

Clinical Decision Support Consortium

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Summary: Electronic health records (EHRs), when used effectively, can improve the safety and quality of medical care. However, EHRs must be paired with clinical decision support (CDS) systems to influence physician behavior effectively. CDS includes a variety of techniques designed to facilitate and guide doctors' decisionmaking toward evidence-based practice. Despite evidence that CDS is effective, only a small number of academic medical centers and integrated delivery networks account for the majority of CDS research and development. Wider CDS adoption has been limited by a variety of issues including: 1) a lack of widely adopted standards for representing and sharing clinical knowledge in a computable form; 2) difficulty developing clinical practice guidelines that can be readily and unambiguously translated into a computable form; 3) absence of a central repository or knowledge resource where computable guidelines can be stored and shared; 4) challenges integrating CDS into clinical workflow; and 5) limited understanding of organizational and social issues relating to CDS.

As demonstrated at sites where CDS is pervasive, these barriers are surmountable. The biggest challenges to widespread CDS adoption include the complexity of the CDS; a lack of understanding of how to create the initial building blocks; identifying costs; and identifying the process for maintaining an up-to-date CDS. To address these challenges, investigators from Brigham and Women's Hospital, Harvard Medical School, and Partners HealthCare Systems (PHS) formed the CDS Consortium (CDSC) in collaboration with 31 organizations, including vendors, health care organizations, and academic institutions, from across the United States.

The goal of the CDSC has been to assess, define, demonstrate, and evaluate best practices for knowledge management and CDS in health information technology (IT) across multiple ambulatory care settings and EHR technology platforms in pursuit of widespread CDS adoption. The CDSC is developing a series of service-oriented CDS interventions focused on diabetes, coronary artery disease, and hypertension screening. Over the first 4 years, the CDSC has: conducted an ethnographic study of CDS that has led to a better understanding of technical and sociological issues related to decision support critical to the Consortium as it develops CDS content and demonstrations at a variety of member sites; developed a practical four-layer knowledge representation stack and knowledge authoring tool for translating clinical guidelines from human-readable into machine-executable form for a variety of CDS modalities; developed and launched a publicly accessible, Web-based Knowledge Management (KM) Portal for collating and browsing knowledge artifacts used in CDS; constructed and tested novel Web-based CDS services and integrated them into two EHRs – the PHS Longitudinal Medical Record (LMR) and the Regenstrief Institute CareWeb; devised a novel measurement model for CDS that takes into account the myriad of ways that CDS can influence practice, as well as accounting for both the decision support process and clinical quality; developed legal agreements to support CDSC knowledge-sharing and use of CDS services; built a robust

clinical content governance process and tackled difficult issues relating to provenance, standardization, localization, and versioning; and disseminated findings through more than a dozen presentations at national and international meetings and published papers at conferences and in peer-reviewed journals.

Project Objectives:

- Assess and define best practices for knowledge management and CDS in ambulatory care. **(Ongoing)**
- Define a novel, practical knowledge representation scheme that allows users to access knowledge in a manner that facilitates the translation of knowledge into CDS within EHRs. **(Achieved)**
- Build a prototype national knowledge repository to support access and use of knowledge artifacts and collaborative knowledge engineering. **(Achieved)**
- Build publicly available cloud-based Web services to provide remote CDS. **(Achieved)**
- Build end-user CDS dashboards that would depict user's compliance with CDS and provide feedback to knowledge engineers on the efficacy of the CDS. **(Achieved)**
- Coordinate overall CDS Consortium evaluation activities. **(Ongoing)**
- Demonstrate the feasibility of a service oriented architecture-based approach through multi-site, multivendor demonstration projects. **(Ongoing)**
- Disseminate results through a variety of traditional channels. **(Ongoing)**

2012 Activities: The CDSC continued to pursue research and development, completing a series of deliverables including but not limited to: 1) a CDSC knowledge authoring tool for creating knowledge artifacts at level 2 and level 3; 2) a new set of clinical rules that were implemented in the CDS service and KM Portal; and 3) Phase 2 demonstrations at the Regenstrief Institute. In addition, the CDS Consortium increased the number of collaborators to include Accenture, Applied Pathways, Evinance, Geisinger, Illinois Gastroenterology Group, InterSystems, Main Line Health, Mayo Clinic, MITRE, Mount Sinai Medical Center, newMentor, TruvenHealth, and the University of Utah.

Dissemination activities in 2012 included a presentation of CDSC progress in a series of demonstration meetings with EHR and clinical content vendors at the annual Healthcare Information and Management Systems Society Meeting in February as well as presentations at IntelliFest in October and at the 2012 American Medical Informatics Association annual symposium in November. The CDSC also published three journal articles and one conference paper in 2012. These included a paper published in the February volume of the *BMC Medical Informatics and Decision Making* journal, describing the results of the ethnographic field studies to identify recommended practices for CDS development and implementation and knowledge management processes: [Recommended practices for computerized clinical decision support and knowledge management in community settings: a qualitative study](#). In addition, a paper describing the practices related to CDS in U.S. community hospitals with mature computerized provider order entry systems was published in the November-December volume of the *Journal of the American Medical Informatics Association*: [Standard practices for computerized clinical decision support in community hospitals: a national survey](#). The full list of publications is available on the [CDSC Web site](#).

Preliminary Impact and Findings: The CDSC has solved critical technical challenges for sharing CDS, developed social and legal frameworks and model contracts to facilitate such sharing, and most critically, built a trusting community of CDS researchers, developers, and clinical information system vendors who are ready to share their knowledge and expertise.

Target Population: Adults, Chronic Care*, Coronary Artery Disease, Diabetes, Hypertension

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

**This target population is one of AHRQ's priority populations.*