Context-Aware Knowledge Delivery into Electronic Health Records

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Summary: A main cause of errors in the health care system is gaps in information available to providers. The provision of just-in-time access to relevant knowledge is essential for the implementation of new care models. Immediately-available information helps patients and providers make better decisions. It helps providers explain patient care options and retrieve and manage the best, up-to-date knowledge available at the point of care.

This research project is developing, implementing, and evaluating a prototype for a scalable and widely deployable knowledge delivery service (the "knowledge broker") that is capable of automatically delivering context-specific information from online resources into electronic health record (EHR) systems via a "knowledge dashboard."

A systematic literature review in combination with focus groups is documenting provider knowledge needs and informing the development of the knowledge dashboard. Once developed, the knowledge dashboard will be integrated into an EHR for use by providers.

Four core design requirements drive the development of the knowledge broker to guarantee its scalability and deployability: 1) the architecture must be open, independent, standards-based, and services-oriented; 2) the knowledge base will be expandable to accommodate additional knowledge needs in various contexts; 3) the knowledge broker will be able to deliver knowledge through mechanisms other than a knowledge dashboard, such as info buttons; and 4) the knowledge broker will be able to account for the needs of and deliver knowledge to providers and patients. This approach will help the dashboard be a potential national model for knowledge delivery at the point of need.

This project will investigate why, how, and when users interact with the knowledge dashboard, as well as the effect of these interactions on the fulfillment of knowledge needs and decisionmaking. Finally, the study will identify areas and opportunities for system enhancement and expansion. An exploratory data analysis will determine the feasibility and planning of a future large-scale quantitative investigation.

Specific Aims:

- Build a knowledge base of patients' and providers' knowledge needs. (**Ongoing**)
- Design, develop, and evaluate the usability of a scalable, widely deployable knowledge delivery service in a laboratory setting. (**Ongoing**)
- Conduct a mixed-method assessment of a pilot implementation of the knowledge broker in a real-

world medical home environment. (**Upcoming**)

2011 Activities: Dr. Del Fiol worked on the systematic review, completing the full-text data extraction and working on search strategies for other databases. A complete abstract screening of EMBASE, CINAHL, and PubMed citations yielded a total of 21,445 abstracts. Two reviewers conducted a full-text screening and data abstraction of 200 articles with excellent agreement between reviewers.

Dr. Del Fiol evaluated the info button standard related to implementation. There is a lack of such evaluation studies and few organizations have done work in this area before from which inferences can be drawn. A broad sample of 17 health care organizations, EHR vendors, and knowledge publishers were interviewed regarding the info button standard, which provided important insights for this aspect of the project.

Substantial progress was made on the development of the knowledge broker software, which was completed in February 2011. There is an open-source agreement signed between the three partners and their institutions. The software was deployed at the University of Utah and the Veteran's Administration successfully integrated it into their Web-based EHR.

A significant amount of time was dedicated to the development and submission of three grants, based partly on the results of this K01 project.

Preliminary Impact and Findings: The systematic review of literature is showing significant recall bias among physicians on information not related to specific patient encounters. This recall bias results in a general underestimation of the number of questions that they have about patient care. Real-time observation is the most accurate way to understand information needs further. As a result, this is the approach that the project will take.

Target Population: Adults

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
