Artificial Intelligence-Supported Patient-Centered Clinical Decision Support: A Summary of Considerations

Artificial intelligence (AI) has the potential to improve patient care when used appropriately in patientcentered clinical decision support (PC CDS). However, patients and their care teams need to be aware of how AI is used in PC CDS and the challenges associated with its use. This resource provides approaches to addressing these challenges, which stakeholders can apply to develop, use, and understand AI-supported PC CDS.

What Is Patient-Centered Clinical Decision Support?

Clinical decision support (CDS) refers to digital tools used to help inform patient care decisions.¹ CDS is used by clinicians in electronic health records (EHRs) and by patients in patient portals and mobile applications (apps). CDS can assist clinicians with diagnosing disease, offer suggestions on best treatment options, and send patient or clinician reminders and/or alerts. PC CDS helps patients, caregivers, and care teams make decisions given a person's circumstances and preferences² and can be made available to patients via patient portals and apps. PC CDS significantly incorporates four patient-centered factors³:

Knowledge	Data	Delivery	्रु Use
Results from evidence- based research that include patient-specific outcomes	Information is provided directly by, and important to, patients	Directly engages patients and caregivers across a range of settings	Supports two-way communication between patients and care teams to support decision making



What Is Artificial Intelligence (AI)?

Al uses mathematics and computer science to analyze data and complete tasks that mimic human behavior.^{4,5} There are different types of Al that analyze data in various ways. The two main categories of Al are predictive Al and generative Al.



Predictive AI can identify patterns in existing data and make predictions about future events.⁶ Examples of predictive AI include rule-based systems, which use a set of rules to solve problems,⁷ or machine learning, which "learns" by identifying patterns from large amounts of data, even if it was not programmed to do so.^{5,8} For example, virtual personal assistants use predictive AI to make recommendations to users.



Generative AI can create new text, images, and data based on models it has been trained on. An example of generative AI is a large language model (LLM), which can create human-like text based on patterns it has analyzed from very large amounts of data.^{8,9} OpenAI's Chat Generative Pre-trained Transformer (ChatGPT) and Google's Gemini are examples of tools that use LLMs.

How Is AI Being Used In PC CDS?

Al is being used in PC CDS to help analyze patient data, support shared decision making between patients and clinicians, and provide recommendations for patient care.^{10,11} Using Al in PC CDS may improve quality of care by providing timely information. It may also allow more time for clinicians to interact with patients.^{12,13} Al is currently being used in PC CDS in the following ways:



Improve information management. Generative AI summarizes information about a patient from different sources (e.g., their medical record, health-related apps, patient-generated information). An example of this task is ambient listening, in which a generative AI tool converts a recorded transcript of a conversation between a patient and a clinician into a visit summary note.¹⁴ Because of these tools, clinicians can spend less time entering data on the computer during visits, and more time communicating and interacting with patients. As a result, patients may feel more listened to during visits, and a patient's care plans may better reflect their needs, values, and preferences.



Provide self-management support. An AI chatbot is a computer program that simulates a human conversation with an end user.¹⁵ AI chatbot technology is being used in many ways in healthcare, such as asking patients questions about their use of prescribed medications.¹⁶ These AI tools summarize the information reported by patients for clinicians, who can then make changes to a patient's care plan if needed. This can help patients get care that is better suited to them, and the close monitoring of medications can help catch any problems early.





Provide communication support. Generative AI is being used to improve communication and shared decision making between patients and their clinicians. For example, clinicians can use generative AI to create draft responses to patient portal messages using their past medical history. The clinician can then review the AI-generated content and send a customized response to a patient through the patient portal.¹⁷ This makes it easier for patients to quickly connect with clinicians, helping them feel more involved in decisions about their care. Chatbots are also examples of AI tools that can enhance communication support.

Improve PC CDS functionality. Generative AI is being used to improve the logic or rules used in PC CDS tools, which can be less costly than humans doing this task. This can lead to PC CDS that does a better job of recommending appropriate care and care plans tailored to each patient. Generative AI is also being used to make CDS alerts more precise and accurate, such as adding more complete medication suggestions. This helps reduce distractions for clinicians during patient care,¹⁸ meaning they have more time to focus on the patients and patient safety during visits.

Monitor patient symptoms. Al-supported technology is being used to detect patient symptoms using patient-provided data. For example, a machine learning tool can use voice technology to recognize fluctuations in a patient's voice pattern due to an asthma flare-up. The AI system can send alerts to clinicians about these symptoms instantaneously, helping patients get the care they need to quickly resolve their symptoms.¹⁹

Provide diagnostic support. Al-supported tools can analyze large amounts of patient data patterns to make recommendations about possible diagnoses to clinicians. For example, a machine learning tool can quickly analyze data from chest X-rays and patient vital signs to identify potential pneumonia diagnoses.²⁰ Such Al-enabled care recommendations can help quickly and accurately prioritize care for patients who need it most. Through quicker diagnoses, Al-supported tools can help ensure that a patient's condition does not get worse.

Personalize treatment. Al-supported tools use complex processes to personalize treatment recommendations for individual patients that better fit their needs. For example, patients with diabetes can upload information about their blood sugar and diet into an app, and a machine learning tool can use this information to create a personalized diet recommendation.²¹ Patients that receive care recommendations tailored to their needs and preferences may be more likely to successfully follow a treatment plan.^{22,23}

Using AI-Supported PC CDS Can Create Challenges

There are some challenges associated with using AI-supported PC CDS tools that patients, clinicians, researchers, and CDS developers need to understand. These challenges can affect adoption and use of these tools for patient care, and solutions should be implemented to resolve them.

- Al can be a "black box." As a result, users may not be able to understand how an Al-supported tool comes to a decision without clear explanation.²⁴ This lack of transparency can make Al-generated output difficult to understand and can affect trust in Al-generated output.^{25,26}
- Al-supported PC CDS is not always trustworthy. Al-supported PC CDS can generate false information (also known as confabulations or hallucinations).²⁷ Also, if an Al tool is trained using incomplete or skewed data, the output it creates will be inaccurate. Such errors can be dangerous when used to make decisions about patient care.²⁸
- Increased use of AI-supported PC CDS could cause "automation bias," in which clinicians and patients could begin to accept all AI-generated output, even when false, just because the output is AI-generated.²⁵ There is concern that using AI-supported tools too much could cause a loss in clinician skills if clinicians rely too much on AI to complete tasks.²⁹ This could negatively affect the quality of care that patients receive from clinicians.

What Promising Practices Can Improve Al-Supported PC CDS?

Based on testing with patients and clinicians,^{16,30} AI-supported PC CDS can be improved in several ways, including being more personal and empathetic and clearly explaining to patients that their clinician is involved in the process. The following practices are some of the ways clinicians, PC CDS developers, and patients can resolve some of the challenges associated with AI tools. These practices can help promote trust in AI-supported PC CDS and improve its safety.^{12,31,32,33}

In addition to the promising practices described above, PC CDS developers and clinicians should promote safety practices when using Al-supported PC CDS with patients.

Action Steps To Improve Patient Safety

- Conduct regular monitoring and testing of tools to reduce the risk of mistakes.^{13,33}
- Provide more education for clinicians and patients on how to use AI-supported PC CDS.^{12,34}
- Improve evaluation of PC CDS tools across multiple settings using standardized metrics.³⁵

Conclusion

The AI-supported PC CDS landscape is evolving—new tools are being developed and the guidance on how to use these tools is changing. As the use of AI-supported PC CDS in healthcare becomes more common, creating tools that are safe and trustworthy for both patients and clinicians will be important. The challenges and promising practices described in this document can inform the future development of AI-supported PC CDS.

PREPARED BY

Sofia Ryan, MSPH; Krysta Heaney-Huls, MPH; Kensaku Kawamoto, MD, PhD, MHS, FACMI, FAMIA; David Lobach, MD, PhD, MS, FACMI; Priyanka J. Desai, PhD, MSPH; CDSiC Implementation, Adoption, and Scaling Workgroup; and Prashila M. Dullabh, MD, FAMIA

WORKGROUP CONTRUBUTORS

Deborah Collyar; Supriya Doshi, MPH, MBA; Stephen Downs, MD; JaMor Hairston, MSHI, MS; Chris Harle, PhD; Scott Link; Dave Little, MD, MS; and Steve Miller, MD

ABOUT THE CDSiC

The Clinical Decision Support Innovation Collaborative (CDSiC) aims to advance the design, development, dissemination, implementation, use, measurement, and evaluation of evidence-based, shareable, interoperable, and publicly available patient-centered clinical decision support (PC CDS) to improve health outcomes of all patients by creating a proving ground of innovation. This document outlines key considerations for the use of artificial intelligence (AI)-supported PC CDS, including examples of how AI is being used in PC CDS, challenges and barriers to using AI-supported PC CDS, and promising practices for using AI-supported PC CDS.

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