ISSUE BRIEF

New Technologies for Improving Behavioral Health

A National Call for Accelerating the Use of New Methods for Assessing and Treating Mental Health and Substance Use Disorders

Prepared by: Adam Powell, PhD along with The Kennedy Forum senior leadership team, including Patrick J. Kennedy, and Garry Carneal, JD, Steve Daviss, MD and Henry Harbin, MD.

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Kennedy Forum Focus Group Participants:*

- **Patrick J. Kennedy**
  The Kennedy Forum
- **Alicia Aebersold**
  National Council for Behavioral Health
- **Alan Axelson, MD**
  InterCare Health Systems Limited
- **Bill Bucher**
  LabCorp
- **Michael Byer**
  M3 Information
- **John H. Cammack**
  Cammack Associates, LLC
- **Garry Carneal, JD, MA**
  The Kennedy Forum
- **George Carpenter**
  MYnd Analytics
- **Cari Cho**
  Cornerstone Montgomery
- **Carl Clark, MD**
  Mental Health Center of Denver
- **Charles Coleman, Jr., PhD**
  IBM
- **Peter Como, PhD**
  US FDA
- **Scott Cousino**
  myStrength
- **Steve Daviss MD, DFAPA**
  M3 Information
- **Dan Dunlop, DC**
  Arcadian Telepsychiatry
- **Juliana Ekong, MD/CMO**
  Quartet Health
- **Jon Evans**
  Safe Harbor Behavioral Health of UPMC Hamot
- **Jocelyn Faubert, PhD**
  Université de Montréal
- **Majid Fotuhi, MD, PhD**
  NeuroGrow Brain Fitness Center
- **Don Fowls, MD**
  Don Fowls and Associates
- **Shanti Fry**
  Neuromodulation Working Group
- **Adam Gazzaley, MD, PhD**
  Neuroscience Imaging Center
- **Robert Gibbons**
  University of Chicago
- **Robert Gibbs**
  Genomind
- **Evian Gordon, MD, PhD**
  Brain Resource
- **Henry Harbin**
  The Kennedy Forum
- **Charlie Hartwell**
  Bridge Builders Group
- **Anthony Hassan, EdD, LCSW**
  Cohen Veterans Network
- **Jen Hyatt**
  Big White Wall
- **Chuck Ingoglia**
  National Council for Behavioral Health
- **Thomas R. Insel, MD**
  Verily Life Sciences
- **Yi Jin, MD**
  The Brain Treatment Center
- **Gary Kagan**
  Linden Capital Partners
- **Harry Kerasidis, MD**
  XLNTbrain
- **Sharon Kilcarr**
  HealthTrackRx
- **Mike Knable, DO, DFAPA**
  Sylvan C. Herman Foundation
- **Allison Kumar**
  FDA/CDRH
- **Corinna Lathan, PhD, PE**
  AnthroTronix, Inc.
- **David Lischner, MD**
  Valant
- **Jay Lombard, DO**
  GenoMind
- **Zack Lynch**
  Neurotechnology Industry Organization
- **Ana Maiques**
  NeuroElectrics
- **Corey McCann, MD, PhD**
  Pear Therapeutics
- **Laura Miles**
  Genomind
- **Travis Millman**
  Pearson
- **Graeme Moffat, PhD**
  InteraXon
- **Ben Nachmani**
  Interaxon
- **Wayne Neff, PhD**
  OptumHealth
- **Kelly O'Brien**
  Kennedy Forum Illinois
- **Joe Parks, MD**
  Missouri HealthNet, a Division of the Missouri Department of Social Services
- **Robert Plotkin, LSW**
  Arcadian Telepsychiatry
- **Steve Ronik, PhD**
  Henderson Behavioral Health
- **Linda Rosenberg**
  National Council for Community Behavioral Health
- **Kevin Scalia**
  Netsmart
- **Michael Schoenbaum, PhD**
  National Institute of Mental Health
- **Steve Sidel**
  Mindoula
- **Kate Sullivan, MS, CCC-SLP, CBIS**
  Walter Reed National Military Medical Center
- **Tim Swinfard**
  Compass Health
- **Akaysha Tang, PhD**
  National Science Foundation
- **Chris Thatcher**
  Neuronetics
- **Jim Triandiflou**
  Relias Learning
- **Tom Tsang, MD, MPH, FACP**
  Valera Health
- **Bruce Wexler, MD**
  Yale School of Medicine
- **Ted Wright, MHA**
  Streamline Healthcare Solutions
- **Matthias Ziegler**
  Lockheed Martin Advanced Technology Laboratories

*Note: The Kennedy Forum hosted several focus groups to discuss Brain Fitness opportunities in the behavioral health field. This list is not exhaustive of all focus group participants. In addition, focus group participation does not mean a formal endorsement of The Kennedy Forum recommendations or this issue brief by the attending organizations.

Published by The Kennedy Forum

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Executive Summary

Individuals suffering from mental health and/or substance use disorders (MH/SUDs) often experience comorbid illnesses, disability, and even death. Treatment for these individuals is limited by the need for more effective treatment regimens, and the stunning lack of technology-based solutions that deliver new treatments and improve access to care. The Kennedy Forum and others view the current failures of under recognized and undertreated MH/SUDs as both a tragedy and a public health emergency.

Technology-based interventions have the potential to radically improve the efficient assessment and treatment of MH/SUDs. Yet, the long and expensive pathways to advance these treatments and solutions to full dissemination poses a challenge that must be addressed.

The Kennedy Forum is uniquely positioned to assume a leadership role in studying how technology can effectively be used to improve behavioral health interventions and outcomes. The Kennedy Forum can work with key stakeholders to facilitate implementation of this goal in multiple ways:

- **Community.** Create a technology coalition of experts that meets periodically to discuss policy issues and technology challenges/opportunities.
- **Enterprise Solutions.** Identify ways to use and deploy behavioral health-specific technology to support electronic health records, predictive modeling, data analytics, telehealth and other B2B/B2C solutions.
- **Treatment Interventions.** Promote effective ways to use technology to support patient assessment and treatment goals, including remote monitoring systems, personal devices, non-invasive neuromodulation interventions, and other applications.
- **Reimbursement.** Improve the frequency and scope of reimbursements for enterprise level and treatment technology solutions that can be used to improve clinical outcomes for MH/SUDs.

Background

The goal of this Issue Brief is to help identify and discuss current challenges and opportunities to promote best practices in leveraging a wide range of technology solutions to improve behavioral health outcomes. *Numerous electronic tools, applications and new treatment approaches have been developed to improve behavioral health outcomes which have yet to see widespread adoption, despite their commercial availability and the existence of clinical evidence to support their use. In this analysis, we focus on three main areas:*

- **Infrastructure tools** are helping discover patients in need of care and unlocking value from data. These tools have the power to link mental illnesses to both physical and self-reported indicators, potentially identifying people who are not yet aware they need help.
- **New assessment tools** are helping diagnose and track a full range of MH/SUD conditions, and are being used along with traditional medical/surgical biomarkers to determine which types of interventions are most effective. Biomarkers have the potential to advance behavioral health in the same way they are advancing somatic medicine.
- **New treatment interventions** are taking behavioral health beyond traditional practices such as talk therapy and pharmaceuticals, and into realms where digital feedback, magnetic stimulation, peer support, and reminders are enabling people to modify the functioning of their minds without experiencing scheduling conflicts or drug-related side effects.

This Issue Brief provides short descriptions of these tools, their barriers to adoption, and strategies for their implementation. Several illustrative examples of each tool are presented in every section to showcase how they function and can improve health and wellness. After describing the available tools, the Issue Brief provides examples of successful deployments, as well as a list of short-term and long-term strategic priorities for policymakers.

Strategic Priorities

Increased education and promotion, as well as policy changes, are needed to achieve wider adoption of behavioral health technologies. Overall, there is a need for greater professional society, patient, and clinician acceptance of these technologies. Increased acceptance will likely be driven by support from public and private payers which play a substantial role in determining the nature of the care which is delivered.

Short-Term Priorities

- Form an independent advocacy and policy organization with key partners with the resources to facilitate short-term and long-term behavioral health priorities for these technologies
- Promote clinician awareness of technology-based approaches to behavioral health care
- Publicize the benefits of technology-based approaches to care to boost patient acceptance
- Increase access to technology-based diagnostic and treatment approaches at government facilities, such as Veterans Affairs (VA) Medical Centers
- Promote widespread adoption of Measurement-Based Care by MH/SUD clinicians and medical providers who treat these conditions
- Identify and publicize model centers that are delivering new treatment technologies
- Advocate for fast-track reviews of any new evidence-based technologies for MH/SUD by both private and public entities including the Centers for Medicare and Medicaid Services (CMS), the Food and Drug Administration (FDA), the US Preventive Services Task Force (USPSTF), public and private insurers, and medical societies
- Foster financial support of unbiased third-party organizations conducting comprehensive reviews of new and emerging technology-based interventions
- Encourage grant funding to companies seeking to commercialize clinically-validated, innovative approaches to patient assessment and treatment
- Advocate for greater investment by the National Institutes of Health (NIH) and other funding bodies to accelerate the dissemination of new and emerging treatments

Long-Term Priorities

- Promote value-based payment as an overall concept and incentive to providing reimbursement for newer forms of treatment
- Advocate that health plans reallocate medical savings from MH/SUDs interventions towards expanding access to newer treatments
- Urge the FDA to clarify regulations for Clinical Decision Support (CDS) software so that developers may create tools to identify risk factors or automate care without fear of unanticipated regulatory action [1]
- Establish additional Current Procedural Terminology (CPT) codes which can be used when billing for technology-based treatments, digital interventions, and biomarker-based interventions

- Promote Medicaid and Medicare policies which facilitate the reimbursement of technology-based treatments [2]
- Develop legislation enabling fast-track reviews of new treatment options for MH/SUDs for both reimbursement and regulatory approval
- Reform licensure regulations so that clinicians may more easily provide care across state lines, enabling telepsychiatry to be more state agnostic
- Enforce existing parity laws and ensure that new treatments for MH/SUDs are not unnecessarily labeled as uncovered due to being experimental

Conclusions

- A multitude of tools have been developed to provide infrastructure support for the treatment of behavioral illnesses, and to facilitate their assessment and treatment. These tools may accompany a number of new treatment and diagnostic approaches that have been developed over the last two decades.
- Many of the tools are not yet widely adopted. Adoption issues are often driven by a lack of clinician and patient awareness and/or funding, rather than a lack of clinical evidence or commercialization. Moving beyond the couch and the pill bottle into a digital future will involve a combination of payer support, clinician education, professional society engagement, and patient acceptance.

Issue Brief:
Technology

Part I. Introduction

Advances in technology offer the potential for greater access to MH/SUD care at lower cost with better outcomes. For people who would have otherwise never seen a behavioral health clinician, technology has the power to help them with self-assessment and self-treatment, to help those unable to afford or conveniently visit a clinician to receive better access to care, and to enhance the quality of care for those already under clinical supervision. This Issue Brief describes the infrastructure, assessment, and treatment tools which are facilitating these improvements in access, cost, and quality.

The Issue Brief begins by highlighting a series of established technologies for improving the care for people with MH/SUDs.

- **Infrastructure tools** are helping discover patients in need of care and unlocking value from data. These tools have the power to link mental illnesses to both physical and self-reported indicators, potentially identifying people who are not yet aware they may need help.
- **New assessment tools** are helping diagnose and track a full range of MH/SUD conditions, and are being used along with traditional medical/surgical biomarkers to determine which types of interventions are most effective. Biomarkers have the potential to advance behavioral health in the same way that they are advancing somatic medicine.
- **New treatment interventions** are taking behavioral health beyond talk therapy and pharmaceuticals and into realms where digital feedback, magnetic stimulation, peer support, and reminders are enabling people to modify the functioning of their minds without experiencing scheduling conflicts or drug-related side effects.

In some instances, this analysis distinguishes between whether the intervention is dependent upon a device or falls under the category of a software application. This distinction is important because it can significantly impact the level of resources required to effectively implement the solution. In a similar vein, off-the-shelf products are compared to customized approaches since each has advantages in specific circumstances. Key barriers to the adoption of targeted technologies are also discussed as they relate to the infrastructure, assessments and treatment categories, along with proposed strategies for promoting widespread adoption.

After examining each of the singular technologies, the Issue Brief considers how multiple technologies can be used together to create comprehensive MH/SUD interventions. Several successful case examples highlight the use of multiple technologies to demonstrate these interactions. The Issue Brief concludes with a summary of the strategic priorities that must be addressed in the near and long term future to advance these technologies to improve access and quality at a lower cost.

Part II. Infrastructure Tools

Electronic Health Records

Electronic health records (EHRs) are critical tools for collecting, managing, and sharing healthcare services information, but the ability of EHRs to communicate with each other remains a significant challenge. Tools and standards have been designed in an attempt to reduce this lack of interoperability, with varying degrees of success. Health Level 7 (HL7), the international health IT standards organization, has the most advanced set of standards to promote interoperability across EHRs. However, use of these standards is voluntary, and adherence to the standards is highly variable. As patients adopt mobile tools and increasingly answer psychometric questions between office visits, MH/SUDs providers will face a growing need to track and monitor the information their patients produce between visits.

The use of EHRs in MH/SUDs lags behind the use of EHRs in other areas of medicine. This disparity is due to a combination of factors including insufficient funding, burdensome privacy laws, and the lack of economies of scale present at many smaller MH/SUDs provider organizations. Although the Health Information Technology for Economic and Clinical Health (HITECH) Act delivered over $30 billion to healthcare practitioners to offset the cost of EHR adoption, such financial incentives have not been extended to behavioral healthcare practitioners.[3]

An additional barrier is the limited selection of EHRs that focus on the needs of professionals treating MH/SUD patients. Few general purpose EHRs have the functions needed for the MH/SUD field, including the proper management and efficient integration of HIPAA-protected "psychotherapy notes," easy generation of group therapy notes, and production and electronic signing of multi-authored documents, including those requiring patient signatures. Federal law limits interoperability of medical records from substance use disorder programs by placing restrictions on who can access these records.[4] A wide variation among state laws governing mental health records makes it difficult and costly for EHR vendors to develop software that is compliant with these nuanced statutes and regulations. Small physician practices also pose a challenge as they contain fewer providers over which to spread many of the fixed costs associated with EHR implementation.

To overcome these challenges, vendors must focus on developing EHR solutions that can handle MH/SUD-related patient-reported outcomes measures, comply with state laws, and are affordable to provider organizations without substantial economies of scale. Liberalization of MH/SUD-related data privacy laws will facilitate the use of EHRs. Cloud-based solutions have the potential to enable behavioral health providers to adopt state-of-the-art EHRs without incurring fixed costs associated with installation.

Examples of EHR vendors that focus on behavioral health include, Askesis, Credible, Netsmart, Streamline Health Solutions and Valant.[5]

Health Information Exchanges

Health information exchange (HIE) software tools are used to improve interoperability. By using standard protocols, such as HL7's C-CDA (consolidated clinical document architecture), records from various EHRs can be accessed by other providers using disparate EHRs. HIEs are typically managed at the state or regional level, and are platforms in which patient information from other clinicians or healthcare systems becomes available to the clinician user. As HIEs evolve, they are beginning to reach out to consumers so that they can go to one place (the HIE) to access most of their healthcare information. This innovation is most useful to those who see multiple providers using different EHR systems. HIEs are also often used to access prescription information via Prescription Drug Monitoring Programs (PDMPs).

As CMS is requiring future certified EHRs to use an application programming interface (API) which will enable outside parties to access and use the information within EHRs, there will be an explosion of innovative tools developed to make use of this new functionality. By grabbing information through the API, third-party tools can aggregate the data and process it so that it is easier for users to interpret. Just as Mint and SigFig have brought aggregation to financial services, API-derived applications have the potential to enable patients and clinicians to gain a more holistic understanding of health data.

Examples of HIE vendors include Mirth, Intersystems, Orion Health, and Aetna Medicity.

Care Coordination and Care Management

Care coordination is a critical tool used to ensure that treatment plans are successfully implemented and patients receive the care intended by their providers. As a concept, care coordination includes workflows associated with population health, case management, disease management, and transitions of care.

Traditionally, care coordination has been conducted via telephone and face-to-face communication. Recently, use of web-based communication is increasing due to its speed and

flexibility. As a practice, care coordination involves the designation of a care team leader (typically the primary care practitioner), scheduling of appointments and services, logistics (supplies and transportation), confirmation of receipt of services, and following up on updated recommendations and treatment planning.

To optimize the coordination of care for a patient or a targeted population, a variety of communication methods are used today, including face-to-face, phone, text, email, conventional mail, fax, EHR-mediated, web-based, and app-based methods. It is imperative that the most effective communication solution be implemented in any given situation to promote the best clinical and financial outcomes.

In addition to establishing meaningful communication channels between the parties, effective and timely feedback loops should be implemented through a number of existing and emerging technology platforms. This will empower the entire care coordination team to stay updated and keep the treatment plan optimized.

Dozens of care management software solutions are available in the market today. Examples include IBM's Phytel, which is able to coordinate effective population health improvement campaigns, outreach and engage with patients, and facilitate two-way communication with large subpopulations. Mindoula uses a combination of app-based and Web-based communications to provide care management-as-a-service by empowering their care managers and staff to engage behavioral health populations in the gaps between clinical visits. It also drives population health improvements powered by proprietary psychometrics and predictive analytics integrated into care management workflows. Netsmart's CareManager is tied to an EHR and is specifically focused on behavioral health. Quartet Health is a venture-backed startup which offers a behavioral health care coordination platform.[6] Valera Health is conducting a clinical trial of its behavioral health care coordination platform at McLean Hospital.[7]

Predictive Modeling & Data Analytics

Predictive modeling is the use of data to identify individuals or targeted populations likely to experience a specific outcome-based upon their characteristics, given information on the outcomes that other individuals have previously experienced. Predictive modeling and data analytics are now having a significant impact on targeting and addressing people in need of medical interventions, including individuals with MH/SUD needs. Data used in these analytic models include clinical data, claims data, demographic data, actively captured patient-reported data, and passively captured patient-reported data. Predictive modeling and analytics can be used to decrease the likelihood that MH/SUD issues will develop. For instance, Travelers has implemented a predictive model which considers worker injury attributes, demographic information, and claims history to predict

which workers are likely to develop chronic pain. By identifying patients likely to develop chronic pain earlier, Travelers has reduced the likelihood that they will receive a prescription for opioids.[8]

The largest barrier to the use of predictive modeling is a lack of comprehensive data. Behavioral health data are often treated differently than physical health data, and several states and the federal government have implemented regulations which limit or impede data sharing related to mental health and addiction issues.[9] As a result, it can be difficult to track how demographic factors and claims histories are linked to behavioral health outcomes. Efforts to liberalize the use of behavioral health data while maintaining patient privacy have the potential to enable patients to receive more timely, targeted, and holistic care.[10]

The use of predictive analytics for behavioral health can be fostered through legislative changes promoting data sharing and through the creation of secure repositories of data which can be used for predictive modeling. Already, a repository of intensive care unit (ICU) data has provided researchers rich opportunities to understand factors impacting the outcomes of ICU stays, even years after they have occurred.[11] A similar approach to MH/SUDs data could facilitate the development of rapid statistical discoveries.

Example vendors: Netsmart offers behavioral health analytics tools for tracking clinical and financial outcomes.[12] IBM's Truven subsidiary offers behavioral health analytics services geared towards policy analysis and quality improvement.[13] Trajectory Healthcare has developed a behavioral health index to help track the impact of various program interventions by examining the impact of mental health conditions on physical health, and vice versa.[14]

Infrastructure Perspectives

When selecting infrastructure services and software, it is important to evaluate the interoperability, security, and privacy policies of offerings. Furthermore, as infrastructure software often requires substantial cost for installation, it is key to ask peer institutions about their overall experiences with both the service and software – both during and after the installation process. Independent evaluations of infrastructure software are sometimes a useful tool to consider. For instance, KLAS offers reviews of enterprise health IT software which may be relevant.[15] Many of these services are dependent on clinical and assessment information produced by the tools discussed in the next section.

Part III. Assessment Tools

Historically, clinicians have directly performed assessments of people in order to gain diagnostic clarity, monitor disease progression, and evaluate response to treatment. Over time, these assessments have been augmented by mechanical instruments (e.g., stethoscope, blood pressure cuff), electric instruments (e.g., electrocardiogram, EEG), mobile devices (e.g., Fitbit, smartphone camera), wireless communications (e.g., image transmission, text messaging), and software-based devices, products and services (e.g., heart rate variability, smartphone apps). Recently, these tools have become more useful and robust, while also enabling critical infrastructure, as predictive analytics and EHRs require the resulting quantitative assessment information.

Active Assessments

Active assessments require user-based interactions, which might or might not include self-assessments.

Measurement-based care principles are embedded within numerical health assessments that depend on active patient engagement, like the Patient Health Questionnaire 9 (PHQ-9) and the Generalized Anxiety Disorder 7 (GAD-7), which can be used to perform initial assessments of a patient's condition and to monitor progress in treatment.[16] Computerized adaptive testing (CAT), which changes the questions being asked based on prior answers, is another type of assessment method.[17,18] In CAT, a large item bank of questions is used to adaptively select items that maximize information based on the subject's responses to previous items. CAT has recently been used to develop tools to reliably screen and measure depression, anxiety, mania/hypomania, and suicide risk in psychiatric settings, emergency departments, primary care, and perinatal clinics.

These assessment tools require the active involvement of patients, as they require patients to complete brief questionnaires. Originally designed for paper-and-pencil use, health questionnaires have been translated into apps and websites that enable greater convenience, and, in some cases, easier sharing of findings with clinicians. Still, using only a single instrument designed to detect the presence of one disorder (e.g., PHQ-9 for depression) risks missing other comorbid symptoms that might otherwise be found using an instrument covering multiple disorders (or multiple single-disorder instruments). To achieve this more efficiently, the USPSTF has recently recommended a staged approach - screening for depression in all adults using a standardized instrument, and then

for those who screen positive, performing additional assessments for common comorbid problems, such as bipolar, anxiety, and substance use disorders.[19] The Joint Commission also recently proposed that all behavioral health accredited organizations must use some form or measurement-based assessments, while the National Committee for Quality Assurance (NCQA) has expanded its requirements for behavioral health assessments beyond depression to include anxiety and substance use disorders.

Although findings from health questionnaires can be useful to patients, they gain added value when reviewed with the assistance of a clinician. Current barriers to adoption include the gap between the patient using the app and the clinician treating the patient, time involved in completing the assessments, the need for serial assessments over time, the workflow required to complete and use the assessment results, and the challenge of incorporating the results within electronic health records (EHRs). Many active assessment apps do not have the means for securely sharing findings with clinicians so that they can be acted upon. Even fewer facilitate integration of findings within EHRs as structured data. In cases where data are sharable, clinicians are sometimes reluctant to recommend such apps, as receiving the data may expose them to liability for interpreting and acting upon the data. While monitoring can be supported by value-based payment mechanisms, it is only partially compatible with fee-for-service medicine. One vendor claims that physicians may attempt to bill for the use of its services to payers as if they had performed assessments in person, but provides no guarantee that they will be successful in doing so.

To increase the use of active health assessments by patients, behavioral health advocacy organizations should work with EHR and other technology vendors to develop tools which transmit findings from smartphones directly into the medical record. The systems should contain features which alert providers of substantial changes in scores so that providers can address developing issues without actively monitoring patient assessment responses. Value-based contracts should enhance provider willingness to recommend active health assessments to patients as the assessments have the potential to provide early warning signs of problems developing between sessions of care, and so may reduce costs and improve clinical outcomes. The resulting assessment metrics can be used to guide treatment-to-target algorithms, while also providing population-level metrics of mental health symptom burden and overall clinician-level and system-level outcome metrics.

Example vendors: STAT Depression Screening PHQ-9 provides iPhone users with a PHQ-9 assessment which is instantly scored.[21] WebNeuro offers online assessments which in some cases may be reimbursable through using the CPT codes for neuropsychological testing.[22] M3 Checklist is a Web-based[23] and app-based tool,[24,25] which produces an overall mental health score and four multidimensional sub-scores, and enables clinicians to monitor their patients' scores over time in one portal or EHR using the laboratory data channel for interoperability. Adaptive Testing

Technologies distributes web-based computerized adaptive tests for a variety of mental health disorders. [26]

Passive Assessments

Active assessments can be challenging to implement, as they require patient engagement. When people are experiencing the symptoms of a mental illness, they may be less likely to willfully engage with assessments, or the world in general. Passive assessments enable determinations about a person's health status to be made using data which is generated without direct user interaction. For instance, a person's mental state can be evaluated by examining their degree of social activity (phone calls and messages), voice characteristics, and physical activity (movement activity as read by accelerometers and change in location as read by GPS) on a smartphone. Some passive smartphone assessments appear to be particularly focused on helping people with bipolar disorder, [27] whose mental state may be more readily detectible by a smartphone than people facing other issues. Furthermore, passive detection can enable a person's support network to learn about issues without the patient actively seeking help. Thus, the passive data can be used to trigger proactive outreach when help is needed. [28]

The principal barriers to adoption of passive assessment tools include lack of commercialization and concerns about privacy. Many of the tools are early in development and not yet commercially available, though this field is changing rapidly. Passive monitoring services capture patient data at all times, which may cause privacy concerns for some and could reduce the willingness to use such an early warning device. Voice analysis apps can be continuously monitoring voice patterns, though it is more practical to analyze samples of speech.

To the extent that passive monitoring tools can enable early intervention, their use may be cost-saving. As the cost of care for people with mental illness is overrepresented by Medicaid enrollees, it is in the government's interest to invest in tools which improve quality while reducing the cost of care. Issuing grants for the development and implementation of passive monitoring tools may increase their availability. Given the cost of bringing these tools to market, private industry is likely to play a leading role in their development. Expanded commitment from both public and private sources will facilitate the adoption of passive monitoring.

Example vendors: Ginger.io [29] provides a passive smartphone monitoring solution, which is paired with selective human intervention. A similar system is being researched at Harvard. [30] Fitbit [31] activity can be used to monitor for changes in activity level associated with anergia or excessive energy. The University of Michigan has developed software that can tell the difference between depressed speech and manic speech. [32]

Telehealth

The field of telehealth has expanded rapidly in recent years and holds an important key to increasing access to behavioral health professionals.

The American Telemedicine Association (ATA) provides important background on the concept of telemedicine and telehealth:

> Formally defined, telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve a patient's clinical health status. Telemedicine includes a growing variety of applications and services using two-way video, email, smart phones, wireless tools and other forms of telecommunications technology.
>
> While the term telehealth is sometimes used to refer to a broader definition of remote healthcare that does not always involve clinical services, ATA uses the term in the same way one would refer to medicine or health in the common vernacular. Telemedicine is closely allied with the term health information technology (HIT). However, HIT more commonly refers to electronic medical records and related information systems while telemedicine refers to the actual delivery of remote clinical services using technology. [33]

Telepsychiatry (and its overlapping cousins, teletherapy and telemental health) promote real-time interactions with a psychiatrist or other mental health professional using videoconferencing technology. Telepsychiatry services enable patients to remotely receive psychiatric assessments and ongoing treatment. Although more patients receive telepsychiatry assessments than treatments, psychiatrists provide a substantial volume of treatment-related sessions as patients that receive remote treatment tend to have multiple sessions of therapy. Telepsychiatry can be useful when patients are incarcerated, living in a remote location, in urgent situations, or are otherwise unable or unwilling to meet a psychiatrist in person. Telepsychiatry is also used as a part of the collaborative care model where primary care physicians take the lead in providing care, but have the patient engage in a telepsychiatry consultation to more fully assess the patient. [34]

Telepsychiatry may be used in lieu of face-to-face care or as a supplement to it. Although there is no requirement for patients to have initial live visits with psychiatrists before engaging in telepsychiatry, patients with in-person relationships with psychiatrists may also wish to meet over video for greater convenience or comfort. Telepsychiatry has been shown to be as effective as face-to-face psychiatry when used for assessment purposes in a primary care or Emergency Department setting. [35] There is also evidence that patients may prefer telepsychiatry – one study found that the majority of children preferred telepsychiatric care to live care. [36]

The primary barriers to adoption of telepsychiatric assessments are awareness, reimbursement, adoption of standards, and restrictive professional licensing laws in some jurisdictions. While services may be available, patients may not know where to find them or even that they are in need of an assessment. In an institutional setting, there may be resistance due to concerns over the potential inferiority of telepsychiatric care, and the potential for such services to replace psychiatrists on staff. Such concerns may be allayed if telepsychiatry is used for after-hours assessments. Quality concerns can be overcome by presenting clinical evidence.

Reimbursement for telepsychiatry and teletherapy remains problematic in many states, but this is rapidly changing as the benefits become more widely recognized, and as standards for the delivery of remote services are adopted by organizations such as the American Telemedicine Association and the American Psychiatric Association. While real-time, or synchronous, services are most common, standards for the use of so-called store-and-forward, or asynchronous, assessment are being developed and implemented. To increase the use of telepsychiatry services for assessment and treatment, targeted marketing should be performed in places where potential patients are likely to visit. For instance, search-based ads for services could be purchased to encourage people attempting to self-diagnose to consider using telepsychiatry instead, as has been done recently by Breakthrough.[37] Targeted mailing could be sent to community hospitals in need of nighttime psychiatry coverage, with a message about expanding access to care and reducing ER boarding rather than reducing costs. Increasing awareness of the economic benefits of telepsychiatry for both patients and psychiatrists is likely to foster its acceptance.[38]

Example vendors: Arcadian Telepsychiatry[39] and REACH Health[40] provide telepsychiatry services. Additionally, solo practice psychiatrists may provide care to new or existing patients remotely using telepsychiatry.

Genetic Assessments

While it is not currently feasible to map the results of genetic testing to DSM diagnoses, genetic assessments are being used to evaluate which medications may be appropriate for individual patients. Genetic may play a role in patients' differences in their responsiveness to treatments. Using the results of genetic tests, it may be possible for psychiatrists to practice personalized medicine, where drugs are prescribed based upon genotype. Based upon this evidence, a number of companies have developed gene panels to guide drug selection.

Personalized psychiatry is in its infancy, and further research is needed to determine how genes map to disease states and drug responses. As there is research demonstrating that genetic testing is associated with increased adherence,[41] and those receiving testing have experienced health improvements during treatment,[42] the effectiveness of the genetic testing itself needs to be analyzed. There is a robust research base on how various genes influence the metabolism of a number of psychotropic drugs which can help guide optimum drug selection. However, the evidence for various gene panels' ability to predict efficacy is still at an early stage. Fostering the use of genetic assessments will require an expansion of the evidence-base. More research needs to be conducted to determine how specific genes are associated with responses to medications and the presence of diseases. Once these connections have been mastered, it may be more feasible to demonstrate the quality and financial benefits resulting from genetic testing. Another challenge is the large amount of data management resources needed to store and analyze large genetic datasets.

Example vendors: Assurex Health offers genetic testing to determine medications appropriate for people with neuropsychiatric conditions.[43] Genomind offers the Genecept Assay, a genetic test which is covered by many insurers and can be used to assess potential efficacy, side effects, and the need for dosing changes for psychotropic medications based on a patient's genetic profile.[44] Brain Resource Limited is sponsoring two clinical trials (iSPOT-A and iSPOT-D) to understand how genetic, cognitive, and biometric markers can be used to predict treatment response in patients with Attention Deficit Hyperactivity Disorder (ADHD) and depression.[45]

Heart Rate Variability

Issues related to Heart Rate Variability (HRV) have been shown to be associated with Alzheimer's,[46] Attention Deficit Hyperactivity Disorder (ADHD),[47] depression,[48] and Social Anxiety Disorder (SAD).[49] Devices have been developed to assess HRV in order to diagnose potential mental illness and they often come paired with biofeedback programs so people can learn to adjust their HRV to experience reduced symptoms of mental disorders.

Barriers to the adoption of HRV training programs include the need for physical hardware and the time commitment required to use the training regimen. The hardware tends to be individually purchased, as it is not widely available for public use. Furthermore, not all clinicians may be comfortable recommending HRV assessment due to a lack of awareness.

Facilitating reimbursement for HRV assessment and treatment may increase its use. Although the time commitment cannot be altered, materials highlighting the benefits of HRV may increase patient willingness to devote the necessary time. Clinician awareness can be increased by performing demonstrations of HRV programs at psychiatric conferences, by mentioning the evidence-base for HRV in newsletters, and by promotion through professional societies.

Example vendors: NeuroSky has developed an ECG chip which can be integrated into products measuring HRV.[50] The HeartMath Institute has released a series of programs for learning to reduce HRV.[51]

Functional Neuroimaging

Functional neuroimaging involves the use of various types of sensors to physically measure activity in the brain. The premise behind functional neuroimaging is that the brain is a network of dynamic neural circuits that can be measured in real-time. Focusing on the activity within these circuits should help to measure and understand both normal and abnormal functioning within the brain. This is a departure from more established measures of brain dysfunction that have historically assessed brain structures, including brain cells, neurotransmitters, and receptors. Looking at how this symphony works together, rather than at isolated instruments or notes, should help us better understand the brain's "music."

Images from single-photo emission computed tomography (SPECT) scans can be used to determine how physical activity in the brain is occurring, which can be helpful in assessing the nature of an illness.[52] Likewise, a quantitative electroencephalogram (QEEG) is an assessment technique that involves measuring brainwaves at the surface of the scalp. Unlike traditional EEG techniques, which show brainwaves on a paper readout, QEEG captures brainwave readings digitally so that they can more easily be analyzed.[53] QEEG has been shown to be useful in detecting ADHD[54] and post-concussion syndrome.[55] However, an EEG-based assessment for ADHD is the only FDA-approved assessment using brain activity to diagnose a mental health or substance use disorder.[56] QEEG provides physiological measurements of signs of mental illness, reinforcing the notion that mental illness can have a physiological basis. QEEG is available in clinics, and may be used in conjunction with a neurotherapy treatment program.

While functional magnetic resonance imaging (fMRI) is another form of neuroimaging that is useful for measuring brain activity, its clinical utility is a work in progress.[57] Technical and statistical concerns exist about fMRI that have recently cast doubt on the validity of results; therefore, more studies should be completed to validate the efficacy of using fMRI for cognitive measurement and diagnosis. The advance of science depends on the ability of others to reliably replicate results, so we expect the field will address these concerns given the great potential of functional imaging. As the field expands its focus from diagnostic categories (e.g., DSM-5) to circuit-based activities and symptoms (e.g., RDoC or Research Domain Criteria[58]), functional neuroimaging is expected to unlock more secrets of the brain.

Access to functional neuroimaging and limited acceptance by clinicians are the primary barriers to adoption. To receive neuroimaging, patients must be able to locate a clinician trained in utilizing neuroimaging with access to a device. As neuroimaging is relatively new to many clinicians, only a limited number of clinicians are comfortable using it. Acquiring the equipment can also be financially prohibitive for some clinicians.[59] While SPECT is likely to remain out of the financial reach of many clinicians, the Defense Advanced Research Projects Agency (DARPA) contest to foster the development of a $30 portable EEG,[60] along with advances in QEEG software such as LORETA,[61] are increasing both the access to and utility of this technology.

In order to increase the use of neuroimaging, it is necessary to increase the evidence-base on how the various circuits in the brain control symptoms and mental states and the clinicians' understanding of neuroimaging techniques. Holding training workshops at conferences may be useful in expanding its adoption. Once clinicians are confident in their ability to use SPECT and QEEG, acquisition of the necessary equipment may follow.

Example vendors: Applied Neuroscience sells NeuroGuide, a software package for QEEG assessment and neurofeedback.[62] BrainMaster Technologies sells hardware for use in QEEG.[63]

Assessment Tool Perspectives

When implementing assessment services and software, it is best practice to ensure that the tools in question have been validated by research and can assess symptomatology drawn from multiple mental health disorders such as depression, anxiety disorders, bipolar disorder, post-traumatic stress disorder and substance use disorders. Consider whether the tool is something entirely novel or if it is simply a digital version of an accepted, well-validated, assessment technique. All techniques should possess an adequate body of research, including comparison to other accepted assessment techniques, before implementation. For example, when considering telepsychiatry services that involve real-time televideo interaction, less scrutiny is needed than when considering service delivered via other means, such as communication by text message or recorded video.

Assessment devices tend to be implemented in conjunction with the services of a clinician. When promoting their use, care should be taken to examine both the quality of the device and the competency of the clinician. HRV and QEEG are used for both assessment and treatment, as treatment can involve utilizing feedback from the device. Thus, although they are assessment tools, the treatment outcomes associated with their use should be considered when selecting a clinician/device combination.

Assessment tools are particularly useful as an ongoing part of the feedback loop to determine the effectiveness of treatment interventions. They can help measure, document, and analyze positive and negative outcomes related to the treatments and interventions chosen to improve one's health. These ongoing measurements are necessary for measurement-based care.

Part IV: Treatment Interventions

Digital Cognitive Behavioral Therapy

Cognitive behavioral therapy (CBT) is a form of psychotherapy used to treat multiple issues, including depression, anxiety, post-traumatic stress disorder, shyness, schizophrenia, and stress management. CBT teaches people to think about the links between their thoughts, feelings, and behaviors. As CBT is a learned technique, instruction can be provided in multiple ways. In addition to being taught face-to-face, CBT training can be provided by web-based programs, and an extensive body of research supports this approach.[64, 65, 66, 67] Mobile apps have been developed to help people log their feelings over the course of the day, facilitating the CBT process.

The main barriers to digital CBT adoption are a lack of patient awareness of its potential benefits, a lack of patient knowledge of how to receive CBT training, and the cost of some training programs. As CBT training can be conducted independently at home, and some training tools are free, cost and access are not the primary barriers to adoption. Awareness may be the larger challenge as the tools that do exist do not appear to be widely used. Also, CBT is a process that may not be helpful to everyone, and requires a degree of critical thinking which may be a struggle for some patients.

Digital CBT use can be promoted by forging partnerships between consumer health portals and CBT vendors to create greater awareness. In some countries, primary care physicians recommend online CBT and copying this approach could increase use in the U.S. Also, marketing campaigns can be built around self-assessment tools. Ultimately, some of the necessary promotion may happen organically, as the rise of capitated payment models may drive physicians to recommend more self-directed treatments.

Example vendors: FearFighter[68] and This Way Up[69] are web-based CBT solutions. iCBT is an iPhone app for evaluating life events using the CBT process.[70] Anti-Anxiety App lets people both learn CBT and keep logs of their lives.[71]

Behavior Modification Software

People dealing with substance use disorders, medication adherence issues, dieting challenges, and other behaviors they wish to change can use behavior modification tools to guide themselves towards a healthier life. Unlike CBT tools, these tools typically ask people to log their consumption and report urges or cravings. When the goal is to encourage a behavior (e.g. medication adherence or exercise), the tools may send periodic notifications about the desired behavior until it is completed. By tracking undesired behaviors and pushing reminders about desired behaviors, these tools seek to reorient how people live. Several applications additionally focus on changing behavior by modifying cognitive function using a training-based approach. One computer game maker is seeking FDA approval for the treatment of Attention Deficit Hyperactivity Disorder (ADHD).[72] Several evidence-based tools have been developed to remediate disorders in cognitive function, including schizophrenia.[73, 74, 75]

As many behavior modification tools are free, awareness of the tools and patient motivation to use them are the main barriers to adoption. In addition, numerous, somewhat duplicative apps, are now available in the marketplace addressing each type of behavior a person may wish to modify. For instance, in 2015 over 90 apps were being offered to help people reduce alcohol consumption.[76] Unfortunately with so much choice, the volume of solutions may actually serve as a barrier, as some people may feel blocked by not knowing which app to select and use.

Recommendations of high-quality apps for each behavior modification scenario by trusted organizations would be helpful in simplifying the process for people who find selecting a tool to be daunting. One recent list of the "top" smoking cessation apps listed ten different options.[77] In cases where numerous choices with subtle differences exist, people may benefit from decision support tools designed for matching people to apps. For-profit, governmental, and non-profit organizations are using multiple approaches to evaluating app quality.[78] For example, PsyberGuide is a non-profit organization which provides reviews of digital tools for mental health, so that patients and clinicians can identify the tools which are most likely to be useful.[79] Nonetheless, as funding for third-party review is limited, many categories of mental health apps are not reviewed by professionals.

Example vendors: LIVESTRONG MyQuit Coach[80] and Smoke Free[81] are two iPhone apps which have been designed to assist people with smoking cessation. COGPACK is a suite of software-based cognitive remediation tools for people with schizophrenia which has been used and researched for over a decade.[82]

Remote Peer Support

Peer support refers to receiving assistance from other people in recovery from similar conditions. This type of treatment aids patients in self-management and provides good value for the investment required. In one review of the literature, peer support was found to have made a difference in two studies, but no difference in four others. [83] The Australian Center for Mental Health Research found a lack of quality research of online peer support groups, and called for more research spending.

Biofeedback

Biofeedback is the use of sensors to heighten individuals' awareness of their physiological processes so that they may better control them. Biofeedback has been used to assist people with anxiety, attention deficit hyperactivity disorder (ADHD), autism, chronic pain, depression, headache, insomnia, post-traumatic stress disorder, substance use disorders, traumatic brain injury, and numerous somatic illnesses. [84] A wide variety of sensors may be used, including capnometers, electrocardiograms (ECGs), electrodermographs (EDGs), electroencephalographs (EEGs), electromyographs, hemoencephaphalographs, photoplethysmographs, pneumographs, and thermometers. [85] Biofeedback encompasses many tools which are used to address many different conditions. For instance, EEG-based neurofeedback has been shown to be efficacious in treating children with ADHD, [86] substance use disorder, [87] and anxiety disorder. [88] Many applications have been researched, and clinical evidence is regularly published in the journal *Applied Psychophysiology and Biofeedback*. [89] Heart Rate Variability, which is also discussed in this Issue Brief, is one form of biofeedback.

The primary barriers to the adoption of biofeedback are a lack of awareness by practitioners and a lack of access to biofeedback devices. Biofeedback has a fixed cost, whereas there are variable costs for pharmaceuticals and online programs delivered as services. Thus, healthcare providers must have an adequate volume of patients which would benefit from a particular biofeedback modality. Even when sufficient volumes exist, adoption is further hampered by issues with reimbursement despite the evidence supporting a number of biofeedback modalities. In spite of these issues, progress is being made in the use of biofeedback due to advances in software and hardware which reduce the cost of biofeedback systems, facilitating home-based and clinic-based use.

Example vendors: Vendors vary according to modality and there are separate vendors for both hardware and software. NeXus [90] offers commercial-grade equipment, while MindPlace [91] offers equipment priced for home use. NeuroGuide offers a normative database of QEEG findings, and has received FDA 510(k) approval for its analysis system. [92]

Electroencephalogram for Treatment Guidance

Electroencephalogram (EEG) has been shown to be a biomarker that can be used to predict a response to psychotropic medications. [93] Thus, in addition to EEG biofeedback or neurofeedback (NFB) being efficacious as a treatment for anxiety, attention deficit disorder, and substance use disorder, EEG measures may be used to guide pharmaceutical-based therapy. Using EEG to shorten the process of matching patients to medications can eliminate the traditional trial and error approach which often comes at a significant financial and personal cost to patients. [94]

The barriers to the adoption of EEG for treatment guidance are similar overall to those for biofeedback. There is a need for greater awareness, access to care, and reimbursement. Also required is technical awareness of EEG by healthcare providers.

Example vendors: MYnd Analytics offers a platform where physicians can exchange their patients' EEG and clinical outcome data in order to prescribe medications which are more likely to be efficacious and advance research on the relationship between EEG readings and clinical response. [95]

Electric and Magnetic Stimulation

Directly stimulating the brain with electricity and magnetism are two non-pharmaceutical ways of alleviating some forms of mental illness. Both have a similar mechanism of action, as magnetic stimulation induces electrical currents within the brain. Since 1938, Electroconvulsive Therapy (ECT) has been used to help people facing a major depressive disorder, catatonia, and mania. [96] Both direct and indirect current may be used for electrical stimulation, and separate scientific literatures have been developed to examine the use of both types of current.

Low-voltage devices, particularly those which can be used directly by consumers, have been a recent area of interest. While concerns have been raised about the safety of their use, one recent study found no evidence of adverse safety effects from low-voltage direct current stimulation. [97] Although not conclusive, research has shown that Cranial Electrotherapy Stimulation (CES) therapies involving applying 1.5 mA or less electricity to the head, may be efficacious in improving

mental health. As a result, the FDA has approved the use of CES, by prescription, for the treatment of anxiety, insomnia, and depression.[98] Nonetheless, a recent Cochrane Review has claimed that no studies of CES warranted inclusion.[99]

As ECT can cause memory loss and the evidence on CES is still being accumulated, transcranial magnetic stimulation (TMS) has been pursued as a means of treating both major depressive disorders and migraines in more recent years. Unlike ECT, TMS is not associated with memory loss or other significant side effects. TMS has gained support as multiple payers initiated coverage for it within the past decade. Also, a recent Cochran Review found some evidence supporting the use of TMS for pain relief.[100] TMS devices have received FDA approval for both the treatment of major depressive disorders and migraines. As an alternative to the FDA-approved devices, a number of companies are selling devices which offer significantly weaker magnetic stimulation. The research on the efficacy of these weaker magnetic stimulation devices is still a work in progress.

Public acceptance is a barrier to electric and magnetic stimulation devices. Films such as *One Flew Over the Cuckoo's Nest* have made members of the public wary of ECT. Further stigma was created when Thomas Eagleton was asked by George McGovern to withdraw his vice-presidential candidacy after the press suggested that Eagleton was potentially unfit for the vice presidency as a result of having received ECT. While ECT has advanced over the years, memory-related side-effects remain. As TMS devices have only recently received FDA approval, awareness and availability are also both barriers to care.

Increasing the use of electric and magnetic stimulation is more complicated than increasing the use of other interventions, as efforts must be made to both enhance access and improve patient acceptance. Counteracting the stigma of the Eagleton incident may require prominent people to publicly declare that they have received ECT or TMS, in a similar manner to which Ms. magazine worked to destigmatize abortion in 1972 through personal public declarations. Since there are fixed costs in providing ECT and TMS which limit availability, health plans can assist in adoption by offering tools to help people locate in-network facilities.

Example vendors: MagVenture[101] has received FDA 510K clearance for its TMS-based treatment for major depressive disorder. Neuronetics[102] likewise has obtained FDA 510K clearance for its TMS-based depression treatment.

Treatment Reminders

Psychotropic medications are ineffective if they are not taken as prescribed and remain in the bottle. Technologies for improving adherence to a medication plan can play an instrumental role in improving outcomes from care. Smart pill bottles and caps work by signaling patients through

light or sound that a required dose of medicine has not been taken. If patients do not respond to the signals, the smart devices can notify caregivers over wireless networks so that patients can be reminded to take their medication.

The main barrier to adoption is the limited public availability of the devices. One vendor has temporarily stopped selling them after being acquired, while another is distributing them to a limited number of organizations but not yet selling them to the public. Given that the devices have been covered by health plans in the past, it is likely that more health plans will be open to covering them in the future.

In order to increase adoption, psychiatrists should consider prescribing adherence technologies along with medications. Also, advocacy by mental health organizations should promote coverage of the technologies by health plans. As the devices are not currently available on the market, coordinated preordering from vendors may produce the sales necessary to resume their widespread availability.

Example vendors: AdhereTech [103] and Vitality [104] have developed smart pill bottles which wirelessly detect whether patients are adherent. The Vitality GlowCap, which has been temporarily withdrawn from the market, provides light and sound-based reminders to patients that have not opened their pill bottles at the scheduled time.

Virtual Reality

Prolonged exposure therapy is an accepted means for treating post-traumatic stress disorder. Veterans experiencing post-traumatic stress disorder can use Virtual Reality Exposure Therapy to undergo virtual prolonged exposure to the war environment from the safety of the United States. Developed with funding from the Office of Naval Research, one program helps Iraq war veterans cope with their post-traumatic stress by providing them a variety of stimuli reminiscent of the war. Visual, auditory, and olfactory cues are used to help former soldiers recall their time in combat in a therapeutic setting. [105] As care is provided in a virtual reality clinic, the veterans use the program under supervision.

As Virtual Reality Exposure Therapy must be used within a clinic, one major barrier to adoption is a lack of access to care. For instance, the virtual treatment for veterans is not available in all states. [106] Another barrier to adoption of Virtual Reality Exposure Therapy is the lack of virtual reality scenarios to fit various types of trauma which constrains the number of people who can currently be assisted.

Implementing broader use of Virtual Reality Exposure Therapy can be achieved by increasing access, and improving applicability and reimbursement. As post-war PTSD recovery is a major application, one solution would be to fund the development of Virtual Reality Exposure Therapy clinics within VA Medical Centers. Funding the development of additional virtual scenarios would increase the benefits of this investment as the virtual reality clinics would experience more utilization if they were more widely applicable.

Example vendors: Virtually Better's Virtual Iraq offers a PTSD program for veterans. [107] AppliedVR is developing virtual reality software for pain and anxiety management. [108]

Treatment Tool Perspectives

Numerous treatment service and software solutions exist that use similar approaches to achieve their goals. When selecting treatment software, it is best practice to consider every "ASPECT" of the tool: whether it is actionable, secure, professional, evidence-based, customizable and transparent. [109] When multiple options exist, tools which have been clinically-validated should be given preference over tools which have not. While many claims may be made for tools, it is important to verify that those claims have been examined through peer-reviewed research, or are based on prior research on similar interventions.

As is the case with devices for assessment, devices for treatment should be evaluated holistically along with the provider of any associated services. In general, it is important for there to be increased promotion of treatment devices to both clinicians and patients. Mental health treatment is traditionally associated with a combination of talk and medication therapy. If devices are considered at all, the public tends to associate devices with antiquated versions of electroconvulsive therapy. Journals should be encouraged to call for device-related research, as doing so will expand both the evidence-base and clinician awareness. Increased clinician awareness can help generate wider knowledge of devices with patients and the public.

Finally, many treatment tools are available for direct purchase by consumers. As many do not require clinical involvement to purchase or use, people who might not seek help from a professional may be able to self-manage conditions which would otherwise go untreated. Due to the varying efficacy of treatment tools, resources are needed to guide consumers towards tools that are safe and efficacious, and to educate them on when it may be appropriate to move beyond self-management.

Part V: Addressing the Overlap

Infrastructure, assessment, and treatment are not as separate as may be suggested by this Issue Brief. Tools often exist at the juncture between multiple categories. For instance, infrastructure tools for population health management may drive physician outreach to high-risk patients for assessment. They may subsequently be used to evaluate the treatment outcomes of the patient population, and used to identify individual patients who do not appear to be successfully responding to treatment.

Overlap is also found where a number of tools combine assessment and treatment in a feedback loop. Many smartphone apps help consumers evaluate whether they have a mental health or substance use disorder, provide an intervention to help treat it, and then periodically evaluate the consumer's progress using a standardized assessment. Likewise, heart rate variability (HRV) monitoring and quantitative electroencephalograms (QEEG) often combine assessment and treatment as treatment involves working with a patient to move assessed values into a desired range. Patients are informed in real-time of their status on a physiological assessment, and given stimuli that act as incentives for moving performance into the desired range. For example, a movie may play, with the sound becoming more audible as values become more optimal, and less audible as values become less optimal. Brain fitness tools also assess performance and offer a means for enhancing performance. *(See the Kennedy Forum white paper on Brain Fitness.)* Thus, assessment and treatment tools are often closely linked.

Part VI: Success Stories

In this section, we describe several case studies that the authors deem are success stories. They are shared with readers as illustrative examples.

Arcadian Telepsychiatry

Arcadian Telepsychiatry helps people in rural and underserved areas receive better access to psychiatry and other mental health services. Patients are typically accompanied by a nurse or other health practitioner to an exam room where they can remotely interact with an Arcadian clinician. Patients and clinicians interact by two-way video conference. The onsite health practitioner may assist the Arcadian clinician in performing exams or in handling an urgent situation, should one develop. Arcadian markets its services to healthcare providers who require mental health support for their patients.[110] Arcadian additionally offers Employee Assistance Programs (EAPs) through

which employees can receive video consultations with health professionals while at home.

Clinical Research Unit for Anxiety and Depression (CRUfAD)

CRUfAD is a joint facility of St. Vincent's Hospital and the University of New South Wales which was established to reduce anxiety and depressive disorders in individuals. CRUfAD houses a virtual clinic used to conduct clinical trials of Internet-based treatment programs for anxiety and depression. It features an anxiety disorders clinic where adults can receive face-to-face assessment and treatment. Finally, it also offers, "This Way Up," a series of clinically-proven web-based courses for anxiety, depression, mixed anxiety and depression, social phobia, panic, and obsessive compulsive disorder. Courses are either self-help based or clinician-supervised, depending upon patient preference. CRUfAD offers a combination of face-to-face care, telemedicine, and self-help while producing the academic research necessary to support its claims. [111]

FearFighter

FearFighter is an online cognitive behavioral therapy (CBT) and exposure therapy program intended to help people manage anxiety, phobias, and panic. While it is an online tool, users are encouraged to find an offline helper to assist them in completing exposure therapy. FearFighter has been reviewed and endorsed by the National Institute for Health and Care Excellence (NICE), a government organization within the United Kingdom. [112] FearFighter's efficacy has been validated by two randomized controlled trials, and has been supported by other research.

Ginger.io

In addition to offering the passive monitoring solution for which it is known, Ginger.io offers a multidisciplinary care model for anxiety and depression. Components of the model include coaches to help users triage needs and navigate services, self-care tools for CBT, psychotherapy from licensed therapists and psychiatrists, real-time monitoring of patient behavior and self-reported data, and medication support for physicians via behavioral data reports. [113] Although not widely available to the public, the technology is being rolled out at Cincinnati Children's Hospital and through the provider network Novant. [114]

Mindoula Health

Mindoula Health offers technology-enabled case management for mental health, with services continuously available and priced to be broadly accessible. Mindoula has a standardized "discovery" process during which patients undergo biopsychosocial assessments, a technology proficiency assessment, a crisis risk assessment, a provider, and a family support assessment. Patients are then matched with a Mindoula team and a service level. Short and long-term goals are set, and an action plan is developed. case managers work collaboratively with patients' primary care physicians and psychiatrists to determine how to best address the challenges faced by the people they serve. Rather than providing treatment, Mindoula's case managers focus on solving problems, managing crises, coordinating care, connecting patients with community services, and helping families address behavioral health challenges. [115]

M3 Information

M3 Information is a research company that offers a multidimensional active assessment tool, the M3 Checklist, which is a 27-item, web-based, patient-rated assessment for symptoms of major depression, bipolar disorder, PTSD, and four anxiety disorders (panic, general anxiety disorder, social phobia, and obsessive-compulsive disorder). [116] There are also questions that assess for functional status and substance use. It was validated in an ambulatory primary care clinic at the University of North Carolina against the Mini International Neuropsychiatric Interview (MINI). The M3 Checklist is commonly used to assess the level of risk of having one of these diagnoses, in addition to longitudinal monitoring of progress and symptom severity over time. It has overcome the limitations of paper-based tools in integrated care settings by using the same workflow as lab tests. Ordered within the EHR, it is pushed to the patient electronically, and then the results securely return to the EHR as structured data for monitoring, analytics, and population registry reporting. By using Labcorp's HL7 channel for data flow, it is interoperable with most EHR systems.

Part VII: Strategic Priorities

At the 2016 annual meeting of the National Council for Behavioral Health, the Kennedy Forum convened one of several Technology Workgroups to address the following key issues: [117]

1. Promoting the interoperability and integration of behavioral health and medical/surgical technologies, including EHRs and HIEs
2. Encouraging population health interventions utilizing analytics and predictive modeling
3. Creating data clearinghouses which link behavioral health and medical/surgical data
4. Improving access to care through telemedicine, smartphone applications, and other mobile technologies
5. Pursuing other technology-related opportunities, as defined by the Workgroup.

The major challenges to these issues include many of the challenges described in the previous pages. Increased promotion and policy changes need to occur for behavioral health technologies to see wider adoption. Overall, there is a need for greater patient, clinician, and professional society acceptance of these technologies. This will likely be driven by support from public and private payers which play a substantial role in determining the nature of the care delivery. As clinicians gravitate towards using technologies for which they are directly or indirectly compensated, public and private payers play a leading role in determining the future of behavioral health. Through a series of short-term and long-term policy actions, increased acceptance of new tools for behavioral health can be achieved:

Short-Term Priorities

- Form an independent advocacy and policy organization with the resources to facilitate short-term and long-term behavioral health priorities for these technologies
- Promote clinician awareness of technology-based approaches to behavioral health care
- Publicize the benefits of technology-based approaches to care to boost patient acceptance
- Increase access to technology-based assessment and treatment approaches at government-run facilities, such as VA Medical Centers
- Promote widespread adoption of Measurement-Based Care by both behavioral health and primary care clinicians
- Encourage the use of tools that assess multiple dimensions of behavioral health, not just depression

- Identify and publicize model centers that are delivering new treatment technologies
- Advocate for fast-track reviews of any new evidence-based technologies for MH/SUDs by both private and public entities: CMS, FDA, USPSTF, public and private insurers, and medical societies
- Foster financial support of unbiased third-party organizations conducting comprehensive reviews of new and emerging technology-based interventions
- Encourage grant funding to companies seeking to commercialize clinically-validated, innovative approaches to patient assessment and treatment
- Advocate for greater investment by the National Institutes of Health (NIH) and other funding bodies to accelerate the dissemination of new and emerging treatments

Long-Term Priorities

- Promote value-based payment as an overall concept and incentive to providing reimbursement for newer forms of treatment
- Advocate health plans to reallocate medical savings from MH/SUDs interventions to expanding access to newer treatments
- Urge the FDA to clarify regulations for Clinical Decision Support (CDS) software so that developers may create tools to identify risk factors or automate care without fear of unanticipated regulatory action [118]
- Establish additional CPT codes which can be used when billing for technology-based treatments, digital interventions, clinical decision support, and biomarker-based interventions
- Promote Medicaid and Medicare policies which facilitate the reimbursement of technology-based treatments [119]
- Develop legislation for enabling fast-track reviews of new treatment options for MH/SUDs for both reimbursement and regulatory approval
- Reform licensure regulations so that clinicians may more easily provide care across state lines, enabling telepsychiatry to be more state agnostic
- Enforce existing parity laws and ensure that new treatments for MH/SUDs are not unnecessarily labeled as uncovered due to being experimental

Part VIII: Conclusion

A variety of tools have been developed to provide infrastructure support for the treatment of behavioral disorders and to facilitate their assessment and treatment. While many of the tools are not yet widely adopted, adoption issues are often not due to a lack of clinical evidence or commercialization, but instead are driven by a lack of clinician and patient awareness or funding/reimbursement.

In addition, we are still in the early days of adopting these new technologies to improve behavioral health. We need to address a range of social, ethical and legal issues associated with the deployment of these emerging technology and software solutions. For example, factoring in quality and privacy concerns is a priority, along with a number of regulatory issues. However, these challenges can be addressed through more dynamic feedback loops and oversight. Moving beyond the couch and the pill bottle and into a digital future will involve a combination of payer support, clinician education, professional society engagement, patient acceptance, and more effective public/private oversight.

The push for value-based payment may solve some of the financial challenges that novel solutions have faced, as it may lessen concerns over reimbursement. As much of the research to date has focused on clinical effectiveness, further research showing that high-tech interventions produce cost-savings will facilitate their adoption. As mental illness often precipitates physical illness and unemployment, the medical and societal savings from effective new interventions are likely to far outweigh savings related to reduced use of other behavioral health services.

To date, a wide variety of hardware, services, and software have shown a demonstrated benefit in improving behavioral health, yet they are not in widespread use. Policymakers should treat this lack of adoption with the same degree of alarm that would be given if there was slow adoption of assessment, treatment, or infrastructure technologies in physical health. Promoting technology-based approaches to behavioral health will have numerous direct and indirect benefits for the American people.

Appendix A: Online Resources

The two online resources highlighted below can be used to identify technologies for behavioral health. Other resources are available, depending on the specialty area and type of technology.

KLAS

KLAS researchers meet with healthcare professionals to get feedback on the information technologies that they are using and compiles the feedback into reports which contain both insights and trends. The reports are shared with healthcare professionals in exchange for feedback, not money. Vendors also receive access to KLAS findings so that they can improve their solutions based upon user feedback. [120]

PsyberGuide

PsyberGuide develops consumer-oriented reviews of digital tools for mental health. A non-profit organization and a project of the One Mind Institute, PsyberGuide reviews interactive websites and smartphone applications intended to help people with anxiety, mood disorders, schizophrenia, post-traumatic stress disorder, and other behavioral health issues. [121]

Appendix

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