New Zealand College of Midwives

TE KĀRETI O NGA KAIWHAKAWHANAU KI AOTEAROA

JOURNAL

"Turn left at the large flax." How times have changed

Midwives' perspectives on the benefits for women and babies following completion of midwifery postgraduate complex care education

Exploring the ways communication technology is used by midwives and pregnant women/people: An integrative review

Timing of cord clamping: An observational study of cord clamping practice in a maternity hospital in Aotearoa New Zealand

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New Zealand College of Midwives Journal

The New Zealand College of Midwives Journal is the official publication of the New Zealand College of Midwives and is a double-blind peer-reviewed journal that presents research undertaken within a continuity of midwifery care framework. The Journal is aimed at both national and international readers with an interest in pregnancy and childbearing, including midwives, student midwives, midwifery managers and educators, allied health professionals and consumers.

The Aims of the Journal are:

- to promote health issues as they relate to childbearing wāhine/women/people and their whānau/families
- to promote the view of childbirth as a normal life event for the majority of wāhine and the midwifery professional's role in effecting this
- to provoke discussion of midwifery issues
- to support the development of Aotearoa New Zealand midwifery scholarship
- to support the development and dissemination of Aotearoa New Zealand and international research into midwifery and maternal and child health
- to provide evidence to support midwifery practice.

PUBLICATION

The Journal uses on line open-access, article-based publishing. Once a paper is ready for publication, it is disseminated first to College members, and then made publicly available on the College website. Each issue covers a calendar year and is available online in full after completion.

SUBMISSIONS

The Journal welcomes original research, literature reviews, case studies, audits and research methodology manuscripts that fit with the Aims of the Journal. Submissions should be emailed to co-editor, Lesley Dixon, practice@nzcom.org.nz.
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EDITORIAL

"Turn left at the large flax." How times have changed

Jean Patterson, sub-editor

This year major health reforms have commenced which will change the structure and delivery of health services throughout Aotearoa New Zealand. It is unclear at present what these will mean for midwives but there is no doubt that there will be some impact on how midwives work.

Communication technology has already changed the way in which we work. I was recently rummaging through some old midwifery notes when I found a yellowed, pencilled map with the inscription: *Turn left at the large flax, carry on to the sheep yards on the right, turn left up the gravel road - we are on the 3rd bend on the left, blue house, dogs under control.* This reminded me of how tricky communications were in rural south Otago without the aid of rapid numbers for rural properties and cell phone technology. If I got lost, I called into the nearest homestead and asked if I could use their phone.

Similarly, when reading the Journal archives in preparation for this editorial, I was again reminded of our very grounded and passionate progress over the decades without the aid of the communication technology available today.

Contributions to the Journal in the early 1990s focused on our political struggle for an independent and skilled profession, and the issues featured a mix of practice wisdom together with our professional aspirations – the layout simple in style. By 1998 the focus was on woman-centred care with the publication of the 'midwifery partnership' monograph. Research papers began to appear more frequently alongside the political and practical midwifery advice.

By the turn of the century in 2000, in addition to practice advice, and student contributions in the student section, the readership was being urged to submit research papers with midwives exhorted to bridge the midwifery research/practice gap. This enabled the Midwifery News (now titled Midwife Aotearoa New Zealand) to continue the important task of keeping members informed on important practice and political issues.

Over the years the Journal has morphed into one that reflects midwifery scholarship which is enhanced by the number of midwives now completing master's and PhD studies. The increase in educational opportunities and the attainment of higher qualifications, however, have not dampened the practice focus and passion of our profession, as the articles remain grounded in practice and reflective of Aotearoa New Zealand's autonomous midwifery profession.

Just as the academic growth of midwifery knowledge has been facilitated by the burgeoning of communication technologies, likewise the College took the decision to publish the Journal online. Electronic copies of the Journal are available on the College website and articles can easily be sourced by an international readership from the CINAHL, Scopus and ProQuest databases – representing a notable change in the chronography of the Journal.

Jean Patterson

While these moves improved access to the Journal, some midwives missed the arrival in the mail of the familiar hard copy when Issue 47 went online in June 2013. While the more regular mailings of individual articles have changed the nature of the Journal, the annual online publication of all the articles published throughout the year has now become something that readers look forward to as the year pulls to a close.

Midwifery in Aotearoa is, in many ways, entering a new era which will once again change the way we view our profession, and the way in which we work. Such changes include the embracing of a co-governance model that will better reflect the shape and needs of our population and move closer to meeting our Tiriti o Waitangi responsibilities and developments in midwifery education. (But these changes would need another editorial to address adequately.) There is no doubt that there are further changes in terms of technology that we are not yet even aware of. It is indeed a time of change.

Meanwhile, we remain acutely aware that the success of the Journal rests on contributions from authors who have a story to tell or research findings to publish. It is also reliant on the dedication of our reviewers and sub-editors who take the time to carefully read and comment on the articles. Having had the privilege of being a small part of the Journal for much of its history, I look forward to seeing it continue to flourish and reflect midwifery practice and scholarship into a more equitable future.

(My thanks to Lorna Davies for her contribution to this editorial.)

Wishing you a peaceful and restful holiday season from the Editorial Team.

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AOTEAROA NEW ZEALAND RESEARCH

Midwives' perspectives on the benefits for women and babies following completion of midwifery postgraduate complex care education

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ABSTRACT

Background: Midwives require an expanded level of knowledge and skill to meet the complex care needs of childbearing clients and babies, along with their whānau (extended family and community) throughout their childbearing experience. Complexity in childbirth summons midwives to apply research in practice to support clinical decisions they make. Postgraduate education is key to preparing midwives with a level of expertise in the provision of evidence-based practice, with the view to improving outcomes for women and babies when care becomes complex.

Aim: To explore the perceived benefits of midwifery postgraduate education for midwives, women, pregnant people, babies and maternity services, following midwives' completion of a Postgraduate Certificate in Midwifery (Complex Care) offered at an Aotearoa New Zealand university.

Method: A purposive sample of 90 midwives who completed the qualification between 2009 and 2017 were sent a link to an online, mixed method, self-report questionnaire. Twenty-six surveys were returned and entered in Qualtrics for analysis. The qualitative component of the questionnaire is addressed in Question 13 and reported in this article.

Findings: A thematic analysis found benefits of postgraduate complex care education included improved quality of care, enhanced knowledge, increased awareness of research, heightened critical thinking capabilities juxtaposed with improved professional development and enhanced communication.

Conclusion: The study corroborated the premise that postgraduate midwifery complex care education is key to improving outcomes for childbearing women and babies in settings requiring complex care. Recognition of the benefits of the Postgraduate Certificate in Midwifery (Complex Care) for the provision of evidence-based practice is central to improving health outcomes when pregnancy and childbirth become complex.

Keywords: qualitative research, postgraduate midwifery education, complex maternity care, health outcomes, confidence

INTRODUCTION

Since the 1990s the changing context of maternity care has affirmed midwifery as an autonomous profession founded upon practice that is evidence based. Increasing complexity in childbirth compels midwives to be reflective practitioners, capable of applying research in practice in the interest of sound clinical decision-making. Critical thinking is pivotal to the process. While midwives may gain rudimentary skills in thinking critically as undergraduates, a Postgraduate Certificate in Midwifery (Complex Care; PGCM-CC) provides enhancement of these skills. This article reports the qualitative findings of a mixed methods study undertaken at an Aotearoa New Zealand (Aotearoa NZ) university. The research explored midwives' perception of the benefits that midwifery postgraduate education has for women and babies, themselves and the maternity services following completion of a PGCM-CC. Importantly, understanding the impact that postgraduate education has on the provision of effective care for childbearing people and their babies is key to improving health outcomes when pregnancy and childbirth becomes complex. Of note is that the terms "client" or "people" are interspersed throughout the text, recognising that language is not neutral (Homer et al., 2020) and therefore our text champions the need for midwifery as an all-inclusive profession to work in inclusive partnership with "everybody" (Midwives Alliance North America, n.d.).

BACKGROUND

The university relevant to our study has delivered the Aotearoa NZ Ministry of Health funded PGCM-CC since 2009. A key driver at the time was to guarantee enough midwives throughout Aotearoa NZ had the knowledge, technical skills and clinical experience to provide effective care for childbearing clients with complex conditions to improve health outcomes for them and their babies. The specifications for the PGCM-CC were designed by the then Clinical Training Agency. More recently, Health Workforce NZ has managed this contract. The broad vision for the PGCM-CC was that individual midwives were supported to achieve a level of proficiency to meet the complex care needs of clients, babies and their whānau when pregnancy, labour, birth and postnatal care became complex. Whānau in te reo Māori, the language of the indigenous people of Aotearoa NZ, means an extended family or community of related families who live together in the same area.

Initially, eligibility criteria for the PGCM-CC restricted access to midwives employed at 0.8 Full Time Equivalence (FTE) or above and, accordingly, nominated as suitable by a District Health Board (DHB) offering tertiary level care. Theory and practice were provided, with each midwife undertaking 400 hours of clinical learning experience with support from DHB-employed midwife preceptors. In 2015 the criteria for entry to the programme changed to include all midwives, including community-based lead maternity carers. Accordingly, the number of clinical placement hours reduced to 100 hours (Eddy, 2015).

The PGCM-CC comprised two 30-point courses to be completed within two years. Expected outcomes had midwifery, client and service foci (Table 1).

Table 1. Vision of expected outcomes of PGCM-CC

Midwifery outcomes

- The application of evidence-based practice across a range of treatment and care models within secondary and tertiary care settings.

Organisational outcomes

- To address organisational midwifery workforce requirements, clinical leadership, management and mentoring skills.
- Advancing the development of a team of midwives with experience and expertise in meeting the needs of clients and babies when their care becomes complicated.

Client service outcomes

- Development of accessible, skilful and timely midwifery assessment, management and co-ordination of client care needs.
- Strengthening of an interdisciplinary approach to care that is both appropriately planned and culturally safe. Care in this context is provided alongside whānau support and demonstrates the benefits from applied, evidence-based midwifery practice.

At the end of 2009, following its first year of delivery, the programme was independently evaluated nationally with positive results. The report noted:

> Highly positive early impacts from the programme are evident for trainees and other stakeholders and they appear to be incremental. All participants perceived the current programme model, with some refinements, is well suited to meeting the need of the profession for capacity building in complex care. (Oliver, 2009, p. 35)

By the conclusion of 2017, 90 midwives had completed the qualification at the study site. The need for ongoing exploration as to whether the programme continues to achieve the desired midwifery and client service outcomes was instrumental in driving the research question of the current study.

AIM

Research question

How has the PGCM-CC impacted on midwives' personal and professional development in the provision of effective care for clients and babies when care becomes complex?

Research aim

The aim is to explore perspectives that midwives report of the benefits, both personally and professionally, following completion of the PGCM-CC.

METHOD

Research design

A mixed method design separated into two parts was used for this study: an online self-report survey which measured midwifery perspectives on an ordinal scale (Questions 1-12); along with a qualitative component (Question 13) that sought midwives' perceptions of the direct benefits for women and babies having a postgraduate-educated midwife providing their care. The findings from this section (Question 13) are the focus of this article.

Participant recruitment

A purposive sampling technique (Etikan et al., 2016) was selected to access past postgraduate midwifery students who completed the PGCM-CC at the study site university between 2009 and 2017 as identified through the university's student records. Email invitations were sent to the last known email address, with a link to an online survey using the Qualtrics survey platform. An information sheet with details of the research project was included.

Data collection

Participants were informed they had one month to complete the survey, with a reminder sent two weeks following the first posting.

Data analysis

Question 13 comprised of an open-ended statement to elicit midwives' views of the perceived benefits for women and babies who were cared for by midwives who had completed the PGCM-CC care for them. A thematic analysis was undertaken, informed by Braun and Clarke (2006). The comments were transferred verbatim to a data file by one of the researchers for preliminary analysis and intuiting themes. Pertinent themes and corresponding sub-themes were identified from the midwives' texts and reviewed by the research team for consistency and agreement. These were colour-coded inductively at a semantic level, relative to the research question. Direct quotes from the participants are used to illustrate the themes and subthemes, and midwives are represented by the notation "midwifery respondent" or "MR" followed by a number e.g. MR24.

Trustworthiness

Trustworthiness of the data was attained through supporting themes with excerpts from the data, along with seeking corroboration with colleagues for thematic agreement and integration in the write-up.

Ethical approval

The research was approved by the Victoria University Wellington's Human Ethics Committee in April 2018 (No. 0000025707). Although the email addresses of the participants were known for the purposes of sending the questionnaire, responses were anonymised through Qualtrics and contained no identifying information and were not linked to an email address.

FINDINGS

Response rate

Of the total of 90 questionnaires sent to midwives who had completed the PGCM-CC since 2009, 27 were returned, indicating a 30% response rate. Of these 27 responses, 24 midwives responded to question 13.

Midwives' perceptions of direct benefits for women and babies from having postgraduate-educated midwives providing care

Midwives' perceptions of the direct benefits to clients and babies were analysed thematically. Further refining encompassed condensing themes with shared meanings for greater concision. Some overlapping between themes was discerned within the same citation. Key themes were tallied with the number of responses as shown in Table 2 and reported in descending order of responses.

Table 2. Midwives' perspectives of the direct benefits for clients and babies having care from midwives who have completed the PGCM-CC

Key themes	Number of responses
Improved quality of care • safe care • stronger, safer workforce • enhanced care • improved clinical skills • 'best' practice	13
Enhanced knowledge • enhanced understanding • insight gained • better informed	11
Increased confidence • greater consumer confidence • improved advocacy for clients	8
Greater awareness of research • evidence-based practice • research-informed practice	8
Critical thinking capabilities • thinking outside the box • having the confidence to challenge practice	6
Improved professional development • career prospects • opening of new pathways • big picture/global prospects • job satisfaction • the potential for growing future midwifery leaders	5
Better communication • sharing knowledge with clients and colleagues • improved advocacy skills	3

Improved quality of care

Overall, 13 midwife participants perceived improved quality of care to be of benefit to clients and babies cared for following completion of the PGCM-CC. Subthemes included: *safe care, stronger, safer workforce, enhanced care, improved clinical skills and best practice.* As one midwifery respondent (MR) stated, knowledge and skills are pivotal for safe care in the context of increasing complexity.

> *The more education put into midwives, the stronger the workforce. With increasing complexity of women coming through, knowledge and skills around the abnormal is critical to safe care. Not enough midwives appear to have these.* (MR 24)

MR 24 determined that further education is critical to providing safe, skilled care in relation to increasing complexity with clients and babies. From this midwife's perspective there are too few midwives with the relevant knowledge and skills to provide safe care when childbearing becomes complex.

Enhanced knowledge

Eleven midwives perceived enhanced knowledge to be of benefit to clients and babies. Sub-themes underpinning enhanced knowledge included: *enhanced understanding, insight gained* and *better informed*, as expressed in one midwife's reflection:

> *As a midwife who has undertaken postgraduate education, I have a passion and interest in evidence-based practice. I feel I have a deeper knowledge base around midwifery and complex care now than before I started postgraduate study. I also like to share my knowledge with women and their whānau.* (MR16)

Salient in the midwife's response is the point that not only is there a link between the benefits of advanced knowledge and enthusiasm for evidence-based practice, but also an invocation to share their "deeper knowledge" with clients and their whānau.

Increased confidence

For eight midwives an increase in confidence had some effect for women and babies. One midwife perceived increased confidence included a personal confidence that enabled consumer confidence (MR17). Moreover, midwifery confidence paralleled improved advocacy for clients. For another midwife, participation in postgraduate study meant greater confidence in her skills, the outcome of which was improved quality of care for clients and babies:

> *Participating in postgrad education shows a willingness to learn and grow as both a practitioner and a person. Women and babies are therefore exposed to a midwife who has more confidence in her own skills which I believe translates to improved quality of care.* (MR2)

In MR2's excerpt, the perceived benefits of the PGCM-CC appear unequivocal, with an increase in confidence intersecting with professional and personal growth along with an improved quality of care.

Greater awareness of research

Eight midwives also perceived greater awareness of research as a benefit of the PGCM-CC. Sub-themes centred on *evidence-based practice* and *research-informed practice*, as revealed in the following citation:

> *I feel the study has opened new avenues for me, both personally and professionally. I have encouraged some of my colleagues to do the same course and will hopefully be able to find the time to do some research over the next few years. This benefits the women immensely because I feel more confident in finding evidence-based practice and communicating that with the women more than I did before.* (MR12)

For MR12 the benefits of the PGCM-CC were the opening of professional and personal pathways for the midwife. Research awareness is positioned alongside confidence, invoking an aspiration toward research savviness, alongside cultivating evidence-based practice for sharing with clients.

Critical thinking capabilities

Six midwives discerned critical thinking capabilities were enhanced because of the PGCM-CC. Sub-themes constituted *thinking outside the box* and *having the confidence to challenge practice*. Following completion of the qualification one midwife

wrote of the benefits to clients and babies, linking improvement in critical thinking at both a personal and professional level: *Critical thinking skills are improved. Participating in postgrad education shows a willingness to learn and grow as both a practitioner and a person* (MR 2).

Another midwife understood critical thinking as a corollary to best practice: *Women and babies benefit from their critical thinking, questioning research-based approach to be sure we provide the best care possible* (MR21).

Both excerpts indicate that improvement in critical thinking capabilities stands midwives in good stead for enriching their professional development.

Improved professional development

Improvement in professional development was a theme emanating from five midwives. Analysis included sub-themes: *career prospects, opening of new pathways, big picture/global prospects, job satisfaction* and *the potential for growing future midwifery leaders*, as one midwife attests:

> *Optimal provision of care is more likely from an appropriately experienced workforce; more likely to be retained if it's nurtured & postgrad study is an integral part of that. Completion of postgrad study helps grow future leaders.* (MR5)

From the midwife's perspective, postgraduate study is fundamental to the retention of an appropriate and experienced workforce to ensure the provision of optimum care and for fostering future midwifery leaders. Similar sentiments were shared in Oliver's (2009) evaluation of the PGCM-CC.

Better communication

Three midwives perceived better communication as of benefit to clients and babies. Sub-themes included *sharing knowledge with clients and colleagues*, along with *improved advocacy skills* as explicated in MR17's excerpt:

> *[…] better communication with women when midwives are aware of complex care. For example, a woman who needs to be referred to fetal medicine will be less anxious about her visit if her midwife has been there, understands who she will speak to and something about the procedure the woman needs. Midwives who are confident in complex care are better advocates for women receiving that care.* (MR17)

Embedded in MR17's text lies the assumption that better communication stems from an awareness of the challenges facing clients in complex care and is key to confidently advocating on behalf of those in need of referral to the fetal medicine team.

DISCUSSION

The broad vision for the complex care qualification was to prepare midwives with a level of expertise to meet the variable needs of clients when their childbearing experience becomes complex. The perceived benefits for women and babies following the completion of the PGCM-CC by 24 midwives included: improved quality of care, enhanced knowledge, increased confidence, greater awareness of research, critical thinking capabilities, improved professional development and better communication (Table 2).

Improved quality of care surpassed all other perceived benefits for clients and babies as an outcome of the PGCM-CC. Walker and Spendlove (2018), in their exploration of the benefits of a master's education for midwives, proffer that postgraduate education has the potential to equip midwives with a more sophisticated level of problem solving for improving quality of care for childbearing people and families. Moreover, in one Aotearoa NZ study regarding the experiences of midwives working in an obstetric high dependency unit, Eadie and Sheridan (2017) found midwives were united in their need for complex care education when caring for clients in a complex care setting. Indisputable was the recognition that high dependency care is qualitatively different than care provided to well clients.

Improved quality of care intersected with enhanced knowledge in building midwives' capability to respond effectively to the candid challenges ahead when care becomes complicated. This is a salient point given the potential for an estimated 15% of women to encounter severe complications in pregnancy and childbirth (World Health Organization, 2017). Pertinent is how birth trauma can have severe consequences for a client's identity long after the event (Byrne et al., 2017). These writers conclude that quality of care may play a pivotal role in attenuating the experience of birth trauma for women.

In the current study, enhanced knowledge intersected with an increase in confidence, culminating in a heightened awareness of research along with an inherent enthusiasm for evidence-based practice. Nuanced is that enhanced knowledge instils in midwives a greater confidence, better enabling them to negotiate a pathway with clients through the complexities of their care. The integration of research into practice summons midwives to judiciously navigate the intangible space between theory and practice that is not only possible with greater awareness of research but is fundamental for applying research in practice. Moreover, midwifery confidence has implications for fostering trust in situations when childbearing people are at their most vulnerable, thus sanctioning their midwife to provide quality advice when they are faced with complex decisions to make or even to make decisions on their behalf if they are unable. When aligned with self-esteem, confidence not only has the potential to spearhead the questioning of practice decisions but also serves to deliver care that is evidence based (Cotterill-Walker, 2012). Greater awareness of research therefore is an essential step in acquiring evidence-based practice, with the added advantage of building toward a body of knowledge for the profession (Walker & Spendlove, 2018). Furthermore, the value of research awareness is its inducement for midwives to think critically.

Critical thinking skills have become integral to postgraduate education (Walker & Spendlove, 2018) and are pivotal in meeting complex needs of clients. Carter et al. (2017) describe critical thinking as "…a reflective process in making judicious purposeful judgments using cognitive processes of analysis, interpretation, evaluation, inference and reflection" (p. 184). In the context of this study, thinking critically has the capacity to generate a confidence at both professional and personal levels for midwives, resonating alongside improvement in professional development and therefore of value to childbearing clients and babies. In furthering professional development, there is the likelihood of fostering effective midwifery leadership; an important attribute when collaborating with other members of the maternity team (Thumm & Flynn, 2018) and progressing evidence-based care for women and babies (Walker & Spendlove, 2018). Moreover, effective midwifery leadership is tantamount to effective communication, being especially germane to complex care settings with regard to a "severe event" (Wahlberg et al., 2019, p. 2).

Better communication in the current study was affiliated with sharing knowledge and advocating for clients. Cotterill-Walker (2012) explains enhanced communication as "The ability to express

opinions and the confidence to challenge and question practice […]" (p. 59). To communicate effectively is key to establishing a collaborative relationship with colleagues, particularly in interdisciplinary settings such as in complex care, as adeptly stated by Renfrew and colleagues: "When midwives work in collaboration as part of interdisciplinary teams providing integrated care across community and hospital settings, they also provide effective midwifery care for women and infants who develop complications" (Renfrew et al., 2014, p. 12). Similarly, in the context of Aotearoa NZ, for Dann and Hill (2018) in their assessment of "early warning systems" for alerting rapid deterioration in the health of clients in hospital settings, complex care is no exception. Dann and Hill advocate adopting a "respectful interdisciplinary discourse" (p. 55) to consider the tenets of both midwifery and obstetric practice as key to interdisciplinary collaboration.

The findings of the current study show unequivocally that the PGCM-CC qualification counts. Clients referred to secondary and tertiary level maternity care with complex needs require complex midwifery assessments and interventions. The qualification stands as the cornerstone for building greater confidence in practice that comes with new and enhanced learning. Importantly, the research adds to a midwifery body of knowledge regarding the benefits of the PGCM-CC. In our mapping of the PGCM-CC (Figure 1) new knowledge and skill have consequences for improved quality of care, through enhanced knowledge and critical thinking capabilities. The upshot lies in opening possibilities for greater research awareness, increased confidence, fostering professional development and improving communication skills. These qualities culminate in an inextricable link with, and integrating research into, practice with a propensity toward heightened capability for quality clinical decision-making.

Figure 1. Mapping midwifery complex care education

Bridging the division between theory and practice is not only possible with heightened knowledge but is fundamental for improving outcomes for childbearing clients and their babies. It is therefore incumbent upon midwifery leaders and health service organisations to facilitate a supportive practice climate (Thumm & Flynn, 2018) for midwives, enabling the benefits of postgraduate education to be fully recognised. Moreover, the influence of these attributes in complex care settings has the potential to enable midwives to effortlessly straddle the boundaries between teaching, practice and research (Albarran & Rosser, 2014), therefore improving outcomes for childbearing clients and optimising babies' wellbeing.

Salient has been the engendering of confidence that has served as a consistent thread throughout the study's findings. Midwifery confidence in decision-making and a client's confidence in their midwife have the potential to cultivate a sense of trust, endorsing the midwife to make decisions in their interest. The PGCM-CC has not only opened space for an appropriate skill mix across the spectrum of midwifery care, but also signals midwifery is coming of age as a profession, shifting from a vocational occupation to a discipline (Hermansson & Martensson, 2013). These writers attest that, despite the absence of no agreed-upon classification of what a discipline is, commonalities include a body of knowledge acquired through cognitive and research activities, a knowledge corpus that can be shared in the interests of enhanced, integrated care for clients and babies (Homer et al., 2014).

LIMITATIONS

A low response rate (30%) together with a nonprobability sampling method has limitations for the generalisability of the findings to all midwives who completed the PGCM-CC since 2009. As such, it is acknowledged that the views of the midwives who did not take part in the current study may differ in principle to those who chose to participate. Moreover, invitations were sent to past postgraduate midwifery students' last known email addresses, accessed from a university's student records. Thus, the low response rate may have been due to loss of some previous students to follow-up because of changes or modifications to email contact details. Furthermore, the survey was post facto and therefore relied on accurate recall over a period of six years and self-assessment of benefit and improved level of midwifery care.

Future research, using a range of methodologies, is appropriate for seeking clients' perceptions of midwifery care from PGCM-CC qualified midwives.

Importantly, the qualitative component has the potential to provide a useful pool of rich data for future metasynthesis (Cooke et al., 2012; Zimmer, 2006). Nonetheless, the current study substantiated that most midwife participants agreed that the complex care qualification was highly valued, with many motivated to engage in further scholarly pursuits.

CONCLUSION

Midwives in this study recognise the PGCM-CC has the capability to improve their quality of care, equip them with enhanced knowledge, and heighten their awareness of the research and the critical thinking capabilities that strengthen their professional development and communication skills. These factors serve to reinforce best practice when both responding to the needs of childbearing people and collaborating with colleagues in multidisciplinary teams. As midwives play a pivotal role in improving outcomes for clients and babies in need of complex care, sustaining a midwifery workforce with advanced knowledge and skills that enable complex care-qualified midwives to participate confidently and effectively as members of a secondary and tertiary multidisciplinary team is vital.

ACKNOWLEDGEMENTS AND CONFLICT OF INTEREST DISCLOSURE

The authors would like to acknowledge the midwives who took part in the study. It was their reflections on the PGCM-CC qualification that provided the rich source of data that was the basis of the findings for this study, bringing into the light that midwives' knowledge of, and skills in, complex care, count. The authors also acknowledge Kass Jane for the design and construction of the survey method of data collection.

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The authors state that there are no conflicts of interest.

Key points

- Midwives require an expanded level of knowledge and skill to meet the complex care needs of childbearing clients and babies.
- This study explored midwives' perceptions of the benefits following completion of the Postgraduate Certificate in Midwifery (Complex Care).
- Undertaking the Postgraduate Certificate in Midwifery (Complex Care) enhanced quality of care through enhanced knowledge, increased awareness of research and heightened critical thinking capabilities.

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LITERATURE REVIEW

Exploring the ways communication technology is used by midwives and pregnant women/people: An integrative review

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ABSTRACT

Background: Pregnant women/people globally are increasingly using digital technology such as texting, emailing, instant messaging, pregnancy applications, social media and the internet to access information about their pregnancy. There is little information, however, on how the technology is used to enable midwives and pregnant women/people to communicate with each other and what effect this may have on the quality of maternal and newborn health within Aotearoa New Zealand.

Aim: To explore the literature on how communication technology has been used to enable midwives and pregnant women/people to connect with each another.

Method: An integrative literature review of peer reviewed studies between 2010 and 2021 was undertaken to explore how communication technology was used to enable midwives and pregnant women/people to connect with each another. The initial search elicited 450 articles, of which five met the inclusion criteria. These were then assessed using the Critical Appraisals Skills Programme checklist.

Results: The five relevant studies were summarised using an evidence table to enable comparison of themes or relationships between the studies. Four main themes were identified: (1) connecting, (2) access to healthcare, (3) privacy and confidentiality, and (4) lack of skills and knowledge. Using communication technology appeared to provide a safe space for information sharing within which pregnant women/people and midwives could connect. A feeling of connection was important, in supporting the pregnant woman/person in their access to maternity services. This emotional connection was enabled regardless of whether the pregnant person and midwife were known to each other. However, concerns were identified relating to issues of privacy, and the skills pregnant women/people and midwives needed to access and use the technology.

Conclusion: Gaps in the published literature were highlighted through undertaking this integrative literature review. The first was in the understanding of how midwives and pregnant women/people use communication technology when communicating with one another, and the second was in how communication technology is used within a midwifery continuity of care model.

Keywords: communication technology, midwives, pregnant women

INTRODUCTION

Effective communication which is responsive to a person's needs and preferences has been identified by the World Health Organization (WHO) as being one of five key categories for improving quality of care during childbirth (Bohren et al., 2017; WHO, 2016). Communication practices that utilise digital technology such as short message service (SMS), emailing and instant messaging have been increasingly used over the last 30 years. (SMS is a system for sending text messages between mobile phones [Cambridge Dictionary, n.d.] and will be referred to as texting throughout this integrative review.) Interactions take the form of being either synchronous (occurring at the same time) or asynchronous (when there is a delay in the sending and/or receiving of a message). Living in a "digital society" or being a "digital citizen" are terms used to describe ways in which people communicate with one another using digital technology (Zwimpfer et al., 2017). There are expectations that communication technology users are interacting, collaborating, sharing and connecting with others through online platforms or messaging services (Zwimpfer et al., 2017). These expectations are noted within Aotearoa New Zealand (Aotearoa NZ) where 91% of adults aged between 18-34 years own a smartphone (Research New Zealand, 2015) and, in 2018, 89% of Aotearoa NZ's population were active internet users (Hughes, 2019). This compares similarly to smartphone use

(Granwal, 2021; O'Dea, 2021) and internet use (Keats, 2021; Statista Research Department, 2021) by adults in Australia and the United Kingdom (UK) respectively. How communication technology is used by pregnant women/people and midwives is the focus of this integrative literature review.

BACKGROUND

Use of communication technology within maternity care

The use of communication technology within healthcare globally takes various forms, with literature referring to mobile health (mHealth), electronic health (eHealth), telehealth, mobile health applications and mobile technology as ways of informing about, or enabling access to, healthcare (Chib, 2010; Daly et al., 2018; Fazal et al., 2020; Labrique et al., 2013; Lupton & Maslen, 2017; Ministry of Health, 2020b; Speciale & Freytsis, 2013; van den Heuvel et al., 2018; White et al., 2019; Willcox et al., 2019). Email and text messaging between healthcare organisations and consumers of healthcare services enable efficient communication in the form of appointment reminders, the dissemination of results and educational information on ways to change or improve lifestyle behaviour (Dobson et al., 2017; Evans et al., 2012; Goldfarb et al., 2016; Leahy et al., 2017; Muller et al., 2016). With advances in technology, mobiles and smartphones have become more accessible to maternity consumers. Internet access has been enhanced, applications have improved in effectiveness and social media platforms have become more fit-for-purpose. This has enabled information about pregnancy, labour and birth or postnatal experiences to be more freely accessible than in previous times (Alianmoghaddam et al., 2019; Fleming et al., 2014; Gleeson et al., 2019; Lagan et al., 2010; Lupton, 2016; Lupton & Pederson, 2016; Tranter & McGraw, 2017; Tripp et al., 2014).

In remote or rural areas where access to healthcare services may be limited, the flexibility and availability of programmes reliant on mobile technologies such as mHealth or telehealth have improved maternal and child health outcomes through texting, voice messaging or video-calling health education and information to pregnant women/people and families (Chib, 2010; Evans et al., 2012; Fazal et al., 2020; Gelano et al., 2018; Labrique et al., 2013; LeFevre et al., 2017; Soltani et al., 2012; Speciale & Freytsis, 2013; Willcox et al., 2015; Willcox et al., 2019). Within Aotearoa NZ, the National Telehealth Service was established between the Ministry of Health (MOH) and Homecare Medical in 2015 to develop and integrate a national telehealth service which incorporated Ministry-funded health services and communication platforms for consumers (MOH, 2020b). This service enabled consumers to access virtually the healthcare service they needed via a range of communication channels.

Within the current global Covid-19 pandemic, use of digital technologies such as video-calling has in some instances replaced the physical face-to-face assessment normally undertaken by midwives. In 2020, when Aotearoa NZ was engaged in a Covid-19 elimination strategy, midwives were encouraged to hold virtual appointments unless a face-to-face appointment was strictly necessary and, where this was the case, to limit contact to no more than 15 minutes (MOH, 2020a; New Zealand College of Midwives, 2020).

Concerns with communication technology within maternity care

While access to technology has been shown to be beneficial, some mHealth technologies can be problematic, particularly if pregnant women/people and midwives are living in areas with poor internet connectivity or mobile phone signal access, such as in rural or remote rural locations (White et al., 2019). Further barriers can also exist for pregnant women/people where there are financial constraints or literacy concerns which can make it difficult to access and interpret health information (Dalton et al., 2018; Fleming et al., 2014; McAra-Couper et al., 2020).

Concerns around unsafe care have been identified by midwives where they feel they are competing with mobile phones when trying to communicate or connect with women during labour or shortly after birth (Dahl et al., 2017; Lewis et al., 2019). Midwives have expressed concerns about delay of care where they perceived women were more focussed on their phone than on the midwife providing care, and where women were interrupting a conversation with their midwife to answer their phone (Dahl et al., 2017; Lewis et al., 2019).

Other concerns identified, which may have far graver consequences, relate to the asynchronous nature of texting or instant messaging, with uncertainty around whether messages had been received, and also the interpretation of messages (Häkkilä & Chatfield, 2005). Within Aotearoa NZ, communication practices where text messaging has been used between midwives and maternity consumers have led to complaints being made to the New Zealand Health and Disability Commissioner (HDC). These complaints led to midwives coming under criticism from coroners for using text messaging which was deemed to be inappropriate for completing a clinical assessment, for inappropriate use of text messaging from a midwife to a woman, for failing to document text messages within the clinical notes, and for situations where the midwife had failed to appropriately advise women about the use of text messaging for urgent matters (HDC, 2013a, 2013b, 2014a, 2014b, 2016). While many of these complaints were related to the use of text messaging, other concerns have been identified with security, privacy of messages and confidentiality of patient information held on devices that do not contain passwords or encryption (Basevi et al., 2014; Goldfarb et al., 2016; Leahy et al., 2017; Muller et al., 2016; Nettrour et al., 2019). This was highlighted in a recent cyber-attack on a district health board (DHB) in Aotearoa NZ, which resulted in the entire IT system and phone lines crashing (Otago Daily Times, 2021). Hackers were thought to have gained access to the DHB network through an employee unwittingly opening an email attachment (Cullen Law, 2021). The impact on patient services within the DHB were still being felt a month after the attack (Wilson, 2021). So, while the use of communication technology is widespread throughout the health system, evidence would suggest there is need for caution and, therefore, there is need for further exploration.

Rationale for integrative review

The ubiquitous use of communication technology within all facets of life has highlighted both the benefits and concerns around how such communication is used between maternity providers and consumers. There is little information, however, identifying how midwives and pregnant women/people use communication technology when communicating with each another. An integrative literature review involves reviewing, analysing and comparing studies on a specific topic that utilise a variety of research methodologies and is therefore useful when there is little known on a particular research topic (Snyder, 2019). This differs from a conventional literature review which tends to summarise relevant literature, or a systematic review which specifically includes experimental research studies, which could otherwise be quite limiting.

AIM

To explore the literature on how communication technology has been used to enable midwives and pregnant women to connect with one another.

METHOD

An integrative literature review of peer reviewed studies published between 2010 and 2021 was undertaken to explore how information and communication technology (ICT) was used to enable midwives and pregnant women to connect with each another. This approach allowed for the inclusion of both qualitative and quantitative methodologies (Russell, 2005; Whittemore & Knafl, 2005). Four databases commonly used within healthcare research – CINAHL, Pubmed, Proquest and the Australia NZ Reference Centre – were used to undertake searches using the following terms (communication technology OR ICT) AND (midwives OR midwife OR midwifery) AND (pregnant women OR pregnancy OR expectant mothers). A description of the review process has been captured using an adapted PRISMA flow chart (Figure 1). While a PRISMA flow chart is generally used when undertaking a systematic review, it is also helpful in providing a visual representation of the integrative literature review process.

Criteria for inclusion in the review

Included studies were those published between 2010 and 2021 which incorporated use of communication technology used during the antenatal period by pregnant women and/or midwives. The results were restricted to English language and peer reviewed publications.

Exclusion criteria

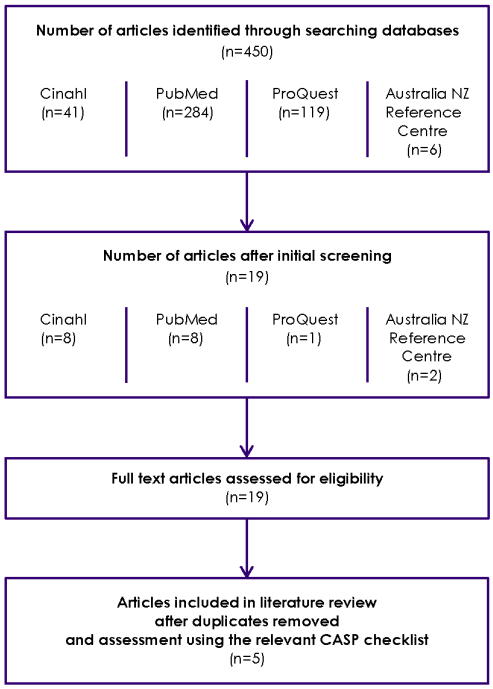
Excluded studies were those where the technology was used as an intervention to screen or diagnose a condition, rather than as a communication device, or where the communication included health professionals other than midwives.

The initial search elicited 450 articles. The title and abstract of each article were reviewed for their relevance. This resulted in the removal of 431, leaving 19 relevant articles. Four duplicates were removed and, after reading in full the remaining 15 articles, five studies were retrieved and assessed for relevance using a Critical Appraisals Skills Programme (CASP) checklist relevant to the appropriate study (CASP UK, n.d.). CASP checklists were developed and piloted originally as an educational pedagogical tool to be used when assessing a study's validity and therefore an appropriate tool to use for assessing the robustness of qualitative, mixed methods and quantitative studies incorporated in this integrative review (CASP UK, n.d.). All five studies satisfied the checklist requirements.

Analysis

Miles and Huberman (1994) describe a four-step process for analysing data when undertaking an integrative review: data reduction, data display, data comparison and conclusion drawing/verification. An annotated bibliography was compiled to determine which publications would be included in the review, and which would serve as background information (data reduction). Once the annotated bibliography had been compiled (data display), the studies were reviewed using the relevant CASP checklist to help appraise and critique the relevance of each study to the review question. The five relevant studies were then compared looking for patterns, themes, or relationships (data comparison). This was done through use of different coloured highlighter pens to identify the different themes between the various studies. An evidence table

Figure 1. Adapted PRISMA flow chart representing the literature review process



(Table 1) was then compiled to summarise the five studies. A final column was added to the evidence table and included the main themes identified from the review. These themes were discussed and agreed by the researchers.

FINDINGS

Five research papers met the inclusion criteria and are presented in Table 1. Included papers were summarised using an evidence table with the following headings: Author, Methods/Design, Sample, Aims, and Themes arising from results.

The studies summarised in Table 1 include two qualitative studies, two mixed methods designs and one quantitative design. The studies were undertaken in Australia (2), Aotearoa NZ (1), the United States of America (1) and the UK (1).

The final column highlights common themes relevant to how communication technology has been used between midwives and pregnant women. The four main themes identified were (1) connecting, (2) access to healthcare, (3) privacy and confidentiality, and (4) lack of skills and knowledge. The overarching theme identified across all studies was connection between pregnant women and midwives. The ability to connect using technology enabled pregnant women to access healthcare services; thereby, it has reduced barriers to healthcare (Gasteiger et al., 2019; McCarthy et al., 2017). The use of communication technology, however, was not always viewed positively when it related to issues of privacy or where there were concerns with having the skills to access and use the technology. Three out of the five studies reviewed identified these issues as concerns (Dalton et al., 2014; Gasteiger et al., 2019; Shroder et al., 2018).

Connecting

Connection was the overarching theme across all five studies. Four types of communication technology were described: texting, video calling, social media (or online discussion forums) and phone calls or use of mobile phones (Dalton et al., 2014; Forti et al., 2013; Gasteiger et al., 2019; McCarthy et al., 2017; Shroder et al., 2018).

Table 1. Summary of studies reviewed

Author	Methods/Design	Sample	Aim/s	Theme/s arising from results*
Dalton et al. (2014)	Mixed methods Semi-structured interviews (n=8) Two focus groups (n=4 & n=9) Self-selected survey (n=19)	Midwives providing antenatal information and education at a hospital in Australia	To investigate attitudes/ experiences of using information and communication technology (ICT) To identify potential factors that encourage/inhibit use in antenatal care	Lacking skills using and accessing technology Concern with privacy and confidentiality Lack of connection when unable to see the person
Forti et al. (2013)	Prospective cross-sectional design Survey (n=15)	Midwives from a group practice in a tertiary hospital in Australia	To explore which were the frequently used communication modalities between midwives and their clients	Connecting
Gasteiger et al. (2019)	Kaupapa Māori methodology ** Semi-structured interviews (n=9)	7 women and 2 men from Northland, Aotearoa NZ	To explore perceptions, and use, of technologies by women and their partners who utilised Kaupapa Māori perinatal health services, which incorporate Māori philosophies and practices	Reduced barriers, promoting access to information Saving time and travel costs Connecting; face-to-face valued Lack of skills using technology Privacy concerns
McCarthy et al. (2017)	Qualitative longitudinal study using thematic analysis Focus groups (n=8; 4 online, 4 face-to-face) Individual interviews (n=28)	31 women and 4 midwives in 2 National Health Service trusts in the UK	To explore the experiences of pregnant women and their midwife moderators using an online Facebook group	Online platform gave some anonymity Enabled access to healthcare information Connection; women trusted the midwife, giving them confidence
Shroder et al. (2018)	Longitudinal mixed methods Surveys & interviews (n=109)	82 pregnant women and 27 caregivers, USA	To explore communication technology use by pregnant women and their caregivers/ partners	Connecting, seeing the person Convenience, saves time Privacy and security concerns

* Full results available from corresponding author. ** Kaupapa Māori methodology focuses on research undertaken by Māori with Māori to improve Māori wellbeing.

In three studies, texting was found to be easy to use and an efficient way for women to contact their midwife when changing appointments, requesting health information or to ask questions (Forti et al., 2013; Gasteiger et al., 2019; Shroder et al., 2018).

Video calling was beneficial for pregnant women when accessing a health professional. The video aspect enabled people's reactions to be seen while also saving costs on travelling to a health provider when accessing the call from home (Shroder et al., 2018). Connecting women to a virtual midwife in an asynchronous online platform environment was beneficial as women felt more comfortable asking questions which they might not otherwise ask a busy midwife face-to-face (McCarthy et al., 2017). The women felt the Face-wives (midwife moderators) were more freely available to respond to questions and concerns in a timely manner. The Face-wives equally felt connected with the women and expressed satisfaction with this online relationship. This connection was developed through a relationship built on trust and confidence, especially around information sharing (McCarthy et al., 2017).

Access to healthcare

Three studies identified how use of communication technology increased access to healthcare information or contact with a maternity provider (Gasteiger et al., 2019; McCarthy et al., 2017; Shroder et al., 2018).

Access to healthcare was enabled in two ways for pregnant women living in a rural location in Aotearoa NZ (Gasteiger et al., 2019). Firstly, communication technology enabled access to online health information and connection with their midwife, thereby reducing costs for travel and wait times at a clinic for a face-to-face appointment. Secondly, communication technology (texting) enabled pregnant women to connect with their midwife in the "virtual space" to ask questions or share information they might not otherwise have done face-to-face or via a phone call. Pregnant women participating in an online Facebook group found this platform provided anonymity and confidence to ask and share information with a "virtual midwife" (McCarthy et al., 2017). The virtual midwife was able to respond to questions in a timely manner which met a need in cases where women were unable to access this information from their busy midwives in face-to-face interactions. In contrast to using an online discussion forum, Skype or Facetime enabled pregnant women to share physical symptoms with their healthcare providers. This was reportedly more convenient and avoided a physical face-to-face assessment (Shroder et al., 2018). The participants in this study commented on the preference for face-to-face online interaction to a phone call as facial expressions and reactions could be seen which provided a more personal connection.

While communication technology has been beneficial in enabling pregnant women/people to access and connect with a maternity care provider, there have also been concerns identified around its use. Two main concerns were identified from the studies in this review and will be reported under the themes: privacy and confidentiality; and skills and knowledge.

Privacy and confidentiality

Privacy and confidentiality were of concern for several of the participants in three of the studies (Dalton et al., 2014; Gasteiger et al., 2019; Shroder et al., 2018). Midwives were concerned about antenatal information provided in an online environment being taken out of context or potentially being misused due to not "seeing" who the information was being shared with (Dalton et al., 2014). Use of communication technology raised several concerns for midwives around their own privacy when their images were posted on social media (Dalton et al., 2014).

Gasteiger et al., (2019) reported women were concerned about advertising appearing on their Facebook site about pregnancy-related matters when they had used search engines to access health information related to pregnancy. This information was then visible to anyone accessing the woman's Facebook site and was something the women had not realised would happen.

Skills and knowledge

Lack of skills and knowledge in using communication technology was identified by women and midwives in two of the studies reviewed (Dalton et al., 2014; Gasteiger et al., 2019). The concerns raised were around accessing the electronic patient portal system (Gasteiger et al., 2019) and concern with "where" the information was going in an online forum (Dalton et al., 2014). Dalton et al., (2014) found midwives were concerned about their own ability and skills with using the technology to communicate with women via social media or other online discussion forums where physical face-to-face interactions were not available. They felt uncomfortable responding to questions in an online platform as they were unsure who was accessing this information and whether this information could be taken out of context.

DISCUSSION AND IMPLICATIONS FOR FURTHER RESEARCH

The aim of this integrative review was to explore how communication technology has been used between midwives and pregnant women/people. The outstanding theme from the five studies reviewed related to the way communication technology enabled a connection to occur between the health professional and maternity consumer.

Being connected did not necessarily mean face-to-face. A feeling of connection was important, in supporting the pregnant woman/person in their access to maternity services. Colorafi (2016) discusses connection as "the energy that exists between people when they feel seen, heard, and valued; when they can give and receive without judgment; and when they derive sustenance and strength from the relationship" (p.2). While the midwives and pregnant women in the studies reviewed were not always "known" to each other, or could see each other, there appeared to be an "emotional connection" which was enabled through use of communication technology. This emotional connection has been discussed in relation to the proximity of care or "intimacy at a distance" that is enabled through use of technologies such as email, texting, webcam and video-links (Lupton & Maslen, 2017; Milligan & Wiles, 2010).

Kenney (2011) suggests that "mutually respectful relationships" within the midwifery partnership are "nurtured by te kanohi kitea (the known face)" (p.132). Building relationships comes about through "sensory engagements" where health professionals and health consumers draw on senses when communicating with one another (Lupton & Maslen, 2017). The importance of the "known face" has been highlighted in other areas of healthcare where telehealth assessments have been undertaken. Gordon et al. (2020) noted that patients felt uncomfortable during a video telehealth assessment if they had not developed a prior relationship with their healthcare provider. Similarly, "seeing the person" online was enough for midwives to feel they could assess a woman in early labour (Faucher & Powell Kennedy, 2020; Spiby et al., 2019). It is arguable that sensory engagements are what create the difference between a physical face-to-face interaction versus a virtual one, particularly when people are unknown to one another.

The lack of sensory engagement or non-verbal communication is a possible explanation for why midwives were concerned with using an online platform without visual connection (Dalton et al., 2014). For the midwives in this study, "not seeing the person" meant they could not respond to facial expressions or see how the person responded to information provided. Conversely, the lack of face-to-face enabled pregnant women to ask their midwife questions they might not otherwise feel comfortable to ask kanohi ki te kanohi (face-to-face; Gasteiger et al., 2019; McCarthy et al., 2017). This has similarly been found in other areas of healthcare or online forums and such connections would therefore appear to provide a protective space for sensitive questions to be asked (Gleeson et al., 2019; Wallwiener et al., 2009).

While a lack of physical face-to-face connection has benefits with people being able to connect using technology, it can also highlight issues with users of communication technology feeling as though they always need to "be connected". There are concerns that this need for always being connected has had implications with respect to people's ability to form relationships during face-to-face interactions (Allred & Atkin, 2020; Gergen, 2002; Rotondi et al., 2017; Srivastava, 2005; Thompson & Cupples, 2008). Gergen (2002) discusses some of the challenges that mobile phone users have with relational communications when individuals are connecting with "absent others" while being present in the room with others. This challenge has been identified by midwives who were concerned they were competing with the phone when providing care to women following birth (Lewis et al., 2019). This in turn may have implications for the way midwives and pregnant women/people establish and navigate relationships face-to-face, where there is potential for distraction when communication devices are used to communicate with others outside of the room.

In summary, both midwives and pregnant women in this integrative review identified having a lack of knowledge and skills when using communication technology to communicate with one another. This would appear to fit with a report undertaken in 2017 in Aotearoa NZ which found that 50% of Aotearoa NZ workers had concerns about their digital capabilities (Zwimpfer et al., 2017). Using communication technology is here to stay; therefore, part of navigating these connections will need to involve midwives and pregnant women/people having discussions around how communication technology might be used effectively and competently throughout the perinatal journey.

CONCLUSION

The literature revealed that communication technology provided a platform for pregnant women/people to access maternity care in a manner that meets individual needs. Despite advances made to accessibility of communication technology over the last 30 years, there appears to be a gap in the published literature relaying how

pregnant women/people and midwives are using and accessing the technology when communicating with each other. Many of the studies reviewed provided information either from the pregnant women and their partners or from health professionals. Only one study included both midwives and pregnant women and this was carried out in an online forum based in the UK. The only Aotearoa NZ study included pregnant women and their partners. This integrative review therefore highlights two significant gaps when considering how communication technology is used by midwives and pregnant people in Aotearoa NZ. These are in understanding firstly, how midwives and pregnant women/people use communication technology to communicate with each other and secondly, specifically how communication technology is used within a midwifery continuity of care model.

The model of midwifery care in Aotearoa NZ is well placed to explore how continuity of care enables midwives and pregnant women/people to use communication technology to connect.

The first author intends to focus on this issue for their doctoral level research.

Key points

- How midwives and pregnant women/people within Aotearoa New Zealand use communication technology to connect with one another is unknown.
- Studies examined in this review found that communication technology can save time and is convenient for both parties to share health messages and schedule appointments.
- There were also concerns, however, related to privacy, the ability to access and use technology, and the lack of connection when unable to see each other.

CONFLICT OF INTEREST DISCLOSURE

The authors declare that there are no conflicts of interest.

AUTHORS' STATEMENT ON GENDER INCLUSIVITY

In supporting the development and move towards using gender inclusive language, "antenatal women/people" has been used to include pregnant people who do not identify as women. The exception is in the description of the search terms which had been undertaken prior to writing up the review and in some of the discussion where "women" is used by the study authors.

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AOTEAROA NEW ZEALAND RESEARCH

Timing of cord clamping: An observational study of cord clamping practice in a maternity hospital in Aotearoa New Zealand

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ABSTRACT

Background: When the umbilical cord is left unclamped after birth, a significant proportion of the blood from the placenta flows into the newborn, increasing the baby's blood volume by approximately 30%. Routine intervention of immediate cord clamping is harmful as it deprives the newborn access to their own blood, resulting in impaired physiological transition at birth and lower iron stores in early infancy. Iron deficiency in early life, even without anaemia, is linked with impaired neurodevelopment.

Aim: The aim of this study was to accurately record birth to cord clamping interval at term vaginal births in a tertiary hospital in Aotearoa New Zealand and concurrently to examine some of the circumstances that may influence the timing of when the cord is cut.

Method: This observational study was undertaken from August 2017 to April 2018. Participants were pregnant women having a vaginal birth at ≥37 weeks gestation. Data collected included birth to cord clamping interval, mode of birth (spontaneous or instrumental), maternal position for birth and practitioners involved in the birth. Descriptive statistics were used to summarise the data.

Results: Participants were 55 women with term vaginal births. The median interval between birth and cord clamping was 3.5 minutes (IQR 2.18 - 5.68 mins). There was a longer median cord clamping time in the group who had a spontaneous birth (median 3.71; IQR 2.67 - 6.23) vs instrumental birth (2.08; IQR 0.55 - 2.30); with maternal side-lying position (6.37; IQR 4.15 - 9.48) vs lithotomy position (2.24; IQR 1.87 - 3.50); with midwife-facilitated birth (4.06; IQR 2.68 - 6.65) vs obstetric-facilitated birth (2.13; IQR 1.48 - 3.28); and when the neonatal team was not called to attend (4.73; IQR3.32 - 8.26) vs when they were called to attend (2.13; IQR 1.28 - 3.27).

Discussion: The median cord clamping time of 3.5 minutes aligns with current local, national and international guidelines, although clamping times as short as 0.23 minutes were observed. The study provides a snapshot of practice at one tertiary hospital, examining data on a range of vaginal births, from uncomplicated midwifery-led births to complicated obstetric-led births requiring neonatal team attendance. By identifying some of the circumstances where cords are clamped early, we may be able to modify the associated factors for these births, thereby improving newborn health outcomes in the future.

Keywords: birth practice, placental transfusion, term newborn, third stage, umbilical cord clamping timing

BACKGROUND

Since its introduction as one of the earliest interventions in childbirth, umbilical cord clamping has been a topic of ongoing debate and research (Downey & Bewley, 2012). There is now substantial evidence showing that immediate cord clamping is harmful. It leads to a reduction in blood volume, leading to low iron stores for infants up to 6 months of age (McDonald et al., 2013), a disruption to newborn transitional physiology (Andersson et al., 2019; Bhatt et al., 2013; Ersdal, et al., 2014; Hooper et al., 2015; Niermeyer & Velaphi, 2013), and a 30% increase in mortality for preterm babies (Fogarty et al., 2018). Whereas, leaving the cord intact for at least 3 minutes has been shown in a randomised control study to increase ferritin by 45% at 4 months (Andersson et al., 2011). Furthermore, reduced iron stores in infancy, even without anaemia, are linked with impaired neurodevelopment (Andersson et al., 2015; Carter et al., 2010; Lozoff et al., 2013; Mercer et al., 2018). Neonatal jaundice has been linked to delayed cord clamping in one meta-analysis (McDonald et al., 2013) but in other studies no correlation was found (Andersson et al., 2011; Begley et al., 2019; Hutton & Hassan, 2007).

Immediate cord clamping, alongside the administration of uterotonic medication and controlled cord traction, was widely adopted in the 1960s when active management was introduced to manage placental birth and to reduce maternal blood loss (Begley et al., 2019). In response to the evidence of harm caused by immediate clamping, a growing number of maternity clinicians report leaving the umbilical cord unclamped for extended periods of time (Boere, Smit et al., 2015; Devin & Larkin, 2018; Fulton et al., 2016; Leslie et al., 2018; Richards, 2009). Also, active management has been adapted to include deferred cord clamping with no significant increase in rates of maternal postpartum haemorrhage (PPH; McDonald et al., 2013).

Many national and international guidelines on intrapartum care have been updated to recommend a delay between birth and cord clamping for any baby not needing resuscitation (Table 1). An umbilical cord clamping guideline introduced at the study hospital in 2014 recommended that, unless resuscitation was required, term neonates should have the cord left unclamped for at least 3 minutes at a vaginal birth and 2 minutes at a caesarean birth (Canterbury District Health Board [CDHB], 2014).

The way in which placental birth is managed is a key driver as to the timing of cord clamping. Midwives in Aotearoa New Zealand (Aotearoa NZ) continue to facilitate physiological placental birth, without a routine uterotonic and with the cord left intact, when the chance of a PPH is low. Even in tertiary hospitals in Aotearoa NZ, where intervention is prevalent, 34.1% of normal births are followed by a physiological placental birth (Dixon et al., 2009).

For women who require active management of placental birth due to a higher risk of PPH, guidance on the timing of uterotonic administration in relation to cord clamping varies from one guideline to another (Table 1). Maternal blood loss and neonatal morbidity do not appear to be affected when synthetic oxytocin is administered before or after cord clamping (Andersson et al., 2013; Farrar et al., 2011; Soltani et al., 2010; Vain et al., 2020; Winkler et al., 2022). As with all perinatal decision making, the timing of administration of a prophylactic uterotonic requires a consideration of potential complicating factors, both maternal and newborn.

International guidelines have not clearly defined an optimal time for cord clamping (Table 1). Early/immediate cord clamping is generally conducted within 1 minute of the birth, interrupting the blood flow between the newborn and the placenta. Delayed/deferred cord clamping typically refers to clamping and cutting between 1 and 5 minutes following the birth of the baby or is sometimes described as leaving the cord intact until pulsations have ceased or until after the placenta is birthed. Post birth, umbilical blood flow accounts for approximately one-quarter to one-third of potential total blood volume in term neonates (Farrar et al., 2011; Yao et al., 1968). This flow is not necessarily related to a set timeframe and varies considerably from one birth to another, dependent on factors such as gestation (Linderkamp, 1982), mode of birth (Andersson et al., 2016), uterine contractions (Stenning et al., 2021; Yao et al., 1968) and neonatal breathing efforts (Bhatt et al., 2013; Boere, Roest et al., 2015; Ersdal et al., 2014). Further, gravity does not influence the volume of placental transfusion as much as was previously reported (Yao & Lind, 1969), with newborns found to receive as much blood when placed on the maternal abdomen as when held at the level of the vagina (Vain et al., 2014).

Blood may continue to move through the cord, both in umbilical arteries and the vein, beyond five minutes post-birth, and will continue even when pulsations have ceased (Boere, Roest et al., 2015). A "cessation of pulsations" continues to be used as an indication that the newborn has received its full quota of placental blood, even though pulsations are felt in the umbilical arteries and not the vein, representing blood moving away from and not towards the baby (Boere, Smit et al., 2015). There is a move towards terminology such as “Wait for white”, to recommend waiting until the cord is flaccid and empty of blood (Burleigh, 2021), or “physiological-based cord clamping” to recommend individualised practice according to the newborn’s response to their extra-uterine transition (Knol et al., 2019).

Observational data on cord clamping practice are limited. The largest observational studies were conducted in maternity hospitals in low-income countries (Ersdal et al., 2014; Nelin et al., 2018). Of those conducted in high-income countries, one observational

Table 1. Cord clamping guidelines. Summarised guidance for umbilical cord clamping for term newborns current at the time of data collection

Organisation (year)	For vigorous term newborn	Timing of uterotonic (active management)	For non-vigorous newborn
New Zealand College of Midwives (2013)	At least 3 minutes	After cord clamping	May be beneficial to leave cord intact for resuscitation
Royal Australian and New Zealand College of Obstetricians and Gynaecologists (2017)	No urgency ...appropriate time frame	Not specified	Not stated
World Health Organization (2014)	Not earlier than 1 minute	Not specified	Ventilation can be initiated before clamping cord
National Institute for Health and Care Excellence (2017)	Not earlier than 1 minute; before 5 minutes	Immediate, prior to cord clamping	Earlier than 1 minute only if concern about cord integrity or newborn heart rate
Royal College of Obstetricians and Gynaecologists (2015)	Defer cord clamping until 2 minutes after delivery	If given before cord clamping, unlikely to have a substantive effect on placental transfusion	Refers to WHO and NICE
American College of Obstetricians and Gynecologists (2017)	At least 30-60 seconds	If delayed until after cord is clamped, no increase in PPH	Immediate if resuscitation is needed
American College of Nurse-Midwives (2014)	5 minutes if skin to skin; 2 minutes if below level of introitus	Not stated	Early or immediate clamping; cord milking may be of benefit
Canterbury District Health Board Guideline (2014)	At least 3 minutes	Uterotonic within first 3 minutes after birth; clamp and cut between 3 and 5 minutes	If newborn needing resuscitation, clamp and cut at 1 minute

study, set in a Canadian tertiary hospital in 2006 and 2007, found that over half of the newborns observed had their cord clamped within 15 seconds of birth (Hutton et al., 2013). Of the 89 practitioners observed, 76 were doctors and 13 were midwives. The majority (93%) of women giving birth in Canada, had an obstetrician or family physician (general practitioner) as their lead maternity carer (LMC) at the time of the study (Guliani, 2015). In the United Kingdom, an observational study timed cord clamping with a stopwatch at 100 births conducted by midwives in 2006 and 2007 and found that 85% of cords were clamped within 30 seconds of the birth and the remaining 15% between 30-100 seconds (Airey et al., 2008). There have not been any published observational studies on cord clamping in Aotearoa NZ where the majority (94.2%) of women have a midwife as their LMC (Ministry of Health [Manatū Hauora], 2019).

The region where this study – (Timing of Cord Clamping [TOCC]) – took place had 6,457 births in 2017, of which 81% occurred in the tertiary referral hospital, 14% occurred in midwifery-led community units and 5% at home (CDHB, 2018). The spontaneous vaginal birth rate for the region was 56.7% (including 5.4% waterbirths) and the instrumental vaginal birth rate was 12.9%. Women who have no medical or obstetric complications are encouraged to birth at the midwifery-led community units, though many choose to birth in the tertiary hospital. Of the 13 birthing rooms at the study hospital, two have birthing pools. Where birth takes place in the tertiary hospital, one of the LMC midwives from the woman's assigned group practice usually attends the birth. If the LMC midwife is unavailable or if complications ensue, birth will be facilitated by hospital-employed midwives and/or the obstetric team. The neonatal team is called to births where there is a potential or actual need for resuscitation, including all instrumental births.

In a survey conducted in Aotearoa NZ, 86% of midwives (n = 257) reported leaving the cord intact for at least 3 minutes during physiological placental birth, with 16% doing the same during an actively managed third stage (Richards, 2009). Observation and self-reported practice do not always look the same (Farrar et al., 2010) and by the researchers choosing an observational measurement of practice, further insight will be gained in this era of ongoing debate on the optimal timing of cord clamping.

AIM

The aim of this study was to accurately record cord clamping timing at term vaginal births in a tertiary hospital in Aotearoa NZ. Data on specific birth factors that may influence cord clamping timing were collected and analysed.

METHOD

Study design and participants

An observational approach was used, examining cord clamping practice at term vaginal births, both spontaneous and instrumental. The research design and population sample of the TOCC study were informed by a Canadian study where cord clamping data were collected from October 2006 to April 2007 (Hutton et al., 2013). As in the Canadian study, the context for this study was a large tertiary hospital where births were facilitated by both midwives and obstetric doctors. The intention of the TOCC study was to collect data on at least 89 births, in line with the paper by Hutton et al.

Ethical approval for the study was received from the New Zealand Health and Disability Ethics Committee (HDEC) on 19 May 2017 (Reference 17/NTB/82). Consultation with Māori health advocates identified cultural aspects to consider. Of note were the significant tikanga/customs related to the care of the pito/cord and whenua/placenta for Māori. It was identified that the results of this study were likely to be relevant for tangata whenua/people of the land. Information leaflets and consent forms, as detailed in the ethics application, were created and shared.

All healthcare practitioners working at the study hospital who make decisions on timing of cord clamping (LMC midwives, hospital-employed midwives and obstetric doctors [consultants, registrars and house surgeons]) were approached to help recruit participants in the study. Any LMC (midwife or obstetrician) who consented to take part was given an explanation of the study and was supplied with information leaflets and consent forms to pass on to women in the third trimester of pregnancy. Women who consented to participate were eligible for inclusion at point of admission to the birthing suite if they were ≥37 weeks pregnant with a singleton cephalic fetus and were not booked to birth by caesarean section. If a woman was not consented at time of admission to hospital for labour care and the lead practitioner caring for her considered it appropriate (that is, she was not unduly distressed or in circumstances where the discussion about the research may have impacted on her ability to cope with labour), participation in the study was offered at this time.

Data collection and analysis

When a woman had consented and progressed to a spontaneous or instrumental vaginal birth at term, one of the health practitioners present at the birth was instructed to measure the cord clamping time by pressing a stopwatch (provided by researcher) once at the time that the entire baby was born and then again when the first clamp was applied to the cord. The stopwatch recorded this time in the format minutes:seconds:centiseconds. If the cord was clamped before the birth of the entire baby, e.g., when the cord was wrapped tightly around the baby's neck, the time was recorded as 0 minutes. Cord clamping times were recorded by the LMC midwife or hospital midwife in a designated notebook, alongside data on mode of birth, maternal position for birth and the practitioners involved. The neonatal team was recorded as being present if they arrived within 5 minutes of the birth.

The anonymised data were transferred to an Excel spreadsheet by the lead investigator. The data were then examined using descriptive statistics to report frequency distributions, medians, ranges and interquartile ranges for cord clamping times in groups with specified birth circumstances.

RESULTS

Data were collected from the births of 56 women between 14 August 2017 and 7 April 2018. One birth was excluded as gestation was <37 weeks. Thus, 55 births were included in the analysis.

The overall median cord clamping time was 3.5 minutes with a range of 0.23 min to 34 min (interquartile range [IQR] 2.18 - 5.68 min). All times were converted from minutes:seconds:centiseconds to minutes, plus the seconds as part of a minute to two decimal places (e.g., 2 minutes 11 seconds = 2.18 minutes).

The median cord clamping time was likely to be longer when the woman had a spontaneous vaginal birth rather than an instrumental birth; when she birthed in a side-lying or upright position rather than a seated position; when a midwife facilitated the birth rather than an obstetric doctor and when there was no neonatal team present at the birth (Table 2).

When cord clamping times were arranged into groups to explore the data according to frequency distribution, it was noted that

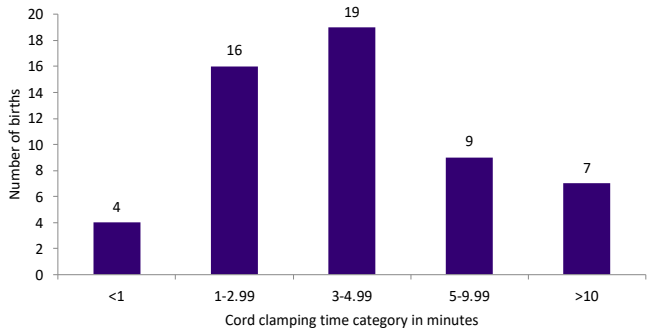
Table 2. Comparison of median and range of cord clamping times by subgroups

Births	n	%	Median	IQR*
All births	55	100	3.50	2.18 - 5.68
Mode of birth				
Spontaneous (including in water)	46	84	3.71	2.67 - 6.23
Instrumental (ventouse and forceps)	9	16	2.08	0.55 - 2.30
Birth position				
Kneeling or standing	10	18	3.93	3.27 - 9.17
Side-lying	7	13	6.37	4.15 - 9.48
Seated (upright or recumbent)	26	47	3.47	2.43 - 4.82
Lithotomy	12	22	2.24	1.87 - 3.50
Birth facilitator				
Midwife	40	73	4.06	2.68 - 6.65
Obstetric doctor	14	25	2.13	1.48 - 3.28
Student	1	2		
Neonatal team present				
No	35	63.6	4.73	3.32 - 8.26
Yes	20	36.4	2.13	1.28 - 3.27

* Interquartile range (25th to 75th centile)

64% (n = 35) of the newborns had their cords clamped between 1 and 5 minutes. Cords were clamped at less than 1 minute for four newborns and at more than 10 minutes for seven newborns (Figure 1).

Figure 1. Frequency distribution of cord clamping times



If the cord is clamped before the full birth of the baby's body the time interval would be recorded as 0 minutes; there were no cases of 0-minute cord clamping in our results.

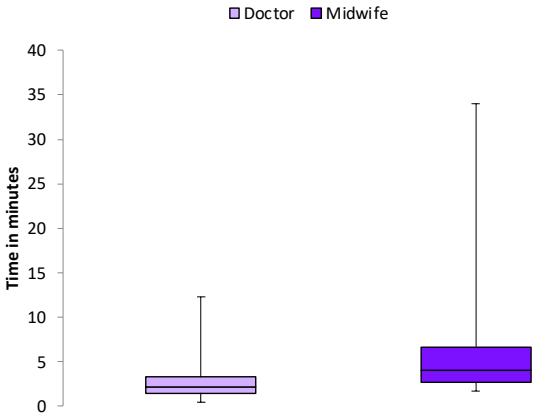
Of the births where the time interval was measured, 84% (n = 46) were spontaneous (one of which was a waterbirth) and 16% (n = 9) were instrumental (either ventouse or forceps). The maximum time that a cord was left intact at an instrumental birth was 4.15 minutes, whereas the maximum time for a spontaneous birth was 34 minutes. Cord clamping times for most spontaneous births (63%) were between 1 and 5 minutes, while the cord clamping times for most instrumental births (78%) were between 0 and 3 minutes. A cord clamping time of over 5 minutes was observed in 35% of spontaneous births but in none of the instrumental births.

The seated (upright or semi-recumbent, not including lithotomy) positions accounted for almost half (47%, n = 26) of all births in the study. There was a similar median cord clamping time for women who birthed in seated positions (median: 3.47 min. IQR: 2.43 - 4.82) and kneeling/standing positions (3.93 min. IQR: 3.27 - 9.17). The birth position with the highest median cord clamping time was side lying (6.37 min. IQR: 4.15- 9.48) and the position with the lowest was lithotomy (2.24 min. IQR: 1.87 - 3.50). Of the four newborns who had their cords clamped before 1 minute, three of the women were in the seated or lithotomy groups and one was in the side-lying group. In all the birth positions, including lithotomy, there was at least one birth where the cord was left intact for over 10 minutes.

The majority of births (73%, n = 40) in the study were facilitated by a midwife. Obstetric doctors facilitated 14 births (25%, n = 14) and one birth was facilitated by a student under the supervision of a registered midwife or obstetric doctor (not specified). The midwives had a median cord clamping time of 4.06 minutes (IQR: 2.68 - 6.65) and the obstetric doctors had a median cord clamping time of 2.13 minutes (IQR: 1.48 - 3.28). Three of the births facilitated by an obstetric doctor, and one by a midwife, had cord clamping times of under 1 minute. One of the births facilitated by an obstetric doctor and six by a midwife had a cord clamping time of over 10 minutes. Midwives commonly (35%) clamped the cord between 3 and 5 minutes, whereas obstetric doctors were most likely (43%) to clamp the cord between 1 and 3 minutes.

A box and whisker plot (Figure 2) highlights inter-professional and intra-professional variation in the timing of cord clamping and shows that the midwives clamped cords later, and with more variation, than the obstetric doctors. Both practitioner groups had similar minimum values for cord clamping timing but the 75th centile was much greater for midwives than for obstetric doctors.

Figure 2. Box and whisker plot of cord clamping times according to practitioner who facilitated the birth



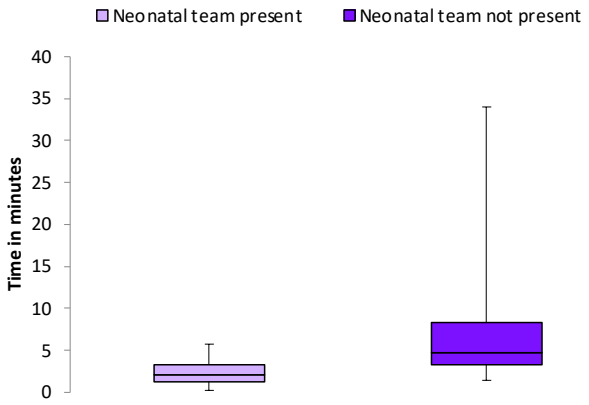
Note: One birth facilitated by a student is not included, as data collection did not specify whether student supervision was by obstetric doctor or midwife.

The neonatal team attended 36% of the births (n = 20) and the median cord clamping time for these births was 2.13 minutes (IQR: 1.28 - 3.27) compared to births where they were not present (median: 4.73 min. IQR: 3.32 - 8.26).

The neonatal team was present for all births where the cord was clamped before 1 minute (n = 4) but not present for any births where the cord was clamped more than 10 minutes after the birth (n = 0). Similarly, they were not present for 70% of the births when the cord was clamped at over 3 minutes. Figure 3

shows there was more variation in cord clamping times for births where the neonatal team was not present compared to when they were present.

Figure 3. Box and whisker plot of cord clamping times according to neonatal team presence



DISCUSSION

The aim of this study was to accurately record birth to cord clamping interval for a sample of term vaginal births in a tertiary hospital in Aotearoa NZ. Time intervals were measured between birth and cord clamping for the 55 babies born vaginally with gestations of ≥ 37 weeks, and specific circumstances related to these births were recorded. The median interval between birth and cord clamping for this sample was 3.5 minutes (IQR 2.18 - 5.68). There was a longer median cord clamping time in groups with spontaneous birth (3.71; IQR 2.67 - 6.23) vs instrumental birth (2.08; IQR 0.55 - 2.30); with maternal side-lying position (6.37; IQR 4.15 - 9.48) vs lithotomy position (2.24; IQR 1.87 - 3.50); with midwife-facilitated birth (4.06; IQR 2.68 - 6.65) vs obstetric-facilitated birth (2.13; IQR 1.48 - 3.28); and when the neonatal team was not called to attend (4.73; IQR 3.32 - 8.26) vs when they were called to attend (2.13; IQR 1.28 - 3.27).

In a similar Canadian study conducted 11 years prior to the TOCC study, the median cord clamping time interval at 89 births was 12 seconds (Hutton et al., 2013). The major difference between this study and the earlier Canadian study is likely due to an awareness of new evidence of the benefits of delayed cord clamping and may also be related to different models of care between the two countries. For example, in Aotearoa NZ most women (94.2%) choose a midwife as their LMC (Ministry of Health [Manatū Hauora], 2019), whereas, in Canada obstetric-led care is more common (Guliani, 2015).

A tertiary location was chosen as the setting for this study to provide a comparison to the previous observational study (Hutton et al., 2013) and to reveal some of the factors known to influence the timing of cord clamping when a mix of health professional groups is involved. For a complex birth at a tertiary hospital, the obstetric, midwifery and neonatal teams are expected to make fast collaborative decisions on cord clamping, often in high-stress situations. Therefore, healthcare practitioners require clear definitions of timings, management and exclusion criteria, to assist in the successful implementation of placental transfusion at births (Anton et al., 2018). Further, the health practitioner groups involved in this study would likely have been influenced by the guidance provided by their own professional organisations (Table 1). However, of note, a local guideline can bring together recommendations from different health professions and provide a general interdisciplinary consensus. Our results aligned with the local health board guideline which recommended a cord clamping time interval of a minimum of 3 minutes where the newborn does not require resuscitation, and a cord clamping time of 1 minute where the newborn does require resuscitation (CDHB, 2014). Of the 55 term vaginal births in this study, only 7% of newborns had their cords clamped at less than 1 minute, demonstrating a shift in practice away from immediate cord clamping.

Whether the birth of the placenta was active or physiological was not documented as part of this study. It is possible that when the extended cord clamping times were documented (29% with median cord clamping time over 5 minutes) a physiological placental birth had occurred. In a survey of midwives in Aotearoa NZ, 73% of respondents (n = 257) reported that, for physiological placental birth, they would leave the cord intact until after pulsations ceased or until the after the placenta had birthed (Richards, 2009).

In this study 81% of all vaginal births were spontaneous and 19% instrumental. A similar distribution of spontaneous to instrumental births was reported in the Canadian study (Hutton et al., 2013), and the finding of a shorter median cord clamping time at instrumental compared to spontaneous births was common to both studies. Neonates who require ventouse or forceps delivery are more likely to require resuscitation (Australian and New Zealand Committee on Resuscitation, 2021) with associated early cord clamping, as indicated by the fact that the neonatal team were present at all nine instrumental births.

Median cord clamping times for different birth positions were on a continuum from lithotomy (2.24 min) to seated (3.47 min) to kneeling/standing (3.93 min) to side-lying (6.37 min). As lithotomy position is most often used for complex births, including instrumental births, this could explain the shorter median clamping time to facilitate newborn resuscitation. When observing maternal positions for birth it was not possible to determine whether the position itself affected the timing of cord clamping or whether certain positions such as lithotomy and supine may have led to an increase in fetal heart abnormalities (Gupta et al., 2017; Huang et al., 2019) and/or lower Apgar scores (Dahlen et al., 2013) and, consequently, a higher likelihood of early cord clamping to facilitate newborn resuscitation.

In this study, the position associated with the longest interval between birth and cord clamping was side-lying, adopted by women at 13% (n = 7) of the births. Births in the side-lying positions may be followed by an initial period of the newborn lying alongside the woman, on a flat surface and in skin-to-skin contact. This flat surface allows the birth practitioner to position the newborn with an effective open airway and thus to encourage spontaneous breathing with an intact cord without having to disturb the maternal or newborn position. In contrast, with seated/lithotomy positions, the newborn will lie on the maternal abdomen to remain skin-to-skin, which is less likely to be an effective flat surface for airway opening. The link between maternal birth position and effective newborn stabilisation with intact umbilical cord has not yet been studied and is a focus of future cord clamping research that may lead to improved neonatal outcomes.

Observations of practitioner involvement in the births found that the median cord clamping times for births facilitated by midwives (4.06 min) was longer than for those by obstetric doctors (2.13 min). This variation in cord clamping practice between health practitioner groups was consistent with findings from the similar Canadian study (Hutton et al., 2013), where the median time for obstetricians was 12 seconds (39/89 births), for family physicians 19 seconds (37/89 births) and for midwives 81 seconds (13/89

births). In Aotearoa NZ, midwives are more likely than obstetric doctors to attend spontaneous uncomplicated births, which are less likely to warrant immediate separation of mother and newborn for preventative or resuscitative measures. In contrast, at complicated births, midwifery, obstetric and neonatal teams are required to share decision-making around when to clamp and cut the cord, taking into consideration the wishes of the woman and her support people. When a new practice is implemented, such as prolonging the interval between birth and cord clamping, interprofessional collaboration is a key strategy for success (Anton et al., 2018).

The neonatal team attended 36% (n = 20) of the births, indicating that there was known fetal compromise or potential newborn compromise. Where the neonatal team was in attendance, the obstetric doctors and midwives were more likely to clamp the cord within 3 minutes of the birth and the neonatal team was present for all four babies whose cords were clamped under 1 minute.

The birthing rooms in the study hospital have resuscitation equipment attached to the wall which is not easy to position at the mother's side at the time of birth. More mobile equipment would enable intact cord resuscitation and compromised babies could benefit from a longer period of placental transfusion, which is known to facilitate cardiopulmonary transition (Bhatt et al., 2013; Ersdal et al., 2014; Hooper et al., 2015; Mercer & Skovgaard, 2002; Niermeyer & Velaphi, 2013). Studies on intact cord resuscitation have demonstrated this practice to be safe and acceptable to parents and clinicians (Katheria et al., 2018; Thomas et al., 2014). In a recent randomised controlled trial, term non-breathing newborns who were resuscitated with an intact cord had higher oxygen saturations than those who had early cord clamping (Andersson et al., 2019). Research into intact cord resuscitation and the implications for birthing practice is currently ongoing across multiple centres worldwide (Katheria, 2019).

STRENGTHS AND LIMITATIONS

This paper reports on the birth to cord clamping interval in Aotearoa NZ and provides valuable information to inform birth practice. A major strength of the study is the robust methodology, whereby participants were consented prior to labour onset and where the interval between birth and cord clamping was timed accurately with a stopwatch.

Because the study avoided the use of an additional person at births to record data, there was less likelihood of the birth being disturbed by a researcher's presence, thereby keeping stress stimuli for women and their newborn to a minimum (Hastie & Fahy, 2009). While we acknowledge that observation will influence practice, the median cord clamping time of 3.5 minutes represents a considerable change in practice compared to previous international observational studies (Airey et al., 2008; Ersdal et al., 2014; Hutton et al., 2013; Nelin et al., 2018), more, we suggest, than would be attributable to the observation factor alone.

Data collection stopped at 55 births for pragmatic reasons (approximately two-thirds of the number we had aimed for) and this was a limitation. The differences in the median birth to cord clamping intervals between groups may not be significant because of the small study sample and therefore should be interpreted with caution. However, the data provide ideas and motivation for future research topics.

The maternity system in Aotearoa NZ experiences multiple structural and systemic factors that have led to workforce shortages (Dawson et al., 2019). Thus, workforce pressures present during the study may have contributed to the delay in reaching greater recruitment numbers. For instance, it was an additional commitment to ask the midwifery and obstetric teams to take part in the study alongside demanding workloads. Due to the small numbers in this study, these results cannot be generalisable to a wider population.

Further, while the presence of a dedicated researcher in the birthing room may have improved consistency of data collection, the decision was made to utilise existing team members to avoid any additional disturbance to the birth setting. However, this meant that these practitioners had to remember to use the stopwatch and record the data.

In addition, the intention was to record a wide range of circumstances which may have influenced cord clamping (such as the intention for active management of third stage, timing of administration of the uterotonic and type of resuscitation) but, as a condition of the locality ethics agreement, the author was asked to limit the volume of data collection to ease workforce pressures. Discussion with midwifery leaders assisted the author to identify which data collection method and which details were most appropriate for the existing work environment and still likely to yield the most useful data.

RECOMMENDATIONS FOR FURTHER RESEARCH

The following areas may provide valuable evidence that could add to the findings of this study:

A study with a similar methodology but with a larger number of births. There may be some statistically significant differences between births that could be demonstrated with a larger data set.

An observational study of midwifery-led births in a community setting. It is likely that midwives practise differently when working in primary care settings. Birth to cord clamping interval may be longer where physiological births are the norm.

Further study into which circumstances may impact the timing of cord clamping. Data collection may be expanded to include: intention of third stage management, timing of uterotonic administration (before or after cord clamping), location of the woman at time of birth (e.g. bed, floor, couch, chair, toilet), positioning of baby before cord clamping (e.g. on woman's abdomen/chest/legs, on birth "surface", held by birth practitioner), length of cord, complications around the time of the birth, Apgar scores, details of newborn resuscitation, and details of cord blood sampling.

A before and after study to support the implementation of an evidence-based multidisciplinary cord clamping guideline.

CONCLUSION

The TOCC study provides a snapshot of practice at one tertiary hospital, examining cord clamping practice at a range of vaginal births, from uncomplicated midwifery-led births to complicated obstetric-led births requiring the neonatal team in attendance.

The median cord clamping time of 3.5 minutes is a positive finding as evidence suggests that, although the optimal time for placental transfusion varies from one birth to another, most newborns need at least 3 minutes of intact cord time post-birth to benefit from increased iron stores and a stable physiological transition.

By identifying some of the circumstances for the 36% (n = 20) of infants in this study that had their cords clamped within 3 minutes of their birth, we may be able to modify these factors for births in the future and thereby provide newborns better access to the full potential of their placental blood.

It is likely that the main reason for early cord clamping is the need to separate the mother and her newborn to facilitate neonatal

resuscitation. This was seen in this study where all four of the newborns who had their cords clamped in less than 1 minute had the neonatal team present at the birth. One strategy to increase placental transfusion time for these newborns is to introduce "bedside" resuscitation tables to support complex resuscitation with an intact cord.

Ongoing work to ensure effective placental transfusion for newborns will involve more education, ongoing research and a re-framing of early cord clamping as an intervention that must only be used when there is clear evidence that it will add benefit and avoid harm.

Key points

- While there is considerable evidence that immediate cord clamping can cause harm, there is little research in Aotearoa New Zealand identifying current practice.
- This study, set in a tertiary maternity hospital in Aotearoa NZ, reveals that, for the births observed, most cords were left intact for over 3 minutes.
- By identifying some of the circumstances where cords are clamped early, we may be able to modify factors for these births, thereby improving newborn health outcomes in the future.

CONFLICT OF INTEREST DISCLOSURE

The authors declare that there are no conflicts of interest.

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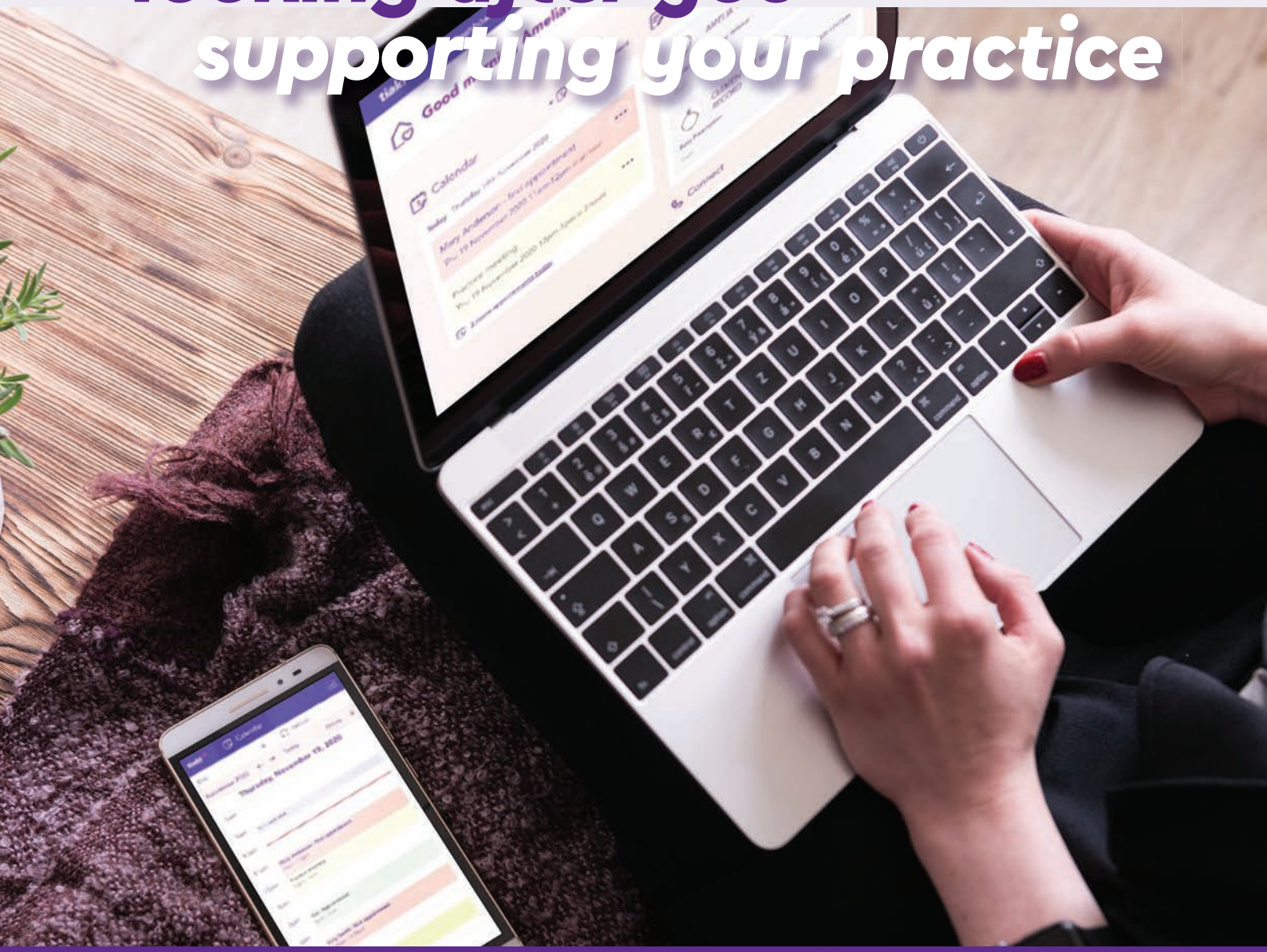

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