

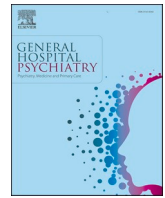


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General Hospital Psychiatry

journal homepage: www.elsevier.com/locate/genhospsych

Editorial

Mobile mental health: Bridging psychiatry and neurology through engaging innovations



Even prior to the COVID-19 pandemic, there has been increasing interest in mobile mental health interventions. The use of smartphone apps to offer immediate access to evidence-based care holds even greater potential today, as mental health needs have spiked in the context of COVID-19 among a wide range of populations from college students [1] to those exposed to COVID [2], and beyond. The increased adoption of telehealth [3] and mobile health applications over the past 12 months [4] in the context of the global pandemic has likely facilitated a longer-term approach that will much more substantially utilize these mobile mental health apps as part of routine care. These approaches do appear to have an impact, as several recent meta-analyses on mental health smartphone app interventions suggest small to moderate effect sizes across a range of mood and anxiety disorders [5–7].

However, there remain many important questions about the feasibility, acceptability, optimal use and impact of these mobile interventions, and these mobile health interventions have not yet been widely adopted in the hospital setting or helped the field reframe treatment approaches. Thus, in this special edition we focus on novel uses of digital health interventions beyond traditional studies of anxiety and depression management apps. Specifically, this special section first examines how these technologies may help to bridge psychiatry and neurology interventions via a pair of linked articles related to migraines. Second, the section focuses on the challenges—and necessary solutions—related to creating the next generation of digital tools that can successfully adapted in the hospital setting. Looking across the five papers in this special edition, it is clear that new approaches and models to care with mobile health interventions are not on the horizon but already here, and thoughtful use of smartphone and related technology is the final key towards stepping into this future.

Despite frequent calls for psychiatry and neurology to unify, bridging the divide between the fields continues to prove elusive [8]. Digital interventions offer one tangible example of such unification and this special edition covers two innovative approaches using apps and wearable sensors. Minen et al. report on 51 people who presented to the emergency department (ED) for a migraine headache and used a smartphone app offering a headache diary and progressive muscle relaxation across a 90 day study [9]. The study found that while engagement varied between patients, those with higher use of the app experienced fewer headache days [9]. This work highlights that while apps are feasible and potentially effective interventions for offering psychologically focused treatments from the ED, research on engagement is critical. Next, these authors also report on an eight-week randomized trial comparing app-based heart rate variability biofeedback to waitlist control for migraine headache prevention [10]. The 52 study participants used the system for a mean of 36 days with more engaged

users reporting reduced headache burden, but less engaged users not experiencing significant change. Both studies highlight innovative ways that mental health techniques can be delivered via digital health technology and leveraged in diverse neurology settings. At the same time, both studies highlight a critical weakness with digital health interventions today – engagement. The challenges Minen and colleagues report are common in this field, a point underscored by a recent study on the free COVID-19 stress related app ‘COVID-Coach’ that suffered an 80% drop in engagement after three days and retained only 1.5% of users after 15 days [11]. Solving the engagement challenge is thus an often hidden but clearly critical area limiting growth of digital health interventions.

The next three papers in this special section focus specifically on this issue of engagement and offer solutions at the level of the technology itself, the clinician using the technology, and the broader healthcare delivery system. Each paper discusses practical methods to increase digital mental health engagement today and highlights opportunity for meaningful improvement at different levels in the future.

First, Morton et al. present a solution towards engagement with behavioral health apps through exploring how user-centered design can be used to create better apps and enable participatory research design [12]. Offering tangible examples through the *Bipolar Budes*, the paper outlines how feasible and impactful this approach can be towards creating the next generation of impactful digital mental health apps. Second, Rodriguez-Villa et al. offer a solution towards engagement in the outpatient clinic through a ‘digital clinic’ model in which apps are integrated into an overall treatment approach [13]. Outlining an implementation framework that blends coaching and technology support with a new team member called the digital navigator, this paper offers a hybrid care model that could be adopted in many settings. Third, Bechtel et al. focus on a system level solution and interviewed 16 care managers at 12 Federally Qualified Health Centers using the Unified Theory of Adoption and Use of Technology as a theoretical model [14]. In addition to engagement issues, they identified three additional themes: infrastructure limitations to support technology, redundant and incompatible clinical and mHealth workflows, and cross-platform and web-access issues. In sum, these three papers look beyond the technology itself and explore how design, engagement, and implementation can be increased to support use of mobile mental health interventions.

The emerging mobile health era presents the field of psychiatry novel opportunities to reimagine the relationship with neurology, reassess the nature of the hospital visit, and even redesign care delivery systems. But as a field, we also know that change is rarely easy and requires that the best evidence be combined with the best support. In this case, the evidence suggests that offering that support towards engagement will be

<https://doi.org/10.1016/j.genhospsych.2021.05.008>

Available online 27 May 2021

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the critical factor. While most psychiatrists are not also neurologists, app developers, clinical system designers, or healthcare policy leaders, we can follow the examples in these special edition articles to utilize lessons from those fields to take the next step into the future for psychiatry.

References

- [1] Kleiman EM, Yeager AL, Grove JL, Kellerman JK, Kim JS. Real-time mental health impact of the COVID-19 pandemic on college students: ecological momentary assessment study. *JMIR Mental Health* 2020;7(12):e24815.
- [2] Boden M, Cohen N, Froelich JM, Hoggatt KJ, Magid HS, Mushiana SS. Mental disorder prevalence among populations impacted by coronavirus pandemics: A multilevel meta-analytic study of COVID-19, MERS & SARS. *Gen Hosp Psychiatry* 2021 Mar 12:Epub.
- [3] Chen JA, Chung WJ, Young SK, Tuttle MC, Collins MB, Darghouth SL, et al. COVID-19 and telepsychiatry: early outpatient experiences and implications for the future. *Gen Hosp Psychiatry* 2020 Sep-Oct;66:89–95.
- [4] Lecomte T, Potvin S, Corbière M, Guay S, Samson C, Cloutier B, et al. Mobile apps for mental health issues: meta-review of meta-analyses. *JMIR Mhealth Uhealth* 2020;8(5):e17458.
- [5] Weisel KK, Fuhrmann LM, Berking M, Baumeister H, Cuijpers P, Ebert DD. Standalone smartphone apps for mental health—a systematic review and meta-analysis. *NPJ Digital Med* 2019 Dec 2;2(1) (1–0).
- [6] Linardon J, Cuijpers P, Carlbring P, Messer M, Fuller-Tyszkiewicz M. The efficacy of app-supported smartphone interventions for mental health problems: a meta-analysis of randomized controlled trials. *World Psychiatry* 2019 Oct;18(3):325–36.
- [7] Soklaridis S, Lin E, Lalani Y, Rodak T, Sockalingam S. Mental health interventions and supports during COVID-19 and other medical pandemics: a rapid systematic review of the evidence. *Gen Hosp Psychiatry* 2020 Sep 1;66:133–46.
- [8] Perez DL, Keshavan MS, Scharf JM, Boes AD, Price BH. Bridging the great divide: what can neurology learn from psychiatry? *J Neuropsychiatry Clin Neurosci* 2018 Oct;30(4):271–8.
- [9] Minen MT, Friedman BW, Adhikari S, Corner S, Powers SW, Seng EK, et al. Introduction of a smartphone based behavioral intervention for migraine in the emergency department. *Gen Hosp Psychiatry* 2021 Mar 1;69:12–9.
- [10] Minen Mia T, Corner Sarah, Berk Thomas, Levitan Valeriya, Friedman Steven, Adhikari Samrachana, et al. Heart rate variability biofeedback for migraine using a smartphone application and sensor: a randomized controlled trial. *Gen Hosp Psychiatry* 2021;69:41–9.
- [11] Jaworski BK, Taylor K, Ramsey KM, Heinz A, Steinmetz S, Pagano I, et al. Exploring usage of COVID coach, a public mental health app designed for the COVID-19 pandemic: evaluation of analytics data. *J Med Internet Res* 2021;23(3):e26559.
- [12] Morton Emma, Barnes Steven J, Michalak Erin E. Participatory digital health research: a new paradigm for mHealth tool development. *Gen Hosp Psychiatry* 2020;66:67–9.
- [13] Rodriguez-Villa Elena, Rauseo-Ricupero Natali, Camacho Erica, Wisniewski Hannah, Keshavan Matcheri, Torous John. The digital clinic: Implementing technology and augmenting care for mental health. *Gen Hosp Psychiatry* 2020;66:59–66.
- [14] Bechtel Jared M, Lepoire Erin, Bauer Amy M, Bowen Deborah J, Fortney John C. Care manager perspectives on integrating an mHealth app system into clinical workflows: a mixed methods study. *Gen Hosp Psychiatry* 2021;68:38–45.

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