Medical Informatics Improves Quality of Care in the Intensive Care Unit

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Advances in medical informatics and widespread implementation of electronic medical records facilitate the implementation of evidence-based practices and improve quality of care in the intensive care unit.

Introduction

Quality of care is an important goal in modern medicine. In the last decade, reports from the US National Academy of Sciences' Institute of Medicine noted an unacceptable rate of medical errors in hospitalized patients. (Kohn et al. 1999). Both errors of commission (treatment administration) and, more frequently, errors of omission are particularly common in the fast paced environment of the intensive care unit (ICU). Recent advances in medical informatics and widespread implementation of electronic medical records can greatly facilitate the implementation of best practices and improve the quality of care in the ICU (see figure1).

Education and Decision Support at the Point of Care

Web-based education allows all critical care providers (physicians, nurses, pharmacists, respiratory therapists) easier access to medical information and may facilitate modest care improvements (Belda et al. 2004). However, decision support is more effective if provided as near to the bedside as possible, and at the time of medical decision-making. The integration of decision support within Computerized Provider Order Entry (CPOE) may be an effective way to achieve this goal. For example, a simple algorithm developed by an interdisciplinary team of local experts (intensivists, anesthesiologists, surgeons, transfusion specialists and ICU nurses) effectively decreased unnecessary transfusions and transfusion complications in our institution (Rana et al. 2006). The teaching of complex processes, such as shock resuscitation or mechanical ventilation, may be facilitated by medical simulation using sophisticated, realistic scenarios, debriefing and feedback.

Practice Monitoring Using Relational Databases

The implementation of the best practices at the bedside is most effective when coupled with regular monitoring of outcomes, processes of care and timely feedback to the providers (see table 1). While administrative databases may allow crude assessment of quality of care in hospitalized patients, multiple shortcomings preclude its use in the critical care setting (Rubenfeld 2004). Administrative databases do not track ICU-specific syndromes (shock, sepsis and acute lung injury), processes of care (goal-directed resuscitation, low tidal volume ventilation) and outcomes (ventilator associated pneumonia). ICU-specific databases, such as the Acute Physiology and Chronic Health Evaluation (APACHE), are more useful, allowing for estimates of severity adjusted mortality and resource utilization (Afessa et al. 2005). Ultimately, electronic medical records are the richest source of ICU-specific information. Thus far, their uses to this end have been limited because of the different structures of specific data sources (laboratory, pharmacy and clinical notes), the absence of standardized coding and overall complexity, greatly limiting effective electronic database queries. Beginning March 21, 2005, the medical records of all new patients coming to Mayo Clinic in Rochester, Minnesota, are in electronic form. Moving to an integrated electronic medical record has been a large, multi-phased, eleven-year project. The benefits of the electronic medical record are already being recognized in the care of patients and the efficiency of operations.

Rule-Based Systems and Electronic Alerts

The availability of electronic data close to real-time allows for the development of specific rules and alerts aimed at preventing medical errors and facilitating evidence-based practices. A simple rule based system that combines pharmacy orders with microbiology sensitivities has been successfully used for more than five years to facilitate adequate antibiotic treatment throughout Mayo Clinic, Rochester, hospitals (Wilson et al. 2005). Furthermore, the development of specific electronic alerts ("data sniffers") can not only prevent drug allergies and drug-drug interactions but can also facilitate recognition of specific ICU syndromes and adverse events, for both quality improvement and clinical research (Finlay et al. 2005).

Conclusion

In conclusion, advances in information technology and medical informatics have the potential to facilitate best practices, prevent medical error, and greatly enhance the quality of care in the ICU.

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