Greater Use of Information Technology Impacts Mortality, Complication Rates, and Costs

Amarasingham R, Plantinga L, Diener-West M, et al. Clinical information technologies and inpatient outcomes: a multiple hospital study. Arch Intern Med 2009;169:108–14.

Study Overview

Objective. To examine the association between the principal features of electronic medical record (EMR) systems and inpatient mortality, complications, cost, and length of stay (LOS) in 4 medical conditions.

Design. Retrospective cross-sectional study.

Setting and participants. 72 acute-care urban hospitals in Texas were selected for evaluation. They were geographically dispersed and represented a mix of teaching and community hospitals with various funding and ownership models. Physicians at each hospital were randomly surveyed with a validated measure of clinical information system automation (the Clinical Information Technology Assessment Tool). The survey asked physicians to score their hospitals on 4 aspects of the EMR: results reporting, electronic notes and records, order entry, and decision support.

Main outcome measures. Association between a hospital's automation scores and inpatient mortality, complications, costs, and LOS. Hospital claims data were collected for each hospital for the period of 1 December 2005 to 30 May 2006. Clinical outcomes derived from the claims data included inpatient mortality, complications, costs, and LOS among patients aged > 50 years who were admitted with myocardial infarction, congestive heart failure, coronary artery bypass grafting, or pneumonia.

Main results. Complete clinical data were available for 167,233 patients. 41 of the 72 hospitals were included in the analysis based on sufficient survey response. The included hospitals had similar characteristics compared with excluded hospitals. Hospitals with higher EMR automation scores had a lower odds of inpatient mortality overall. Higher electronic notes and records scores were associated with a significant decrease in mortality (odds ratio [OR], 0.85 [95% confidence interval {CI}, 0.74–0.97]). Hospitals with higher order entry scores were associated with decreased mortality in patients admitted for myocardial infarction (OR, 0.91 [95% CI, 0.83–0.99]). Higher decision support scores were associated with improved mortality among patients with pneumonia (OR, 0.79 [95% CI, 0.63–1.00]). Hospitals with more sophisticated decision support had lower complication rates (OR, 0.84 [95% CI, 0.79–0.90]), with the exception of an increase in complications associated with higher electronic notes scores. More sophisticated decision support, order entry, and results reporting were all associated with lower hospital costs; this was most prominent among patients who had undergone coronary artery bypass grafting (–$1043 [95% CI, –$1729 to –$55]). There was no significant effect on LOS based on any of the EMR score metrics.

Conclusion. Among the conditions sampled, increasing EMR sophistication may be associated with improvements in mortality, complication rates, and cost.

Commentary

Health information technology holds enormous promise. A vision for ubiquitous EMR systems and decision support has been a goal of the federal government and played a large role in the recent presidential election [1]. Despite its promise and the billions of dollars spent thus far on development and implementation of this technology and billions more newly promised by the current administration, the evidence for its effectiveness and its return on investment remains mixed [2–4]. Many hospitals and most outpatient practices have not yet invested in these technologies, waiting for lower costs, demonstrated benefit, and a clearer national agenda for things such as interoperability.

One important characteristic of this study by Amarasingham et al was that it measured actual physician use of features such as electronic notes and decision support. EMR systems are often implemented with sophisticated features turned off or systems are being implemented in a step-wise fashion over several years. A large landmark study found little effect of the EMR on outpatient visits [5]. One explanation for this effect is that real-world settings often do not have informatics faculty or financial resources to support a robust EMR and are essentially using an incomplete EMR, which has a more modest impact. This current study measures this confounder and evaluates the individual components in real-world settings.

The results of this well-controlled study, although encouraging, were mixed. Decision support had positive effects virtually across the board. Electronic notes had mixed outcomes and historically have been a more difficult aspect to implement among providers. Costs associated with admissions were decreased in most cases. It would be interesting to do a more formal return on investment analysis to measure the incremental costs of supporting a more robust EMR with the savings demonstrated here. There was minimal impact on LOS, but the authors argue that LOS has already been reduced to its bare minimum and any further reductions are bound to be small and difficult to measure. Although the authors measured for many confounders, they could not quantify the effects of safety and quality initiatives that may have affected outcomes during the study window.

Applications for Clinical Practice

Robust health information technology at every point of care is likely inevitable, and its arrival will be mediated by money, the changing nature of the health care workforce, increasingly data-driven disease management and reimbursement, technology advances, and government policy. Studies such as this, which evaluate these resources under real-world conditions, provide valuable data for hospitals and individual providers in decisions to purchase and implement health information technology. This study also further establishes that the survey measure used is a powerful tool that could be applied in the outpatient setting to inform the future implementation of health information technology at all points of care.

—Review by Marc M. Triola, MD

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