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Anesthesia practice during elective Cesarean delivery under spinal anesthesia: a prospective observational study

Submission ID

62

AUTHORS

Barrera, Juliana;¹ Sharrock, Aislynn;¹ Massey, Simon;^{1,2} Gunka, Vit^{1,2}

¹Department of Anesthesia, BC Women's Hospital and Health Centre, Vancouver, BC, Canada; ²Department of Anesthesiology, Pharmacology & Therapeutics, Faculty of Medicine, The University of British Columbia, Vancouver, BC, Canada

INTRODUCTION

The incidence of intraoperative pain in women undergoing elective Cesarean delivery (CD) under neuraxial anesthesia is reported as high as 22.7%.¹ This is associated with poor patient outcomes and adverse psychological sequelae.² The 2022 Obstetric Anaesthetists' Association (OAA) guidelines provide recommendations for best clinical practice, specifically targeting prevention and management of intraoperative pain during CD.² The purpose of this observational study was to assess our current clinical practice during elective CD under spinal anesthesia with respect to OAA guidelines.

METHODS

After research ethics board review ethics approval was waived. This prospective observational study evaluated anesthesia consultants during elective CDs under spinal anesthesia in healthy pregnant patients. Consultants were encouraged to follow their usual clinical practice. Data was collected by a single assessor. Primary areas evaluated included requirement for additional intravenous (IV) analgesia, spinal sensory block assessment modality and technique, target sensory block level, and identification of T5 dermatome on a standardized diagram. Group performance is presented as frequencies and percentages.

RESULTS

A total of 14 consultants were evaluated. No patients required additional IV analgesia. Spinal block assessment was performed using a combination of modalities including light touch, pinprick and ice 1/14 (7%), light touch and ice 5/14 (36%), pinprick and ice 7/14 (50%), and ice only 1/14 (7%). Among consultants employing light touch, 3/6 (50%) used a cotton ball, 2/6 (33%) used gauze, 1/6 (17%) used a Neurotip. When inquired about target sensory level before surgery initiation, 2/6 (33%) aimed for T5 to light touch, 3/6 aimed for T6 to light touch and 1/6 aimed for T4 to ice without using light touch as target modality. T5 dermatome was correctly

identified by 4/14 (29%) consultants (Figure). None of the consultants using light touch and targeting T5 level was able to correctly mark T5 dermatome on a standardized diagram.

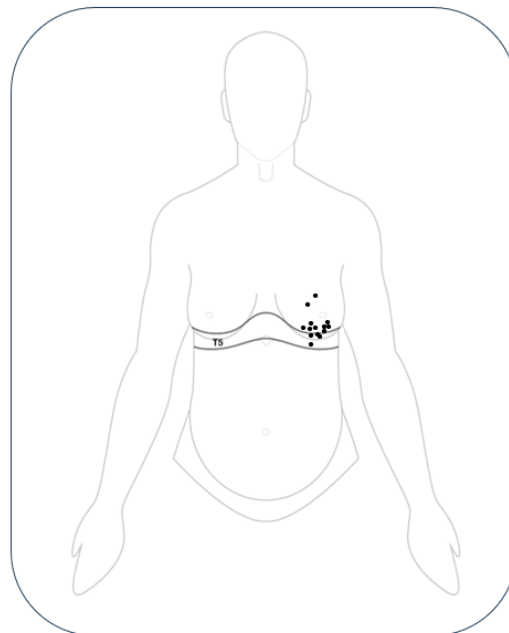
DISCUSSION

Considerable differences were found between our clinical practice and OAA guidelines. Furthermore, we observed significant practice variability among consultants. OAA guidelines recommend light touch as primary modality with at least T5 sensory block to minimize the risk of intraoperative pain.² Less than half of consultants used light touch with another modality. Only two consultants targeted T5 prior to incision, both of them misidentified T5 by one dermatome. Overall, less than a third of consultants marked T5 dermatome correctly. The results of this study identified areas and opportunities to standardize our anesthesia practice in alignment with OAA guidelines.

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Figure Standardized upper female torso diagram



(●) represents individual consultant T5 dermatome identification ($n = 14$). Actual sensory T5 dermatome outlined. Based on the original Cleveland Clinic 2022 Dermatome Diagram.

Point-of-care ultrasound in anesthesia and critical care for obstetric patients: a scoping review

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105

AUTHORS

Young, Laura V.;¹ Sjaus, Ana;^{1,2} Zaphiratos, Valerie^{3,4}

¹Department of Women's & Obstetric Anesthesia, IWK Health Centre, Halifax, NS, Canada; ²Department of Anesthesiology, Pain Management and Perioperative Medicine, Dalhousie University, Halifax, NS, Canada; ³Department of Anesthesia, CHU Sainte-Justine Hospital, Montreal, QC, Canada; ⁴Department of Anesthesiology and Pain Medicine, University of Montreal, QC, Canada

INTRODUCTION

Often marked by rapid shifts and increased diagnostic uncertainty, pregnancy, labour, and delivery present unique clinical challenges. The growing use of diagnostic point-of-care ultrasound (POCUS) as an extension of physical examination in this setting has been boosted by increasingly accessible training and equipment. Nevertheless, the evidence for its exact role, pregnancy-specific validation, standardization of techniques, normal values and patient benefits have yet to be defined for many of the POCUS modalities in this population.

The purpose of this review is to present the inclusive scope and the nature of the literature to date on diagnostic POCUS in obstetric anesthesia and critical care. The intent is to identify research strengths and gaps, facilitate the work of researchers, clinicians, and educators to expedite further projects, define the scope of POCUS skills for obstetric anesthesiologists, compose curricula and perform periodic updates. The scoping review methodology is suited for this purpose.

METHODS

We applied the five-stage process from the Joanna Briggs Institute methodology for scoping reviews updated by Arksey and O'Malley.^{1,2} Given the evolving scope of POCUS, we anchored its definition within the indication-acquisition-interpretation-medical decision (I-AIM) framework as "ultrasound use at the bedside for immediate diagnostic purposes."³ The search strategy stemmed from the research questions: to identify the publications, methodologies, clinical aspects, research gaps and suggestions for further research.

The strategy was broadly inclusive and peer-reviewed by a health science librarian. We included English-language publications on anesthesia and critical care for obstetric populations from 24 weeks gestation to postpartum, excluding the studies of procedural ultrasound, education, and simulation. The search was conducted in PubMed, EMBASE and WebOfScience, covering the period from January 2000 to 2024. The retrieved articles were uploaded into Covidence (Veritas Health Innovation, Australia), deduplicated and independently screened by

two reviewers. Relevant articles were re-screened for eligibility based on the full text and the data extracted for analysis from the finally included articles. The third reviewer was available to reach a consensus. Descriptive analysis was conducted to summarize the findings adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension for scoping reviews (PRISMA-ScR).⁴

RESULTS

Of the 7,777 identified articles, with 851 duplicates and 6,200 excluded during initial screening, 864 were selected for full-text review. Data were extracted from 351 articles that met the criteria (Figure). Globally, literature on POCUS has increased over time, with 31% of studies identified as “POCUS.”

Original research comprised 126 observational studies, 15 randomized trials, and three systematic reviews. The most represented applications of POCUS were gastric, cardiac, prediction of postspinal hypotension, lung ultrasound and validation studies (cardiac output, ventricular function). Hemodynamic instability was the most common indication, with multiple modalities used (cardiac, lung, and vascular ultrasound) for risk stratification, fluid management and prediction/detection of complications of preeclampsia. Small exploratory studies (median sample size, 44.5; IQR, 25–64) were prevalent, with 44.3% featuring parallel comparison group(s). Case reports represented 42% of all articles, highlighting POCUS’s role in reducing diagnostic uncertainty, expediting management, and guiding the treatment.

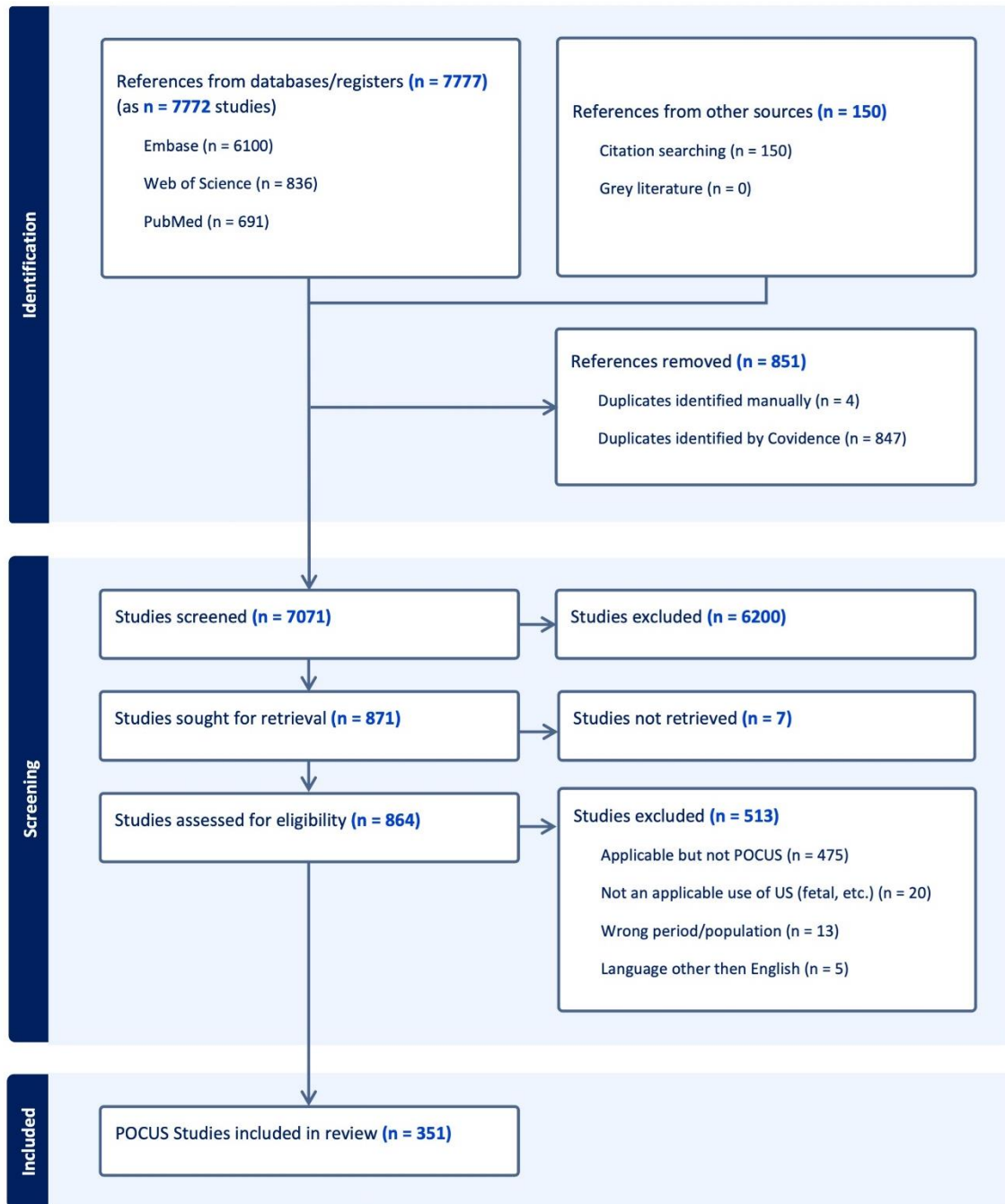
DISCUSSION

This review presents the first attempt to summarize the entire scope of literature on the use of POCUS in obstetric anesthesia and critical care. Point-of-care ultrasound has the potential to improve timing and accuracy of bedside decisions in this challenging setting. Embraced globally, POCUS may address the rising maternal morbidity in high- and low- resource settings. Advancing from exploratory research towards larger multicentre studies is necessary to support the clinical utility of POCUS evident in case reports. In its published form, this scoping review may support further strides towards its broader clinical implementations.

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Figure PRISMA flow diagram



The incidence of spinal anesthesia failures during elective Cesarean deliveries: a comparison of two different suppliers

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88

AUTHORS

Reaume, Noaah; Pellerin, Alixe; Goncin, Una; Gamble, Jonathan; Walker, Mary Ellen; Hedlin, Peter

Department of Anesthesiology, Perioperative Medicine and Pain Management, University of Saskatchewan, Royal University Hospital, Saskatoon, SK, Canada

INTRODUCTION

Spinal anesthesia is commonly used in Cesarean deliveries. This procedure uses bupivacaine to achieve a subarachnoid block (SAB). A failed SAB can be defined as surgical pain/discomfort requiring further intravenous/inhalational agents, or conversion to general anesthesia.¹ The conversion to general anesthetic may negatively impact the neonate, as many induction medications readily cross the placenta.² The associated swelling, friable tissues, and decreased esophageal sphincter tone also increase the risk of intubation in pregnancy.²

The literature identifies multiple patient, provider, and/or product factors associated with SAB failures. A previous chart review found the failure rate at our maternity hospital was 2.5% in 2020, following a change in bupivacaine supplier in 2018. This is comparable to previous literature citing a 0.5–6.4%^{2,3} failure rate. We therefore sought to determine the rate of Cesarean delivery SAB failures at our maternity hospital in 2017, in comparison to 2020, along with factors associated with SAB failures.

METHODS

Anesthetic and obstetric records were obtained for all Cesarean deliveries performed at our maternity hospital from June 2017 to June 2018 ($N = 1,519$). A complete chart review was performed for all SAB cases ($n = 922$), with non-SAB anesthesia cases (e.g., general anesthesia) excluded from the analysis ($n = 527$). Subarachnoid block cases were then categorized as either a successful or failed block. Subarachnoid block failures were then categorized based on management (e.g., SAB re-attempted, intraoperative supplementation, or conversion to general anesthesia).

Patient factors (body mass index, number of fetuses, gestational age, diagnosis of gestational hypertension and gestational diabetes mellitus) and spinal anesthesia factors (bupivacaine baricity and volume, fentanyl and epi-morphine doses, insertion level, number of attempts, complications, time from SAB to recovery room) were recorded. Mann–Whitney U , Chi square, and Fisher's Exact tests were used to evaluate differences in metrics between

successful and failed blocks in 2017–18, as well as between the failure groups in 2017–18 and 2020. Alpha was adjusted to account for multiple comparisons ($\alpha = 0.025$).

RESULTS

The SAB failure rate at our maternity hospital from June 2017–June 2018 was 4.3%, in comparison to the observed SAB failure rate in 2020 of 2.5% ($P = 0.018$). The risk of SAB failure with a 95% confidence interval was 1.73 (1.1 to 2.9) times greater in 2017–18 vs 2020. No significant differences were observed with respect to patient factors between successes and failures in 2017–18 or 2020. Nevertheless, failures required significantly more insertion attempts than successful blocks in 2017–18 (2.0 [1.0–2.0], 1.0 [1.0–1.0]; $P < 0.001$) and 2020 (2.0 [1.0–2.0], 1.0 [1.0–1.0]; $P < 0.001$). Additionally, we found that failures in 2017–18 were significantly longer cases overall, as compared with successful blocks (105.0 min [90.0–125.0], 90.0 [73.0–110.0]; $P < 0.001$). There was no statistical difference in factors between the 2017–18 and 2020 failure groups. In 2020, failures were observed to occur in batches. This grouping effect was not observed in 2017–18 with bupivacaine from a different supplier.

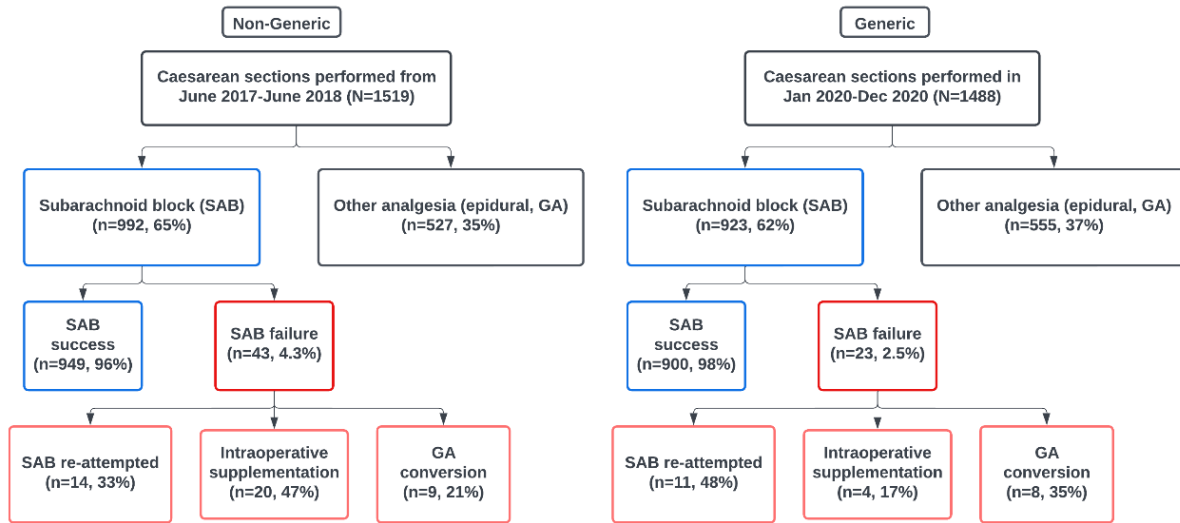
DISCUSSION

The SAB failure rate in 2017–18 was almost double the rate observed in 2020. This was inconsistent with our hypothesis that the failure rate would be lower in 2017–18, prior to the transition to generic bupivacaine. In 2017–18, failures were more likely with longer cases, a possible indicator of increased surgical complexity. We did not find an association between failure rates and patient factors or anesthetic complications. The observed grouping of failures in 2020 may be related to the integrity of certain bupivacaine lot numbers. These findings will inform an ongoing prospective study on SAB failures at our maternity hospital.

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Figure Flow charts describing the distributions of subarachnoid block (SAB) success and failures in 2017–18 and 2020 at our maternity hospital



The role of extracorporeal membrane oxygenation in acute intrapartum or postpartum events during Cesarean delivery: a scoping review

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55

AUTHORS

Zhang-Jiang, Sofía;¹ Rajkumar, Sherwin;² Lin, Cheng;¹ Kumar, Kamal¹

¹Department of Anesthesia & Perioperative Medicine, Western University, London, ON, Canada; ²Schulich School of Medicine & Dentistry, Western University, London, ON, Canada

INTRODUCTION

Cardiovascular diseases, hypertensive disorders of pregnancy, postpartum hemorrhage (PPH), and obstetric embolism, including amniotic fluid embolism (AFE) and pulmonary embolism (PE), are among the most common diagnoses associated with maternal death in Canada.¹ These conditions may cause hemodynamic collapse with cardiopulmonary failure and subsequent multi-organ failure. In critical situations, extracorporeal membrane oxygenation (ECMO) can temporarily facilitate gas exchange and/or circulatory support. There is presently no consensus regarding the peripartum use of ECMO in the obstetric population, given the rarity of these clinical diagnoses and lack of randomized controlled trials. We aimed to review the literature and determine whether there is a role for ECMO in the management of acute intrapartum or early postpartum events causing hemodynamic instability during Cesarean delivery in obstetric patients.

METHODS

Search criteria were established using a modified PICO model. Our study population included patients undergoing or who immediately underwent a Cesarean delivery. Intervention was the use of ECMO for acute intraoperative or postoperative events causing hemodynamic instability within 24 hr of delivery. Case reports of ongoing ECMO support prior to Cesarean delivery were excluded. Outcomes included maternal mortality, days on ventilator, intensive care unit length of stay, hospital length of stay, and maternal complications. Fetal or neonatal mortality was not considered a relevant outcome given delivery occurred prior to ECMO initiation. We searched PubMed, Embase, Medline, and Cochrane Central databases until 14 April 2023 to identify articles for review. Two authors independently assessed titles, abstracts, and full-text articles. We included case reports and case series published in full and in English. Research ethics approval was not required for this review of published papers.

RESULTS

We identified 18 publications concerning ECMO use in obstetrics following an acute intraoperative or postoperative event (Table). Twenty unique cases were described among the case reports and case series. The average maternal age was 34.6 yr. Of the 17 patients whose gestational ages were reported, 12 were term and four were preterm. The most common clinical diagnosis was AFE ($n = 13$), followed by PE ($n = 3$), PPH ($n = 3$), and stress-induced cardiomyopathy ($n = 1$). Nineteen patients were initiated on venoarterial ECMO and one on veno-arteriovenous ECMO, with a mean ECMO duration of 4.2 days. There was one maternal death (5%) secondary to hemodynamic collapse because of oxygenator blockage by amniotic fluid debris shortly after connection to ECMO. Twelve patients remained on the ventilator for an average of 15.3 days (median = 6.5 days). Ten of 15 patients had uneventful recoveries, with four patients reporting neurologic weakness at discharge and one patient with neurocognitive dysfunction.

DISCUSSION

Our results suggest that ECMO use in the obstetric population for hemodynamic collapse during or immediately following Cesarean delivery is associated with good maternal survival to discharge, with a maternal mortality of 5%. AFE was the most common indication. Most patients had no neurocognitive deficits at discharge. The occurrence of disseminated intravascular coagulation in most patients rendered the adjustment of anticoagulation for ECMO a challenge. Limitations include the observational nature of the data, limited sample size, and publication bias favouring publication of successful cases. Further prospective studies are needed. In conclusion, ECMO can be considered in acute peripartum cardiopulmonary failure.

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Table Characteristics of patients treated with ECMO

Study	Study Design	Age (y)	Gestational Age (wks)	Clinical Diagnosis	Timing of Presentation	Type of ECMO	Duration on ECMO (d) ^a	Maternal Death	Days on Ventilator (d)	Hospital LOS (d)	Maternal Complications at Discharge
Adachi et al. 2021	Case report	40	37	AFE	Postpartum	VA	4	No	6	17	None
Balciuniene et al. 2021	Case report	28	40	PE	Postpartum	VAV	10	No	N/A	N/A	None
Biderman et al. 2017	Case series	41	N/A	AFE	Intrapartum	VA	4	No	25	N/A	N/A
		41	N/A	AFE	Intrapartum	VA	6	No	92	N/A	N/A
		31	N/A	AFE	Intrapartum	VA	0	Yes	0	N/A	N/A
Depondt et al. 2019	Case report	36	39	AFE	Postpartum	VA	5	No	5	N/A	None
Fang et al. 2016	Case report	35	36	AFE	Postpartum	VA	2	No	8	N/A	Mild right hand motor weakness
Fernandes et al. 2015 ^b	Case report	30	37	PE	Postpartum	VA, then VV	3.5	No	N/A	46	None
Leeper et al. 2013 ^b	Case report										
Golzarian et al. 2023	Case report	31	35	AFE	Postpartum	VA	5	No	N/A	N/A	None
Hsieh et al. 2000	Case report	34	N/A	AFE	Intrapartum	VA	1.5	No	N/A	24	None
Huang et al. 2017	Case series	39	34	AFE +/- PPH	Intrapartum	VA	2	No	N/A	14	None
		34	39	PPH	Postpartum	VA, then VV	2	No	N/A	12	None
Ijuin et al. 2021	Case report	39	38	AFE	Postpartum	VA	3	No	6	14	After 3 months of rehabilitation following discharge, cerebral performance category score of 2; able to perform independent activities of daily life
Jo et al. 2011	Case report	37	37	Stress-induced CM	Postpartum	VA	8	No	10	22	None
Kim et al. 2020	Case report	39	38	AFE	Intrapartum	VA	5	No	7	>41	Neuropathic pain and symptoms of foot drop in the right leg; able to take small steps while relying on a quad cane
McDonald et al. 2017	Case report	22	36	PE	Postpartum	VA	5	No	N/A	N/A	A persistent right foot drop and a right flexion contracture of upper limb post fasciotomy
Reyftmann et al. 2006	Case report	36	37	PPH	Postpartum	VA	6.5	No	N/A	N/A	None
Tafesse et al. 2022	Case report	34	39	PPH	Postpartum	VA	5	No	6	26	Still required hemodialysis at discharge, but no longer required 4 months postpartum
Viau-Lapointe et al. 2019	Case report	30	38	AFE	Postpartum	VA	2	No	13	18	Still with difficulty walking at 9 months followup
Wu et al. 2022	Case report	35	34	AFE	Postpartum	VA	4	No	6	90	None

^aRounded to nearest half day

^bFernandes *et al.* and Leeper *et al.* describe the same clinical case

AFE = amniotic fluid embolism; CM = cardiomyopathy; ECMO = extracorporeal membrane oxygenation; LOS = length of stay; PE = pulmonary embolism; PPH = postpartum hemorrhage; VA = venoarterial; VAV = veno-arteriovenous; VV = venovenous

The use of social media to augment postpartum research recruitment: an exploratory study

Submission ID

125

AUTHORS

Enriquez, Andrea;^{1*} Sandhu, Ria;^{1*} Chau, Anthony (Anton);^{1,2} Vidler, Marianne;³ Flexman, Alana;^{1,2} Sultan, Pervez;⁴ George, Ron;⁵ Keys, Elizabeth;⁶ Ou, Christine;⁷ Tomforhr-Madsen, Lianne;⁸ Biferie, Michelle;¹ Ke, Janny X. C.^{1,2,9}

*Co-first authors with equal contribution

¹Department of Anesthesia, St. Paul's Hospital, Providence Health Care, Vancouver, BC, Canada; ²Department of Anesthesiology, Pharmacology & Therapeutics, The University of British Columbia, Vancouver, BC, Canada; ³Department of Obstetrics & Gynaecology, Faculty of Medicine, The University of British Columbia, Vancouver, BC, Canada; ⁴Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University, Palo Alto, CA, USA; ⁵St. Michael's Hospital, Toronto, ON, Canada; ⁶School of Nursing, The University of British Columbia, Kelowna, BC, Canada; ⁷School of Nursing, University of Victoria, Victoria, BC, Canada; ⁸Educational and Counselling Psychology, and Special Education, The University of British Columbia, Vancouver, BC, Canada; ⁹Department of Anesthesiology, Pain Management, and Perioperative Medicine, Dalhousie University, Halifax, NS, Canada

INTRODUCTION

Recruitment of postpartum research participants is challenging.¹ As digital platforms and technologies become more prevalent, social media may be an efficient, cost-effective strategy to augment traditional advertising and in-person approach to patient recruitment. Eight in ten Canadian adults use social media platforms.² One study in pregnant patients found the incorporation of social media with traditional recruitment strategies led to a 12-fold higher rate of recruitment (from 0.62 recruits/month to 7.5 recruits/month).³ The purpose of this study was to explore the engagement characteristics of a social media strategy when combined with conventional approaches, in the setting of an ongoing prospective provincial longitudinal cohort study for patients undergoing Cesarean delivery.

METHODS

After institutional research ethics board approval, postpartum patients who had a scheduled Cesarean delivery in the preceding week were recruited into a longitudinal study, with completion of eligibility questionnaire, consent, and questionnaires using a digital health platform. Patient recruitment consisted of conventional approaches (i.e., in-person, posters) and social media platforms (Instagram, Facebook, and Messenger). For social media, starting September 2023 we posted educational postpartum content twice weekly, reached out to

other perinatal accounts in the province, and included targeted keywords in posts. Starting November 2023, we ran seven social media advertising campaigns using graphics containing study information with an embedded link to the study sign-up website. Each advertising campaign was scheduled with a new graphic design and ran for seven days, using platform targets including age (19 to 45 yr) and geography. As part of the longitudinal study, participants were asked on the digital platform how they learned about the research study. Our primary outcome was the proportion of participants who learned about the study through social media compared with other sources. Secondary outcomes included engagement metrics from advertising campaigns and educational costs, as well as the total costs incurred from social media. Results were analyzed using descriptive statistics.

RESULTS

Between August 2023 and January 2024, 39 participants consented for the research study. Of these participants, 61.5% (24/39) indicated they learned about the study through social media, 12.8% (5/39) through physical posters, 10.2% (4/39) through health care providers, and 7.7% (3/39) through other sources such as community organizations, family or friends, and patient information packages. The remaining 7.7% (3/39) participants did not respond to the question. On average, each of the seven week-long campaigns led to a reach of 14,123 Facebook accounts and 189 link clicks to the study website with sign-up information. Women aged 35–44 accounted for 50% of link clicks across all ad campaigns. The bi-weekly patient educational material reached 2,146 Instagram accounts. The total cost of the advertisement campaigns was \$770.82.

DISCUSSION

Social media contributed to more than half of the patient recruitment, reaching a wide provincial population that would not have been possible with traditional in-person recruitment. Nevertheless, social media recruitment required dedicated planning and effort, and the recruited population may not be representative of the demographics spectrum of the postpartum population. Further studies are needed to determine optimal social media strategies for postpartum research recruitment, including the role of educational materials, privacy and security, the use of other social media platforms, and ensuring representation across diverse demographics.

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