Abstract

Background

Maternal and newborn mortality is a major problem especially in low- and middle-income countries, like Rwanda. Several causes that lead to these deaths are preventable. These include pre-eclampsia, obstructed labor, infections, post-partum hemorrhage, hypertensive disorders and newborn's failure to breathe. Strategies for prevention and treatment are grouped in a set of seven key obstetric services which have been identified by the WHO, UNICEF, and UNFPA referred to as Basic Emergency Obstetric and Newborn Care (BEmONC) services that can be provided by nurses and midwives. However, available research evidence on maternal and newborn care remains characterized by gaps on the appropriate measures in assuring the quality of BEmONC. Some of the documented challenges include; poor access to evidence-based clinical guidelines, limited knowledge and skills in BEmONC among healthcare workers, and lack of continuous learning opportunities. Indeed, several researchers have recommended that solutions that use mobile phones to improve health system functions, termed mHealth, potentially overcome some of these challenges. In that perspective, the current research investigated the use of an mLearning and mHealth decision support tool, the safe delivery mHealth application (SDA) in the management of the most frequent birth-related complications of postpartum hemorrhage (PPH) and newborn asphyxia in Rwanda. The study was founded on pragmatism theory and guided by the implementation research model to investigate the effectiveness, the symptomatology, and the acceptability of the SDA in the context of Rwanda.

Methods:

This research is a three-phased research (pre-SDA intervention, SDA intervention, and post-SDA intervention) using a pre-post intervention design with a convergent parallel mixed-method approach composed by four components:

- A qualitative component using semi-structured interview guides to conduct four focus group discussions with 26 nurses and midwives to elucidate their reflections on baseline knowledge and skills surveys results and baseline record review findings, and to explore their perceptions and experience of PPH management and neonatal resuscitation in district hospitals.

- A quantitative component using self-administered questionnaires (SAQs) completed by 54 nurses and midwives to assess the effects of the SDA intervention on knowledge and skills.
- A quantitative component using data extraction sheets to conduct a six months pre-SDA record review and a six months post-SDA record review to examine the effects of the SDA intervention on nurses' and midwives' clinical decision making with regards to maternal and newborn outcomes.
- Qualitative and quantitative descriptions of the acceptability and perceptions of the SDA among end-users and key stakeholders. The quantitative part used a self-administered questionnaire for the acceptability survey completed by all end-users (54 nurses and midwives). The qualitative part included two focus group discussions with 24 nurses and midwives and six key informant interviews with key stakeholders (two maternity matrons, two responsible for maternal and child health, and two district hospital managers).

Descriptive and inferential statistics were used to analyze the quantitative findings from the surveys and thematic analysis was used for qualitative data.

Findings:

Collectively, the findings in this thesis shed light on the beneficial effects of using the SDA as an mLearning and mHealth decision support tool in the context of Rwanda. First, the findings highlighted longstanding challenges faced by nurses and midwives when managing birth-related complications, such as PPH and newborn asphyxia, in district hospitals in Rwanda. Some of the key challenges like insufficient skills, lack of continuous learning opportunities, and limited access to evidence-based clinical guidelines to support their daily clinical decisions are solved by the use of the SDA in routine practices. In addition, Pre-post SDA surveys highlighted the effectiveness of the mLearning feature of the SDA in the context of Rwanda and revealed a significant increase of knowledge scores and skills scores on PPH management and NR among nurses and midwives. Also, the pre-post SDA records review analysis highlighted the effect of the decision support feature of the SDA in the context of Rwanda and revealed a significant association between the SDA intervention and newborns' and maternal' outcomes following neonatal resuscitation and PPH management. Further, the nurses and midwives perceived the SDA as having improved their ability to manage childbirth complications. They indicated general agreement that the SDA is easy to use, is an effective decision support tool, and training tool. They also reflected on future use of the SDA in Rwanda by suggesting additional features and functions to the SDA developers such

as computer/laptop version of the SDA, additional videos, SDA version in the local language, and a discussion forum in the SDA. Key stakeholders also perceived the SDA as a useful tool with a reasonable cost and recommended its implementation in routine practices. They were optimistic that the SDA could be scaled up and be sustained in the whole country.

Conclusion:

This study has proved through its findings the importance of using the SDA in routine practices, which was associated with improved knowledge and skills in PPH and NR as well as improved maternal and newborn outcomes. In addition, The SDA was accepted and perceived useful by both end-users and key stakeholders. The study, thus, concludes that the SDA show promise for improving the management of birth-related complications such as PPH and newborn asphyxia. These findings are highly relevant in low- and middle-income countries like Rwanda, where maternal and newborn deaths from preventable causes are still present and quality emergency obstetric and newborn care is the ultimate target. Future long duration research is needed on the scalability, cost- effectiveness and sustainability of the SDA in the context of Rwanda. A further assessment of the SDA contribution to the reduction of maternal and newborn mortality is also needed.

Keywords: BEmONC; post-partum hemorrhage, neonatal resuscitation, nurses and midwives, mHealth, mLearning, safe delivery mHealth application, Rwanda.