Technological Ventures Offer New Hope for the Future of Psychiatry

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Psychiatrists are on the front lines of the troubling state of mental health care in America. Our patients demonstrate the diversity of problems faced in mental health, including poor access, demand that far exceeds supply, high costs, and stigma. As the US population grows, insurance coverage and reimbursements shift, and the cohort of psychiatric providers is unevenly distributed across the country, the supply and demand mismatch will only worsen. Awareness of these limitations often makes it difficult to appreciate that we are also at the front lines of exciting, hopeful new solutions to these problems—as long as we pay attention to the progress happening around us and learn how best to integrate it into our practice.

There is a strong imperative to develop innovative and scalable solutions that address the gaps in access to and quality of care; and solutions are being created by various parties (eg, entrepreneurs, investors, insurance companies, politicians, hospital administrators, and patients). It is now more important than ever that we join forces with stakeholders and share our ideas and expertise to create new ideas that work for our patients and for the systems in which we function.

Brainstorm, the Stanford Laboratory for Brain Health Innovation and Entrepreneurship, is the first of its kind—an academic laboratory dedicated to transforming brain health through entrepreneurship. Brainstorm applies the biopsychosocial model of disease to tackle problems on the systems level. Launched by a founding team of physicians from around the country, we unite the worlds of medicine, business, and technology to foster innovative ventures that optimize health and human potential. We accomplish this through education, collaboration, and creation.

Through research and collaboration with academic and industry leaders, we have found that for an innovative solution to successfully address challenges, it should be safe, effective, accessible, affordable, measurable, and scalable. Technological innovations are rapidly emerging because they are uniquely suited to meet these criteria—and meet them quickly. From the more familiar text messaging, video conferencing, and mobile phone applications to the newer areas of virtual reality, augmented reality, behavior tracking, wearables, sensors, and chatbots—these are the solutions that can change the future of psychiatry.

To avoid any conflict of interest or perception of endorsement in this article, we discuss the technologies in general categories instead of giving specific examples or using company names. Many mental health technological ventures are early stage and are still working toward clinical validation and/or development of a sustainable business model.

Technology as a solution
Accessibility. Technology gets care to patients who cannot otherwise reach care. Whether the issue is transportation, inconvenience, or short-staffing of psychiatrists in a particular geographic location, the problem is the same—patients lack access to quality mental health care. What many people can access, however, is a smartphone, computer, or their local, tech-friendly hospital. Innovators are using tools for patient care that are not very different from the ones we know (eg, FaceTime), which we use to chat with family or friends around the world. Technology is being used to provide app-based therapy, coverage in psychiatric emergency departments, consultation to medical care, and founds in inpatient psychiatric units—all in settings that previously may not have had access to psychiatric coverage.

Affordability. Digital mental health services provide affordable alternatives to traditional care. They lessen some of the fixed and variable overhead costs of more human resource-heavy solutions, such as office space, waiting rooms, and administrative staff. This means that care can be delivered by providers more efficiently, and it can be obtained by patients more affordably.

Not only are digital solutions less costly to use, they are also less costly to develop. While the average cost of developing a psychiatric pharmaceutical treatment exceeds $2.5 billion, the cost to develop a psychiatric digital treatment can average around $500,000 to $1,000,000.

Measurability. One of the greatest challenges in clinical psychiatric practice is the lack of objective measurement to inform clinical decision-making. With the use of technology, data previously unmeasured can be captured and meaningful insights can be made on the individual patient level as well as by aggregating data into larger databases referred to as “big data.” Behavioral patterns (eg, a depressed patient whose number of daily steps suddenly declines) are tracked over time as well as deviations from baseline. Such tracking alerts physicians about the recurrence of symptoms between visits and allows for earlier intervention—resulting in improved outcomes.

Scalability. Digital solutions can take ideas that work and replicate them more quickly and effectively than would otherwise be possible. Once there is evidence that a solution works, it can quickly be reproduced and adopted elsewhere without the common barriers of cost and staffing. This ability to scale offers technology the potential to make a population-level impact.

Ongoing considerations
While many technological innovations have successfully met the standards explained above, most have yet to deliver consistently on 2 fundamental criteria of behavioral health care: safety and efficacy.

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Safety. Given the complex history of psychiatry, it is important that diagnostic and treatment modalities are safe. Safety has been difficult to control because to date, many novel psychiatric products have been unregulated. However, recent progress has been made on this front. In July 2017, the FDA launched a new pilot effort to regulate digital medical products, the “Software Precertification Pilot Program,” with the goal of “[providing] patients with timely access to high-quality, safe, and effective digital health products.” Its effectiveness will be shown in time. Meanwhile, it is our responsibility to make sure that patients are physically safe on the other side of the screen, that we understand the nuances of the liability involved in each encounter, and that we understand the implications of prescribing a digital solution.

In addition to patient safety, it is important to consider the security of patients’ health information. While many technology-based products are HIPAA compliant, some ask users to voluntarily share personal information and may not be held to the same privacy standards. It is critical for clinicians to remind patients of these nuances and the associated risks so that patients know what is secure and what is not.

Efficacy. To advance the state of mental health, we need solutions that make a concrete impact on clinical outcomes, social outcomes, and financial outcomes. Because the digital age is still new, the effectiveness data are not robust. A significant advantage of studying technology is that it is well suited to being analyzed. As digital ideas continue to emerge, clinicians and researchers need to keep an open mind about technology, not only as a means to treat patients but also to critically evaluate and develop an evidence base for future patients.

An overview of the technology landscape

From mobile apps to telemedicine to virtual reality games, new ideas that incorporate technology are emerging daily, and clinicians will inevitably be asked about them. With the vast amount of available digital solutions, it can be challenging to stay informed. One way to conceptualize these solutions is to group them into 3 categories. Screening, identification, and diagnosis. Psychiatry has primarily relied on clinical assessment and self-report for screening and diagnosis. Unfortunately, this can be a barrier to timely, scalable care as well as prevention and early intervention. According to the NIMH, with today’s screening and diagnostic methodology (as well as barriers such as stigma and access to care), the average delay between the onset of symptoms and intervention is 8 to 10 years. While statistics like this are inherently multifactorial, digital solutions aim to address these challenges and help clinicians obtain and utilize quality, objective information.

A prime example is digital phenotyping. Digital phenotyping is the process of taking data collected by technology such as sensors and smartphones, and turning data into clinically relevant information. For example, a smartphone can collect information on how much patients are moving around or engaging with others; this information can be collected either actively by direct input from users or passively, by using functions such as the GPS or logs of outbound calls and messages. These data can be used to screen, diagnose, prevent, and treat disease, and researchers have begun to study the accuracy and potential of these tools.

Therapeutic interventions. While not technically a treatment modality, telepsychiatry was one of the first forays into ways of reaching patients for assessment and treatment. Today, through audio, video, and text, clinicians can consult with colleagues or provide care to patients. Telepsychiatry can be equally as effective as in-person treatment in terms of diagnostic accuracy, treatment effectiveness, and quality of care. Clinicians and patients have mixed feelings about these alternative modes of communication, wondering, for example, how texting affects the patient-doctor relationship. An

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Technology holds great promise to improve the future of mental health care. It is the responsibility of all clinicians to educate themselves on its implications. This article focuses on the following:

● What technology offers as a solution to challenges in the field
● Considerations unique to the use of technology in practice
● An overview of the types of technology-based solutions currently available for use in mental health

Stanford Brainstorm: The World’s First Academic Laboratory for Brain Health Entrepreneurship (www.stanfordbrainstorm.com)

Educate

As an educational pioneer, Stanford Brainstorm launched the country’s first university course on mental health innovation. We educate students, clinicians, entrepreneurs, executives, investors, and the public about ventures and trends in the field through our workshops, research, articles, and book. We provide entrepreneurs with the knowledge and skills that they need to create venture-based solutions to brain health problems.

Collaborate

Successful innovations are fueled by collaboration. We identify visionary innovators and connect them with the resources and people needed to turn ideas into successful ventures. Brainstorm’s curated network unites stakeholders to best realize potential ideas. We host events to identify the most important ideas, challenges, and potential in the field and share what works so that others can build upon proven successes.

Create

Your idea can make an impact, especially with the right experts by your side. Stanford Brainstorm partners with industry leaders and entrepreneurs to translate promising ideas of all stages into validated, marketable products and services. We help you create solutions that are usable and effective.

Systems of care

Clinical technology is progressing in tandem with structural changes in the mental health care delivery system.

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The current movement toward value-based care is bringing forth many digital solutions to help increase patient satisfaction, improve population health, and lower the cost of health care. One of the biggest moves from a systems perspective has been in leveraging digital tools to create and improve care coordination.

There are opportunities that startups and traditional companies have been working to identify and address: databases and digital tools to match patients with clinicians, schedule appointments, connect with multiple care providers, facilitate e-prescriptions, manage health insurance claims, and identify users at risk for mental illness or relapse. Care coordination tools have been particularly effective, and the increase in value is seen across several domains.

**Concluding thoughts**

Technology has the potential to treat patients who currently are unable to access care, to prevent disease, and to provide early intervention and quality treatment—it can be the gateway to psychiatric care. With these new modalities, physicians are better able to provide quality care to all patients with mental health and other problems. We need to understand emerging technological trends that will lead the way to better health and greater opportunity for our patients to access help.

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**References**


**THE QUIZ/Fibromyalgia**

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**Fibromyalgia is one of the most controversial diagnoses in the field of pain management.** Some health care professionals believe that the symptoms of this disorder are primarily due to mental disorders, while others believe that it is a physical disorder and that any signs of mental disorders are secondary to the pain and other physical symptoms. It is clear that many symptoms of fibromyalgia can also be symptoms of mental disorders, and it can be difficult to differentiate between them.

1. The most current research indicates that fibromyalgia is a musculoskeletal disorder.
   A. True
   B. False

2. Which diagnostic screening instruments are considered to be the most useful for diagnosing fibromyalgia?
   A. Widespread Pain Index
   B. McGill Pain Questionnaire
   C. Symptom Severity Scale
   D. A and C
   E. All of the above

3. Chronic widespread pain is sufficient to make the diagnosis of fibromyalgia.
   A. True
   B. False

4. The diagnosis of fibromyalgia should be made only after other possible etiologies for widespread pain are excluded.
   A. True
   B. False

5. Current research indicates that mental disorders may be frequently misdiagnosed as fibromyalgia.
   A. True
   B. False

6. What form of therapy has been found to be most efficacious for the management of fibromyalgia?
   A. Cognitive behavioral therapy
   B. Pharmacotherapy
   C. Exercise
   D. Acupuncture

7. What form of exercise appears to be most effective for the management of fibromyalgia?
   A. Aerobic
   B. Strengthening
   C. The most effective form of exercise has yet to be determined

8. Opioids are the most effective analgesics for the management of fibromyalgia.
   A. True
   B. False

9. In addition to tramadol, which other medications have been found to be effective for the management of fibromyalgia?
   A. Amitriptyline
   B. Milnacipran and duloxetine
   C. Pregabalin
   D. SSRIs
   E. A, B, and C
   F. All of the above

10. What form of psychotherapy appears to be most effective for the management of fibromyalgia?
    A. Cognitive behavioral therapy
    B. Biofeedback
    C. Hypnotherapy

11. As of yet, there are no good predictive factors to determine which of the recommended therapies is most likely to benefit the individual patient with fibromyalgia.
    A. True
    B. False

**FOR ANSWERS TO THIS QUIZ, PLEASE SEE PAGE 16.**