

Physicians' Experiences Using Commercial E-Prescribing Systems

Physicians are optimistic about e-prescribing systems but face barriers to their adoption.

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ABSTRACT: Public and private efforts are under way to promote electronic prescribing to improve health care safety, quality, and efficiency. Findings from this qualitative study of physician practices suggest that substantial gaps may exist between advocates' vision of e-prescribing and how physicians use commercial e-prescribing systems today. While physicians were positive about the most basic e-prescribing features, they reported major barriers to maintaining complete patient medication lists, using clinical decision support, obtaining formulary data, and electronically transmitting prescriptions to pharmacies. Three factors help explain the gaps: product limitations, external implementation challenges, and physicians' preferences about using specific product features. [*Health Affairs* 26, no. 3 (2007): w393–w404 (published online 3 April 2007; 10.1377/hlthaff.26.3.w393)]

ELECTRONIC PRESCRIBING HAS BEEN IDENTIFIED as an important technology for improving the safety, quality, and efficiency of health care.¹ Many also believe that e-prescribing is potentially the “killer app” that will drive broader adoption of information technology (IT) by physicians, particularly those in smaller practices. Its adoption by physicians has been slow, however. In 2004–05, only 21.9 percent of physicians reported that IT was available in their practices to write prescriptions electronically.² Many public- and private-sector efforts are under way to promote adoption, including initiatives by the U.S. Department of Health and Human Services (HHS).³

Research suggests that the basic documentation functions of e-prescribing systems that allow physicians to enter and store patient prescriptions have the potential to increase patient safety and reduce costs through improved legibility and practice efficiency.⁴ Many e-prescribing advocates, however, see “true” e-prescrib-

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ing as going beyond simply using computers to write and store prescriptions, to include more advanced features. One study estimated that physicians' use of these more advanced features could greatly expand the benefits of e-prescribing.⁵ Such features include the ability to maintain a complete medication list and a recent medication history for each patient; clinical decision-support tools, including alerts and reminders, which, in their more sophisticated form, incorporate patient-specific medical information such as patients' chronic conditions or medication allergies; access to patient-specific formulary data; and capacity for two-way electronic communication between the computer systems of the medical practice and the pharmacy, as well as the mail-order pharmacy benefit manager (PBM), for sending prescriptions, clarifications, and renewal requests. Together, these advanced features have the potential to further improve patient safety and reduce costs by providing more-complete patient information and clinical advice at the point of care; removing additional sources of human error in communication between practices and pharmacies and PBMs; increasing formulary compliance; and automating the prescribing process more completely.

Despite the intense interest in e-prescribing, much of the research on it focuses on the inpatient, rather than ambulatory, setting.⁶ Studies typically examine a single institution, often with a home-grown computer system. To better understand how e-prescribing is being implemented today, this study reports on the experiences of physician practices—varying by size, ownership, specialty, and location—in using a wide range of commercial e-prescribing products. The paper highlights important ways in which reported use of e-prescribing lags behind policy goals; explores the reasons for these gaps as well as physicians' perceptions of the benefits of e-prescribing as currently implemented; and discusses implications for evolving public- and private-sector efforts to promote e-prescribing.

Study Design And Methods

This paper draws on forty-four discussions with respondents in twenty-six participating organizations, conducted by telephone between November 2005 and March 2006 by two-person teams. The majority of respondents were at fifteen practices with e-prescribing and included IT or practice administrators, medical directors, physician-users, and other users. Discussions also were held with administrators or physicians at six practices without e-prescribing. Five other respondents included health plan, vendor, and pharmacy representatives.

Because few sampling frames identify providers with IT systems, studies on IT use often focus on a single organization or IT vendor. We used data from the Community Tracking Study (CTS) site visits and physician survey to identify practices with and without e-prescribing.⁷ Physician practices were then selected purposively to capture variation in size, ownership, specialty, and geographic location (Exhibit 1).

Semistructured discussions were conducted using guides with topics tailored

EXHIBIT 1 Characteristics Of Study Sample Physician Practices, 2005–06

Practice characteristic	Number of practices (N = 21)	Practice characteristic	Number of practices (N = 21)
Size (number of physicians)		Number of locations	
5–10	4	1	4
11–20	5	2–9	7
21–50	0	10–25	6
51–100	6	26–50	2
101+	6	51+	2
Ownership		Specialties	
Physicians	12	Multispecialty	13
Hospital	5	Single specialty	
Medical school	2	Primary care	3
Community health center	2	Medical or surgical specialty	5

SOURCE: Authors' analysis of study data.

NOTES: Exhibit shows practices both with and without e-prescribing. Practices were located in the following Community Tracking Study (CTS) sites (number of practices in parentheses): Boston (3); Cleveland (1); Indianapolis (1); Lansing (3); Little Rock (4); northern New Jersey (1); Orange County (CA) (2); Seattle (3); and Syracuse (3). E-prescribing vendors used by practices include the following (number of practices in parentheses): A4 Health Systems (1); Allscripts (2); Alteer (1); Amicore (1); DrFirst (1); GE Centricity (2); InstantDx (1); Medent (1); MISYS (1); NexGen (1); RelayHealth (1); RxNT (1); and ZixCorp (1).

to the type of organization. For example, for practices with e-prescribing, guides were specified for the four respondent types listed above and were further customized to practices with stand-alone versus electronic medical record (EMR)-based e-prescribing systems and to reflect local-market differences. Each discussion guide was used for one to eight respondents.

We asked broad, open-ended questions to explore how practices used e-prescribing systems; facilitators and barriers to e-prescribing adoption and use; and respondents' perceptions of the effects of e-prescribing on practice operations, prescribing patterns, and patient satisfaction. For example, physician discussions centered on two key questions: (1) How do you use the e-prescribing system for prescribing and managing patient medications, and (2) which capabilities of the e-prescribing system are most/least important to you? The five industry experts provided background information on e-prescribing initiatives, formulary data, pharmacy connectivity, and state pharmacy regulation. Discussion notes were coded and analyzed using Atlas.ti qualitative software. The coding allowed weighting of the evidence supporting each finding and identification of respondent disagreements and disconfirming evidence.

Study Findings

■ **Variation in e-prescribing systems.** Two-thirds of the practices in the study used the e-prescribing module of an electronic medical record (EMR), while the remainder used stand-alone e-prescribing systems. Most practices had different technology vendors (Exhibit 1). The majority of practices had fully implemented e-pre-

scribing, with about half of the practices' systems in place for more than two years.

■ **Challenges to maintaining complete patient medication lists.** Practices encountered obstacles to maintaining complete medication lists during the rolling out of their e-prescribing systems. Loading patient medication lists into the system was a major undertaking. Not only did practices have to enter the data manually, but because many physicians did not maintain up-to-date, complete medication lists in their paper charts, they had to review the lists and consult with patients to fill in missing information.

None of the respondents reported being able to access a comprehensive list of their patients' medications prescribed outside of their practices. In fact, in three of the practices with stand-alone e-prescribing, individual physicians' systems were networked only with other physicians in their particular office location or were not networked at all, resulting in limited or no access even to prescriptions written by colleagues.

Physicians continued to rely on patients as the main source of information to complete medication lists. Many practices built strategies into their workflow to collect this information—for example, by developing office policies to systematically review a patient's current medications at the beginning of each visit. Such policies, however, were not always enforced. Ultimately, getting complete data was dependent upon what the patient was able or willing to communicate.

The practices with stand-alone e-prescribing systems were able to access medication histories for some insured patients via the vendor, RxHub. RxHub checks for eligibility among patients getting medications via the “big three” PBMs—Caremark, Medco, and Express Scripts—or other payers that are connected to RxHub's network. RxHub uses a matching algorithm based on five identifiers including patient name and date of birth. Thresholds for matching are conservatively set to avoid misidentification. As a result, respondents noted that if names and other information were not identical in the two systems, as was often the case, matches failed. If RxHub makes a match on the patient, the physician is shown the patient's adjudicated prescription drug claims in a separate screen, providing information on at least some prescriptions written by other physicians.

Some respondents reported that they found the service to be of limited value, for two reasons. First, it generated information on only a subset of insured patients, and, second, even for patients who were matched, adjudicated claims data did not directly translate into an active medication list. For example, physicians could not tell if any medications had been discontinued. Regardless, neither stand-alone nor EMR-based e-prescribing provided a single, complete patient medication list.

■ **Limited use of clinical decision support.** All but one of the practices' e-prescribing systems offered some clinical decision support in the form of drug-drug interaction alerts. However, access to more advanced decision support was limited; about half of practices reported being able to check for drug-allergy interactions,

and only 20 percent, for drug-condition contraindications. Even the more IT-savvy physicians with EMRs were not aware of whether or not their system had other advanced clinical decision support such as drug-lab interactions. Respondents pointed out that alerts only work if patient-specific information such as allergies and conditions are entered into the system and maintained, which they reported was often not the case. The lack of complete and accurate medication lists also limited the capability of the more basic drug-drug interaction alerts.

Although a few physicians considered the available drug interaction alerts to be very important, most others believed that they were only occasionally useful—for example, when prescribing an unfamiliar medication. There was general agreement that the pop-up alerts were triggered too easily, even when set to the most severe threshold. As a result, physicians typically overrode them.⁸ One practice even disabled the pop-up alert function altogether. In another, the physicians had considered the pop-up alerts in their first EMR system a “big joke” and thus selected a replacement EMR without that feature. In contrast, three other practices reported increasing their use of alerts, building customizations such as specialty-specific drug-disease alerts, and methodically entering allergy information.

■ **Difficulty obtaining accurate patient-specific formulary information.** Physicians in slightly more than half of practices did not have access to formulary data electronically when they wrote prescriptions, because either the systems did not have the feature or the practice had chosen not to enable it. In two of these practices, physicians did not view the available data because they continued to hand-write prescriptions, which nurses then entered into the system.

In the practices where physicians had access to formulary information, respondents pointed out that information was available for only a subset of patients, with estimates ranging from 25 percent to 90 percent. They identified a number of reasons for the difficulties in accessing patient-specific data. For example, for patients who have drug coverage separate from their medical coverage, practices must input additional insurance information that they do not routinely collect. Also, the practice management systems must be able to transmit these data to e-prescribing systems, a feature not routinely available. Only one IT-savvy practice mentioned trying to tackle these problems. The stand-alone systems in the study provided access to formulary information via RxHub. But, as noted above, there were limitations to the number of insured patients RxHub typically matched.

Moreover, e-prescribing systems, regardless of the formulary data vendor used, sometimes omitted the formularies of major health insurers, including Medicaid. One respondent disclosed that even the health plan that financed the practice's system had not provided its formulary information to the e-prescribing vendor.

Even when a plan's formulary information was available, practices often questioned the data's reliability for a variety of reasons. Concerns included routinely out-of-date data, even from national health plans, and the formulary information's being provided for some but not all of a health insurer's products. As one respon-

dent noted, “The formulary data are disillusioning. The system may look like it is prompting the doctor with correct formulary information, but it is not.”

Practice administrators took different approaches to addressing these problems, including disabling the formulary feature; working with the e-prescribing or formulary vendors, or both, to add specific health plans, sometimes for a fee; contacting the health plans directly to attempt to obtain the data; replacing the formulary data vendor; and deleting certain plans with unreliable data.

Physicians held varied views on the value of formulary information in selecting medications. In some practices, physicians believed that formulary data were reliable and reduced pharmacy callbacks. They saw value in lowering patients’ out-of-pocket costs and wanted data for more of their patients. However, in many practices, physicians routinely ignored the formulary information, for a variety of reasons. Some physicians thought that it covered too few patients to be worthwhile or that the data were unreliable. Others found little value in the automated suggestions for alternative medications or felt strongly that they should select the most medically appropriate drugs for patients without regard to the formulary. Still others believed that responsibility for keeping up with formulary details should remain with pharmacists, given physicians’ already limited time with patients and their lack of financial incentives to improve formulary compliance.

■ **Limited connectivity with pharmacies and mail-order PBMs.** Only the practices with stand-alone e-prescribing systems were using electronic data interchange (EDI), which allows electronic transmission between physician practice computers and pharmacy or PBM computers. Even where used, EDI was generally a one-way means of communication from the practice to the pharmacy; pharmacies still called or faxed physician practices for clarifications and renewals. None of the practices with EMRs were using EDI; prescriptions either were electronically faxed directly from the practices’ computers to pharmacies’ printers or were printed out in the office and handed to the patient. Practice estimates of the percentage of prescriptions printed ranged from only 10 percent to close to 100 percent.

Practices in some markets cited uncertainty about state regulations as a major impediment to electronic transmission via electronic fax or EDI. In particular, multiple practices in Arkansas, New York, and Michigan perceived confusion among stakeholders over what types of electronic transmissions were allowed under state regulations, with practices in the same state having conflicting perceptions of the law. Most respondents in these states were holding off on EDI transmissions, or even electronic faxes, until they received adequate guidance from regulators. Similarly, in one New Jersey practice, physicians were concerned about whether electronic signatures were legal on printed prescriptions in the state. To avoid having pharmacies reject them, these physicians hand-signed all printed prescriptions, not just prescriptions for controlled substances that require handwritten signatures under federal law.

Local pharmacies’ lack of readiness was cited in most markets as a barrier to full

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electronic transmission. For example, a physician in Syracuse reported that despite the presence of national chains reportedly capable of electronic transmissions, pharmacies in the area were not yet even “fax-friendly.” Most practices using electronic fax or EDI reported spending substantial time educating local pharmacies about e-prescribing. This included both informing pharmacies that electronic transmissions were legal and making sure that pharmacies routinely checked their fax machine or computer system for the transmissions. Respondents reported that it took a couple of months of daily communication about individual patients for pharmacies to begin to treat electronic transmissions as routine. Until that point, practices reported that pharmacies regularly called when patients arrived to pick up medications because they could not find the prescriptions.

Two industry experts explained that most local franchises of national pharmacy chains had systems that could receive prescriptions via electronic fax and EDI (in all states where it was legal) and that all pharmacists were trained to use them. They believed, however, that pharmacies typically must reach a critical mass of electronic prescriptions to successfully incorporate checking these new sources into their workflow.

In addition to problems with local pharmacies, many practices noted that at least some of the mail-order PBMs routinely rejected prescriptions sent via electronic fax or EDI, even though they believed that the PBMs should be able to accept them. Some practices tried to work directly with PBMs to get them to accept electronic transmissions, while others worked through the e-prescribing vendor. A fair number chose to avoid the issue altogether. As one practice noted, “It’s easier to just print the prescription out and sign it and give it to the patient to mail.”

■ **Challenges continue after initial implementation.** Practice administrators anticipated the organizational challenges to implementation, including overcoming physician resistance and changing practice workflow. They also were not surprised that implementing e-prescribing required substantial staff resources. Practices were less prepared, however, for the amount of interaction needed with outside parties, such as vendors, state regulators, and local pharmacies, to implement and maintain the system.

Rolling out a system was reported to be very complicated. For example, in a practice that was implementing an EMR, a physician worked with the practice’s IT department for four hours a week for six months to iron out the “kinks” in just the e-prescribing module. The physician then tested the system live with his patients before it was rolled out first to the other physicians in his office and then to other practice locations.

Practices continued to devote staff resources for maintenance after implementation, as one respondent said, “to deal with the daily problems that come up with the technology...even two years into it.” Most respondents reported maintaining regular contact with IT vendors about system issues well beyond the initial implementation phase. As one physician stated, “The [EMR] product doesn’t really work the way we thought it would. We have worked with the vendor to create a lot of ‘work-arounds’ to get the system to do what we want.” While some practices relied on vendors to resolve issues with other outside parties, others invested considerable time in dealing directly with the appropriate parties.

■ **Perceived benefits of e-prescribing.** Despite all of these challenges, respondents uniformly believed that e-prescribing improves prescribing safety and quality while increasing practice efficiency, and they did not want to go back to paper. Most of the benefits they identified are derived from the basic documentation features of the system. Respondents’ perceptions varied more widely about the value of more advanced features as implemented.

Prescribing safety and quality. Most physicians rated improved legibility as the greatest benefit of e-prescribing because they believed that it reduced pharmacy errors in filling prescriptions resulting from poor handwriting or incomplete information, or both. Physicians also valued having clearly documented medication lists that were more comprehensive than what was typically in paper charts, despite the continuing challenge of capturing outside prescriptions. They thought that patients valued having access to printed medication lists as well.

Physicians using EMRs noted additional clinical benefit (as well as greater efficiency) from having the medication list embedded in the patient’s electronic record. For example, they felt that they were less likely to authorize a renewal without the appropriate documentation because they could easily check lab results, when a patient was last in for a visit, and so on. In contrast, practices with stand-alone e-prescribing systems continued to pull charts to access needed clinical data and to file updated printouts of medication lists.

Physicians were less enthusiastic about the benefits of features intended to modify prescribing choices. Most of them believed that drug-drug safety alerts only intermittently helped them identify an interaction that they might otherwise have missed. Similarly, access to complete information on medications and dosages in the e-prescribing systems’ medical dictionaries helped physicians periodically—for example, when prescribing a new drug or a drug they did not prescribe often. While most physicians claimed that they had been active generic prescribers even before they began e-prescribing, they generally believed that e-prescribing tools (for example, formulary information or medication dictionary) made these efforts somewhat easier. Physicians who regularly used formulary data did report some marginal change in prescribing practices.

Practice efficiency. Most physicians agreed that writing new prescriptions electronically took about the same amount of time as writing them on paper once they

became familiar with the system and had created a “favorites” list. For those practices that sent new prescriptions electronically, e-prescribing systems eliminated much of the staff time spent printing, faxing, and calling in prescriptions.

Legible prescriptions also meant many fewer callbacks for clarification. But respondents believed that the greatest time savings came from streamlining management of renewals, particularly for patients with multiple medications.

Only one practice could quantify savings from e-prescribing. Most of the others provided examples of how it had freed up support staff to do other tasks, although they could not point to staff cuts exclusively from e-prescribing. Several respondents felt that there were no substantial savings because any efficiency gains needed to be balanced against the up-front and ongoing costs of implementing the system and the additional effort invested in tasks that had not been done routinely—for example, collecting information on outside prescriptions. Their perspective was that e-prescribing produces better outcomes for a comparable effort.

Discussion

The results of this study suggest that sizable gaps may exist between policymakers’ vision of e-prescribing and physicians’ actual use of commercial e-prescribing products. Physicians were generally very positive about the impact of their systems’ most basic features on prescribing safety, quality, and practice efficiency through improved legibility, better documentation, reduced pharmacy callbacks, and improved management of renewals.

The findings suggest, however, that e-prescribing today might be more limited than what many policymakers envision, for several reasons. The products used by the practices in this study often lacked advanced features. In practices that did have these features, physicians often did not use them because of implementation hurdles or their perceptions that the features did not add value. These findings are generally consistent across respondents and respondent organizations, even though the types of physician practices that participated in the study, the e-prescribing systems they had in place, and the length of time those systems had been in use varied greatly.

Much of the literature assessing barriers to e-prescribing adoption and use has focused on cost, physician resistance, and changing practice workflow.⁹ Our findings highlight the role of product limitations, external implementation challenges, and physicians’ preferences for how to use system features and are consistent with several other assessments of e-prescribing system functionality and provider-pharmacy connectivity.¹⁰

Respondents’ implementation hurdles belie the view that e-prescribing products are relatively simple “plug-and-play” applications. It is hard to imagine that e-prescribing as it exists today can be the “killer app” that will drive further IT adoption. All of the practices we examined, regardless of size, IT expertise, geographic location, or vendor, had invested many financial and human resources in

implementing and maintaining e-prescribing.

■ **Study limitations.** Our study has several limitations. We did not examine the experiences of small practices with fewer than five physicians. Because our sample size of practices was small and selected purposively, study results might not be generalizable to all physician practices. Conversely, practices in the study were likely among the earliest adopters of e-prescribing in their local markets, and they did not abandon e-prescribing as other practices might have done. Moreover, IT champions might have been more willing to participate in the study. This bias toward successful practices suggests that our results might underestimate the challenges of implementing e-prescribing for the average practice.

■ **Implications for efforts to promote e-prescribing.** Many public- and private-sector efforts are under way to help support more widespread e-prescribing.

Communitywide initiatives. Communitywide (state or local) e-prescribing initiatives are being rolled out across the country, sponsored by private health plans, state and local governments, and public-private partnerships. Beyond the financial support many of these efforts provide, communitywide initiatives could bring all parties to the table, including e-prescribing and other technology vendors, physician practices, local pharmacies, and state regulators, to support a timely and smooth transition to EDI transmissions. Similarly, these initiatives could work with health plans and the other necessary parties within the area to promote the availability of formulary data. The Centers for Medicare and Medicaid Services (CMS) could serve as a model for formulary aggregation. The CMS is playing this new role in providing uniform data on Medicare Part D drug plans to third parties. E-prescribing initiatives also might provide physicians with access to more complete patient medication lists by providing the infrastructure for communitywide exchange of prescribing data among providers or, at a minimum, comprehensive claims data.

Technical standards. HHS has undertaken a multiprong approach to supporting increased adoption and use of more-advanced e-prescribing, which includes implementing provisions of the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003. One of HHS's levers for addressing the obstacles identified in this study is the adoption of technical standards, which must be used for Medicare-related e-prescribing transmissions. By mandating a common format for encoding data, the goal is to promote interoperability—the seamless exchange of data—among the information systems of prescribers, pharmacies, health plans, PBMs, and other entities. HHS has been working with private-sector grantees to pilot-test MMA-mandated technical standards for (1) core data necessary to transmit prescriptions, (2) patient eligibility and benefits, and (3) formularies. The pilots are being jointly administered by the CMS and the Agency for Healthcare Research and Quality (AHRQ).¹¹ These technical standards may address some of the functional and implementation barriers identified in this study. For example, by improving interoperability, standards are intended to reduce bar-

riers to electronic connectivity between physician practices and pharmacies and PBMs and improve the ability to share medication histories and formulary data.

Many policymakers and IT experts believe that adopting standards will help drive vendors to provide more-robust features in their products. However, while any systems used to write e-prescriptions for Medicare beneficiaries will need to comply with the technical standards, MMA does not require vendors to include the functions. So, for example, when formulary data are provided, they must be in the required format, but there is no mandate for health plans or vendors to begin routinely providing comprehensive formulary data.

Certification. HHS also has contracted with the private-sector Certification Commission for Healthcare Information Technology (CCHIT) to certify that health IT systems meet minimum requirements for functionality, security and reliability, and interoperability.¹² The CCHIT is certifying ambulatory EMRs but has no plans for stand-alone e-prescribing systems. By moving beyond standards to also identify product functions, certification may drive EMR vendors to routinely offer the minimal requirements. As noted in this study, some products do not offer basic clinical decision support, formulary data, or EDI, which are all functions included or planned for CCHIT certification. However, the process neither specifies how these functions should be designed nor evaluates “usability,” comparing how well different products work in clinical practice. As a result, certification is unlikely to directly address many of the design and implementation barriers noted in this study.

Medicare Part D. Some of our findings are particularly pertinent to the CMS’s implementation of e-prescribing for Medicare. Many beneficiaries are in stand-alone Medicare prescription drug plans. To support formulary use, e-prescribing systems that use patient health plan identifiers to match patients to formulary information will need to be designed to download the data from the practice management system, as discussed above. Physician practices with these systems will have to be educated about the need to collect Part D information from patients as well. Resolving the barriers to electronic transmissions with mail-order PBMs has become even more important, since many Part D plans give beneficiaries the same financial incentives to use mail order that most privately insured people face.

TO MORE RADICALLY TRANSFORM MEDICATION MANAGEMENT in the way envisioned by policymakers—using IT tools to select appropriate and cost-effective medications based on complete patient medication and medical history—might require more than improving basic product functionality and allowing for more complete and efficient exchange of data. E-prescribing advocates suggest that additional efforts are needed to strengthen clinical decision-support tools.¹³ Also, they suggest that payment incentives or other financial support may be required to not only lower the costs of adoption but also drive routine use of IT features with the potential to fundamentally influence how physicians

prescribe medications.

We speculate that the findings in this study are applicable to EMR and health IT adoption more generally. As with medication management, effective use of health IT to broadly transform care will require continued efforts on many fronts.

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NOTES

1. eHealth Initiative, *Electronic Prescribing: Toward Maximum Value and Rapid Adoption*, 14 April 2004, <http://www.ehealthinitiative.org/initiatives/erx/document.aspx?Category=249&Document=269> (accessed 26 February 2007).
2. J.M. Grossman and M.C. Reed, "Clinical Information Technology Gaps Persist among Physicians," Issue Brief no. 106 (Washington: Center for Studying Health System Change, November 2006).
3. D.S. Bell and M.A. Friedman, "E-Prescribing and the Medicare Modernization Act of 2003," *Health Affairs* 24, no. 5 (2005): 1159–1169.
4. For literature reviews and descriptions of e-prescribing system features, see eHealth Initiative, *Electronic Prescribing*; and J.M. Teich et al., "Clinical Decision Support in Electronic Prescribing: Recommendations and an Action Plan: Report of the Joint Clinical Decision Support Workgroup," *Journal of the American Medical Informatics Association* 12, no. 4 (2005): 365–376.
5. D. Johnston et al., *The Value of Computerized Provider Order Entry in the Ambulatory Settings* (Boston: Center for Information Technology Leadership, 2003).
6. See Bell and Friedman, "E-Prescribing and the Medicare Modernization Act of 2003."
7. For a description of the Community Tracking Study, see HSC, "Design and Methods for the Community Tracking Study," 2 March 2007, <http://www.hschange.org/index.cgi?data=01> (accessed 9 March 2007).
8. This finding is consistent with the literature. See, for example, H. Van der Sijs et al., "Overriding of Drug Safety Alerts in Computerized Physician Order Entry," *Journal of the American Medical Informatics Association* 13, no. 2 (2006): 138–147.
9. See J. Halamka et al., "E-Prescribing Collaboration in Massachusetts: Early Experiences from Regional Prescribing Projects," *Journal of the American Medical Informatics Association* 13, no. 3 (2006): 239–244.
10. See testimony presented to the National Committee on Vital and Health Statistics, Subcommittee on Standards and Security, 25–27 May 2004, <http://www.ncvhs.hhs.gov/040525mn.htm> (accessed 28 March 2007); and C.J. Wang et al., "Functional Characteristics of Commercial Ambulatory Electronic Prescribing Systems: A Field Study," *Journal of the American Medical Informatics Association* 12, no. 3 (2005): 346–356.
11. For more information on the pilots, see the AHRQ National Resource Center for Health Information Technology home page, <http://www.healthit.ahrq.gov>.
12. See Certification Commission for Health Information Technology, "CCHIT's Development Products," 2007, <http://www.cchit.org/work/criteria.htm> (accessed 26 February 2007).
13. G.J. Kuperman, R.M. Reichley, and T.C. Bailey, "Using Commercial Knowledge Bases for Clinical Decision Support: Opportunities, Hurdles, and Recommendations," *Journal of the American Medical Informatics Association* 13, no. 4 (2006): 369–371.