Improving medical adherence in cardiovascular disease management with mHealth technologies

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The availability of valuable resources for patients and physicians to use for disease prevention and chronic disease management is rapidly expanding. Outpatient offices are being transformed into more patient-centric and empowering information centres while urgent care and emergency department facilities are working to streamline operations and improve the ease of patient care and communications. However, a large amount of innovation has also occurred outside of these traditional models. From web-based symptom queries and medical information platforms, smartphone-enabled apps for counting calories or providing baseline assessments of skin abnormalities to the countless new sensor devices for activity tracking, blood pressure monitoring, electrocardiographic assessment and beyond, a patient’s home can be nearly as sophisticated as a modern medical facility. The rapid growth in these mobile health (mHealth) technologies is as exciting as it is complex and we are only scratching the surface of understanding the challenges and opportunities brought by these novel medical technologies. The product of a perfect collision between the continued increases in computing power confined to ever-smaller dimensions and a global expansion of mobile connectivity, as evidenced by the ubiquity of smartphones, with the desire by patients to take a more active role in health management combined with the realization of the limits of the current medical systems, mHealth is on track to vastly transform medical practice. However, questions remain as to which interventions are the most promising and successful, how to integrate them into future models of care and which patients would truly receive the greatest benefit from the adoption of mHealth into their preventative or disease management strategies.

In this issue Gandapur and colleagues turn their attention to concentrate solely on randomized controlled trials utilizing mHealth interventions for medical adherence in the treatment of cardiovascular diseases. Although mHealth research remains in its infancy, there have been several prior systemic reviews to focus on adherence to date with mixed results, but this study is the first to focus only on cardiovascular disease. That the management of chronic cardiovascular disease is certainly different from managing mental health, infectious, pulmonary, or even paediatric diseases, all which have carefully been studied, their strategy to assess only cardiovascular diseases makes this an important contribution. Though indeed sharpening their focus on cardiovascular disease and including only high-quality trials, their analysis included only 10 studies total, the majority of which addressed ischaemic heart disease (6 studies) with the other conditions being poorly represented, hypertension (2 studies), and congestive heart failure and stroke each covered by single studies. While the paucity of trials available for study limited the breadth of this group findings, this limitation was further compounded by overall study heterogeneity both in regards to total number of participants and in follow-up time. For ischaemic heart disease alone, the trials spanned from 30 days to 1 year and included anywhere from 62 to 21 752 participants. Despite these differences and limitations, the improvements observed for various clinical parameters here are encouraging and heighten the need for additional high-quality clinical metrics moving forward.

As mHealth strategies gain traction with patients, practitioners, and health care systems, it is important to note that one size does not fit all. This goes for sensor and device technologies as well as any integrated communication and notification platforms. Just as in our clinical practices where we specifically tailor our risk/reward discussions to individual patients based on our personal interactions and history with them, the next step for mHealth as a whole will be one of adaptive learning and personalization. Taking a page from many social media platforms individualized content and targeting to move towards more individualized care should be a major priority in the years to come. Analogous to some of the hurdles of the self-driving car, the aspects limiting success are not entirely technological but human, or moreover the ability of the technology to adequately interface with humans. The majority of the studies examined by Gandapur and colleagues used text messaging as the primary mode of reminder communication for participants to take their medications. The promise and possibility of mHealth goes so much further than basic text messaging. Would Joaquin Phoenix’s character in the 2013 Hollywood film ‘Her’ responded to Scarlett...
Johansson as strongly if she communicated only via text messaging and was not completely aware of all the ups and downs or happiness and stress in his day-to-day life? While the success of digital medicine may not require such advanced, or privately invasive, artificial intelligence, it will likely ask for more than a passive, impersonalized, poorly timed, and static reminder by SMS. Interestingly, and supporting the concept that patients need to be central in the design process, when novel devices such as an ePill box with reminders were compared with just smartphone-based messaging for patient with congestive heart failure, the smartphone alone was preferred.11

As work is done to develop the next innovative mHealth tools and healthcare systems aim to incorporate these strategies into existing patient care models to improve patient outcomes and reduce healthcare costs, the need for creative input and collaboration from patients, clinicians, and engineers will be a key strategy for success. Just as Gandapur and colleagues expressed concern that our understanding of which specific aspects of various mHealth interventions act as the driving forces for improved outcomes remains poorly understood, the factors remain understudied. A cross-collaborative approach to future mHealth studies will benefit not only from maintaining the high-level clinical study framework we’re used to in medicine but also the inclusion of clinical psychologists and behavioural economists for a better understanding of the complex human factors affecting patient medical adherence outcomes.

Gandapur and colleagues have provided us with a high quality, thorough, and forward-looking assessment of the existing data pertaining to mHealth interventions to modify medical adherence in ischaemic heart disease, hypertension, congestive heart failure, and stroke. That mHealth has just recently started gaining the attention it deserves from academic medicine the inclusion of mHealth tools in advanced clinical research is only beginning. The signals for success here are encouraging, and our ability to better understand the complexities of adherence are likely to benefit from the advances in and integration of multi-platform mHealth data streams such as location, social media and social network patterns, activity levels, physiologic parameters in addition to mental and emotional health status. Though novel technologies may help unmask our understanding of the individual barriers to achieving optimized disease prevention and treatment goals, the human factors are certainly to remain a great challenge to complete success.

References