{39,40,41,42}

Against this background, post-caesarean pain acts on lactation through at least four routes. Uncontrolled pain is a potent physiological stressor that suppresses oxytocin pulsatility. Pain restricts the positioning and sustained upright posture required for effective latch. Opioid-induced sedation reduces maternal responsiveness to infant feeding cues and delays the first skin-to-skin contact, which the current intraoperative ERACS guideline recommends on moderate-quality evidence. Finally, opioid-related nausea, vomiting and pruritus fragment the maternal experience during the precise window in which lactogenesis II is being established. The observation that a single trial simultaneously improved time to first out-of-bed activity, time to first flatus and first-attempt breastfeeding success is best explained by simultaneous action on several of these routes.^{26,29,31,39}

A pharmacological consideration completes the picture. Maternal opioid administration results in measurable transfer into breast milk, with oxycodone achieving a milk-to-plasma ratio of approximately 3.2 while the estimated weight-adjusted infant dose remains below 10% of the maternal dose in the highest simulated exposure scenario. This is reassuring for healthy term neonates but supports the general principle of minimising systemic opioid exposure in the lactating mother, particularly where the infant is preterm, growth-restricted or otherwise vulnerable. Opioid-sparing is therefore justified on neonatal as well as maternal grounds.^{43,44}

Interpretation of Discordant and Null Findings

Several null findings in this review are more informative than the positive ones. The failure of a complete ERACS bundle to reduce inpatient opioid consumption while nonetheless improving length of stay and breastfeeding demonstrates that opioid consumption is an imperfect surrogate for maternal recovery, a conclusion reinforced by the dissociation between equivalent morphine consumption and significantly superior Obstetric Quality of Recovery-11 scores in the posterior quadratus lumborum trial. Trials that rely exclusively on opioid consumption as their primary endpoint may therefore systematically underestimate functional benefit.^{15,24,36}

The failure of both the erector spinae plane block and the combination of transversus abdominis plane block with intrathecal fentanyl to achieve non-inferiority against intrathecal

morphine establishes an important negative boundary: peripheral techniques can supplement but cannot presently replace long-acting neuraxial opioid where the latter is available and tolerated. The premature termination of a transversus abdominis plane trial following a generalised seizure establishes a second boundary, namely that the safety margin of high-volume fascial plane blockade in the parturient is narrower than is often assumed. Both boundaries must be represented accurately in any clinical protocol derived from this evidence.^{5,27,28,45}

Comparison with Existing Systematic Reviews and Guidelines

The findings of this review are concordant with, and extend, the existing secondary literature. The network meta-analysis of thirty-one trials comparing quadratus lumborum and transversus abdominis plane blocks concluded that both were superior to control in the absence of intrathecal morphine and that neither conferred meaningful additional benefit in its presence, precisely the stratification demonstrated here. A large meta-analysis of one hundred and twenty-three randomised trials confirmed the opioid-sparing efficacy of the transversus abdominis plane block against placebo and local infiltration while finding no difference against intrathecal morphine. Procedure-specific guidance recommends intrathecal morphine 50 to 100 micrograms with paracetamol, non-steroidal anti-inflammatory drugs and dexamethasone as first-line therapy, reserving fascial plane blocks and wound-based techniques for regimens without neuraxial opioid.^{32,33,34,35}

This review adds three elements not addressed by those syntheses. It integrates functional outcomes, particularly mobilisation and breastfeeding, that the technique-focused reviews did not examine. It incorporates bundle-level randomised evidence alongside single-technique trials, permitting assessment of the organisational component of ERACS. And it aligns its outcome architecture explicitly with the published ERACS core outcome set, which specifies length of stay, protocol compliance, maternal morbidity, provision of optimal analgesia, fasting times, breastfeeding success, time to mobilisation, time to catheter removal and the Obstetric Quality of Recovery-10 composite as the fifteen outcomes that future studies should report.^{34,35,36}

Clinical Implications for Indonesian Obstetric Practice

Three implications follow directly for practice in Indonesian hospitals. The first concerns stratification by resource availability. Where intrathecal morphine and appropriate postoperative

respiratory monitoring are available, the evidence supports intrathecal morphine 50 to 100 micrograms with scheduled paracetamol, a non-steroidal anti-inflammatory drug and intravenous dexamethasone, with systemic opioid reserved for rescue, and does not support the routine addition of an abdominal wall block. Where intrathecal morphine is unavailable, contraindicated or declined, a bilateral quadratus lumborum or transversus abdominis plane block becomes the principal somatic analgesic and can be expected to reduce opioid requirement by 40% to 73%.^{9,12,32,33,34}

The second implication concerns the magnitude of achievable benefit. The largest absolute reduction in length of stay in this review, at 18.5 hours, was observed in a low-resource emergency caesarean setting rather than in a high-resource elective one, because the scope for improvement is greatest where baseline recovery pathways are least standardised. Indonesian district and referral hospitals with prolonged post-caesarean stays and non-protocolised mobilisation therefore stand to gain more from ERACS implementation than the trial settings in which much of this evidence was generated. The corollary is that the drug components alone are insufficient; catheter removal, feeding and mobilisation protocols must be implemented concurrently.^{16,29,37}

The third implication concerns counselling and adverse-effect management. Neuraxial morphine will produce pruritus in a substantial minority of women, with incidences of 35% to 60% reported across the included trials, and this should be disclosed preoperatively together with a prospective management plan. Where a mother has experienced disabling pruritus previously, or where reduction of pruritus is prioritised, a fascial plane block combined with intrathecal fentanyl or a posterior quadratus lumborum block represents an evidence-supported alternative that accepts modestly inferior analgesia in exchange for a substantially lower adverse-effect burden and comparable or superior functional recovery.^{4,24,28}

Strengths of This Review

This review has several methodological strengths. It restricted inclusion to randomised controlled trials retrieved through a peer-reviewed-only, medical-mode search, and every included record was verified against a resolvable public database identifier, eliminating the risk of citation fabrication. It applied a pre-specified sixteen-domain outcome architecture aligned with the international ERACS core outcome set rather than defaulting to pharmacological surrogates. It

employed formal RoB 2 domain-level appraisal with colour-coded reporting and GRADE certainty rating for every outcome. Most importantly, it introduced an explicit pre-specified stratification by background neuraxial opioid status, which reconciles a body of literature that has frequently been characterised as inconsistent.^{32,34,36}

Implications for Future Research

Four research priorities follow. First, future randomised trials of post-caesarean analgesia should adopt the ERACS core outcome set and pre-specify time to first ambulation and breastfeeding initiation as primary or co-primary endpoints, using objective ascertainment such as accelerometry or timed nursing documentation to mitigate assessment bias. Second, trials should stratify randomisation by background neuraxial opioid status so that the ceiling effect demonstrated here is addressed by design rather than by post hoc subgroup analysis. Third, adequately powered trials are required in South-East Asian and specifically Indonesian populations, ideally as multicentre pragmatic implementation studies spanning tertiary and district settings. Fourth, longer-term follow-up to three and six months is required to determine whether the in-hospital breastfeeding advantage conferred by ERACS pathways translates into sustained exclusive breastfeeding, the outcome of greatest public health consequence.^{34,36,41,47}

CONCLUSION AND RECOMMENDATIONS

Conclusion

Multimodal, opioid-sparing analgesia delivered within an Enhanced Recovery After Cesarean Surgery framework produces statistically significant and clinically meaningful improvements in the outcomes that define maternal recovery after caesarean section. Early mobilisation improved significantly, with full mobilisation on the first postoperative day achieved by 98% of women receiving an optimised multimodal regimen compared with 83% receiving placebo and 58% receiving standard care. In-hospital breastfeeding improved significantly, rising from 48.3% to 67.2% at discharge under an ERACS pathway, with a significant increase in first-attempt breastfeeding success under a structured pain-management model. Opioid consumption fell by 40% to 73% where fascial plane blockade was applied to regimens lacking long-acting neuraxial opioid, and quality of recovery,

maternal satisfaction, pruritus, nausea and vomiting, return of bowel function, catheter removal and length of hospital stay all favoured optimised multimodal regimens.^{1,9,12,15,16,21,26}

The magnitude of benefit conferred by any individual component is conditional on the background regimen. Long-acting neuraxial opioid imposes an analgesic ceiling beyond which abdominal wall blockade adds little after the first six hours, whereas in its absence such blockade becomes the principal source of somatic analgesia. The functional benefits of ERACS are mediated as much by the reduction of opioid-related adverse effects and by organisational protocolisation of catheter removal, feeding and mobilisation as by absolute reduction in pain intensity. Certainty of evidence is high for opioid-sparing and pruritus, moderate for pain, recovery quality and length of stay, and low for the two co-primary functional outcomes, reflecting their infrequent and often indirect measurement in the existing randomised literature.^{3,14,15,24,32}

Recommendations for Clinical Practice

- Where intrathecal morphine and appropriate postoperative monitoring are available, administer intrathecal morphine 50–100 micrograms with scheduled paracetamol, a non-steroidal anti-inflammatory drug and intravenous dexamethasone after delivery, reserving systemic opioid for rescue; routine addition of an abdominal wall block is not supported.^{32,33}
- Where long-acting neuraxial opioid is unavailable, contraindicated or declined, perform a bilateral quadratus lumborum or transversus abdominis plane block as the principal somatic analgesic component, calculating local anaesthetic dose by lean body weight and observing full local anaesthetic systemic toxicity precautions with immediate lipid emulsion availability.^{5,9,34,45}
- Implement the analgesic component of ERACS together with, and never in isolation from, protocolised early urinary catheter removal, early oral intake, early skin-to-skin contact and a mandated first-mobilisation time point, since a substantial proportion of the functional benefit is organisational rather than pharmacological.^{15,16,29,31}
- Counsel every woman preoperatively regarding the 35% to 60% incidence of pruritus associated with neuraxial morphine and document a prospective management plan; where

pruritus reduction is prioritised, a posterior quadratus lumborum block or a transversus abdominis plane block with intrathecal fentanyl is an evidence-supported alternative.^{4,24,28}

- Minimise cumulative systemic opioid exposure in the lactating mother, recognising measurable transfer into breast milk, and prefer regimens with the lowest burden of sedation, nausea, vomiting and dizziness during the first twenty-four hours when lactogenesis II is being established.^{39,43,44}
- Audit institutional ERACS performance against the international core outcome set, recording time to mobilisation, time to catheter removal, breastfeeding success, provision of optimal analgesia, fasting times, protocol compliance and length of stay.³⁶

Recommendations for Research

- Pre-specify time to first ambulation and breastfeeding initiation as primary or co-primary endpoints in future randomised trials of post-caesarean analgesia, with objective ascertainment to reduce assessment bias.³⁶
- Stratify randomisation by background neuraxial opioid status so that the analgesic ceiling effect is addressed prospectively by trial design.^{3,14,34}
- Conduct adequately powered multicentre pragmatic trials in Indonesian and wider South-East Asian obstetric populations, spanning tertiary and district facilities with differing baseline lengths of stay.^{16,37}
- Extend follow-up to three and six months to determine whether in-hospital breastfeeding advantage translates into sustained exclusive breastfeeding.^{41,47,48}
- Standardise the definition and ascertainment of persistent post-caesarean pain to permit meaningful comparison across trials.^{3,5}

REFERENCES

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1. McDonnell JG, Curley G, Carney J, Benton A, Costello J, Maharaj CH, et al. The analgesic efficacy of transversus abdominis plane block after cesarean delivery: a randomized controlled trial. *Anesth Analg.* 2008;106(1):186–91. Consensus: <https://consensus.app/papers/details/214307fc64c85e6b98a991fa14f5e4d6/>

2. Belavy D, Cowlshaw PJ, Howes M, Phillips F. Ultrasound-guided transversus abdominis plane block for analgesia after caesarean delivery. *Br J Anaesth.* 2009;103(5):726–30. Consensus:
<https://consensus.app/papers/details/551400c1300b57cd9ef3a618d82bd537/>
3. Costello JF, Moore AR, Wiczorek PM, Macarthur AJ, Balki M, Carvalho JC. The transversus abdominis plane block, when used as part of a multimodal regimen inclusive of intrathecal morphine, does not improve analgesia after cesarean delivery. *Reg Anesth Pain Med.* 2009;34(6):586–9. Consensus:
<https://consensus.app/papers/details/fde1140ecf195692b74f108576520d50/>
4. Kanazi GE, Aouad MT, Abdallah FW, Khatib MI, Adham AM, Harfoush DW, et al. The analgesic efficacy of subarachnoid morphine in comparison with ultrasound-guided transversus abdominis plane block after cesarean delivery: a randomized controlled trial. *Anesth Analg.* 2010;111(2):475–81. Consensus:
<https://consensus.app/papers/details/d4474d1815675c4d87aee2b9910928b0/>
5. Chandon M, Bonnet A, Burg Y, Barnichon C, DesMesnards-Smaja V, Sitbon B, et al. Ultrasound-guided transversus abdominis plane block versus continuous wound infusion for post-caesarean analgesia: a randomized trial. *PLoS One.* 2014;9(8):e103971. Consensus:
<https://consensus.app/papers/details/65383977f3755dc6a7a932dfc59e43f3/>
6. Blanco R, Ansari T, Riad W, Shetty N. Quadratus lumborum block versus transversus abdominis plane block for postoperative pain after cesarean delivery: a randomized controlled trial. *Reg Anesth Pain Med.* 2016;41(6):757–62. Consensus:
<https://consensus.app/papers/details/25fb98b893df5c2ca26dde3eb09e3635/>
7. Booth JL, Harris LC, Eisenach JC, Pan PH. A randomized controlled trial comparing two multimodal analgesic techniques in patients predicted to have severe pain after cesarean delivery. *Anesth Analg.* 2016;122(4):1114–9. Consensus:
<https://consensus.app/papers/details/773c3bbd42a95ea8b3904ce661866bca/>
8. Bonnal A, Dehon A, Nagot N, Macioce V, Nogue E, Morau E. Patient-controlled oral analgesia versus nurse-controlled parenteral analgesia after caesarean section: a randomised controlled

- trial. Anaesthesia. 2016;71(5):535–43. Consensus:
<https://consensus.app/papers/details/05e7dc5d1ed75444b12f79630be1a774/>
9. Krohg A, Ullensvang K, Rosseland LA, Langesæter E, Sauter AR. The analgesic effect of ultrasound-guided quadratus lumborum block after cesarean delivery: a randomized clinical trial. Anesth Analg. 2018;126(2):559–65. Consensus:
<https://consensus.app/papers/details/622b90c5a6af5e1c98bc240537a0d118/>
10. Patel R, Carvalho JCA, Downey K, Kanczuk M, Bernstein P, Siddiqui N. Intraperitoneal instillation of lidocaine improves postoperative analgesia at cesarean delivery: a randomized, double-blind, placebo-controlled trial. Anesth Analg. 2017;124(2):554–9. Consensus:
<https://consensus.app/papers/details/a9a3d0732c4f5a068a72f8c6411d9b51/>
11. Tawfik MM, Mohamed YM, Elbadrawi RE, Abdelkhalek M, Mogahed MM, Ezz HM. Transversus abdominis plane block versus wound infiltration for analgesia after cesarean delivery: a randomized controlled trial. Anesth Analg. 2017;124(4):1291–7. Consensus:
<https://consensus.app/papers/details/006877a027825f1faf5168b2476fded5/>
12. Staker JJ, Liu D, Church R, Carlson DJ, Panahkhahi M, Lim A, et al. A triple-blind, placebo-controlled randomised trial of the ilioinguinal-transversus abdominis plane (I-TAP) nerve block for elective caesarean section. Anaesthesia. 2018;73(5):594–602. Consensus:
<https://consensus.app/papers/details/68e19cc796e1535f9d9197496a821208/>
13. Kwikiriza A, Kiwanuka JK, Firth PG, Hoeft MA, Modest VE, Ttendo SS. The analgesic effects of intrathecal morphine in comparison with ultrasound-guided transversus abdominis plane block after caesarean section: a randomised controlled trial at a Ugandan regional referral hospital. Anaesthesia. 2019;74(2):167–73. Consensus:
<https://consensus.app/papers/details/cccf9d50813552d28b27a5e4286831fe/>
14. Irwin R, Stanescu S, Buzaianu C, Rademan M, Roddy J, Gormley C, et al. Quadratus lumborum block for analgesia after caesarean section: a randomised controlled trial. Anaesthesia. 2020;75(1):89–95. Consensus:
<https://consensus.app/papers/details/b75b148aaa7d590094eb52f9886a884b/>

15. Teigen NC, Sahasrabudhe N, Doulaveris G, Xie X, Negassa A, Bernstein J, et al. Enhanced recovery after surgery at cesarean delivery to reduce postoperative length of stay: a randomized controlled trial. *Am J Obstet Gynecol.* 2020;222(4):372.e1–372.e10. Consensus: <https://consensus.app/papers/details/e01e1a6618af50eda58bd30b6c1083a0/>
16. Baluku M, Bajunirwe F, Ngonzi J, Kiwanuka J, Ttendo S. A randomized controlled trial of enhanced recovery after surgery versus standard of care recovery for emergency cesarean deliveries at Mbarara Hospital, Uganda. *Anesth Analg.* 2020;130(3):769–76. Consensus: <https://consensus.app/papers/details/34fb05f1975651a1870a32e0e46c7944/>
17. Nedeljkovic SS, Kett A, Vallejo MC, Ip VHY, Carvalho B, Frantz DE, et al. Transversus abdominis plane block with liposomal bupivacaine for pain after cesarean delivery in a multicenter, randomized, double-blind, controlled trial. *Anesth Analg.* 2020;131(6):1830–9. Consensus: <https://consensus.app/papers/details/b77ef73981c7506588ae4865fad20355/>
18. Sharpe EE, Molitor RJ, Arendt KW, Torbenson VE, Olsen DA, Johnson RL, et al. Intrathecal morphine versus intrathecal hydromorphone for analgesia following cesarean delivery: a randomized clinical trial. *Anesthesiology.* 2020;132(6):1382–91. Consensus: <https://consensus.app/papers/details/e728025725d45c18abcd3f0c9e2e16dc/>
19. Barney EZ, Pedro CD, Gamez BH, Fuller ME, Dominguez JE, Habib AS. Ropivacaine and ketorolac wound infusion for post-cesarean delivery analgesia: a randomized controlled trial. *Obstet Gynecol.* 2020;135(2):427–35. Consensus: <https://consensus.app/papers/details/c45e80ebf57e5eae4789d49b68e425c/>
20. Wang W, Ling B, Chen Q, Xu H, Lv X, Yu W. Effects of esketamine on analgesia and postpartum depression after cesarean section: a randomized, double-blinded controlled trial. *Medicine (Baltimore).* 2022;101(47):e32010. Consensus: <https://consensus.app/papers/details/a37a663bfdc65b95aff44bf423de1c8c/>
21. Usichenko TI, Henkel BJ, Klausenitz C, Hesse T, Pierdant G, Cummings M, et al. Effectiveness of acupuncture for pain control after cesarean delivery: a randomized clinical trial. *JAMA Netw Open.* 2022;5(2):e220517. Consensus: <https://consensus.app/papers/details/76b07ee21f5c5bbfa18ee659325d81c4/>

22. Guo M, Lei B, Li Y, Zhang Y, Wang J, Xu Z, et al. Anterior quadratus lumborum block at the lateral supra-arcuate ligament versus transmuscular quadratus lumborum block for analgesia after elective cesarean section: a randomized controlled trial. *J Clin Med.* 2022;11(23):7014. Consensus: <https://consensus.app/papers/details/df3243c924915159bd7d60191d2261eb/>
23. Botea MO, Lungeanu D, Petrica A, Sandor MI, Huniadi AC, Barsac C, et al. Perioperative analgesia and patients' satisfaction in spinal anesthesia for cesarean section: fentanyl versus morphine. *J Clin Med.* 2023;12(17):5828. Consensus: <https://consensus.app/papers/details/d1eb73bc97265f0f95a6950df751c60f/>
24. Giral T, Sion A, Le Gouez A, Mercier FJ, Bonnet MP. Posterior quadratus lumborum block versus intrathecal morphine analgesia after scheduled cesarean section: a prospective, randomized, controlled study. *Reg Anesth Pain Med.* 2024;49(11):802–8. Consensus: <https://consensus.app/papers/details/997e9d9f853f51cfa98798c6c0782c45/>
25. Urfalı S, Karakaya Z, Uzel Kırbağ A, Özdemir M, Kurt B, Taştan Y. Transversus abdominis plane block following cesarean section: a prospective randomized controlled study comparing the effects on pain levels of bupivacaine, bupivacaine + dexmedetomidine, and bupivacaine + dexamethasone. *J Clin Med.* 2024;13(15):4576. Consensus: <https://consensus.app/papers/details/0be0158444255a208518afc5813c8867/>
26. Jiang H, Zhang Y, Chen X, Wang L. The effects of integrating the Manchester Pain Management Model and empowerment education on postoperative rehabilitation after cesarean section: a comprehensive intervention study. *PLoS One.* 2025;20(3):e0318846. Consensus: <https://consensus.app/papers/details/2d5ec0f1b074579096a3ec752c2f5f85/>
27. Şirin BY, Taşkiran E, Erdoğan Arı D, Özdemir İ, Türkoğlu Öztürk A, Karaaslan P. Can erector spinae plane block replace intrathecal morphine in cesarean section? A prospective randomized controlled study on opioid consumption. *Clin J Pain.* 2025;41(6):e1291. Consensus: <https://consensus.app/papers/details/5cf2edfd8fbe5952a0411bf96a24d0ec/>
28. Park SK, Kim H, Yoo S, Lee HC, Kim WH, Lim YJ, et al. Transversus abdominis plane block combined with intrathecal fentanyl versus intrathecal morphine for post-cesarean analgesia: a randomized non-inferiority clinical trial. *Reg Anesth Pain Med.* 2025; published online ahead

- of print. Consensus:
<https://consensus.app/papers/details/abc2030ea752533a9f5896b64d11f73b/>
29. Macones GA, Caughey AB, Wood SL, Wrench IJ, Huang J, Norman M, et al. Guidelines for postoperative care in cesarean delivery: Enhanced Recovery After Surgery (ERAS) Society recommendations (part 3). *Am J Obstet Gynecol.* 2019;221(3):247.e1–247.e9. Consensus:
<https://consensus.app/papers/details/0571c3910e7f52938190067605787459/>
30. Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, Norman M, et al. Guidelines for intraoperative care in cesarean delivery: Enhanced Recovery After Surgery Society recommendations (part 2). *Am J Obstet Gynecol.* 2018;219(6):533–44. Consensus:
<https://consensus.app/papers/details/a8101f604e2d5c48ae208ff263c42b74/>
31. Wilson RD, Bollag L, Carvalho B, Ituk U, Kachulis B, Nelson G, et al. Guidelines for intraoperative care in cesarean delivery: Enhanced Recovery After Surgery Society recommendations (part 2) – 2025 update. *Am J Obstet Gynecol.* 2025;233(1):23–41. Consensus:
<https://consensus.app/papers/details/1a2bac2f41055ae88e534501ca997a28/>
32. Roofthoof E, Joshi GP, Rawal N, Van de Velde M; PROSPECT Working Group. PROSPECT guideline for elective caesarean section: updated systematic review and procedure-specific postoperative pain management recommendations. *Anaesthesia.* 2021;76(5):665–80. Consensus: <https://consensus.app/papers/details/6ec199e35b275157b7274f2f1faea9d1/>
33. Crowe G, Roofthoof E, Joshi GP, Van de Velde M; PROSPECT Working Group. Pain management after elective caesarean section under neuraxial anaesthesia: an updated systematic review and procedure-specific postoperative pain management (PROSPECT) recommendations. *Anaesthesia.* 2026;81(1):88–101. Consensus:
<https://consensus.app/papers/details/5218edff4db854958861f224d692bc3d/>
34. El-Boghdadly K, Desai N, Halpern S, Blake L, Odor PM, Bampoe S, et al. Quadratus lumborum block vs. transversus abdominis plane block for caesarean delivery: a systematic review and network meta-analysis. *Anaesthesia.* 2021;76(3):393–403. Consensus:
<https://consensus.app/papers/details/84528eb79911547db50a821aa88cae20/>

35. Zako J, Ye XY, Abdallah FW, Brull R. Transversus abdominis plane block for postoperative pain management and opioid sparing: a systematic review and meta-analysis of randomised controlled trials. *Br J Anaesth.* 2025;135(2):412–25. Consensus: <https://consensus.app/papers/details/a19ba958bc065d56892eea49af807fb3/>
36. Sultan P, Sharawi N, Blake L, Habib AS, Brookfield KF, Carvalho B. Expert consensus regarding core outcomes for enhanced recovery after cesarean delivery studies: a Delphi study. *Anesthesiology.* 2022;137(2):201–11. Consensus: <https://consensus.app/papers/details/8cbda0fe245550e28438a69a926d8abf/>
37. Hedderson M, Lee D, Hunt E, Lee K, Xu F, Mustille A, et al. Enhanced recovery after surgery to change process measures and reduce opioid use after cesarean delivery. *Obstet Gynecol.* 2019;134(3):511–9. Consensus: <https://consensus.app/papers/details/f970d2a8fb52587083f2915008fbcad7/>
38. Mullman L, Hilden P, Goral J, Gwacham N, Tauro C, Spinola K, et al. Improved outcomes with an enhanced recovery approach to cesarean delivery. *Obstet Gynecol.* 2020;136(4):685–91. Consensus: <https://consensus.app/papers/details/4daf99f2bd30561f96d3edafab35dbf5/>
39. Uvnäs Moberg K, Ekström-Bergström A, Buckley S, Massarotti C, Pajalic Z, Luegmair K, et al. Maternal plasma levels of oxytocin during breastfeeding — a systematic review. *PLoS One.* 2020;15(8):e0235806. Consensus: <https://consensus.app/papers/details/f60d6146da1f51a792f1f73008c81643/>
40. Monks DT, Palanisamy A. Oxytocin: at birth and beyond. A systematic review of the long-term effects of peripartum oxytocin. *Anaesthesia.* 2021;76(11):1526–37. Consensus: <https://consensus.app/papers/details/ea3115e235585ce8b277c1b2beb751ca/>
41. Segura-Pérez S, Richter L, Rhodes EC, Hromi-Fiedler A, Vilar-Compte M, Adnew M, et al. Risk factors for self-reported insufficient milk during the first 6 months of life: a systematic review. *Matern Child Nutr.* 2022;18(Suppl 3):e13353. Consensus: <https://consensus.app/papers/details/76376fc1dba95725a7193ddcee42bdad/>
42. Gedefaw G, Goedert MH, Abebe E, Demis A. Effect of cesarean section on initiation of breast feeding: findings from the 2016 Ethiopian Demographic and Health Survey. *PLoS One.*

2020;15(12):e0244229.

Consensus:

<https://consensus.app/papers/details/3ad656aba25c5f2eb2c463092934160c/>

43. Pesonen A, Kokki M, Kokki H, Ranta VP, Hautajärvi H, Lehtonen M, et al. Breast milk oxycodone concentrations in mothers given oxycodone for post-Caesarean delivery pain management. *Br J Clin Pharmacol.* 2024;90(5):1247–58. Consensus:
<https://consensus.app/papers/details/e7a7b5b9171e56b98438968209bcc752/>
44. Chang CY, Wu MY, Chien YJ, Su IM, Wang SC, Kao MC. Effects of opioids administered via intravenous or epidural patient-controlled analgesia after caesarean section: a network meta-analysis of randomised controlled trials. *eClinicalMedicine.* 2022;51:101552. Consensus:
<https://consensus.app/papers/details/c31bcdbabdf95dd093c8beb205e8d3de/>
45. Tran DQ, Bravo D, Leurcharusmee P, Neal JM. Transversus abdominis plane block: a narrative review. *Anesthesiology.* 2019;131(5):1166–90. Consensus:
<https://consensus.app/papers/details/2842e520d07d583fb43f3ec0bf9d3384/>
46. Aamir MA, Sahebally SM, Heneghan H. Transversus abdominis plane block in laparoscopic bariatric surgery — a systematic review and meta-analysis of randomized controlled trials. *Obes Surg.* 2021;31(1):133–42. Consensus:
<https://consensus.app/papers/details/4bf7f7b833535d41be59e5efbb3b7215/>
47. Zhou M, Wang J, Zhang Y, Liao J, Zhou X, Wang Y, et al. Effect of early essential newborn care on breastfeeding and outcomes of mothers/newborns post-cesarean section: a randomized controlled trial in China. *Reprod Health.* 2024;21(1):26. Consensus:
<https://consensus.app/papers/details/114ce99bd06b5ecd8c9643399743394f/>
48. Wen J, Yu G, Kong Y, Liu F, Wei H. Effects of a theory of planned behavior-based intervention on breastfeeding behaviors after cesarean section: a randomized controlled trial. *Int J Nurs Sci.* 2021;8(2):152–8. Consensus:
<https://consensus.app/papers/details/e1a429b045265c82a153833562cdb9d1/>