Health Science Inquiry

Who's Monitoring the Health-Monitoring Applications?

Anisa Morava[1] **and Yoah Sui**[1]

[1]University of Western Ontario

The proliferation of mobile health applications (m-Health apps) is dramatically changing the landscape of self-monitoring health behaviours. In 2010, approximately 200 million m-Health apps were downloaded worldwide, offering individuals the ability to track their calories, physical activity, sleep, ovulation cycle, and medications [1]. One third of Canadian adults reported using one or more m-Health apps to track health-related behaviours in 2017 [2]. m-Health apps can play an important role in optimizing health outcomes, particularly for users in locations with limited access to healthcare professionals [3]. Although m-Health apps can promote knowledge of, and engagement with, personal health and well-being, there are growing concerns regarding the quality and implementation of evidence-based information in these apps.

The majority of m-Health self-monitoring apps share similar features such as collecting demographic information to create an individual profile (*e.g.* age, sex, weight, etc.), providing an interface for data entry regarding the chosen health-related behaviour (*e.g.* a field to track foods consumed), and providing feedback in various formats (*e.g.* a graph of daily calories consumed). To truly promote accurate self-monitoring and ultimately positive behaviour change, the information gathered and delivered by these m-Health app features should be based on empirical research, which currently is not always the case. A recent review of maternal and child health apps revealed only 40% of the examined applications provided content from evidence-based medical literature [3]. Similarly, Pagoto and colleagues examined thirty weight management m-Health apps and concluded less than 20% of potential evidence-based behavioural strategies for weight loss were being employed [4].

The lack of evidence-based and accurate information used in m-Health apps negatively impacts their effectiveness in numerous ways. For instance, several m-Health apps omit collecting important demographic variables such as health literacy, education level and socioeconomic status, which have marked effects on health outcomes. These omissions can be potential barriers to successful health behaviour change [5]. Furthermore, when considering feedback delivery, ensuring its effective articulation can greatly enhance behavioural change. For instance, relapses during health behaviour change are very common [6]. While many m-Health apps notify users that their goal has not been met, they often fail to provide research-driven strategies to improve future goal attainment [6]. Moreover, inaccuracies in m-Health apps can have dangerous consequences. For instance, a review of skin lesion monitoring apps found 3 out of 4 apps incorrectly identified 30% of cancerous lesions as "unconcerning", highlighting the risks of unregulated apps on health-related decisions [7].

For m-Health apps to truly improve health, changes to the development, maintenance, and regulation of these apps are warranted. Ensuring collaboration amongst healthcare providers, researchers, application designers, and users during the development and maintenance of the application is a critical component to delivering accurate, high quality, and user-friendly content [3]. Moreover, a significant lag between current research findings and their availability on m-Health apps could potentially result in the promotion of ineffective strategies [8]. To combat this lag, implementing systems that connect application developers with up-to-date research could improve m-Health app success. These systems could involve m-Health application developers partnering with existing health authorities such as the National Institute for Health and Care Excellence (NICE), which is a group of healthcare providers, health researchers, and public health professionals who curate updated healthcare guidance reports to inform practice [9]. Organizations such as NICE can provide health-related content from their most recent reviews, as well as links to associated open-access journal articles for m-Health app developers to ensure content is current and credible.

The abundance of m-Health apps can also be overwhelming to users, and begs the question: which applications are more reliable and effective than others? Although rating systems on the App Store and Google Play Store exist, these ratings reflect the user's experience with the application, rather than the quality of information being presented. Beyond rating systems, m-Health apps, specifically for self-monitoring, have limited regulations [1]. Agencies such as the Food and Drug Administration and the National Health Service have made some progress, such as imposing regulations on m-Health apps to meet the criteria for a medical device and creating websites that review m-Health apps for users [10]. Although these are all positive steps towards improving the quality of m-Health apps, more rigorous and unified regulations alongside user ratings are needed to ensure high-quality information is being

delivered. Stakeholders should explore the development of a unified m-Health regulatory organization with a primary focus on enforcing high-quality and updated scientific approaches amongst apps. This unified regulatory organization could provide a framework for m-Health apps to follow during the development of apps, as well as minimum standards that must be met and maintained for the app to receive approval.

In sum, m-Health apps are well positioned to be an important element of future healthcare systems; however, ensuring that the information users receive is evidence-based and regulated is critical for optimizing health outcomes.

References

[1] Silva BM, Rodrigues JJ, de la Torre Díez I, López-Coronado M, Saleem K. Mobile-health: A review of current state in 2015. Journal of biomedical informatics. 2015;56:265–272.

[2] Paré G, Leaver C, Bourget C. Diffusion of the digital health self-tracking movement in Canada: results of a national survey. Journal of medical Internet research. 2018;20(5):e177.

[3] Scott KM, Gome GA, Richards D, Caldwell PH. How trustworthy are apps for maternal and child health? Health and Technology. 2015;4(4):329–336.

[4] Pagoto S, Schneider K, Jojic M, DeBiasse M, Mann D. Evidence-based strategies in weight-loss mobile apps. American journal of preventive medicine. 2013;45(5):576–582.

[5] Feinstein JS. The relationship between socioeconomic status and health: a review of the literature. Milbank quarterly. 1993;71(2):279–322.

[6] Schwarzer R. Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. Applied psychology. 2008;57(1):1–29.

[7] Wolf JA, Moreau JF, Akilov O, Patton T, English JC, Ho J, et al. Diagnostic inaccuracy of smartphone applications for melanoma detection. JAMA dermatology. 2013;149(4):422–426.

[8] Zhang MW, Ho CS, Cheok CC, Ho RC. Smartphone apps in mental healthcare: the state of the art and potential developments. BJPsych advances. 2015;21(5):354–358.

[9] National Institute for Health and Care Excellence. Developing NICE Guidelines: the manual; 2014. [Online; accessed 8-Feb-2019]. Available from: https://www.nice.org.uk/process/pmg20/chapter/introduction-and-overview.

[10] Yetisen AK, Martinez-Hurtado J, da Cruz Vasconcellos F, Simsekler ME, Akram MS, Lowe CR. The regulation of mobile medical applications. Lab on a Chip. 2014;14(5):833–840.

Anisa received her BSc from McMaster University. She is currently a second year Master's student at Western University. Her research focuses on the effects of aerobic exercise and caffeine on cognitive performance.

Yoah received his BSc from the University of Waterloo, and his M.A. from Western University. He is currently a PhD candidate at Western University. His research focuses on the impact of excessive sedentary behaviour on subjective well-being in university students. He enjoys playing guitar, mountain biking, and chasing after his two dogs.