MOBILE MATERNITY

Care Providers' Experiences with and Attitudes Towards Virtual Antenatal Care:

Findings from a Provincial Study

Submitted to the Specialist Services Committee, Doctors of BC

Jude Kornelsen, PhD | Daria Nowaczek, MSc |
Shiraz Moola, MD | Robin Johnson, MD | Mona Mate BA, PgD, CPHIMS -CA.PMP

December 24, 2021

SSC SPECIALIST SERVICES COMMITTEE

UBC THE UNIVERSITY OF BRITISH COLUMBIA

Table of Contents

EXECUTIVE SUMMARY 5

ABRIDGED REPORT 12

Introduction 13

Background 15

Methods 16

Cross-cutting findings 17

Summary of survey results 18

Summary of results from Focus Groups and Interviews: 21

- Theme #1 – Attributes of Virtual Care
- Theme # 2 – Barriers to Virtual Care
- Theme # 3 Systems Interventions

Current Context of Virtual Care 27

Conclusion & Overarching Recommendations 29

FULL REPORT 30

Introduction and Context 31

Background 33

Methods 37

Survey Results 38

Changes in Health Care Delivery 40

Gaps in Patient Care during COVID-19 41

Virtual Maternity Care: 42

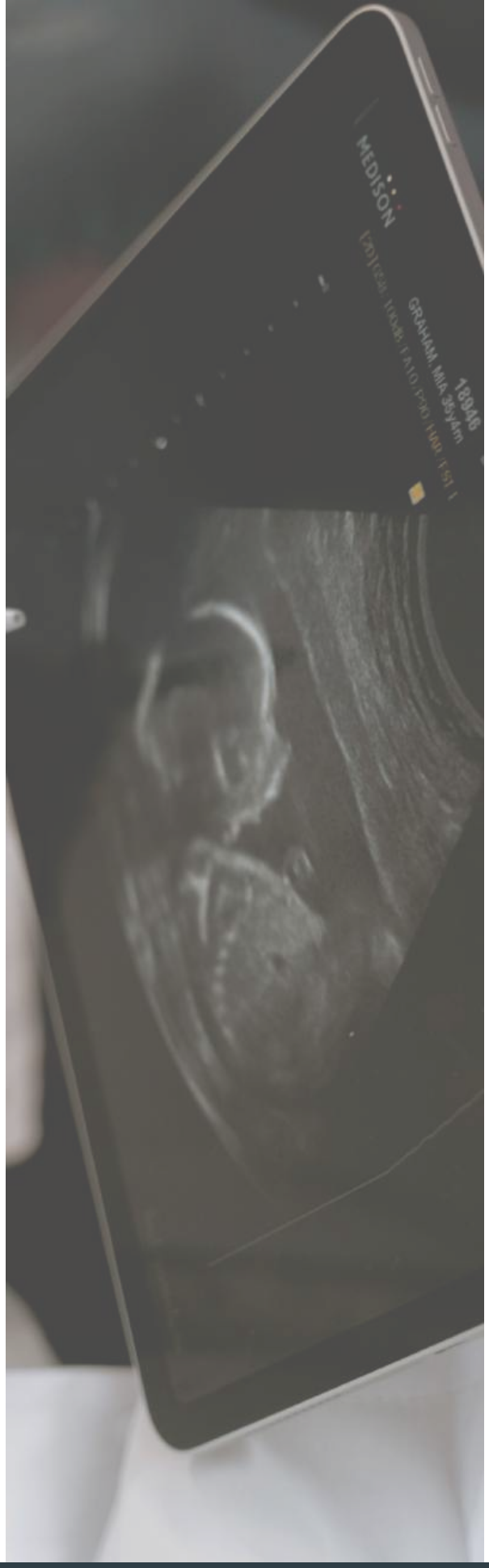
- Practioner Values & Preferences
- Benefits & Barriers
- Clinic Impact

Results from Interviews and Focus Groups 51
Attributes of Virtual Care 52
Benefits of Virtual Care 56
Virtual Care Challenges 58
Patient- Provider Dynamics: 60
- Tripartite Care

Barriers to Perinatal Virtual Care: 65
- Connectivity and Access
- Integration into Practice

System Enablers of Virtual Care: A Meta Perspective 70
- Local vs. Centralized Resources
- Local Relationships
- System Supports to Facilitate Quality Virtual Care

Macro (System)-Level Supports 73
Meso (Practice)-Level Supports 76
System Improvements 77
Networks of Virtual Care 78
Conclusion and Recommendations 80
References 82



Abbreviations

MOM	The Mobile Maternity Care Project
GP	General Physician
EMR	Electronic medical record
CME	Continuing Medical Education
MFM	Maternal Fetal Medicine
EFM	Electronic fetal monitoring
OB/GYN	Obstetrician/gynecologist
FHR	Fetal heart rate
VBAC	Vaginal birth after caesarean
BMI	Body mass index
API	Active Pharmaceutical Ingredient
PTN	Patient Transfer Network
MBMD	MicrobloggingMD, a secure messaging software for patients to communicate with healthcare professionals

Executive Summary

Executive Summary

Introduction

Rural and remote residents of BC face challenges of accessing health care close to home, particularly when specialist care is required. Economies of scale make it unfeasible for specialists to practice in low-volume environments, leading to the reliance on primary care physicians, midwives and registered nurses in rural communities. When a patient requires complex care that exceeds the scope of primary care practitioners, however, referral or transfer is the only option. Emerging evidence reflects the physiologic morbidities and the substantial cost for both mothers and newborns who need to travel to access care. Research has documented the social morbidities for parturient women, families, and communities that result from this dislocation (Kornelsen, J. & Grzybowski, S., 2005; Grzybowski et al., 2015). A solution to enhancing access to specialist care for rural and remote populations has been through the development, refinement and implementation of virtual care strategies. "Virtual care" broadly refers to ways in which health care providers can remotely interact with patients – or other providers – through the use of telephone, text messaging, or video communication.

As an early contributor to virtual maternity care in BC, the Mobile Maternity Care project (MOM) was funded by the Specialist Services Committee in 2015 as a proof of concept to assess the efficacy of linking primary maternity care providers with a regional obstetrical specialist for urgent and routine consultative support at a distance.

The MOM initiative started small, equipping eight rural sites without local access to intrapartum care across the Interior Health Authority with portable tablets to facilitate access to the participating specialist. This connection allowed for improved shared care of high-risk pregnancies to reduce patient travel to see a specialist. It was also available as a 'safety net' for precipitous deliveries in communities without supportive local resources and facilitated real-time educational opportunities between specialists and primary care providers through direct consult for clinical conditions. Most importantly, the MOM project pioneered a system for tri-partite visits, i.e., clinical encounters that included the specialist, the local primary care provider and the birther and family.

When the MOM project began in 2015, uptake of virtual maternity care was primarily embraced by 'early adopters' with slow spread to the 'early majority' of users. Gradually, in the ensuing years, other platforms have been added to the provincial landscape; there has also been the emergence of direct pathways for patients including the First Nations Virtual Doctor of the Day, a direct-contact line for patients in rural, remote and Indigenous communities and HEiDi (HealthLink BC Emergency iDoctor-in-assistance) pathway when they call HealthLink BC (8-1-1), among others. More recently, necessity has spurred this diffusion more broadly in the context of COVID-19. Health Canada (2021) notes that since COVID-19, "adoption of virtual care has dramatically increased with approximately 86% of B.C. patients connecting with a physician virtually (phone, video, email, etc.) between April and September 2020 alone".

Care provider satisfaction, a key element of the Institute for Health Care Improvements' Quadruple Aim (alongside improving the health of populations, enhancing the experience of care for individuals, and reducing the per capita cost of health care (Feeley, 2017)) leads to the stability of a health system innovation over time. As we moved into the final phases of the MOM project in 2020 and began considering opportunities for 'scale and spread', we recognized a gap in our understanding of the implementation of virtual maternity care: clear evidence on the experience and – most importantly – needs of rural care providers. To address this gap, we set out to:

- Understand health care providers' perspectives and experiences with virtual maternity care (rural GPs, midwives and obstetricians) and the utility of virtual tripartite visits;
- Identify barriers and challenges of providing virtual maternity care in BC;
- Outline systems level needs desired by rural providers for virtual and non-virtual maternity care in BC; and
- Provide a set of recommendations to guide the implementation of virtual maternity care in BC.

These objectives were based on our growing understanding of care provider experiences gained through the course of the MOM project.

It is our hope that the findings from our primary research across rural BC on care providers' preferences for virtual care will contribute to provincial discussions of the continued growth and evolution of such care in BC. It is clear that this modality will only expand over the coming years and we look forward to seeing how provider – in addition to patient – preference will guide implementation.

Methods

The goal of this mixed methods study was to understand and document the virtual care needs, preferences and experiences of specialist and primary rural maternity care providers in British Columbia, to provide context for the Specialist Services funded Mobile Maternity Care (MOM). Data collected via:

Cross-Cutting Findings

Several cross-cutting themes, revealed through both the **survey and focus group findings,** emerged. When asked about their experiences with different modes of virtual communication, care providers described...

Fee Codes

Considering additional work involved, fee codes for virtual care are too low.

However, care providers did express the desire to continue using fee codes for virtual care.

Access & Travel

Patients were generally more likely to attend appointments if they were virtual and did not require travel and virtual care increased access to maternity care.

The reduction in travel time was seen as an important benefit of virtual care.

Consultation Dynamics

Many participants noted the benefits of tripartite consultations during COVID 19.

Concerns over lack of physical examinations and associated consequences.

"Good communication with a specialist and clear directions and encouraging advice" was noted by several respondents.

Local, Regional Preference

Care providers preferred to work with specialists from their regional referral centre, who understand rural health care and the rural maternity context.

To ensure that the advice or support being offered is relevant, respondents noted the importance of specialists being aware of the resources available at local sites.

Barriers

Participants experienced,issues with **internet and cell phone coverage, internet speed, lack of access to required equipment** (i.e.: computer, tablet), and **unfamiliarity with medical technology/digital platforms and apps** were often noted.

In summary, participants expressed a desire for virtual tools that are:

✓ **Easy to set up and use, secure**

✗ **Do not increase providers' workload**

Participants want to continue using virtual tools because they see the value it brings to rural maternity care but they also stressed the importance of in-person visits in building relationships and connections and being supported and remunerated appropriately, so they can continue offering virtual care.

Survey Findings

Sixty-nine participants completed all sections of the survey:

51% - Family Physicians | **37%** - Midwives | **6%** - Ob/Gyn | **6%** - Nurse Practitioners

Changes in Healthcare Delivery during COVID-19:

Majority noted the use of **at least two virtual tools** or all the depicted options (telephone, video, email and SMS).

Eighteen percent of participants noted changes in the way they communicate with specialists, with increased use of virtual tools.

Changes Participants want to Retain Post COVID-19:

1) **The continued use of virtual communication tools,**
2) **Changes to in-person visit schedules and**
3) **The continued ability to use fee codes for virtual care**

Gaps in Patient Care during COVID-19:

2 gaps that were commonly mentioned were:

- **Lack of physical examinations and associated consequences**
- **Challenges in building relationships.**

Virtual Maternity Care: Practitioner Values & Preferences

59% - **Continuity of care and carer**

62% - **Patient access to comprehensive, culturally safe health care**

68% - **Patient access to optimal care**

Barriers to Virtual Maternity Care

When asked about system constraints relating to the use of virtual tools with patients, the **top three responses** included:

58% **Internet accessibility**

57% **Speed of internet provider services in the area**

55% **Lack of access to required equipment (i.e.: computer, tablet)**

Benefits

94% selected **'reduction of travel time for patients'** as the main benefit.

72% indicated 'increased patient accessibility to appropriate care team members' as their response.

Optimal Organization of Virtual Care

Responses regarding the desired characteristics of virtual care were sorted into four categories:

Access and connectivity: concerns included the desire for "reliable", "fast" and "secure" internet connections.

Provider to provider contact: specifically regarding communication.

Ease of use: respondents requested that these systems be "portable" especially for use in emergent situations

Other: requesting quality video, security and ensuring workload is compensated for.

Summary of Results from Survey Findings

Analysis of focus group and interview transcripts revealed three overarching themes:

Theme #1 - Attributes of Virtual Care

Phones were selected as primary virtual tool for **connecting with patients**; often combined with in-person visits.

When connecting with other **providers,** participants expressed a preference for speaking on the **phone or texting.**

The main benefit of virtual care for providers was increased efficiency.

The main challenge was the **impact** of the tripartite model **on workflow.**

Most participants still saw value in the tripartite model, because of notably **improved communication.**

Three main issues were discussed under 'Quality of Care':

1. **Lack of physical examination during virtual appointments**
2. **Patient-provider relationship dynamics**
3. **Inefficiency and triage for virtual care**

Theme #2 - Barriers to Virtual Care

Connectivity & Access

- Rural patient populations have limited access to devices and inconsistent access or lack of phone minutes, WIFI access, and cellular plans*.
- Unreliable internet required switching to phone calls and some participants altered their workflows to avoid high internet traffic times.
- Poor internet connection and cell reception experienced in town, along highways, and likewise poor connection at some patients' residences.

User Experience

- Issues with the set-up or facilitation of the virtual appointment, along with audio or visual problems. Some described timebeing wasted troubleshooting.
- Increased workload due to conducting virtual group meetings, sending reminder emails, the required Zoom links, and additional handouts.
- Providers needed to review or provide, large amounts of patient information to use certain virtual platforms. This reduced uptake of these platforms.

Theme #3 - System Interventions

Participants generated many ideas that can improve the provision of virtual care, stressing the **importance of local:**

- **Resources**
- **Knowledge**
- **Relationships**
- **Need for appropriate patient follow up**

Local providers have a better understanding of their community and surrounding communities compared to those located elsewhere and are very aware of the available clinical facilities and limitations they face. Those providing support also need to **understand the community culture and birthing culture.**

Participants described some challenges and concerns over the centralization of health services.

For example, some noted backlash from connecting first with a non-regional resource instead of the providers at their designated referral centre. Others spoke of their experience with Telus Babylon (a centralized system) and the lack of details provided in their referrals.

Conclusion & Overarching Recommendations

Adapting the current implementation of virtual maternity care in British Columbia may be enhanced through the following provider- and evidence-derived strategies, many of which are currently underway in BC:

1.  **Maintain the current priority of improving broad-band access across rural BC;**

2. **Ensure Regional Health Authority leadership to navigate the quickly changing virtual care landscape.**

3.  **Maintain and develop appropriate fee codes to adequately remunerate care providers for virtual care.**

4.  **Develop virtual pathways that include regional specialist involvement in consultations.**

5.  **Roll out virtual care platforms in the context of networks of care; and**

6.  **Implement a framework for evaluation and Continuous Quality Improvement.**

Understanding the experiences of rural health care providers with virtual care is essential to refining guidelines and recommendations for the incorporation of virtual care into practice during and after COVID 19.

Abridged Report

Abridged Report

Introduction

Rural and remote residents of BC face challenges of accessing health care close to home, particularly when specialist care is required. Economies of scale make it unfeasible for specialists to practice in low-volume environments, leading to the reliance on primary care physicians, midwives and registered nurses in rural communities. When a patient requires complex care that exceeds the scope of primary care practitioners, however, referral or transfer is the only option. In obstetrics, this means that women with 'high risk' pregnancies must travel to the nearest specialist centre to receive care, even for non-emergent situations. In some instances, patients are unable or choose not to travel due to a combination of financial and/or family constraints or due to significant challenges associated with remote geographical locations. Emerging evidence reflects the physiologic morbidities and the substantial cost for both mothers and newborns who need to travel to access care. Research has documented the social morbidities for parturient women, families, and communities that result from this dislocation (Kornelsen, J. & Grzybowski, S., 2005; Grzybowski et al., 2015). A solution to enhancing access to specialist care for rural and remote populations has been through the development, refinement and implementation of virtual care strategies.

"Virtual care" broadly refers to ways in which health care providers can remotely interact with patients – or other providers – through the use of telephone, text messaging, or video communication.

As an early contributor to virtual maternity care in BC, the Mobile Maternity Care project (MOM) was funded by the Specialist Services Committee in 2015 as a proof of concept to assess the efficacy of linking primary maternity care providers with a regional obstetrical specialist for urgent and routine consultative support at a distance. The MOM initiative started small, equipping eight rural sites without local access to intrapartum care across the Interior Health Authority with portable tablets to facilitate access to the participating specialist. This connection allowed for improved shared care of high-risk pregnancies to reduce patient travel to see a specialist. It was also available as a 'safety net' for precipitous deliveries in communities without supportive local resources and facilitated real-time educational opportunities between specialists and primary care providers through direct consult for clinical conditions. Most importantly, the MOM project pioneered a system for tri-partite visits, i.e., clinical encounters that included the specialist, the local primary care provider and the birther and family.

When the MOM project began in 2015, uptake of virtual maternity care was primarily embraced by 'early adopters' with slow spread to the 'early majority' of users. Gradually, in the ensuing years, other platforms have been added to the provincial landscape such as the Rural Coordination Centre of BC's Real Time Virtual Support program for peer-to-peer support for both urgent and non-urgent cases for Emergency care (RUDi), Pediatrics (CHARLiE), and Maternity and Newborn (MaBAL) (Rural

Coordination Centre of BC, 2021). There has also been the emergence of direct pathways for patients including the First Nations Virtual Doctor of the Day, a direct-contact line for patients in rural, remote and Indigenous communities and HEiDi (HealthLink BC Emergency iDoctor-in-assistance) pathway when they call HealthLink BC (8-1-1), among others. More recently, necessity has spurred this diffusion more broadly in the context of COVID-19. **Health Canada (2021) notes that since COVID-19,**

> *Adoption of virtual care has dramatically increased with approximately 86% of B.C. patients connecting with a physician virtually (phone, video, email, etc.) between April and September 2020 alone.*

Alongside the emergence of these virtual solutions, strategies and policies are being developed at a provincial level to ensure privacy and security of patient and provider data through the development of secure data platforms. Additionally, evidence-based guidance is being developed to support the appropriate integration of remote care with in-person care, not only to ensure opportunities for examinations and tests when warranted, but also in recognition of the importance of inter-personal contact in health and healing (Health Canada, 2021). Provincial coordination is needed to ensure a smooth implementation. We also need thoughtful coordination for crucial discussions on how we ensure regional specialists are included in solutions and not by-passed. Otherwise, we risk the exclusion of specialists' voices due to highly centralized systems.

As with all health care transformation, improved patient experience remains the north star, and international evidence suggests high levels of satisfaction both with the quality of the appointments themselves and the attendant reduction in the need for travel with all of the associated actual and social costs. This satisfaction has led to increased specialists follow-up where otherwise such care would not be sought (Leighton et al., 2019), which we can use as a proxy measure for reduced health care system costs.

Care provider satisfaction, a key element of the Institute for Health Care Improvements' Quadruple Aim (alongside improving the health of populations, enhancing the experience of care for individuals, and reducing the per capita cost of health care (Feeley, 2017)) leads to the stability of a health system innovation over time. As we moved into the final phases of the MOM project in 2020 and began considering opportunities for 'scale and spread', we recognized a gap in our understanding of the implementation of virtual maternity care: clear evidence on the experience and – most importantly – needs of rural care providers.

To address this gap, we set out to:

- Understand health care providers' perspectives and experiences with virtual maternity care (rural GPs, midwives and obstetricians) and the utility of virtual tripartite visits;
- Identify barriers and challenges of providing virtual maternity care in BC;
- Outline systems level needs desired by rural providers for virtual and non-virtual maternity care in BC; and
- Provide a set of recommendations to guide the implementation of virtual maternity care in BC.

These objectives were based on our growing understanding of care provider experiences gained through the course of the MOM project. This included the value of the 'safety net' video access to a regional specialist, the positive regard for tri-partite visits and the role they played in improving inter-professional communication and understanding, expediting specialist advice (thus accelerating sometimes necessary changes to patient care plans) and increasing 'real world' learning in contexts where shoulder-to-shoulder access to colleagues is diminished due to geographic isolation. We heard of the need for improved connectivity in many rural communities, challenges of ensuring patients had access to devices – and bandwidth – for virtual appointments, and the desire to have one coordinated provincial system for virtual care alongside the need for the integration to Electronic Medical Records platforms.

It is our hope that the findings from our primary research across rural BC on care providers' preferences for virtual care will contribute to provincial discussions of the continued growth and evolution of such care in BC. It is clear that this modality will only expand over the coming years and we look forward to seeing how provider – in addition to patient – preference will guide implementation.

Background

Virtual care has been defined as any interaction between patients and/or members of their circle of care, occurring remotely, using any forms of communication or information technologies with the aim of facilitating or maximizing the quality and effectiveness of patient care (Shaw, Jamieson, Agarwal, Griffin, Wong, & Bhatia, 2018). For the purpose of this study, virtual care means patient care consults by video conferencing, digital communications between team members and/or patients such as messaging, and email, and video consults between providers.

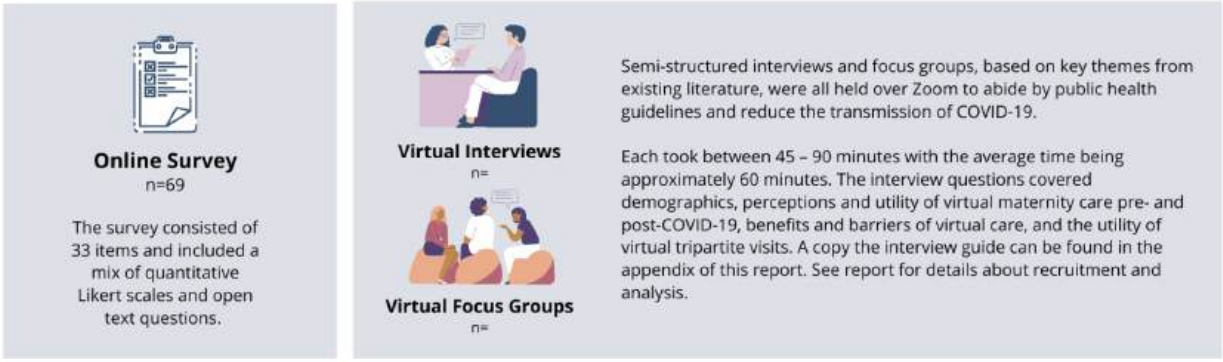
The challenge of providing sustainable access to intrapartum care for rural communities in British Columbia and across Canada has been well documented and described alongside maternal newborn outcomes as well as psycho-social and cultural outcomes. These challenges have been amplified in the recent context of COVID-19, which has precipitated a rapid shift to virtual care for many health care providers. A variety of provincial projects and exemplars enhanced by the Virtual Care Strategy are directing the development of virtual health services to support rural providers. The uptake of technology has also been accelerated due to COVID-19.

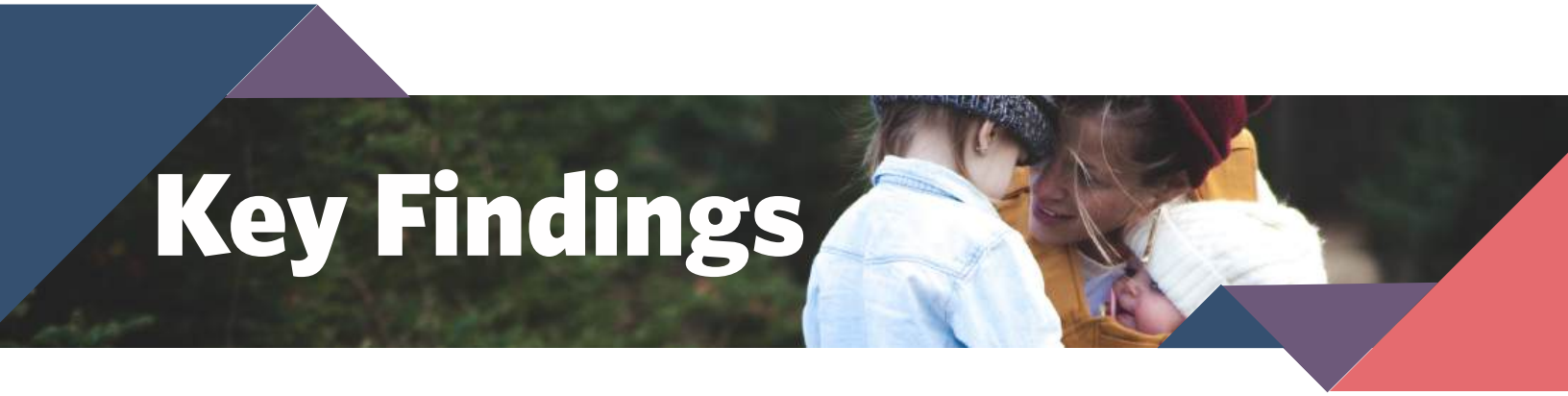
Although immediate solutions are necessary for provider and patient safety, there is a broader need for a provider-informed strategic plan for post-COVID-19 virtual maternity care in rural communities. To date, no provincial initiative has focused on understanding and documenting the needs of maternity care practitioners to provide virtual care. The results from this provincial survey will be used to focus further discussion on the characteristics of an optimal system to meet patient and provider needs within a rural context.

Methods

The goal of this mixed methods study was to understand and document the virtual care needs, preferences and experiences of specialist and primary rural maternity care providers in British Columbia, to provide context for the Specialist Services funded Mobile Maternity Care (MOM).

Data collected via:





Key Findings

In this section we first summarize cross-cutting findings that emerged during both phases of the study, followed by key results from the survey and then the main findings from the focus groups and interviews.

Cross-Cutting Findings

Several cross-cutting themes, revealed through both the **survey and focus group findings,** emerged. When asked about their experiences with different modes of virtual communication, care providers described...

Phone Consultation

- Convenient, low barrier method of communicating.
- Accessible and few technical difficulties.

Video Consultation

- Option appreciated however, many challenges with this technology.
- Time consuming and at times frustrating to set up videoconferencing and deal with technical difficulties.

Text Message Consultation

- Need for more secure texting options.

Respondents expressed a desire for continued use of virtual communication tools.

When reflecting on barriers with virtual care that participants experienced, issues with internet and cell phone coverage, internet speed, lack of access to required equipment (i.e.: computer, tablet), and unfamiliarity with medical technology/digital platforms and apps were often noted.

Some survey items and interview/focus group questions inquired about optimal organization of virtual care. Respondents described the importance of access and connectivity, and ease of use of virtual tools. A strong desire for "reliable", "fast" and "secure" internet connections, access to technological support, resources to operate the technology" and "real time help" was expressed by participants.

Fee Codes

Participants also emphasized that fee codes for virtual care are too low considering the amount of additional work involved.

However, care providers did express the desire to continue using fee codes for virtual care.

Tripartite Model

The benefits of tripartite consultations during COVID 19 were noted by many participants.

Access & Travel

Appreciation that virtual care often increased access to maternity care for patients was often expressed along with the recognition that patients generally are more likely to attend appointments if they are virtual and do not require patient travel.

The reduction in travel time was seen as an important benefit of virtual care.

Consultation Dynamics

Concerns over lack of physical examinations during virtual care and associated consequences were frequently noted because of worries that care providers might be missing things or not seeing the full picture.

The challenges in building relationships with patients when providing virtual care were also reported by care providers. **The importance of "good communication with a specialist and clear directions and encouraging advice" was noted by several respondents to the survey, focus groups and interviews.**

Local, Regional Preference

A preference for getting support from specialists from their regional referral centre was noted rather than using a provincial resource. Care providers preferred to work with specialists who understand rural health care and the rural maternity context.

To ensure that the advice or support being offered is relevant, respondents noted the importance of specialists being aware of the resources available at local sites.

In summary, participants expressed a desire for virtual tools that are:

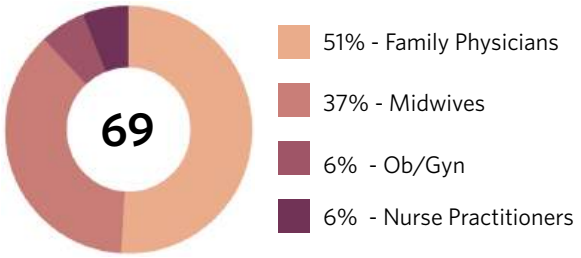
Easy to set up and use, secure

Do not increase providers' workload

Participants want to continue using virtual tools because they see the value it brings to rural maternity care but they also stressed the importance of in-person visits in building relationships and connections and being supported and remunerated appropriately, so they can continue offering virtual care.

Summary of Survey Findings

Sixty-nine participants completed all sections of the survey:



Most responses were received from providers in **Interior** and **Northern Health.**

Half of participants worked in rural communities with **100-500** maternity patients per year (48 %) and one in three (28 %) worked in communities with **fewer than 100** patients.

Changes in health care delivery during COVID-19:

COVID-19 and measures to contain the pandemic have resulted in the adoption of various virtual tools. When asked which virtual tools they have adopted to reach out to patients, the **majority noted the use of at least two virtual tools** or all the listed options (telephone, video, email and SMS). Two respondents commented on challenges they experienced with the use of virtual tools. For example, respondents described videoconferencing as "cumbersome" and noted limited options for secure texting.

Eighteen percent of participants noted changes in the way they communicate with specialists, with increased use of virtual tools like phone and zoom reported by these participants. Setting up clinic visits that include the patient, primary health care provider and specialist on the phone were described as beneficial for patients and providers.

Changes to health care delivery that respondents want to retain post-COVID:

COVID-19 has contributed to multiple changes in clinical practice. Participants were asked which aspects they would like to retain post-COVID-19. Analysis of this open-ended question revealed three main categories:

1. The continued use of virtual communication tools,
2. Changes to in-person visit schedules and
3. The continued ability to use fee codes for virtual care.

In addition to the three categories described above, other respondents noted the desire for continued infection prevention control through cleaning procedures and greater use of PPE. Meanwhile, some respondents said that they hope to return to a pre-COVID-19 clinical practice.

Gaps in patient care during COVID-19:

The shift to virtual care during COVID-19 has been widely adopted and supported the provision of care in a time where physical distancing was essential to reduce the spread of infection. Although participants valued virtual care, they also perceived gaps in patient care.

Two gaps that were commonly mentioned were:

1. Lack of physical examinations and associated consequences and
2. Challenges in building relationships.

Perceived gaps in patient care relating to a lack of physical examination were described as limitations based on the lack of hands-on assessment. One respondent noted that fewer "in-person appointments will result in less in person monitoring (i.e., FHR)". Other participants observed that they are "unable to fully assess the mental and physical health of their patients"

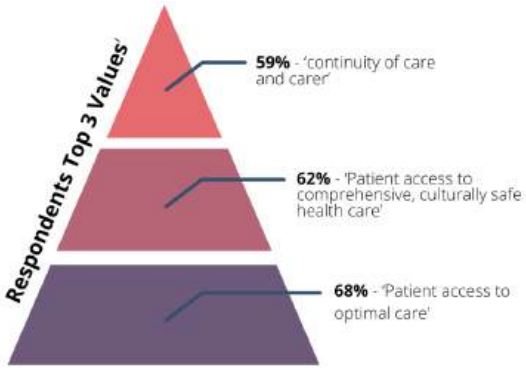
And that "it can be difficult to assess affect and risk factors for depression over the phone"

The inability to complete these routine assessments contributed to the overall concern expressed by respondents about the potential of "missed diagnoses due to lack of exams". Care providers worried that they might "miss subtle nuances over the phone".

In addition to gaps in care relating to the lack of physical examinations, many respondents highlighted the impact virtual care has had on building relationships and connecting with patients. Care providers noted that relationship building as an integral part of family practice and reported challenges communicating with patients when providing virtual care.

Virtual Maternity Care: Practitioner values and preferences

Care providers were asked to select their top three values in their maternity practice that are most important to consider for virtual care services (six pre-defined response options could be selected). Respondents considered 'patient access to optimal care' (68%), 'patient access to comprehensive, culturally safe health care' (62%), and 'continuity of care and carer' (59%) as their top three values. Additionally, 'patient access to appropriate consultant and knowledge to make informed choices' was another value selected by many respondents (54%).



Participants considered "quick consults with colleagues (within 2 hours response)" their highest priority with respect to virtual specialist communication (51%). The highest priority for virtual primary care communications was 'face to face (video) for scheduled care consults with patients' (43%), followed by 'virtual visits for unscheduled, non-emergent care' (27%).

Virtual Maternity Care: Benefits and Barriers

Benefits

Although participants reported having to manage and overcome several constraints associated with the use of virtual tools, many benefits of virtual care were also noted.

94%, selected 'reduction of travel time for patients'

76% 'increased patient accessibility to appropriate care team members'

A few participants mentioned other benefits, including access to specialists and how virtual care enables access for patients who would otherwise not travel outside of their community.

Barriers

When asked about system constraints relating to the use of virtual tools with patients, the top five responses included:

Internet accessibility (58%)	**Speed of internet provider services in the area (57%)**	**Lack of access to required equipment (i.e.: computer, tablet) (55%)**	**Unreliable cell phone service coverage (54%)**	**Unfamiliarity with medical technology/ digital platforms and apps (52%).**

Participants were also asked to identify any system constraints regarding their personal adoption of virtual care tools. The top constraints selected were: speed of internet provider services in the area (45%); unreliable cell phone coverage (38%); unreliable internet provision (37%) and fee code too low for additional work involved (32%). **According to the participants in this study the majority of the barriers faced are related to access, connectivity and lack of appropriate billing for a provider's time.**

Virtual Maternity Care: Clinic impact and preferences for clinical decision supports

Respondents were asked how providing virtual care to patients has impacted their clinic. Two areas were identified as having a moderate impact: The 'additional workload for practitioners providing clinical care' was noted as a barrier by 47% of participants and 24% cited 'additional workload for administrative teams.

Participants were asked about their preferences when seeking clinical decision support in a non-emergent situation. Respondents expressed a preference for connecting with specialists from their regional referral centre (51%) rather than use of a provincial resource who can guide the immediate care and connect with regional teams later (cited by 1 %) although many respondents (44%) would be appreciative of either option (regional or provincial) for receiving guidance (see Figure 6). In an acute situation, respondents also favoured connecting with their regional referral centre (59%) rather than use of a provincial resource (4%).

Optimal organization of virtual care:

Finally, participants answered questions about the most important features of a virtual interface and system for support for obstetrical care. Responses regarding the desired characteristics of virtual care were sorted into four categories: access and connectivity, ease of use, provider to provider contact, and other.

Access and connectivity concerns included the desire for "reliable", "fast" and "secure" internet connections. Another respondent noted that they would like to have access to technological support to ensure that the system they are using is working correctly, including "resources to operate the technology". In describing the virtual interface or system, respondents frequently used the phrase "ease of use" to describe their ideal set up. Respondents requested that these systems be "portable" especially for use in emergent situations. The overall utility of virtual tools and systems is not only dependent on the technology but also on the individuals who are using them. Respondents commented

on the importance of "real time help", "reliable availability of provider/specialist on the other end – not intermittent availability", and overall "a willing provider on the other end of the call". One participant noted the importance of "good communication with a specialist and clear directions and encouraging advice". To ensure that the advice or support being offered is relevant, respondents noted the importance of specialists being aware of the resources available at local sites.

Other respondents noted that they would like the virtual technology to have "good quality video for showing FHR strips", "good sound", and the "ability of the consultant and primary care physician to control the camera". With the increased adoption of virtual tools, respondents noted that security is an important feature of virtual care. Respondents reflected on patient concerns regarding reassurance of the security measures that are in place to protect their privacy and maintain confidentiality. Another expressed concern was that of workload: extra tools or new systems may require more time and effort to set-up or manage and therefore respondents would like systems that prioritize "efficiency as staff for set up can be limited" and "does not increase primary care providers workload without pay".

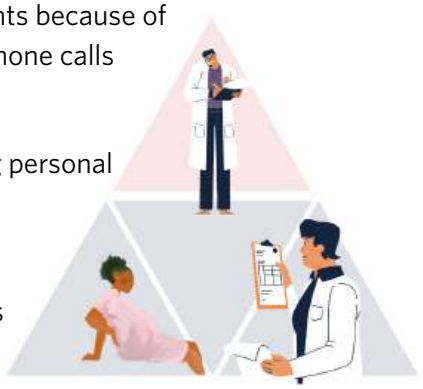
In the final question of the survey, participants were asked to submit any overall comments about their experience with- and /or preferences regarding virtual care. Many respondents offered comments about their willingness to use video and the value it brings to rural maternity care, while at the same time indicating the barriers and challenges of its use. Internet connectivity, costs and billing, privacy, and security concerns were mentioned as challenges reducing the use of -or comfort level with virtual care. This has led some respondents to prefer the use of phone over video communication. Other respondents emphasized the value of in-person visits in building relationships and connections, and how this can be difficult through virtual modalities.

Summary of Results from Interview Findings

Analysis of focus group and interview transcripts revealed three overarching themes: Attributes of Virtual Care, Barriers to Virtual Care & Systems Interventions.

1 Attributes of Virtual Care

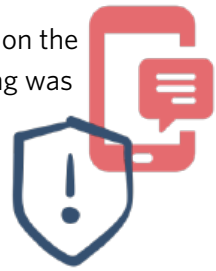
The use of phone was reported as the primary virtual tool for connecting with patients because of ease of use and fewer technological challenges, compared to video conferencing. Phone calls were often combined with in-person visits, to care for patients during COVID 19.



Texting was common but respondents expressed concerns with security and setting personal boundaries (some felt too accessible).

Establishing boundaries has been helpful. One example involved the MOA being responsible for the text-only phone during business hours, clearly stating that text is for only non-urgent matters. The use of texting in the practice of midwifery was noted as very successful and desired by some GPs.

When connecting with other providers, participants expressed a preference for speaking on the phone or texting. Most did not use video to communicate with colleagues. Text messaging was commonly used and convenient for sending photos (with no identifiers). Sending photos via text caused fewer interruptions as providers can respond when they have time. Participants expressed some concerns with texting not being secure and noted that secure options are too challenging to operate and have had low up take.



Benefits of Virtual Care:

Reduction in travel and increased access to care were reported as the two main benefits of virtual care for patients. When patients do not need to travel long distances, they experience benefits such as saving on travel costs, not having to take time off work, being able to have other family members or support people attend appointments, and not needing to arrange childcare and/or transportation, as well as reducing the risks associated with travelling in poor weather conditions.

Providers noted that in-person appointments are not always needed, as counselling can be done remotely, and they felt it was unfair to ask patients to travel for short appointments if it could be done over the phone. Virtual care also increased access to patients who would not come into a clinic and enables providers to connect with patients' in-between appointments if needed.

The main benefit of virtual care for providers was increased efficiency, i.e. virtual care has increased care providers' efficiency in getting through their workloads or patient volumes, resulted in better waitlist management, and allowed them to utilize gaps in their schedule to make phone calls. MOAs can facilitate this by keeping a list of patients that providers can contact when they have free time in their schedule.

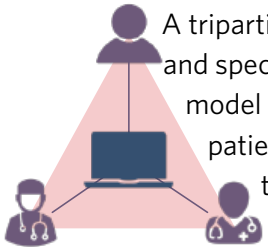
Quality of Virtual Care:

Three main issues were discussed under this subtheme: Lack of physical examination during virtual appointments, patient-provider relationship dynamics & inefficiency and triage for virtual care. Participants communicated that it is difficult to determine patient's height and weight distributions, physical functionality, and overall health and wellbeing using phone or video calls. There is a need for providers to be able to use all their "senses" (in-person) to assess their patient. Participants expressed the importance of seeing patients in person as this can give providers information about their patient's personal life or current situation that would be harder to determine over the phone.

Relationship dynamics have changed with increased use of virtual care. Participants reported lack of respect or focus from patients during appointment times, feelings of reduced patient connection, and misinterpretations/miscommunications. Positive aspects of the patient-provider dynamic included increased levels of comfort for patients, opportunities for teaching, and the potential of 'seeing' more of a patient's life than before.

A couple of respondents noted that inefficiency can stem from the fact that the information gathered from patients in a virtual setting can be limited compared to in-person visits.

Tripartite model:



A tripartite clinical consultation involves the family physician or midwife in addition to the patient and specialist. When discussing attributes of virtual care, participants often mentioned the tripartite model and the benefits and challenges of convening specialists, primary care providers and patients during the same virtual visit. Improved communication was seen as a major asset of the tripartite model, reducing reliance on patient recall, and ensuring that patients do not forget information that needs to be brought up. Primary care providers can also support patients by translating technical information as well as provide moral support. The tripartite model also improved communication between car providers, reducing the need to contact other providers directly or wait to receive a formal consultation letter. Opportunities to learn from one another, be supported and reassured by colleagues and increased confidence with complex cases were noted as additional benefits of this model. The tripartite model can also increase involvement of midwives and provide overall "in-room" support.

The main challenge or concern that was raised by participants was the impact of the tripartite model on workflow, such as scheduling challenges and logistics of coordinating two providers and a patient. Most participants still saw value in the tripartite model even with the scheduling challenges, in part because these appointments occur infrequently. Morning appointments have worked well for some providers and PCPs might only join for a portion of the meeting. Some participants felt that a consult letter was enough, and there was no need to meet virtually.

Concerns over billing due to two providers being present were noted.

2 Barriers to Virtual Care

Participants described several barriers to provision of virtual care. These barriers fell into two main categories: Connectivity & access and user experience. With respect to connectivity and access, providers described patient challenges, provider challenges and infrastructure challenges. Common challenges for rural patient populations included limited access to devices (e.g., phones or computers) as well as inconsistent access or lack of phone minutes, WIFI access, and cellular plans. **These challenges are exacerbated among rural low-income patients.**

Provider challenges described included issues with poor internet connection, which has led to changes in how providers conduct virtual care. Unreliable internet required switching to the use of phone calls versus video calls to ensure fewer issues and more consistency with the quality of communication. Delays in access to Zoom accounts were reported by some providers. Some participants noted that they altered their workflows to avoid the high internet traffic times.

Infrastructure challenges that were discussed by providers included poor internet connections and poor cell reception experienced in town, along highways, in hospital buildings, in provider home

offices, and likewise poor connection at some patients' residences.

Many experienced dropped calls and in an effort to manage these issues there has been a reliance on landlines, pagers, or physically moving to an area with better reception/connection.

Some participants reported good access and connectivity, and no challenges with conducting virtual care due to recent improvements to infrastructure.

Another barrier to providing virtual care was the user experience, which included three subcategories: time & workflow, workload, and patient information.

Providers discussed various challenges with workflow and the time required to deliver virtual care, including issues with the set-up or facilitation of the virtual appointment, along with audio or visual problems. Some described time wasted trouble shooting, causing delays in workflow and issues with maintaining set appointment times. This resulted in providers switching to the use of phone to avoid these issues and respect patients' time.

Another barrier was the increase in workload due to virtual care, e.g., the extra time and work required in order to conduct virtual group meetings, sending reminder emails to those attending, the required Zoom links, and additional handouts. Some struggled with finding the correct link and ensuring it was sent on the correct platform. These challenges caused frustration, but some participants recommended solutions, such as creating a Zoom information template to be used via Gmail, that includes all the required information in one spot. The shift to virtual care came about quickly and with limited support placing a lot of the technical demand on providers as well as increasing the overall number of daily tasks.

Another barrier was the large amounts of patient information that providers needed to review or provide to use certain virtual platforms. This reduced uptake of these platforms.

Younger and more vulnerable populations may be hesitant about virtual visits. The need to download an app or read through "ten pages of instructions" or disclaimers may be a barrier for some patients and these factors should be given greater consideration to improve engagement with these patient populations.

3 System Interventions

Participants generated many ideas that can improve the provision of virtual care, stressing the importance of local resources, knowledge, and relationships and the need for appropriate patient follow up. There were consensus that regional or local resources are favoured over provincial resources for consultations and that a provincial or centralized resource would only be adequate for general advice. Participants emphasized that local knowledge is essential to provide appropriate support and care. Local providers have a better understanding of their community and surrounding communities compared to those located elsewhere and are very aware of the available clinical facilities and

limitations they face. Those providing support also need to understand the community culture and birthing culture.

Developing and maintain local relationships with colleagues was deemed important. Regional resources were favoured due to the ability to maintain existing professional relationships and the importance of building new relationships within a community or region. Relying on local colleagues was also seen to make rural practice more sustainable as some providers are experiencing low patient volumes and would benefit from additional work.

Participants described the importance of patient follow up when providing virtual care. They noted contact should be made with those who will receive the patient and there is an expectation that the contacted provider will follow-up with the patient. Providers expressed greater comfort in consulting with their local obstetricians because they felt that local providers would be more likely and willing to follow up.

Participants described some challenges and concerns over the centralization of health services. For example, some noted backlash from connecting first with a non-regional resource instead of the providers at their designated referral centre. Others spoke of their experience with Telus Babylon (a centralized system) and the lack of details provided in their referrals.

Needed Supports identified by participants:

Respondents were encouraged to describe the support that would help them practice rural obstetrics and optimize delivery of virtual care. This 'Blue Sky' discussion resulted in various recommendations described below:

A Community Focus - Desire for increasing in-community delivery of care and community connections through virtual and non-virtual means.

Connectivity and Access - Need for improvements with respect to equitable access to internet and related devices, ease of use, and further infrastructure development.

Education about Virtual Care - Need for education on virtual care for patients and providers to help reduce potential fear and hesitancy around the use of technology.

Fee Code Adaption - Maintaining appropriate renumeration or fee codes for the continuation of virtual care services.

IT Assistance - Need for IT support and general virtual set up support.

Practice Supports - Practices want future support with set up of virtual appointments.

Health Authority Involvement and Consent Documents - Desire for a health authority wide consent form/process.

No Need for More Technology - Desire to utilize phones and optimize available technology.

Security - Providers want clear guidelines for what platforms are secure and safe to use and would like secure texting options.

Systems Level Needs (virtual or not):

Various systems level suggestions emerged during the focus groups and interviews: more support for midwives, health stations for conducting virtual appointments, a streamlined system for finding out who is on call/available (with real time updates), and reproductive mental health services.

Specific recommendations included:

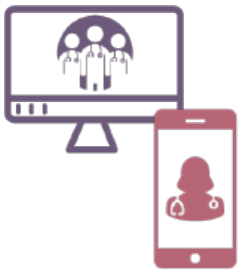
EMR - Have everything integrated to the EMR (video, phone, resources, etc.), and consider a provincial EMR, so everyone can access the same EMR.

One System - One service that has it all (email, app, contacts, video, patient log in, etc.), province wide single health platform that everyone is using and provides province wide access to information.

Network for Providers:

Participants had several recommendations about how to strengthen the network of providers, to optimize rural obstetric practice.

- ***Involvement of referring provider -*** Level of referred specialist involvement with patient can be unclear and participants would like that to be better communicated or standardized.
- ***Trust – Judgement*** - Ability to refer to the same person for one community is desired. Participants have preferences in terms of who they want to refer their patients to which is not always the individuals that the health authority selects.
- **Utility (of a provider network)** - Support for rural networks: conferences via Zoom, making providers aware of what services are available and who is available to them and their patients, virtual rounds, Listserv (email distribution), need to present a judgement free environment to be successful, mentorship for new providers, and peer-to-peer support (for adverse experiences, etc.).



- ***Continuing Medical Education (CME) -*** Need for CME, such as case discussions, journal club, courses for rural providers on how to manage cases in their context, teaching via zoom, etc.
- ***Continued use of existing modalities that facilitate provider networks-*** Examples included: What's App groups, teaching/training via Zoom, Zoom rounds, email chains.

Current Context of Virtual Care: The Influence of the COVID-19 Pandemic

This investigation into care providers experiences with the use of virtual modalities to support rural maternity care occurred during the second wave of COVID-19. During this time, health care providers were conducting most clinical visits virtually as per public health guidelines. Maternity care providers were guided by the (changing) best available evidence for in-person prenatal visits which set minimum targets for in-person visits but, as summarized by the BC Centre for Disease Control, emphasized "where appropriate Virtual visits (instead of in-person visits) should continue, to minimize the chance of exposure to COVID-19" (BC Centre for Disease Control, 2021). Given this context, we asked participants in this study which tools they adopted directly due to COVID-19, whether this altered their communication with patients and other providers and which virtual practices they intended to maintain post-pandemic. Each is discussed, below.

Adoption of Virtual Tools:

Most respondents noted that they had integrated the use of virtual tools into their practice due to COVID-19 including increased use of phone, Zoom, other videoconferencing services, texting, email and group messaging services such as WhatsApp. One respondent noted that they found that email was very helpful for providing patients with updates and maintaining contact:

> *In COVID, in the context of it in Canada, I think the main thing that we actually really used was just e-mailing, like e-mailing patients handouts and appointments and places and things like that (PCP_02).*

Another respondent commented that they offer their patients the choice of video or phone as they are aware that not all patients have access to [...] technology:

> *...since COVID, we kind of give the patient the option of either doing a video call versus a telephone call and because some people don't have access to the internet or phone vice versa, and we have been using Doxy primarily for that, which we have found to be moderately effective...(PCP_23).*

Many respondents noted fluidity in the modalities used as the pandemic progressed:

> *We – no, we [used video] at the beginning, and that didn't last for us. We just use the telephone. (PCP_13).*



Provider to provider communication:

Several respondents reported that communication with specialists and peers did not change due to COVID-19. Many continued to use the same tools and approaches, including the use of phone, fax, hallway consults (in person), texting, MBMD, formal consult letters, video with certain specialities, and PTN when needed:

> *...not much has really changed in terms of like virtual connections with our specialists. I mean we have three OB's that are here in town and our connection to them remain the same, post COVID [onset], meaning that we would connect to them typically by phone or by writing a consult letter and because they're right in town there wasn't that need to use online approaches to connection. Just the typical, telephone, text message or writing a consult letter....(PCP_06).*

A few respondents, however, commented that they had experienced changes in the way they communicate with other providers, noting that they have "abandoned" using the switch board to contact other providers as it has become too time consuming to listen to the extra messaging recorded, relating to COVID-19 (PCP_02).

The use of phone calls has drastically increased according to one respondent, "a lot more consultations on the phone with specialists. So, it's been a big change this year." (PCP_21).

Changes in the use of virtual tool also included use of available iPads in emergency rooms, which has allowed primary care providers to "pull up a specialist to talk [to]", which most noted, "has been a big change" (PCP_20). Another respondent observed that group chats have been a new addition to how they communicate with colleagues, "...since COVID, started using WhatsApp to have a group chat amongst ourselves. Initially that was just to help coordinate all the changes that were happening with COVID a year ago, and now we use it for many purposes..." (PCP_23).

Retention of Virtual Tools Post COVID-19

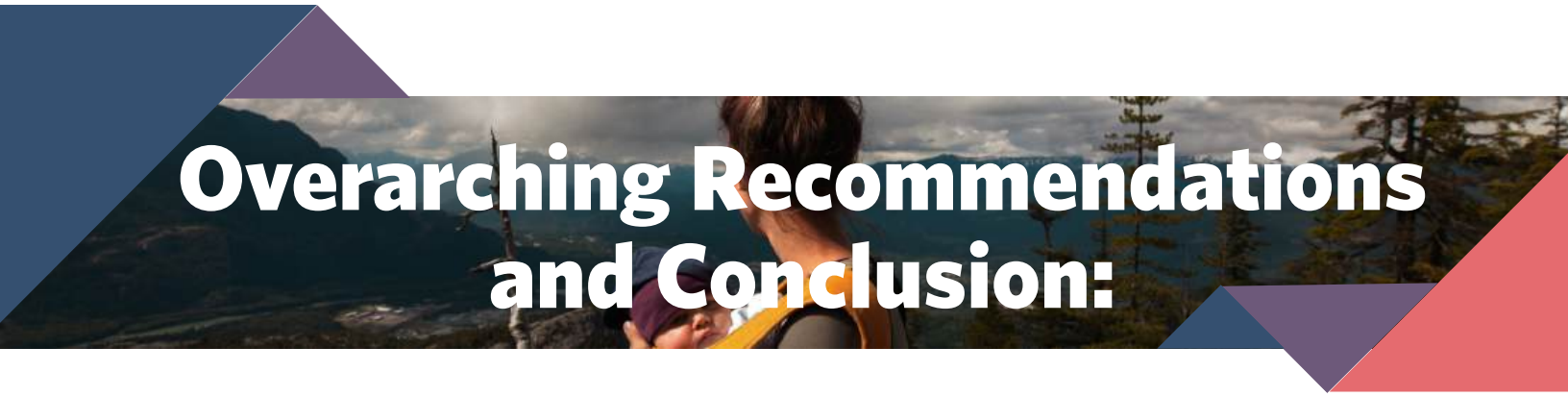
Some respondents expressed a desire to maintain the (increased) use of phone and video for connecting with patients as these options benefit the patient by reducing the need to travel and allowing for more flexibility in daily workflows. One respondent stated:

> *I think there's a place for it, especially for patients that can't come to your office because they live remotely and access to specialist care is a barrier for them. I think there certainly is a place for telehealth and virtual visits because of its ease and its flexibility for a lot of patients in my perspective and I think I would probably continue adapting it into my practice (OB_29).*

Other respondents commented that they would also continue to use virtual tools as long as appropriate billing of the service was maintained. A few respondents noted that they would continue to

use virtual tools as long as appropriate billing of the service was maintained. A few respondents noted that they would continue to use virtual tools but not completely rely on them for all contact with all patients. One respondent stated that, post COVID-19, their preference "would be to use video for new consults with patients rather than telephone" (OB_07), while another respondent stated that they would likely run their practice with "at least half virtual, [and] half in-person" (OB_25).

A lack of desire to continue to use virtual care post COVID-19 was noted by a minority of respondents who voiced the desire to return to in-person care. One respondent stated, "I personally don't see myself using those [virtual tools] in a post COVID world. Maybe that's just because I'm a stubborn person that just wants to go back to normal... I have no intentions of continuing virtual things unless I'm really needing to." (PCP_17).



Overarching Recommendations and Conclusion:

Adapting the current implementation of virtual maternity care in British Columbia may be enhanced through the following provider- and evidence-derived strategies, many of which are currently underway in BC:

1. Maintain the current priority of improving broad-band access across rural BC.
2. Ensure Regional Health Authority leadership to navigate the quickly changing virtual care landscape.
3. Maintain and develop appropriate fee codes to adequately remunerate care providers for virtual care.
4. Develop virtual pathways that include regional specialist involvement in consultations.
5. Roll out virtual care platforms in the context of networks of care.
6. Implement a framework for evaluation and Continuous Quality Improvement.

Understanding the experiences of rural health care providers with virtual care is essential to refining guidelines and recommendations for the incorporation of virtual care into practice during and after COVID 19.

Full Report

Full Report

Introduction and Context

Rural and remote residents of BC face challenges of accessing health care close to home, particularly when specialist care is required. Economies of scale make it unfeasible for specialists to practice in low-volume environments, leading to the reliance on primary care physicians, midwives and registered nurses in rural communities. When a patient requires complex care that exceeds the scope of primary care practitioners, however, referral or transfer is the only option. In obstetrics, this means that women with 'high risk' pregnancies must travel to the nearest specialist centre to receive care, even for non-emergent situations. In some instances, patients are unable or choose not to travel due to a combination of financial and/or family constraints or due to significant challenges associated with remote geographical locations. Emerging evidence reflects the physiologic morbidities and the substantial cost for both mothers and newborns who need to travel to access care. Research has documented the social morbidities for parturient women, families, and communities that result from this dislocation (Kornelsen, J. & Grzybowski, S., 2005; Grzybowski et al., 2015). A solution to enhancing access to specialist care for rural and remote populations has been through the development, refinement and implementation of virtual care strategies.

"Virtual care" broadly refers to ways in which health care providers can remotely interact with patients – or other providers – through the use of telephone, text messaging, or video communication.

As an early contributor to virtual maternity care in BC, the Mobile Maternity Care project (MOM) was funded by the Specialist Services Committee in 2015 as a proof of concept to assess the efficacy of linking primary maternity care providers with a regional obstetrical specialist for urgent and routine consultative support at a distance. The MOM initiative started small, equipping eight rural sites without local access to intrapartum care across the Interior Health Authority with portable tablets to facilitate access to the participating specialist. This connection allowed for improved shared care of high-risk pregnancies to reduce patient travel to see a specialist. It was also available as a 'safety net' for precipitous deliveries in communities without supportive local resources and facilitated real-time educational opportunities between specialists and primary care providers through direct consult for clinical conditions. Most importantly, the MOM project pioneered a system for tri-partite visits, i.e., clinical encounters that included the specialist, the local primary care provider and the birther and family.

When the MOM project began in 2015, uptake of virtual maternity care was primarily embraced by 'early adopters' with slow spread to the 'early majority' of users. Gradually, in the ensuing years, other platforms have been added to the provincial landscape such as the Rural Coordination Centre of BC's Real Time Virtual Support program for peer-to-peer support for both urgent and non-urgent cases for Emergency care (RUDi), Pediatrics (CHARLiE), and Maternity and Newborn (MaBAL) (Rural d

Coordination Centre of BC, 2021). There has also been the emergence of direct pathways for patients including the First Nations Virtual Doctor of the Day, a direct-contact line for patients in rural, remote and Indigenous communities and HEiDi (HealthLink BC Emergency iDoctor-in-assistance) pathway when they call HealthLink BC (8-1-1), among others [Mona?] More recently, necessity has spurred this diffusion more broadly in the context of COVID-19. **Health Canada (2021) notes that since COVID-19,**

> *Adoption of virtual care has dramatically increased with approximately 86% of B.C. patients connecting with a physician virtually (phone, video, email, etc.) between April and September 2020 alone.*

Alongside the emergence of these virtual solutions, strategies and policies are being developed at a provincial level to ensure privacy and security of patient and provider data through the development of secure data platforms. Additionally, evidence-based guidance is being developed to support the appropriate integration of remote care with in-person care, not only to ensure opportunities for examinations and tests when warranted, but also in recognition of the importance of inter-personal contact in health and healing (Health Canada, 2021). Provincial coordination is needed to ensure a smooth implementation. We also need thoughtful coordination for crucial discussions on how we ensure regional specialists are included in solutions and not by-passed. Otherwise, we risk the exclusion of specialists' voices due to highly centralized systems.

As with all health care transformation, improved patient experience remains the north star, and international evidence suggests high levels of satisfaction both with the quality of the appointments themselves and the attendant reduction in the need for travel with all of the associated actual and social costs. This satisfaction has led to increased specialists follow-up where otherwise such care would not be sought (Leighton et al., 2019), which we can use as a proxy measure for reduced health care system costs.

Care provider satisfaction, a key element of the Institute for Health Care Improvements' Quadruple Aim (alongside improving the health of populations, enhancing the experience of care for individuals, and reducing the per capita cost of health care (Feeley, 2017)) leads to the stability of a health system innovation over time. As we moved into the final phases of the MOM project in 2020 and began considering opportunities for 'scale and spread', we recognized a gap in our understanding of the implementation of virtual maternity care: clear evidence on the experience and – most importantly – needs of rural care providers.

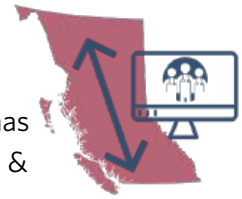
To address this gap, we set out to:

- Understand health care providers' perspectives and experiences with virtual maternity care (rural GPs, midwives and obstetricians) and the utility of virtual tripartite visits;
- Identify barriers and challenges of providing virtual maternity care in BC;
- Outline systems level needs desired by rural providers for virtual and non-virtual maternity care in BC; and
- Provide a set of recommendations to guide the implementation of virtual maternity care in BC.

These objectives were based on our growing understanding of care provider experiences gained through the course of the MOM project. This included the value of the 'safety net' video access to a regional specialist, the positive regard for tri-partite visits and the role they played in improving inter-professional communication and understanding, expediting specialist advice (thus accelerating sometimes necessary changes to patient care plans) and increasing 'real world' learning in contexts where shoulder-to-shoulder access to colleagues is diminished due to geographic isolation. We heard of the need for improved connectivity in many rural communities, challenges of ensuring patients had access to devices – and bandwidth – for virtual appointments, and the desire to have one coordinated provincial system for virtual care alongside the need for the integration to Electronic Medical Records platforms.

It is our hope that the findings from our primary research across rural BC on care providers' preferences for virtual care will contribute to provincial discussions of the continued growth and evolution of such care in BC. It is clear that this modality will only expand over the coming years and we look forward to seeing how provider – in addition to patient – preference will guide implementation.

Background



Virtual care has emerged as a complementary modality to in-person health care visits, bridging distance to health care for rural and remote communities and, during the COVID-19 pandemic, facilitating the need for social distancing due to public health guidelines. Although virtual care has been applied to emergency medicine (Kim et al., 2020; Ho, 2021), stroke care (Chan, O'Riordan & Appireddy, 2020) and other areas of health care (Hsiehchen et al., 2021; Ahn, 2020), less consideration has been given to its application to maternity care. There is, however, emerging evidence regarding its use in pre- and post-partum care, fetal There is, however, emerging evidence regarding its use in pre- and post-partum care, fetal monitoring and diagnostics for both low and high-risk pregnancies (Kern-Goldberger & Srinivas, 2020; Whittington & Magann 2020). The growing integration of telemedicine into maternity care has a substantial impact by providing increased access to care for those in rural areas (Brown & DeNicola, 2020). Rural maternity patients are faced with geographic challenges when needing to access specialist care as these providers tend to be concentrated in urban areas; this requires patients to devote time and personal expense to access necessary specialist services. Telemedicine is increasingly utilized to support access to obstetrical

specialists or subspecialists care for high-risk pregnancies but also facilitates access to primary care for those in remote settings without local access to primary care. Emerging research has focused on the efficacy of virtual visits specifically for high-risk pregnancies, post-partum care and in the context of COVID-19.

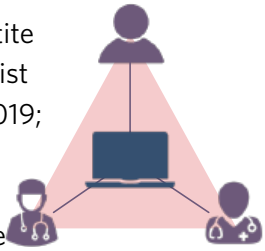
High risk Pregnancies and Post-Partum Care:

High-risk pregnancies may require consultations with obstetrical specialities (e.g. maternal fetal medicine, -MFM) which may or may not include the need for ultrasound services. Telemedicine consultations with obstetrical specialists have increased and have become an essential service for connecting patients who reside in remote or underserved areas to specialist care.

Pregnancies classified as high-risk or at-risk have been successfully managed at a distance through the use of telemedicine. Whittington & Magann (2020) noted programs that included the use of various telemedicine tools in the management of hypertensive disorders, diabetes, and other conditions that may exceed the scope of primary care providers (Kern-Goldberger & Srinivas, 2020; Whittington & Magann, 2020). Fetal monitoring has incorporated the use of telemedicine to allow patients to be monitored at home or by a provider in their local community, reducing the need for parturient to travel. Fetal monitoring with telemedicine includes cardiotocography, phonocardiography, and electrocardiography (Kern-Goldberger and Srinivas, 2020). Kern-Goldberger and Srinivas (2020) note that fetal monitoring through telemedicine has potential risks, related to response time and quality of care, if an abnormal result were to present and an increased level of care was required. Other notable obstetrical services provided through telemedicine include echocardiography and genetics.

Examples of virtually facilitated postpartum care include programs that offer telephone-based cognitive behaviour therapy as a means to support earlier hospital discharge and at home care (Kern-Goldberger and Srinivas, 2020).

Tripartite Care:



Multiple studies have been conducted on programs in the United States that have utilized tripartite telemedicine consultations to provide rural patients with high-risk pregnancies access to specialist obstetrical care, specifically maternal fetal medicine (MFM) and neonatology (Leighton et al., 2019; Wood, 2011; Lowery et al., 2007; Ivey et al., 2015; Bronstein et al., 2012; Haynes et al., 2020). A tripartite clinical consultation involves the family physician or midwife in addition to the patient and specialist. This blended consultation allows the patient and support people, local health care providers and a specialist (MFM or other specialty) to meet to plan care, reducing the need for travel. These appointments have been used most effectively to ensure the local provider is involved in care planning and can follow up with the patient on specialist recommendations. In addition, when hands-on care is needed, the local provider, often guided by the specialist, can facilitate. For example, tele-ultrasound programs based in the United Kingdom have involved a rural patient and a sonographer at a local site, and a specialist that directs, views, and provides consultation on the conducted scan, from a remote site (Smith et al., 2021; Bimead et al., 2020). One unique study conducted in La Loche, Saskatchewan, investigated the use of a telerobotic ultrasound in which the sonographer remotely

the sonographer remotely controlled the scan from hundreds of kilometers away and the patient was at a local site with the support of a site assistant (Adams et al., 2018; Adams et al., 2020).

The studies and evaluations conducted on the tripartite telemedicine consultations and the tripartite tele-ultrasound programs highlight the feasibility and acceptability of providing virtual maternity care to high-risk rural patients. The existing research has primarily focused on the patient perspective or the patient voice to determine the acceptability and benefits of virtual specialist care and services. Benefits identified include a reduction in patient costs, a reduction in the required distance of travel, ability to receive care locally, a high degree of patient satisfaction, and that the provided care is of high quality. Two studies calculated the dollar amount that would be saved for each visit that was conducted by telemedicine options. These saving were $43.33 USD based on a study conducted in 2011 and $90.28 USD in another study conducted in 2019 (Wood, 2011; Leighton et al., 2019). This is likely an under-estimate in British Columbia due to more expansive geography requiring additional transportation and accommodation costs. A recent study in BC estimated that on average, total out of pocket costs for patients needing to travel to access care outside their home community was $2,234 (Kornelsen et al, 2021); this included incidental costs such as lost wages and costs incurred in maintaining the home residence (house sitting, etc.).

Smith and colleagues (2021) also noted costs incurred related to time off work, childcare, and a partner or support person taking time off work, all of which contributed to the approximate savings for patients at £439 GBP. In addition to cost savings, telemedicine reduces the amount of physical distance that must be travelled, and overall time spent commuting. One program found that there was a 75% decrease in required travel distance when telemedicine options were utilized, while another study reported that the average time needed to travel to the telemedicine sites was 20 minutes, compared to the approximate 230 minutes, in order to arrive at the large fetal medicine centre (Ivey et al., 2015; Smith et al., 2021).

The efficacy of increased local care through the remote assistance of a specialist was noted in several studies that reported on the location of delivery and newborn transfers (Ivey et al., 2015; Wood, 2011; Leighton et al., 2019; Haynes et al., 2020). The percentage of deliveries that occurred in the local community of the participating patients, due to the support of telemedicine programs involving MFM, ranged from 75-84% (Ivey et al., 2015; Wood, 2011; Leighton et al., 2019). Haynes and colleagues (2020) found similar results when comparing the use of telephone and telemedicine consultations in that newborn transfers were less likely to occur if a telemedicine consultation had been completed (64.0% vs. 82.0%).

Patient Satisfaction:

Emerging studies on patient experiences with telemedicine show consistently high levels of satisfaction (Lowery et al., 2007; Wood, 2011; Leighton et al., 2019). Likewise, in one study, the tripartite model for telemedicine appointments was rated positively by the majority of patients (86%) (Leighton et al., 2019). Bidmead and colleagues (2020) undertook qualitative interviews with maternity patients who access virtual care and noted positive reactions including the main benefit of

convenience (Bidmead et al., 2020). More urgently, Leighton et al., (2019) found that if it was not for the presence of the telemedicine options at a local site, patients would not have followed through with seeking MFM care.

Studies show that telemedicine options for accessing MFM care or ultrasounds services contribute to positive maternal and newborn outcomes and did not decrease the overall quality of care. Leighton et al., (2019) assessed the outcomes of maternal and child health by comparing the MFM telemedicine cohort with the in-person MFM cohort. Lower rates of disease were found in the telemedicine group compared to the in-person group, along with lower rates of premature delivery, lower rates of NICU admissions, and a shorter length of stay in the NICU (Leighton et al., 2019). The reported quality of scans and diagnostics for tripartite tele-ultrasounds has also been an indicator of the quality of care provided through telemedicine. Overall high-quality imaging allowed for all but one case to be assigned a decisive diagnosis and no incorrect diagnoses were reported (Smith et al., 2021). Smith et al., (2021) deemed the use of tele-ultrasound consultations as effective for prenatal diagnosis and monitoring for preterm small-for gestational age, preterm premature rupture of membranes, twin-to-twin transfusion syndrome and red cell alloimmunization. While the quality of imaging varied among the different exams reported in Adams et al., (2020), the results indicate that the use of a telerobotic ultrasound system is effective for first-trimester exams along with focused second and third trimester exams. Challenges were reported with visualization of some structures required for a complete second-trimester exam and therefore it was advised that another examination should be conducted (Adams et al., 2020).

The specialists involved in the Smith et al., (2021) study ranked the image and audio quality highly, with median rating of 4 out of 5, and 5 out of 5 respectively.

Patient acceptability and benefits of participating in the varied telemedicine options is well established in the literature, however, there is limited research that provides an in depth understanding of the providers' perspective and experience with conducting virtual care. Only two studies, completed on tripartite tele-ultrasound programs provide insights to the provider experience. Bidmead and colleagues (2020) identified that providers were supportive of the appointment format but noted some concerns, relating to working as a team to complete a scan, instead of performing the scan on their own (Bidmead et al., 2020). Primary care provider benefits were reported to include greater access to specialists, improved management of complex cases and an opportunity for local providers to enhance their knowledge, experience, or skill set (Bidmead et al., 2020). Effective communication between providers was another noted provider benefit, reported in the study by Smith et al., (2021).

Concerns:

Concerns regarding privacy and barriers and challenges faced by providers and patients are emerging in the literature, potentially due to the necessary rapid adoption due to COVID-19. The majority of the literature that focuses on the barriers and challenges with virtual obstetrical care is based in the United States and there is an overall lack of research that provides a Canadian context. Eswaran and Magann (2021) highlight privacy concerns, which was noted as a main deterrent to the uptake of telehealth. Providers must ensure that the technology used to conduct virtual obstetrical care is compliant with the Health Insurance Portability and Accountability Act (HIPPA) (Eswaran and Magann, 2021). Patient barriers were noted to include challenges with using the virtual tools and technology including access

to devices (Eswaran and Magann, 2021; Ukoha et al., 2021). Provider barriers were acknowledged in the literature but were limited and specific to the American context. Common barriers for physicians included: state-specific licensing which prevented physicians from working across geographies even though they might be the most appropriate provider; lack of pay parity (i.e. equivalent pay for similar services, whether telehealth or in person) in some jurisdictions, internet speed and connectivity and a lack of validated remote patient monitoring systems (Eswaran and Magann, 2021). Ukoha and colleagues (2021) commented on barriers to the equitable implementation of telemedicine, which included provider biases and perceptions regarding patient capacity and access, which may contribute to which patients are offered the use of virtual tools (Ukoha et al., 2021).

To address gaps in the literature, a mixed methods study of the virtual care experiences of primary rural maternity care providers in British Columbia was conducted

Methods

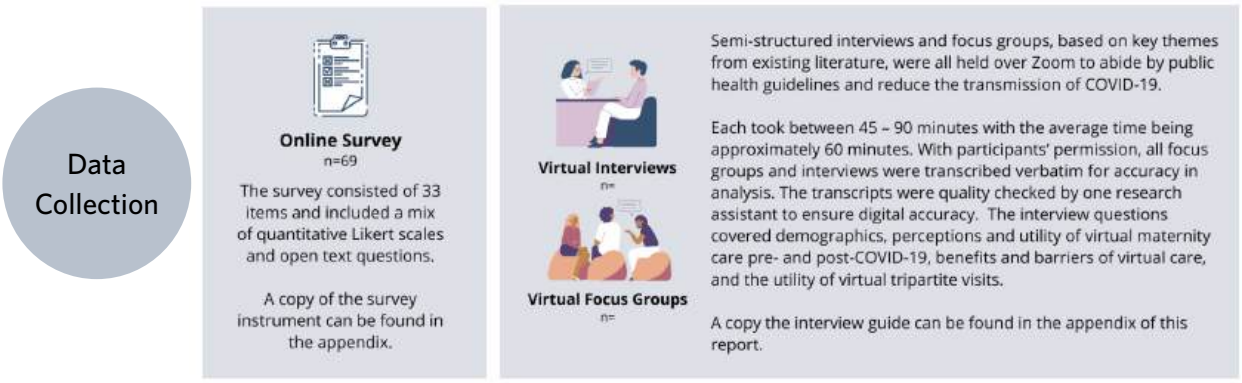
This scoping work set out to understand and document the virtual care needs, preferences and experiences of specialist and primary rural maternity care providers in British Columbia as context for the Specialist Services funded Mobile Maternity Care (MOM) project. It arose from the observation of a gap in understanding of care provider preferences juxtaposed with the accelerated availability of virtual care during the COVID-19 pandemic. We used a mixed-methods approach, combining survey research and virtually facilitated interviews and focus groups.

Inclusion Criteria

We invited all self-determined rural primary care providers (Family Physicians and Midwives) and rural and urban specialist Obstetricians and sub-specialist Maternal Fetal Medicine providers who practiced in BC to participate.

Recruitment

The survey was distributed through care provider focused list serves and newsletters with a provincial reach including through UBC's Department of Family Practice, the Midwives Association of BC and Divisions of Family Practice/Doctors of BC. Focus group and interview invitations were sent through the same channels and interested potential participants contacted the research team to confirm a time.



Analysis

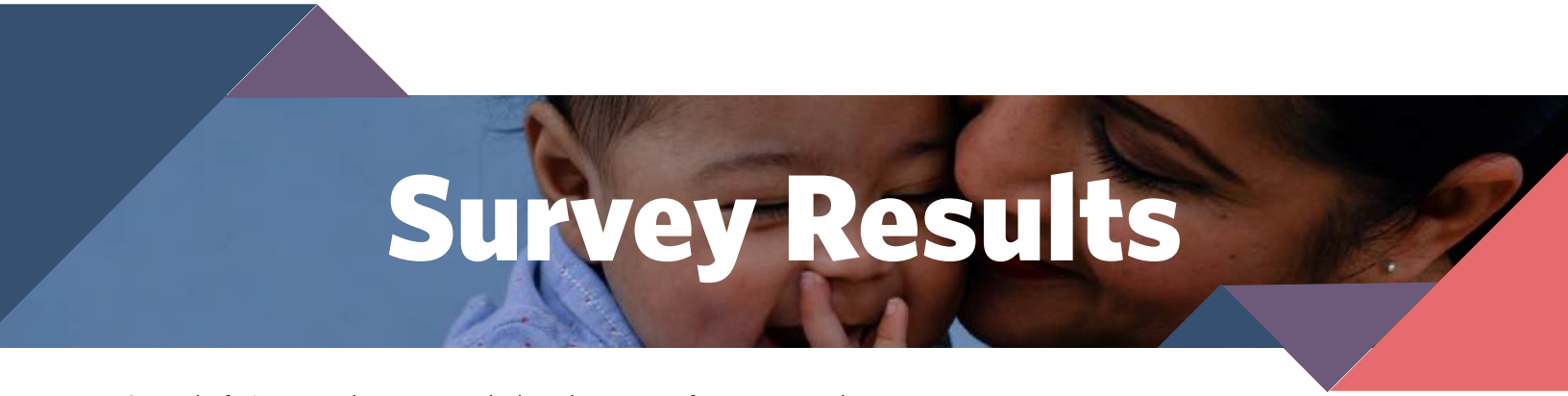
Virtual Needs Survey

We did descriptive analysis of the quantitative data, mainly reporting frequencies. Open-text questions were reported by predominant themes using techniques suggested by Braun and Clarke (2006). Participant responses were read, a small code book was developed and Nvivo was used to organize initial codes. The complete process description is noted in the analysis of the interview and focus groups data in the paragraph below. The main themes were then reported for each survey question.

Interviews and Focus Groups

The data collected from the interviews and focus groups was analyzed by through a thematic analysis framework outlined by Braun and Clarke (2006). We engaged in an in depth reading of the transcripts and made notes of preliminary codes. A code book was developed to organize the initial codes and was refined iteratively throughout the analysis process. Qualitative data analytic software, Nvivo, was used to sort the transcripts into the initial codes. Patterns began to develop and related codes were grouped together into themes. The themes were then reviewed, defined, and written up and can be found in the findings section of this report.

Ethics approval was granted by the University of British Columbia's Behavioural Research Ethics Board.



Survey Results

A total of 124 providers responded to the survey from across the province.

Provider responses were eliminated if the total recorded completion of the survey was less than 100%. As a result, the total of included provider responses used in this analysis is 69.

Characteristics of participants:

Of the 69 respondents, 51% were family physicians, 37 % midwives, 6 % obstetricians/gynecologists, and 6 % nurse practitioners (see Figure 1).

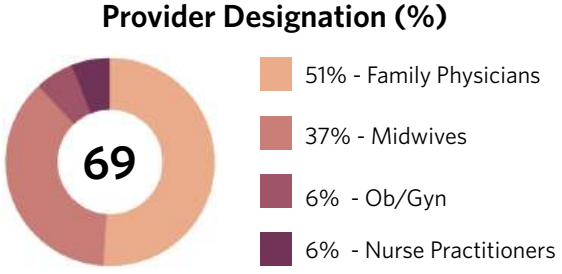


Figure 1: Provider designations of participants (n=69)

Forty-one percent of respondents practiced in the Interior and one in three in the North (see Table 1 for details). The majority of respondents identified their practice setting as rural (87%) and 13% said they primarily practice in urban areas.

Table 1: Practice Location (n=69)

Health Authority	Percentage
Interior Health	41%
Northern Health	28%
Island Health	16%
Vancouver Coastal	9%
Fraser Health	6%

Annual volume of maternity patients & distance to referral centre

Most respondents (84%) saw less than 100 maternity patients in their practice annually with some providers seeing 100-500 (16%). No respondents reported practice volumes over 500 patients. While most respondents worked in practices with less than 100 births per year, the annual volume of maternity patients in the community was much larger. One of two respondents (48 %) worked in communities with 100-500 maternity patients per year. See Figure 2 for more details.

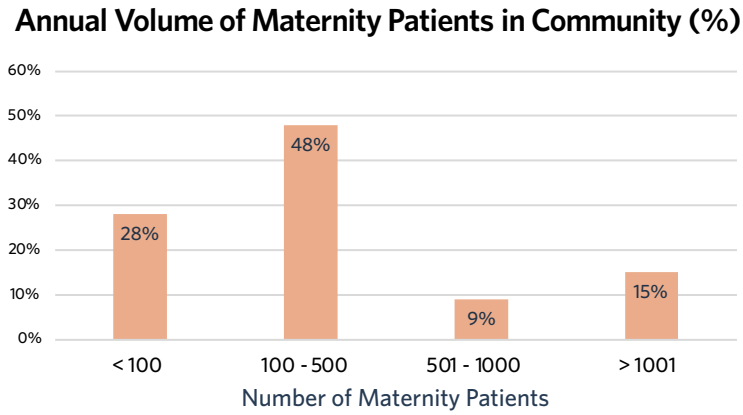


Figure 2: Annual Volume of Maternity Patients in Community (n=69)

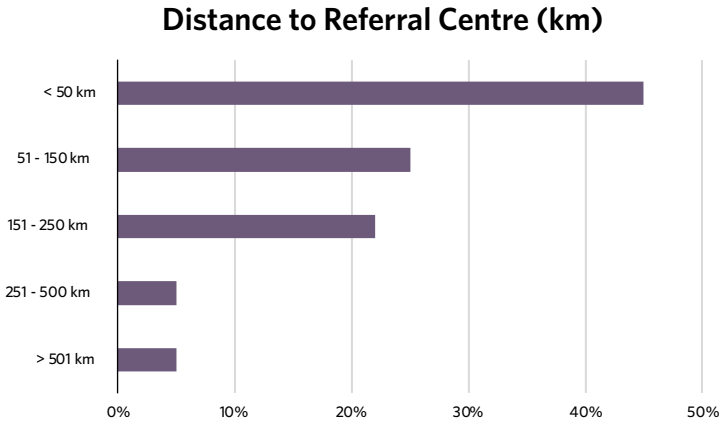


Figure 3: Distance to Referral Centre (km)

Most respondents (45%) indicated that they were situated less than 50km away from their referral centre. The remaining respondents indicated that the distance to the nearest referral centre was farther away (see Figure 3). One in two participants (53 %) reported that their community has a visiting OB specialist. Those who have an OB specialist visiting their community, the majority (73%) only have the specialist available for one day per month

Changes in Health Care Delivery during COVID 19:

COVID-19 and measures to contain the pandemic have resulted in the adoption of various virtual tools. When asked which virtual tools they have adopted to reach out to patients:

37% of respondents selected 'telephone'

37% chose 'Other'. The respondents that selected 'Other' highlighted the use of multiple virtual tools.The majority noted the use of at least two virtual tools or all of the listed options (telephone, video, email and SMS).

Two respondents commented on challenges they experienced with the use of virtual tools. For example, respondents described videoconferencing as "cumbersome" and noted limited options for secure texting.

The majority of respondents (82%) reported no changes in the way that they communicate with specialists, while 18% indicated that they have changed their mode of communication. Those that have experienced changes in communication noted greater use of virtual tools like phone and video calls via Zoom. Three respondents highlighted that due to COVID-19, specialists (or OBGYNs) no longer visit their community. Two respondents described scenarios where they have supported patients in communicating with specialists by arranging a three-way phone call with the primary care provider, patient, and specialist. One respondent outlined that due to the challenges some patients experience with access to cell phone minutes and/or landlines, specialists have had a hard time contacting their patients. In order to reduce this gap in communication, the respondent detailed a solution:

> *"We have been arranging that the patient comes into the office to see our Maternal Child Health RN, and they call the specialist office at a pre-arranged time (organized through email). Or we arrange that at their next in-person appt with the RN, we will call the specialist."*

Incorporating the specialist during the patient's in-person visit with their local care provider helps reduce potential loss to follow up with specialists or delays in access to specialist care.

Changes to Health Care Delivery that Respondents want to Retain post COVID

COVID-19 has contributed to multiple changes in clinical practice. Participants were asked which aspects they would like to retain post-COVID-19. Analysis of this open-ended question revealed three main categories:

1. **The continued use of virtual communication tools,**
2. **Changes to in-person visit schedules**
3. **The continued ability to use fee codes for virtual care.**

Support for continued use of video or virtual tools was noted by the majority of respondents. Virtual tools listed included the use of telephone, email, and SMS, in addition to video. Some respondents elaborated on their intentions to maintain the use of video or virtual tools because of the associated convenience for patients and providers. Respondents noted that "virtual care can be a very useful resource (..) when used for remote patients" and those who are " (...) unable to travel". At the time of data collection, 89% of respondents were incorporating some form of virtual care into their regular practice.

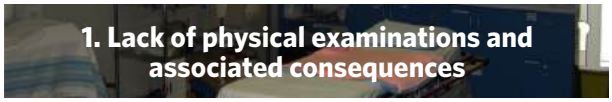
In efforts to reduce the spread of COVID-19, BC public health recommended a reduced in-person visit schedule to minimize the risk of exposure (BC Centre for Disease Control, 2021). Several respondents suggested that they would be content with keeping a version of this altered prenatal schedule or adjusting the visit schedule to make it personalized to the patient. Respondents suggested "Possibly reducing the number of in-person visits" or providing a "more individualized prenatal visit schedule".

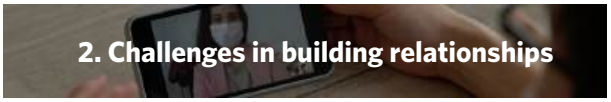
To accommodate for COVID-19 the BC Ministry of Health introduced virtual billing codes for providers. Two respondents noted their desire for being able to maintain these billing codes post-COVID.

In addition to the three categories described above, other respondents noted the desire for continued infection prevention control through cleaning procedures and greater use of PPE. Meanwhile, some respondents said that they hope to return to a pre-COVID-19 clinical practice.

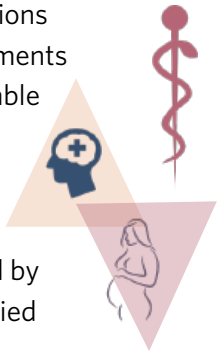
Gaps in Patient Care during COVID-19

The shift to virtual care during COVID-19 has been widely adopted and supported the provision of care in a time where physical distancing was essential to reduce the spread of infection. Although participants valued virtual care, they also perceived gaps in patient care. Two gaps that were commonly mentioned were:





Perceived gaps in patient care relating to a lack of physical examination were described as limitations based on the lack of hands-on assessment. One respondent noted that fewer "in-person appointments will result in less in person monitoring (i.e., FHR)". Other participants observed that they are "unable to fully assess the mental and physical health of their patients"



And that "it can be difficult to assess affect and risk factors for depression over the phone"

The inability to complete these routine assessments contributed to the overall concern expressed by respondents about the potential of "missed diagnoses due to lack of exams". Care providers worried that they might "miss subtle nuances over the phone".

"Yes, subtle things that you pick up on when seeing someone in person. Facial expressions, [..] how they walk etc. that may lead you to ask other questions that they don't bring up"

"I believe there is a possibility for more mistakes with virtual care. It is easy to overlook things when you are unable to examine a patient and see them face to face"

In addition to gaps in care relating to the lack of physical examinations, many respondents highlighted the impact virtual care has had on building relationships and connecting with patients. Care providers noted that relationship building as an integral part of family practice and reported challenges communicating with patients when providing virtual care.

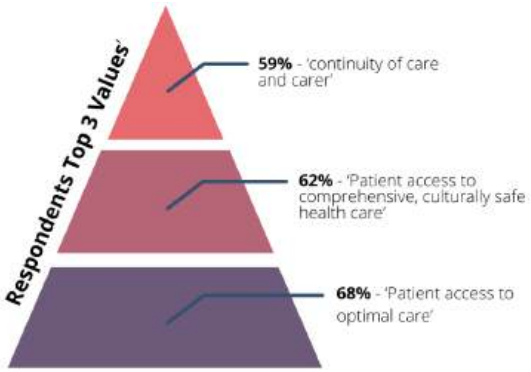
One respondent stated that it is "more difficult to build relationships, which is key to family practice". Others mentioned challenges with establishing trust with patients, which has contributed to "increased patient anxiety as they feel less attached to their maternity providers".

The described disconnect between patients and providers was specifically noted for first-time mothers and parents. A respondent commented that "patient satisfaction is somewhat decreased with fewer face-to-face visits, especially for first time parents because they are not establishing as much of a therapeutic relationship" and another stated that "first time mothers report less support from interprofessional team members including prenatal education and supports". Although most respondents mentioned the lack of support felt by first time mothers, health care providers also heard that "repeat mothers feel less supported with the mix of in person and virtual appointments".

In order for providers to cultivate trusting relationships with their patients, establishing a connection through good communication is essential. Multiple respondents considered challenges with connecting or communicating effectively with patients as a gap in the use of virtual care. One respondent expressed that "it is much more difficult to read patient body language [...] when appointments [are] conducted over the phone". Two respondents described challenges in communicating with patients virtually due to the patient being new to their practice, or due to differing cultural norms. One health care provider noted that depending on the cultural background of the patient it can be "very challenging to get health information, even in person. This is made WAY more challenging on the phone or by video, especially if [the patients] don't have a strong relationship with us, like if they're a new patient, and you have to ask health history questions over video? Forget it. Not happening."

Virtual Maternity Care: Practitioner values and preferences

Care providers were asked to select their top three values in their maternity practice that are most important to consider for virtual care services (six pre-defined response options could be selected). Respondents considered 'patient access to optimal care' (68%), 'patient access to comprehensive, culturally safe health care' (62%), and 'continuity of care and carer' (59%) as their top three values. Additionally, 'patient access to appropriate consultant and knowledge to make informed choices' was another value selected by many respondents (54%).



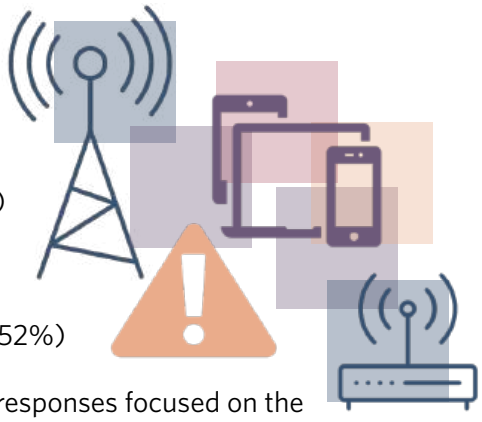
Participants considered "quick consults with colleagues (within 2 hours response)" their highest priority with respect to virtual specialist communication (51%). The highest priority for virtual primary care communications was 'face to face (video) for scheduled care consults with patients' (43%), followed by 'virtual visits for unscheduled, non-emergent care' (27%).

A few survey participants selected 'Other' and provided additional details as to what would be a priority outside of the options listed. One respondent saw "secure text messaging with both patients and providers/professionals" as a priority. One participant spoke of the desire for a consistent platform to communicate with patients and their colleagues. Additionally, they emphasized the value of including other family members or support people through virtual means when they were not able to attend office visits.

Virtual Maternity Care: Benefits and barriers

Barriers:

When asked about system constraints relating to the use of virtual tools with patients, the top five responses included:



1) Internet accessibility (58%)

2) Speed of internet provider services in the area (57%)

3) Lack of access to required equipment (i.e.: computer, tablet) (55%)

4) Unreliable cell phone service coverage (54%)

5) Unfamiliarity with medical technology/digital platforms and apps (52%)

In addition, 24% of respondents detailed other barriers or constraints. These responses focused on the barriers or challenges to virtual care for the patient, for the provider, or challenges with associated costs and billing. Patient barriers included virtual 'burn-out'. One respondent noted "patient burn-out on virtual platforms, if they use it a lot for work". Other challenges for patients that participants noted included inconsistent access to phones and challenges securing childcare so that the patient can focus on the appointment. Additionally, it was noted that some patients lack virtual literacy leading to a "hard time using video platforms".

Respondents have also experienced their own challenges with the use of virtual care including difficulty performing assessments virtually (e.g. to assess fetal heartrate and fundal height) and the limited availability of secure virtual platforms. Respondents also mentioned the costs associated with providing virtual care options for their patients. "Costs to practice" and "cost of tech upgrades..." along with the lack of funding opportunities were listed as system constraints. Two respondents commented that they did not experience any barriers or system constraints.

Participants were asked to identify any system constraints regarding their personal adoption of virtual

Benefits

Although participants reported having to manage and overcome several constraints associated with the use of virtual tools, many benefits of virtual care were also noted.

94%, selected 'reduction of travel time for patients'

76% 'increased patient accessibility to appropriate care team members'

A few participants mentioned other benefits, including access to specialists and how virtual care enables access for patients who would otherwise not travel outside of their community. One participant noted that a benefit was "access to subspecialists! SO many patients decline MFM/Gyn Onc referrals because they don't want to travel..."). Other participants noted the increased focus that virtual appointments allowed for. As noted by one survey participant, virtual appointments offered more time for informed-choice discussions and helped support the providers' ability to maintain ongoing relationships with their patients:

> *"improved trust between provider and patient...so many times in the past few months I have had a phone call or texted with a patient and there's nothing new to report, no changes, no concerns...but they express that they are happy someone is checking in on them. They feel that the last thing they are thinking about is their pregnancy, and just by calling or texting to see how they're doing, they feel validated [...] will hopefully help with mental health in pregnancy/postpartum."*

Another respondent acknowledged that "all of [the listed benefits] are possible but only if the system is designed, supported and funded with these intentions as collaboration in particular is not well supported".

Virtual Maternity Care: Clinic impact

Respondents were asked how providing virtual care to patients has impacted their clinic. Response options included: Insignificant impact, minor impact, moderate impact, and major impact. The level of significance attached to each potential impact is visualized in Figure 4.

Insignificant	Minor	Moderate
• Blocking rooms in fee for service clinics (45%)	• Maintenance costs to practitioners (38%) • Providing a space for virtual care, including an exam room when necessary (34%) • Start-up costs to practitioners (31%) • Additional workload for administrative team (24%)	• Additional workload for practitioners providing clinical care (47%) • Additional workload for administrative team (24%)

Figure 4: Impact of Virtual Care on Clinics

Participants were asked to note their preferred mode of communication for five practice scenarios. The options included video, secure communications/messaging, telephone, E-mail, and other. None of the respondents preferred e-mail for any of the scenarios. The proportion of health care providers who elected video, secure messaging, or telephone as their preferred modalities for different scenarios is displayed in Figure 5.

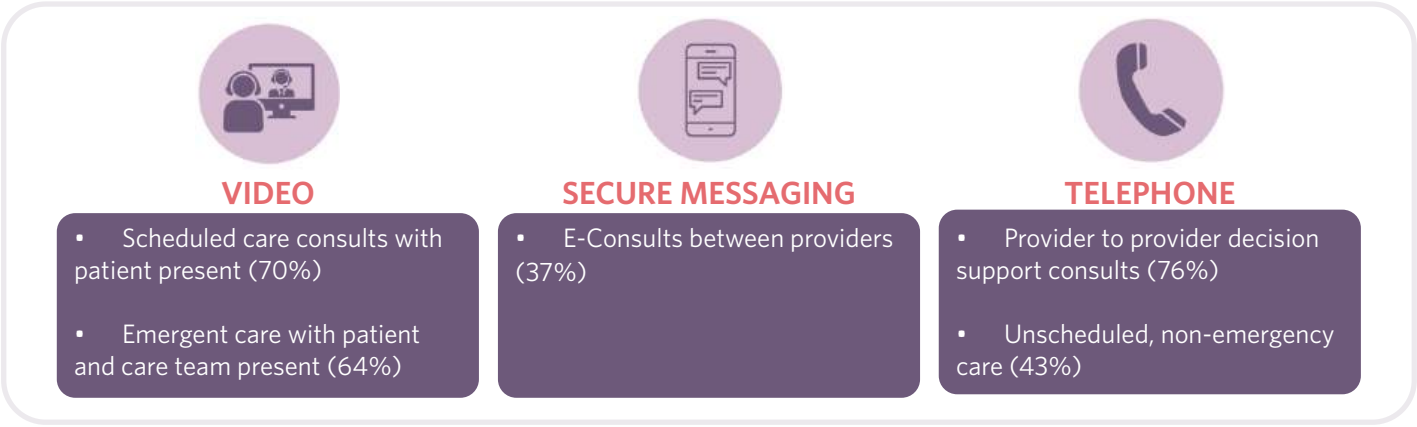


Figure 5: Preferred Virtual Tool (or System) for Five Different Consult Scenarios

Preferences for virtual clinical decision supports:

Participants were asked about their preferences when seeking clinical decision support in a non-emergent situation. Respondents expressed a preference for connecting with specialists from their regional referral centre (51%) rather than use of a provincial resource who can guide the immediate care and connect with regional teams later (cited by 1 %) although many respondents (44%) would be appreciative of either option (regional or provincial) for receiving guidance (see Figure x). In an acute situation, respondents also favoured connecting with their regional referral centre (59%) rather than use of a provincial resource (4%). See Figure 6.

One respondent noted that they would use "whichever [modality] is most timely/ relevant". Another participant focused on the knowledge of rural contexts and commented that they would be comfortable with either a regional or provincial resource, provided that the "specialist MUST understand [the] rural context...". Having access to specialists with knowledge of the local context in an emergent situation is essential.

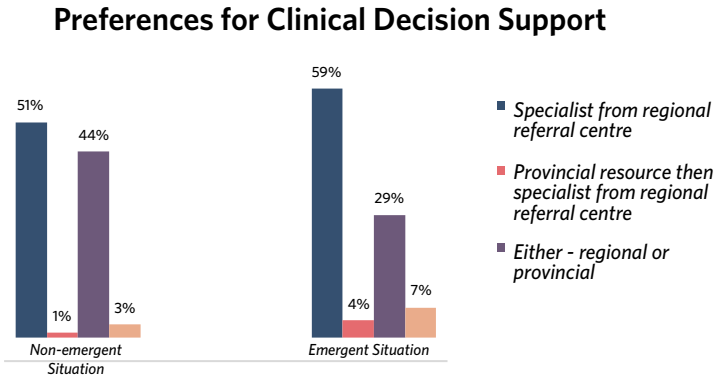


Figure 6: Preferences for Clinical Decision Support

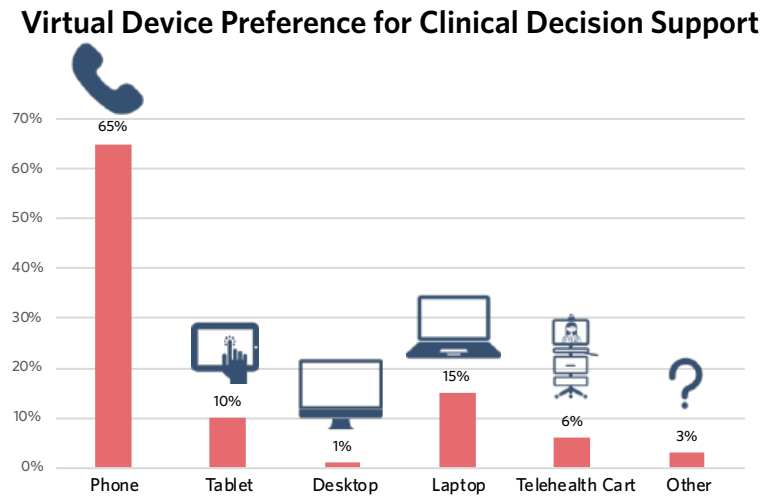


Figure 7: Virtual Device Preference for Clinical Decision Support

As virtual technology expands, so do the number of different types of devices used to communicate. Respondents were asked - when seeking clinical decision support, what is their preferred device? The phone was the option selected most often (65%) followed by laptop computer (15%) and tablet (10%) (see Figure 7).

Respondents indicated the strongest preference for video conferencing for communication between patient and primary care provider (54%). The use of video conferencing was also favored for communication between patient and specialist (44%). Two in three respondents (68 %) specified that they would not use video conferencing in the provision of clinical care and 63% would not use it in a clinical emergency (see Figure 8).

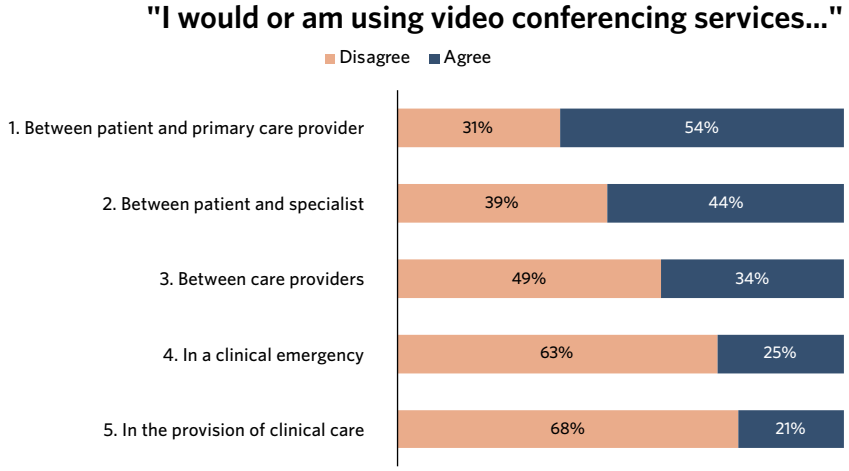
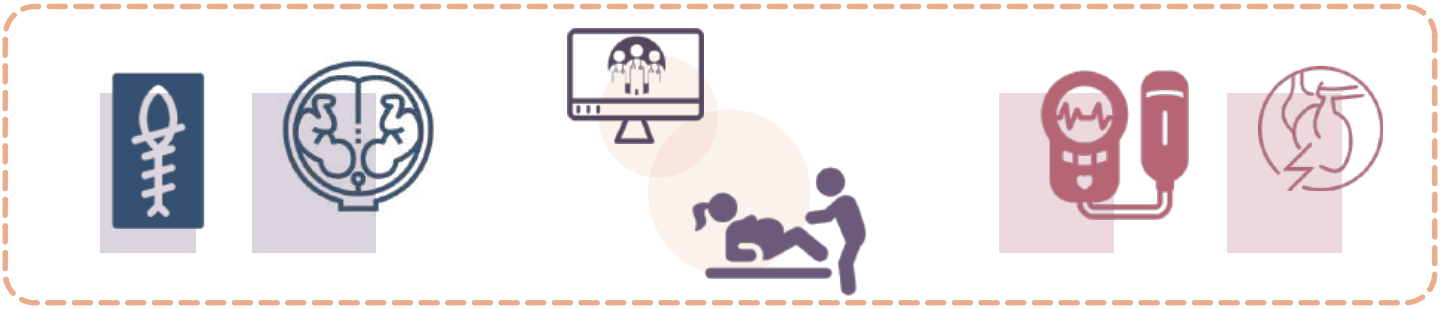


Figure 8: "I would or am using video conferencing services..."

Use of virtual care during clinical emergencies:

Participants were asked to describe emergency situations in which they have used or would have considered using videoconferencing. The value of videoconferencing in specific clinical and transfer scenarios, as well as in providing 'in-room' support, were described often. See Figure 9 for a list of clinical emergency scenarios.



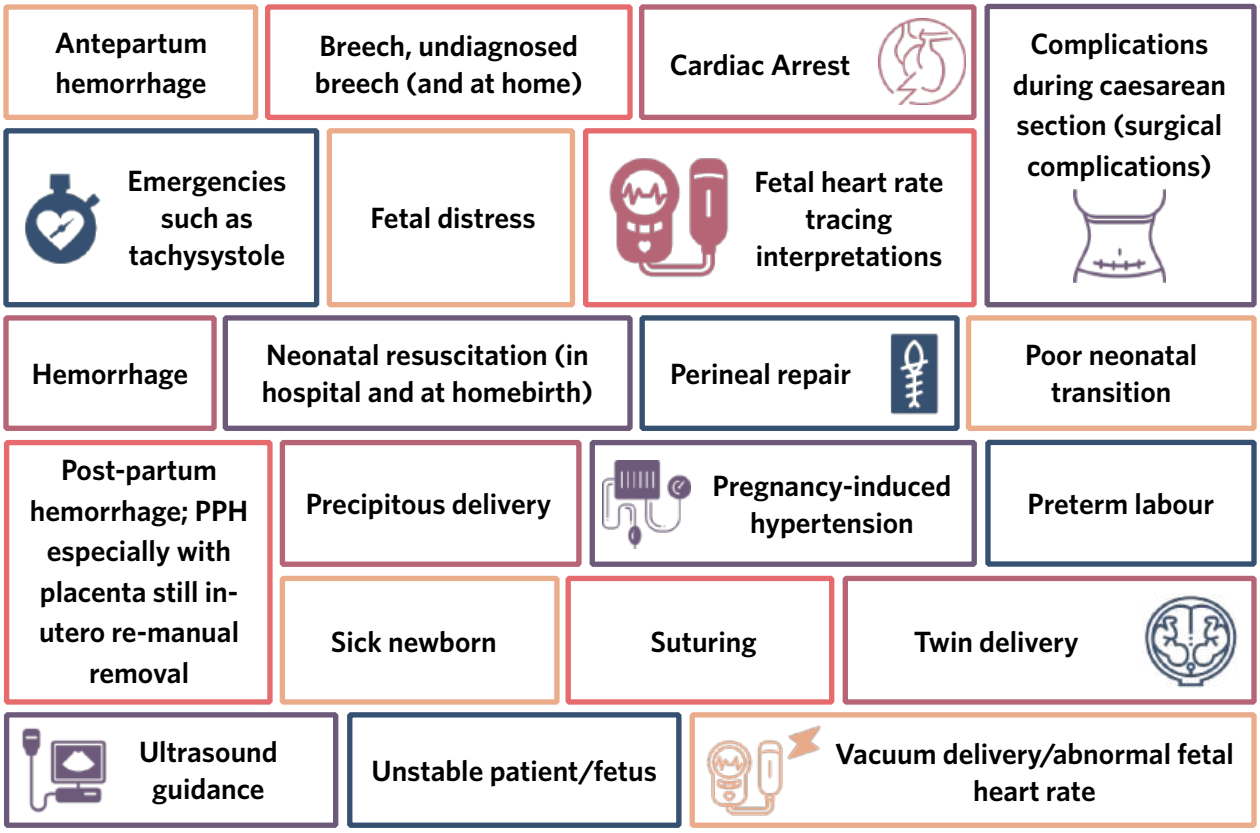


Figure 9: Utility of Video Conferencing for Clinical Emergencies

Respondents highlighted the utility of video in two stages of the transfer process:

1) determining the need for transfer **2) stabilizing the patient prior to transfer**

> *Deciding whether or not to transfer someone to another hospital who had abnormal EFM…the receiving OB and I used Facetime so I could show them the EFM.*

In addition, one respondent described a scenario in which a patient was traveling to receive care, where continuity of communication would have been essential:

> *Client is travelling to our community (where Level 2 Hospital is) by car and is having a precipitous delivery on the side of the road (without midwife / ambulance present).*

Respondents who did not detail specific clinical scenarios or transfer situations commented more generally on how video conferencing enables 'in-room' support from other providers or specialists. Respondents noted that video conferencing can provide the feeling of 'in-room' support in that it can aid in the answering of "questions involving physical aspects that specialist should see, that are difficult to explain" or to provide "support for advanced skill when providers are not available in person". Two respondents not only acknowledged scenarios where they have used or would use video,

but suggested that they would be willing to provide 'in-room' support through video for their peers:

> *An emergency birth in an ambulance, talked with EMS in the moment...and I would consider using it in any situation if in-person support was not available. I am fortunate to have specialist colleagues who can arrive at the hospital in an emergency, but if needed, I would do it with video support.*

> *I have never done this, but I would be comfortable if there was ever a situation where a care provider was in a remote community and someone came in in active labor, if the care provider needed reassurance and help from someone skilled in normal birth, I would be happy to talk them through that. [..]*

The potential success of video conferencing in emergency situations was highly dependent on the provider's view of its utility as well as their willingness to participate. Not all respondents were convinced of the utility of video conferencing and several indicated that they had not used video or had not considered using video in an emergency situation. One survey respondent noted they "would use telephone not video" or they have "only used the phone". One participant wrote that they would not opt for video if it meant a potential delay in arrival of in-person specialist support:

> *In an emergency I will generally need the OB/gyn there in person, would rather they spend their time getting there than waiting and giving advice on video and delaying arrival.*

The utility of video conferencing in emergency situations was also questioned by respondents due to concerns of privacy and consent. One participant was "concerned about security and patient privacy with video broadcast of the perineum / sensitive body parts. I don't think an emergency setting allows for appropriate discussion and consent."

Another respondent concurred regarding concerns with obtaining consent:

> *...I feel in many emergent OB scenarios it would be difficult to obtain appropriate consent. As the consultant I would be open to this though if patient had provided consent for such an instance earlier in pregnancy.*

Based on respondent experience with previous emergent care cases

38%

Deemed that a video link to a specialist would not have benefitted any previous cases.

1/3

Health care providers (31%) agreed that it would have benefited emergent cases

31%

Considered that video would 'Likely' have helped in emergent care cases.

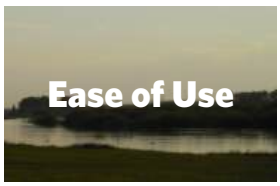
The respondents who saw value in the use of video during emergency situations were asked to provide details about these cases. The submitted responses focused on: 1) specific clinical scenarios and 2) transfer scenarios. The specified emergent clinical and transfer scenarios that have or could have benefitted from the use of video are listed below in Table 3.

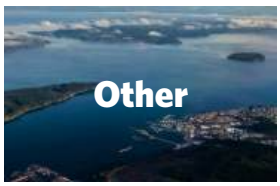
Table 3: Utility of Video Conferencing for Clinical emergencies

1. Specific Clinical Scenarios	
Neonatal stabilization (initial steps of NRP completed but ongoing support needed, for example requiring respiratory support) when paediatric care provider not available or en-route	PPH with retained placenta when the consultant was in the OR and unable to be at bedside. Perhaps another consultant could have video-conferenced in
Abnormal fetal heart rate in the setting of maternal hypotension after epidural. Needed advice on management and whether to wait and pursue SVD if FHR improved vs. going to c-section. Also, in a face presentation in multiparous patient with precipitous labour where provider had not previously managed a face presentation	An undiagnosed breech at home birth; OB was reachable by phone but I know it was difficult for them to support the midwives without being able to see what was happening, especially since the breech presentation was found as the mother began to push
Emergent twin delivery - vertex/breech with PPH	Preterm delivery of cephalic/breech twins. Managed well by phone, with consultant. Video would have been nicer
Undiagnosed breech birth, consults	Acute PV bleeding with discoloration on the abdomen
Abnormal tracing, tear, presentation	Suturing, vacuum, hypertension management, preterm labour management
2. Transfer Scenarios	
Neonatal emergency stabilizing to prepare for transport to higher-level center or abnormal findings in a neonate	Atypical FHR tracing with a patient not in labor trying to figure out if the patient was safe enough to transport to a facility with a higher level of care. Would have been nice to have the OB at the receiving facility see the tracing himself would have saved time in the transport scenario

Finally, participants answered questions about the most important features of a virtual interface and system for support for obstetrical care.

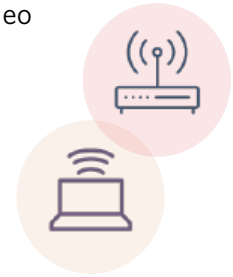
Responses regarding the desired characteristics of virtual care were sorted into four categories:





Access and connectivity concerns included the desire for "reliable", "fast" and "secure" internet connections. One respondent gave a real-life example of how crucial it is to maternity practice to have

a strong internet connection, "...it's frustrating enough when you're Skyping your mom and the video freezes but that CANNOT happen when an OB is walking you through a breech birth". Another respondent noted that they would like to have access to technological support to ensure that the system they are using is working correctly, including "resources to operate the technology, I don't want it to distract me from caring for the patient (connecting, positioning cameras, maintaining, and troubleshooting the connection)". A high-quality internet connection is essential for the use of any virtual or remote system and is one of the main sources of provider frustration.



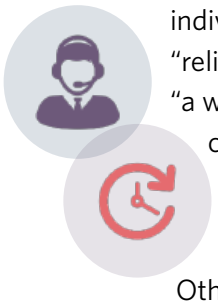
In describing the virtual interface or system, respondents frequently used the phrase "ease of use" to describe their ideal set up. Some respondents included more detail about what ease of use means to them and how systems could be refined:

"Ease of access in an emergency (not trying to remember passwords!)"

"Easy to keep track of message threads and photos, easy for clients to access"

"Reliability, easy to access and use - if for an emergency situation, I think would have to be able to be accessed by allied care or nursing staff if physician busy"

Respondents requested that these systems be "portable" especially for use in emergent situations. The overall utility of virtual tools and systems is not only dependent on the technology but also on the individuals who are using them. Respondents commented on the importance of "real time help", "reliable availability of provider/specialist on the other end – not intermittent availability", and overall "a willing provider on the other end of the call". One participant noted the importance of "good communication with a specialist and clear directions and encouraging advice". To ensure that the advice or support being offered is relevant, respondents noted the importance of specialists being aware of the resources available at local sites.



Other respondents noted that they would like the virtual technology to have "good quality video for showing FHR strips", "good sound", and the "ability of the consultant and primary care physician to control the camera". With the increased adoption of virtual tools, respondents noted that security is an important feature of virtual care. Respondents reflected on patient concerns regarding reassurance of the security measures that are in place to protect their privacy and maintain confidentiality. Another expressed concern was that of workload: extra tools or new systems may require more time and effort to set-up or manage and therefore respondents would like systems that prioritize "efficiency as staff for set up can be limited" and "does not increase primary care providers workload without pay".

In the final question of the survey, participants were asked to submit any overall comments about their experience with- and /or preferences regarding virtual care. Many respondents offered comments about their willingness to use video and the value it brings to rural maternity care, while at the same time indicating the barriers and challenges of its use. Internet connectivity, costs and billing, privacy, and security concerns were mentioned as challenges reducing the use of -or comfort level with virtual care. This has led some respondents to prefer the use of phone over video communication. Other respondents emphasized the value of in-person visits in building relationships and connections, and

how this can be difficult through virtual modalities. One respondent gave an example of the differences that they have experienced with patient visits conducted virtually versus in-person:

> *I appreciate having the option of phone/ video conference appointments with our clients (during COVID and also for those who live outside our community); however, many of our clients have expressed that they wish they could come back to the office, as they feel 'disconnected' from us because of the technology. We still offer 10 minute in-person appointments for appropriate assessments, and it is interesting how much more people will disclose (ex: emotional issues; further questions/ concerns) once we are face to face, even though we had already had a virtual appointment for 30-40 minutes earlier that day.*

Respondents to this survey commented that virtual care is a useful addition to in-person care but it should not be considered a replacement:

> *I think it has an important role in connecting rural patients to specialist care. I do not think it should replace appropriate in person prenatal visits with primary care providers. I do not think it should be used as a substitute if there is a need to travel to obtain more detailed investigations.*

Understanding the experiences of rural health care providers with virtual care is essential to refining guidelines and recommendations for the incorporation of virtual care into practice during and after COVID 19.

RESULTS FROM INTERVIEWS AND FOCUS GROUPS:

Attributes of Virtual Care for Perinatal Health:

Key Points:

Telephone contact was **privileged** for most non-urgent patient communication;

Many respondents also used text messaging due to client demand;

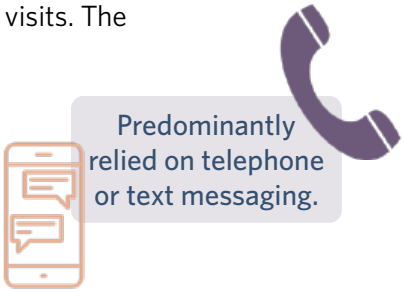
Midwives were most likely to respond to text messages 'after hours', challenging work-life balance;

Unsecure texting was a concern for some participants

Benefits of Virtual Care included reduced burden of patient travel and increased provider efficiency.

Uses of Virtual Care for Perinatal Health:

Participants in this study identified several attributes of perinatal virtual care within the context of patient visits and consultations with other care providers. Most participants noted they most frequently used telephone contact or text messaging to augment or replace in-person visits. Very few health care providers reported the use of video technology in the context of clinical visits. The attributes of virtual care are described in more detail below.



Patient Visits:

Respondents described the use of virtual technologies to facilitate patient visits.

Telephone:

Telephone use was reported as the primary virtual tool for connecting with patients, due primarily to its simplicity. One participant stated that the use of phone is sufficient, "none of us do video with patients, it's all phone, which I don't think is too limiting" (OB_12). Another participant mentioned that they feel like they "can do most things with antenatal care on the phone" (PCP_13). A further participant noted that the use of phone for follow-ups is hassle free in that "it's just so simple to pick up the phone and kind of deal with things that way" (OB_25).

The use of call forwarding by a GP OB group was mentioned by one participant as one way in which the phone is utilized in their practice. The participant noted that it has been a "hugely useful tool" and it can help reduce the number of acute presentations as they "can offer that reassurance on the phone", often to patients they already know (PCP_15).

Several participants reported the value of combined phone – in-person visits allowing them to achieve "a bit of a balance." In-person visits were seen as important to assess the fetal heart rate, weight, and other 'hands on' aspects of care, but many found it to be "quite reasonable, to do telehealth [phone] for every second visit or so..." (OB_28). Another participant commented that they utilize the phone for counselling related to breach or VBAC but their patients would attend an appointment in-person to confirm BMI or weight distributions prior to a procedure (OB_28). For one participant, in-person visits were reported to be the main way the participant has been in contact with their patients stating, "actually for my maternity patients, I am doing some telephone calls, but mostly in-person visits." (PCP_09).

The efficiency of the phone was cited most frequently in leading to provider preference, with some respondents describing the tendency of the phone to facilitate uninterrupted communication ('you tend not to interrupt patients as much if you're just on the phone: I find I listen better...'). Likewise, most valued it as a modality to connect with other providers for clinical consultations.

Despite the clear value of the telephone in facilitating clinical care, however, most participants stressed preferring in-person visits in the antenatal period ('there's just certain aspects of physical care that can't be replaced over the video or telephone'). This was due mostly to the tactile advantage of the physical exam in pregnancy:

> *I really like to look at the belly and I like to lay hands on the belly, I'm a very tactile and visual kind of doctor, so I always do my Leopold's and my hands on the belly and I estimate fetal weights and you know, I look at people's faces to see if they're puffy or they're getting pre-eclampsia and I can see it before the blood pressure goes up, so you can get some of that over tele-health because I do have tele-health but it's, I mean medicine is all the senses right? Like we use all our sense and so when you take away one or two of my senses, I'll do the best I can and it's really hard to compensate for that, but it's not the same as having all our tools in our toolbox. (OB_16).*

Reports of patient preference aligned with provider preference: most favored use of the telephone, particularly when juxtaposed with video-mediated visits. As one stated:

> *when I connect with patients, I say like at the beginning, is it okay if we're just on the phone? I have had a lot of patients have been like 'yes it's so great I'm so sick of staring at a screen, like this is, this is nice, it's refreshing'...(OB_29).*

The preference for phone compared to video was also noted to be related to the set up required for video calls and the ability for patients to potentially multitask while on the phone. Additionally, one participant mentioned that their patients have commented on the fact that there is very little difference between phone and video appointments: "they don't feel like the experience is diminished because there's no video capability". (PCP_15).

A few participants noted a difference in response between primiparous and multiparous patients, the former being more wary of the lack of in-person visits: [primips] "don't like virtual [visits] and really want to be seen in-person while multips appreciate the virtual options as they do not have to make arrangements for childcare". Other participants commented that "multips, they don't even care about a video, they just want to have a quick phone chat, be done, consider it an appointment" (PCP_21).

Text Messaging:

Most participants reported the use of text messaging to facilitate communication with patients, many considering it their "first line of communication" (PCP_10), reverting to telephone and in-person as necessary. Despite its ubiquitous use, many participants expressed concerns about security and setting personal boundaries. Most acknowledged being comfortable responding to texts for quick questions but aimed to avoid any in depth advise. Although some participants indicated that they would respond to more urgent text messages on 'off-hours' if they were available, they drew the line at non-urgent questions ("[I would] not ... answer questions like is my sunscreen going to be okay to use?" (PCP_03)). Others, however, expressed the need for clearly established boundaries; for example, not responding to non-urgent texts until they are in the office. As one participant noted, "I'm not going to kill myself trying to respond, just kind of teaching people those boundaries, just by our reciprocal behaviour." (PCP_08).

Other participants noted that although their clients are "very keen" to use text messaging, doing so created expectations that they would be available 24/7.

One participant noted the successful use of texting observed among their midwifery colleagues and their desire to adopt this service for patients of GPs, but unfortunately, it was not met with great enthusiasm:

> *One of the midwife superpowers I've observed is they have phones that patients can text and that makes a huge difference for access and for that ability to send photos and short clips, often of like newborn's breathing rates and things like that.. So that's something I've been kind of working with my colleagues like would they be willing to have a GP phone that we answer 9 to 5 and they're all like absolutely not. Never. No way. (PCP_15).*

A few participants reported patient communication through the use of a portal, or "an API, sort of like Ocean...it puts the whole thing right in the EMR and I don't have to worry about documenting ...patient's concerns and that sort of takes administrative load off our staff too [because] our phones are very very busy." (PCP_23).

Provider Consultations:

Care providers in this study described protocols for communicating with other providers (generalist – specialist and specialist – generalist).

Telephone:

Several participants noted that the phone is the optimal choice because it is "easy to use" and, as one summatively noted, "there are less technological issues, its sufficient, it just makes the most sense really, and its' what we're all used to using" (PCP_06). Another person observed that the specialists are "quite good for giving phone advice" (PCP_03).

The majority of participants reported that when contacting other provider for a consult, they would use the telephone.

Text Messaging and Communication Apps:

Text messaging, as a means of connecting providers, was used as frequently by participants in this study as phone calls due to convenience and ease of use as well as the advantage of leading to less interruption to the specialist. As one participant noted,

> *...if I need something that's not urgent, I can send that through and [the OB] can glace at it and I think. 'okay, I can address that later' and if I need something that's urgent, [the OB] can glance at it and say, 'hey I need to step up the appointment and so doing something'. That's not going to be quite as interruptive as a phone call ...it is quite valuable in the way that we've seen it at our clinic at least. (PCP_03).*

Texting was also used by rural participants in this study to enhance communication between providers in a small community setting:

> *I think... in the smaller communities there tends to be more intimate relationships between everybody, so I would say text is super common. Providers will just reach out and say 'hey have you got time to chat about this later' or you know, 'can you help me out with an ultrasound at 11 or something', so it can be a little bit more informal too.(OB_25).*

Another key attribute of text messaging was the ability to send pictures.

As one participant noted, "if I have a strip that I want a specialist opinion, I would take a picture because you can really zoom nice into, you can take a big picture and then they can zoom into it..." (PCP_02). Another participant commented on the convenience of nurses texting photos of concern for a follow-up phone discussion. Most participants reported exercising precautions when texting photos, including removing patient identifiers and ensuring patient consent. Many also noted that use of text messages elicited satisfaction from patients ("Patients are often eager to get another opinion...when they know they're going to get a second opinion back within a few minutes" (OB_07)). Several primary care providers noted that the efficacy of sending pictures by text reduced the need for video connections or, in some instances, was a satisfactory replacement when video was not working.

The majority of participants reported that when contacting other provider for a consult, they would use the telephone.

The value of texting noted by the participants in this study were juxtaposed by concerns about unsecure texting. Another participant described secure options as difficult to log into therefore, most providers "defaulted to just ordinary texting". With regards to the platform 'MDMB', one participant noted that although they thought it was a useful app, to be successful it required 'buy-in' from the whole practice group, which they did not have. The general lack of wide-spread uptake diminished the effectiveness of the app for many respondents.

In addition to concerns about secure versus unsecure texting, the need for documentation was an additional reason some participants were reluctant to text: "[I would] have to record that in some way and sometimes it's just easier in a phone call or formal consultation" (PCP_08).

Uptake of video-mediated visits:

Most participants in this study observed that the addition of video to a virtual (telephone) consultation did not add any particular advantage in routine care. As one participant noted:

> *I personally have a strong preference for just phone and then in person visit if you have to do an exam or if you find that it's a challenging situation. I personally don't think video adds anything, to the contrary I think it could be a detractor. (OB_25).*

A few participants talked about the benefits of being able to 'see' the patient in some capacity as well as gauge patient understanding. However, several participants noted that ultimately "video helps but it still isn't quite the same" (PCP_23).

This held true in the context of consultant visits as well:

> *...very rarely do I feel like when talking to a consultant I need to see their face, and very rarely do I need to show them something and if I do need them to show them something, I feel quite capable about chatting with them on the phone and describing it first and then if they feel they need to see it in person then we can arrange that after. Telephone, not video conference, would be my preferred option just because it's more available and faster and more people are comfortable with it. (PCP_06).*

Benefits of Virtual Care:

Almost all participants noted the benefits of virtual care for both patient and provider communication, including the reduced burden of patient travel and attendant costs and increased provider efficiency. Each are discussed below.

Reduction in Patient Travel:

Almost all participants noted the reduction in necessary patient travel afforded by virtual care, along with the consequent personal benefits and cost savings.

This included not having to take time off work, attend appointments alone or arrange child care,as well as reducing the risks associated with travelling in poor weather conditions.

As one participant noted, "[it is] very helpful for patients who have difficulty accessing transportation or [who] have mobility issues". Convenience was also highlighted by participants who noted patients could attend visits during their workday or on their lunch hour.

Increased Access to Care:

Several participants commented that in-person visits are not always necessary. One participant observed "there are certain patients that you don't need to see [regularly] if things are going well and offering a phone consultation would make [us] more accessible". Another participant commented that the expectations for travel on rural patients is often unfair in that "it seems cruel that someone has to come to me and... drive however many hours and sit for half an hour in my waiting room and I spend like 20 minutes with them..." (OB_16). Due to the counselling aspects of their work and understanding that in-person appointments can be a barrier, one participant echoed previous comments that virtual care offers greater "accessibility", to the point that "people can do it [take a phone call] when they're driving home from work...". The accessibility of virtual care has also been beneficial for connecting with patients that are unlikely to attend an appointment in-person as described by one participant:

> *...for like our vulnerable population and you know, people that would probably, would never show up in my office, now I'm able to have sessions with them on contraceptive counselling because... they're answering their phone. And we can chat and sometimes if like someone didn't show up in the office ... you might never see them again, but this way like we can have a conversation, maybe they don't answer, but we'll call back. (OB_29)*

Care and Support During COVID-19:

Virtual visits were seen as particularly useful for maintaining antenatal appointments while balancing restrictions due to concerns of COVD-19. One participant stated that they would "rather have a partial visit" and that "more young people these days have their own dopplers" which providers would listen to over the phone. During COVID, parenting groups on various topics switched to online platforms and were noted by one participant to be well received and well attended by patients. One participant noted that there were "potentially more people attending because it was online" compared to in-person, when participants would have to "schlep their babies and toddlers out…". Access for partners or support persons was also noted as a benefit to virtual care due to limits on additional people attending in-person visits. One participant noted that they have used Facetime or speaker phone prior to the pandemic to connect with partners at work and continued this practice during the pandemic. The participant also commented on the overall shift to virtual care stating that "it's just nice that we've been pushed to get a little more creative and we can meet patients where they've wanted us to be at for quite a long time" (PCP_6). In addition, three participants described unique cases where virtual platforms enabled access for a partner or support persons while a patient was in active labour. One participant noted a case of a young primigravida that had several family members on Zoom for support through the labour process and noted that this had "made my job a lot easier". The other two participants mentioned the use of Facetime to connect the patients with their mothers and a sister for support, both of which 'worked out well'.

Efficiency for Providers:

Several providers described how the use of virtual care has increased their clinical efficiency enabling higher volume and supporting their ability to address urgent matters. As one participant said,

> *"I think the main benefit that I've found is, because we always try to judge and keep our wait lists across different communities more or less equal, now if I see I fall behind in Smithers, I just book an extra virtual day. If the OR is cancelled, I can leverage that time to do an outreach clinic and do a bunch of consults, decide who I need to see in person… (OB_25)"*

Many participants also noted the benefit of being able to fit appointments into gaps in their schedule:

> *"…if you have a free day or a free morning or something like that it is really expeditious and effective to book a day of consults over the phone and that can be really very very helpful and useful. Having the flexibility to do that is brilliant, especially doing what we do because there's so many variables all the time (OB_25)."*

Other participants described attending to virtual appointments specifically during labour and delivery or between operative procedures ([I]"can just go to a back room and do a couple phone calls"). This was generally facilitated at a scheduling level by maintaining a list of patients amenable to

unscheduled appointments, allowing them to "hit the list" when time permits. Most mentioned that unscheduled visits cannot be done for in-person appointments due to travel time logistics and that "if you have to change [an in-person visit] it's an absolute disaster in the office". The same participant noted that when changes in the schedule do occur the "consequences of changes are much less" as patients did not have to travel or take time off work in order to attend the appointment.

Overall, although benefits to virtual care were noted, particularly in the context of the COVID-19 pandemic, in person care was preferred by almost all participants. As one participant summarily noted, "so much of medicine is still... hands-on; you need to have that art of medicine and we can replace some of it with technology but I don't think that any of us will say that it's better care without seeing people." (OB_28).

Virtual Care Challenges:

Although virtual care was viewed by most participants in this study as enhancing patient care, concerns such as the implications of the lack of physical exam, changes to the patient-provider dynamic and the inefficiency of virtual care when higher acuity care is needed were noted. Each will be explicated below.

Lack of Physical Exam (in-person):

The lack of physical exams was noted as a limitation particularly with regards to determining weight and height distributions. Participants reported that although patients can convey this information, weight distribution is essential. One participant described a patient case where the participant disagreed on the patient's V-BAC candidacy and commented that:

> *"...when I saw [the patient] I'm just thinking... this is not a great candidate... how is this patient not sectioned? But I think sometimes on the phone... there are some cues that occur when you see a patient often maybe related to obesity and again, like sort of functional status that you can't get on the phone...(OB_29)."*

The lack of in-person contact due to the use of virtual tools in the practice of midwifery was also discussed by participants. As one commented, "...to diagnose and understand women in their overall health and well-being I need to see them, I need to smell them, I need to see how they walk in the door, how they sit down, how they look at me...this is very important" (PCP_06).

Participants' concerns regarding the lack of physical exams were not only focused to their personal practice. Some participants commented that they were concerned that other providers had not physically seen patients prior to them being in their care, one stating, "primary care practitioners have been saying, "I haven't actually seen this patient, can you examine them?" Which I find is a bit problematic with virtual care" (OB_14). The other participant also noted that they have had patients mention that they have not been seen by their GP and that they think "it is very difficult for them to provide good care without seeing people..." (OB_28).

One participant reported a patient had experienced a pregnancy loss during a time when the patient was being cared for by a combination of phone and in-person visits. The participant noted that using a video call instead of a phone call would not have done much to help in that situation as they would not have been able to use a doppler for an assessment. The participant explained further that they noticed "that other care providers weren't doing Zoom calls either, they were all doing phone calls, and we felt like they were missing things so we kind of went back to the in-person stuff over the summer and tried to do some phone visits, but again always gave it [as] an option for them to see us in person because of our experiences" (PCP_18).

A lack of in-person appointments has also contributed to concerns of potentially lacking knowledge about a patient's personal life or current situation which may impact health outcomes or access to future care. One participant stated that:

> *...somebody can look really, really great and they come in reeking of cannabis. You're not going to get that on a phone call. You know? And they're probably, they're not going to admit to as much use as you can smell, right? So and even just stuff like you know, you might be more likely to ask questions about food security or transportation issues and stuff when you get those cues around the in person visit. Like if they show up late because they couldn't get a vehicle or something like that. That's something that's going to be important to know, come time to deliver and they can't get themselves to the hospital. (PCP_23).*

The post-partum period and related appointments were also reported as an area of concern, again due to missing visual cues. One participant stated that:

> *...you lose so much of how the baby's doing, what their interactions are like, what the attachment is like, how are they handling the baby. There has been some very sad and challenging situations where they haven't been coming in for their postpartum appointments and there's been significant weight loss or issues around postpartum depression that you only really get by being in person. You can ask them how you're doing, even on video, and they'll say fine and they could hold it together, but there's something about being present that makes a big difference there.*

Virtual Triage:

Although 'efficiency' was noted as an overall benefit of virtual care for most providers, multiple participants in this study reported inefficiencies due to duplicating virtual visits with in-person visit when a physical exam was necessary. This increased provider fatigue. As one participant noted,"[some days there are] four or five people that you're re-booking next day or you're bringing in that afternoon because you actually do have to see them physically in person, not just on Zoom" (PCP_06).

The concern of inefficiency as well as the overall appropriateness of virtual care options for certain patients gave rise to the need for increased adeptness with triage for in-person appointments.

Illustratively, one participant commented that it has been "tricky to know who needs to be seen in person and who can be seen virtually" and that they think that things are being missed. Another participant echoed these concerns along with the fact that there is a level of trust that providers will "triage appropriately and make sure we [providers] see people appropriately".

Some participants described techniques they used to triage including reviewing clinic visit schedules in advance, noting reasons for the visit and then evaluating whether or not a phone call would be appropriate. Others conveyed pre-appointment assessments with patients themselves. One participant noted:

> *...now I'm just adding in that filter of is that likely to be appropriate for a phone visit and I might get my staff to call them and just say no, you should come in, or I might call them myself quickly and just say I just want to make sure that we're using this time properly, let me ask you a couple questions and then we might change it to in person or vice versa (PCP_06).*

Patient - Provider Dynamics:

Many participants commented on both positive and negative patient-provider dynamics due to the use of virtual care. Negative changes included a lack of prioritization of the virtual visit, feelings of reduced patient connection, and misinterpretations of information provided. Positive aspects included increased levels of connection and comfort for patients, opportunities for teaching, and the potential of 'seeing' more of a patient's life than before. Each are discussed below.

Negative dynamics:

Although virtual tools have contributed to increased accessibility for patients to attend appointments or receive follow-up communication from wherever they are located and at various times throughout the day, participants reported that this has led to increased multitasking and limited focus from patients during virtual visits with their providers. One participant commented that, in their experience, "patients don't have as much respect for our time, they don't really pay attention, they're busy with a screaming toddler in the background, they make no effort to dedicate themselves to the appointment." (OB_12). Another participant echoed the concern, noting "they're just squeezing it into their day" but felt it was hard to know if the information being provided is "registering at all" (PCP_23). Some patients' more "casual" approach to virtual appointments may not be ideal but one participant noted that there is a "learning curve" and that patients will have to adjust "if they can't hear what the doctor is saying, its's them losing out on care. They have to do their due diligence as well, so I think we'll all get better at managing it." (OB_25).

Lack of connection is another concern reported by participants as a result of virtual visits. One participant commented that "we're really missing that kind of connection with the clients and not feeling like it's the same level of care or level of knowing each other." (PCP_23). Another participant echoed this sentiment by stating that not being in the same room as someone impacts the ability "for

building trust and for really establishing that connection". There were also concerns about privacy with some participants noting they are usually unaware if a patient is alone or in a safe space, which can make it difficult to assesses intimate partner violence.

Positive dynamics:

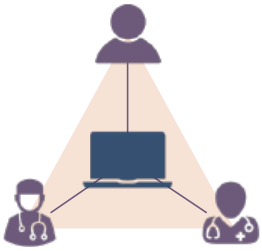
Although fewer positive dynamics were observed, the ones that were reported included increased comfort and easier connection during the clinical encounter due to patients being at home in a comfortable and familiar setting. Others noted an increased feeling of connection and reassurance with patients because there was no need to wear masks, while others noted a greater potential for partner involvement. Adolescents and teenagers were specifically identified as a demographic easier to connect with through virtual care. One participant commented that there is less potential for intimidation compared to coming into an office.

The ability to connect and facilitate teaching with respect to midwifery care was noted as a positive element of the patient-provider dynamic achieved through the use of video calls. One participant stated that:

> *"...we almost create this dynamic where we're interacting together, we see each other, and we can respond to each other's body language. Almost as if we were in the same room...I actually find it way more effective than the in-person visits for that type of thing, for all the teaching that we do. (PCP_21)."*

Virtual tools have created an opportunity for greater connection among some patients and providers as well as the potential to provide greater insights on a patient's life. One participant eloquently stated that "sometimes the virtual window into someone's life and home and what they're living in is way more informative than what we get when they come to our clinic and the contrary can be true as well."

Tripartite Care:



The potential for a clinical encounter involving a specialist, primary care provider and patient together has been heralded as one of the primary benefits of virtual care. Participants in this study both identified significant benefits to this modality and also fundamental challenges to achieving it, whether based on practical experience or hypothetically.

Previous Experiences with Tripartite Care:

Previous experience with the use of the tripartite model varied among participants, with approximately half of the participants reporting no previous experience. A few specialist participants related experiences with midwives, reporting they worked well. Some participants specifically noted the value of the midwife being co-located with the patient for calls that may involve patients that have had "issues with or concerns being referred to an obstetrician..." (OB_28). Others had experiences with registered nurses and patients, one relating a story of a U. The participant related enthusiastic positive regard from the nurse in the post-visit follow-up ("she said 'oh my goodness it was perfect. This is what I did, this is what happened and I'm going to remember that forever', so she's got that in her little book

which is good." (PCP_04). Others related anecdotes of virtual care technology facilitating the remote use of ultrasound: "So the nurse held the probe, the patient held the phone that the probe was hooked to and then the [patient's] sister was aiming at the phone that the probe was [connected too]..." (OB_19). The participant was connected through Zoom and reported that they, "were able to see position, fluid, and placenta locations pretty easily and in fact [the nurse] unintentionally got a spectacular four chamber review of the heart too. So it was actually a pretty good machine. I was actually very impressed with that." (OB_19).

Benefits of Tripartite Care:

Improved communication was considered the major asset of the tripartite model as it reduces the reliance on patients' recall of information from their specialist appointments. One specialist participant mentioned that it is particularly helpful to have three-way conversations for complicated cases as "the patient doesn't have to remember what you say and go back and talk to the other one, we can just put everyone in the same virtual room." (OB_19). In addition, it helps to ensure that patients do not forget relevant information that needs to be brought up in their specialist appointment. One participant commented on their experience of attending an appointment with a patient and that "it was really helpful that I was on the call because the mom actually did forget many important details in terms of her history and the reason that we were doing the consult." (PCP_21). Another participant also noted their concerns of how information was discussed with a specialist:

> *...you send them to see the OB with these concerns and then the OB said no, no this is fine and you almost wonder did they talk about that? Did that come up? Like how clear was the consult? So, it can be really frustrating when it's things like you know, consenting for trial of labour after caesarean or they have these comorbidities or other things are going on. Did they really get into that?... (PCP_06).*

Many participants observed that their attendance would be helpful as it can be challenging for patients to understand all the discussed information:

> *...often some things are unclear or they have questions afterwards and sometimes the specialists are obviously busy and don't necessarily have time to clarify certain points or talk through certain things. Some patients will kind of nod their head during the visit and then after the fact be like what just happened... (PCP_01).*

Others described the importance of 'interpretation' of specialists visits by primary care providers, particularly when information discussed is "way too technical" and the efficiency of understanding the clinical scenario when hearing it directly from the specialists. In addition to interpretation, others mentioned that they would be there for their patients as "moral support" (PCP_13).

Overall, as one participant mentioned, this model allows all care team members to "validate care plans primarily", be on the same page, and reduce the potential for misunderstandings. (PCP_10).

Participants also reported that tripartite care would improve communication between care providers by reducing the need to contact other providers directly or endure a potentially long wait to receive a formal consultation letter. One participant stated that it would "remove a step" of reaching out to a provider after seeing a patient as they "can all just talk together". (OB_22). Other participants noted that they "might not get a consult [letter] for days" (PCP_17) and the wait for recommendations can delay when action can be taken.

As the tripartite model facilitates providers with varied expertise to attend an appointment at the same time, many reported another benefit being the opportunity to learn from one another as well as be supported and reassured by their colleagues. One participant commented that they "learn so much" and that a specialist offering "clear and explicit direction" would make them "feel more comfortable in providing care" (PCP_11). Another participant mentioned the value of the primary care provider being involved because "you can reinforce what was discussed or clarify anything that is unclear" (PCP_18).

Others noted the visits are useful for increasing confidence with complex cases:

> *"I think it would be really useful for some of those complicated visits, especially where we're doing shared care, to feel more confident to carry on with [patient] care in between their specialist visits to know kind of what the specialist wants us to be watching for, you know, and to learn from as well. So I see a real benefit to doing some of those visits. (PCP_06)."*

Several participants noted examples of when the use of a tripartite visit or call would be beneficial. One participant commented that this model would be good for providing advice when they do not have to be in the same physical space as the patient. Another participant stated that it may be useful if they were required to manage something that they had never seen before or a procedure where they had limited experience.

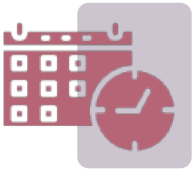
A few participants mentioned that this model could facilitate greater involvement of midwifery providers. One specialist observed that patients who are "skeptical of medical care, maybe not as trusting of Western medicine, I think feeling like they have a midwife at their side, kind of pro-protecting their interests could be rapport building for certain patients" (OB_14). Another participant mentioned that in certain scenarios a patient's midwife has not been "looped" in right away and that it would be "super helpful to have them in on the conversation from the get go" (OB_29).

The provision of 'in-room' support during acute situations was mentioned as a way in which the tripartite model could be utilized. One participant described a scenario where they may be in need of clinical decision support:

> *"...when there's cases that we're struggling with and we want to talk with the OB ... should we keep pushing the oxy? Should we be going to the section, should we you know, to have a video and to be able to have like pretend that the OB is there consulting I think would be really helpful... (PCP_06)."*

Challenges and Solutions to Achieving Tripartite Care:

The main challenge reported by participants with respect to tripartite appointments was the impact on office workflow. Several participants commented on the scheduling challenges and logistics of coordinating two providers and a patient. One participant was not convinced that the efforts would be worthwhile, stating "scheduling difficulties would probably far outweigh the utility." (OB_ 12). Other participants acknowledged the scheduling issues but still considered it a valuable endeavor: "guaranteed it's going to be a headache, [but] there are just some things that are worth it." (PCP_21). Another participant acknowledged workflow issues but added that "if it's a particular case that's challenging, I think that probably it would be worth coordinating, whether telephone or video: I think it would be helpful" (OB_07).



In this context, enablers of tripartite care focused on good scheduling, some reporting "as long as it was scheduled" and "[If I] had enough notice" it would be manageable. Some noted the relative infrequency of the need for such visits would allow scheduling around such visits: "I don't see it being that frequent so I think I would just make it work around the patients for the day" (PCP_11). Another participant echoed the likely infrequency of tripartite appointments and subsequent capacity to accommodate: "those are just patients that we can count on the fingers with one hand. So, it would definitely make sense to find time to address that patient's needs." (PCP_09).

Some participants adopted strategies to facilitate tripartite visits: "we always manage to book things first thing in the morning and then [the patient] has a pretty good chance of being seen [by the specialist] during their visit." (PCP_03). Another approach noted was managing time on tripartite calls by attending one portion and then leaving the patient to finish up their appointment with the specialist while they attend to other consultations. Suggestions for incorporating tripartite visits into practice included "[making] more time between visits …" as well as designating the appointments to the 'on-call person' to not interrupt the clinic day' (PCP_18).

Two participants with previous experience with tripartite visits noted that the technology involved did not always work as intended and, at times, they had to switch to using Facetime or the telephone. Another participant reported that the technology used was "very unwieldy" and there were often issues with the connecting (PCP_17).

Another challenge noted by many was billing. As one participant noted:

> *"I don't know how we will be compensated for that because you know, MSP I don't think would pay for a specialist and a family physician visit on the same or maybe under some conferencing option, that would be available. (PCP_09)."*

Some participants pointed out instances when tripartite calls were not helpful, specifically when a consult letter was already provided ("we send letters back after every encounter so I don't – I don't think it's something that's super necessary." (OB_12)).

Several participants commented that they thought the concept is interesting and a "really nice idea" but also mentioned that birthers from their community may want to travel outside of the community

for a specialist appointment in order to partake in other activities like shopping (PCP_04). Another participant stated that they did not see the utility of tripartite for maternity care due to the fact that "if, you know, the people that I'm referring to maternity care for OB help, they need to go and see them [in-person]." (PCP_13).

Barriers to Perinatal Virtual Care:

Key Points:

- Lack of wireless infrastructure in many rural communities is a barrier to virtual care for some rural providers
- Some patient populations lack access to technology and infrastructure due to costs
- Texting is a common solution in low-income communities
- There have been modest improvements in rural connectivity due to the shift to remote learning and health care during COVID-19
- Health care providers also experience lack of access to reliable connectivity
- Virtual care can lead to inefficiencies due to technological challenges
- Patient consent for virtual care can be challenging and a barrier for some patient populations.

Introduction:

'Barriers to Virtual Care' was identified as the second major theme from the focus groups and interviews conducted with rural maternity providers and included connectivity and access and user experience. Connectivity is considered here as the quality of internet connection through WIFI or cellular data while access relates to the availability of digital devices and internet connection. User experience refers to barriers or challenges associated with the actual patient visit including challenges with time management, workflow and workload, and concerns about the security of patient information. Each are described in detail, below.

Connectivity and Access:

Patient Challenges:

Common challenges for rural patient populations, as reported by respondents, included limited access to devices (e.g., phones or computers) as well as inconsistent access or lack of, phone minutes, WIFI access and cellular plans, all of which are necessary for participation in virtual care. Respondents commented that these challenges are exacerbated among rural low-income patients. As one participant noted, "...it may be too much for them to... download the app or leave their e-mail address because sometimes their lives fluctuate so much that they're couch surfing and access to the internet is different and it [virtual visits] hasn't proven to be excellent with [low-income patients] ..." (PCP_04). Another respondent noted that they didn't feel that "going down the video route... was going to work for the patient population they served, due to inconsistent WIFI access, text only phones, and a lack of minutes."

Several respondents spoke of how they have had to rely on the use of a telephone, by default, as "telephone calls generally work" but many of their patients are still faced with barriers to standard phone use due to limited minutes, text-only phones, lack of cellular data plans, or reliance on public WIFI. One respondent described that "...towards the end of the month, it seems patients' minutes run up, then once cheque day comes – you can get through and get on the phone" (PCP_11). Another respondent mentioned that some patients have to rely on a "work around phone" when they run out of minutes and then the provider would have to "call their grandma's house at a set time..." or "text people to then set up a time that they could be somewhere to talk on a phone or find better internet" (PCP_03). One respondent provided an example of a patient that did not have minutes or internet access readily available on their phone and that it would require the patient to "walk over to [the grocery store] to see if a message comes through ..." (PCP_11). This example aligns with other respondents' comments relating to the importance of texting patients compared to phone calls. When a patient has run out of minutes or has a text only phone, providers can send text messages and when the patient is able to connect to the internet the messages will come through, compared to missing a phone call completely. One respondent noted how texting has been "so important for arranging visits or even getting care to them [patients/clients]" (PCP_15). Another respondent described their clinics' utilization of text messaging in response to the challenges faced by their "hard to attach" maternity patient population, "we definitely, with a good portion of our patients, saw a need to be able to communicate in that way, in order to actually get access to care" (PCP_27).

Although most respondents noted the patients were able to secure some access to telephone communication, two respondents mentioned a complete lack of device access among their patient populations.

Provider Challenges:

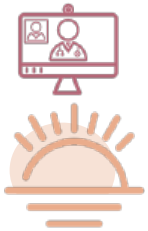
Respondents reported that care providers also experienced lack of connectivity in some rural areas. Several respondents noted poor internet connections which required that they switch to the use of phone calls versus video calls to ensure fewer issues and more consistency with the quality of communication:

> *I must say, I've gone mainly to phone calls just because it's much more reliable than video calls in terms of getting through the day reliably on time because there's so much troubleshooting with connections...I kind of got frustrated with that quite fast and it would lead me to phone calls unless the patient had a strong preference for video call (OB_14).*

> *There are times where there's just like the connection is bad or there's an echo or they're like I can't really hear you that well, so we abandon and end up on the phone, which isn't as good as speaking face to face like this, but definitely technology is the, the biggest problem (PCP_18)*

Other respondents noted their challenges with using video platforms as they experienced "...huge

issues with internet glitching, streaming, and losing calls..." (OB_28). Poor connection or unreliable internet has prompted discussions around altering workflows, as mentioned by one respondent, to compensate for times where there may be high internet traffic:



> *What I've been hearing from the GPs is just that it's hit or miss, like some people have better internet and are able to do a really good Zoom call, and other people will always default to telephones. It's hours of the day, usually morning is a really good time for people to do their virtuals. Evenings, when everyone's at home, streaming things and it's really hard. So, as long as you try to get your virtuals in, in the morning, it seems to be more effective... (PCP_10).*

Respondents also noted challenges faced by providers with respect to access to desired technology for virtual care. One respondent outlined their experience of acquiring a text-only phone for their maternity clinic:

> *It took us four years but then we got one and the number of hoops and jumping throughs and all those things was archaic but in fact we should probably look back and say oh this phone has received 1,472 texts in the first six months of life because it's huge for the patients. You never would've thought that it was going to take that long. People were on their third pregnancy by the time we got it so. Grow a whole human before you can get a phone out of [Health Authority]. Twice. Three times (PCP_04).*

With the recent increase of virtual care due to COVID-19, one midwife reported that at the time of the interview Zoom accounts were not made available to them:

> *We've just been doing phone calls because midwives haven't been given Zoom accounts. Physicians all have Zoom accounts, but we weren't given any, so we just do phone calls with clients and we get them to like, videotape the ultrasound or whatever um— to take photos or whatever to share with partners. Yeah, I think that felt like a barrier certainly, to not have access to like an encrypted video account that we can do virtual care from (PCP_10).*

Infrastructure Challenges:

Respondents collectively noted challenges with cellular reception and internet connection in a variety of places where they are trying to complete their work or connect with patients. This included poor connections experienced in town, along highways, in hospital buildings, in provider home offices, and likewise poor connection at some patients' residences. One respondent described their personal residence as a "radio ditch" and that "all the signals in the world cannot get into my home" which has made working from home, particularly conducting virtual care, a serious challenge. This same respondent also stated that they live approximately 10–15 minutes away from town and that during this drive "there's dead spots on the highway" which pose a barrier to potentially connecting with patients as "a lot of times when we call patients now, they're driving".

Slow internet connection was reported by one remote respondent. They noted that they have been "struggling a lot with all things video" due to the slow internet and "how much everyone on the island is online" (PCP_10).

Another respondent spoke of the challenges with both internet and cell service in their area:

> *the infrastructure is just not really there as much to support the system, like internet is really so bad, there's a couple if places in [our town] where there's no cell coverage and so yeah that's a big challenge..." (PCP_20).*

Due to poor and inconsistent reception, respondents reported that calls have been dropped or they have been unable to reach their desired contact. One respondent commented that "it's really patchy all over the coast...I'll usually drop a call at some point" (PCP_11). Another respondent described that "between us and [next town] there's bad cell reception and lots of times, even phone calls get dropped or it's choppy, and you can't really hear" (PCP_20).

Cumulatively, this leads to difficulties in providing care:

> *One side of their house they get service and the other side they don't get service, and so, unless they're sitting right beside this one window, with their phone up in the air, and they know exactly when they're expecting my phone call, it was just a nightmare to get a hold of them...(PCP_15).*

In order to mitigate some of these connectivity issues, respondents have had those on the receiving end of their calls adjust their physical positioning or rely on the use of landlines instead of cell phones. As one respondent noted: "if you're making a cell phone to cell phone call you can't hear each other and so I always try and call from a landline" (PCP_04). The reliance on older forms of technology was also noted by one respondent who mentioned their use of pagers:

> *Midwives, we still carry a pager. I'm not kidding because there are places even within [our town] where if someone was calling a phone, say we had a cell phone that was specific for the person on call they wouldn't get through. So those little analog pagers work 99 percent of the time. Versus about 87 to 90 percent of the time with a cell that would be designated as the on-call cell. (PCP_04).*

Good Connection and Access:

Despite the connectivity and access challenges faced by many respondents, some noted recent improvements in infrastructure which directly improved the care they were able to provide. One respondent noted:

> *A year ago, so it would be pre-COVID...connectivity was identified as a problem in this quarter because of the Highway of Tears and they did improve it. We've had more cell towers go up, everything. So, the service for internet and cell service, has improved a lot..." (PCP_13).*

A few respondents noted that access to cell phones has not been an issue for the maternity population

as “every young person has a cellphone” and that it is their senior patients that often lack the technology.

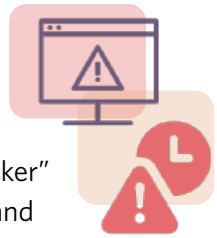
Integration into practice:

Time & Workflow:

Several respondents reported that they have experienced challenges with conducting virtual patient visits due to issues with the set-up or facilitation of the virtual appointment, along with audio or visual problems. Ultimately, as noted by respondents in this study, these challenges contributed to increased frustration, inefficient appointments and workflow, increased workloads, and concerns regarding the security of patient information. One respondent spoke of a situation where the provider and patient spent 45 minutes trying to troubleshoot:

> *I think the patient was struggling on their end to figure out the Zoom platform, and I don't - not sure what was happening on our end if that was the issue, but it ended with us doing it over the phone anyways. So, I think there's some issues with actually kind of getting the meetings set up and having the patient figure out what to do with it. Not everyone's comfortable with that platform (OB_07).*

Another respondent commented that too much of their appointment time was spent “getting the audio to work or helping the patient to adjust their screen; even with super young tech savvy people [there are challenges]...’ (PCP_27). The same respondent noted that they have stopped using Doxy as it was “really frustrating” and easier to talk on the phone.



These challenges resulted in appointments needing to be rescheduled, wasted appointment time and delays in workflow. One respondent described video virtual technology as a “time sucker” and at times preferred not to use video technology, especially if they are late to appointments and want be respectful of their patient’s time.

> *I did one yesterday, it was supposed to be virtual, I was late, and this person was a teacher, so her time was very short. I was like, so I'm going to walk myself into the only room we have with speakers, re-log in, possibly have an issue, we'll probably lose about six minutes of time, just getting it sorted and so I just called her and I was like, I don't want to make you any later than I've already made you, so I'm not going to try even to do this virtually because it's just going to suck time. So that's it (PCP_18).*

This sentiment was echoed by another respondent who commented on managing their workflow: “Patients call in for 15 minutes and you spend 8 of those minutes like, ‘can you hear me? Can you – oh I missed that, oh you're on mute’. Then it just kind of gets a bit frustrating for that and keeping yourself on track and especially if you're doing a combination of virtual [video] and in-person visits.” (PCP_02).

Workload:

Increased workload due to organizing visits was noted as a barrier to virtual patient care, particularly

due to the organizational overhead. One participant spoke of all the extra time and work that had been completed by a colleague, in order to conduct virtual group meetings. This included, sending reminder emails, the required Zoom links, survey information, and additional handouts to those attending. This allowed the respondent to facilitate the meeting and not worry about all the "extra stuff" which was noted to be "the biggest problem".

Overall, the time and effort required to set-up and conduct virtual patient visits has been an adjustment for most participants in this study due to the precipitous nature of needing to adopt the technology in the context of COVID-19 and the limited support. One respondent summarized the challenges:

> *...There are a lot of technical demands on us that came very, very rapidly. We've been advocating for access to virtual care for a decade, when it came it came quickly like within two weeks everything is virtual across the province and not so much training. It's one thing if your patients are not tech savvy but it's another if you're also trying to navigate you know, two EMRs going live at the same time, like well here's a platform, here's Zoom, here's Doxy, here's the video conferencing in your EMR and which one do you pick and which one do you use and I would say if I was being honest that you couldn't default to what is efficient and it goes back to the previous point around work flow efficiencies because now we have so much more stuff going on (PCP_02).*

System Enablers of Virtual Care: A Meta-Perspective:

Patient Consent:

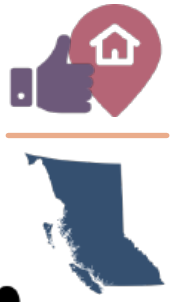
Several respondents also highlighted that the amount of information patients are required to provide or review prior to starting a virtual appointment has been a challenge and potential barrier to using certain virtual care platforms. One respondent described "70% of patients couldn't get on" one popular platform and that the overall process was "really cumbersome", and prompted questions of concern from the respondent: "Why do you need to collect all this information? We don't video record all our in-person visits. I don't know maybe some people do, but I sure don't [laughter] so there should be more-easy just encrypted platforms that are secure, that anybody can access." (OB_16).

Another respondent reported related observations among their younger and more vulnerable populations, in that there is some hesitancy to virtual visits through the use of an app or virtual platform. The respondent expressed that the need to download an app or read through "ten pages of instructions" or disclaimers may be a barrier for some patients and that these factors should be given greater consideration in order to improve engagement with these patient populations.

Rural and remote health care is, by necessity, defined by lower procedural volume due to lower population densities. This creates challenges for sustainable specialist practice, particularly for services that require continuous availability and either fluctuating need or not enough need for a robust call rota of providers. Within this context, the planning imperative to centralize highly specialized care is reasonable; it is more difficult, however, to plan specialist care in a way that creates

a balance between meeting local population needs and provider sustainability. This tension was clearly identified by participants through a discussion of the preference for regional or provincially centralized virtual consultation, which is discussed below.

Local vs. Centralized Resources:



Respondents were asked to comment on the utility of a provincial versus regional resource, as a means of support, for managing obstetrical patients in rural communities. Although centralized resources were seen as valuable for general advise ("[it is] better than having no one"), most respondents in this study emphasized the importance of local-adjacent or regional resources for consultation. As one respondent noted:

> *I think most of us would prefer regional if it's available. The question is if it's not available or it's not accessible then I think there would be a role for having somebody who was more on a provincial level just to provide advice. (PCP_06).*

Others noted the value of provincial resources such as RUDI[3], ROSe[4] and the RACE[5] line, observing they were well serviced by these resources and the gap lay in virtual access to specialists. Local-adjacent or regional access reflected the importance of local knowledge which, many participants suggested, gave rise to a better understanding of the context of care including availability of resources. As one participant noted:

> *...because we know the travel times, we know what's available, we will know what's available in lab. I can honestly not see how somebody that's so far off site can always give the appropriate advice. Not because of their knowledge gap, but just because of local knowledge...I think the reality is that you do need local knowledge to be appropriate in your care. (OB_25).*

The importance of regional knowledge was reinforced through experiences with provincial resources such as the Patient Transfer Network (PTN):

> *...if I'm talking to someone in downtown Vancouver, they have no idea what is happening out in [my community], in the boonies...even with PTN we call them and they're like 'okay, so where's [your community]?' And it's like okay let's start from scratch and then move from there. (PCP_20).*

[3]Rural Urgent Doctor in-aid: physicians with experience in emergency and rural medicine offer support to healthcare providers via Zoom; support is available 24/7. (Rural Coordination Centre of BC, 2021)
[4]Rural Outreach Support: A group of critical care specialists that provide 24/7 virtual support to rural healthcare providers with patients in immediate need of critical care services
[5]Rapid Access to Consultative Expertise: A phone line used by primary care providers to get timely advice from specialists (http://www.raceconnect.ca/)

In addition, to an awareness of local resources, understanding the community (birthing) culture was identified as an important aspect of local knowledge. One respondent noted that:

> *...the birth culture is different in every place, if you have somebody from Vancouver where you know they may be used to higher risks, the birth culture can be different and then sometimes the advice given may be different and its sometimes tricky when I end up having to work with those obstetricians who are closer. Some of it is rural specificity and knowing what we can deal with at our local [hospital], but some of it is also birth culture and what that obstetrician or specialist may be comfortable with, in that other setting. (PCP_17).*

Local Relationships:

An additional attribute of local-adjacent or regional consultations was the ability to maintain existing professional relationships and the importance of building new relationships with specialists that rural providers were most likely to work with. One respondent commented:

> *...it's not overly helpful for me to consult with the provincial [resource] because it's nice to have the camaraderie and I'm going to know those other obstetricians that I'm working with at that local site and then also I find sometimes the advice given, especially if you're coming from a bigger centre to a smaller centre...can be a little bit different and so as much as it would be nice to have the provincial experience, the advice sometimes is so different that it's nicer for me to stay on the regional level. It increases my interaction with my colleague and it's somebody that I see all the time and so for me it would be better to be on that regional. (PCP_17).*

Another respondent noted that unless the case they are managing is complicated and in need of sub-specialist care such as Maternal-Fetal-Medicine or cardiac obstetrics, contact with local providers would be best as it increases "inter-professional relationships in your sort of core local group" (PCP_17). The most productive relationships were underscored by a sense of trust that comes from shoulder-to-shoulder work on the part of both specialists and generalists. As one participant noted:

> *...I think in general, it's way easier to like trust the specialist... that they're hearing you and that they understand the geography that plays into the decision making, ...especially around like 'do we need to transfer this patient?', when they're your home specialist. ... I think I would way rather like [to] have a relationship [with a regional specialist], have a sense of how things are going to go, know that they know where I am, and where we're talking about this patient ending up. (PCP_27).*

Additionally, several primary care providers were aware of the importance of supporting local specialists by contributing to their procedural volume ("I would be very cautious to go outside of our local climate" (PCP_03)). Another respondent echoed these concerns with respect to their community, commenting that, "one of our obstetricians has to moonlight at other places just to pay bills, so I just don't see [centralization of resources] fitting our community at this point" (PCP_03).

Primary care providers also emphasized the importance of obstetrical consultations with those who would receive the patient should a transfer out of community be necessary. One respondent stated that they would be more comfortable consulting with their local obstetricians due to the fact that "if somebody says 'oh please do this', they're going to be willing to follow through with that". Several participants felt that a rupture in this continuity would negatively affect patient care (PCP_03).

System Supports to Facilitate Quality Virtual Care:

Respondents were asked what system interventions they felt would lead to optimized virtual antenatal care in British Columbia. Thematic to almost all participant responses was a recognition of the importance of the availability of local care providers to support not only low-risk patients, but to facilitate connections with specialist care and be available for follow-up. Beyond a robust local infrastructure, participants noted macro (system)-level supports (ensuring connectivity and access, providing education on the use of virtual care, retention of fee-codes post-pandemic and Health Authority leadership, technological sufficiency and integrated electronic medical records) and meso (practice)-level supports (administrative, IT and infrastructure assistance). Discussion of the value of networks of virtual care and virtual care providers superseded both meso- and macro- categories by linking practice level and health system concerns. Each will be discussed below.

Macro (system)-level supports:

Connectivity and Access:

Multiple respondents in this study commented on the need for improvements with respect to equitable access to internet and related devices, which, in most instances, required further infrastructure development. One respondent discussed the need to "support patient's access to technology and access to resources for that [technology]" and that it must be addressed "...equitably and fairly, so that every patient has that opportunity" (PCP_11). Another respondent added that ensuring that internet is affordable for rural patients would be "huge for healthcare" (PCP_11).

Several respondents commented that increasing access to devices for marginalized populations would be helpful and noted a potential solution, consisting of creating spaces in communities where patients, who lack access to reliable internet, could utilize a private space and internet connection to participate in their virtual appointments:

> *...even if there is some kind of collaboration with public spaces to provide... even the library, for example, to have a private, room that can be booked, that patients can access, I think [that] would be quite useful. To have a good, solid connection there, something in local communities. Publicly funding clinics, for example [so the] medical clinic could have a little virtual care booth that patients could access would take away a lot of the connection problems. (OB_14)*

Related to accessibility was the need to increase ease of use of virtual technology. Respondents noted that both providers and patients would benefit from technology that is "smoother" and that this would

increase the overall acceptability of its use. As one participant, referring to a virtual application, noted,

> *[We need] something that's easy, to be used on a phone because a lot of our folks are... relying on Wi-Fi in public places, so they can't just pull up their laptop or it's just easier with your kids around and stuff (PCP_08).*

Most participants noted that removing interface access barriers would remove "excuses" for not using virtual care.

Education on Virtual Care:

Several respondents noted the need for education on virtual care for patients and providers to help reduce potential fear and hesitancy around the use of technology. One respondent commented that "the education part is a big part for everyone" and that many "patients don't have that capacity" for virtual technology and are "stuck with [the use of] telephone" (PCP_02).

This included staying current with rapidly evolving technology.

Fee Code Adaptation:

Most respondents reported the need to maintaining appropriate fee codes for remuneration for virtual visits. As one said,

> *...the billing codes need to stay and not be taken away because you can't spend your time doing consults if you're not going to get paid for them... I think if they want us to do that kind of thing [virtual care] then the codes have to stay... (OB_05).*

Almost all respondents noted this was essential if the virtual health care gains achieved during COVID-19 were to remain post-pandemic, and most thought virtual care facilitated optimal care for rural patients. As one participant noted,

> *I think with the advent of the telephone visits and actually being paid appropriately for that it does actually improve care in a lot of cases and the turnaround time to get things done, has actually been better in many situations. (PCP_21).*

Some respondents critiqued the current payment structures for virtual visits. One respondent noted that "[remuneration for] virtual maternity care is paid, for family practice, significantly less than any other virtual visit for any other segments of the population" and added they now need to be more comprehensive: "these aren't simply maternity visits, they're also counselling visits, infectious disease lessons, and sometimes you have grandma on the line too, and dad and all those things." (PCP_04). Exacerbating the increased load of individual calls, a few participants noted an increase in seemingly trivial patient calls due to easy availability:

> *...people call me for the silliest stuff now, that they never would've called me before and they never would've come in [for], and now they have access to me and I think the billing codes are going to have to change, or something's going to happen here because I don't see how the government can sustain paying us for these visits that are really you know [are] not whole visits.... from a governmental health systems perspective, I think that's just silly (PCP_24).*

Health Authority Leadership :

A few respondents noted the need for health authority leadership to navigate changing and challenging virtual care modalities. Specifically, guidance for platform selection, remuneration for associated costs and the need for a standardized consent documentation process. Participants pointed to the underutilization of secure messaging services like MBMD and attributed this to lack of system-level promotion and education. Others appealed to the need for guidelines on handling patient complaints arising in the virtual encounter and clearer guidance on what platforms are acceptable ("just confirmation of what we can use" (OB_19)).

Funding support for the use of virtual care platforms like Zoom, was reported to be limited, particularly for midwives, as one respondent noted that the provided Zoom accounts only allow for a maximum 40-minute call and the providers must pay for accounts that offer more features:

> *if we're doing like other meetings or different things, we're still paying for our Zoom account, right? And so, you know like again it's kind of money and time off our backs that we don't get compensated for which is just starting to get old, personally. (PCP_18).*

Sensitivity to the realities of rural care:

Urban specialist awareness of community capacities regarding maternity care was highlighted by many participants. One respondent commented that they would like "centralized providers [to] be more aware of the supports available in rural places" and suggested that this information could be provided by showing "someone on Facetime... 'this is our nursery, it's a room with a stablette, like you may note there are no NICU nurses here'..." (PCP_24).

Technological Sufficiency:

Many respondents indicated that the support they require or would like to have, does not necessitate additional technology and instead the focus should be on refining existing technology and practice. For some, this reflected a sense that current technology is not being used to capacity and the desire to prioritize other aspects of health services:

> *I think what we're hearing ... is [providers] wouldn't really support a big investment in any video infrastructure... there wouldn't be a lot of support for spending a lot of money on a virtual system at the moment. I think we have more important things to spend money on. (OB_25).*

Several participants provided more detail with regards to the perceived efficacy of Smartphones for virtual care. One commented:

> *...I don't think we should look at anything outside of smart phones...we all have our cell phones on us...why not use smart phones and if you need to add video, you add on video? I think we should try to recognize the smart phone as probably the platform that's probably going to be the most widely accepted. (OB_25).*

Meso (practice)-level supports:

Some respondents reported ways they felt virtual care could be supported at a practice level. These included employing an MOA to manage the administrative elements of providing virtual care, an individual to provide a 'set-up' service that ensures the technology for virtual care is working correctly, designated clinic rooms for virtual care, and group classes that are both accessible in-person and on Zoom. One person described their needs concisely:

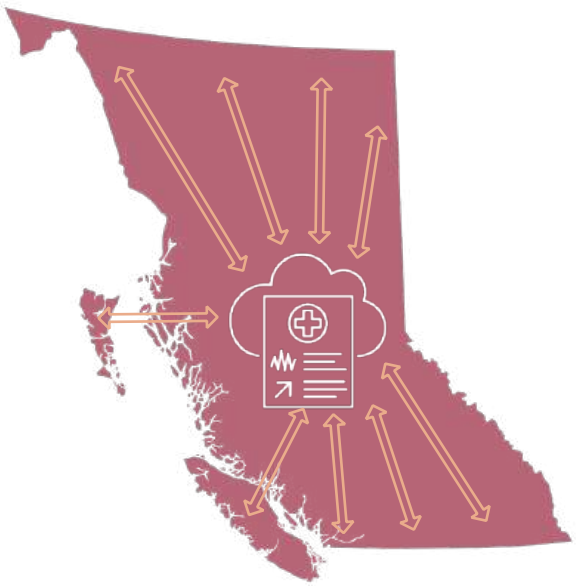
> *...if I could have a week of clinic where someone could come and help me set up my video, it's okay that I see less patients, and it's not going to drastically affect billing, and the confidentiality is looked after, and all the other important logistic legal pieces are looked after. I mean, I'd be keen to do my clinics by video. (OB_07).*

Although others echoed this ideal support framework, most acknowledged it was probably unrealistic ("if somebody's going to set it up for me and I just have to walk into the room and talk to the patient, sure. But that's never going to happen" (PCP_27)).

Security:

Many respondents in this study raised security and privacy concerns and the attendant need for help in ensuring patient privacy is maintained in the course of using virtual technologies. Most of these participants, however, noted they would prefer to be provided with the options that they can use, compared to "the rules" regarding acceptable technologies.

For many, safety concerns extended beyond security of virtual data from a provider perspective to ensuring patients were well informed of the risks of virtual visits and had created a secure environment at their end. Despite provincially-available secure texting options, many participants in this study were unaware of such services.



EMR:

The most common enabler of comprehensive, integrated virtual care identified by participants in this study was adapting current Electronic Medical Records (EMR) platforms to include video and telephone connectivity and establishing a provincial EMR. One respondent commented what an ideal integrated system would look like:

> *...we would just sort of press a button and that would either phone or video call the patient. We would have links [so] I could be immediately sending [information] to my patients about postmenopausal or AUB or something. So instead of me rattling off all these different treatments, I could almost just like press my AUB button and it would automatically send them all of the resources that I want them to read for their follow up appointment or if they were trying to describe me a lesion or something, or where it was, I [would] have something that I could send them. [Overall] just more integration with the EMR, just to make things simpler (OB_28).*

Ohers, however, saw the provincial drive for standardization as potentially disadvantageous to rural communities due to the urban focus of centralized health service delivery. As one participant noted:

> *...there's such a drive of having things provincially like having a provincial EMR and having things more centralized [in] the province and sometimes our rural communities are forgotten in this piece because I don't have the same access and my patients necessarily don't have the same access and our patients that live on the reserve have no access. When we look at implementing something that is province wide, the focus shouldn't just be on the urban patient, but how would the rural patient be incorporated into this? (PCP_26).*

Beyond integrated functionality, other participants described the benefit of increased capacity to transfer patient data between providers ("a portal that would be accessible by care providers and [used for] secure transfer of patient records, and that record could actually just go straight into my EMR would be fantastic." (PCP_08). This would ensure a "paper trail" and reduce the workload on office managers. One respondent mentioned their experience with an EMR-like system used in the United States which supported easy access to notes reflecting both outpatient and inpatient services, commenting "that [would] be [a] very very big ideal" (PCP_21).

Participants in this study hypothesized that integrated and enhanced EMR functionality would lead to increased uptake which, in turn, emphasized the need for provincial standardization or, at least, interoperability. This was pertinent particularly in the context of shared practice between Family Physicians, Midwives and Obstetricians. In the experience of several participants in this study, the lack of interprofessional integration has led to duplicate work (e.g., two providers filling out an antenatal record).

> *...it will have to be looked at as what's the best EMR to transfer all other EMRs into and then work sufficiently for everybody and that's where you're going to get lots of different opinions, because everyone thinks their EMR is best, because that's why you have six different EMRs. (PCP_26).*

System Improvements:

Participants in this study offered suggestions for innovations that would enhance rural, virtual perinatal

care. For example, one respondent noted the potential of a pre-natal app that can be accessed on a smartphone and display various results, GBS or ultrasound, as it is challenging when "results [are] coming from different places, it's hard to just amalgamate that all into just one spot" (PCP_15). Overall, centralized access to patient information is greatly desired:

> *...That would just be amazing if you could literally log in and say okay, I, wanted to see this and this and this on this patient and boom here it is and oh wow, here's the pre-natal record which was actually populated by the OB when they saw them too you know? (PCP_15).*

Point of care ultrasound (PoCUS) viewed over a virtual platform was identified as a practice enhancement that would benefit remote obstetrical care. One respondent commented on their community's challenge with consistent access to ultrasound and suggested "some kind of virtual support to authenticate the point-of-care ultrasounds that GPs are doing" (PCP_10). Another respondent stated that "physical examinations and getting clinical information over a video platform, yeah potentially there would be a role there for minor ultrasound things like checking fluid and position and things like that" (OB_22).

Other respondents commented on employing public health nurses to support rural maternity care by taking on the tasks of "basic measurements like doing the SF or you know doing the basic measurements... you have somebody with a hands-on position in a smaller community that can connect virtually with a physician" (PCP_26). The same respondent also noted that there could be an opportunity to utilize pharmacies for delivering care as there are "trained personnel at least on site and so there's infrastructure there that we're not really utilizing for anything other than dispensing locations...allowing the pharmacists to do some of the assessments and maybe we can assist them to deal with maternity care..." (PCP_26).

One System:

A common desire noted by respondents is to streamline or standardize to one system to increase convenience and access to information. One respondent stated:

> *...if we wanted to have a virtual utopia we'd streamline [virtual obstetrical care], we'd have one service that provides you with all the avenues. One service that says alright this is your e-mail, this is your app, these are your contacts, this is your video option, and then patients can also log in to contact your doctor via whichever means and it'll tell the patient how to connect with that (PCP_02).*

Others commented that many people are using different platforms and having a standardized platform would ensure safety, security and privacy as well as save time as everyone would be familiar with how it functions. This would require a province-wide digital health platform and province wide access to patient information, an aspiration voiced by several respondents who recognized the inefficiencies of multiple sources of patient information that currently exist. One participant described how this would

be useful by providing an anecdote:

> *...access to patient reports, or ultrasounds or that kind of thing, you know, being in the Okanagan, we often get patients who come from Lower Mainland or what not, on vacation and they happen to go into labour early or they've pushed it a little bit and they're close to their due date and we are doing this struggle at 10pm at night on a Friday trying to get anything we can find about patient documents....that would just be amazing if we could log in and say okay, look their 20-week ultrasound was normal, no placenta previa, all of this stuff, would just really revolutionize flow. [For] both rural and urban to be honest. (PCP_15).*

Networks of Virtual Care:

Recently, the value of geopolitical organization of health service delivery through networks of care has been seen as a solution to sustaining health services across rural geographies (Iglesias & Kornelsen, 2018). The networks are both clinical, relying on established, historical referral patterns, and administrative in that they provide a framework for care across sometimes expansive distance. Many participants in this study recognized the value of virtual technologies in facilitating administrative and clinical relationships with colleagues in other communities. Below, we discuss the utility of networked care.

Utility of a Rural Network:

Respondents noted that the use of virtual platforms would help connect providers that are geographically far apart and increase provider awareness of regional services and support. To be effective, however, participants observed that networks must be a judgement free environment, and to have a focus on peer-to-peer support or mentorship. Many participants felt that expansion of a virtual infrastructure for connectivity, in addition to clinical support, would enable more participation in administrative and social events for rural providers. As one participant noted:

> *just knowing who works where...I don't know who they all are because everything changes quickly and I don't know what their particular interests are so again a bit like [the] pathways thing, but just within kind of obs and gyne it would be great (OB_05).*

Although there was general positive interest in the idea of a virtually-supported social and administrative network, several participants were not clear on how to establish such a network in a way that would promote interest. The importance of a 'judgement free environment' was reiterated by several participants, one noting "[there should be no] "judgement about why you're practicing that way, that is maybe specific to your community and the resources that you have" (OB_07). This attitude of acceptance would promote a level of vulnerability that would allow true support from peers. Several participants valued the idea of peer support, one person noting that "sometimes people take their frustrations out on this e-mail group and it ends up being... a horrible way to let out your woes. I think it would be really good to have some access to actual care, as opposed to ranting on a group e-mail."

(PCP_18). Another respondent noted that a "mentorship component would be great" to help develop connections with more senior colleagues (PCP_11).

Continuing Medical Education:

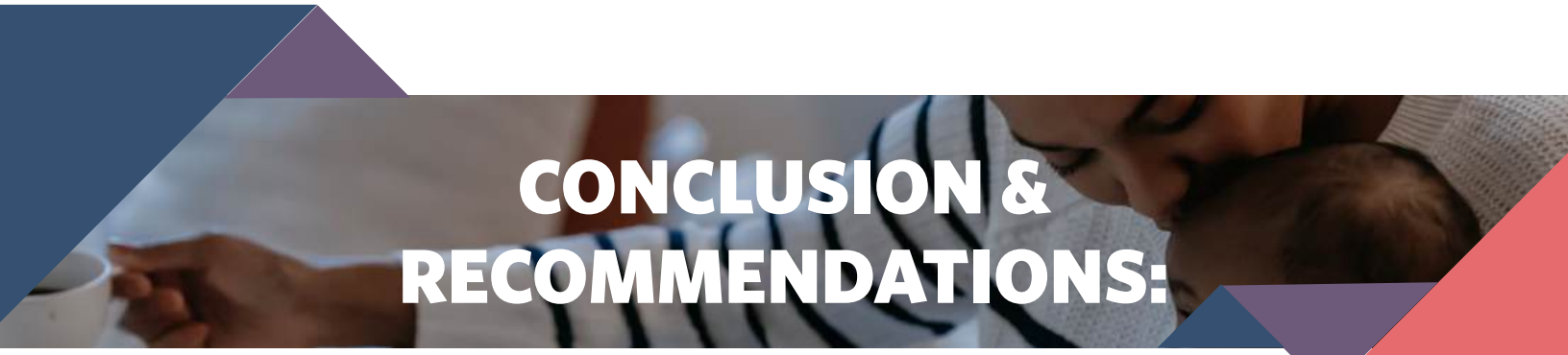
Several participants noted that a virtually-facilitated network would provide a good opportunity for Continuing Medical Education (CME) either as platform for a journal club, simulation training or specific courses targeted to the needs of the membership. For example, one person noted,

> *So you know they don't need to learn about forceps, vacuums, because they're never going to use them. They need to know what happens when someone is fully dilated, what do they do with that? What happens when someone's delivered and now they're hemorrhaging, what do you do with that? And so making sort of a half day course or a full day hands on course that we can travel with and take to our smaller sites to give them practice. (OB_19).*

Several participants were already involved with such virtually-facilitated networked providers through communication modalities such as What'sApp: "[The group] has been really really handy...to feel connected to other midwives practicing in a similar situation" (PCP_17). Another respondent noted their experience with learning a new skill on Zoom and how it worked well:

> *I learned how to insert the Nexplanon virtually, it's an implant for birth control. It's amazing and the sessions were taught on Zoom...it worked so well and it's a skill that I'm so glad I've gotten (PCP_27).*

Other respondents reported successful monthly group rounds which brought together regional maternity providers. In reference to one Zoom-based group one participant noted, "uptake for those meetings has been higher because it's more accessible for people and then similarly we do our clinic meetings once a month on Zoom as well, so that's been more consistently attended because it's just simpler." (PCP_27).



CONCLUSION & RECOMMENDATIONS:

Adapting the current implementation of virtual maternity care in British Columbia may be enhanced through the following provider- and evidence-derived strategies, many of which are currently underway in BC:

1. Maintain the current priority of improving broad-band access across rural BC to facilitate virtual access to health care by acknowledging that achieving Canada's Health Act's mandate to equitable access to health care necessarily includes equitable access to broad-band

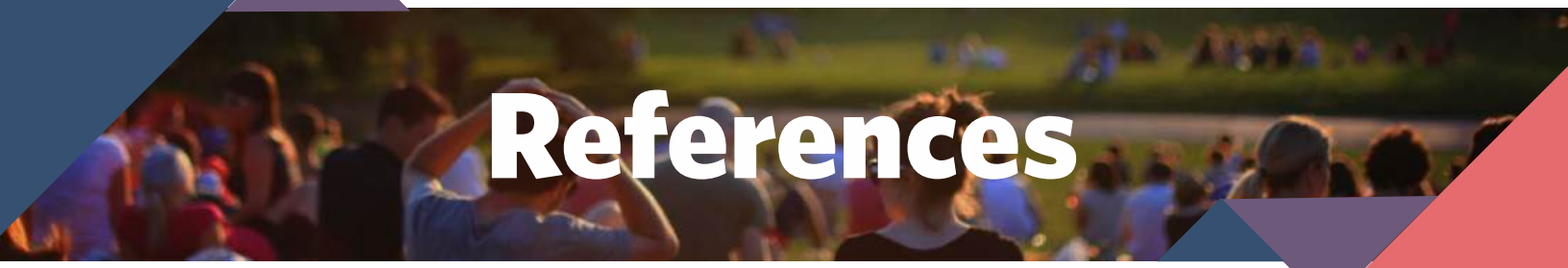
2. Ensure Regional Health Authority leadership to navigate the quickly-changing virtual care landscape. This includes coordinated regional guidance on platform selection, remuneration for associated practice costs and the need for a standardized consent documentation process. It also involves:
   a. Ensuring optimal technologies and processes to maintain patient privacy during virtual consultations;
   b. Accelerating the integration of video and telephone connectivity into virtual care platforms and ensuring the capacity to transfer patient data between providers

3. Maintain and develop appropriate fee codes to adequately remunerate care providers for virtual care, recognizing the need for increased comprehensiveness of visits

4. Develop virtual pathways that include regional specialist involvement in consultations to increase sustainability of rural specialist practice the sufficient clinical volume

5. Roll out virtual care platforms in the context of networks of care to facilitate linkages between geographically distant providers in order to develop a rural community of practice and support rural Continuing Medical Education and Quality Improvement

6. Implement a framework for evaluation and Continuous Quality Improvement to assess the integration, use and outcomes of virtual care, including patient and provider satisfaction and impact on previously established practices.



References

1. Adams SJ, Burbridge B, Chatterson L, McKinney V, Babyn P, Mendez I. Telerobotic ultrasound to provide obstetrical ultrasound services remotely during the COVID-19 pandemic. Journal of telemedicine and telecare. 2020 Oct 20:1357633X20965422.

2. Adams SJ, Burbridge BE, Badea A, Kanigan N, Bustamante L, Babyn P, Mendez I. A crossover comparison of standard and telerobotic approaches to prenatal sonography. Journal of Ultrasound in Medicine. 2018 Nov;37(11):2603-12.

3. Ahn D.T. The COVID-19 pandemic: A "Tech"-tonic shift toward virtual diabetes care. Journal of Diabetes Science and Technology. 2020; 14(4): 708-709.

4. BC Centre for Disease Control. Antenatal Visits During the COVID-19 Pandemic. 2021, Mar 11. http://www.bccdc.ca/Health-Professionals-Site/Documents/COVID19_AntenatalVisitsDuringPandemic.pdf.

5. Bidmead E, Lie M, Marshall A, Robson S, Smith VJ. Service user and staff acceptance of fetal ultrasound telemedicine. Digital health. 2020 May;6:2055207620925929.

6. Bronstein JM, Ounpraseuth S, Jonkman J, Fletcher D, Nugent RR, McGhee J, Lowery CL. Use of specialty OB consults during high-risk pregnancies in a Medicaid-covered population: initial impact of the Arkansas ANGELS intervention. Medical Care Research and Review. 2012 Dec;69(6):699-720.

7. Brown HL, DeNicola N. Telehealth in maternity care. Obstetrics and Gynecology Clinics. 2020 Sep 1;47(3):497-502.

8. Chan S, O'Riordan A, Appireddy R. Exploring the determinants and experiences of senior stroke patients with virtual care. Canadian Journal of Neurological Sciences. 2020. 48(1); 87-23.

9. de Mooij MJ, Hodny RL, O'Neil DA, Gardner MR, Beaver M, Brown AT, Barry BA, Ross LM, Jasik AJ, Nesbitt KM, Sobolewski SM. OB Nest: reimagining low-risk prenatal care. In Mayo Clinic Proceedings 2018 Apr 1 (Vol. 93, No. 4, pp. 458-466). Elsevier.

10. Division of Family Practice. Microblogging MD Launched. 2021. https://divisionsbc.ca/thompson-region/community/newsletters/2018-may-newsletter/04

11. Doxy.me. For Patients. 2021. https://doxy.me/en/.

12. Eswaran H, Magann EF. Use of Telemedicine and Smart Technology in Obstetrics: Barriers and Privacy Issues. Clinical Obstetrics and Gynecology. 2021 Jun 29;64(2):392-7.

13. Feeley, Derek. The Triple Aim or the Quadruple Aim? Four Points to Help Set Your Strategy. 2017, Nov 28. http://www.ihi.org/communities/blogs/the-triple-aim-or- the-quadruple-aim-four-points-to-help-set-your-strategy.

14. Grzybowski S, Fahey J, Lai B, Zhang S, Aelicks N, Leung B, Stoll K, Attenborough R. The Safety of Canadian Rural Maternity Services: A Multi-Jurisdictional Cohort Analysis. BMC Health Services Research. 2015;15;410.

15. Haynes SC, Dharmar M, Hill BC, Hoffman KR, Donohue LT, Kuhn-Riordon KM, Rottkamp CA, Vali P, Tancredi DJ, Romano PS, Steinhorn R. The impact of telemedicine on transfer rates of newborns at rural community hospitals. Academic pediatrics. 2020 Jul 1;20(5):636-41.

16. Health Canada. British Columbia Virtual Care Action Plan. 2021, June 25. https://www.canada.ca/en/health-canada/corporate/transparency/health-agreements/bilateral-agreement-pan-canadian-virtual-care-priorities-covid-19/british-columbia-action-plan.html.

17. Hsiehchen D, Muquith M, Haque W, Espinoza M, Yopp A & Beg M.S.. Clinical efficiency and safety outcomes of virtual care for oncology patients during the COVID-19 pandemic. JCO Oncology Practice. 2021.17(9);1327-1332.

18. Ho K. Virtual care in the ED: a game changer for the future of our specialty? CJEM. 2021 Jan 23(1):1-2.

19. Iglesias S, Kornelsen J. An evidence-based program for rural surgical and obstetrical networks. Rural and Remote Health 2018; 18(4):4912. https://doi.org/10.22605/RRH4921.

20. Ivey TL, Hughes D, Dajani NK, Magann EF. Antenatal management of at-risk pregnancies from a distance. Australian and New Zealand Journal of Obstetrics and Gynaecology. 2015 Feb;55(1):87-9.

21. Kern-Goldberger AR, Srinivas SK. Telemedicine in obstetrics. Clinics in Perinatology. 2020 Dec 1;47(4):743-57.

22. Kim J, Friedman J, Clark S, Hafeez B, Listman D, Lame M, Eid D.A.B, Sharma R, Platt S. Implementation of a Pediatric Emergency Telemedicine Program. Pediatr Emerg Care. 2020;36(2);104-107.

23. Kornelsen J, Grzybowski S. The Costs of Separation: The birth experiences of women in isolated and remote communities in British Columbia. Canadian Women Studies Journal. 2005;24(1), 75-80.

24. Kornelsen J, Khowaja A, Av-Gay G, Sullivan E, Parajulee A, Dunnebacke M, Egan D, Balas M, Williamson P. The rural tax: comprehensive out-of-pocket costs associated with patient travel in British Columbia. BMC Health Services Research. 2021;21(1).

25. Leighton C, Conroy M, Bilderback A, Kalocay W, Henderson JK, Simhan HN. Implementation and impact of a maternal–fetal medicine telemedicine program. American journal of perinatology. 2019 Jun;36(07):751-8.

26. Lowery C, Bronstein J, McGhee J, Ott R, Reece EA, Mays GP. ANGELS and University of Arkansas for Medical Sciences paradigm for distant obstetrical care delivery. American Journal of Obstetrics and Gynecology. 2007 Jun 1;196(6):534-e1.

27. Race Rapid Access to Consultative Expertise. About RACE. http://www.raceconnect.ca/about-race/.

28. Rural Coordination Centre of BC. Real-Time Virtual Support (RTVS) Overview. 2021., https://rccbc.ca/rtvs/

29. Rural Coordination Centre of BC. RUDi (Rural Urgent Doctor in-aid). 2021. https://rccbc.ca/rtvs/rtvs-pathways/rudi/.

30. Rural Coordination Centre of BC. RTVS Pathways: Use Case with ROSe and RUDi. 2020, Sept 29. https://enews.rccbc.ca/2020/09/29/rtvs-pathways-use-case-with-rose-and-rudi/.

31. Shaw J, Jamieson T, Agarwal P, Griffin B, Wong I, Bhatia RS. Virtual Care Policy Recommendations for Patient-centred Primary Care; Findings of a Consensus Policy Dialogue using a Nominal Group Technique. J Telemed Telecare. 2018; 24(9): 608-615. Doi: 10.1177/1357633X17730444.

32. Smith VJ, Marshall A, Lie ML, Bidmead E, Beckwith B, Van Oudgaarden E, Robson SC. Implementation of a fetal ultrasound telemedicine service: women's views and family costs. BMC Pregnancy and Childbirth. 2021 Dec;21(1):1-8.

33. Ukoha EP, Davis K, Yinger M, Butler B, Ross T, Crear-Perry J, Perron-Burdick M, Nijagal MA. Ensuring Equitable Implementation of Telemedicine in Perinatal Care. Obstetrics and Gynecology. 2021 Mar;137(3):487

34. Whittington JR, Magann EF. Telemedicine in High-Risk Obstetrics. Obstetrics and Gynecology Clinics of North America. 2020 Apr 29;47(2):249-57.

35. Wood D. STORC helps deliver healthy babies: the telemedicine program that serves rural women with high-risk pregnancies. Telemedicine and e-Health. 2011 Jan 1;17(1):2-5.

MOM
MOBILE MATERNITY

The Centre For Rural Health Research

SSC
SPECIALIST SERVICES COMMITTEE

UBC
THE UNIVERSITY OF BRITISH COLUMBIA