

The Nurse Assistant App

Citation for published version (APA):

van Pelt, S. (2021). *The Nurse Assistant App: development and evaluation of an electronic decision aid to improve the quality of antenatal care in Magu district, Tanzania*. Gildeprint Drukkerijen. <https://doi.org/10.26481/dis.20210917sp>

Document status and date:

Published: 01/01/2021

DOI:

[10.26481/dis.20210917sp](https://doi.org/10.26481/dis.20210917sp)

Document Version:

Publisher's PDF, also known as Version of record

Please check the document version of this publication:

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Impact

Worldwide, pregnant women are at risk of pregnancy-related health complications. This risk is substantially higher for women living in low- and middle-income as opposed to high-income countries and where there is limited access to high-quality maternal health services such as antenatal care. The main aim of this dissertation was to investigate whether an electronic decision aid would be useful to support improvements in the quality of antenatal care in a low-income country.

The studies in this dissertation describe the situation regarding the provision of antenatal care in Magu district, Tanzania, and provide several suggestions for improvement from a broad variety of perspectives. Both healthcare workers and pregnant women expressed the need for improved infrastructure to ensure the availability of medication, equipment, and diagnostics. High quality antenatal care is difficult to ensure without basic health facility infrastructure in place including basic stock and availability of equipment required in antenatal care. We found in our research that participating health facilities could only deliver 25% of essential services for pregnant women. Not receiving essential antenatal care interventions can not only negatively impact health outcomes of pregnant women and their unborn child but also influences a women's decision to seek care and the motivation of healthcare workers in delivering care. Moreover, innovations such as an electronic decision aid are likely to fail without a supportive environment for adoption and implementation. These results show that there is a need for decision-makers at the regional (district) and national level to focus on upgrading basic health facility infrastructure as a foundation for better healthcare, including antenatal care. This should be enabled before introduction or investing in new innovations that the healthcare facility climate may not yet be ready for or benefit optimally from.

The results of this dissertation might also be relevant for programme developers in Tanzania or other low- and middle-income countries considering developing and implementing an electronic decision aid in healthcare settings. Available evidence focuses on the outcomes of digital health interventions and much less on process optimization in the development or implementation phase. This dissertation is one of the first to present a practical and accessible evaluation and lessons learned from the *development and implementation process* of an electronic decision aid in low-resource settings. This pragmatic evaluation presents examples and lessons learned during this process and shares important considerations and pitfalls to avoid when developing and implementing an electronic decision aid.

In our research we reported that health facilities where the electronic decision aid was used during antenatal care obtained a *lower* completeness score for delivery of essential antenatal care services compared to control facilities. Reasons for this decrease in antenatal care service delivery at health facilities using the electronic decision aid might be the extra burden this tool places on healthcare workers. Indeed, in the qualitative part of this mixed-methods research project, healthcare workers expressed that the electronic decision aid increased

their workload and took more time than using the paper-based registration system. These results might help programme developers in taking an informed decision to focus on the development of an electronic decision aid or focus on other interventions first optimize the conditions for a future health intervention, including the training of staff. Furthermore, for programme developers considering developing and implementing an electronic decision aid, these findings draw attention to the need to comprehensively map local contextual factors that are likely to influence implementation, and design clear implementation protocols for an intervention, which are agreed upon and co-developed with local implementers to ensure alignment with local realities.

Finally, this dissertation is of direct relevance for international organisations aiming to improve healthcare in low- and middle-income countries through the development of an electronic decision aid. Through the case of the implementation of an electronic decision aid to promote antenatal care in Magu district, Tanzania, the conditions are described under which a programme is likely to fail or succeed. The primary goal of any electronic decision aid in healthcare settings is to enable better health outcomes or healthcare improvements. To reach this, it is important that the local healthcare system and contextual factors are understood and reflected in the development, implementation, and designs of the electronic decision aid. Historically, many international organisations have focused on developing interventions or electronic decision aids which are well intentioned but did not sufficiently account for local health system or infrastructure challenges and realities. This might create a mismatch between envisaged outcomes of an intervention and actual possibilities given local realities and factors. This dissertation highlights the importance of formative work in intimately understanding the local context and infrastructure as these factors can significantly impact the uptake of an intervention and its possibility for being embedded in clinical practice over time.