OpenCDS: Enabling Clinical Decision Support at Scale through Open-Source, Standards-Based Software and Resources

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Abstract
OpenCDS is a multi-institutional effort to develop open-source, standards-based clinical decision support (CDS) tools and resources that can be widely adopted to improve health and healthcare. Core OpenCDS components include a reference implementation of the HL7/OMG Decision Support Service standard; an open-source implementation of the emerging HL7 Virtual Medical Record standard; and a full-featured knowledge authoring environment. Ultimately, OpenCDS aims to democratize CDS by establishing a widely adopted, open-source framework for disseminating CDS at scale.

Introduction
Despite its great potential to improve health and healthcare, robust CDS capabilities are not widely available. An important reason for this limited availability is the prevalence of non-standard and proprietary approaches to implementing CDS, which makes it difficult to scale CDS across applications and institutions. OpenCDS is a multi-institutional effort to overcome this problem through the collaborative development of open-source, standards-based CDS tools and resources that can be widely adopted to impact healthcare at scale.

OpenCDS Collaborators
Current collaborators include the University of Utah, HLN Consulting, the Veterans Health Administration, Intermountain Healthcare, EBSCO, Apelon, and a number of organizations from outside of the United States.

OpenCDS Architecture and Key Components
OpenCDS is designed as an application-independent CDS Web service that can be plugged into various health information system environments through a standard service interface. Key components of OpenCDS include:
- **Standard interfaces and data models**, including (i) a reference implementation of the HL7/OMG Decision Support Service interface; (ii) an implementation of the emerging HL7 Virtual Medical Record data model standard; and (iii) tools for mapping from one standard model to another (e.g., from a CCD to a vMR)
- **Reference knowledge management framework and content**, including (i) a clinician-friendly, Web-based knowledge authoring and management platform built on top of JBoss Drools; (ii) full-featured terminology support; (iii) a repository of metadata-tagged knowledge resources and an associated knowledge sharing service; and (iv) high-value reference knowledge resources based on national care quality metrics
- **Adapters for other CDS engines**, so that knowledge implemented using alternate approaches can be served up through the standard HL7/OMG Decision Support Service interface to OpenCDS clients

Current State and Future Directions
OpenCDS is available through an Apache 2.0 license. Moving forward, OpenCDS collaborators will continue to iteratively enhance and leverage the platform. Further information on OpenCDS is available at http://www.opencds.org.

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References