SmartMom: teaching by texting

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Citation: UBCMJ. 2020: 11.2 (9-10)

MHealth, or mobile health, leverages the use of cellular devices and digital media to achieve health-related goals. It encompasses the use of mobile communication and multimedia, and their integration in wireless health care delivery systems. There is much evidence from randomized controlled trials that mobile health (mHealth) can change health behaviour, including smoking cessation, weight loss, physical activity, and stress management.[1-5] The Health Belief Model of Behavior Change theorizes that recipients change their beliefs and attitudes as a result of information received at the point of decision making. Messages serve as a cue to action, essentially providing "just-in-time" salient tips to help motivate behaviour choices.[1]

Prenatal education is designed to teach women and their support persons about the physiological and psychological changes of pregnancy, what to expect during prenatal care, and how to prepare for labour, birth, and newborn care. Attendance at prenatal education classes has been associated with higher rates of attendance at prenatal care, compliance with prenatal screening, lower rates of preterm birth and low birthweight,[2] and higher rates of vaginal births in Canadian[3] and U.S.[4] observational studies. In Canada, only 32% of pregnant women attend prenatal classes, and those in rural locations are even less likely to attend. Women are increasingly turning instead to the internet, especially smartphone pregnancy apps, to navigate the complexities and challenges of pregnancy and birth. However, there are concerns about the quality of this information. An overview of 370 apps found through the Google Play Store reported that only three apps documented having a scientific board.[5] Furthermore, there are concerns about bias. A recent cross-sectional review reported that the most common sources of content for apps were either website portals for laypersons or commercial sites, rather than healthcare organizations.[6] In Canada, the most popular pregnancy website is the Johnson & Johnson's owned *babycenter.ca*. Sites driven by consumer-based advocacy organizations, such as *mothersofchange.org*, *todaysparent.com*, or forums such as *parentscanada.com* do not reference sources for their content. In addition, information available from the internet is potentially overwhelming in its sheer volume, exacerbating the difficulty of identifying accurate, relevant, evidence-based, and unbiased information. Finally, there are concerns about the completeness and timeliness of information that is not organized to provide the right information to the right person at the right time. For example, a study examining the content of two frequently used free U.S. apps, *Text4Baby* and *My Pregnancy Today*, reported that neither delivered comprehensive prenatal information.[7]

To address the need for accessible and reliable prenatal education, our research group (*www.optimalbirthbc.ca*) created "SmartMom," Canada's first prenatal education program delivered to cellphones by short message service (SMS) text messaging (Figure 1). Women enrolled in SmartMom receive three SMS text messages each

Figure 1 | SmartMom Landing Page for Cell Phone.

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week. These messages focus on accessing knowledge, undergoing assessment, and adopting behaviours to support healthy pregnancy and physiologic birth. They provide information and links to online sources of evidence-based topics such as discomforts of pregnancy, fetal development, exercise and activity in pregnancy, nutrition, labour and birth, mental health, prenatal screening, and vaccinations. Messages also suggest topics of conversation with healthcare providers (Figure 2).

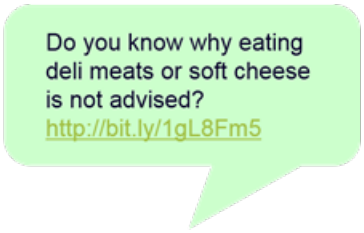

Figure 2 | Sample SmartMom message.

The messages are consistent with current professional guidelines and peer reviewed prenatal education curricula,[8] and have been endorsed by the Society of Obstetricians and Gynaecologists of Canada. They are brief (136 characters or fewer) and tested for health literacy (grade eight reading level). Messages contain embedded links to more detailed information online. Consistent with Social Cognitive Theory, our links also take women to interactive learning tools designed to enhance engagement and promote self-efficacy, critical elements in behaviour change.[9,10] Our focus group findings[11] and those of others[12] have reported that women want a "personalized touch" in digital programs. SmartMom provides optional supplemental streams for women who wish to have additional messages addressing special topics such as: reducing use of tobacco, alcohol or illicit drugs; depression; obesity; maternal age over 35; violence in the home; and vaginal birth after a prior cesarean section.

The back-end software sending messages to subscribers was developed by MEMOTEXT, a Canadian company with extensive experience in mHealth. The message set is anchored to the woman's due date so as to be relevant to each week of gestational age for individual participants. MEMOTEXT has developed an enrollment portal to allow women to quickly, anonymously, and securely enroll in the program by texting from a cell phone. The company is based in Toronto and encrypts and stores all data on Canadian servers. Impact Mobile, a Canadian aggregation company, directs messages sent by MEMOTEXT to subscribers via wireless carriers. The Canadian Wireless Telecommunications Association, a trade group that represents the cellular carriers, has successfully negotiated on our behalf with TELUS, Bell, Rogers, and other English-language carriers to allow our text messages to be delivered free of charge to users. In the unlikely event that participants live in areas without cellular coverage, the program can be accessed via the internet at *smartmomcanada.ca*. SmartMom has been successfully launched in the Northern, Fraser, and Interior Health Authorities in British Columbia, with Vancouver Coastal Health and the Northwest Territories joining in early 2020. SmartMom initially launched in 2017 as a pilot. Since then, over 5000 women have enrolled and 500 currently join each month.

To evaluate the program, women complete online surveys at enrollment and at completion of the program. Nearly all participants—99%—have indicated that the program was useful to them and that they would recommend it to a friend. They indicated that the reliability and comprehensiveness of the information were important factors in their satisfaction, as well as the fact that they did not have to search for information online. These reasons were closely followed by a desire to know about local resources and receive reminders related to their stage of pregnancy. Our evaluations to date have demonstrated significant improvements on knowledge tests and standardized measures of anxiety, depression, and fear of childbirth at completion of the program. We will be evaluating perinatal outcomes including rates of preterm birth, fetal growth restriction, and stillbirth, based on comparisons of enrolled versus non-enrolled women. Personal health numbers, provided by participants in a secure fashion to Memotext via the SmartMom website, will be sent to health authorities who will link them to health outcomes and then send de-identified data back to the investigators for outcome analysis. Our findings indicate that SmartMom is reaching our target audience of young (76% of participants), lower educational attainment (18% with high school education or less), Indigenous (9%), and visible minority populations (33%).

The future of health education is tied to advantages found in the use of digital media and mobile technology. SmartMom exemplifies use of mHealth to improve access to health education for underserved populations to effect improvements in knowledge and health outcomes.

Conflict of interest

Dr. Pennington reports grants from BC Children's Hospital Research Institute, Peter Wall Institute for Advanced Studies, and the Alva Foundation during the conduct of the study.

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