

CDS Connect: Final Report 2024

Clinical Decision Support (CDS) Connect is a freely available, web-based platform that enables the CDS user community to identify evidence-based care, translate and codify information into interoperable health information technology standards, and leverage tooling to promote a collaborative model of CDS development.



CDS “artifacts”—actionable medical knowledge (e.g., clinical practice guidelines, peer-reviewed articles, local best practices, and clinical quality measures) translated into computable and interoperable decision support

Executive Summary

Healthcare continues to evolve as the digital revolution leads to innovations in using technology and data to impact care. The Agency for Healthcare Research and Quality (AHRQ) launched the CDS Connect project in 2016 to disseminate patient-centered outcomes research findings into practice. CDS Connect provides a public platform focused on integrating evidence-based care more rapidly into clinical practice through electronic health systems and applications.

The eighth year of the CDS Connect project focused on system maintenance and updates to ensure that the tools remain shareable, standards-based, and publicly available. This report organizes this project year’s accomplishments by the four major components of CDS Connect: the Repository, CDS artifacts, the Authoring Tool, and the open-source tools.

Repository

The [CDS Connect Repository](#), the platform’s first prototype tool, hosts structured, interoperable CDS expressions—known as CDS artifacts—that support decision making by clinicians and patients.

Covering an array of clinical topics, artifacts in the Repository were developed by the MITRE team and trusted third parties. The Repository demonstrates a way to more rapidly incorporate evidence-based research into clinical practice through interoperable CDS.

This year’s Repository accomplishments include:

- Upgrading to Drupal 10.2 and PHP 8.2 (both key components of the content management capability)
- Improving webpage styling, page rendering, and navigation elements to enhance usability
- Implementing non-phishable multifactor authentication for privileged user accounts, bringing the project further into compliance with an executive order



CDS Connect

- Performing remediation to address issues detected by Health and Human Services security scans and enhancing spam and bot detection on webform submissions, both further increasing the platform's security posture
- Expanding documentation and configuration management of Repository processes for developing new features, applying security patches, updating components, and content management in preparation for transition
- Establishing 178 Repository and Community accounts, allowing users to submit CDS artifacts for possible publication in the Repository and receive email alerts about the latest news on CDS Connect

CDS Artifacts

Highlighting the work of MITRE and the greater CDS community, artifacts span a variety of functions (alerts, risk assessments, order sets, event-condition-action rules, smart documentation forms, data summaries, multimodal formats, and calculators) that represent different degrees of implementation.

From posting narrative summaries and Implementation Guides (IG) to piloting an artifact in a health system, the Repository showcases how evidence-based research can be incorporated into clinical practice.

An annual review process keeps the actively maintained artifacts intended for clinical use current, reflecting the most up-to-date clinical evidence. In addition to managing external-contributor submissions and annual review process, MITRE completed an annual review and update of eight IGs and associated artifacts:

- [Healthy Diet and Physical Activity for CVD Prevention in Adults With Cardiovascular Risk Factors](#)
- [Factors To Consider in Managing Chronic Pain: A Pain Management Summary](#)
- Statin Therapy for the Primary Prevention of CVD in Adults ([clinician-facing](#) and [patient-facing](#))
- [Statin Therapy for the Prevention and Treatment of CVD: An eCQM-derived CDS](#)
- Prediabetes and Type 2 Diabetes ([screening](#) and [counseling](#))
- [Aspirin Use to Prevent Cardiovascular Disease: Preventive Medication](#)

Authoring Tool

The [CDS Authoring Tool](#) is a user-friendly web application for creating standards-based CDS logic using Health Level Seven International® (HL7®) Clinical Quality Language (CQL) and the HL7 Fast Healthcare Interoperability Resources® (FHIR®)* data model; CDS logic can then be integrated within electronic health record systems.

An Authoring Tool account allows users whose expertise does not include software development to easily author CDS logic that features inclusion and exclusion criteria, subpopulations, conditional recommendations, and custom modifiers. Leveraging the Authoring Tool's integration with the National Library of Medicine's Value Set Authority Center (VSAC), authors can define clinical elements using value sets and standard terminologies. Experienced authors may also import externally authored CQL, specify run-time parameters, and test their logic using synthetic data. Exporting valid CQL using the FHIR Release 2, 3, or 4 data models is as simple as clicking a button.

* FHIR® is a registered trademark of HL7®.

This year's Authoring Tool accomplishments include:

- Adding a step-by-step tutorial to introduce the Authoring Tool to new authors
- Expanding Authoring Tool recommendations to return a structured FHIR MedicationRequest and ServiceRequest, increasing CQL capabilities
- Utilizing updated VSAC FHIR Application Programming Interface to provide authors with enhanced Value Set search results
- Increasing visibility and control of test patient data with a new view of complete FHIR JavaScript Object Notation (JSON) data and ability to download them as a FHIR JSON Bundle
- Improving code maintainability and reusability through React refactoring
- Revising code quality to incorporate expanded automated tests
- Implementing a variety of enhancements and bug fixes to improve the user experience
- Establishing 172 accounts, with 45% requested for use in university health informatics coursework

Open-Source Tools

CDS Connect developed a number of open-source tools.

[CQL Services](#) is an open-source application enabling users to expose CQL-authored logic over custom and CDS Hooks–based web services.

The [CQL Testing Framework](#) is an open-source library allowing developers to create and execute detailed test cases for CQL libraries.

The [Pain Management Summary Application](#) is a Substitutable Medical Applications, Reusable Technologies (SMART) on FHIR application enabling clinicians and patients to view all individual patient data that might be relevant to managing that patient's pain.

Freely available on [GitHub](#), these tools complement the Authoring Tool's capabilities and encourage their implementation.

This year's Open-Source Tools accomplishments include updating:

- Pain Management Summary to reflect changes in logic and terminology
- Pain Management Summary to leverage modern build tooling for improved maintainability
- CQL Services to support CDS Hooks 2.0 features, including system actions and feedback
- CQL Services and CQL Testing Framework to support new VSAC authentication scheme
- Dependency libraries and fixing bugs as necessary

Future Directions

In addition to maintaining alignment with interoperable health standards, recommendations for CDS Connect include:

- Supporting CDS developers as they navigate federal requirements and guidance, such as the Office of the National Coordinator for Health Information Technology Health Data, Technology, and



Interoperability: Certification Program Updates, Algorithm Transparency, and Information Sharing Final Rule and the U.S. Food and Drug Clinical Decision Support Software guidance

- Introducing artifact metadata fields to encourage CDS developers and artifact authors to take into account federal guidance on CDS software, in addition to the role(s) artificial intelligence technologies may have had in the creation of their work
- Expanding the use of the Repository, Authoring Tool, and prototype tools by promoting awareness and adoption by institutions of higher learning and other learning communities
- Increasing documentation and training resources for artifact authors and developers to further enhance the user experience and to promote the platform’s capabilities
- Developing methods and mechanisms for providing artifact authors and developers with end-user feedback options, usage statistics, and impact metrics
- Participating in the development and evolution of CDS standards, including FHIR, CDS Hooks, and CQL
- Exploring opportunities to leverage artificial intelligence tools, synthetic patient data, and sandbox environments to test and pilot patient outcomes and organizational fit prior to CDS selection

Next Steps

By late summer 2024, the MITRE team will transition CDS Connect to AHRQ, as AHRQ continues to explore sustainability. In evaluating collaborative models of sustainment for CDS Connect (including partnerships with public and/or private organizations), AHRQ will chart a path for the continued development and dissemination of the evidence-based tools and CDS practices.

Those interested in learning more may choose to sign up for one of AHRQ’s newsletters at <https://www.ahrq.gov/news/newsletters/index.html> or request to be added to the CDS Connect Update Email list at <https://cds.ahrq.gov/contact-us>.

Resources



For more information on the CDS Connect project:

<https://cds.ahrq.gov/cdsconnect>



To view CDS artifacts in the Repository:

<https://cds.ahrq.gov/cdsconnect/repository>



To view all the Open-Source tools:

<https://github.com/AHRQ-CDS>



To sign up for a CDS Connect account:

<https://cds.ahrq.gov/cdsconnect/signup>



To view the Authoring Tool:

<https://cds.ahrq.gov/authoring/>



To try the Pain Management Summary App:

<https://apps.smarthealthit.org/app/cds-connect/>



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