The Clinical Decision Support Consortium[*]

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Abstract. Clinical decision support (CDS) can impact the outcomes of care when used at the point of care in electronic medical records (EMR). CDS has been shown to increase quality and patient safety, improve adherence to guidelines for prevention and treatment, and avoid medication errors. Systematic reviews have shown that CDS can be useful across a variety of clinical purposes and topics. Despite broad national policy objectives to increase EMR adoption in the US, current adoption of advanced clinical decision support is limited due to a variety of reasons, including: limited implementation of EMR, CPOE, PHR, etc., difficulty developing clinical practice guidelines ready for implementation in EMR, lack of standards, absence of a central repository or knowledge resource, poor support for CDS in commercial EMRs, challenges in integrating CDS into the clinical workflow, and limited understanding of organizational and cultural issues relating to clinical decision support. To better understand and overcome these barriers, and accelerate the translation of clinical practice guideline knowledge into CDS in EMRs, the CDS Consortium is established to assess, define, demonstrate, and evaluate best practices for knowledge management and clinical decision support in healthcare information technology at scale – across multiple ambulatory care settings and EHR technology platforms.

Keywords. clinical decision support, knowledge representation, knowledge engineering, knowledge management

1. The Clinical Decision Support Consortium

A significant body of evidence suggests that clinical decision support (CDS) systems, when effectively used, have an impact on healthcare cost, quality, efficiency, and patient safety. Studies have shown that decision support can help clinicians improve diagnosis [1–7], increase quality and patient safety [8–15], adhere to guidelines for prevention and treatment [11, 16–21], and avoid medication errors [15, 22–26]. Recent systematic reviews by Garg [12] and Kawamoto [27] have shown that a significant majority of trials of decision support systems have resulted in measurable improvements in patient care.

Despite the overwhelming evidence of its effectiveness, current use and adoption of clinical decision support is limited, and a small number of academic medical centers

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and integrated delivery networks account for the bulk of clinical decision support research and development [28]. Wider adoption of decision support has been held back by a variety of significant social, economic, and technical issues, including, but not limited to:

- A lack of widely-adopted standards for representing and sharing clinical knowledge in a computable form.
- Difficulty developing clinical practice guidelines that can be readily and unambiguously translated into a computable form.
- Absence of a central repository or knowledge resource where computable guidelines can be shared and stored.
- Challenges in integrating decision support into the clinical workflow.
- Poor support for clinical decision support in commercially available electronic health record (EHR) systems.
- A limited understanding of organizational and social issues relating to clinical decision support.

While these issues have been barriers for adoption of clinical decision support systems they are surmountable, as evidenced by a small number of sites where decision support is pervasive. We believe that the biggest challenge to fostering widespread adoption of clinical decision support is in documenting, generalizing, and finally translating the experience from these advanced sites to broader community settings. To address this challenge, investigators from Brigham and Women's Hospital, Harvard Medical School, and Partners HealthCare Information Systems (PHS), have formed the Clinical Decision Support Consortium (CDSC) in collaboration with the Regenstrief Institute, Kaiser Permanente Northwest Research Group, the Veterans Health Administration, Masspro, GE Healthcare, and Siemens Medical Solutions.

The goal of the CDSC is to assess, define, demonstrate, and evaluate best practices for knowledge management and clinical decision support in healthcare information technology (IT) at scale – across multiple ambulatory care settings and EHR technology platforms. The CDS Consortium is confident that working together, with Agency for Healthcare Research and Quality (AHRQ) support, significant progress towards widespread adoption of clinical decision support can be made in a short period of time.

2. The CDSC Approach

CDSC's approach to the above goal is iterative and cyclical: we will begin with a survey of the knowledge management lifecycle and supporting infrastructure (such as knowledge management systems, terminology services, and data standards) at the CDSC clinical sites. We will then work together to define best practices for translating knowledge into a multi-layered human readable knowledge specification, including publicly available web services for CDS. At each point in this process, we will conduct careful evaluations, documenting lessons learned from each site. The ultimate work products will fall into three main categories:

First, tangible, actionable knowledge artifacts such as the shareable, human-readable and computable forms of clinical practice guidelines (CPGs) under study, public web-services for CDS demonstrations, and a CDS Knowledge Portal and Repository to facilitate widespread adoption of these artifacts.

Second, detailed guidance and recommendations, based on what we learn from our combined efforts, for external parties such as the Certification Commission for Health Information Technology (CCHIT), the Health Information Technology Standards Panel (HITSP), and the clinical practice guideline developer community.

Third, a set of knowledge and best practices, such as methods for the knowledge management lifecycle, development of both human readable knowledge artifacts and machine-interpretable knowledge, and management of decision-support related organizational change. We will share this knowledge through a variety of channels, such as presentations, academic papers and content posted through the Doctor's Office Quality Information Technology (DOQ-IT) University developed and maintained by Masspro, and the National Resource Center for Healthcare Information Technology maintained by AHRQ.

3. CDSC Research Questions

At each point, our work will be guided by a series of high-value research questions:

- How do we **improve** the translation of knowledge in clinical practice guidelines into actionable clinical decision support in healthcare information technology?
- How do we optimally **represent** knowledge and data required to make actionable clinical decision support content in human readable and machine-readable and executable forms?
- How do we **collate**, **aggregate**, and **curate** knowledge content for clinical decision support in a knowledge portal used by members of the CDS Consortium? How may we use such a tool to support knowledge management and collaborative knowledge engineering for clinical decision support at scale, across multiple healthcare delivery organizations, and multiple domains of medicine?
- How do we **demonstrate** broad adoption of clinical decision support at scale in different healthcare IT products that are used in disparate ambulatory care delivery settings? Such demonstrations may show the utility of simplified clinical decision support knowledge specification in human readable form, as well as the utility of publicly available CDS web services, and their incorporation in CCHIT-certified electronic health records (EHR).
- How do we **define** and **evaluate** best practices in response to the above assessments and demonstrations? Evaluation must include an assessment of how to incorporate clinical decision support services at scale in a variety of vendor healthcare information technologies, as well as products developed in academic settings. Further, how do we **deploy** clinical decision support services in healthcare information technology in a manner that improves CDS impact?
- How do we take the lessons garnered through the course of these investigations and broadly **disseminate** them to key stakeholder audiences, including academic informatics, patient safety and quality, clinical professional societies, small office practice settings, and more?

4. Conclusion

CDS is an essential element of healthcare information technology that has the power to transform healthcare delivery. Adoption of HIT has been slow, however, and to facilitate adoption of HIT with effective CDS we aim to accomplish several primary goals:

- Define a practical approach to knowledge management in ambulatory care
- Define a multi-layered, practical knowledge representation format, and provide publicly available CDS web services
- Create a Knowledge Repository and Portal for use by diverse institutions, and vendors, implementing CDS
- Demonstrate the feasibility of this approach through multi-site, multi-vendor demonstration projects.

For all of the above primary goals, we will aim to disseminate our findings and work products widely, through the CMS DOQ-IT web site, and the AHRQ National Resource Center for HIT. The CDSC study funding began in March, 2008. Despite the fact that actual work for some of the teams are scheduled to start later in the life of the project, representatives form all teams are participating in the project activities now. This is an important step to ensure effective teamwork, coordination, and understanding of common goals. We expect to deliver first results by the end of the first year of the study. More detailed information is available upon request.

Please visit our public website for CDSC study: www.partners.org/cird/cdsc.

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