



Health IT and clinical decision support systems: human factors and successful adoption

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This special online issue of *JAMIA* focuses on Health IT (HIT) and Clinical Decision Support Systems (CDSS). It starts with a presentation from an FDA commissioned working group led by Bates *et al* (*see page e181*) on a regulatory framework for HIT intended to be simple, effective, and non-duplicative. A significant open question is related to the tradeoff between costs and benefits in HIT and CDSS implementation. Slight *et al* (*see page e226*) examine the costs associated with electronic health record (EHR) system implementation in the UK. Calculation of benefits is more difficult because of the variable adoption rates and the relatively small number of articles proving definitive benefits, not to count potential publication biases. Some authors also worried that clinician adoption of CDSS alerts and reminders might vary according to racial differences in the patient population. This variance could exacerbate disparities in health care, but Mishuris and Linder (*see page e269*) show that this is not the case in the particular population that was studied.

With the increased adoption of EHRs and CDSS there has been a corresponding increase in articles describing variable success rates. Having reliable instruments to measure adoption and usability is critical to knowledge advancement in this area. Everson *et al* (*see page e257*) show that the American Hospital Association instrument to measure adoption has acceptable reliability and validity. Similarly, Yen *et al* (*see page e241*) show the validity of a HIT usability evaluation scale. Human factors are known to be associated with success of CDSS for

medication prescription, and this is the topic of articles by Cresswell *et al* (*see page e194*), Russ *et al* (*see page e287*), Phansalkar *et al* (*see page e332*), and Tsalpepas *et al* (*see page e358*). Griffon *et al* (*see page e270*) show that a graphical user interface based on icons improves information retrieval of medical guidelines. Articles by Nahata *et al* (*see page e219*), Beeler *et al* (*see page e297*), and Gupta *et al* (*see page e347*) describe evaluations of CDSS for medication alerts, VTE prophylaxis, and CT orders for mild traumatic brain injury, respectively.

Just a decade ago CDSSs encoded knowledge derived from experts. With the increasing availability of data and powerful analytics, data-driven predictive models are increasingly being implemented. However, use of clinical data to build such models remains controversial due to concerns about patient privacy and data security. Bernstam *et al* describe privacy concerns of breast cancer patients (*see page e320*), and Chida *et al* present a secure computation system for statistical analyses (*see page e326*). This issue of the journal also presents analytic methods to build predictive models from data. Smith and Mezhir (*see page e203*) describe an interactive Bayesian model to predict survival in pancreatic cancer, Flamand *et al* (*see page e232*) mines local climate data to assess epidemic patterns, Cheng and Zhao (*see page e278*) integrate different types of data to predict drug-drug interactions, and Jiang *et al* (*see page e312*) predict clinical outcomes using genomic data sets. This type of machine learning and data mining can only be done when data are standardized across different

sources. Goossen and Langford (*see page e363*) explain the development of the HL7 V3 care provision standard, and Mouglin and Grabar (*see page e185*) examine potential conflicts in multiply-related concepts within the UMLS.

CDSSs typically provide targeted information to clinicians, but their needs can vary according to their professional role. Kannampalil *et al* (*see page e249*) compares the information seeking strategies of residents, nurse practitioners, and physician assistants in critical care settings, showing different patterns that may be associated with the different types of training. Schuster *et al* (*see page e352*) describe variable rate of electronic handoff instrument utilization by nurses, physical therapists, care planners, and social workers, which suggests that customization by role might improve adoption. Perrier *et al* (*see page e341*) evaluate the effectiveness of two different types of shortened systematic review formats for clinicians. Finally, Zhao *et al* (*see page e212*) present a new metric to identify influential users of online health communities, and Bian *et al* (*see page e369*) present an integrated clinical research administration system.

As our field evolves, we expect to see an increase in comprehensive evaluations of HIT and CDSS systems in addition to novel informatics contributions in the design and implementation of these systems. *JAMIA* will continue to document the evolution of our field, and to enrich the biomedical literature with outstanding articles representing the most innovative work of our diverse informatics community.