Abstract: Clinical information systems depend on close integration to workflow for success. We describe a method for user-driven design that guided our development of a computerized rounding and sign-out system. The resulting system supported clinical workflow sufficiently well that it spontaneously attracted new users, required no training, and is currently used by 95% of the house staff at two academic medical centers.

Introduction: Successful implementation of clinical information systems relies on careful integration of these systems into clinician workflow. That workflow is changing rapidly, with increasing reliance on hospitalists, and the new work hours restrictions on graduate medical trainees (“residents”). These changes amplify the importance of dependable systems for efficiently managing role-based, team-centered patient information and for conducting safe transfer of patient care (“sign-out”). Sign-out technique is not formally taught in US medical schools, nor do good mechanisms to support it exist in commercially available Electronic Medical Record systems. Physicians typically develop their own, ad-hoc sign-out strategies that are unstructured and often must give way to other workflow demands. We employed a user-driven design strategy to develop a high-reliability method and system for clinician rounding and sign-out called Cores (Computerized Rounding and Sign-out).

Methods: We studied information handling routines for the separate tasks of sign-out and daily patient care ward work among 31 physician services at two teaching hospitals using a three-part analytical technique. Subjective workflow analysis: During qualitative interviews, residents described current methods of obtaining and managing patient information for ward work and sign-out; they prioritized these information types and sources for inclusion in the system. Objective workflow analysis: Observers evaluated the timing, location, and information content of ward work tasks and sign-out tasks during uninterrupted clinical work. Examples of paper rounding lists and standardized sign-out cards were collected and evaluated. Active participation analysis: The first author participated in rounding work and sign-out activities among resident teams to develop a prototype method and system. A subgroup of 28 residents then participated in refining the system’s design.

Results: Information handling by residents demonstrated common elements across multiple services. Most clinician teams used a paper patient list to manage both nightly sign-out and daily ward work, and this tool was critical to existing workflow. Using Rapid Application Development, we designed a web-based application that permitted role-based patient list management from any workstation, incorporated downloaded patient data from institutional sources, and produced well-organized paper patient lists. These reports fit existing clinician workflow while permitting expansion to other platforms, like wireless PDAs. The system was piloted after 6 weeks of development for 45 resident users. After four weeks, system use had spontaneously grown to 312 users, who managed 1976 patients per month. At one year, usage grew to 734 users per month, who managed 3575 patients, representing 95% of the potential user pool and 80% of the total inpatient volume. All clinician use of Cores was voluntary, and no users received formal training.

Discussion: Systems that manage clinician-entered patient details, like a summary of overnight plans, have been previously described. Cores adds important elements by linking to institutional data sources and organizing this information, together with clinician notes, into team-centered reports that permit role-based management. These features were developed in response to our user-driven design, characterized by a three-part analytical technique, Rapid Application Development, and user-guided modification during pilot testing. Later study of this system additionally demonstrated improved measures of continuity of care and user efficiency. While the Cores system was described in the surgical literature, we detail here the user-driven design strategy we believe is of interest in clinical informatics projects.

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References: