TECHNOLOGIES FOR CREATING AN ELECTRONIC CLINIC.

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Annotation: Increasing both access to and quality of mental healthcare is a global priority. One solution is to integrate technologies such as smartphone apps and sensors directly into care. Acknowledging many prior attempts and barriers, we introduce the Digital Clinic which is an already functioning clinic using smartphone apps to augment and extend care today at Beth Israel Deaconess Medical Center (BIDMC) in Boston, Massachusetts. In this piece, we outline the theoretical foundation of the Digital Clinic and its emphasis on the therapeutic alliance, measurement-based care, and shared decision making. We explore both workflow and engagement challenges as well as solutions including a new care team member, the Digital Navigator, and the customization of technology. Acknowledging that the Digital Clinic is an evolving program, we offer details on our implementation in order to allow others to replicate, expand on, and improve these initial efforts.

Key words: Digital clinic, Mental health, Digital phenotyping, Therapeutic alliance, Program model, Individualized interventions

The growing burden of mental health and the limitations of the clinical workforce to meet new demand have widened the treatment gap. The COVID-19 pandemic has highlighted the imminent need for new and innovative avenues to increase both access to and quality of care. Yet efforts around computerized therapy and recently emerging smartphone apps have not yet transformed mental health despite their clear potential to offer scalable, accessible, and affordable solutions. The challenges underlying the realization of digital solutions are not technological. They are instead rooted in the need to create trust and clinical systems that ethically and effectively utilize new digital tools. In this paper, we describe the concept and early implementation of a digital clinic, which integrates digital innovations into traditional care models for assessment, treatment and care management of patients with mental health disorders. The digital clinic described in this paper offers a conceptual and feasible model for care delivery that can be implemented in diverse settings.

The goals of the digital clinic are to improve both access to and quality of care through the ethical integration of digital technologies into clinical workflows, evidence-based care, and shared decision making in a sustainable and scalable manner. Distinct from telepsychiatry which offers synchronous telehealth, we define digital health and clinics as using asynchronous technologies such as apps and sensors to collect comprehensive data and inform care. Digital care and digital clinics can supplement telehealth (and in person care) by bringing new data into the virtual visit and offering increased support for patients between those visits. The concept of the digital clinic has many names and draws inspiration from ongoing digital mental health research , models of hybrid care, implementation science efforts, and healthcare technology development work . The cross disciplinary nature of the

digital clinic underscores its unique potential to offer impactful care as well as some of the operational challenges it faces towards successful implementation.

Addressing the needs of both patients and clinicians to utilize technology effectively, the digital clinic model is not a new concept. In early 2003 when CD-ROMS were novel, a brick and mortar digital clinic was established in London and offered access to computer-based treatments supported by a psychologist. While the rise of the internet made this clinic less relevant, newer efforts to introduce hybrid care have emerged. Often employing remote coaches who are not licensed clinicians, these platforms seek to engage patients through personalized contact. Yet failure of mental health startups, such as Lantern, that offer this type of hybrid care and mixed published results on the efficacy of coachesillustrate a complicated picture. Several reasons elucidate why companies have struggled to gain footing including insufficient funding and dissonance between business models and routine clinical care. Reports from many users of technology related mental health services have noted such experiences “feel different from real life”. Lack of transformative clinical outcomes from technology and a concomitant lack of connection felt through a strong therapeutic alliance appear as common challenges.

Challenges to digital clinics are understandable in light of past and present overvaluation of technology combined with undervaluation of clinical staff. While technologies such as smartphone apps are themselves scalable and available for immediate download to billions of people today, their meaningful use and clinical impact is low. A 2020 study examining the use of over 100,000 health apps in clinical studies found that apps were used for an average total of 5.5 days . Another study of popular mental health apps with over 100,000 downloads found that the average engagement rate after 10 days was just under 4%. Emerging evidence and clinical intuition suggests that sustained engagement with smartphones and digital tools is likely to be enhanced when they are used in conjunction with support from mental health care providers in clinical settings.

Yet today many clinicians are not able to support digital tools or care. While COVID-19 has forced clinicians to adopt telehealth, a study showed that 33% of psychiatrists preferred voice calls to videoconferencing visits because they lacked confidence in how to use telehealth technologies with patients. There is less evidence of integrating digital health tools like apps and sensors into care. A 2020 systematic review of factors impacting clinicians' use of technology highlighted that social and organizational factors led by workflow issues prevented adoption . Other barriers include concerns from clinicians regarding privacy, liability, and a lack of confidence in the technology. The popular non-adoption, abandonment, scale-up, spread, and sustainability framework for digital health notes that clinician champions are often the most critical contributor in enabling clinical adoption .

Drawing from early experiences and literature on digital health, hybrid care, engagement models, and technology adoption – we propose that a new digital clinic can address the current gaps in technology engagement and clinical workflow to maximize their synergy. The foundation of the digital clinic is based on patient centered care—incorporation of patients' perspectives, support systems, and values —that draws on the therapeutic alliance and its clinical benefits through facilitating shared decision making and understanding . The digital clinic model is intended to be scaled and built on with the goal of increasing access to high quality, evidence-based care. As such, we outline our experience of establishing a digital clinic

at Beth Israel Medical Center (BIDMC). While our implementation is made unique by our care team, patients, and site, the models and concepts are global in their application.

The development of the digital clinic. The digital clinic requires efficient technology and a structured workflow to build therapeutic trust and deliver effective evidence base care. Realizing that today's electronic medical records often slow care and detract from the therapeutic alliance, we want to ensure that technology improves clinical operation without impeding care. A clinical visit follows standard processes of information gathering, clinical decision making, and treatment planning. The digital clinic focuses treatment by reducing the need for information gathering, and makes clinical decision making and treatment planning a collaborative, iterative conversation. We leverage mindLAMP, a digital platform built and designed with patient input, to aggregate patient data, guide reflection, and help inform treatment.

Preconditions: needs and resource assessment. Core barriers that sites may face in establishing a digital clinic include digital health literacy, patient and clinician willingness to adopt digital tools, workflow issues, and regular engagement. Since the digital clinic requires participants and clinicians to use smart phone technology, access to a smart phone is a prerequisite. Direct feedback from patients and the onsite clinical team— formally structured into the pre-implementation stage — should be incorporated into the program's implementation plan during this precondition stage as well.

Our team offers the app and its underlying code as free, open source software so that others can utilize and expand upon it. However, other applications and digital resources are useful in the digital clinic. The goal is not to link the clinic to a single technology but rather to work with patients and utilize the ones that best support their treatment. There are many digital health programs and apps available today and we recommend resources, such as the American Psychiatric Association's app evaluation framework, to assist in informed decision making [23].

Engagement, from both patients and clinicians, is a considerable barrier that hinges on comfort using selected technologies. The Digital Opportunities for Outcomes in Recovery Services (DOORS) program offers a clinical model for teaching digital literacy skills to patients with serious mental illness. DOORS and Digital Navigator training were created by our team in response to a lack of resources that teach patients and clinicians, respectively, digital health skills, competencies, and confidences. The clinical workflow model also emphasizes the importance of creating a physical space for team technology training, defining roles and responsibilities, mapping changes to workflow, and identifying additional support that may be accessed or required. It is critical that all participants (patients and clients) have access to appropriate technology compatible devices. With smartphone ownership in the US up from 35% in 2011 to 81% in 2018, smartphone access may be less of a barrier with time. Nonetheless, the care team assists patients with reviewing options for affordable or free smartphone plans when applicable (in the US often through Projection Lifeline) and is aware of which apps and programs can run on which phones.

Pre-implementation. Pre-implementation barriers include creating an engaged and committed feedback committee, determining the role of selected technologies, and ensuring that the clinical team is prepared to integrate these technologies into care. A feedback committee engages diverse stakeholders including the care team, patients and their family members, and data scientists. We facilitated small, informal focus groups to understand

various comfort levels using mobile apps, collect input on mindLAMP, and discuss ways technology can enhance care. We also drew on feedback from previous clinical experiences to design visits that integrate digital tools into therapy safety and effectively. Incorporating relevant feedback – at every stage – allows the digital clinic to continuously improve and adapt to meet the needs of its patients. We are able customize the app at every visit to offer each patient unique survey assessments, data captures, health information, and activities that are relevant to their own illness and recovery. The clinical team works with the patient to determine how the platform is used and can best support the patient. Thus not all features of the app are used at all times, and use adapts to reflect shared decision making and changing clinical needs. App use is not a set protocol. This practice is in contrast to many health apps that guide care and push the clinician into a support role and addresses a chief reason for dissatisfaction with apps among both patients and clinicians. Other practices to support mindLAMP integration include the Digital Navigator offering clinicians technical support, providing sufficient time for participants to adjust to the new intervention (incorporating technology with treatment), and gathering and incorporating constructive feedback from all members of the care team.

Technology should be versatile enough to support diverse use cases and permit customized information flow. One advantage of mobile technology is the ability to rapidly share and access information that the patient is at the center of. The potential of virtual team meetings that include any combinations of the team – in which graphs that show symptom progression or medication adherence patterns can be shared (with consent) by screensharing – offers a means to provide inclusive and responsive team-based care. Clear parameters and guidelines around communication with patients outside digital clinic visits are considered here as well. Policies and informed consent to ensure use and response to any messages sent through the messaging feature on mindLAMP are well outlined and emergency plans are put in place. Some clinics may be able to monitor messaging 24/7 and while others may not. Use of backend analytical software to identify changes in app data that may warrant a response are also considered during pre-implementation. Actions plans that respond to an event of unusual patient data are established to ensure safety.

To assess the impact of the digital clinic and allow for continuous process improvements, an assessment battery was created. The multi-level assessment process offers a number of different scales, with the goal of assessing different dimensions related to the clinic including perspectives from both staff and patients, clinical outcomes, engagement, and other metrics of success. The conceptual framework for this selection of measures is based on Berwick's “triple aim” of health care improvement: optimizing care delivery by improving health outcomes, decreasing costs per capita, and improving patient (and clinician) experience Baseline clinical factors such as age, functional disability, motivation to change, comorbid substance use, and clinical history of trauma are also collected to identify potential moderators of digital impact. Combined, these assessments help us measure our impact overtime and capture a more complete patient profile to contextualize progress and feedback.

The digital clinic offers a unique design to improve treatment outcomes without taxing an already burdened mental health care system. In recent years numerous studies have shown an increase in access and use of mobile technology within underserved populations. This new model for delivering care draws on access to mobile technology to increase access to mental health care. The digital clinic has the potential to reach and engage marginalized populations

and achieve clinical outcomes that meet needs of local clinical and cultural demands. Through synthesizing digital technology and clinical workflow, the digital clinic can increase access to and also quality and specificity of care.

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