

# INNOVATION CENTER PROGRESS REPORT

JUNE 2024

## CDSiC Innovation Center: Quarterly Report

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## PURPOSE

The CDS Innovation Collaborative (CDSiC) Innovation Center prepares a publicly available quarterly progress report to provide a summary of the status of all projects and activities being conducted within the CDSiC Innovation Center's two Cores and Planning Committee during the reporting period.

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## Introduction

NORC at the University of Chicago (NORC) is pleased to submit the second 2024 quarterly report to the Agency for Healthcare Research and Quality (AHRQ) on the Clinical Decision Support Innovation Collaborative (CDSiC) Innovation Center. This quarterly report provides a summary of the status of projects and activities being conducted within the CDSiC Innovation Center in year three.

The 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. Products put forth by the CDSiC will provide innovative solutions that promote the adoption of PC CDS to facilitate whole-person, evidence-based care and improve patients' health and care experience. Ultimately, the CDSiC aims to create a world where patients, caregivers, and clinicians have the information needed to make decisions that improve health and well-being for all individuals.

The CDSiC Innovation Center is the real-world test bed of the CDSiC, leading the development and application of CDSiC tools, learnings, and insights. The Innovation Center consists of a Planning Committee and two Cores:

- **Core 1. Measurement and Value of CDS:** The purpose of this Core is to standardize the measurement of all aspects of PC CDS and demonstrate PC CDS utility through the implementation of safe and effective PC CDS.
- **Core 2. Conducting and Coordinating CDS Projects:** The purpose of this Core is to test PC CDS projects in real-world settings to ascertain best practices for implementation and monitoring to ease last mile implementation challenges.

## Status Report

This quarterly report provides a summary of the status of all projects and activities being conducted within the CDSiC Innovation Center from April 2024 through June 2024. Over this period, the Innovation Center has focused on executing four projects across both Cores.

### Innovation Center Cores

The Innovation Center Cores are tasked with developing and completing four projects that advance PC CDS research. Based on discussions with AHRQ and the Planning Committee, Innovation Center leadership identified projects aimed at addressing gaps in measuring and monitoring PC CDS performance and using novel technology to facilitate PC CDS. The overarching goals of these projects are to validate a comprehensive performance measurement framework and to develop chatbot

prototypes to help patients, clinicians, and CDS developers understand real-world implementation and measurement considerations for PC CDS and any unintended consequences.

The projects vary in terms of expected length of time to complete based on scope, falling into one of three Levels.

- Level 1 projects are the largest in scope, involving significant effort and multiple modes of research or real-world assessments, with the expectation of tangible results.
- Level 2 projects involve a medium amount of effort and one mode of research or real-world assessment.
- Level 3 projects are shorter-term and may be proof-of-concept ideas or pilots.

Core 1 is undertaking two Level 2 projects and Core 2 is undertaking two Level 1 projects. One of Core 1's projects will be supporting the assessment of both Core 2 projects.

## Core 1: Measurement and Value of CDS

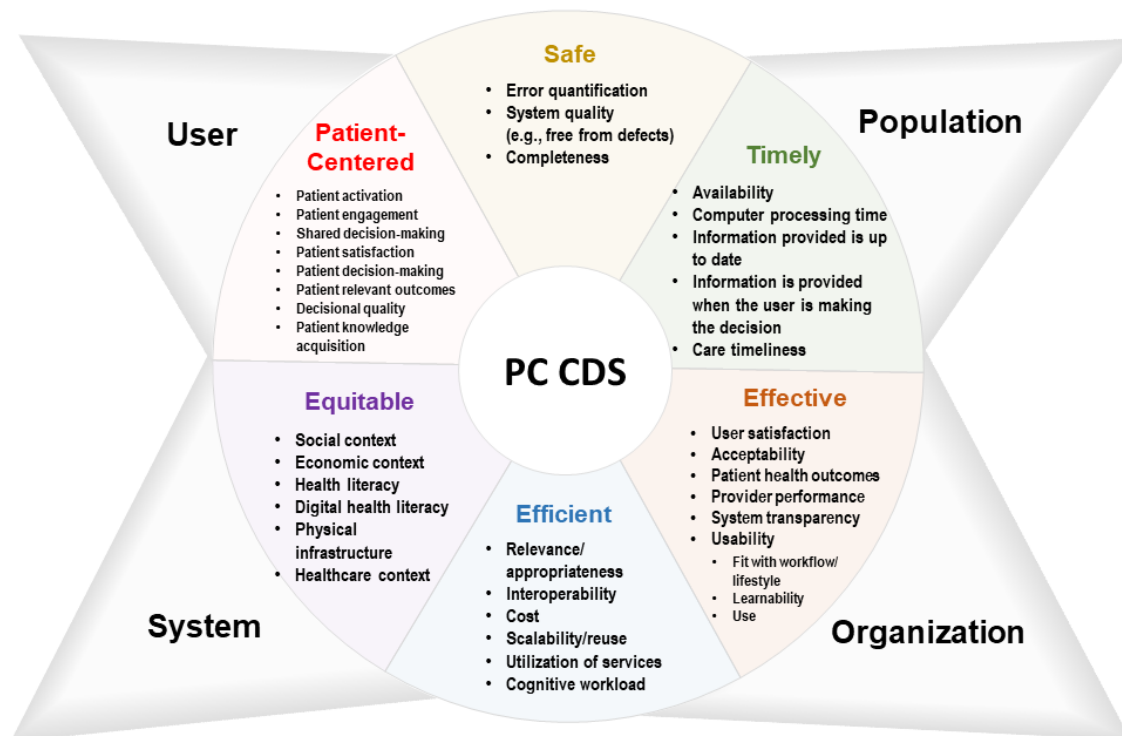
Significant gaps exist in the tools, techniques, and standards required to accurately measure and monitor the performance of various forms of PC CDS across the design, development, implementation, and use spectrum. To address these gaps, Core 1 is undertaking two projects: 1) conduct a cross-cutting assessment of how PC CDS is measured in the real-world, and 2) evaluate Core 2's prototype PC CDS tools (see details in the Core 2 section below).

### 1. Cross-cutting Assessment of Real-World Experience in PC CDS Measurement

In years one and two of the CDSiC, the Innovation Center developed a new, comprehensive PC CDS performance measurement framework that includes key domains, subdomains, and levels of measurement that CDS developers and others should consider when assessing PC CDS interventions (see Exhibit 1). The goal of this framework is to provide a basis for consistent measurement of PC CDS design, development, implementation, and use across the structure, process, and outcome spectrum.

In the third year of the CDSiC, the Core 1 team tested the framework by examining how current AHRQ-funded projects are evaluating and measuring real-world PC CDS interventions. The three aims of the cross-cutting assessment were to: 1) validate the PC CDS performance measurement framework; 2) gather researcher perceptions about the limitations and challenges of using the performance measures in AHRQ-funded PC CDS projects; and 3) use information gathered to develop an action plan for advancing the development and use of PC CDS performance measures.

**Exhibit 1.** The Patient-centered Clinical Decision Support Performance Measurement Framework



In Q2 2024, the Core 1 team revised and finalized a report that describes findings from the cross-cutting assessment examining how framework measures are used in 20 real-world AHRQ-funded PC CDS projects. The team reviewed published materials from the projects, which included 40 peer-reviewed articles and final reports, to gather information on the type of data, technology, and measures were used. The team then conducted key informant interviews with nine principal investigators of the projects to gather perspectives on PC CDS performance measures and measurement-related gaps and challenges. The findings of the report highlight key measurement trends, gaps, and challenges for measurement. The discussion section describes how the findings can be used to refine the PC CDS performance measurement framework and identifies six opportunities for advancing PC CDS measurement development.

For dissemination, the Core 1 team presented the findings from the real-world measurement assessment at the CDSiC Annual Meeting session focused on “Scaling and Measurement of PC CDS.” The team provided an overview of the projects included in the assessment and shared the common measurement areas as well as identified gaps and areas for improvement for PC CDS performance measurement. At the end of the session, the team answered participants’ questions about the findings and shared ideas for future measurement development.

## Deliverables Submitted in Q1:

- Core 1 submitted the final report titled, “Real-World Performance Measurement of PC CDS Tools” that describes the aims, methods, findings, and action plan for PC CDS performance measurement.

## Dissemination Activities

- Core 1 presented the findings from the cross-cutting assessment at the CDSiC Annual Meeting on May 14<sup>th</sup>, 2024.

## 2. Assessment of Core 2’s Prototypes

To build understanding of PC CDS performance measurement, Core 1 is conducting two assessments of Core 2’s prototype tools. The team has leveraged the PC CDS performance measurement framework and findings from the cross-cutting assessment to determine measurement domains and subdomains for each project assessment. Further details about each project’s assessments can be found in the next section.

## Core 2: Conducting and Coordinating CDS Projects

Artificial intelligence (AI) can facilitate the collection and use of patient information for PC CDS to provide summative, distilled information to clinicians, leaders, and patients making health care decisions. In recent years, large language models (LLMs) like OpenAI’s ChatGPT<sup>1</sup> have been increasingly utilized in health care applications, namely in the areas of education, triage, and contextual question-answering.<sup>2,3</sup> The evidence reported has been mostly positive in terms of effectiveness and user satisfaction, with evaluators indicating some responses from chatbots to be more empathetic and higher quality compared to those from physicians.<sup>4</sup> However, there are several considerations for the use of AI in decision support tools, and more studies are needed exploring patient and clinician perspectives on the subject. To address these gaps, Core 2 is undertaking two projects: 1) design, develop, and deploy a chatbot prototype to support medication adherence; and 2) design and develop a chatbot prototype to support patient-clinician communication.

### 1. Design, Development, and Deployment of a Chatbot Prototype to Support Medication Adherence

In this project, Core 2 is codesigning, developing, and conducting technical feasibility and usability testing of a text-messaging application (app) to help patients improve adherence to medications for hypertension. The app will leverage an AI-based tool to text patients who have been identified as having uncontrolled blood pressure to ensure that a) patients begin and continue taking their medications as prescribed, and b) the medications have the desired effect. The app can ask questions in English or Spanish and will use natural language processing (NLP) to understand patient responses, but it will not provide medical advice. The app will be integrated with the electronic health record (EHR) using Substitutable Medical Applications and Reusable Technologies (SMART) on Fast Healthcare

Interoperability Resources (FHIR®)<sup>5</sup> to allow clinicians to monitor patients' medication use between visits and intervene if necessary.

**Design and Development.** In Q2 2024, the Core 2 team held codesign sessions with three patient representatives and advocates from the CDSiC Stakeholder Center. Patients were asked to share their overall impressions of the texting program and provide feedback on the clarity and relevance of five conversation scenarios. The team began incorporating patient's feedback in the design of the program.

**Pilot site.** The Core 2 team also established a health system to serve as a pilot site for the technical feasibility and usability testing. They began the process of integrating the app into the health system's EHR, which included weekly meetings with the health informatics and security teams.

**Evaluation.** The Core 1 team finalized the assessment plan for the design, development, and deployment of the medication adherence app. The assessment will include mixed-methods data collection from: 1) the technical team on the feasibility of integrating the app with the EHR; 2) the clinical team on the utility of the information and its integration into the clinical workflow; and 3) health system patients on the usability and patient-centeredness of the app. The Core 1 assessment team began joining the weekly meetings with Core 2 and the health system technical team to understand the integration process and challenges.

**Dissemination.** For dissemination, the Core 2 team demonstrated the "final" version of the medication adherence prototype to AHRQ. They first provided an overview of the design and development process, including how patients were engaged, and described the upcoming assessments by the Core 1 team. The team then presented a live version of the patient-facing text messaging conversations and solicited feedback from AHRQ attendees. The Core 2 team also presented the medication adherence prototype at the CDSiC Annual Meeting. The presentation began with an overview of medication adherence interventions and then discussed how this intervention improves upon earlier designs, including the decision to use NLP over other forms of AI.

#### **Deliverables Submitted in Q2:**

- Core 2 submitted the final Assessment Plan that describes the aims, research questions, and data collection and analysis methods of the assessment.

#### **Dissemination Activities:**

- Core 2 presented a demonstration of the final prototype to AHRQ project officers and colleagues on April 26<sup>th</sup>, 2024. Meeting minutes were provided following the meeting.
- Core 2 presented on the use of AI in the medication adherence prototype at the CDSiC Annual Meeting on May 14<sup>th</sup>, 2024.

## 2. Design and Development of a Chatbot Prototype to Support Patient-Clinician Communication

In this project, Core 2 is co-designing and developing an interactive LLM-powered prototype called the Patient Artificial Intelligence Guided E-messages (PAIGE) that will serve as an intermediary between



patients and clinicians via the patient portal. The aim is to improve accuracy and efficiency in patient-clinician communication by using a chatbot to field and summarize information from patients about their symptoms for clinicians to make care decisions. They partnered with Vanderbilt University Medical Center® (VUMC®) to extract a sample of patient portal message and clinician responses as well as traditional triage handbooks to train different models (e.g., a local fine-tuned LLM,<sup>6</sup> GPT-4<sup>7</sup>) to ask clarifying questions on the clinicians' behalf. The team will conduct laboratory testing with clinicians to assess the quality and completeness of the LLM-generated summaries.

**Design and Development.** In Q2 2024, the Core 2 team continued refining the prototype based on feedback from patients, clinicians, and researchers at VUMC®.

**Evaluation.** the Core 1 team finalized the assessment plan for the design and development of PAIGE. They completed five interviews with patients to assess the performance of the system to generate relevant clarifying questions to patients. Patients were asked about their experience communicating with their doctor via patient portals, and then they were given the opportunity to test hypothetical questions with the PAIGE prototype. Patients were then asked to rate the clarity of the questions, their ease of comprehension, the perceived relevance of each question, and whether the summary accurately reflected their questions. To assess the timeliness and ease of use, the team also recorded the time required for PAIGE to generate the list of clarifying questions. To assess readability, the team asked patients questions from an eHealth Literacy scale.<sup>8</sup> The team also began the clinician assessment which will include survey responses from six to eight clinicians. The team selected 10 of the interactions from the patient interviews and asked clinicians to rate the appropriateness and accuracy of the PAIGE-generated responses and summaries.

**Dissemination.** For dissemination, the Core 2 team demonstrated the “final” version of the PAIGE prototype to AHRQ. They first provided an overview of the design and development process, including how patients were engaged, and described the upcoming assessments by the Core 1 team. The team then presented a pre-recorded and live version of the patient-facing portal submissions and solicited feedback from AHRQ attendees. In addition, the Core 2 team presented the PAIGE prototype at the CDSiC Annual Meeting. The presentation focused on how LLM was used (and not used) to facilitate patient-clinician communication. The team provided a station at the meeting for participants to test the PAIGE prototype in between meeting sessions.

#### **Deliverables Submitted in Q2:**

- Core 2 submitted the final Assessment Plan that describes the aims, research questions, and data collection and analysis methods that will guide the assessment.

#### **Dissemination Activities:**

- Core 2 presented a demonstration of the final prototype to AHRQ project officers and colleagues on April 26<sup>th</sup>, 2024. Meeting minutes were provided following the meeting.
- Core 2 presented on the use of AI in the medication adherence prototype at the CDSiC Annual Meeting on May 14<sup>th</sup>, 2024.

## Innovation Center Deliverables

In Exhibit 2, we outline each Core’s project deliverables to date, as well as the future deliverables in progress.

**Exhibit 2.** Summary Table of Deliverables

Project	Status
<b>Innovation Center</b>	
Project Outline and Timeline	Complete
Revised Charter	Complete
Revised Operational Framework	Complete
<b>Core 1</b>	
Cross-cutting Assessment Report	Complete
Patient-Clinician Prototype Assessment Report	In Progress
Medication Adherence Prototype Assessment Report	In Progress
<b>Core 2</b>	
<i>Medication Adherence Prototype</i>	
Specification & Requirements Document	Complete
Medication Adherence Prototype Demonstration	Complete
<i>Patient-Clinician Communication Prototype</i>	
Specification & Requirements Document	Complete
Patient-Clinician Prototype Demonstration	Complete

## Planning Committee

The Planning Committee will meet once during this quarterly reporting period on June 26, 2024. The meeting will focus on sharing findings from the third year’s projects. Core 1 will discuss the final findings from the real-world PC CDS measurement assessment, and Core 2 will discuss the preliminary findings from the ongoing prototype assessments. After each project presentation, Co-Leads will provide at least 10 minutes of Question & Answer for the Planning Committee members to provide feedback.

## Next Steps

This quarterly report provided updates on the Innovation Center’s project activities in the third year of the CDSiC. Over the next three months, Core 1 will complete the assessments of the Core 2 PC CDS prototypes and will submit draft assessment reports to AHRQ. Core 2 will finalize the development of both prototypes and assist Core 1 with the final assessments.

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