Is AI for Psychologists?

Brenda K. Wiederhold, PhD, MBA, BCB, BCN

We must face our fears if we want to get the most out of technology—and we must conquer those fears if we want to get the best out of humanity.

—Garry Kasparov

IN JUXTAPOSITION TO President John F. Kennedy's famous statement "Ask not what your country can do for you, ask what you can do for your country," I'm asking, "What can artificial intelligence (AI) do for me (and you) the busy clinician?" We are bombarded now with both positive and negative stories of AI. AI has existed since the 1940s. In 1957, Frank Rosenblatt, a psychologist at Cornell, used AI to study learning. The early models were based on the idea of the "perceptron," and looked at how neurons could be used in an artificial neural network. This idea of machine learning (ML) was used to model memory and cognition, which was further developed in the 1980s.

AI in mental health care remains in its infancy. However, there are a number of interesting areas where both research and early clinical studies have been done. Today, the dramatic improvement in computer processing combined with robotics, virtual reality (VR), natural language processing (NLP), advanced sensors, and other new technologies creates a landscape for limitless possibilities. Below are but a few of the areas of AI that show significant potential as useful clinical adjuncts.

Fitzpatrick et al.¹ used automated conversational agents in a self-help program for college students with symptoms of anxiety and depression. ML has been used to detect depression by examining changes in voice, gait, facial expression, social media content, and other areas of normal life activities. This is potentially a significant development, since the American Academy of Pediatrics now recommends that all young adults be screened for depression. This is a good example of how AI can be put to practical use, since we don't currently have enough mental health professionals to actually screen all children and young adults. The creation of this type of database could assist in the selection of appropriate pharmacological agents and digital medicine interventions.

In a 2018 study,² a mobile app explored the use of AI and clinical algorithms to reduce pain and inpatient hospitalizations in 112 patients with cancer-related pain. Study results showed a reduction in pain severity, but with an accompanying increase in anxiety scores. This suggests that a more comprehensive intervention is needed before we consider widespread adoption in clinical practice.

A recent Cochrane Review³ examined 13 studies with a total of 14,133 participants who used automated mobile

phone-based smoking cessation support programs. There was moderate evidence that the mobile interventions resulted in better quit rates than minimal smoking cessation support. This study exemplifies how we need to process this new technology whereby mobile apps are subjected to rigorous clinical study and review. The National Health Service in the United Kingdom established a framework for evaluating patient-focused health apps several years ago. However, studies as recent as 2016 showed less than half patient-facing apps were likely to be beneficial for patients. In 2019, we see several other regulatory bodies trying to understand how best to evaluate digital health products. As has been seen in numerous other fields (such as VR), it is important to have clinical involvement throughout the process of creation, development, and testing of apps, as well as clinical insight into the objective evaluation of the resultant products.

Another exciting area combines AI with mobile computing, remote sensor monitoring, wearable technologies, and telehealth capabilities. A recent policy statement from Vibrant Mobile Health⁴ listed six possible advantages of AI: (a) the ability to complete highly complex tasks with greater efficiency, accuracy, and reliability than humans; (b) lower susceptibility to burnout, boredom, fatigue, or forgetfulness; (c) improved feelings by patients that the AI is less biased and judgmental; (d) lower anxiety levels by individuals when discussing intimate issues; (e) more individualized patient care through integration of data from intelligent devices such as biofeedback devices and wearables; and (f) more appropriate adaptation to aspects of a patient's culture such as race/ethnicity, or socioeconomic status. This may include customization of mannerisms, dialect, and other characteristics to enhance patient rapport between the virtual clinician and the patient.

Of particular note, items (c) and (d) were confirmed in the 1980s in a study of information queries from the San Diego County Medical Society. In this study involving "tapes by phone," the overwhelming majority called to listen to topics related to sexually transmitted diseases and pregnancy. There is a history of patients being more comfortable discussing intimate and private issues with computers. The fact that this remains an issue over the past 40 years suggests that we might need to evaluate how we are currently delivering mental health care.

There are a number of studies whereby facial expressions, language, body position, and other types of nonverbal signals are used to detect psychological stress. This area of AI involving affective computing has been used to improve expression of emotions in both robots and virtual agents. The recent DARPA program, Detection and Computational Analysis of Psychological Signals systems, uses computer vision, ML, and NLP to analyze social signals, language, and physical gestures to detect psychological distress cues in military personnel.

VR continues to provide an important platform for the evaluation and treatment of patients. Over the past year in particular, an interesting development has occurred that has been underreported. The quality of the graphics seen in the production of avatars (both humans and animals) has escaped and surpassed the uncanny valley. I invite you to take a look at the latest PlayStation 4 images to convince yourself. Whether re-creating past traumas, important events, life situations, family involvement, or any other conceivable social interaction, this important tool will allow us to add a level of intricacy that was previously unavailable.

Recent approval by the Food and Drug Administration of robotics in hospitals to connect providers to patients via wireless televideoconferencing exposes interesting possibilities for access and treatment. Could these robots deliver sufficiently sophisticated mental health care using AI technology across the continuum of the clinic, hospital, and eventually the home? Will the preferred therapist be a robot in the future?

We are seeing an explosion of objective data in psychology, including brain scans and new specific tract scans, genetics, and biochemistry. The ability to collect objective data is quickly overwhelming the ability of psychologists to interpret it. This is probably one of the most important areas of AI that can be used not only to assess patients, but also to determine the most appropriate and individualized treatment plans.

An AI algorithm created at Vanderbilt University Medical Center has used hospital admission data from 5,000 patients and was 84% accurate in predicting the likelihood of suicide.⁵ Facebook also allows users to report suicidal content, ramping up these efforts after several people live-streamed their suicides in early 2017. A year ago, their AI began automatically flagging posts with suicidal expressions for the company's human reviewers to analyze.⁶ Additionally, researchers who used AI in the analysis of speech pattern classification were 83% accurate in predicting psychotic episodes in patients with schizophrenia.⁷ In these types of studies, especially in suicide prediction, we have neither discussed nor determined all the major liability issues surrounding this important intervention.

In the near future, the most likely scenario is human clinicians working closely with AI systems to improve assessment, treatment, follow-up, and long-term care in patients with mental health disorders and those requiring behavioral health interventions. Garry Kasparov, the chess world champion who was beaten by IBM's Deep Blue in 1997, imparted an interesting lesson about AI. After a period of reflection, he gave an excellent TED Talk entitled "Don't

Fear Intelligent Machines, Work with Them," which I encourage you to view for an interesting perspective.⁸ One take away was that combining the best capabilities of humans with the best capabilities of robots and computers will lead to the most successful outcomes. It makes sense that humans are humans and computers are computers, and we don't necessarily need to model computers after humans or humans after computers. This important area needs much more extensive development and testing, and will no doubt create the need for a new training paradigm for mental health care professionals. It will be interesting to see how our professional organizations respond to such new technology.

Although most results are very preliminary, the utility of AI appears to address some of the fundamental needs in the assessment and treatment of patients with mental health disorders. Many patients do not have access to adequate mental health services, and AI may provide part of the solution. There is no question that AI has the capability to screen large data sets and massive amounts of data, and with the help of humans in the loop, we humans need to determine the best outcomes of the AI revolution.

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Brenda K. Wiederhold
Editor-in-Chief