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# CDS, UX, and System Redesign – Promising Techniques and Tools to Bridge the Evidence Gap

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## Abstract

**Introduction:** In this special issue of eGEMs, we explore the struggles related to bringing evidence into day-to-day practice, what I define as the “evidence gap.” We are all aware of high quality evidence in the form of guidelines, randomized clinical trials for treatments and diagnostic tests, and clinical prediction rules, which are all readily available online. We also know that electronic health records (EHRs) are now ubiquitous in health care and in most practices across the country. How we marry this high quality evidence and the practice of medicine through effective decision support is a major challenge.

**About the Issue:** All of the articles in this issue explore, in some fashion, CDS systems and how we can best bring providers and their work environment to the evidence. We are at the very early stages of the science of usability. Much more research and funding is needed in this area if we hope to improve the dissemination and implementation of evidence in practice. While the featured examples, techniques, and tools in the special issue are a promising start to improving usability and CDS, many of the papers highlight current gaps in knowledge and a great need for generalizable approaches. The great promise is for “learning” approaches to generate new evidence and to integrate this evidence in reliable, patient-centered ways at scale using new technology. Closing the evidence gap is a real possibility, but only if the community works together to innovate and invest in research on the best ways to disseminate, communicate, and implement evidence in practice.

## Acknowledgements

None.

## Keywords

clinical decisions support, user experience, user interface, systems redesign, patient-reported outcomes

## Disciplines

Databases and Information Systems | Graphics and Human Computer Interfaces | Health Information Technology | Health Services Research

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# CDS, UX, and System Redesign – Promising Techniques and Tools to Bridge the Evidence Gap

Thomas McGinn, MD, MPH<sup>1</sup>

## ABSTRACT

**Introduction:** In this special issue of eGEMs, we explore the struggles related to bringing evidence into day-to-day practice, what I define as the “evidence gap.” We are all aware of high quality evidence in the form of guidelines, randomized clinical trials for treatments and diagnostic tests, and clinical prediction rules, which are all readily available online. We also know that electronic health records (EHRs) are now ubiquitous in health care and in most practices across the country. How we marry this high quality evidence and the practice of medicine through effective decision support is a major challenge.

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In this special issue of *eGEMs*, we explore the struggles related to bringing evidence into day-to-day practice, what I define as the “evidence gap.” We are all aware of high quality evidence in the form of guidelines, randomized clinical trials for treatments and diagnostic tests, and clinical prediction rules, which are all readily available online. We also know that electronic health records (EHRs) are now ubiquitous in health care and in most practices across the country. How we marry this high quality evidence and the practice of medicine through effective decision support is a major challenge.

There are multiple steps to this process of closing the evidence gap, which are part of the larger concept of usability and clinical decision support (CDS). First and foremost is the proper evaluation of the quality of the evidence. Only after this step can we discuss the following steps of workflow analysis, usability testing, and full integration into EHR that enhance adoption of evidence by health care providers.

While outside the scope of this issue, the systems for grading evidence are critical and agreement upon how to grade is important. In the era of “big data” and learning health systems, this first step needs special consideration. Arguably, many health systems and providers are overly impressed with large quantities of data or big data. However, big data does not necessarily equal evidence or at least high quality evidence. To illustrate this point, [Derek Corrigan and colleagues](#) propose a *multistep maturity model for clinical prediction rules*, which describes six incremental steps required to evolve an organizations’ infrastructure from the lowest level use of evidence (literature-based clinical prediction rules) to a fully electronic and computable service-oriented general model.<sup>1</sup>

Once the evidence is considered to be of high enough quality for integration into the EHR, the

challenge then becomes adoption of the evidence through CDS. Without adoption of the evidence offered through effective CDS, providers can’t be influenced. Early attempts to offer providers evidence in the EHR have had poor adoption rates and hence little influence on the clinical environment. CDS implementation now incorporates a formative assessment and understanding of the facilitators and barriers in the environment in which the CDS will be integrated. [Wyer et al.](#) shed light on the *activities needed to change and develop practitioner behavior toward more evidence-based practice*, drawing on lessons learned from five years of running the Teaching Evidence Assimilation for Collaborative Health Care (TEACH) program.<sup>2</sup>

This poor adoption of CDS has created the need for appropriate usability studies where testing the user interface (UI), user experience (UX), and functionality of the tool become integral parts of the tool’s success. Usability testing is most effective when conducted in clinical environments where it is possible to observe behaviors and interactions between providers, patients, the EHR, and the clinical microcosm and workflow (emergency room, primary care clinics, inpatient setting, etc.)—all of which should be formally evaluated when developing and testing a CDS intervention.

The special issue has a unique focus on the *science and methods of CDS and usability*. Understanding and measuring how all these factors interface with each other enables us to determine the most effective means of providing decision support and, hence, improving the clinical process. Formally analyzing the workflow environment, performing think-aloud studies, performing simulation scenarios with the CDS tool, and performing near live clinical testing prior to launching the decision support tool are all critical steps to improving and bridging the evidence gap.



Several authors in this issue address CDS and usability. [Dr. Edward Melnick and colleagues](#) describe the user-centered design (UCD) approach to developing a decision support tool for deciding whether or not to obtain a CT scan for minor head injury in an emergency department. Through shared use of a bedside tablet computer by the patient and provider, the tool promotes their shared decision-making.<sup>3</sup> Along similar lines, [Foraker et al.](#) share the implementation strategy for an EHR-based CDS visualization tool to enhance patient-provider communication about cardiovascular health in the outpatient setting.<sup>4</sup>

[Dr. Andrea Hartzler and colleagues](#) from the University of Washington share the human-centered design process used to develop a dashboard displaying patient-reported pain and disability outcomes following spinal surgery.<sup>5</sup> The collection of patient-reported outcomes (PROs) draws attention to issues important to patients—physical function and quality of life. Integrating this data to enhance patient care, however, requires thoughtful consideration of the user experience and the data presentation.

In addition, developing techniques to measure various forms of usability and reporting on the success and failure of these tests are important in this phase of the evolution of the EHR. Several examples of new *approaches to integrate evidence at the point of care and changing clinical behavior* are shared, as well as the related challenges of these new processes. A multistep model for integrating evidence at the point of care is reviewed in the article by Corrigan and colleagues mentioned above. [Dr. Emily Patterson and colleagues](#) share a case example from the Veteran's Health Administration, detailing insights from a workflow analysis conducted by the National Institute of Standards and Technology of an innovation prototype.<sup>6</sup> And

[Dr. Joseph Kannry and colleagues](#) review a unique randomized trial with usability testing that includes key factors for successful CDS.<sup>7</sup>

Finally, Baier et al., Sheehan et al., and Kharbanda et al. explore *methods to improve UCD* by designing technology to support the health consumer and priority populations, specifically older adults and children. [Baier et al.](#) test an electronic, personal health-record based, self-management system for falls prevention, using an approach that analyzes four components: tasks, users, representations, and functions.<sup>8</sup> [Sheehan et al.](#) share a multiphased approach to create a Web application for home health consumers seeking to choose among providers.<sup>9</sup> [Dr. Kharbanda et al.](#) discuss a usability study to explore health record interfaces that help providers better identify teen-related blood pressure problems.<sup>10</sup>

All of the articles in this issue explore, in some fashion, CDS systems and how we can best bring providers and their work environment to the evidence. We are at the very early stages of the science of usability. Much more research and funding is needed in this area if we hope to improve the dissemination and implementation of evidence in practice. While the featured examples, techniques, and tools in the special issue are a promising start to improving usability and CDS, many of the papers highlight current gaps in knowledge and a great need for generalizable approaches. The great promise is for “learning” approaches to generate new evidence and to integrate this evidence in reliable, patient-centered ways at scale using new technology. Closing the evidence gap is a real possibility, but only if the community works together to innovate and invest in research on the best ways to disseminate, communicate, and implement evidence in practice.

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