Informing Mobile Health Policy for Pregnant Women in Rural Populations in Canada, with a Focus on Pre-Eclampsia

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Abstract. Canadian healthcare suffers rural disparities, especially in maternal and prenatal care. Drawing on a literature review, the paper highlights the potential of mobile health (mHealth) applications to bridge this gap and improve maternal care in rural communities. mHealth tools have great potential for knowledge and trust-building among healthcare workers and pregnant women. To support the success of these solutions, more funding and policy support are required. mHealth solutions have a great potential for great economic savings while addressing healthcare disparities and ensuring everyone has access to high quality care.

Keywords. Maternal health, pre-eclampsia, mobile health (mHealth), health policy, rural communities

1. Introduction

Rural disparities in maternal and prenatal health are a significant source of concern in Canada. Women residing in remote areas tend to have certain attributes that increase their risk of poor pregnancy outcomes, such as comparatively high teen birth rates and living in less prosperous communities [1]. Women in rural areas are 40% more likely to suffer deliveries involving severe maternal morbidity and are 17% more likely to be readmitted to the hospital when compared to their urban counterparts [1]. In addition, the infant mortality rate is 2.6 times higher for those living in less resource abundant areas [2]. Fortunately, mobile health (mHealth) has been acknowledged, on a global and national level, for its vital role in rejuvenating healthcare [3]. Thus, this paper issues a call to action for provincial health authorities to utilize clinician-facing mHealth for the early detection of pre-eclampsia (PE), a potentially fatal complication of pregnancy hypertension. The outcomes of mHealth studied in this scope of research, like PIERS on the Move (POM), demonstrate that there is an immense opportunity for mHealth to intervene to bridge rural disparities [4-6]. Ultimately, this paper aims to address rural disparities in Canada by promoting policy-driven mHealth solutions focused on maternal and prenatal care.

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2. Methods

Academic databases including PubMed, Embase, and Web of Science were used to retrieve 18 articles for the rapid review with the following search sentence: "(((mHealth) AND (women)) AND (preeclampsia)) AND (rural)". The Covidence software program was used to manage the articles and 5 duplicates were removed. The inclusion criteria were pregnant women, children, mHealth diagnosis, management of pre-eclampsia, management of maternal health, health equity, health policy, and rural health. The exclusion criteria were non-pregnant women and any other digital health tool (telemedicine). The resulting 11 articles were screened as part of the title and abstract screening. 5 articles were examined in the full-text review to derive insights for the results table.

3. Results

Table 1. Review of studies focused on maternal health mHealth applications captured in the search strategy, compiling study source, location, application name, and the most relevant outcomes.

Study Source	Location	mHealth	Relevant Outcomes	Intervention Barriers
Boene et al., 2021	Rural Mozambique	PIERS on the Move (POM)	Increased knowledge on pregnancy complications. Confidence in recognizing danger signs related to PE and administering injections for seizures. Accuracy measuring blood pressure.	Incomplete visits due to poor connection to pulse oximeter or battery life depletion.
Charanthi-math et al., 2021	Rural India	POM	Confidence in recognizing signs of labor. Comfortability accompanying pregnant women that require medical attention.	Incomplete visits and battery life depletion. Too many fields or complex to correct mistakes.
Kinshella et al., 2021	Rural Pakistan	POM	Earlier detection of PE and more timely decision-making to seek care. More effective and valuable delivery of community health services.	Patient concerns with data-sharing of photos.
Abejirind-e et al., 2018	Rural Ghana	Bliss4Mi dwives (B4M)	Improved knowledge and skills of health workers. Increased patient trust in diagnostic advice and motivated referral compliance.	Lack of education on intervention and patient distrust in B4M.
Wirth et al., 2018	Rural Bangladesh	uChek©	Processed 10-20 urinalysis tests within half an hour compared to standard of 1 test per half an hour. Reduced wait times and human error.	Barriers were not discussed.

Note. All mHealth applications listed target community health workers by assessing the risk of pre-eclampsia. B4M also screens for gestational diabetes and anemia.

4.   Discussion

The literature underscores the potential of mHealth applications as valuable tools for midwives globally, particularly in non-invasive screening for pregnancy-related complications such as PE, gestational diabetes, and anemia [4-8]. For instance, the POM app has shown significant effectiveness in predicting adverse outcomes of PE in rural areas of India, Mozambique, and Pakistan, improving maternal health outcomes, and reducing hospital readmissions [4-6]. Tailoring digital health interventions, like POM, for rural areas in Canada could benefit both patients and healthcare providers. This can alleviate the substantial economic burden associated with managing PE, which currently costs the Canadian healthcare system $8.6 million [9, 10]. Implementing mHealth apps holds the potential to save over $1.3 million in healthcare costs, despite the need for addressing challenges related to implementation and usability, offering a promising means for empowering midwives, and providing essential guidance and support to pregnant women in resource-limited settings [9, 10].

Ultimately, the value of mHealth's ability to promote knowledge and trust building will reap in higher quality care, proactive decision-making before adverse events occur, patient compliance, and patient empowerment.

4.1. Policy Options

Dubbed "a country of perpetual projects", it is rare for projects in Canada to move beyond the pilot stage to sustainable programs [11]. This is a waste of investment, research effort, and time, where there is a great potential to deliver better quality and access to care. To increase usage of mHealth tools to address PE, evidence-based apps with proven efficacy should be added as a service to the Schedule of Benefits. Having clear insurance coverage for these tools helps to establish long-term support for their usage and supports the sustainability of their implementation.

To help guide clinicians to effectively use mHealth solutions and integrate the tools with their practice, specific clinical guidelines are required. The Canadian Medical Association developed a few guiding principles for physicians recommending mHealth apps to patients but there are no explicit guidelines for how to manage and control data flow, interpret analysis or recommendations given by the app, or remain compliant with privacy regulations [12]. Clinical guidelines created by the Society of Obstetricians and Gynecologists of Canada for using mHealth tools to treat PE not only ensures a standard quality of care with the way these tools are used in clinical practice, but it also makes it easier to evaluate the success of these tools.

Because of the digital divide, rural communities tend to have less digital literacy skills, affecting patients' and providers' ability to use mHealth tools. To address this, Canada's Digital Literacy Exchange Program should be adapted to train patients and providers in rural communities to use mHealth tools with high fidelity. Higher digital literacy not only enables individuals to gain the full benefits of the tool, but it also helps foster trust in the technology and improves patient engagement [13].

In developing mHealth solutions as a tool to improve outcomes and access to healthcare amongst rural populations, it is also vital to make sure that these tools do not inadvertently become barriers for the very populations trying to be served. Infrastructure such as good network connectivity are integral to the feasibility of mHealth. However, with 38% of rural households lacking access to a sufficient internet connection, this is not a universally accessible resource [14]. One possible solution is to provide direct-to-

consumer subsidies for broadband access for these populations. The government of Canada launched a similar initiative, Connected Families, in 2017 for low-income families [15]. Extending this initiative to increase access to quality healthcare to rural communities would be in keeping with Canada's Connectivity Strategy, which aims to increase access to stable high-speed internet to support Canada's social and economic development [16].

5.   Conclusion

A view of the healthcare system through a lens of rural health shows the inequities faced by rural communities. However, other sectors of healthcare also have underlying inequities rooted in racism, sexism, classism, and other forms of discrimination. While many discriminated groups have a unique history with the healthcare system and require their own individualized strategies and approaches, many can benefit from the same policies recommended in this paper. In continuing this work, more research is required on experiences and outcomes of discriminated populations, especially with consideration to intersectional identities. However, these disparities are ultimately systemic and while technology like mHealth tools can make a positive impact on the experiences of affected people, they do not replace policy interventions targeting the upstream social determinants and reducing the root disparities.

Acknowledgement

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