Original Research

Effects of computerized physician order entry on medication turnaround time and orders requiring pharmacist intervention

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Abstract

Background: Previous studies have demonstrated that computerized physician order entry (CPOE) of prescriptions reduces both turnaround time (TAT) and medication errors. However, these studies have been performed primarily in large academic centers with a relatively small number of medication orders. As such, many studies investigating the impact of CPOE on the level of pharmacist intervention have yielded conflicting results.

Objective: The objective of this study was to examine the effects of CPOE on medication order TAT and the frequency of medication orders requiring pharmacist intervention in a community-based medical center.

Methods: A prospective cohort study was conducted at a community-based medical center. A total of 24,767 prescriptions written for 940 patients over a six-month period were stratified into CPOE or non-CPOE (handwritten) cohorts. TAT between cohorts were tested using analysis of variance and Tukey's Honestly Significant Difference test. The number of orders requiring pharmacist intervention was compared between cohorts and tested using chi-square test or Fisher's exact test. Medication orders requiring pharmacist intervention were stratified by patient characteristics, therapeutic class, and types of medication error.

Results: Medication orders not using CPOE were approximately 8 times more likely to require pharmacist intervention (2.26% versus 0.29%; $P < 0.001$), with the majority of pharmacist interventions performed to prevent medication errors. The overall mean TAT for medication orders was significantly shorter in the CPOE group in comparison with the non-CPOE group (22.2 ± 86.5 min versus 81 ± 256.7 min; $P < 0.001$). CPOE orders nearly eliminated medication errors with wrong dosage forms and formulary issues.

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Conclusions: Medication orders entered via CPOE are associated with a significant reduction in medication TAT and less likely to require pharmacist intervention. Use of CPOE may improve quality of patient care and efficiency of health care delivery.

Introduction

Consideration of both medication turnaround time (TAT which is defined as time from order entry to pharmacist order verification) and safety in the medication use process is critical if improved patient outcomes are to be realized. Computerized physician order entry (CPOE) has long been supported as a means to reduce prescribing errors and preventable adverse drug events (ADEs).[1–4] While CPOE may still result in preventable medication errors, the benefits of CPOE over paper-based medication ordering have been well documented.[4–10]

Leung and colleagues evaluated the impact of a vendor CPOE system in five community hospitals on adverse drug events. The authors reported a reduction of preventable ADEs by approximately one-third; however, there was an increase in both potential, and overall ADEs.[6] With the exception of the aforementioned study, much of the literature supporting CPOE has been derived from large academic medical centers, thus making generalizability difficult.[11,12] As such, there is a need for documentation of the benefits of CPOE in community medical centers.

With CPOE, complex rules embedded within the system and prompts to assist the physician with medication orders have been shown to improve compliance with a hospital's medication ordering protocols.[13,14] CPOE can eliminate physician and nursing transcription errors, thereby eliminating legibility and completeness of prescription information as possible sources of medication errors.[15,16] Multiple studies have shown CPOE to reduce medication error and ADE across a variety of health care settings.[4,17–22] CPOE implementation at an academic medical center led to a significant change in use of the drug, and the proportion of doses that exceeded the recommended maximum decreased from 2.1% to 0.6%.[23]

Computer-assisted prescriptions were less likely to contain errors and thus required less pharmacist's time, clarification, and intervention compared to traditional handwritten prescriptions and medication orders.[24–26] Installation of CPOE at a community hospital substantially reduced the rate of medication clarification placed by pharmacists to prescribers from 2.8% to 0.4%.[27] Some studies, however, have shown that utilizing integrated clinical information technology such as CPOE in prescribing actually increases the rate of pharmacist interventions, justifying the need for further study to examine the true effects of CPOE.[21,28,29]

In addition to a positive impact on medication errors, CPOE can have a beneficial impact on timeliness of care. It has been shown that timely administration of some medications can be critical to patient outcome.[13,30] Across a variety of settings, the implementation of CPOE has reduced the average medication TAT by 23%–88%.[15,31–35] Other studies have shown less significant, but still meaningful reductions, with TAT reductions of 79% and 54% respectively at a community hospital and a university hospital.[27] Studies have noted that time savings from CPOE may be offset by an increase in prescriber time spent on ordering due to increase computer tasks associated with order entry.[36,37]

Many of the these studies have evaluated a small number of medication orders, did not stratify by therapeutic class, and were resultant to early generation CPOE systems making it difficult to generalize results.[15,33–35] Furthermore, it is not known whether reductions in TAT are dependent on order type.

Traditionally, pharmacist have contributed to reducing medication errors and validating medication orders.[38] Most medication order interceptions by pharmacists occurred after the medication order during prescription fulfillment.[39] With the advent of information technology, there is a possibility to embed the judgment of the pharmacist into the CPOE through a series of complex rules and decision criteria and to improve the effect of pharmacist intervention in reducing medication errors.[40]

The specific objectives of this study were to examine the effect of CPOE on medication order