



Research Reviews

Cesarean Section Delivery Pain

Introduction: Cesarean section delivery (CSD) is the most common surgery in the world, and the rate is increasing¹. In the United States, which has one of the highest cesarean rates in the world, this surgery occurs in approximately 1/3 of all births². Postpartum pain is known to be higher with this delivery, and optimal pain control is vital as pain is linked to delayed recovery, poor clinical outcomes, and poor maternal–fetal bonding.³ Opioid addiction prevalence in women who gave birth by cesarean is 1 in 300 of opioid-naïve women.⁴

General Literature Overview: This literature review focuses on current pain management for CSD: the modification of routine analgesic sets, standardization of these sets, and the use of alternative care interventions such as virtual reality, nurse-supported care, and physical therapy (PT). The American College of Obstetricians and Gynecologists (ACOG) revised its clinical guidance document in September 2021 regarding postpartum pain, and its summary is included.

There is currently sparse research investigating PT intervention for patients who have undergone CSD that is without bias⁵. These studies however do indicate positive improvements in pain, abdominal muscle and bowel function, and mobility across the spectrum of care (early post-op through 5 years). These findings were supported recently in an unblinded randomized controlled study of 72 final participants included in this review.⁶

Although PT intervention for those who have undergone CSD may appear novel, PT intervention has been purported by expert physical therapists dedicated to women's health as early as 1985⁷. This reviewer participated as an instructor in a continuing education course to physical therapists that included CSD rehabilitation in 1983. It is of utmost importance that physical therapists advocate for this patient population not only in the realms of doctoral education, clinical practice and research but also in policy and guidelines for professional organizations. The ACOG Clinical Consensus document whose summary is included below, does not mention PT intervention for postpartum pain management, including CSD.⁸ Obstetricians and gynecologists in the United States look to ACOG for clinical practice guidance. Based on the ACOG Clinical Consensus document alone, it is clear that there is work to be done in the realms of research, advocacy, and education.

Articles:

1. Bornstein E, Husk G, Lenchner E, et al. Implementation of a Standardized Post-Cesarean Delivery Order Set with Multimodal Combination Analgesia Reduces Inpatient Opioid Usage. *Journal of Clinical Medicine*. 2021;10(1):7. doi:[10.3390/jcm10010007](https://doi.org/10.3390/jcm10010007)
2. Sangkum L, Thamjamrassri T, Arnuntasupakul V, Chalacheewa T. The Current Consideration, Approach, and Management in Postcesarean Delivery Pain Control: A Narrative Review. *Anesthesiol Res Pract*. 2021;2021:2156918. doi:[10.1155/2021/2156918](https://doi.org/10.1155/2021/2156918)

3. El Hams S, El Najar N, Abu El-Aish K. Effect of nurse-supported care on pain management in women undergoing caesarean delivery: a comparative study. *Lancet*. 2021;398:S24-S24. doi:[10.1016/S0140-6736\(21\)01510-5](https://doi.org/10.1016/S0140-6736(21)01510-5)
4. Almedhesh SA, Elgzar WT, Ibrahim HA, Osman HA. The effect of virtual reality on anxiety, stress, and hemodynamic parameters during cesarean section: A randomized controlled clinical trial. *Saudi Med J*. 2022;43(4):360-369. doi:[10.15537/smj.2022.43.4.20210921](https://doi.org/10.15537/smj.2022.43.4.20210921)
5. Weerasinghe K, Rishard M, Brabaharan S, Mohamed A. Effectiveness of face-to-face physiotherapy training and education for women who are undergoing elective caesarean section: a randomized controlled trial. *Arch Physiother*. 2022;12:4. doi:[10.1186/s40945-021-00128-9](https://doi.org/10.1186/s40945-021-00128-9)
6. Stone J, Skibiski K, Hwang S, Barnes C. Physical Therapy in Addition to Standard of Care Improves Patient Satisfaction and Recovery Post-cesarean Section. *J WOMENS HEALTH PHYS THER*. 2021;45(1):10-19. doi:[10.1097/JWH.0000000000000187](https://doi.org/10.1097/JWH.0000000000000187)
7. Simonds A, Owen W, Palombo A, Rele A, Rogers L, Rosenblatt M. Section on Women's Health CSM Posters. *Journal of Women's Health Physical Therapy*. 2017;41(1):46-61. doi:[10.1097/JWH.0000000000000073](https://doi.org/10.1097/JWH.0000000000000073)
8. ACOG, Clinical Consensus. Pharmacologic Stepwise Multimodal Approach for Postpartum Pain Management. Published September 2021. Accessed June 13, 2022. <https://www.acog.org/en/clinical/clinical-guidance/clinical-consensus/articles/2021/09/pharmacologic-stepwise-multimodal-approach-for-postpartum-pain-management>

Article 1

Bornstein E, Husk G, Lenchner E, et al. Implementation of a Standardized Post-Cesarean Delivery Order Set with Multimodal Combination Analgesia Reduces Inpatient Opioid Usage.

Abstract

Background: Opioid use has emerged as a leading cause of death in the US. Given that 1 in 300 opioid-naïve patients exposed to opioids after **cesarean** birth will become persistent users, hospitals should strive to limit exposure to these medications. We set out to evaluate whether transitioning to a standardized order set based on multimodal combination analgesic therapy decreases the exposure to opioids after **cesarean** delivery. Methods: Our health system's post-**cesarean pain management** electronic medical record (EMR) order set was changed from standing NSAIDs (Ibuprofen 600 mg every 6 h) and additional acetaminophen and opioid medications (Oxycodone 5 mg/acetaminophen 325 mg every 3 h or Oxycodone 10 mg/acetaminophen 650 mg every 6 h for moderate and severe **pain**, respectively) as needed (PRN) to a multimodal combination therapy with acetaminophen (975 mg every 6 h) and NSAIDs (Ibuprofen 600 mg every 6 h) as primary analgesics and opioids PRN (Oxycodone immediate release (IR) 5 mg every 3 h for moderate to severe **pain**). We performed a retrospective analysis across seven hospitals comparing inpatient opioid use, administration of other analgesics, and severe **pain** episodes (**pain** score ≥ 7) between the patients who were treated before and after implementation of the multimodal order set. Chi square and Student t-test were used for statistical analysis with significance determined as $p < 0.05$. Results: A total of 12,898 **cesarean** births were included (8696 prior and 4202 after implementation). The multimodal order set was associated with marked decrease in the incidence of post **cesarean** opioid use (45.4% vs. 67.5%; $p < 0.0001$), lower average opioid dose (26.7 mg vs. 36.6 mg of oxycodone; $p < 0.0001$), and increased dose of acetaminophen (8422 mg vs. 4563 mg; $p < 0.0001$), while severe **pain** scores were less frequent (46.3% vs. 56.6%, $p < 0.0001$). Conclusions: Multimodal analgesic therapy for post-**cesarean pain management** reduces inpatient opioid use while improving **pain** control. Incorporation of a multimodal order set as a default in the EMR facilitates effective and widespread implementation on a large scale. Obstetric units should consider standardizing post-**cesarean pain management** orders to include routine (not PRN) multimodal

combination therapy with acetaminophen and NSAIDs as primary analgesics. [ABSTRACT FROM AUTHOR]

Article 2

Sangkum L, Thamjamrassri T, Arnuntasupakul V, Chalacheewa T. The Current Consideration, Approach, and Management in Postcesarean Delivery Pain Control: A Narrative Review

Abstract

Optimal postoperative analgesia has a significant impact on patient recovery and outcomes after cesarean delivery. Multimodal analgesia is the core principle for cesarean delivery and pain management. For a standard analgesic regimen, the use of long-acting neuraxial opioids (e.g., morphine) and adjunct drugs, such as scheduled acetaminophen and nonsteroidal anti-inflammatory drugs, is recommended unless contraindicated. Oral or intravenous opioids should be reserved for breakthrough pain. In addition to the aforementioned use of multimodal analgesia, preoperative evaluation is critical to individualize the analgesic regimen according to the patient requirements. Risk factors for severe postoperative pain or analgesia-related adverse effects will require modifications to the standard analgesic regimen (e.g., the use of ketamine, gabapentinoids, or regional anesthetic techniques). Further investigation is required to determine analgesic drugs or dose alterations based on preoperative predictions for patients at risk of severe pain. Outcomes beyond pain and analgesic use, such as functional recovery, should be determined to evaluate analgesic treatment protocols.

Article 3

El Hams S, El Najar N, Abu El-Aish K. Effect of nurse-supported care on pain management in women undergoing caesarean delivery: a comparative study.

Abstract

Background: Pain management after caesarean delivery is important because acute pain in the postoperative period is associated with persistent pain, increased opioid use and postpartum depression, and delayed functional recovery. We investigated the role of nurse-supported care in acute pain management after caesarean delivery, which as far as we know has not previously been investigated in Gaza. **Methods** This was a comparative study done from March, 2018, to October, 2018, among women assigned to undergo caesarean delivery. Research nurses at the Al-Helal Al-Emirati Hospital, Rafah, Gaza Strip, occupied Palestinian territory, were trained to give supportive pain management care to women after caesarean delivery, including individualised care and educational sessions on pain, nutrition, exercise, and wound care. Women were randomly assigned to receive nurse-supported care or usual care. Pain assessment scales (range 1–5, where 1=no pain and 5=pain as bad as it could be) were used to record pain at 1, 6, 12, 18, and 24 h after caesarean delivery. The time from the end of the caesarean delivery to the first request for analgesia and the total amounts and types of analgesics (pethidine ampules, diclofenac ampules, or indometacin suppositories) used in the first 24 h were recorded as primary outcomes. Secondary outcomes were nausea and vomiting scores (0–3, where 0=no nausea or vomiting and 3=severe and unresponsive to antiemetic drugs), sedation scores (0–3, where 0=patient awake and 3=severe sedation and patient difficult to rouse), and pruritis scores (0–2, where 0=no pruritis and 2=severe pruritis needing treatment). Data were analysed with SPSS (version 22.0). Groups were compared by using the Student's t-test and χ^2 . P values less than 0.05 were significant. The study was approved by the Ministry of Health and Helsinki Committee, Gaza Strip. Women provided verbal informed consent for inclusion in the study when they were assigned to the caesarean delivery. **Findings** 108 women participated, with a mean age of 29.2 years (SD 5.50). 49 women were randomly assigned to nurse-supported care and 59 to usual care. Pain was reduced in the nurse-supported care group compared with in the usual care group at 12 h (mean score 1.15 [SD 0.25] vs 1.60 [0.67], $p=0.002$) and at 18 h (1.08 [0.22] vs 1.26 [0.21], $p=0.049$) but did not differ significantly at other times. The time to first requesting analgesia was shorter in the nurse-supported care group than in the usual care group (mean 3.38 h [SD 1.01] vs 6.16 h [2.01], $p=0.038$). The proportions of women who asked for a first analgesic were similar in the two groups (30

[61%] and 36 [61%]), whereas seven (14%) women in the nurse-supported care group requested a second analgesic compared with 13 (22%) in the usual care group ($p=0.045$). There were no significant differences between the two groups for nausea and vomiting, sedation, or pruritis. Interpretation Nurse-supported care provided better analgesia than usual care in women who had undergone caesarean delivery. A multicentre study is needed to explore the types, duration, and repeatability of the effects of nurse supportive care on pain perception and duration of hospital stay after caesarean delivery. Funding None.

Article 4

Almedhesh SA, Elgzar WT, Ibrahim HA, Osman HA. The effect of virtual reality on anxiety, stress, and hemodynamic parameters during cesarean section: A randomized controlled clinical trial.

Abstract

Objectives: To investigate the effect of virtual reality (VR) on anxiety, stress, and hemodynamic parameters during cesarean section (CS). **Methods:** This is a randomized controlled clinical trial conducted at the operating theatre / Maternal and Children Hospital, Najran, Saudi Arabia from February to October 2021. The study comprised a random sample of 351(176 study and 175 control) low-risk pregnant women undergoing elective CS with regional anesthesia. Data collection was carried out using 5 instruments. Basic and clinical data sheet, maternal hemodynamic parameters assessment sheet, brief measure of preoperative emotional stress, a novel visual facial anxiety scale, and maternal satisfaction scale. Virtual reality group exposed to 3D natural videos associated with calm Quran or music voices via phone using VR glasses immediately after anesthesia until completion of skin suture. The control group left for routine hospital care. **Results:** The VR group showed significantly lower stress and anxiety levels immediately after skin suture and 2h postoperative ($p=0.000$). Maternal satisfaction 2 hours after CS showed that 58% of the VR group were completely satisfied compared to 11.3% of the control group (FET=135.359 $p=0.000$). Virtual reality have an impact on hemodynamic parameters at some time points while peripheral oxygen saturation did not differ significantly ($p>0.05$). **Conclusion:** Virtual reality significantly reduced anxiety and stress among women undergoing CS under regional anesthesia. Virtual reality may be added to the routine intraoperative techniques that help induce patient relaxation and increase satisfaction.

Article 5

Weerasinghe K, Rishard M, Brabaharan S, Mohamed A. Effectiveness of face-to-face physiotherapy training and education for women who are undergoing elective caesarean section: a randomized controlled trial.

Abstract

Background: Caesarean Section (CS) is associated with numerous post-operative problems. The current literature reveals that physiotherapy interventions such as pelvic floor rehabilitation and post-surgical rehabilitation enable enhanced recovery in the post-operative period. The purpose of this study was to investigate the effectiveness of face-to-face physiotherapy training and education prior to elective CS in improving post-operative outcomes. **Methods:** A single blind parallel randomized controlled study was carried out at De Soysa Hospital for Women (DSHW), Colombo. Fifty-four women who were to undergo elective CS were recruited to the study. The women in the intervention group ($n = 27$) received face-to-face physiotherapy training and education; the control group ($n = 27$) received only the standard nursing care. Outcome measures such as perception of post-operative pain, dosage of additional analgesics required, pain upon returning to functional activities and lengths of hospital stay were collected. Results were analyzed using IBM SPSS 20 using descriptive statistics and independent samples t-test. **Results:** Mean post-operative pain score (control group; 4.2 ± 0.46 vs. intervention group; 1.7 ± 0.7) and doses of additional analgesics required were significantly higher in the control group than that of the intervention group. Pain upon returning to functional activities decreased significantly within 2 days in both groups, and values were lower in the intervention group. The intervention group showed a shorter hospital stay than the control group (control group; 3.9 ± 0.3

vs. intervention group; 3.00 ± 0.0) ($p < 0.05$). Conclusions: Face-to-face physiotherapy training and education prior to elective CS appears to be a promising intervention to improve the post-operative outcomes by reducing post-operative pain, doses of additional analgesics required, pain upon returning to functional activities and lengths of hospital stay. Trial registration: SLCTR/2019/029-APPL/2019/028; Registered on 6th of September 2019..

Article 6

Stone J, Skibiski K, Hwang S, Barnes C. Physical Therapy in Addition to Standard of Care Improves Patient Satisfaction and Recovery Post-cesarean Section.

Abstract

Background: Cesarean section represents the most commonly performed inpatient surgical procedure in the United States. The few studies currently available regarding the role of physical therapy in postoperative recovery only look at the first few days or weeks postpartum. The goal of this pilot randomized controlled trial was to assess the impact of physical therapy post-cesarean delivery and to serve as a potential basis for future research. Objective: To evaluate the short- and long-term impact of an individualized, comprehensive physical therapy program on post-cesarean delivery recovery. Study Design: Unblinded randomized controlled trial. Methods: The intervention group went through an individualized 6-week physical therapy program, which included in-clinic treatment and home exercises in addition to usual postoperative care. Outcome measures used were a visual pain rating scale, Oswestry Disability Index, patient satisfaction questionnaire, and self-rated exercise confidence scale. Results: Seventy-two participants were included in final analysis. Satisfaction was significantly higher at 14 weeks ($P = .048$) and 6 months ($P = .047$) in the intervention group. Pain rating was significantly lower at 14 weeks ($P = .049$) in the intervention group. A significant change was found between baseline and 14-week/6-month follow up for Oswestry ($P < .0001$), patient satisfaction ($P = .024$), and self-efficacy with exercise ($P = .034$) in the intervention group. A significant main effect for self-efficacy with exercise ($P = .025$) in the intervention group was found at all time points compared with standard of care. Significant differences between variables were found for the Oswestry intervention group [8-14 weeks ($P = .003$), 8 weeks to 6 months ($P = .001$), and 8 weeks to 1 year ($P = .007$)] and the standard of care group [8 weeks to 6 months ($P = .001$) and 8 weeks to 1 year ($P = .006$)]. Conclusions: Participants who received physical therapy had significantly improved outcomes compared with the standard of care group. This suggests that physical therapy may be a helpful adjunct to cesarean delivery recovery, although larger studies should be done for definitive conclusions

Article 7

Simonds A, Owen W, Palombo A, Rele A, Rogers L, Rosenblatt M. Section on Women's Health CSM Posters. Effectiveness of Physical Therapy Interventions on Physical Measures of Health After Cesarean Section Delivery: A Systematic Review.

Abstract

Purpose/Hypothesis: More than 1 million women in the United States deliver via cesarean section delivery (CSD) annually. CSD is a known risk factor for chronic pelvic pain and is associated with poorer measures of health compared with vaginal delivery. Women's health physical therapists are uniquely qualified to address impairments after CSD, including pain, muscle function, and mobility across the care continuum. However, CSD rehabilitation is not routinely implemented in the United States. Physical therapy (PT) interventions to improve physical measures of health post-CSD may decrease pain and improve function. Evidence for the effectiveness of PT interventions may improve patient care and mitigate poorer health outcomes associated with CSD. Number of Subjects: N/A. Materials/Methods: Literature search was conducted from September to November 2015 using CINAHL, Cochrane Library, PubMed, and Ovid MEDLINE databases and utilized "cesarean section," "post-operative pain," "scar," "abdominal strength," "incision healing," and "rehabilitation" as search terms. Exclusion criteria were non-English language, cesarean scar pregnancy, prenatal studies,

uterine rupture, ectopic pregnancy, endometriosis, oophorectomy, hysterectomy, and non-PT interventions. Articles were critically appraised by multiple reviewers and graded using the Oxford Center for Evidence Based Medicine (CEBM) Levels of Evidence and Cochrane Risk of Bias Assessment Tool (ACROBAT). Results: Ten studies were selected and scored as level 2B to level 4 (CEBM) and were determined to have a high risk of bias (ACROBAT). PT interventions were found to significantly decrease pain, decrease physical disability, and increase functional mobility post-CSD. Interventions provided postoperatively significantly decreased time to ambulation, increased intestinal function, and decreased analgesic use compared with usual care. Interventions provided between 3 and 6 months significantly decreased pain, increased abdominal muscle thickness and endurance, and reduced inter-rectus distance. Soft-tissue mobilization, exercise, functional mobility, kinesiotaping, and electrical stimulation were utilized post-CSD at days 0 to 3, 3 to 6 months, and 5 years. Conclusions: Significant improvements in pain, abdominal muscle function, mobility, and bowel function were identified in women post-CSD following PT intervention compared with usual care. PT intervention resulted in decreased analgesic use in the immediate postpartum period. Improvements were found at days 1 to 3, 3 to 6 months, and 5 years. The lack of high-quality studies on rehabilitation outcomes post-CSD limits the strength of this review. However, calculated effect sizes of interventions support the conclusion that PT is more effective than usual care. Future research should prospectively investigate long-term effects of early rehabilitation, especially related to chronic pelvic pain. PT interventions were found to improve physical measures of health post-CSD in both postoperative settings and beyond 3 months postpartum.

Article 8

ACOG, Clinical Concensus. Pharmacologic Stepwise Multimodal Approach for Postpartum Pain Management.

Summary of Consensus Recommendations. General Considerations for Postpartum Pain Management

Obstetrician–gynecologists and other obstetric care professionals should be familiar with safe and effective pharmacologic and nonpharmacologic therapies for postpartum pain management. Obstetrician–gynecologists and other obstetric care professionals should engage in shared decision making with individuals regarding their preferences for pain management; doing so may improve satisfaction, decrease opioid use, and potentially reduce misuse and diversion. Obstetrician–gynecologists and other obstetric care professionals should be aware of inequities in the assessment and treatment of pain and consider ways in which their own biases may contribute to perpetuating them. Obstetrician–gynecologists and other obstetric care professionals should use a stepwise multimodal approach using a combination of agents with different mechanisms of action to effectively individualize pain management in the postpartum period. Nonsteroidal anti-inflammatory drugs (NSAIDs) may be used for the management of postpartum pain in all individuals, including those with hypertensive disorders of pregnancy.

Vaginal Birth

A stepwise multimodal approach to analgesia beginning with an NSAID or acetaminophen and, if needed, escalating to an opioid is recommended after vaginal delivery. Cesarean Birth For postoperative cesarean pain, a stepwise multimodal approach should include standard oral and parenteral analgesic adjuvants such as acetaminophen, NSAIDs, and opioids. Breastfeeding Considerations Acetaminophen and ibuprofen are first-line analgesics for postpartum pain for individuals intending to provide breast milk to their infants. Intravenous ketorolac is an acceptable component of postpartum multimodal therapy for individuals intending to provide breast milk to their neonates; although information about medication levels in breast milk is not available for intravenous ketorolac, they are likely low in the immediate postpartum period.

Obstetrician–gynecologists and other obstetric health care professionals should counsel individuals who are prescribed opioid analgesics about the risk of central nervous system depression in the

individual and in the breastfed infant. If a codeine-containing medication is selected for postpartum pain management, duration of therapy and neonatal signs of toxicity should be reviewed with individuals and their families.

Discharge Considerations

Obstetrician–gynecologists and other obstetric health care professionals should engage in shared decision making with individuals regarding pain management after hospital discharge, incorporating pharmacologic interventions that may include opioids. Duration of opioid use should be limited to the shortest reasonable course expected for treating acute pain.

References:

1. Sangkum L, Thamjamrassri T, Arnuntasupakul V, Chalacheewa T. The Current Consideration, Approach, and Management in Postcesarean Delivery Pain Control: A Narrative Review. *Anesthesiol Res Pract.* 2021;2021:2156918. doi:10.1155/2021/2156918
2. Boyle A, Reddy UM, Landy HJ, Huang CC, Driggers RW, Laughon SK. Primary Cesarean Delivery in the United States. *Obstet Gynecol.* 2013;122(1):33-40. doi:10.1097/AOG.0b013e3182952242
3. Sangkum L, Thamjamrassri T, Arnuntasupakul V, Chalacheewa T. The Current Consideration, Approach, and Management in Postcesarean Delivery Pain Control: A Narrative Review. *Anesthesiol Res Pract.* 2021;2021:2156918. doi:10.1155/2021/2156918
4. Bornstein E, Husk G, Lenchner E, et al. Implementation of a Standardized Post-Cesarean Delivery Order Set with Multimodal Combination Analgesia Reduces Inpatient Opioid Usage. *J Clin Med.* 2021;10(1):7. doi:10.3390/jcm10010007
5. Simonds A, Owen W, Palombo A, Rele A, Rogers L, Rosenblatt M. Section on Women's Health CSM Posters, Effectiveness of Physical Therapy Interventions on Physical Measures of Health After Cesarean Section Delivery: A Systematic Review. *J Women's Health Phys Ther.* 2017;41(1):46-61. doi:10.1097/JWH.0000000000000073
6. Stone J, Skibiski K, Hwang S, Barnes C. Physical Therapy in Addition to Standard of Care Improves Patient Satisfaction and Recovery Post-cesarean Section. *J Womens Health Phys Ther.* 2021;45(1):10-19. doi:10.1097/JWH.0000000000000187
7. Gent D, Gottlieb K. Cesarean rehabilitation... physical therapy. *Clin Manag Phys Ther.* 1985;5(3):14-19.
8. ACOG, Clinical Concensus. Pharmacologic Stepwise Multimodal Approach for Postpartum Pain Management. Published September 2021. Accessed June 13, 2022. <https://www.acog.org/en/clinical/clinical-guidance/clinical-consensus/articles/2021/09/pharmacologic-stepwise-multimodal-approach-for-postpartum-pain-management>

About the Author

This Research Review was provided by Deborah B. Riczo, PT, MEd, DPT, founder of Riczo Health Education. She is the author of "Sacroiliac Pain: understanding the Pelvic Girdle Musculoskeletal Method," and "Back and Pelvic Girdle Pain in Pregnancy and Postpartum: finding relief using the Pelvic Girdle Musculoskeletal Method," and provides continuing education to health care providers through APTApelvichealth, Physiopedia and Motivations. You can contact Deborah by email at Deborah@RiczoHealthEducation.com or on Instagram/Facebook @RiczoHealthEducation.