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Usability and feasibility of a tablet-based Decision-Support and Integrated Record-keeping (DESIRE) tool in the nurse management of hypertension in rural western Kenya



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ABSTRACT

Background: Mobile health (mHealth) applications have recently proliferated, especially in low- and middle-income countries, complementing task-redistribution strategies with clinical decision support. Relatively few studies address usability and feasibility issues that may impact success or failure of implementation, and few have been conducted for non-communicable diseases such as hypertension.

Objective: To conduct iterative usability and feasibility testing of a tablet-based Decision Support and Integrated Record-keeping (DESIRE) tool, a technology intended to assist rural clinicians taking care of hypertension patients at the community level in a resource-limited setting in western Kenya.

Methods: Usability testing consisted of "think aloud" exercises and "mock patient encounters" with five nurses, as well as one focus group discussion. Feasibility testing consisted of semi-structured interviews of five nurses and two members of the implementation team, and one focus group discussion with nurses. Content analysis was performed using both deductive codes and significant inductive codes. Critical incidents were identified and ranked according to severity. A cause-of-error analysis was used to develop corresponding design change suggestions.

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Abbreviations: AMPATH, Academic Model Providing Access to Healthcare; AMRS, AMPATH Medical Record System; CDM, chronic disease management; CVD, cardiovascular disease; DESIRE, Decision Support and Integrated Record-keeping; HIV, human immunodeficiency virus; LMICs, low- and middle-income countries; mHealth, mobile health; ODK, Open Data Kit; SSA, sub-Saharan Africa.

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Results: Fifty-seven critical incidents were identified in usability testing, 21 of which were unique. The cause-of-error analysis yielded 23 design change suggestions. Feasibility themes included barriers to implementation along both human and technical axes, facilitators to implementation, provider issues, patient issues and feature requests.

Conclusions: This participatory, iterative human-centered design process revealed previously unaddressed usability and feasibility issues affecting the implementation of the DESIRE tool in western Kenya. In addition to well-known technical issues, we highlight the importance of human factors that can impact implementation of mHealth interventions.

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1. Introduction

The number and type of mobile health (mHealth) applications, developed for a wide variety of health interventions, have proliferated over the past several years. This is particularly true in low- and middle-income countries (LMICs), where mHealth solutions have been proposed to address the huge shortfalls in qualified health professionals by complementing a taskredistribution strategy with clinical decision support [1]. While there has been a subsequent surge in the literature following the rapid growth in mHealth interventions, most studies have been focused on the outcomes of interventions. Relatively few have explained what components contribute to successful outcomes and what aspects lead to failed implementation, despite the recognition that lack of attention to usability and feasibility issues has been shown to increase overall costs and delay successful implementation [2,3]. In addition, feedback for iterative system improvement is relatively lacking [4]. A recent systematic review of mHealth literature demonstrated that only 14% of studies reported on user assessment of technology [5].

Of the mHealth usability and feasibility studies that have been published, very few have been conducted in sub-Saharan Africa (SSA) [5]. Technical challenges that have been reported include lack of broadband Internet access, inconsistent or limited network availability, transmission error detection and management, transmission of large files, ensuring patient privacy during wireless transmission, information security, phone security and sharing, and usability issues [1,6]. Administrative challenges include lack of business model, insufficient strategic leadership, absence of a change management plan, difficult learning environment, limited buy-in from practitioners, high staff turnover, and limited eReadiness [1,7].

While the majority of the mHealth literature has involved infectious and maternal health issues, cardiovascular disease (CVD) is the leading cause of mortality in the world, with 80% of CVD deaths occurring in LMICs [8]. Hypertension, a major risk factor for CVD, contributes significantly to the burden of CVD in SSA. However, awareness, treatment, and prevention of hypertension remain very low throughout SSA [9,10]. In order to properly address the human resource challenge of managing CVD and hypertension in LMICs, task-redistribution of CVD care from physicians to nurses has been proposed [11]. In this context, mHealth interventions to support hypertension and CVD care delivery have been developed and are being evaluated [12,13]. For example, the Academic Model Providing Access to Healthcare (AMPATH), based in western Kenya, has recently expanded its clinical scope of work from human immunodeficiency virus (HIV) to address non-communicable diseases, including an integrated diabetes and hypertension care program. To supplement its task redistribution strategy, AMPATH has developed a tablet-based Decision Support and Integrated Record-keeping (DESIRE) tool to record patient data and assist rural clinicians with clinical decision-making. From the outset of the project, it was recognized that an iterative process of usability and feasibility assessment would be critical for the potential successful implementation and scale-up of the project. Thus, this usability and feasibility study was conducted to assess the barriers and facilitators to implementing the DESIRE tool.

2. Methods

Usability and feasibility testing of the DESIRE tool is one component of a larger implementation research project evaluating different aspects of nurse management of hypertension in western Kenya [14]. Institutional review boards at the Icahn School of Medicine at Mount Sinai (New York) and Moi University College of Health Sciences (Kenya) have approved the protocol.

2.1. Setting

AMPATH is a collaboration among Moi University College of Health Sciences, Moi Teaching and Referral Hospital, and a consortium of North American universities and medical centers, founded in western Kenya in 2001 [15]. The partnership works to deliver health services through the Kenyan Ministry of Health facilities, and has established a human immunodeficiency virus (HIV) care system in western Kenya that serves over 100,000 patients. In partnership with the Government of Kenya, AMPATH is expanding its clinical scope of work to address comprehensive primary care, including hypertension.

Currently in Kenya, only physicians are authorized to manage hypertension [16]. Traditionally, the nurse's role in hypertension care is to enhance self-management strategies by educating and counseling the patient about medication adherence and lifestyle modification [17]. In general, if a patient is found to be hypertensive, they would require referral to a hospital to be further evaluated and managed by a physician. AMPATH has a Memorandum of Understanding with Download English Version:

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