

The Role of Informatics in Health Care Reform

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Improving health care quality while simultaneously reducing cost has become a high priority of health care reform. Informatics is crucial in tackling this challenge. The American Recovery and Reinvestment Act of 2009 mandates adaptation and “meaningful use” of health information technology. In this review, we will highlight several areas in which informatics can make significant contributions, with a focus on radiology. We also discuss informatics related to the increasing imperatives of state and local regulations (such as radiation dose tracking) and quality initiatives.

Key Words: Informatics; health care.

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There is no denying that the health care system of the United States is facing a crisis. On one hand, the United States spends more of its gross domestic product on health care than any other nation in the world, according to the World Health Organization (WHO)’s annual compilation of health-related data for its 193 member states (1). On the other hand, WHO ranked the US health care system 37th in overall performance among its 191 member states in 2000 (2).

Improving health care quality while simultaneously reducing cost has become a high priority. There has been a push for Accountable Care Organizations, which are groups of health care providers whose reimbursement is tied to quality improvements and cost reductions (3). The practice of radiology also faces increasing regulations and monitoring for quality improvements, such as the Mammography Quality Standards Act and Program, which require monitoring of radiation dose.

Informatics is crucial in tackling the challenge of improving quality and curbing cost. Several recent legislations focus on health information technology. The American Recovery and Reinvestment Act of 2009 includes \$25.8 billion for health information technology investments and incentive payments. The Health Information Technology for Economic and Clinical Health Act, enacted as part of the American Recovery and Reinvestment Act of 2009, promotes adaptation and “meaningful use (MU)” of health

information technology. It mandates that incentives be given to Medicare and Medicaid providers not simply for adaption of Electronic Health Record (EHR) but specifically for meaningful use of EHR technology.

Accordingly, definition of MU in EHRs has been an important issue. In July 2010, the Department of Health and Human Services released the definition for stage 1 (of ultimately three stages) of MU, intended for deployment in 2011 and 2012. Definitions for future stages (stages 2 and 3) are under discussion (4).

The Medicare and Medicaid EHR Incentive Programs, administered by the Centers for Medicare and Medicaid Services, provide a significant financial incentive for eligible professionals and hospitals to meet the MU criteria. Medicare incentive program awards \$44,000 over 5 years for eligible health professionals and a \$2 million base payment for eligible hospitals and critical access hospitals (CAH). As anticipated, the incentive payments will later be replaced by penalties for noncompliance; in 2015 and later, eligible Medicare professionals, eligible hospitals, and CAHs that do not successfully demonstrate MU will have a payment adjustment in their Medicare reimbursement. Medicaid offers a similar EHR incentive program, with \$63,750 to eligible professionals and \$2 million base payment to hospitals.

Stage 1 of MU has 25 objectives for eligible professionals. To qualify for an incentive payment, 20 of these objectives (including 15 required core objectives and 5 of the 10 menu set objectives) must be met. Similarly, there are 24 objectives for eligible hospitals and CAH, with 14 required core objectives and 5 of the 10 menu set objectives that must be met to qualify for incentive payment. The MU criteria were designed primarily from the perspective of primary care physicians; although many American College of Radiology (ACR) recommendations are likely going to be included in stage 2 (5). There is overlap in MU goals for the primary care physician and the radiologist, and informatics methods to achieve MU in radiology need to be considered now in

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order to realize the incentives for participating as well as to be able to anticipate new directions in MU as radiology becomes a focus area of these criteria in the future.

In the following sections, we will highlight several areas of MU relevant to radiology in which informatics can make significant contributions. Multiple MU objectives, from both the core and menu sets, are involved, including “Implement one clinical decision support rule relevant to specialty or high clinical priority,” “Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach,” and “Capability to exchange key clinical information among providers of care and patient-authorized entities electronically.”

We will also discuss other informatics tools that are pertinent to health care reform, including the tracking of medical radiation doses and improving efficiency.

DECISION SUPPORT SYSTEMS

Decision support systems are informatics tools that can help health care providers make the most appropriate decisions in the given clinical situation. In radiology, there are two types of decision support: 1) decision support for selecting the best imaging procedure for the given clinical indication (targeting referring physicians, called computerized physician order entry decision support—CPOE-DS) and 2) computer-based “second opinion” systems to improve radiological interpretation of the image (targeting radiologists, called computer-assisted diagnosis—CAD—or decision support). Incorporating decision support into the care process is one of the goals of the MU criteria on “implementing one clinical decision support rule related to a high priority hospital condition along with the ability to track compliance with that rule.”

CPOE-DS

Between 2000 and 2006, Medicare expenditures for imaging services, including computed tomography (CT), magnetic resonance imaging (MRI), and nuclear medicine such as positron-emission tomography, rose from \$3.6 billion to \$7.6 billion. This represents an average of 17% increase per year (6). One study reviewed 459 outpatient elective imaging studies (62% CTs and 38% MRs) requested by primary care physicians and found 26% to be inappropriate based on an evidence-based appropriateness criteria (7). Appropriate guidelines, such as the ACR Appropriateness Criteria® (ACR-AC), have been developed as evidence-based recommendations to assist referring clinicians in determining the most appropriate imaging exam or treatment for given clinical situations. However, a recent survey of 126 physicians showed that the utilization of such guidelines is low—only two physicians (1.6%) used the ACR appropriateness criteria as the first source for selecting the best imaging technique, behind UpToDate, radiologist consult, Google, specialty journals, and several other resources (8).

Evidence-based guidelines such as the ACR-AC are more comprehensive than random search engines such as Google. However, few clinicians use them to guide practice; a major reason for this low utilization is that not enough clinicians are aware of the ACR-AC, and they are not perceived as easily available as some of the other resources. Perhaps most important, the ACR-AC are not generally incorporated into order entry systems; the ideal time to deliver decision support is when clinicians place the order because they are generally time-pressured and do not have time to look up criteria such as ACR-AC during the busy clinical workflow. If readily available (ie, integrated into the computerized order entry system), it will be efficient to “push” the knowledge about imaging appropriateness to clinicians, saving them time spent on looking up other resources (9).

Several computerized radiology order entry systems have been developed with integrated decision support systems to facilitate appropriate imaging orders. Such a system was developed at a large metropolitan academic center to assist in ordering high-cost outpatient imaging tests (CT, MR, and ultrasound) by providing a 9-point appropriateness rating score based on the given clinical indications and the ACR-AC. There was a substantial decrease in the growth rate of CT, MR, and ultrasound orders observed using this system (10). The decision support system was further refined by preventing nonclinicians from ordering imaging studies that received a low appropriateness score. This change resulted in a significant decrease in the fraction of low-yield CT, nuclear medicine exams, and MR imaging performed (11). The program can also suggest a better exam in the event of a low score or inappropriate exam (10,11). A similar decision support tool was implemented at the Virginia Mason Medical Center, where ordering physicians have to answer a list of questions to confirm adherence to the institutional evidence-based imaging indications for selected high-volume imaging procedures such as lumbar MR, brain MR, and sinus CT. There was a substantial decrease in the utilization rate of these studies compared to the control group (12). In a 10-year analysis of a web-based CPOE system with embedded decision support, there was a significant increase in both the proportion of electronically created imaging orders (from 0.4% in 2000 to 61.9% in 2010) and the proportion of electronically signed orders (from 0.5% in 2000 to 92.2% in 2010) (13).

Despite its promises, order entry decision support systems face many challenges. An important pitfall for such systems is alert fatigue. Though not specifically explored yet in radiology CPOE-DS, this has been shown in other medical domains. A recent 18-month retrospective study examined the response of clinicians and pharmacists to warfarin critical drug-drug interaction alerts. In this order entry decision support system, clinicians are provided an alert when ordering a medication (in this case, warfarin) that is known to have potentially critical drug-drug interaction with medications already included in the inpatient or outpatient medication profile. Clinicians are required to either cancel the order or enter an explanation as

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