Medication Safety + Mobile Health = Patient Engagement in CKD

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Traditional health care has often meant a focus on quality, the encounter with the patient, and over the last 20 years, evidence-based care. As a whole, these features represented key foundational pieces for care models. Today, a variety of new themes or trends is coming to bear simultaneously on top of that foundation, including patient centeredness, optimal use of technology, safety, and patient self-management.

In their paper "Remote usability testing and satisfaction with a mobile health medication inquiry system in CKD," Diamantidis *et al.* (1) bring these themes together. Diamantidis *et al.* (1) conducted a substudy as part of the Safe Kidney Care Cohort Study (ClinicalTrials.gov NCT 01407367) by recruiting 20 subjects to test a mobile health medication inquiry system (MIS) using either short messaging service text or a personal digital assistant with stoplight imagery. After a tutorial, subjects were given three sample pill bottles with names of randomly selected medications. The subjects then inputted the medication name into the MIS. The MIS then provided one of four responses related to the medication's safety in CKD: safe, not safe, use with caution, or an error message.

Importantly, the subjects also received the eHealth Literacy Scale assessment, a validated tool for identifying, assessing, and using electronic health information (2). The text messaging modality was limited in terms of medication database availability, and therefore, only eight potential medications were included in that part of the study. Overall satisfaction with the MIS was high, and there were only three error messages during the conduct of the study.

The use of patient-centered technology and commonly accessed communication methods in a home setting addressing medication safety is significant. Injuries related to medication use or medication errors are common, clinically significant, and often very expensive. In the acute care setting, rules–based decision support systems and changes to order entry processes have reduced medication error rates and adverse drug events (3). However, despite a wide variety of mobile applications addressing medication adherence in outpatient and nonclinical settings (4) and pharmacist-assisted education in retail settings, there has been far less work examining medication safety in direct-to-patient and home settings.

Mobile health technologies (mHealth) seem to have an ever-expanding role in health care, with some ambiguity as to the best setting or use of such technology. mHealth can (*1*) store, manage, and transmit data; (*2*) provide clinical decision support; and (*3*) facilitate distance care (5). Examples of the last include mental health care for symptom assessment, educational purposes, resource locations, and tracking of treatment progress (6).

In general, it has been difficult to determine if mHealth-delivered applications alter self-management of chronic illnesses. A recent analysis examined a number of different study constructs, including randomized, controlled trials, interrupted time series studies, controlled before and after studies, and quasi randomized, controlled trials (7). In patients with diabetes, there was a small degree of evidence that self-management may have been enhanced, and in patients with asthma, there were greater improvements in peak expiratory flow. However, in terms of clinical outcome measures, such as hemoglobin A1C and BP control, as well as health care resource use measures (*e.g.*, additional clinic visits or hospitalizations), there was very little evidence of a beneficial effect from mHealth interventions. In other settings, mHealth interventions had differential effects, including an association with increased medication adherence and reduced viral load in HIV and improved maintenance of smoking cessation (8).

Diamantidis *et al.* (1) directed their approach differently. Diamantidis *et al.* (1) tackled an interface between education, patient engagement, and self-management. Although basic information provided through web-based education is passive, Diamantidis *et al.* (1) personalized the education process through training and individual device use, making it more interactive. Not surprisingly, user satisfaction with MIS was high. In nonclinical areas, mobile phone applications are more likely to have a positive effect when they are informational and user centered (9), two features relevant to this study construct.

Technology use carries with it additional considerations. Personal digital assistants and most smartphones have small screen sizes and variable data entry options, bandwidth, and memory (10). In this context, the study by Diamantidis *et al.* (1) was straightforward and also, somewhat minimalistic. As a usability assessment of a fundamental mHealth tool, the study was well done. As a study of mHealth, there are features of advancing technology that make a study like this both positive and obsolete at the same time. The rapid advancement of

new technologies, such as tablets, is an important consideration, especially given the greater ease of their use by some older individuals, including differential font size, larger display, and higher-contrast text versus smaller devices (11). In addition, the evolution of application program interfaces (the routines, rules, protocols, and tools for building software components that define how they interact and their programming interfaces with users) positions the content delivery embedded in this study as both straightforward but at a foundational level versus the far more expanded use of interactive technology available today.

The usual caveats of any clinical study could well be applied to this work, casting it, at best, in an ambiguous light. This study was not powered. It did not have a set of defined clinical outcomes. It was not randomized. However, Diamantidis *et al.* (1) did not conceive of this work in this way. Diamantidis *et al.* (1) declared their work usability testing, and this type of study is actually very important. It sits at the intersection of implementation science and the pragmatic acceptance of contemporary culture that inserts itself into our practice on a regular basis. Moreover, it fundamentally engages the principles of safety (medication safety), effectiveness (gauging the effect of communication modalities), efficiency (patient ease of use), timeliness (rapid feedback), equity (eHealth literacy), and patient centeredness, the tenets proposed originally by the Institute of Medicine in Crossing the Quality Chasm (12) as fundamentals of a health care system that meets patient needs.

The recognition that mobile technologies are part of our existence is now self-evident to anyone who uses a smartphone or tablet. The fact that we can harness such technology to better treat CKD is logical. What Diamantidis *et al.* (1) have done is extend that treatment platform beyond traditional care settings into the home. Diamantidis *et al.* (1) have used a tool to create a small but very important first step in achieving patient engagement and patient satisfaction in self-care.

Disclosures

None.

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