



Commentary

E-prescribing: A focused review and new approach to addressing safety in pharmacies and primary care

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Summary

E-prescribing, the health information technology (HIT) that enables prescribers to electronically transmit prescriptions to community pharmacies, has been touted as a solution for improving patient safety and overall quality of care. However, the impact of HIT, such as e-prescribing on medication errors in acute care settings, has been widely studied and shows that if poorly designed or implemented, HIT can pose a risk to patient safety by introducing a source of medication errors. Unlike acute care settings, safety issues related to e-prescribing in primary care settings (where e-prescriptions are generated and transmitted) and pharmacies (where e-prescriptions are received) have not received as much attention in the literature. This paper provides a focused review of patient safety issues related to using e-prescribing systems in primary care and pharmacies. In addition, the paper proposes using human factors engineering concepts to study e-prescribing safety in pharmacies and primary care settings to identify safety problems and possible mechanisms for improvement.

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Introduction

Handwritten prescriptions have been the primary means of communicating drug choice and therapy of a patient between prescribers and pharmacists. Over time, the hazards associated with handwritten prescriptions such as difficulties with legibility, risk of misinterpretation, and falsification of handwritten prescriptions prompted the adoption of electronic prescriptions (e-prescriptions).¹ Consequently, the use of e-prescribing was promoted as a means of reducing medication errors in pharmacies caused by

illegible handwritten prescriptions.² E-prescriptions are generated within e-prescribing systems and are electronically transmitted to pharmacies via a secure network between prescribers and pharmacies.³ E-prescribing involves direct computer-to-computer transmission of prescriptions from physician offices to community pharmacies.^{4,5}

E-prescribing was initially intended to allow for all medication orders to be received and processed electronically thereby completely eliminating the use of paper in the processing of prescriptions in pharmacies. The ultimate goal of implementing

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e-prescribing was to achieve the following: reduce medical errors, decrease pharmacy costs, improve both prescriber and pharmacy efficiency, eliminate handwriting interpretation errors, reduce phone calls between pharmacists and physicians, reduce data entry, and expedite prescription refill requests.⁶ The use of e-prescribing systems has led to an increase in the number of e-prescriptions being processed pharmacies.⁷ In 2009, 190 million e-prescriptions were processed, compared to 68 million in 2008 and 29 million in 2007. A potential reason for increasing e-prescription receipt in pharmacies is the allocation of funds worth approximately \$48 billion to encourage the adoption and use of e-prescribing by prescribers. Consequently, the number of e-prescriptions routed to pharmacies grew by 72% between 2009 and 2010.⁷ A growing concern among community pharmacists who are the recipients of e-prescriptions sent by prescribers are the patient safety implications of new kinds of medication errors and information omissions caused by the use of e-prescribing.⁸

On the prescribing end: hospital settings

The effect of e-prescribing on patient safety and quality of patient care in hospital settings has been rigorously studied.⁹ Because safety issues associated with using e-prescribing in pharmacies and other ambulatory care settings have received less attention, investigations of e-prescribing use in hospital settings can inform e-prescribing research in community practice. There is a growing body of empirical data on the negative impact e-prescribing can have on patient safety in hospital settings. Ash and colleagues have investigated extensively the implications of using e-prescribing systems in hospital on prescriber's workflow and patient safety.^{10–14} These studies adopted both qualitative and quantitative methods to investigate the major unintended adverse consequences produced by e-prescribing systems in hospital settings. Results from these studies described how prescribers used e-prescribing systems, and the problems and inefficiencies associated with its use. The findings from this line of research have shed light on the unexpectedly high level of unintended consequences and potential patient safety concerns that may arise from the use of this relatively new technology. Examples of such unintended consequences included: changes in communication patterns, generation of new kinds of errors, more and new work for clinicians, unfavorable workflow issues, overdependence on technology, continuous demands

for system upgrades, persistence of paper, negative emotions toward the technology, changes in power structure and work roles.^{15,16}

The identified unintended consequences of e-prescribing systems were reported to have affected both prescribers and pharmacists who were using this technology. Implementation of e-prescribing systems in hospital settings has commonly resulted in disruptions in workflow and changes in work system design.¹⁷ Inadequate implementation also has been suggested to be the major facilitator of new kinds of errors produced by these systems in hospital settings.^{6,15,18,19} One study reported that 44.3% of errors that occurred in the hospital happened because of the presence of an e-prescribing system and would likely not have happened with traditional handwritten prescriptions.¹⁸ Hospital pharmacists in this study intervened upon 524 erroneous medication orders and the time required for the interventions ranged from 0.05 to 552 h. These pharmacists were able to correct the e-prescription errors only if they had access to patients' clinical data and had sufficient time. The study also reported that unintentional omission on the part of the prescriber, wrong drug selection, and wrong dosage regimen errors were the most frequent types of prescribing errors that occur with e-prescribing systems.

Generally, the research findings on the effect of e-prescribing on medication errors were partially attributed to their settings, the system design features, or the nature of prescribers' work. Studies conducted on homegrown systems (vs. commercial products/systems) or on systems with manual chart review show a higher ability to detect medication errors with e-prescribing.²⁰ One study stated that design features of e-prescribing such as poor drop-down menu, poor screen design, or inaccurate or incomplete patient medication lists especially in certain diseases can pose a threat to patient safety.²¹ Another study that examined the relationship between prescribing errors, use of e-prescribing technology, complexity of tasks and interruptions in healthcare settings reported that common errors that occurred include: selection of incorrect medication, dose, route, and formulation.²² When prescribers were interrupted when performing tasks on e-prescribing systems, they required almost three times longer to complete complex tasks when compared to simple tasks. Interruptions when using e-prescribing systems were suggested to be a possible contributing factor to medications errors when using this technology possibly due to loss of concentration by the user.

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