



Mental Health
Commission
of Canada

Commission de
la santé mentale
du Canada

Artificial Intelligence in Mental Health Services: A Literature Review

The burden of mental illness among people living in Canada is high. Approximately one in five Canadians are affected by mental health issues in any given year, and one in two might be affected by age 40. Yet, barriers to care, such as access, stigma, cost, and the lack of flexibility in treatment (e.g., the inability to tailor treatment to individual needs), have been an issue for many Canadians affected by mental illness. Technology may have a role to play in improving the access and delivery of mental health services.

A limited literature search for “artificial intelligence” and “mental health” was conducted (English documents published between January 1, 2014 and September 5, 2019). Studies that met the inclusion criteria were evaluated for strengths and limitations in their design and execution.



Key messages

While AI applications are being developed to **predict, diagnose, and treat** mental health problems or illnesses, how effective they are and how to incorporate them into mental health care services is still uncertain. The literature review this report is based on evaluated the published evidence on AI for the prevention, diagnosis, and treatment of mental health illnesses. The review focused on the clinical effectiveness of AI applications, purpose of use, patient populations, primary users, and related evidence-based guidelines.

- A wide range of artificial intelligence (AI) applications are being developed for use in mental health care. While mainly intended to support clinicians in their diagnoses, some applications are also intended to support clients in their treatment.
- Compared with physician diagnoses, the diagnostic accuracy of AI models is generally moderate to high (accuracy ranged significantly across AI models and mental health conditions).
- In treatment, AI applications appear to be effective for reducing symptoms of depression and improving access to crisis resources.
- Research on using AI for preventing mental health problems is lacking, as are guidelines for using AI in mental health care. There is also lack of research in assessing AI in specific groups such as older adults, immigrants, refugees, ethnocultural, or racialized populations; First Nations, Inuit, or Métis peoples; and members of lesbian, gay, bisexual, transgender, and queer or questioning, and two-spirit (2SLGBTQ+) communities.
- AI technologies are still in the early stages of development and testing. Without more research, identifying how to use AI most effectively for mental health care services is unclear. The safety of using AI in mental health care is also not known.

AI includes self-learning computer systems that can imitate human brain functions such as problem solving and pattern recognition. Personal assistants (e.g., Siri, Alexa, Google Assistant) are one type of AI already popular in everyday life. With its increasing use in health care, **AI has the potential to augment care, change how it is delivered, and improve access.**



Key findings

The studies reported findings on a wide range of AI applications (e.g., chatbots, which mimic human conversation, usually through text) and on populations that included persons living with bipolar disorder, schizophrenia, major depressive disorder, postpartum depression, post-traumatic stress disorder (PTSD), and those who have suicidal ideation – or thoughts – or have attempted suicide. Using AI interventions to prevent the development of mental health conditions or promote mental wellness was not a focus of these studies. Most focused on adults between the ages of 18 and 65 years.

For which populations has AI been used to prevent, diagnose, or treat mental health problems or illnesses?

AI has been used to diagnose individuals with suicidality (thoughts of suicide), major depressive disorder, bipolar depression, anxiety, schizophrenia, and PTSD, as well as to treat individuals with depression, bipolar depression, anxiety, and PTSD.

Who have been the primary users of AI for preventing, diagnosing, or treating mental health problems or illnesses?

AI applications have mainly been intended for clinicians who diagnose individuals. Some AI technologies (e.g., conversational agents [chatbots], AI mobile apps) have been intended for use as a resource or treatment option for persons living with mental health problems or illnesses. They have also been intended for those involved in treatment planning (e.g., health-care organizations) and caregivers.

What has been the main purpose of AI in preventing, diagnosing, or treating mental health problems or illnesses?

AI applications have mainly been used to support diagnoses by helping determine whether an individual has a particular mental health disorder. AI technology has also been used to predict or assess the risk of having a mental illness. In terms of treatment, AI technologies have been used for a range of purposes:

- as a platform for interacting with clients
- as a means of predicting which clients are more likely to respond to treatment
- as a method of collecting data that can be used to adapt content (e.g., lessons, tools, and motivational messaging)
- as a way to provide mental health support using various styles and types of therapy in a conversational format
- as a strategy to overcome perceived barriers in the use of crisis resources.

How effective is AI for preventing, diagnosing, or treating mental health problems or illnesses?

AI applications have generally had moderate-to-high diagnostic accuracy for distinguishing the individuals with mental health conditions from those without. However, the reported accuracy of each AI program differs from study to study and depends on the condition being assessed. Three studies examining AI-based treatment options (e.g., conversational agents [chatbots], mobile apps) reported that these tools increased the use of crisis resources and reduced symptoms of depression and anxiety. Compared with psychotherapy

support and education, conversational agents significantly reduced depressive symptoms yet did not significantly reduce anxiety. Added coaching may further reduce anxiety symptoms (but not those of depression).

The literature review included **34 studies (eight systematic reviews, three randomized controlled trials, and 23 non-randomized studies)**, published between 2015 and 2019 and conducted in Canada (three studies) and internationally.

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The Mental Health Commission of Canada commissioned a [CADTH literature review](#) and an [environmental scan](#) to address the role of AI in mental health services. This summary report is based on the literature review [Artificial Intelligence and Machine Learning in Mental Health Services: A Literature Review. Ottawa: Canadian Agency for Drugs and Technology in Health (CADTH), Mental Health Commission of Canada (MHCC); 2021 June.]



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