

Commentary on the Federal Government's Role in Influencing E-prescribing Use and Research

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Takeaway Points

In an effort to improve patient safety, the federal government has played a major role in influencing the adoption and use of e-prescribing systems.

- Due to financial incentives for meaningful use, and penalties for lack of implementation, many organizations have rapidly adopted e-prescribing systems.
- However, rapid implementation has uncovered long-term costs and unintended patient safety hazards that require empirical research to fully characterize the true contribution of e-prescribing to healthcare systems.
- Research initiatives have therefore shifted from a focus on e-prescribing usefulness to an emphasis on safety concerns and expanded use.
- Studying how users interface with this new technology, how systems have been implemented, and their impact on healthcare processes and outcomes is crucial.

Abstract

Electronic prescribing (e-prescribing) is one of the most studied areas of health information technology due to advocacy for its use by influential organizations such as the Institute of Medicine (IOM). In the United States, the federal government has played a significant role in encouraging use of e-prescribing technology and in stimulating associated research nationwide. The federal government has increased e-prescribing research initiatives through agencies such as the Agency for Healthcare Research and Quality (AHRQ) and the Health Resources and Services Administration (HRSA). Initial initiatives focused on the development of standards for e-prescribing systems and implementation. In recent times, e-prescribing research initiatives have become more focused on identifying unintended consequences of using this technology and identifying new possibilities of use that were previously not envisioned. Continuous studies of how healthcare professionals are interfacing with this new technology, how systems have been implemented, and the impact of this technology on healthcare processes and outcomes are crucial.

Introduction

Health information technology (HIT), particularly electronic prescribing (e-prescribing), has received global attention in recent times.¹ E-prescribing, one of the most studied areas of HIT, is defined as “the use of computing devices to enter, modify, review, issue and/or transmit medication prescriptions” by clinicians for individual patients.² Advocates for e-prescribing exist within various organizations and include researchers, clinicians, hospital administrators, pharmacists, business councils, the Institute of Medicine (IOM), state legislatures, healthcare agencies, and the lay public.³ Healthcare organizations are being socialized to accept the use of HIT as a standard for best practices in healthcare delivery. The federal government mandated the meaningful use of e-prescribing systems by 2012, to improve quality of care and patient safety.⁴ Consequently, the federal government made e-prescribing an inextricable part of healthcare delivery. The mandate for meaningful use of e-prescribing requires all hospitals to implement this technology in a manner that can be significantly measured. Organizations that comply with this regulation will receive incentives for rapid adoption, while organizations that do not comply will be penalized by the Centers for Medicaid and Medicare Services (CMS) beginning in 2012. This unprecedented regulation has led to widespread implementation of e-prescribing and research on the challenges, barriers, failures, and successes of e-prescribing systems. This commentary explores the federal government’s influence on e-prescribing use and research.

Spurring Adoption and Use

The federal government contributed substantially to public- and private-sector initiatives to encourage the adoption of e-prescribing by organizations.⁵ Specifically, the US Department of Health and Human Services (HHS) played a significant role in promoting adoption.⁶ As a stimulus for organizations to utilize e-prescribing, in January 2009 CMS began offering incentives to prescribers that administered e-prescriptions. An underlying assumption of this action by CMS was that nationwide adoption of e-prescribing was an important step toward reducing healthcare expenditures spent on treating adverse drug events.⁷

Over the last two decades, reports released by the IOM influenced the federal government's decision to promote nationwide adoption of e-prescribing. In 1999, the IOM report *To Err Is Human: Building a Safer Health System* estimated that the death rate associated with medication errors was approximately 7,000 annually.⁸ Half of the medication errors that were considered to be preventable were reported to have resulted in adverse drug events. A subsequent IOM report, *Crossing the Quality Chasm*, stated that the use of technologies such as e-prescribing systems could help reduce medication errors and improve patient safety. Healthcare organizations were therefore compelled to implement e-prescribing systems due to endorsements by highly regarded organizations such as the Leapfrog Group and the American Academy of Pediatrics.⁹ This created momentum in the healthcare industry for organizations to install e-prescribing systems to help prevent prescribing errors that result in patient harm and expensive litigation.

The 1999 IOM report exposed many challenges that were facing the healthcare system, such as the high frequency of medication errors, increased awareness of poor patient care quality, and disparities in HIT within organizations. The collective recognition of issues, particularly the high rate of medication errors in healthcare settings, led to regulatory approaches to solving these problems. Therefore, the federal government mandated increased use of HIT to improve patient safety, including the adoption of e-prescribing technologies on a national scale.

Initiatives to Promote Research

The federal government increased research initiatives through agencies such as the Agency for Healthcare Research and Quality (AHRQ) and the Health Resources and Services Administration (HRSA) to promote widespread adoption, education, investigation, and dissemination of information on e-prescribing systems. These initiatives began in order to improve patient safety and quality of care in the US healthcare system. The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 authorized grants and incentives totaling between \$14 billion and \$27 billion to promote meaningful use of e-prescribing by organizations.¹⁰

Grants awarded by federal agencies such as AHRQ and HRSA played a primary role in directing, stimulating, and disseminating research evaluating e-prescribing systems. Early research on e-prescribing focused on development of standards for e-prescribing and pilot projects using standalone systems. These studies were done to assist organizations to select safe e-prescribing systems. E-prescribing systems have gradually evolved from standalone systems to fully integrated electronic health records (EHRs) and health information exchanges (HIEs) with more complex capabilities.¹¹

Identifying Research Needs

Over the last five years, national interest in e-prescribing increased due to federal government legislation. The Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003 was aimed at increasing the adoption of e-prescribing on a national level. CMS published a report mandated by the MMA on the need to educate healthcare organizations on the standards of e-prescribing. The report evaluated issues with e-prescribing such as reduction of adverse drug events, efficiency, effectiveness, and provider uptake through pilot testing in multiple organizations.¹²

AHRQ, the agency charged with supporting research to improve the quality of healthcare in the United States, has awarded \$260 million dollars in grants and contracts to encourage HIT research.¹³ Pilot studies were jointly administered by CMS and AHRQ to evaluate the usefulness of e-prescribing systems in reducing medication costs, medication errors, and time spent by physicians and pharmacists to clarify prescriptions.^{14,15} On September 8, 2008, AHRQ announced that research on the implementation and use of HIT such as e-prescribing systems was still a national priority. AHRQ also expressed interest in investigations focused on discovering new uses of e-prescribing technology previously not conceptualized.¹⁶ One of the most

recent research areas is the use of e-prescribing systems to prescribe controlled substances. This is important because 25 percent of all prescriptions consist of controlled substances. AHRQ expressed interest in funding research to help design, implement, and field test a system for e-prescribing of controlled substances.¹⁷

Encouraging Use

In 2006, 15 percent of physicians were using e-prescribing in their practices, and still only 23.9 percent used this technology as of 2008 despite federal government efforts.^{18,19} Many organizations indicated that a lack of financial resources, rapid change of standards for e-prescribing, and lack of IT support and knowledgeable staff to manage these systems were barriers to adoption. In 2008, the federal government began offering physicians financial incentives for using and penalties for not using e-prescribing. However, adoption rates of e-prescribing remained low in small and rural communities. AHRQ and HRSA began providing grants to advance the use of e-prescribing in poorer hospital facilities located in rural settings. AHRQ and HRSA also provided tool kits to help guide these organizations through every stage of implementing e-prescribing systems. Follow-up grants were awarded to expand training programs and integrate HIT into the curriculums of academic institutions to increase the number of available e-prescribing system experts.²⁰

The structure and function of an organization affects its choice of e-prescribing system to be implemented. Organizations with timely access to high-quality technical support to help manage organizational and workflow changes are typically successful in implementing e-prescribing.²¹ Conversely, organizations in which users have limited understanding of e-prescribing capabilities, difficulty with technical aspects of implementation, and insufficient technical support are more likely to be unsuccessful in adoption and implementation. Many other factors, such as type of specialties or roles, standard of care within the organization, and knowledge and awareness of available systems, contribute to an organization's access to, choice of, and use of an e-prescribing system.

A primary determinant of the type of e-prescribing system that an organization chooses to adopt is the availability of resources. Organizations such as large academic medical centers have adequate technology expertise and the financial capability to develop or purchase, customize, and implement state-of-the-art e-prescribing systems. On the other hand, solo providers and small organizations have limited access to informatics expertise and money to develop or install complex and more efficient systems.²² Although many organizations seek to comply with mandatory adoption of e-prescribing systems, some organizations are faced with unexpected challenges and uncertainties about how implementation would affect their organization.²³ An organization's failure to use e-prescribing now implies a deviation from the prescribed legal standard of care. Organizations now have to consider the malpractice implications of e-prescribing systems due to risks associated with challenges during the implementation process. Liabilities can arise from poorly designed e-prescribing systems.²⁴

Shifting Research Perspectives

Studies conducted in the early 1990s proposed that organizations' resistance to the adoption of e-prescribing systems stemmed from individual clinicians' fear of technology, organizational concerns about the negative impact of this technology on relationships with patients, and the disruptive impact on workflow.^{25,26} Later, in 2005, studies found that costs, impact on workflow, lack of widespread interoperability, security and privacy concerns, application speeds, and system maintenance requirements were more relevant in organizations' resistance to adopting e-prescribing systems.²⁷ Results from these studies have been instrumental in influencing the direction of e-prescribing research. The reported e-prescribing research needs stimulated organizations such as the Center for Health Information Technology at the American Academy of Family Physicians to create tool kits to share strategies for selecting and implementing e-prescribing systems. In 2006, the Certification Commission for Health Information Technology also began certifying e-prescribing systems to assist organizations in making informed decisions when purchasing e-prescribing systems.

Most studies on e-prescribing examine its role in facilitating or reducing medication errors in organizations. Earlier studies on e-prescribing systems in organizations were commonly conducted in inpatient hospital settings rather than ambulatory settings in order to evaluate the quality of e-prescribing transactions.²⁸⁻³⁰ These studies typically examined only one organization. Studies prior to 2005 typically focused on efficacy (the potential to reduce errors) and user satisfaction. Organizations that reported positive benefits using e-prescribing systems were generally those conducted in academic medical centers that had implemented "home-grown" systems. Home-grown systems are systems that are built by medical researchers and are operated only within their own organizations. These standalone systems are commonly found in hospitals associated with

medical schools and have been reported to have increased efficiency in reducing medication errors and lowering healthcare costs.³¹ One study that elucidated the positive benefits of e-prescribing systems was conducted by Kaushal et al. between 2005 and 2007. This study found that the adoption of e-prescribing could result in a sevenfold decrease in rates of prescribing errors.³²

After 2005, there was a major shift in the perspective used to research e-prescribing technology. More studies began to examine ways in which this technology could contribute to medication errors.³³ Koppel et al. found that e-prescribing systems facilitated 22 types of medication error risks in hospital settings. This study was instrumental in shedding light on the medication error risks with e-prescribing technology that had not been previously considered.³⁴ It is now clear that e-prescribing research cannot focus on only inpatient settings or only one hospital but has to be expanded to include outpatient settings and multiple large-sized organizations for the results to be generalizable and meaningful.³⁵ Researchers are beginning to identify that issues arising from e-prescribing use are not limited only to hospital settings.³⁶ Hence, work is being carried out to examine the impact of e-prescribing systems in other organizations apart from traditional hospital settings. These organizations include community pharmacies that are the primary recipients of electronically written prescriptions from hospital settings.

Educating organizations on the benefits of the ability of e-prescribing technology to improve safety was the primary focus of early studies. These studies sought to provide information on the readiness of organizations to adopt e-prescribing, physician and nurse perceptions about the technology, and attempts to provide evidence of the cost benefit of e-prescribing systems so as to obtain buy-in from organizations. Studies relating to cost, physician resistance to the technology, impact on practice workflow, perceptions of users and patients, and limitations of various systems were also prevalent in the scientific literature.³⁷

Currently, e-prescribing research revolves around five main areas:

1. Comparing functional capabilities between e-prescribing systems so as to detect unintended hazards
2. Examining how to facilitate the implementation to meet specific workflows
3. Discovering new uses to improve efficiency and patient safety
4. Evaluating the impact on processes and outcomes³⁸
5. Investigating how e-prescribing could be used to improve quality of care in patients with chronic conditions such as diabetes and hypertension

The most recent studies on e-prescribing systems involve identifying current problems, developing standards for e-prescribing design, and applying human factor principles to redesign e-prescribing to suit individual organizational needs.³⁹ Studies are also being done to examine ways of expanding the use of e-prescribing systems to help organizations monitor patient compliance with medication use and response to drug treatments. Current investigations are focusing on examining the quantitative impact of e-prescribing on the quality of patient care when the current functional capabilities of an e-prescribing system are modified.⁴⁰

What Remains to Be Done

The federal government is beginning to see the need to develop standards to establish consistency of e-prescribing systems among all systems or geographic locations. Studies on e-prescribing systems are often system-specific or specific to a geographic location and may not be generalizable to all US healthcare systems.⁴¹ There is still a lack of understanding of how data gathered from multiple e-prescribing systems can be used to improve the quality of these systems.⁴²

Healthcare organizations are also interested in scientific evidence to show that the benefits of e-prescribing systems outweigh the long-term costs of maintaining these systems.⁴³ Organizations starting without a well-developed informatics infrastructure are more likely to make greater investments than organizations that already have a well-developed infrastructure in place. Some organizations have also identified the need to balance safety risks resulting from human errors and inadequately designed e-prescribing systems. Increasingly, evidence of concerns held by users of e-prescribing systems within organizations is being documented. Such information will be useful to regulatory bodies to ensure that organizations that design this technology are complying with newly established guidelines.⁴⁴

The future of e-prescribing research largely relies on federal government initiatives shifting from incentivizing meaningful use of e-prescribing technology to supporting the identification and addressing of problems with this technology to reduce the

likelihood of errors. Many of these errors and problems have already been identified in the scientific literature. E-prescribing research initiatives should be targeted toward addressing safety risks associated with advancement of this technology. Since the federal government is aggressively pushing for widespread use of e-prescribing technology, it should advocate for research that supports the development and use of functional capabilities of this technology to enhance safety.

Conclusion

The use of e-prescribing systems has become pervasive within organizations in the last two decades. The adoption of e-prescribing has been accelerated by various interest groups and regulatory requirements as a result of increased concern to find solutions to high medication error rates in healthcare organizations. The federal government, in particular, has played a major role in influencing research conducted on e-prescribing and creating standards for e-prescribing systems being implemented in organizations in the United States. Research on the ability of e-prescribing to improve safety has predominantly come from organizations using e-prescribing in inpatient settings or using locally developed systems created by organizations for their own use.⁴⁵

The IOM has reported that error rates in the United States are high and that the use of e-prescribing systems will help to alleviate medication errors and reduce the cost of healthcare. Until recently, organizations considered the use of e-prescribing to be a primary way to reduce medication errors and improve patient safety. However, an increasing number of organizations are beginning to question this assumption. More research needs to be done to confirm or disprove the assumption of the IOM that HIT will reduce medication errors and healthcare costs. With federal incentives promoting meaningful use of e-prescribing systems, it is likely that more organizations will adopt this technology. The rapidly evolving nature of this technology makes continuous studies on the effects of e-prescribing systems relevant and necessary.

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