

## Implementing and Improving the Integration of Decision Support into Outpatient Clinical Workflow

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**Organization:** Indiana University  
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**Project Period:** September 2007 – March 2011  
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**Summary:** Computerized clinical decision support (CDS) and the use of electronic medical records (EMRs) can improve clinical decisionmaking, adherence with evidence-based guidelines, and quality of care. However, the implementation of CDS into clinical settings is not well understood, and poor integration can hinder its use and minimize its benefits. Common barriers to implementation include poor interface design, usability problems, and failure to accommodate the workflow of a clinical environment.

This project is a field study and controlled simulation analysis on integrating CDS for colorectal cancer screening into outpatient clinical workflow. The team used key informant interviews to identify site-specific best practices; direct observation of colorectal cancer screening CDS to identify barriers and facilitators to workflow integration; rapid prototyping of design alternatives based on findings from the direct observations; and controlled simulation to test the impact of design on efficiency, usability, and workload. The three study participants—the Regenstrief Institute, the Department of Veterans Affairs (VA), and Partners Healthcare System—use different EMRs but according to a [systematic review](#) published in 2006, are all institutions that have improved quality and efficiency by using CDS.

During the first phase, the team conducted site visits to collect qualitative data on factors for effective integration of CDS into clinical workflow in different EMRs. The second phase used measurable attributes—including efficiency, usability, and workload—from the first phase to develop and test alternatives for improved clinical workflow integration in a simulated setting with experienced users.

### Project Objectives:

- Identify key approaches to CDS development for colorectal cancer screening at two VA Medical Center sites and two nationally recognized non-VA sites to obtain effective CDS integration into clinical workflow. **(Achieved)**
- Develop and test CDS design alternatives for improved integration into clinical workflow through a controlled simulation study and subsequent implementation. **(Achieved)**

**2011 Activities:** The project team completed all work on this project by the end of 2010 and spent most of the first few months of 2011 disseminating the findings. Members of the research team presented a poster, [Impact of a Redesign for Colorectal Cancer Screening Computerized Decision Support](#) and a presentation, [Investigating Integration of Computerized Decision Support into Workflow at Three Benchmark Institutions](#) at the Veterans Affairs Health Services Research and Development Service 28th Annual National Meeting in February 2011. A manuscript, [Redesign of a Computerized Clinical Reminder for Colorectal Cancer Screening: A Human-Computer Interaction Evaluation](#) describing the results was published in the November 2011 volume of *BMC Medical Informatics and Decision Making*.

Findings from this study directly informed the design of a prototype cancer screening support tool funded by a contract from the Centers for Disease Control and Prevention.

**Impact and Findings:** EMR and CDS systems differed across the sites. Despite design differences, there were common generalizable barriers, including: 1) lack of coordination among “outside” exam results, primary care, and specialty care; 2) poor data organization and presentation; 3) omission of provider and patient education in the decision support tool; 4) lack of interface flexibility; 5) the need for technological enhancements; 6) unclear role assignments; 7) organizational issues; and 8) disconnect between decision support and quality reporting.

Design enhancements to the VA’s existing colorectal cancer screening clinical reminder positively impacted aspects of usability and workflow integration, but not workload. The qualitative analysis revealed broad participant support for the design enhancements and specific suggestions for improving them further. This type of lab-based human-factors evaluation of CDS and other informatics tools is critical for testing design changes prior to implementation.

Overall, the team found that identifying effective strategies in the design, implementation, and integration of CDS into workflow is crucial for effective cognitive support. Despite the use of several different health systems, barriers were quite consistent. Effective design and integration of new technologies requires mindful iteration. There is a need for new CDS prototypes that: 1) improve data organization and presentation; 2) integrate outside results; and 3) provide just-in time education and cognitive support. Designing and testing prototypes using these features may help inform the next generation of cognitive support.

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**Target Population:** Adults, Cancer

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

**Business Goal:** Implementation and Use

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