



Research article

Canadian midwives' perspectives on the clinical impacts of point of care ultrasound in obstetrical care: A concurrent mixed-methods study[☆]

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ARTICLE INFO

Keywords:

Point of care ultrasound
Primary maternity care
Midwifery

ABSTRACT

Introduction: Point of Care Ultrasound (POCUS) is used globally in obstetrics to conduct real time bedside ultrasound scans to answer a clinical question, and it may be conducted by a non-sonography healthcare practitioner. The College of Midwives of Ontario expanded the scope of practice in 2018 to allow registered midwives to perform POCUS during clinical assessments. In response, a POCUS training curriculum for practicing midwives was developed. This paper reports on the perceptions of learners about the impact of this training on their clinical practice. **Methods:** We conducted a mixed-methods study to understand learner perceptions. Data collection included surveys at four time points over a year, and semi-structured interviews. Quantitative data were analyzed through descriptive statistics, and qualitative analyses used a constructivist approach to grounded theory.

Results: The frequency of POCUS use within antenatal care increased among learners, with common applications including assessment of fetal presentation and confirmation of viability. POCUS was seen to holistically aid practitioners care by providing additional skills and knowledge to improve care quality and access to care, particularly for remote areas where ultrasounds are not easily available. However, participants articulated a need for clearer regulatory guidelines outlining how this technology should be applied in midwifery. Equipment purchasing and maintaining costs were a barrier for many midwives.

[☆] **Article Description:** This paper describes how point of care ultrasound (POCUS) technologies have been incorporated into Ontario midwifery care in response to a new POCUS curriculum.

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<https://doi.org/10.1016/j.heliyon.2024.e27512>

Received 28 November 2023; Received in revised form 29 February 2024; Accepted 29 February 2024

Available online 5 March 2024

2405-8440/© 2024 Published by Elsevier Ltd.

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Conclusions: Participants who had access to a device are continuing to use sonography within their clinics to provide comprehensive midwifery care informed by real-time ultrasound assessments. POCUS scans were seen to offer many benefits to improve patient care.

Statement of Significance

Problem or Issue	Pregnant people do not have access to required ultrasounds.
What is Known	Point of Care Ultrasound (POCUS) provides an opportunity to perform bedside scans. Globally, particularly in low and middle income countries, midwives are learning and applying POCUS to their scope of practice to improve sonography access and pregnancy care.
What this Paper Adds	This paper addresses the minimally understood roles POCUS can play in a high income area. This is explored in Ontario, Canada after a recent scope expansion allowing midwives to include POCUS in their practice with appropriate training.

1. Introduction

Point of Care Ultrasound (POCUS) is a bedside ultrasound exam, performed in real-time, often by a non-sonographer health practitioner to aid clinical assessment and decision making. POCUS is increasingly used within healthcare, for example by paramedics, family physicians, emergency physicians, and physiotherapists [1–3]. The devices used for POCUS can be small, lightweight, hand-held, often designed to be portable [1–3]. Although POCUS is valuable for clinical assessment for targeted indications, it does not replace a diagnostic scan, but rather provides practitioners with additional information to better inform their care plans and to determine if further investigation or intervention is required [1].

Point of care technologies are gaining favour for use during pregnancy to facilitate care planning [4–12]. The Society of Obstetrician and Gynaecologists of Canada clinical practice guide pertaining to POCUS suggests that it is beneficial and recommends that all pregnancy care facilities have access to a POCUS device [13]. Clinical pregnancy indications that may prompt a POCUS scan, if a practitioner has the appropriate sonography knowledge and skills, include: assessment of fetal well-being or fetal presentation, and assessments before complicated deliveries like caesareans [13].

Among midwives, there is growing evidence regarding the safe application of POCUS, particularly in remote settings and low- and middle-income countries where communities may have limited access to sonography [8–11]. The positive implications of POCUS in countries such as Zambia, Rwanda, Kenya, and Liberia have been highlighted, including how this technology improved practitioners' clinical decision making. Midwives were able to gather relevant clinical data to guide care planning and improve access to ultrasound assessment. Within these areas, the ease of transport associated with handheld devices was highly valued and aligned well with supporting out of hospital births in these communities [7–11].

In the Canadian context, in 2018 the College of Midwives of Ontario (CMO) expanded the midwifery scope of practice to include sonography [14]. To include POCUS in their clinical care, Ontario midwives were required to have the requisite knowledge, skills, and judgement to start using the technology with their patients. The CMO did not define what constituted POCUS expertise and no formal education was required [14]. Following this change in scope, researchers in Ontario conducted a needs assessment among midwives and demonstrated there were high levels of enthusiasm and openness to learning POCUS but many indicated they required training [15]. Respondents felt this additional skill could provide faster and more accessible clinical care. Specifically, they cited assessments of gestational age, fetal position, fetal heart rate, confirmation of viability as being areas of clinical care that could be improved with this expanded skill.

In response to the change in scope and learner demand to be able to use POCUS within Canadian midwifery care, a post-qualification education course was designed and launched in 2019. The curriculum development and implementation involved a partnership between education programs in midwifery at McMaster University and sonography at Mohawk College in Hamilton, Ontario. The course included five online modules, a hands-on two-day workshop, and a clinical practicum. Learner assessments included module quizzes, an objective structural clinical exam (OSCE) at the end of the workshop, and logbook assessments of scans completed during the practicum [16,17]. This article set out to evaluate the perceived clinical impacts of POCUS use among the first cohort of course learners.

2. Methods

To explore Ontario midwives' perceptions of implementing their new POCUS training, a concurrent, triangulated mixed-methods study using quantitative surveys and semi-structured qualitative interviews was developed. The variation in methods allowed us to see a broader range of phenomena with respect to POCUS clinical applications [18,19]. The quantitative and qualitative data were given approximately equal priority in the study, but were completed sequentially, with the surveys occurring prior to the interviews. All learners (18) who were enrolled in the course were invited to participate in the research, by email, directly from the research team.

The survey questions were created and piloted by the research team, however, no formal validation process was done. They were structured with Likert scales, as well as open-ended responses. Both the five and seven point scales were used to account for the differing levels of variance of participants' responses as guided from the literature. Survey data collection occurred at four time periods (pre-course, post-course, four-months post-course, and one-year post-course) from October 2019–2020. On the four-months post-

course survey, participants were invited to participate in an interview. Surveys were administered online via REDCap, a secure database to ensure participant confidentiality. All questions were voluntary and anonymous. Data analyses included descriptive statistics in R and Excel for all quantitative results to understand the trends across the four surveys with respect to frequencies, percentiles, the mean, the median, and distributions of the survey responses [20–23].

The semi-structured interview questions were also developed by our study team based on the survey questions to probe more deeply into issues raised in the surveys. The interviews were conducted by a female, non-clinician master's student via telephone and online video-chat, de-identified, and verbatim. Qualitative findings were analyzed using a combination of Corbin and Strauss and Charmaz grounded theory approaches in NVivo [24–28]. Before any qualitative analyses occurred, the interview transcripts were sent to participants to review to ensure accuracy. The coding was completed and reviewed by BKJ and BMD. Transcripts were read and initial codes and concept maps were created to explore data patterns. The transcripts were then coded line by line, describing what participants were discussing; axial coding was then completed by grouping and refining the open codes to see how they compared. Final qualitative analyses involved creating data themes through selective coding, where codes were categorized into themes that were reviewed by BMD to ensure they represented participants' views; the rest of the research team reviewed final qualitative codes [24–28]. Multiple reviewers in qualitative analyses aided in reflexivity as well as the dependability and reliability of the data themes. The quantitative and qualitative data were compared concurrently throughout the analysis process. Triangulation helped to ensure the trustworthiness, credibility, transferability, dependability, and conformability of study findings as qualitative data was compared to the quantitative counterpart. All data was converged so that results could be compared to shed light on perspectives into the roles, benefits, and drawbacks of POCUS in pregnancy. We integrated the qualitative and quantitative data at the time of interpretation and reporting, and will present these in a thematic merging narrative.

3. Results

Eighteen participants were in the first POCUS course cohort, 17 midwives and one family physician from across Ontario. The pre-course and post-course surveys had 100% response rates, while the four-months post-course and one-year post-course surveys had 61% and 56% response rates respectively; five interviews were conducted with midwives.

Study results are presented by themes of how midwives applied the course to improve clinical care and healthcare access, as well as key considerations such as patients' perspectives and POCUS costs. Interview participants' quotes will be distinguished using their interview number.

3.1. Improving patient care & access

After course completion, the majority (63%) of participants felt that POCUS had positively impacted their clinical care management. One participant summarized this in how it is "great value to have midwives do obstetric ultrasounds because we also have the ability to interpret it in a clinical way, right away for the client" (Midwife 3).

Participants expressed excitement about learning sonography skills, and they articulated how the technology would provide improved, comprehensive pregnancy care. One participant shared an example of this by how they had monitored a growing fibroid, educated their patient on this issue, and organized their transfer of care to an obstetrician using POCUS:

She was only 13 weeks pregnant, and this was a pretty big fibroid, and I wanted to consult, and she was no, no, no, I don't see the big deal, so I did a scan ... I measured it [at 13 weeks], and so I had already had an ultrasound report from her dating scan ... but then this was a month later ... I said, do you want to see it?" She'd never seen it before ... You can see how, here's your baby, and then here's the fibroid - so, baby, fibroid." I measured it for her, and said, Yeah, [it] may be even slightly bigger now than it was. (Midwife 5)

The potential for greater clinical efficiency was summarized by one participant's comment when they stated that by using POCUS

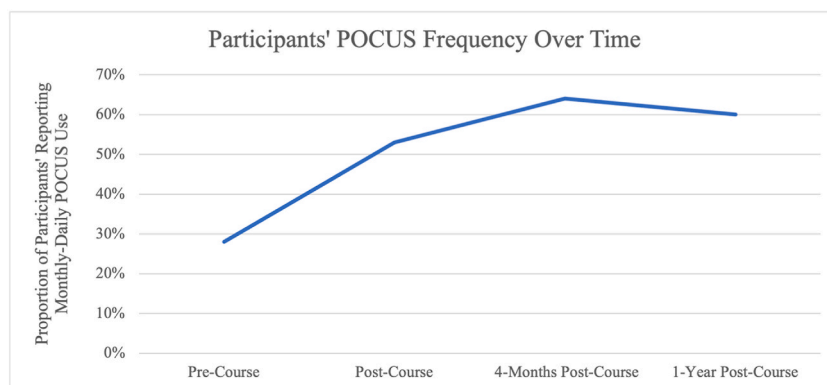


Fig. 1. Participants' POCUS frequency over time.

they were “able to speed along [a patient’s] assessment process by being able to look at the images and say everything looks pretty normal” (Midwife 4).

The portability of handheld POCUS devices was also described by participants as a solution to improve healthcare services in underserved areas. Specifically, the rural midwives in our study commented on the large distances their patients often travelled for an ultrasound and how POCUS offered the potential to alleviate that burden. One participant summarized this point when they stated: “[My] small practice is rural, and clients have many barriers to care, including financial, transportation and geographic isolation. The hospital we refer to is 1.5-h drive away. Quick access to POCUS would improve care for our community” (Midwife 2). As such, at one-year after completion of the course, 67% of respondents felt that POCUS improved patient care and improved their time to diagnosis for clinical concerns. It is hoped that the inclusion of POCUS in midwifery will help to expand the roles midwives play in providing care to communities as one participant summarized the belief that “midwives are underutilized in not just in Ontario but in general” (Midwife 1).

3.2. Implementing POCUS in practice

Throughout the one-year study period, POCUS frequency of use, reported as daily to monthly scanning, grew from an initial 28%–64% at four-months post-course, and 60% in the final survey (Fig. 1).

The specific clinical indications participants cited as the most frequent reason for conducting a scan included fetal presentation (64%) and confirmation of viability of the first trimester (55%) (Fig. 2). Additionally, 50% reported using POCUS to confirm second trimester viability. The clinical indications cited least frequently included ruling out ectopic pregnancy, establishing gestational age/dating, and biophysical profile (BPP) (Fig. 2).

Many participants reported being mindful to discern when a POCUS assessment would aid in clinical judgement and only using the technology when indicated. This awareness of ensuring the appropriate use of POCUS also sparked comments from midwives about the importance of resource allocation for other healthcare resources like diagnostic scans or other tests:

We’re sending people for completely unnecessary scans, which as a clinician, I was just gobsmacked at, but as a clinician myself, I do not send people for scans unless it’s necessary, because it’s an unnecessary draw on the system. (Midwife 5)

While participants acknowledged POCUS is a fantastic resource, they felt practitioners must always reflect to ensure clear clinical purposes for using these devices as healthcare systems are continuously overburdened so proper resource management is key.

3.3. Patient perspectives on POCUS in midwifery care

Several participants described that their patients and families were eager to have a POCUS scan during their care. One midwife shared that their patients “are extremely excited about it and really happy to have had a midwife who is able to do it” (Midwife 4). At study completion, 70% of respondents felt that POCUS was beneficial for the patient experience, and 50% felt that POCUS helped reduce patient anxiety surrounding their pregnancy. Especially with the uncertainties of pregnancy, such as complications or concerns surrounding viability, participants reported that having quick access to an ultrasound to confirm the presences of a heartbeat was relieving for patients. Additionally, participants shared how beneficial it was for facilitating parental bonding. One midwife spoke about how seeing the images allowed the parents to feel more connected with their developing baby:

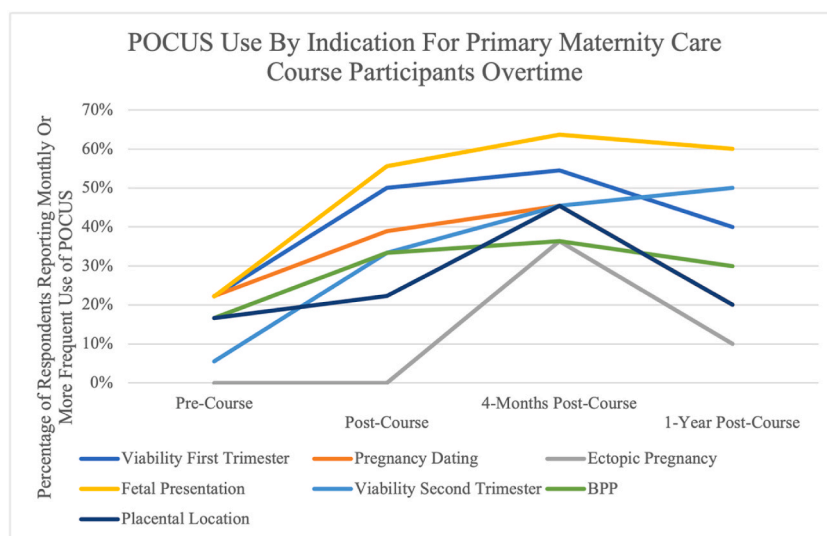


Fig. 2. POCUS use by indication for participants over time.

[Parents] love [POCUS], because whenever I do a scan like a BPP, usually I spend more time - you show them the baby's face, and how the baby's sucking, and you can see the lips ... we go through parts of the anatomy, and they love that. (Midwife 5)

3.4. POCUS costs

The associated costs with the ultrasound device was frequently described as a barrier that impacted the ability to include this tool in clinical care. In addition to the costs associated with the POCUS training course, participants needed to find the funds to invest in a device and its maintenance. These costs were significant financial undertakings, especially for smaller clinics with less income.

Participants also expressed concern that they did not receive any additional financial compensation if they were to include POCUS in their care provision, despite this additional skill set, and the additional time required with patients to perform scans. A few midwives commented that the lack of remuneration was a common theme with midwifery scope expansions: "it's a general problem within midwifery ... just the scope is expanding, and the money is not, and the time is not, and the ways to get paid are not. I think that needs to catch up" (Quinn).

4. Discussion

The results of our study highlight the impact of including midwifery-led POCUS in pregnancy care. A key finding from our data was that being able to offer a bedside scan helped to improve the participant's clinical care and efficiency. The Society of Obstetricians and Gynecologists of Canada outlines this benefit in their position paper also by recognizing that access to POCUS, available at all times, is helpful for addressing urgent clinical inquiries and for alleviating patient anxiety [13]. From an emergency obstetrical perspective, in one study, POCUS helped reduce emergency room visit times by 20% for intrauterine pregnancies [5]. Given the continuously overburdened healthcare environments throughout Canada, healthcare practitioners and policy makers need to consider the roles POCUS can play to improve clinical efficiency to help patients get the care or treatment they require faster. Ensuring faster access to treatment provides better clinical efficiency which may in turn have other benefits, such as resource management and clearer treatment plans, so practitioners are freed up to see other patients or more time for clinical counselling.

Many of our participants were interested in including POCUS as part of their clinical expertise from a desire to better serve their communities through improved access and timely care. Ontario is a large province with many remote communities, particularly in the Northern regions. Oftentimes, community members need to travel great distances for perinatal and sonography care because of the minimal health resources available in their area. Their ability to easily learn the skills and apply them in practice demonstrates that ready use of midwifery-led POCUS warrants further investigation as a strategy to improve access to services. This is an important finding given that beyond Ontario, across Canada, and in other nations with large remote populations, disparities in rural health are pervasive. In Saskatchewan, 64% of pregnant individuals in urban centres had a second trimester ultrasound while only 9% of participants in rural areas had this scan [29]. In the United States, only approximately 39% of rural areas across the country had POCUS access [30]. Our research provides an example from a high-income country which supports the findings from other low- and middle-income countries about the value of midwifery-led bedside scanning as a way to facilitate opportunities for patients to access sonography [3,8–10].

In addition to the gains made in clinical efficiency and access to care, our study highlighted that patients were supportive of having their midwife conduct point of care scans. This has also been identified by other authors, with one study reporting that 100% of pregnant patients felt safe with POCUS being used in their care [3]. With such high patient support and interest in POCUS, more attention is needed to training and availability of this technology to increase availability among practitioners. Since our study focused on midwives' perspectives, additional research examining the perspectives of midwifery patients in Ontario would be beneficial.

While patient support is a major factor of the inclusion of bedside scanning in midwifery, it is equally important that the technologies are being appropriately included into care to ensure patient wellbeing and safety. Our research identified the most common clinical indications for using POCUS. Given that there are limited guidelines from regulatory organizations in Canada for POCUS use in pregnancy, it is important that practitioners can discern when a POCUS scan is appropriate and when additional diagnostic scanning is needed. For example, at the end of the study, participants reported that they were not using POCUS for suspected ectopic pregnancies (10% of survey respondents) or to complete a BPP (30%), based on the knowledge and judgment that these indications were more appropriate for a diagnostic ultrasound—highlighting participants' high clinical critical thinking skills and POCUS knowledge [16,17]. These insights could help to shape future regulatory, policy and care guideline documents to ensure this technology is applied consistently [13,15]. Research about how POCUS is being applied by midwives may also inform health policy makers and funders about the time and financial compensation needed to include this scope expansion into routine midwifery care. Our findings regarding common indications for using POCUS in clinical settings are also important for future curriculum development and education courses to allow educators to prioritize the knowledge and skills needed for commonly used assessments. It is hoped that POCUS education will be embedded within pre-qualification midwifery training to promote the inclusion of bedside ultrasound in clinical practice.

The limitations associated with this work were the lower response rates in the last two surveys. The four-months and one-year post-course surveys likely had lower response rates because of the onset of the Coronavirus-19 pandemic and the extended time that had elapsed since completing the course in Fall 2019. Given the small sample size of this cohort, further research with additional learners regarding how midwives apply POCUS in their midwifery practice might provide new insights. As this was the first iteration of the McMaster-Mohawk POCUS course, it is recommended that longitudinal data be collected to see what volume of scanning is necessary for learners to maintain competency in sonography.

5. Conclusion

POCUS provides healthcare practitioners the ability to perform ultrasound scans at the bedside to provide real-time information to inform clinical decision making. The benefits of incorporating POCUS into midwifery care were demonstrated in our data. Practitioners were excited to learn and apply POCUS to provide more comprehensive clinical care and improve healthcare access. Participants identified that POCUS was beneficial for assessments for fetal presentation and gestational viability. Midwives in our study found their patients to be receptive and excited when midwifery-led POCUS was used in their care. The cost of training, purchasing the device, and maintenance of the technology were reported as barriers to clinical application. Overall, the positive reception and integration of POCUS by Ontario midwives in our first cohort indicates the merits of having this technology readily available.

Funding

This work was funded through the IDEAWORKS Catalysts Fund, the Mohawk College: College Voucher for Technology Adoption, and McMaster's Midwifery Education Program.

Ethics approval & consent to participate

Ethics approval was received by the Hamilton Integrated Research Ethics Board to complete this project (Project ID: 7525). Participants completed consent forms to participate in this research.

Declaration

No patients were included in this research, participants were healthcare practitioners. Any participants whose data are included in this publication have consented for all data to be included in this manuscript to be published.

Data availability

Data is available upon request.
Last Updated: February 29, 2024.

CRediT authorship contribution statement

Bronte K. Johnston: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Elizabeth K. Darling:** Writing – review & editing, Supervision, Funding acquisition. **Anne Malott:** Writing – review & editing, Supervision, Funding acquisition. **Laura Thomas:** Writing – review & editing, Funding acquisition. **Beth Murray-Davis:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Abbreviations

BPP Biophysical Profile
CMO College of Midwives of Ontario
POCUS Point of Care Ultrasound

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