

Electronic Prescribing in Ambulatory Practice: Promises, Pitfalls, and Potential Solutions

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Objective: To examine advantages of and obstacles to electronic prescribing in the ambulatory care environment.

Data Sources: MEDLINE and International Pharmaceutical Abstract searches were conducted for the period from January 1980 to September 2000. Key words were electronic prescribing, computerized physician order entry, prior authorization, drug utilization review, and consumer satisfaction. In September 2000, a public search engine (www.google.com) was used to find additional technical information. In addition, pertinent articles were cross-referenced to identify other resources.

Data Extraction: Articles, symposia proceedings, and organizational position statements published in the United States on electronic prescribing and automation in healthcare are cited.

Data Synthesis: Electronic prescribing can eliminate the time gap between point of care and point of service, reduce medication errors, improve quality of care, and increase patient satisfaction. Considerable funding requirements, segmentation of healthcare markets, lack of technology standardization, providers' resistance to change, and regulatory indecisiveness create boundaries to the widespread use of automated prescribing. The potential solutions include establishing a standardizing warehouse or a router and gaining stakeholder support in implementation of the technology.

Conclusions: Electronic prescribing can provide immense benefits to healthcare providers, patients, and managed care. Resolution of several obstacles that limit feasibility of this technology will determine its future.

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Historically, healthcare has lagged behind major industries in automation and computerization.¹⁻³ Compared with other record-dependent industries such as banking and airlines, healthcare has been using outdated and inefficient methods to store, retrieve, and transfer information.^{2,3} In the early 1980s, when computerization was widely welcomed and appreciated by other markets, community pharmacies and physician offices continued to rely on paper records to process third-party claims manually.^{1,4} Even today in the age of online banking, retailers, and customer service, paper and phones are the predominant methods of communication between physicians and pharmacists.

... BEGINNINGS ...

Automation has been implemented in some fragments of the healthcare industry. More than a decade ago, pharmacy benefit management companies (PBMs) and managed care organizations (MCOs) in search of fast and efficient means of high-volume prescription claims processing introduced the concept of online claims adjudication. This linked pharmacy providers directly to the payers, making these industries the most interconnected area of healthcare. At the same time, inpatient automated physician order entry attracted some hospitals' attention.⁵⁻⁹ In 1998, 34% of 1000 surveyed US

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hospitals contemplated using automated physician order entry, although few actually implemented it.¹⁰ Reduced medication errors, increased formulary compliance, improved interdepartmental communications and physician prescribing practices, and decreased costs of care were among positive findings reported by the hospitals using electronic physician order entry.^{9,11-16} Although these benefits could greatly impact healthcare in the ambulatory setting, computerized physician order entry (ie, electronic prescribing) has not been widely implemented in physician offices to improve the process of prescription writing.¹⁷

Inpatient Versus Outpatient Practice

The organizational structures of inpatient and outpatient practices are vastly different. This difference may account for the limited use of electronic prescribing in the ambulatory environment. All departments within a hospital or a health system are integrated within a single organization and share financial risks and certain responsibilities. Thus, process improvements and inefficiencies in 1 department affect all others. On the other hand, in ambulatory practice, interdependent structures (especially physician practices and pharmacies) are mostly segregated. A financial advantage or risk for 1 party is not necessarily transferred to or shared by the other.

Today, with the help of sophisticated technology, electronic prescribing may positively impact outpatient care. Although it is difficult to guarantee that the benefits of computerized order entry in hospitals will transfer readily to the outpatient setting, computerized order entry has the potential to optimize patient care by serving as a link between physicians, pharmacies, and MCOs. So far, however, outpatient physician orders captured electronically with any device were estimated to comprise only 2% of all prescriptions written by 650,000 physicians practicing in the United States in 1999.¹⁷

... PRODUCTS AND TECHNOLOGY ...

Electronic Prescribing Products

Personal computer (PC)-based electronic prescribing products emerged first; however, today more than 20 handheld electronic prescribing products are available. **Table 1** lists some of the handheld products and their manufacturers. Although different with respect to technology, platform, means of information delivery, and clinical resources, these products all offer the same service. A prescription

pad and sometimes even a patient chart are traded for a personal digital assistant (PDA) device or a desktop computer. Physicians retrieve patient profiles containing allergy, medication history, and health insurance information while examining their patients. If a physician decides to prescribe a medication for a patient, he or she will use the device as an electronic prescription pad. As discussed later in the computer technology section, some PC-based product vendors might require a computer terminal and Internet connectivity in every examination room, whereas PDA-based product vendors might require handheld devices and wireless connectivity. Regardless of hardware requirements, the concept of electronic prescribing remains the same.

Prescription Order Flow

Most of the electronic prescribing products offer different ways of assisting physicians through the prescription-writing steps. Some systems, like Axolotl's Elysium Prescription Writer, use the *International Classification of Diseases, Ninth Revision* (ICD-9), diagnosis code to link therapeutic classes with corresponding diagnoses. In that case, after recording a diagnosis of depression, a physician will be prompted to choose from a list of selective serotonin reuptake inhibitors, tricyclic antidepressants, monoamine oxidase inhibitors, and miscellaneous antidepressant classes. Some manufacturers (eg, Firekey) just offer physicians a list of all therapeutic categories. Their logic is that the ICD-9 code does not always reflect a diagnosis; sometimes, it represents symptoms that can be manifested by many conditions. Heleos's MyHippo, LogonHealth's LH Prescription Center, and other products use "smart" technology and learn which agents the physician prescribes most often. Medications can be selected from the top 50 to 100 prescribed agents, which also can be subcategorized into therapeutic categories.

In either case, a physician is offered a complete drug database, providing all the marketed medications, their dosage forms, available doses, and brand or generic status. The device also can serve as a drug information and clinical practice guideline resource. Once all the necessary prescription components have been selected, the device can warn the prescriber of any drug interactions, verify insurance formulary status, and even perform preadjudication. Most of the products listed in **Table 1** provide drug interaction and formulary status screening. To save time and effort, some programs (eg, Allscripts' TouchScript) are designed to notify physicians of

drug interactions and formulary status at the time the physician chooses an agent.

Computer Technology

Makers of automated physician order-entry products use various technologies to support their functionality. Each manufacturer uses different devices, platforms, computational architecture, and means of connectivity (Table 2). Interestingly, some vendors can tailor their system to provide the prescriber with a choice of devices, platforms, or both. Wireless connectivity is an attractive feature for many physicians because it eliminates the geographical restriction factor. A physician could access a patient's chart on Sunday afternoon from a friend's house or from home at 3 AM after receiving a call from a local emergency room. Client-server computational architecture involves a front end of the application that the user sees and interacts with (ie, a device) and a back end that is responsible for seamlessly carrying out the requested tasks (ie, a server). Most of the software maintenance, data integration, and processing

occurs on a server, which is maintained by the application service provider (the back end). The application service provider connects to the various local devices at client sites. This computational architecture can significantly diminish prescriber anxiety and costs related to software installation, hardware maintenance, system crashes, and updates.

Electronic prescribing product vendors utilize different degrees of implementation of the client-server architecture. At present, software and hardware features vary among many electronic prescribing products; this variability might significantly diminish once prescribers' needs and interests are clearly identified and recognized. For instance, if prescribers favor handheld devices, PC-based products might become obsolete.

Prescription Transmission

What happens when a prescription is ready to leave a physician's office? The answer depends on what kind of electronic prescribing product has been selected.

Table 1. Selected Handheld Electronic Prescribing Products

| Company | Web Site | Product | Electronic Delivery (Fax or EDI) |
|-----------------|---|------------------------|----------------------------------|
| Allscripts | http://www.allscripts.com/ | TouchScript | Yes |
| ePhysician | http://www.ephysician.com/ | ePhysician Practice | Yes |
| Firekey | http://www.firekey.com/ | n-Script | Yes |
| Heleos | http://www.heleos.com/ | MyHippo | Yes |
| iMedica | http://www.imedica.com/ | iMedica PhysicianSuite | Yes |
| iScribe | http://www.iscribe.com/ | iScribe i3000/i5000 | No |
| LogonHealth | http://www.logonhealth.com/ | LH Prescription Center | Yes |
| MDPad | http://www.mdpad.com/ | MDPad | No |
| M2Verticom Corp | http://www.wirelessmd.com/ | WirelessMD | Yes |
| ParkStone | http://www.parkstonemed.com/ | ParkStone System | Yes |
| PocketScript | http://www.pocketscript.com/ | PocketScript | Yes |
| Rx-Pro.com | http://www.rx-pro.com/ | Rx-Pro Palm VII | Yes |

EDI = electronic data interchange.

Some electronic prescribing products only print the prescription in the office. The printed prescription can have 2 parts: the patient information and the actual prescription. Patients educated at the point of prescribing are better prepared for a counseling session with a pharmacist. At the point of dispensing, pharmacists can reiterate and add to the counseling points made by the physician and answer the questions of already knowledgeable consumers.

Other products take the prescription-writing process 1 step further and electronically deliver a prescription directly to a pharmacy (Table 1). Currently, most products offer this option by transmitting prescriptions through a satellite network or over telephone lines to a fax machine in the pharmacy. However, some products (ie, TouchScript and PocketScript) promise to transmit prescriptions to the pharmacy's computer terminals through the process known as electronic data interchange (EDI). Electronic data interchange can occur via private networks (the method used by pharmacy claims processors) or over the Internet. An electronic

prescription format will simplify processing of prescriptions in a pharmacy.

... PROMISES ...

Some critics might claim that electronic physician order entry will mostly benefit MCOs and PBMs by enhancing their degree of control over healthcare providers. However, even in its infancy, electronic prescribing can offer tremendous benefits to healthcare providers and patients, just as it does to MCOs and PBMs (Table 3). Electronic prescribing may greatly decrease the time between point of care and point of service, reduce medication errors, improve quality of care, and increase patient satisfaction.

Unification of Point-of-Care and Point-of-Service Processes

In a recent article, Davis stated that hospital pharmacies receive medication orders up to 8 hours after they were written.¹⁸ It is quite likely that it takes even longer for a prescription to get to a retail or a mail-order pharmacy. By connecting physicians directly to MCOs and PBMs, point of care and point of service will merge into a single process.

Currently, at the time physicians provide care to their patients, their access to critical information is limited by time and resources. However, the physician's ability to review a patient's medical history, lab tests, clinical practice guidelines, and drug formularies—information available at the touch of a button on a handheld device or a PC—could significantly impact his or her decision making. Moreover, electronic prescribing would enable prospective drug utilization review (DUR) to serve its intended purpose in a most efficient manner. Prospective DUR is implemented by pharmacies, PBMs, and MCOs to improve the quality of patient care by assessing prescribed therapy before it is dispensed.¹⁹ The purpose of this process is to advise pharmacists of potential therapeutic conflicts that should be resolved by physicians. If DUR were initiated at the point medications are prescribed, a higher intervention rate could be achieved because drug therapy conflict alerts would be directed at prescribers.

Synchronization of point-of-care and point-of-service processes will enhance the efficiency and productivity of providing patient care. As illustrated by Figure 1A, the present provision of care consists of redundant steps and time-consuming processes. Because patient records are stored mostly in an

Table 2. Electronic Prescribing Technology

| | |
|-----------------------------------|--------------------------------------|
| Devices | |
| ■ | Desktop/laptop personal computer |
| ■ | Handheld personal digital assistants |
| | —Palm |
| | —Handspring Visor |
| | —Casio Cassiopeia |
| | —Compaq iPAQ |
| | —HP Jornada |
| Platforms | |
| ■ | Windows CE |
| ■ | Palm OS |
| ■ | Windows |
| Means of connectivity | |
| ■ | Physical media network |
| | —Internet |
| | —Private network |
| ■ | Wireless network |
| Computational architecture | |
| ■ | Client-server |
| | —Application service provider |

inconsistent paper format, they can not be easily retrieved, shared, or interpreted. Physicians write orders on a prescription blank and then record them in patients' charts. These orders are either transcribed on the phone or brought to the pharmacy, where they are entered in the computer. A small study surveying pharmacists determined that 42% of incoming prescription orders were received by phone. This study determined that pharmacists spent an average of 2.8 and 2.5 minutes on the phone in the process of transcribing new prescriptions and refill authorizations, respectively.²⁰ Through eliminating these redundant, time-consuming steps, electronic prescribing should allow practitioners to focus on providing care rather than on data management. Prior authorization, therapeutic interchange, member eligibility, formulary status, and DUR are conducted in multiple redundant steps and are often directed at the wrong parties (Figure 1A). For instance, although at the point of service a pharmacist is prompted that the prescribed agent is not on the formulary or requires prior authorization, the pharmacist has no authority to directly change the prescription. Instead, he or she contacts the prescriber's office in an effort to relay the DUR message through a number of individuals whose primary responsibility is just to communicate the message back to the physician. More than 50% of the clinical calls to physician offices concern pharmacy issues.²¹ Again, the patient's chart is in the hands of the physician. This loop can continue if the doctor needs to contact an MCO or a PBM to request a prior authorization or to appeal a specific policy. Sometimes, days can be spent before the intended therapeutic intervention reaches the patient, who is caught in the middle of this frustrating cycle.

Computerized physician order entry can most efficiently terminate this runaround practice by addressing quality-of-care issues to the appropriate party—prescribers—at the most appropriate time—the point of prescribing (Figure 1B).

Reduction of Medication Errors

Another advantage of automated physician order entry is its potential to significantly reduce the number of medication errors. Adverse drug effects have been estimated to rank from the fourth to the sixth leading cause of death in the United States.²² The annual cost of preventable drug-related morbidity and mortality is estimated to be between \$17 and \$29 billion.¹⁵ The number of Americans who die every year as a result of medical errors (44,000 to

98,000 people) was estimated to exceed the number who die from vehicular accidents, breast cancer, and acquired immune deficiency syndrome. Finally, the Institute of Medicine reports that medication errors, a subset of medical errors, account for at least 7000 deaths per year in the United States.¹⁵ In addition to miscommunication of verbal orders, illegibility and misinterpretation of poorly handwritten prescriptions are the most frequently identified causes of medication errors.

To prevent most common causes of medication errors, the Institute for Safe Medication Practices, the National Coordinating Council for Medication Error Reporting and Prevention, and the American Society of Health-System Pharmacists actively support the use of computerized order entry by the prescribers.^{11,23,24} Electronic prescribing can minimize medication errors attributed to mistakes regarding agent identity, dosing, and scheduling. Studies show that hospital-based electronic ordering systems reduce medication errors, adverse drug effects, allergic drug reactions, infection rates, and cost of care.^{11,13-15,23} Installation of electronic order entry at the Brigham and Women's Hospital was linked to a decrease in the rate of potentially harmful medication errors by 55%; researchers reported that the use of computerized order entry resulted in approximately \$10 million saved annually.¹³

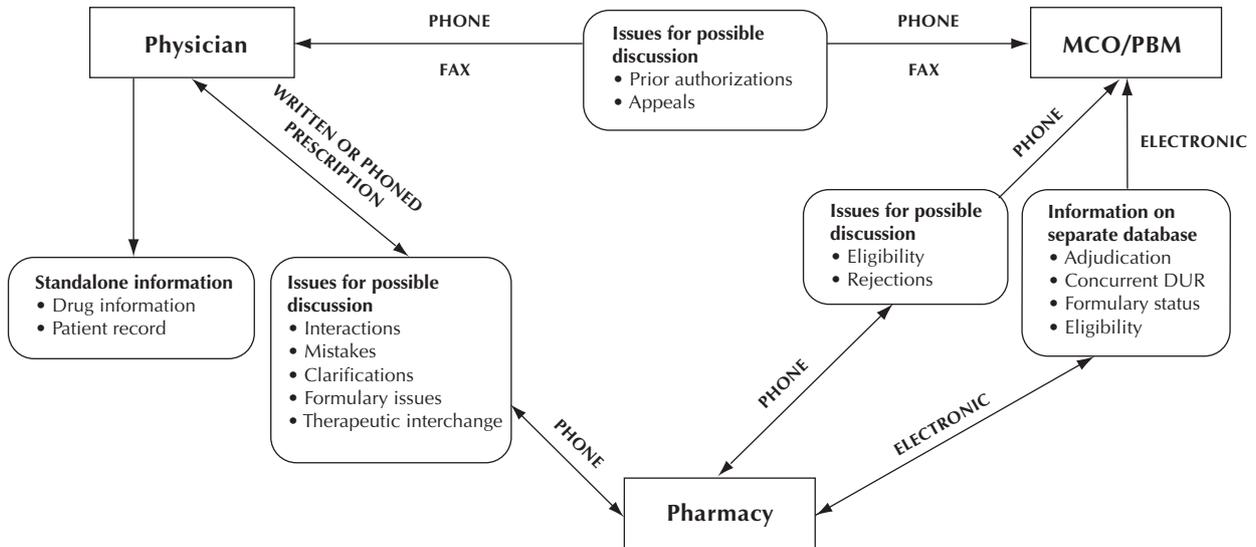
Improvement in Quality of Care

Computerization of physician order entry can equip MCOs with the tools to improve quality of care while containing costs. Data management and

Table 3. Promises and Pitfalls of Electronic Prescribing

| |
|---|
| <p>Promises</p> <ul style="list-style-type: none">■ Elimination of the time gap between point of care and point of service■ Reduction of medication errors■ Improved quality of care■ Increased patient satisfaction <p>Pitfalls</p> <ul style="list-style-type: none">■ Considerable funding requirements■ Fragmentation of the healthcare market■ Product quality■ Lack of technology standardization■ Providers' resistance to change■ Regulatory indecisiveness |
|---|

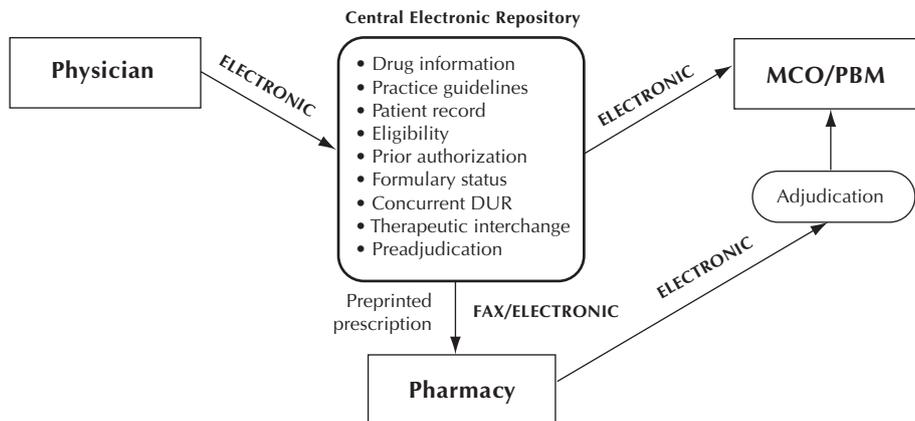
Figure 1A. Current Communication Process Among Physicians, Pharmacies, and Managed Care



This flowchart demonstrates that many steps in the present process are redundant because they are initiated after a prescription leaves the doctor's office.

MCO = managed care organization; PBM = pharmacy benefit management; DUR = drug utilization review.

Figure 1B. Impact of Electronic Prescribing on Communication Process Among Physicians, Pharmacies, and Managed Care



Electronic prescribing will help physicians address quality-of-care issues at the moment orders are initiated. Consequently, this technology can enhance efficiency and productiveness of providing care.

MCO = managed care organization; PBM = pharmacy benefit management; DUR = drug utilization review.

provider compliance monitoring could be more feasible with electronic prescribing. Even partially electronic medical records would significantly enhance data tracking and analysis by providing opportunities for real-time data availability and instantaneous audits. Examples include monitoring patient compliance, identifying drug utilization patterns, and monitoring provider compliance with guidelines. Increased provider compliance was achieved in studies evaluating effects of electronic ordering systems in acute-care and ambulatory settings.^{11,12,25} Studies conducted in hospitals concluded that automated physician order entry improved physician prescribing practices and increased generic substitution and formulary compliance.^{11,12,16} A pilot study that analyzed more than 3200 electronically processed prescriptions from 17 physicians at 5 outpatient practices determined that implementation of computerized order entry resulted in increased formulary compliance (from 83% to 95%) and generic substitution rates (from 85% to 99%).²⁵ Therefore, electronic prescribing systems can improve physician adherence to practice guidelines. Schiff et al stated that electronically delivered recommendations (ie, realistic, evidence-based, and unbiased practice guidelines) can significantly impact physicians' prescribing behavior.²⁶

Increased Patient Satisfaction

For MCOs, the key advantage of electronic prescribing is enhanced member satisfaction, an outcome sought by organizations in the intensely competitive managed care market. The perception that the medical care is of inadequate quality is one of the main reasons consumers change health plans.²⁷ Often, members form their opinions of the entire plan from their experience with the pharmacy service. Consumers' attitudes toward formularies and prior authorizations are more negative than their attitudes toward other drug management strategies.²⁸ Inefficiencies of these processes largely contribute to these misleading perceptions. Computerized physician order entry should increase patient satisfaction by facilitating seamless resolution of formulary and prior authorization issues. Automation of the prior authorization process significantly decreased call volume to a PBM from physicians and pharmacists.²⁹ Consequently, healthcare providers had more time to devote to their patients, while patients were less frustrated in efforts to receive medications prescribed by their physicians.²⁹

... PITFALLS ...

Many issues create barriers to the widespread use of electronic prescribing (Table 3). Considerable funding requirements, healthcare and technology market segmentation, skepticism, indecisiveness, and opposition from healthcare providers and legislators impede the growth of this newly emerging industry. However, the multitude of benefits offered by electronic prescribing warrant resolution of these issues. A full discussion of solutions is beyond the scope of this article, although they will be mentioned briefly. By increasing awareness of the pros and cons of electronic prescribing technology, this article provides the readers with an opportunity to actively participate in such future discussions.

Funding Requirements

Considerable funding resources would have to be invested before paperless prescribing becomes the only method of prescribing. Thus, a legitimate question of financial responsibility might confound many business, technology, and healthcare players. Finding funding for this technology is predicated on determining the key stakeholders who will benefit financially from its implementation.

Manufacturers of electronic prescribing products use several strategies to establish sources of revenue. Using the argument that managed care will benefit the most from this technology, many rely heavily on MCOs and PBMs to pay for the provided services. Meanwhile, some companies invite physician participation and provide free hardware, software, services, and support; others charge physicians a monthly fee. Pharmacies, especially retail chains, are expected to assume financial responsibility when electronic transmission of prescriptions to pharmacies is widely implemented. Retail pharmacies might be charged per transaction, a charge analogous to a switch fee, or a claim-processing fee. Other players profiting from the benefits of electronic prescribing (eg, the pharmaceutical industry, data integration firms) are getting involved as well. Regardless of who takes on this financial burden, it is crucial to invest in a technology that has the greatest potential to survive competition and to stay on top of the rapidly evolving information technology (IT) industry.

Fragmentation of the Healthcare Market

In order to implement electronic prescribing successfully, standardized methods for secure commu-

nication of confidential information must be used. However, the current healthcare market is fragmented, and connectivity is practically nonexistent (Figure 1A). Although electronically connected with MCOs and PBMs, pharmacies are isolated from physician practices. With paper and telephones as the predominant means of communication, physicians are separated from managed care plans. Segmentation of the healthcare market is further reinforced by the fact that automation is utilized for specific isolated tasks, rather than global ones.

Related to the fragmentation issue is the lack of access to or use of available technology in many of these sectors. Although they use EDI to process claims, 60% of retail pharmacy computers do not even have Web browsers or access to the Internet.^{23,30} Most of the physician offices with computers use various hardware and software strictly for administrative purposes.

Product Quality

In contrast to healthcare, the IT market is primarily vendor driven. With a relatively small number of products available today, IT companies are competing for a substantial segment of the e-prescribing business. In pursuit of a fair market share, technology companies might distribute products before they are fully developed and tested. A low-quality product can easily spoil the product's reputation and the potential business for others of its kind. For example, if electronic prescribing products do not provide physicians with customized formularies (many groups within a plan often have their own formularies) and DUR edits at the same level that they are performed by the pharmacy claims processors, physicians will abandon this technology before it is given a fair chance to grow.

Lack of Technology Standardization

Lack of health informatics standardization is frequently mentioned as an argument against electronic prescribing. The American Health Information Management Association defines health informatics standard as a "commonly agreed-upon manner of collecting, maintaining, or transferring data between computer systems."³¹ Uniqueness of hardware and software features promotes a healthy competition among vendors; however, marketed electronic prescribing products must abide by the same set of standards. Otherwise, entangled in the technical and administrative specifics of many products, MCO, PBMs, pharmacies, and especially physicians will quickly lose interest. For instance, a physician

is not going to carry 20 digital devices in his pocket just because each product can reciprocate data with only 1 insurance plan and a few pharmacies. Proprietary vendor standards would not withstand the market pressure.

A national standard should be established for the format, mode, and security measures of electronic prescription transmission. National EDI standards for submitting electronic health transactions will be implemented under the Health Insurance Portability and Accountability Act of 1996 (HIPAA) instituted by the US Department of Health and Human Services. The National Council for Prescription Drug Program (NCPDP) standard, developed by the private sector, was chosen by HIPAA for retail pharmacy third-party claims processing because of its widespread use.³²

No format, however, was formally selected for transmission of electronic prescriptions from physician offices to pharmacies. Two messaging formats, both of which comply with the EDIFACT standard for electronic prescriptions, are competing for that status: SCRIPT by NCPDP and MEDPRE by the American Society for Automation in Pharmacy.^{11,33} Neither has been widely embraced by retail pharmacies.¹ However, many vendors purport that their systems are compliant with the SCRIPT standard.⁴ If EDI between physicians and pharmacies occurs via either the Internet or private networks, standards must be applied to both modes of transmission.

Privacy and security standards also are targeted by HIPAA. Digital signatures, encrypted key-based authentication (ie, public key infrastructure), 128k encryption, firewalls, secure sockets layers, and intrusion detection software are among the plethora of incipient solutions for securing medical information access, provider authentication, and patient confidentiality.³⁴ However, there needs to be an open security protocol that can be utilized by the different computer systems and software platforms. Unlike other aspects of standardization, the absence of privacy and security standards directly affects not only provider acceptance but also consumer approval. The IT industry must assure providers and consumers that it can guarantee both security and confidentiality of patient information.

Provider Resistance to Change

Human factors play a significant role in acceptance of electronic prescribing. Regardless of technology advances and breakthroughs, human interest determines product viability and success. If the concept of electronic prescribing does not appeal to

physicians and pharmacists, this state-of-the-art technology will be largely ignored by the healthcare industry. Workflow interference, familiarization with the technology, and time commitment might overshadow the potential advantages of computerized order entry from the prescribers' standpoint. Having perceived electronic prescribing solely as the means for monitoring and restricting physicians' prescriptive authority, certain critics relate it to the Trojan horse or the Big Brother effect. Without even considering the benefits of automated order entry, physicians who already have negative feelings about managed care can be easily persuaded by this argument.

If prescribers accept computerized order entry, ambulatory physician practice would have to rely heavily on the technology. System glitches and crashes could significantly impact or even jeopardize their whole practice. Prescribers must weigh the promises and pitfalls of electronic prescribing against the already existing flaws of the pen and paper system. These benefits may include a reduction in phone calls regarding prescription drug benefit coverage; minimization of medication errors and related questions on dosing, drug interactions, and patients; and even a potential reduction in missing or forged prescriptions. It is evident that the concept of electronic prescribing will force physicians to change their workflow. If they resist the change and entrust the technology to the office staff, potential advantages of electronic prescribing will be moot.

Pharmacists can have the same reservations. A considerable portion of retail pharmacists' daily activities involves transcribing prescriptions and facilitating therapeutic interchange, prior authorization, and other point-of-service-related processes. Because electronic prescribing will resolve these issues before prescriptions even enter a pharmacy, a pharmacist's role could change dramatically. Many pharmacists might welcome the change in job function. The potential for improved communication with the patient rather than the insurance company is a clear benefit for most pharmacists, allowing patients to take advantage of the opportunity to discuss the effects of the medication rather than its cost. However, a typical retail pharmacist might not be ready to step away from computers and phones to get closer to patients on the dispensing side. In the pharmacy community, there is concern about prescription integrity and third-party impact on patients' pharmacy choice. In a small, geographically restricted survey conducted in 1999, 97% (36 of 37) of com-

munity pharmacists agreed that a prescription's integrity might be compromised if third-party interception is allowed.²⁰ Finally, if electronic prescribing decreases patients' waiting time for prescriptions, retail profits from over-the-counter and nonmedication sales might be unfavorably impacted, a potential deterrent for large chain pharmacies to adopt this technology.

Regulatory Indecisiveness

Legislative opposition or regulatory indisposition can easily prevent paperless technology from becoming part of the healthcare system. While HIPAA attempts to regulate electronic vendors, providers, and payers to protect patient confidentiality and to ensure data security, state boards of pharmacy are still scrambling to understand the implications of electronic prescriptions. Currently, in the states of South Dakota and Vermont and in the District of Columbia, pharmacies are not even permitted to accept faxed prescriptions.⁴ There is a discrepancy among state paper prescription requirements in reference to font size, color, blank format, and so forth. More than 30 state boards have approved electronic transmission of prescriptions for noncontrolled substances; however, none of the boards has addressed transmission of electronic prescriptions for scheduled medications.^{4,35} Regulatory decisions on transmission security, provider identification, and patient confidentiality will play the biggest role in determining the future of electronic prescribing technology.

... SOLUTIONS ...

Several potential solutions may aid in overcoming the pitfalls noted earlier. There is no single best solution; rather, a combination of solutions most likely will be necessary to overcome the barriers to implementing ambulatory electronic prescribing.

Centralized Warehouse/Router

Combining information from insurance companies, pharmacies, and physician offices in 1 central location is the most promising solution to overcoming the major pitfalls in electronic prescribing. A central source where information can be gathered from, or routed to, other sources would aid in minimizing the issues of lack of technology standardization and fragmentation of the healthcare environment with respect to prescriptions; such centralization might even improve product quality.

In February 2001, AdvancePCS, Express Scripts, and Merck-Medco joined forces to form RxHub (www.RxHub.net). This new entity is being developed to link all participating parties in the prescription-delivery process. The company announced that the system should be operational by late 2001 or early 2002.

As an electronic exchange link, this organization intends to standardize communications through electronic prescribing software, both PC based and handheld. RxHub plans to use the existing NCPDP standards as a platform for accelerating the adoption of electronic prescribing and prescription processing. The company does not intend to supplant claims processors or PBMs; rather, it intends to be the "telephone" company, the switch, between the physician's office and the pharmacy.

Stakeholder Buy-in

Another key element in resolving the pitfalls of electronic prescribing is to demonstrate the financial and clinical benefits of the process to key stakeholders. These stakeholders include MCOs, legislators, providers, and patients.

At the financial level, demonstrating the cost effectiveness of the process to MCOs would involve demonstrating a reduction in the cost of processing prescription claims. This reduction may include, but not be limited to, fewer resources required to process prior authorizations through existing practices, compliance with formulary restrictions, and improved marketability to employer and purchasers. For example, marketability may be improved if an MCO can demonstrate to purchasers a consistent ability to maintain drug costs at a predetermined level through electronic prescribing. More studies are needed in this area.

The benefits of reduced medication errors, shorter prescription-processing time, and improved monitoring of patient care should be emphasized to providers and legislators. In this era of high-profile medication errors and the bad press surrounding MCOs, these improvements should be welcomed. However, the industry leaders, including MCOs, PBMs, and e-prescribing companies, need to improve the "sale" of the process to these key individuals. Additional research and demonstration projects are likely to be required before providers and legislators are convinced of the benefits. The formation of RxHub.net should aid in allowing for more demonstration projects without as much research investment because 1 of the major barriers to imple-

mentation, technology standardization, may be overcome.

Finally, patients need to be sold on the product to provide a grassroots driving force behind implementation. The benefits of decreased waiting time at the pharmacy, minimal hassle due to questions about benefit coverage, and potentially improved communication from healthcare providers should be emphasized. Physicians may be able to tell the patient, at the point of prescribing, what his or her copayment will be for a certain drug. If the patient informs the physician that he or she can't pay that amount, the physician can either reinforce to the patient the need for that particular drug or seek a less expensive alternative agent. Similarly, at the pharmacy, the patient and the pharmacist can have better communication on how to take the medication and what to watch out for, rather than an argument about the cost of the prescription.

... BEYOND ELECTRONIC PRESCRIBING ...

Many products offer prescription order entry as one of the features, or modules. An entire set can consist of prescription, practice management, referral, laboratory test, and radiology modules. Like their PC-based counterparts, some handheld systems such as Firekey, ePhysician, and InfoScribeRx offer other modules in addition to the electronic prescribing module. Some systems (eg, Firekey's n-Script or Allscripts' TouchScript) provide periodic reports on prescribing preferences, daily scheduling, and office applications management. However, this is just a beginning. In the future, systems of this prototype will be able to communicate, integrate, and analyze data globally and in great detail. The technology can optimize patient care by enabling primary care physicians, specialists, and pharmacists to share medical information and communicate among one another. At a touch of a button, cardiologists, neurologists, and gastroenterologists could review their patients' primary care or pharmacy medical records and provide their input to the other team players. The decision-making process would be fully shared by all the involved parties: providers, consumers, and payers. An established line of communication among physicians and the other team players would facilitate utilization of everyone's expertise to optimize patient care. For instance, pharmacists would be able to voice their opinions in real time while physicians prescribe, not hours or

days afterwards. In addition, patients would have more opportunities to participate in their own care. Moreover, assuming that confidentiality and data ownership issues are resolved, the managed care and pharmaceutical industries would be able to access and exchange vital information on disease treatment trends.

... SUMMARY ...

Electronic prescribing technology can decrease a gap between healthcare and other record-dependent industries, which are highly automated. Implementation of electronic prescribing in outpatient practice is more practical today than it was a decade ago. The concept of computerized order entry offers to trade patient charts, prescription pads, drug information references, and other office resources for a single device that usually fits in a pocket. Computerized prescribing can provide immense benefits to healthcare providers, patients, and managed care. The list of its promises includes elimination of the time gap between point of care and point of service, reduction of medication errors, improved quality of care, and increased patient satisfaction. Several obstacles limit feasibility of electronic prescribing: considerable investment capital, segmentation of the healthcare market, lack of technology standardization, providers' resistance to change, and regulatory indecisiveness. Resolution of these issues will determine the future of this intriguing concept.

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