

E-prescribing: E for error?

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Case Objectives

- Define e-prescribing.
- Describe ways in which e-prescribing can reduce health care costs.
- State how commonly prescription errors occur with e-prescribing.
- Describe steps that can be taken by health care providers to limit errors associated with e-prescribing.

Case & Commentary- Part 1:

A 63-year-old man with multiple medical problems was seen by his primary care doctor for a routine follow-up appointment. Despite receiving psychotherapy, the patient admitted that he continued to struggle with anxiety. In light of these complaints, the primary care doctor elected to prescribe an antianxiety agent, alprazolam. The clinic had just implemented electronic prescribing—the ability to electronically transmit a new prescription to a pharmacy. The physician reassured the patient that he didn't need a paper prescription and could simply go to the pharmacy to pick up his medications.

Electronic prescribing (e-prescribing) is the transmission, using electronic media, of prescriptions or prescription-related information from a prescriber (physician, nurse practitioner, etc.) to a pharmacy. The information may flow to a number of parties in addition to the pharmacy, such as a pharmacy benefit manager, health plan, or an intermediary, such as an e-prescribing network (a large centralized system to process electronic prescriptions). In its simplest form, as in this case, e-prescribing involves two-way transmissions between the point of care and the pharmacy.⁽¹⁾ E-prescribing is intended to replace writing out, faxing, or calling in prescriptions, and its many proposed benefits include safer, more efficient, and more cost-effective care.⁽²⁾

Because of these potential benefits, the federal government has put in place major incentives for providers to adopt e-prescribing ⁽³⁾ (Medicare Modernization Act, 2003) and to adopt electronic health records (EHRs) ⁽⁴⁾ through the meaningful use incentives (American Recovery and Reinvestment Act, 2009). According to a health information technology (IT) stimulus report published in 2009, the health IT incentives

included in the federal stimulus law will significantly increase the rate of electronic prescribing and save \$22 billion in drug and medical costs in the next decade.⁽⁵⁾ The authors report that the e-prescribing savings would come from (i) informing doctors at the point of prescribing about the cost and clinical characteristics of medication options and letting doctors select the best and most affordable drugs, including more generic prescriptions; (ii) providing doctors with patients' medication histories to prevent harmful drug interactions and duplicate prescriptions; (iii) notifying physicians of pharmacy options, including mail-order and retail drug stores, to help curb patients' out-of-pocket costs; and (iv) reducing wait times and errors related to illegible handwriting by transmitting prescriptions electronically to pharmacies. The report also estimates that the increase in e-prescribing could prevent 3.5 million medication errors and 585,000 hospitalizations by 2018.

A recent literature review shows substantial evidence that e-prescribing can improve the safety, efficiency, and cost-effectiveness of patient care.⁽²⁾ Several previous studies demonstrated the benefits of integrated [clinical decision support](#), which requires the availability of accurate and complete pharmacy eligibility, benefit, and formulary information at the point of care. The availability of insurance coverage and copay information at the point of care can reduce the number of calls to providers seeking information for changes in medications to covered agents or requests for prior authorization information. Furthermore, the copay information offers an opportunity for providers to engage patients in their own care by involving the patient in deciding what agent the patient will receive based on cost and benefits. In addition, studies showed that clinical decision support systems change prescribing behavior and significantly lower prescription drug costs. In a Massachusetts study, the cost savings had a potential of reaching \$845,000 per 100,000 patients.^(6,7) A study at the Henry Ford Health System found that e-prescribing was associated with an increase in the prescribing of generic drugs, lower administrative costs, and reductions in adverse drug events.⁽⁸⁾

While these benefits have been realized in many locations, successful e-prescribing on a truly broad scale has not been achieved. More widespread adoption depends on the coordinated actions of many stakeholders and the continuing evolution of standards, capabilities, and competencies to ensure that robust and accurate transmission of e-prescribing data and workflow processes are the rule rather than the exception.

Across the United States, the number of prescribers sending electronic prescriptions has increased since 2008. Recently, with the initial rollout of the meaningful use standards and incentive payments, this growth has been accelerated by adoption of EHRs. Standalone e-prescribing systems, which can create and refill prescriptions for individual patients, manage medications and view patient history, connect to a pharmacy or other drug dispensing site, and integrate with an electronic medical record (EMR) system, have actually dropped slightly, likely due to movement toward EHRs. The Surescripts National Progress Report is the primary source of information for e-prescribing adoption and use.⁽⁹⁾ By the end of 2010, the Report found that there were 234,000 active e-prescribers, representing 34% of all office-based physicians in the nation. About 20% of eligible prescriptions were sent electronically in 2010, versus 12% in 2009. Drug Enforcement Administration regulatory changes that give prescribers the option of issuing prescriptions for controlled substances electronically should drive future growth of e-prescribing.

Case & Commentary- Part 2:

The clinic nurse entered the medications into the computer system. However, while entering the prescription for alprazolam, she inadvertently entered an additional medication, atenolol, a prescription intended for a different patient. Quickly recognizing her error, she deleted the e-prescription in the computer, assuming the order had been canceled.

Unfortunately, despite her efforts to cancel the atenolol order, the e-prescription went through to the pharmacy. When the patient arrived at the pharmacy, he was given both medications. Although he thought it was a bit strange to receive two medications for his problem, he was willing to do anything to reduce his anxiety. Consequently, he took both medications as instructed. A few days later, during his cardiology appointment, the error was noted, and the atenolol was discontinued.

Health IT, including e-prescribing, creates opportunities to improve patient safety that do not exist in paper-based systems. For example, paper-based systems cannot detect and alert clinicians of drug–drug interactions, whereas electronic decision support systems can. While evidence suggests that implementing new technology (including e-prescribing) improves patient safety, research has also demonstrated the potential for new technologies to result in unintended consequences.⁽¹⁰⁻¹⁷⁾ In the case of e-prescribing in the ambulatory setting, chief among these unintended consequences is the potential for new errors introduced by computer-generated prescriptions.

A recent study reported the frequency, types, and causes of errors associated with outpatient computer-generated prescriptions.⁽¹⁸⁾ Of 3850 prescriptions reviewed in the final sample originating from three different states, 452 (11.7%) contained 466 total errors, of which 163 (35.0%) were considered potential adverse drug events.⁽¹⁸⁾ The most common error was omitted information (60.7% of all errors and 50.9% of potential adverse drug events). The information omitted most often was duration, dose, or frequency. Omission errors are relatively easy to overcome by designing an e-prescribing system where fields must be filled before a prescription can be completed. However, electronic systems have a more difficult time addressing certain safety issues, such as wrong patient or wrong diagnosis.

To maximize the benefits of e-prescribing, including improved transmission and reduced medication errors, both physician practice and pharmacy staff must use the system routinely to gain experience with it. However, not all physicians who implement health IT use the e-prescribing application to generate and transmit new prescriptions or renewals consistently. Similarly, not all community and mail-order pharmacies have the ability to receive new prescriptions electronically or to send electronic renewal requests. Some pharmacies have faced an additional challenge because they sometimes need to manually enter or edit prescription data into their own computer system, despite using an e-prescribing system.⁽¹⁹⁾

Several important steps have been proposed to improve the safety of e-prescribing. Three prescription fields commonly requiring manual manipulation include medication name, quantity, and patient instructions (also known as "Sig"). To address challenges related to drug name, experts have recommended that the National Council for Prescription Drug Programs (NCPDP) consider using a new technical standard, RxNorm, a standardized nomenclature for clinical drugs, in place of National Drug Code (NDC) Directory codes as the main identifier. The NDC for a drug is a unique identifier specific to a manufacturer, strength,

dosage form, and package size. RxNorm could help reduce drug selection inefficiencies and potential errors by better conveying physicians' intent without requiring them to overspecify their choice. For example, from a drop-down menu in the e-prescribing system, a provider might select "minocycline tablet, 100 mg" that is considerably more expensive than a capsule. In the past, the provider would have written for "minocycline 100 mg" and allowed the pharmacist to select "capsules" in the system because of the cost difference. A pharmacist cannot change from tablets to capsules without calling the provider for authorization.

To improve on the quality of patient instructions in e-prescribing, the Structured and Codified Sig Format is being incorporated into the NCPDP SCRIPT transaction standards, moving from free text to a structured format. Currently, many e-prescriptions received at the pharmacy need to be rewritten in order to be understood by patients. For example, a provider will type patient instructions using the Latin Sig "t.i.d." in the text; the pharmacist will then need to replace "t.i.d." with "three times a day" so that the patient can understand the instructions. Moving from free text to a structured format for transmitting prescriptions between provider systems and pharmacy systems will allow providers to write more complete, clinically accurate, and unambiguous instructions. E-prescribing vendors could also explore ways to improve system design to mitigate existing problems with conflicting Sigs. Other recommendations include providing additional physician training and developing best practices to encourage physicians to send or call in amended prescription information to the pharmacy to avoid repeating mistakes.

In this case study, the primary care provider expected that the new e-prescribing system would deliver efficient and effective information in a timely fashion with little effort. Unfortunately, the clinic nurse entered the atenolol without checking the name and date of birth on the patient profile and then, after realizing her mistake, did not verify that the medication was deleted from the medication list before or after transmission to the pharmacy. In addition, the system allowed the nurse to prescribe on behalf of the doctor and transmit without first being verified by the doctor. The degree to which e-prescribing software includes forcing functions requiring prescribers to review order entry before transmission varies widely among different computerized prescribing systems. A function that requires the prescriber to review all prescriptions (including new, renewals, or changes) before sending would have listed the atenolol as a new prescription ready for transmission to the pharmacy. A return receipt of prescriptions that reach the pharmacy would also have alerted the nurse that two prescriptions arrived at the pharmacy. A required step to confirm deletions would also be useful, but could add extra steps to a workflow that is already complicated by new technology.

In addition to system functionalities that could have prevented dispensing the wrong medication to the wrong patient, many provider-focused interventions may be necessary to optimize medication safety. Providers need to continue to inform their patients of the name and appropriate use of medications when prescribed. If a patient is not sure why a particular medication was prescribed, they should be encouraged to talk to their doctor or pharmacist. Providing and reviewing a current medication list with patients as part of the visit summary would also help to identify discrepancies when they occur before the patient leaves the office. The sharing of patient care summaries at transitions of care as a requirement for meaningful use incentives should extend to include the pharmacist as a specialist in the care of each patient. Sharing such summaries can alert the pharmacist to treatments without appropriate diagnoses, as well as provide valuable clinical information to monitor management of chronic drug therapies.

Some steps health care providers should take to maximize safe e-prescribing performance in the future include:

Take-Home Points

- Verify name and date of birth before entering an order.
- Review all new medications and intended use with the patient.
- Confirm deletion of an order entered in error while reviewing the patient's current medication list at the end of the visit. Provide a paper or electronic copy to the patient.
- Follow up with a phone call to the pharmacy to ensure that the wrong medication was not transmitted for the wrong patient, especially when a prescription is canceled or changed.
- Document software design and workflow challenges to feedback to the vendor and provider practice for future training opportunities or upgrades.

Merely installing health IT in health care organizations will not result in improved care. The design, implementation, and use of health IT will affect its safe performance. Safer implementation and use of health IT is a complex, dynamic process that requires a shared responsibility between vendors and health care organizations. E-prescribing systems are no exception.

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