Electronic Medical Records and Quality Improvement

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KEYWORDS

• Electronic health records • Electronic medical records • Quality improvement • Meaningful use

KEY POINTS

- Recent legislation has incentivized American hospitals and providers to rapidly adopt electronic medical records (EMRs) and demonstrate meaningful use of them. This implementation will drive quality improvement for the next 5 to 10 years.
- EMRs allow numerous surgical quality initiatives to be implemented efficiently: examples are the Joint Commission's Surgical Care Improvement Program (SCIP), surgical timeout, and care hand-offs. Such quality initiatives are otherwise difficult or impossible to realize with paper processes.
- Successful implementation of EMRs requires considerable time and money. Patients can be harmed when EMRs are poorly implemented.

INTRODUCTION

Widespread adoption of electronic medical records (EMRs) in the United States is transforming the practice of medicine from a paper-based cottage industry into an integrated health care delivery system. For the purposes of this article, an EMR is defined as a systematic collection of digital health information that theoretically can be shared across different health settings and is designed to accurately capture the state of the patient (or population) at all times. Most physicians and institutions view widespread use of EMRs to be inevitable. But the transformation has not been painless. Many have questioned whether the substantial investment in EMRs has really been justified by improved patient outcomes or quality of care. Despite these concerns, widespread adoption of EMRs is currently a national priority: in 2009 Congress and the Obama administration enacted the Health Information Technology for Economic and Clinical Health (HITECH) Act. The HITECH act provided unprecedented incentives and penalties for meaningful use of EMRs. This article describes historical and recent efforts to use EMRs to improve the quality of patient care, and provides a roadmap of EMR uses for the foreseeable future.

EARLY EFFORTS

In the 1970s and 1980s, early informatics experts envisioned computers as intellectual amplifiers that could help doctors diagnose disease. Automated history-taking, combined with statistical associations of diseases with physical and laboratory findings, could alert the physician to the most probable diagnosis, and suggest the most appropriate, safest course of action.[1] Such assistance could free up the physician to perform tasks that are uniquely human, such as bedside skills or managing emotional aspects of a patient's illness. Some experts envisioned that entire specialties, such as primary care or anesthesia, could be largely regulated to computerized automation.[1] These predictions never came to pass.

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At the same time, simple computer systems were developed to automate discrete departments or processes within the hospital or clinic. Software to handle coding or billing, laboratory results, simple text reports (eg, microbiology, pathology, or radiology), or radiographic images (PACS: Picture Archiving and Communication System) became commonplace. Unfortunately, the data structures and formats of these systems were typically proprietary and protected by the vendor. This made integration between software packages difficult or impossible. In 1987, a protocol named Health Level-7 was founded to provide data standards and definitions to allow for sharing of health information. Health Level-7 was accredited in 1994 by the American National Standards Institute and created a "common language" for health systems to be able to talk to one another.

In 1999, the Institute of Medicine published "To Err is Human: Building a Safe Health System," which reported that up to 98,000 Americans died annually as a result of preventable medical errors.[2] Examples included adverse drug events, improper transfusions, wrong-site surgery, falls, pressure ulcers, and mistaken patient identities.[2] Lack of integration within the US health care system was cited as a major contributor to these errors. Shortly thereafter, systems engineering principles were applied to patient safety and medical informatics to address many of the Institute of Medicine's listed causes of patient harm. Health information systems were recognized to be more than a digital reproduction of the paper chart. Rather, they were recognized to be major actors that interact with humans to form a complex adaptive system.[3] The EMR is not an adjunct to the system of care, *it creates the system of care*.

QUICK WINS

By the early 2000s, computerized order entry systems (CPOE) were developed to address several errors reported by the Institute of Medicine. CPOE systems could eliminate handwriting errors, reduce incomplete orders, eliminate ambiguous abbreviations, force proper units, and standardize orders within an organization almost overnight. When combined with automated clinical decision support (ie, automated weight or body-surface-area dosing, drug-drug or drug-allergy interaction, order sets, and other rule-based alerts) or bar-coded medication administration (right drug, right formulation, right dose, right patient, right time), many medical errors were avoided. One study reported that such systems could reduce nonintercepted serious medication errors by 81%.[4] As a result, CPOE was heralded as a hospital "best practice" in medication safety and a litmus test of safe care.[4] Many payors and advisory groups, such as the Leapfrog Group, pushed CPOE systems heavily in the mid-2000s.

UNINTENDED CONSEQUENCES

Although CPOE systems could overcome many of the obvious problems associated with paper-based orders, sometimes their implementation actually harmed patients. One hospital reported a doubling of the hospital mortality rate after a commercially sold CPOE system was implemented.[5] The increased mortality was attributable to usability and workflow issues: physicians could not write orders until patient arrival and registration (delaying care), no order sets were built, less provider time was spent at the bedside, and there was less communication between doctors and nurses. The designers of these systems did not anticipate the complexity of care processes within the hospital. Many physicians also pointed out the poor usability of EMR systems. Alert fatigue (defined as alerts so frequent that the physician ignores or overrides the result) was recognized as a major limitation to CPOE and decision support systems. Many hospitals did not commit adequate resources to successfully understand their own internal processes to implement EMR systems.

Despite these growing pains, by the late 2000s, most reports in the literature showed that incorporation of health technology resulted in an overall improvement in access to care, patient satisfaction, provider satisfaction, effectiveness of care, and efficiency of care.[6] By 2010, more than 50% of American office-based practices had incorporated EMRs.[7]

THE HEALTH INFORMATION TECHNOLOGY FOR ECONOMIC AND CLINICAL HEALTH ACT OF 2009

The 2008 presidential election made health care reform a major debate in the United States. After taking office, the Obama administration and Congress passed the HITECH Act under Title XIII of the American Recovery and Reinvestment Act of 2009. Under the HITECH Act, the US Department of Health and Human Services was budgeted up to $27 billion to promote and expand the adoption of health information technology. Under the act, individual provider incentive payments of up to $44,000 through Medicare and up to $63,750 through Medicaid were made available, provided clinicians could demonstrate meaningful use of EMRs in addition to simple EMR implementation. In 2010, the Department of Health and Human Services proposed meaningful use requirements and solicited public comment. The