Computerized provider-order entry: challenges, achievements, and opportunities

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The Merriam-Webster dictionary defines ‘traction’ as the adhesive friction of a body on a surface on which it moves.1 Within the field of biomedical informatics, we have updated that definition so that the ‘body’ may refer to a technological advance, and the ‘surface’ to a person, group, or environment in which the technological advance has been introduced. In this context, traction implies adoption or environment in which the CPOE as the most critical component of a safe decision-making environment,2 leading to the eventual mandates for CPOE as a part of certified health information technology,3 justifies this assertion. The early efforts of informatics researchers such as McDonald,4 Miller et al,5 Geissbuhler and Miller6 and Warner et al,7 who first described the potential of clinical decision support during order entry has finally been accepted. The evidence in support of this technology is, in fact, sufficiently compelling that there is no longer much value in publishing any but the most innovative and well-designed studies in this domain.

Despite the attainment of traction, researchers in our field have not ignored many of the challenges associated with the vision of quality healthcare combined with usable tools. In the world of order entry decision-support, usable implies addressing the challenges of alert fatigue, high rates of alert overrides and human factors engineering to align the cognitive process of ordering with user interfaces for CPOE. There have been numerous reports about the unintended consequences of using CPOE. These reports range from an early observation about problems with picklists11 to adoption barriers12 and later, unintended consequences13–15 and even errors facilitated by CPOE.16

This issue of JAMIA includes a number of articles focused on these ongoing CPOE challenges. One of those challenges—the issue of alert fatigue—can be addressed through innovative human factors engineering. The articles led by Scott et al17 and Riedman et al18 specifically discuss this approach. Using simulation, Scott and colleagues17 compared the prescribing error rates associated with displaying electronic prescribing alerts using interrupting versus non-interrupting modalities. Their results address the relative advantages and disadvantages of different design strategies for commercial e-prescribing decision support, and remind us about the importance of human factors engineering expertise in clinical systems development. Riedman and colleagues18 report on a Delphi study to prioritize the best ways to improve medication delivery alerts. This study addresses some of the attributes of potential drug interactions that, if included in drug knowledge bases, could be exploited using human factors engineering to help decision makers respond to alerts.

In addition to the alignment of functional requirements with good design principles, attention to prescribing workflow is an emerging area of importance. Baysari and colleagues19 report on their observational study involving teams of physicians on ward rounds, as they encountered prescribing alerts that should have potentially previously planned therapeutic interventions. Their paper builds on the early observations by many researchers in the field who have noted the importance of understanding established workflow as a prerequisite to system design.

Articles in this issue also remind us about the need to measure rates of error and guideline adherence to improve CPOE systems iteratively. For example, Nanji and colleagues20 used a retrospective method to evaluate the incidence of medication prescribing errors after implementing an e-prescribing system. Their study identified a few categories of errors that may come as a surprise to some JAMIA readers. Wettenhall and colleagues21 evaluated the incidence of duplicate medication orders before and after CPOE implementation. Their study utilized a pre-post methodology and identified factors that led to a significantly higher rate of duplicate orders after CPOE implementation. Finally, the study by Austrian22 points to the importance of careful comparative effectiveness research methods to assess how CPOE can impact guideline adherence.

Of course, as with all technological advances, it is clear that the traction provided by CPOE allows other technologies to evolve. In this issue, Cheung and colleagues23 continue a discussion catalyzed recently by Friedman et al24 about a learning e-health system. Cheung et al25 describe a registry for medication incidents that features multidisciplinary input and prescriber or pharmacy comparative feedback. The system also supports centralized surveillance for serious incidents, and mechanisms to disseminate warnings at that scale.

Efforts to improve CPOE further, to integrate CPOE into the evolving landscape of health information technology and to propose breakthrough ideas in this domain are underway by experts in biomedical informatics. JAMIA will continue to be a source of these innovative and transformative articles.

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