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Informatics support for clinical decisions

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The utilization of Clinical Decision Support (CDS) systems is increasing with implementation of electronic health record (EHR) systems across the USA. One of the first and most studied CDS applications has been computerized provider order entry (CPOE), particularly CPOE related to medications. Many EHR systems check drug dosage, allergies, and drug-drug interactions as clinicians enter their orders, and issue alerts as needed. However, alert overriding in CPOE systems is common practice. Nanji (*see page 487*) reports that over 50% of alerts are overridden at a particular academic health center and proposes how to decrease unintended CPOE effects on workflows and communications (*see page 481*). Related to workflows, Coiera (*see page 414*) offers a model to study workspaces in which critical communications among clinicians occur.

Many articles in this issue focus on medication management, including three systematic reviews that address barriers and facilitators for CPOE implementation (*see page 535*), quality of mobile applications to support medication self-management (*see page 542*), and identification of adverse drug events (*see page 547*). Tamblyn (*see page 391*) reports on the large gap between medication records of community-based pharmacies and reports of medications from emergency department records. Dixon (*see page 517*) provides an informatics approach to narrow this type of gap by combining information from multiple sources,

including patient-reported data. Miller (*see page 564*) describes an innovative CPOE tool supporting clinical research and quality improvement, while Woods (*see page 569*) reports on a decrease in atypical medication orders with the introduction of alerts.

Other articles in this issue address different types of CDS systems. Bellows (*see page 432*) reports on a CDS that individualizes clinical practice guidelines. A test result notification system is evaluated in a randomized controlled trial by Dalal (*see page 473*), and recommended practices for those involved in CDS systems are described by Wright (*see page 464*). Collins (*see page 438*) describes functional specifications for maintaining continuity of care across different types of healthcare providers.

Genetic and environment information are being collected at a rapid pace and will likely be more present in EHRs in the near future. Goldspiel (*see page 522*) provides solutions for integrating pharmacogenetic information and CDS into the EHR. Martin-Sanchez (*see page 386*) makes the case for increased inclusion of environmental factors in biomedical research information systems. Wall (*see page 399*) presents a new search tool for extraction of disease-associated genes from the literature.

A balance of structured and unstructured data in the EHR will also likely be achieved in the near future. Structured data in EHRs are important to facilitate analysis and research. However, inclusion of unstructured data in the EHR is also important to

ensure that the some aspects of healthcare provision are well accommodated. JAMIA is the premier venue for discussion on the appropriate balance of structured and unstructured data in EHRs. Morrison (*see page 492*) reports on an exploratory national evaluation of benefits and risks of increased structuring and coding of the EHR, while articles by Solti (*see page 406*), McDonald (*see page 423*), and Dligach (*see page 448*) report on elegant NLP strategies to structure information in narrative clinical text. Examples of data analytics that rely on structured data are also provided in this issue of JAMIA. Galvez (*see page 529*) presents a visual analytical tool for quality improvement, and Tabak (*see page 455*) and Hauskrecht (*see page 501*), respectively, describe a machine learning tool and new algorithm to enable clinical predictive modeling.

Finally, in order for EHR and CDS systems to have a true impact, we need to train users and developers. To increase utilization of EHRs and build capacity in health information technology (HIT), Landman (*see page 558*) reports on the use of a simulation center to increase EHR usability, while Mohan (*see page 509*) evaluates the US-based ONC HIT curriculum.

We hope our readers will enjoy this issue of the journal and will stay tuned for the next one, where we will present how EHR-derived data will be connected through clinical data research networks that are beginning to build a national infrastructure for patient-centered outcomes research.