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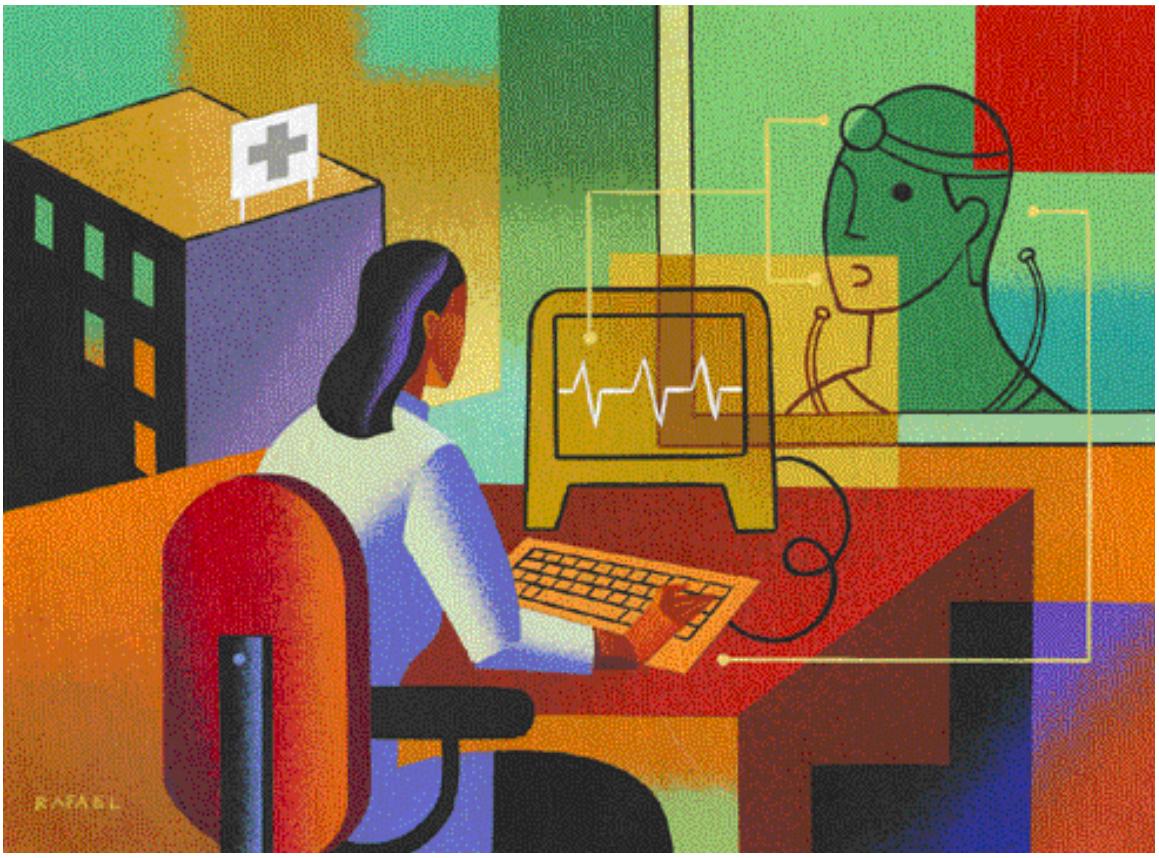

Electronic Medical Records: Lessons from Small Physician Practices

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October 2003

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Electronic Medical Records: Lessons from Small Physician Practices

Prepared for:
CALIFORNIA HEALTHCARE FOUNDATION

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About the Foundation

The California HealthCare Foundation, based in Oakland, is an independent philanthropy committed to improving California's health care delivery and financing systems. Formed in 1996, our goal is to ensure that all Californians have access to affordable, quality health care.

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Executive Summary

THIS PROJECT WAS DESIGNED TO PROVIDE solo/small group physicians with practical information on electronic medical record (EMR) implementation and use. About 70 percent of active, practicing physicians in California work in solo/small groups of ten physicians or fewer, yet little has been published on their experience using EMRs. Understanding EMR use in solo/small groups also can help policymakers in government, employer coalitions, and public and private funding agencies to better craft policies to hasten EMR adoption.

Methodology

A diverse group of EMR physician champions in 20 solo/small practices were interviewed between May and December of 2002. Half the sample used seven different EMR products, while the other half used the same EMR. Almost all practices had ten primary care physicians or fewer, and most (13) were in California.

The interview protocol contained numerous open-ended questions about EMR use. Categories of EMR physician users were created based on characteristics of users, including extent of EMR use, benefits, and time spent making changes to complement the EMR, as well as current time spent at work.

The study had several important limitations. Many cost and benefits estimates are imprecise for a variety of reasons. Moreover, interviewees were not representative of EMR users, or the entire physician population, since they were early adopters of the EMR. Nevertheless several patterns of findings emerged that were striking enough to be of use to EMR considerers and policymakers.

Background: EMR Capabilities and Their Use

The electronic *viewing* capability was a core feature, but what physicians could actually view varied among practices. Most physicians were electronically *documenting* in the exam room during the patient visit, and many were using electronic forms (templates) that were specific to the type of visit or to the patient's disease or condition. Clinician electronic prescribing or *ordering* was prevalent and popular. Electronic *messaging* usually was limited to interoffice messages. Clinicians used *care management/follow-up* capabilities, including health

maintenance reminders or disease-specific templates with embedded clinical practice guidelines.

Other EMR capabilities less often used included *analysis and reporting* functions, patient-directed capabilities (such as ability for patients to securely communicate with their providers or view their data), and *billing and scheduling* capabilities that were an integral part of EMR use.

Lessons Learned From Implementing EMRs

Initial EMR Financial Costs Are Substantial, While Benefits Vary

Initial costs ranged from $15,000 to $50,000 *per physician*, with a median cost of $30,000 per physician, plus revenue losses due to fewer than normal patient visits for weeks or months after the EMR implementation. Ongoing financial costs were much lower.

Financial benefits varied greatly, ranging from no benefits to gains of more than $20,000 per year per physician. Quality benefits were common but also varied greatly. Almost all users reported increased quality of patient care due to better data legibility, accessibility, and organization, as well as prescription ordering, and prevention and disease management care decision support.

Decreased staff costs were common and varied greatly. More successful users decreased transcriptionist, medical records, data entry, billing, and receptionist costs. Increased revenue was less common; some reported increased revenue from higher coding levels, more complete capture of services provided, and more services per visit.

Physician EMR Users Differ in Benefits Reaped

Clinicians differed greatly in how they used the EMR, the amount of effort invested in making changes, and the benefits generated. *Complementary changes* were essential for generating EMR benefits and reducing extra time costs due to using the EMR. Changes included systematically entering patient data from paper charts, customizing electronic forms (templates) that came with the EMR software, creating documenting shortcuts, arranging extra support for technical problems, reorganizing workflow in the exam room, and reorganizing processes (e.g., who does what and how) in the office. Most interviewees emphasized that it took extra time—often several months or years—to effect these changes and learn to use the software.

Five types of EMR users were identified.

Viewers minimally interacted with the computer, obtained few benefits, and had invested little time in making complementary changes to increase benefits; at the time of the interviews they spent little extra time at work. Viewers did not electronically enter any data, but rather dictated or hand-wrote notes and prescriptions.

Basic Users entered a limited amount of data into the EMR, obtained few benefits, had invested limited time in customizing electronic forms, entering past data, and making other changes to complement the EMR, and at the time of the interviews spent the same or more time at work. Interviewees were concerned that some basic user colleagues would become "stuck" at a low level of EMR use and benefits.

Strivers still invested substantial additional time in customizing software, entering past patient data, reorganizing workflows, and generally learning to more efficiently use the EMR software; they still reaped only moderate financial benefits, and spent more time at work. They electronically documented, using templates with documentation shortcuts, and thus generated some savings from reduced transcription and medical records staff.

Arrivers had been "strivers" for some period of time, but had already invested substantial additional time in activities that complemented the EMR implementation. As a result, the arrivers were reaping sizable benefits and spent the same or less time at work than before the EMR. Notably, most expected even more benefits, both

financial and quality-related. All arrivers documented electronically extensively, and most had reorganized their exam room and office workflows.

System Changers were similar to arrivers, but were characterized by even more benefits and time savings per patient, use of numerous customized electronic forms, and more extensive changes in workflow—especially delegating numerous tasks to other clinical staff. System changers focused on quality improvement and advocated stronger internal and health plan incentives to encourage EMR use.

Technology Differences Explain Only Some Differences in Benefits

Clearly, differences among EMR software technologies had some effect on benefits achieved. Nevertheless, the data suggest that the wide variety of EMRs examined have sufficient capability, usability, and flexibility to enable the early adopters to succeed, at least to some extent, given that the most successful users—arrivers and system changers—used *five different* EMRs. At the same time, ten interviewees in four of the five different user types used the *same* EMR. That is, despite almost identical software, users of the same EMR had a wide range of benefits and time costs. Clearly, much more than EMR software determines EMR-related benefits and costs.

Recommendations for Small Groups

Identify an EMR champion—or don't implement. One or more physician EMR champions must be willing to lead in purchasing and implementing the EMR. Potential EMR champions need to assess whether or not they have the personal characteristics, including determination, needed to succeed with an EMR.

Obtain physician commitments to use the EMR. Physicians in the practice must make specific time commitments to document electronically and learn to use the EMR effectively to generate benefits.

Maximize electronic data exchange. This is critical for reducing paper and data entry and thus costs. Practices need specific commitments from the labs and vendors that they will set up efficient electronic data exchange and adequate data exchange between the practice's EMR and the billing and scheduling software.

Arrange comprehensive support. Support should address all technical and process issues. Although some vendors provide good support, it tends to be less comprehensive than needed. It may be very difficult to arrange truly comprehensive support in most areas.

Incentivize physicians to use the EMR. Practices should reward those physicians who generate benefits from reduced medical records, transcriptionist, and data entry staff time.

Suggestions for Purchasers, Public Policymakers, and Funding Agencies

Purchasers, government policymakers, and private and public funding agencies have an important role to play by promoting quality performance reporting and financial incentives that disproportionately benefit EMR users, and by encouraging the development of community-wide electronic clinical data exchange and new support entities. Funding demonstrations and evaluations of these new initiatives can help determine what helps EMR users achieve success more quickly.

Also needed is increased qualitative and quantitative research on users of EMRs, including research into what can move a viewer, basic user, or striver to an arriver status more quickly. More basically, it is important to know whether it is realistic to expect that a majority of physicians could become arrivers in the foreseeable future, given their characteristics, or whether it will take a long time for even the best policies to improve quality of care by transforming most physicians into EMR users.

I. Introduction

THIS PROJECT PROVIDES SOLO/SMALL GROUP physicians with practical information on EMR implementation and use. This group was the focus for two reasons. First, EMRs are clearly important to at least a substantial minority of physicians. Although estimates of actual EMR use rates are relatively low—likely substantially less than 13 percent[1]—estimates of physician *interest* in EMRs are substantially higher, ranging from 31 percent to more than 65 percent of all physicians nationwide.[2] Second, about 70 percent of active, practicing physicians in California work in solo/small groups of ten physicians or fewer,[3] yet little has been published on their experience using EMRs.

This report should also be of interest to employers and employer coalitions that provide health care benefits, policymakers in government that craft legislation, managers at the Centers for Medicare and Medicaid Services, and research and demonstration funding agencies. These stakeholders increasingly recognize that IT generally—and the EMR specifically—is critical to improving quality of care, including in solo/small groups.[4, 5] Understanding EMR use in solo/small groups can help policymakers craft policies that can hasten EMR adoption.

II. Methodology

Practices and Selection Methods. A diverse group of EMR physician champions in 20 solo/small practices were interviewed. By design, half the sample used a wide variety of EMR products, while the other half used a single EMR. The design enabled researchers to examine the diversity of use and benefits possible from a variety of products, as well as one single product. All practices were small: eight practices had solo physicians, nine others had two to ten physicians; two practices with 17 and 25 physicians were included because the practice left EMR adoption up to semi-autonomous small sites within the practice. One small practice joined a large group (of 140 physicians) during the interview period.

Of the 20 practices selected, a majority were in California and most had primary care physicians. Of the thirteen California practices, nine were primary care (family physicians or internal medicine); the others were cardiology, urology, endocrinology, and pulmonology practices. Of the seven non-California practice interviewees, all were family physicians. The American College of Physicians and the American Academy of Family Physicians helped identify volunteers, as did two vendors that provided a list of EMR reference sites (six of the cases). Data were collected in May through December 2002 for the non-California practices, interview data also were obtained in 2000 and 2001 from a previously funded study.

EMRs Used and Years of User Experience. Ten practices used Practice Partner, while the other half used seven other EMRs: QD Clinical (four practices), Alteer, NextGen, A4 Healthmatics, AutoChart, Soapware, and Cliniflow. Most physicians were satisfied with their EMR and EMR vendor. Users had between six months and ten year's experience with EMRs; the median EMR use was five years.

Interviewees were not representative of all physicians or even EMR users. Using Rogers' terminology for innovation adopters,[6,7] interviewees fell into the early adopters or innovators categories. This sample overrepresents the high-achieving end of the spectrum of innovation adopters, in large part because these were physician EMR champions who had been using the EMR for several years, and had volunteered for the study—less successful physicians who were not EMR champions were less likely to volunteer. Nevertheless, more advanced users described their own experiences when they were less

advanced in their use, and also described the experiences of some of their colleagues who were less advanced in EMR use.

Interview Process. The interview protocol contained numerous open-ended questions about EMR use. Between one and four telephone interviews were conducted for each practice. The researchers observed EMR use and conducted additional in-person interviews in three practices. The investigators conducted all interviews.

Data Analysis. The researchers used a qualitative research software program (QSR Nvivo) to code transcribed interview data to several dozen concept categories (such as "implementation activities" and "workflow changes"), manage the data, and help analyze responses across interviews, including relationships among variables. For the analysis, the researchers used explanation building and pattern matching qualitative research techniques.[8] Categories of EMR physician users were created based on characteristics of users, including extent of EMR use, benefits, and time spent making changes to complement the EMR, as well as whether or not they were now spending more or less time at work.

Limitations. This study has several important limitations. Many cost and benefits estimates are imprecise for various reasons—some EMR implementations had taken place years ago, some clinicians did not have estimates or did not have them readily available, and practice characteristics (e.g., practice size and patient volumes) changed over time, making pre-EMR/post-EMR comparisons difficult. Data were obtained from the physician EMR champion or lead physician, who also provided an overview of use by others in the practice. Data were not obtained from non-champions in practices that were non-solo, other than in one site where the researchers conducted an observational study. As a result, interviewees were not representative of EMR users, let alone of the entire physician population. Moreover, practices could not be systematically followed over time.

Nevertheless several patterns of findings emerged that were striking enough to be of use to those considering EMR implementation as well to policymakers developing programs to hasten its adoption. At the same time, further research is needed to provide more indepth, precise, and comprehensive information to these audiences.

III. EMR Capabilities and Their Use

EMRs have seven main types of clinical capabilities that correspond to seven sets of clinical activities within ambulatory physician practices. These capabilities are: viewing, documenting, ordering (e.g., prescriptions and labs), messaging, care management, analysis and reporting, and patient-directed (e.g., patients ordering prescription refills online). All eight EMR products had the first five capabilities; each EMR had somewhat different features for each capability. Some EMRs also included integrated billing and scheduling capabilities. This report focuses on physician users, although clinical support staff also used EMR capabilities.

The most often used capabilities of the EMR are the following:

Viewing. The electronic viewing capability was a core feature, but what physicians could actually view varied among practices. Virtually all interviewees viewed past progress notes, problem lists (chief complaints), past medications, and allergies. Some could view lab results, consultant reports, hospital inpatient data and other related clinical data, but only if they had arranged data exchange interfaces between their EMR and outside information systems, or if their staff entered data on paper (e.g., lab results) into the EMR.

Documenting. The electronic documenting capability enabled users to record progress notes, chief complaints and diagnoses, allergies, prescriptions, and other data electronically. Most physicians entered data in the exam room during the patient visit. Most used electronic forms (templates) that were specific to the type of visit (e.g., routine return visit) or to the patient's disease or condition (e.g., diabetes or low back pain) or a combination of both. Features of the electronic forms varied among EMRs. Even users of the same EMR product varied greatly in their use of electronic forms and their features. The electronic forms acted to prompt physicians to guide the clinicians' exam and discussion with the patient. Physicians used some combination of typing in free text, clicking on structured boxes (or "picker lists") that were embedded in the electronic forms, and clicking on "macro" placeholders in the electronic forms in order to generate standard text phrases or sentences for that prompt.

Ordering. The electronic ordering capability enabled users to enter prescriptions into electronic forms, where they could

select from various ordering possibilities, and to receive decision support (alerts) on drug/drug and drug/allergy interactions. Clinicians usually handed the printed prescription to the patient and/or faxed prescriptions directly to the pharmacy. Pharmacies used fax or phone to communicate. Only a handful of practices had drug formulary information, or used lab, referral, or other ordering capabilities.

Clinician electronic prescribing was both prevalent and popular. Although initial prescriptions took time to enter, refilling prescriptions saved time for physicians and staff:

> *"One of the most daunting tasks is [when a] Medicare patient comes in and needs refills of ten medications. My writing is atrocious, and the more I write the worse it gets. The prescription writing [feature] makes it so neat and legible. No question about the pharmacist misinterpreting anything."* —Family physician, solo practice

Messaging. Electronic messaging usually was limited to interoffice messages—for example, a patient's telephone request for a prescription refill might go from the receptionist to the physician to the receptionist. No interviewees had Internet email capabilities integrated into the EMR.

Care Management/Follow-up. EMR prevention and disease management capabilities overlapped with the documentation capability. For health maintenance, most interviewees had to pull health maintenance data—that is, had to remember to seek information on health maintenance status for the patient, although others had customized their templates to automatically import reminders. Clinicians who used disease- or condition-specific templates with embedded clinical practice guidelines felt that care improved as a result.

> *"When I look through the template as I'm talking with the [diabetic] patient…the template asks whether the patient has visited an eye doctor in the last year. It asks if the patient is examining his feet daily. Or it asks if the patient is on an ACE inhibitor. You can say 'no' or 'advised to do so.' Under the diabetic plan, you put down what you advise them to do, when you want them to come back, what the labs are. I can…bring up the diabetic treatment medication module and print that out. That's a lot better [than before the EMR]."*
>
> —Family physician, small group practice.

Other EMR capabilities less often used included the following:

Analysis and Reporting. Most interviewees could do simple searches of patients—for example, to identify female patients on hormone replacement therapy. However, few used most EMR analysis and reporting functions, in part because coded data were limited.

Patient-directed. The EMRs usually had no capabilities that patients could use, such as ability to access a practice Web site in order to securely communicate with a provider or view their data; capabilities that were available were rarely used. Most interviewees discouraged patients from sending email and replied to email messages by phone.

Billing and Scheduling. Some practices used EMRs with integrated billing and scheduling modules; other practices created interfaces to exchange data between the EMR and practice management system software. Many practices had no integration at all between the EMR and billing/scheduling software. Greater integration reduces duplicate data entry and permits automated service capture and higher visit level coding.

IV. Lessons Learned From Implementing the EMR

Lesson One: Initial EMR Financial Costs Are Substantial, While Benefits Vary

Initial costs are high. Those considering implementing an EMR tend to focus on highly visible financial purchase costs with good reason, since they are substantial. Initial costs ranged from $15,000 to $50,000 *per physician*. For the nine cases that provided rough estimates and had implemented the EMR fewer than four years before, the median cost was $30,000 per physician. The amounts depended on various factors. For example, better pre-existing hardware or leased EMR software/hardware decreased the initial outlay, while data exchange interfaces, use of more nurse practitioners and physician assistants per physician, and use of more notebook computers increased the initial outlay. There was considerable variation in software costs among vendors. Some cost data were sketchy, as this project depended on interviewees' reported costs. Moreover, hardware costs have been falling over time.

Most interviewees reported that they substantially reduced patient visits (and thus lost revenues) for a couple of days during the installation period, and scheduled fewer than normal patient visits for a period of weeks or months after the EMR implementation because getting used to the EMR took extra time. Unfortunately, interviewees could not quantify such revenue losses.

Ongoing financial costs were substantially lower than initial costs. They included 15 percent to 20 percent of initial software costs for vendor support and upgrades, and replacements for, and enhancements to, hardware.

Financial benefits varied greatly. Many interviewees reported similar types of benefits from implementing the EMR, although the amounts varied greatly, ranging from no benefits to gains of more than $20,000 per year for a couple of physicians in one practice.

Quality benefits were common but varied. Almost all users reported increased patient care quality due to such improvements as better data legibility, accessibility, and organization, prescription ordering, and prevention and disease management care decision support.

These reports are consistent with a growing body of evidence on the benefits of IT and EMRs on quality of patient care. In addition to stating the benefits of decision support and reminders, interviewees also stressed more basic changes:

> *"…there is a tremendous amount of poor or lost information that really impacts patient care….doctors don't remember all the illnesses or all the medicines and can't read anybody else's notes in the chart. I looked through all the charts at [an academic health center]—most are illegible and that goes for every institution around the country. So you can't read the information, can't find it, and then if you become suddenly sick, you can't deal with it. You can fix all that with an EMR. Also if something bad comes up [e.g., a recalled medicine], you can find patients that might be affected….there is a better way to practice medicine."*
>
> —Pulmonologist, small group practice

Several interviewees stressed the benefits of providing patients and consultants with better printed information, thus improving the coordination of care:

> *"The biggest benefit is to patient care. Patient care charts are legible and drug interactions can be seen. One of the biggest problems is that patients are on multiple medications and go to multiple specialists and pharmacies, so nobody knows who's taking what. Now, every time they come in, they get a print-out of all their medicines and they're told 'take this to all your different specialists and if they change your medicine or dose, mark it down and the next time you're here, bring it in' and we print out a new one. So all the specialists know exactly what the patient is taking."*
>
> —Family physician, solo practice

Decreased staff costs were common. More successful users decreased transcriptionist, medical records, data entry, billing, and even receptionist staff FTEs. However, as indicated below, some types of EMR users reaped none of these benefits. Several physicians who dictated pre-EMR were especially enthusiastic about the cost savings:

> *"We realized that when we looked over the last two years, the cost to pay for a four- or five-year lease for hardware and software was equal to the same amount that we would have been paying for transcription. So by simply waving goodbye to the transcriptionist…we transferred the money we would have been paying her and used that to finance our [EMR] computer."*
>
> —Family physician, small group practice

Increased revenue was less common. Many interviewees felt more comfortable coding to higher Medicare Evaluation and Management (E&M) levels (visits and consultations provided by physicians or residents under their supervision) than they had prior to using an EMR, since the electronic forms had prompted them to do what was needed to justify the higher levels and to document that fact. Asked about whether the EMR increased revenue by increasing the level of coding, one respondent replied:

"I think it does because it makes you think about it. I'm not sure if internists are as bad as family practice docs, but we tend to just sort of code the same thing for everything. We tend to under-code because it's easier to under-code than worry about [Medicare fraud and abuse charges]."

—Family physician, small group practice

Others reported increased revenue from more complete capture of services provided, especially with EMR/billing software integration. A few physicians provided more services per visit, which increased revenues. Increased revenue was less common than decreased staff costs and varied as much, from none to very substantial. Revenue tended to accrue most to physicians who saw fee-for-service patients, and that had data exchange integration between the clinical EMR and the billing system (or module) capabilities.

Lesson Two: The Five Types of Physician EMR Users Differed in Benefits that They Reaped; Successful Users Documented Electronically and Made Many Complementary Changes

In order to illustrate the differences among a spectrum of users, five different types (categories) of physician users were created: viewers, basic users, strivers, arrivers, and system changers. Viewers and basic users, the least advanced users, had mostly unchanged clinical and business processes that still relied heavily on paper or scanned images. In contrast, arrivers and system changers had reengineered work processes enough to virtually eliminate paper-based clinical processes. Thus, more advanced users used more EMR capabilities, usually reaped more financial and quality benefits, and had invested more time in making changes that complemented the EMR than the less advanced users.

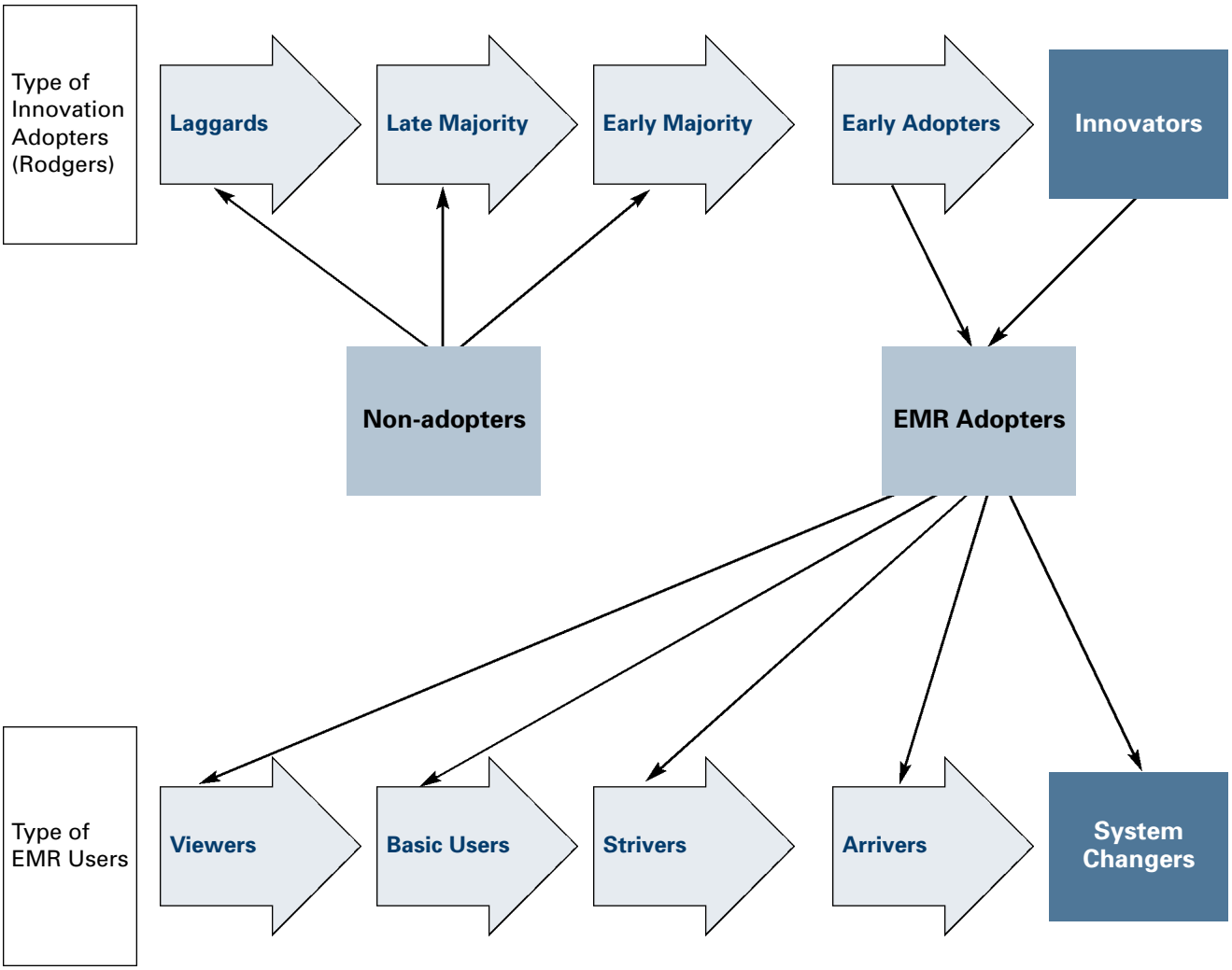
Strivers were in the middle of the spectrum. They spent the most extra time at work, since they were still investing time in making changes that could generate benefits and eventually reduce their time costs. At the point of the interviews, extra time spent at work was minimal at both ends of the spectrum, as viewers spent little extra time using the system or making changes (and reaped fewer benefits), and arrivers and system changers had become more efficient during their workday as a result of investing extra time in making complementary changes.

Complementary changes were essential for generating EMR benefits and eventually reducing extra time costs due to implementing the EMR. They included such activities as systematically entering patient data from paper charts, customizing electronic forms (templates) that came with the EMR software, creating documenting shortcuts, arranging extra support for technical problems, reorganizing their workflow in the exam room, and rearranging processes in the office as a whole.

Many physicians reported that they had to invest extra time to make the type of complementary changes described above. For example, physician champions spent extra time selecting the EMR, preparing for EMR installation, and then implementing the EMR—they participated in training sessions, learned how to use the software, oversaw installation, engaged in trouble-shooting, and worked with the EMR installation staff to help others learn the basics of EMR use. Subsequently, many interviewees reported that they continued to invest extra time—several months or even several years—in such activities as entering past patient data, customizing templates, and trouble-shooting technical problems.

Clinicians differed greatly in how they used the EMR, the benefits that they generated, the amount of effort invested in making changes, and the changes that they made. Several different types of EMR users are outlined below. As Figure 1 indicates, it is important to keep in mind that the EMR user types are from a relatively small part of the spectrum of physicians that Rogers called (EMR) Early Adopters and Innovators.[6, 7]

Figure 1. Types of Innovation Adopters and EMR Users



Viewers

Viewers minimally interacted with the computer, obtained few benefits, and had invested little time in making complementary changes to increase benefits; at the time of the interviews they spent little extra time at work. Both viewer interviewees used the EMR to view data and to do little else—they did not electronically enter any data, but rather dictated or hand-wrote progress notes and prescriptions.

For example, in one practice, staff imported the transcribed progress notes into the EMR and staff (not physicians) electronically entered the hand-written prescriptions. The practice had not reorganized workflow, maintained problem lists, or made other efforts to use the EMR efficiently, and thus it maintained parallel paper and electronic processes. As a result, they saw no staff cost savings or revenue increases, and little change in physician time spent at work. Interviewees attributed some of the minimal EMR use to the poor performance of the EMR product—the only interview with negative reviews of an EMR.

Basic Users

Basic users entered a limited amount of data into the EMR, obtained few benefits, had invested limited time in customizing electronic forms, entering past data, and making other changes to complement the EMR, and at the time of the interviews spent the same or more time at work. While there was only one basic user interviewed, more advanced EMR users described some colleagues as having these characteristics. The basic user viewed data, maintained some electronic lists (e.g., chief complaints, past medications, and allergies), and ordered prescriptions. The basic user dictated visit notes while viewing visit- or disease-specific templates, and had trained the transcriptionist to fill out the template as she transcribed. Although the practice aimed to eliminate the paper chart (and medical records staff), transcription costs remained high, and the practice had added costs of scanning tests and paper consultant reports.

Interviewees were concerned that some basic user colleagues—who had invested minimal time in making the changes needed to have the EMR produce more benefits—would remain at a low level of EMR use and benefits, and continue to spend the same or more time at work, which would eventually undermine their willingness to use the EMR.

Most interviewees fell into the striver or arriver categories of users who had already embraced the concept of the EMR as an integral interactive tool in their work.

Strivers

Strivers still invested substantial additional time in creating changes that complemented the EMR with the hope of generating financial benefits and reducing their time costs. The five strivers continued to customize software, enter past patient data, reorganize workflows, and generally learn to use the EMR software more efficiently. Although they made more use of EMR capabilities than did viewers and basic users, they still were reaping only moderate financial benefits.

Strivers electronically documented using templates with documentation shortcuts, and thus generated some savings from reducing transcription and medical records staff. For example, one interviewee estimated that he eliminated $600 in transcription costs per month. However, the physician still had to spend an extra hour a day at work, more than three years after implementing the EMR. In part, he believed that he was leaving work later due to time needed to provide higher quality of care, including documenting visits and communicating results more thoroughly, and sending better information to specialists. The same interviewee also had identified a series of efficiency improvements (including improved templates) that he thought would help in reducing time at work.

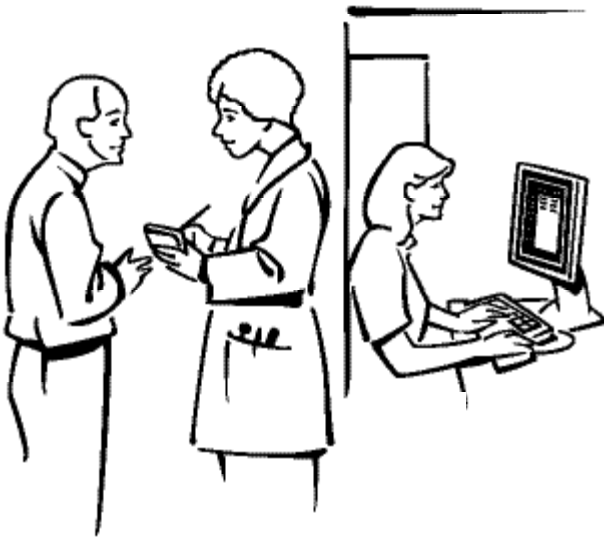
One striver—a self-described "sophisticated user" who recently switched to a new EMR—discussed the time demands of changing workflow, learning to use the software, and customizing templates:

> *"[The EMR] disrupts your workflow a lot initially. There is a big learning curve to actually use it in the room with a patient, or to document using some combination of handwriting, notes, and [data entry or dictation]. It takes a couple of months to really become a competent user. Classes or practice or tutorials are better than doing nothing, but once you've done them, you feel…at the bare bones level of being able to [use the EMR]."*
>
> —Pulmonologist, small group practice

The same interviewee also discussed the time required in addressing technical problems, including support for hardware breaks:

> *"I am the support system….That's really one of the biggest problems I see right now, for little offices at least—there is no information systems department. So when things go down, when a printer or computer breaks, when things freeze, you have to stop and go deal with it because others really can't."*
>
> —Pulmonologist, small group practice

Arrivers



Arrivers had been strivers for some period of time; unlike strivers, they had already invested substantial additional time in activities that complemented the EMR implementation—they had entered past patient data, customized templates, created interfaces, developed stable technical support structures, and generally ascended the EMR learning curve. As a result, the ten arriver interviewees were reaping sizable benefits and spent the same or less time at work than before the EMR. Notably, most expected even more benefits, both financial and quality-related.

One arriver discussed the time spent (during the striver phase) to prepare for the EMR and to customize templates—for example, so that vital signs, lab, or other data could be imported automatically into the progress note or key phrases could be generated quickly, sometimes at the click of a mouse button.

> *"That champion that I was talking about? Not only do you need to spend extra time with the other providers but....before you start the program there's a lot of setup that has to be done, including setting up your health care maintenance reminders and lab tables....massaging existing templates for your practice and creating new templates, and new quick text [documentation shortcuts]. I remember being here late in the evening, almost every day working another hour or two on the computer ...[for the first year]."*
>
> —Family physician, small group practice

Entering past patient data into the EMR was time-consuming.

> *"As we went along, we tried to retire paper charts. Initially we dictated problem lists and social histories, and used a transcriber trained by the vendor to input it into the system. She quit when her volume was going way down because we weren't dictating our regular notes. Now we're manually entering three charts a day as patients come in. We transfer [past information] into the problem lists and social, family, past medical history, into the health maintenance sections of the EMR. We scan key reports that are recent. All this takes extra time."*
>
> —Family physician, small group practice

Most arrivers had reorganized their exam room and office workflows—especially important because, as one interviewee put it, "the EMR changes how you do things." Changing workflow meant changing tasks performed by each staff member. For example, since receptionists and nurses spent less time tracking down charts, they could spend more time talking with patients and entering patient data into electronic forms prior to the patient entering the exam room, which reduced the time physicians needed to document the visit. Using new EMR-related capabilities to keep track of patients' care, staff also could identify and then contact patients who had not yet taken ordered tests, were overdue for preventive tests, or needed some chronic care follow-up. In each case, the physicians first created protocols or rules for identifying patients that needed follow-up care, and procedures for when and how staff would follow-up with patients.

Sometimes the extra time arrivers spent at work (during the striver phase) was coupled with reduced revenues for a limited period of time:

> *"The first three months I cut back on the number of patients I saw by around 25 percent. And then when I found I wasn't staying really late at night, then I'd add a few more patients. So I'd cut down patients by maybe 10 to 15 percent. At around six months, I was no longer staying late at night but I knew it was taking me more time. I had to work through lunches or stay a little late. But by the time I got to* three years*, the time I spent at work was the same as before the EMR. When you get past three years, then suddenly, you're going home early."*
>
> —Family physician, small practice

System Changers

System changers were similar to arrivers, but were characterized by even more benefits and time savings per patient, use of numerous customized electronic forms (templates), and changes in workflow—such as those discussed above—especially delegating numerous tasks to other clinical staff. They also attempted to change the external environment by encouraging health plans to reward practices for producing higher quality of care due to the EMR.

In contrast to arrivers, system changers went further in the type of changes they made, in part because both were strong leaders within their practices. Notably, both had focused on quality improvement:

> *"I can incorporate sophisticated clinical pathways into my practice that are sophisticated. For example, if we decide to screen for depression, I put those questions in the template; I can't help but screen for it—takes no time at all.*
>
> —Family physician, small group practice

Both system changers advocated stronger internal incentives to encourage EMR use:

> *"Eventually you want to incentivize. We need to cut down on the dictation, so one of the redesigns we're currently working on is to give docs the cost of the dictation as part of their productivity, so they have an incentive to say, 'I want to decrease my dictation; how do I do that?' And we say, 'Here, here's a template.' "*
>
> —Family physician, small group practice

The system changers were local leaders, attempting to change the external environment by persuading payers and independent practice associations (IPAs) to reward quality of care. The experience of one interviewee illustrates that such rewards would disproportionately benefit physicians using EMRs.

> *"There's a pot of money [from withheld payments on HMO patients]…that will be returned to us based on how well we practice medicine. Thirty-nine percent of it is how cost effective we are, but the rest of it…is quality of care and patient satisfaction. Suddenly this EMR is probably going to generate hundreds of thousands of dollars. When the HMOs announce what parameters they will use, with this program we can make sure that we achieve close to 100 percent on every selected parameter. A paper record office would never be able to even try to do that; we will be able to do it very easily. That will pay for this system two or three times over."*
>
> —Family physician, small group practice

It is also important to note that *both* system changers had joined larger groups. They were in the process of integrating themselves into those groups and becoming EMR champions in a larger arena of action.

Lesson Three: Technology Differences Explain Only Some of the Variation in Benefits

Clearly, differences among EMR software products had some affect on benefits achieved. Some EMRs were more capable, usable, and flexible than others. Certainly, bad EMR software could lead to implementation failure, as in the case of the practice that found that its EMR was unacceptable and was seeking a new one. Unfortunately, it was impossible to determine which EMRs provided the most benefits and the best value, given the small sample.

Nevertheless, the data suggest that many different EMRs have sufficient capability, usability, and flexibility to enable the early adopters to succeed, at least to some extent, given that the most successful users—arrivers and system changers—used *five different* EMRs. Moreover, most interviewees were quite satisfied with both EMR products and services. One explanation for these findings is that in selecting software, clinicians looked for different EMR styles that would work for them (e.g., some EMR software packages emphasize typing in free text, whereas others emphasize structured data entry). Another explanation is that many in this extraordinary sample of early adopters had characteristics that enabled them to make changes that led to at least some success, despite differences in the underlying usefulness of the technology.

The data underscore the fact that *how* the EMR is used is important, as ten interviewees in four of the five different user types used the same EMR. That is, despite almost identical software, users of the same EMR had a wide range of benefits and time costs. Clearly, much more than EMR software determines EMR-related benefits and costs.

Alternatives to Full EMRs

EMR use is one path to quality improvement. However, EMR use often forces clinicians to make numerous and sometimes difficult changes in how they work, leading to extra time costs that compound the already substantial financial costs of the EMR. Such potentially prohibitive time and financial investments discourage EMR adoption.

One alternative to a full-blown EMR is to adopt the component EMR capabilities incrementally—e.g., adopt lab viewing followed by electronic prescribing. Take the case of purchasers implementing new performance standards that require decision support for electronic prescribing, and for prevention and disease management. Such requirements may be better served by component capabilities.

However, most performance standards likely would require physicians to use several types of integrated EMR capabilities, not just one or two. For example, in order to use decision support to improve quality, physicians would need to electronically view data; order prescriptions; document chief complaints, allergies, and other data; report and analyze performance data; and likely need care management templates and inter-office messaging. Moreover, physicians would have to make accompanying data exchange, workflow, and other changes. Thus a requirement that physicians use decision support to improve quality of care would require use of key elements of an integrated EMR, as well as complementary changes that would require real effort.

There is no data—for or against—to indicate whether or not an incremental approach is a viable alternative. Especially unclear is the extent to which electronic and paper workflow can peacefully co-exist—i.e., produce benefits and yet require minimal cost, data exchanges, and changes in workflow.

V. Recommendations for Small Groups

Identify an EMR Champion—or Don't Implement

For solo/small groups considering an EMR, one or more physician EMR champions must be willing to lead in purchasing and implementing the EMR. Potential EMR champions need to assess whether or not they have the personal characteristics, including determination, needed to succeed with an EMR. Potential EMR champions should think about the kind of differences between the EMR early adopters that were interviewed and most other clinicians. Most early adopter interviewees found it difficult to make needed changes, despite their overall IT savvy, workflow change skills, and positive attitude towards change. Other solo/small group physicians may find it even more difficult to achieve success, given that they are likely to have less IT savvy and less enthusiasm towards making EMR process changes.

At present, becoming an EMR champion can be challenging. While some physicians are willing to spend some time getting used to EMRs and making needed changes, most physicians do not necessarily want to figure out by themselves how to most efficiently enter past data, fix hardware and software IT problems, customize software, reengineer their workflow and their office's workflow, and orchestrate data exchange interfaces between themselves and outside data providers.

Obtain Physician Commitments to Use the EMR

If a practice has one or more EMR champions, other physicians in the practice must make specific time commitments in order to achieve success. Physicians must understand that they will have to change their workflow in order to generate benefits—in particular, not write or dictate progress notes but instead type in text or click on check boxes. Moreover, they need to commit extra time to learn to use the EMR effectively, including customizing electronic forms and their own documentation shortcuts. Without that commitment, some physicians will quickly become discouraged, reduce their potential EMR use, not generate EMR-related financial or quality benefits, and reduce the benefits generated by others.

Maximize Electronic Data Exchange

Maximizing electronic data exchange is critical for reducing paper and data entry and thus for reducing costs. First, the practice has to obtain adequate electronic data from outside sources. In particular, this means obtaining specific commitments from the labs to set up efficient electronic data exchange to enable physicians to view lab results within the EMR. Second, the practice needs to arrrange adequate data exchange between the EMR and the billing and scheduling software within the practice. For some, this means purchasing an EMR with integrated scheduling and billing modules, and converting data from the old system to the new system. For others, this means obtaining contractual commitments from the EMR and practice management software vendors to set up efficient electronic data exchange between the two systems. Since most users in the sample had no guarantees, user experience with data exchange was highly variable.

Arrange Comprehensive Support

Clearly, comprehensive and multifaceted support services would help many physicians learn to use EMRs more effectively and more quickly. Comprehensive services should address all technical issues, including hardware, software, operating systems, telecommunications and process issues—past data entry, template customization, workflow redesign, and learning efficient use of the EMR. Although some vendors provide good support, it tends to be less comprehensive than needed for the many changes that go well beyond direct use of the EMR software.

In reality, it may be very difficult to arrange truly comprehensive support, since the market does not offer it in most areas. At a minimum, the practice must have solid technical service support as a backup to whatever the hardware, telecommunications, and software vendors can provide.

Most EMR vendors supply the names of potential technical support services firms, although some vendors may not know how effective such firms really are.

Practices considering adopting an EMR could also obtain some support from other practices in the same area that had already successfully adopted the same EMR and are willing to provide ongoing advice on how to use the EMR efficiently, change workflow, and overcome obstacles.

Motivate Physicians to Use the EMR

Practices should consider rewarding those physicians that electronically document and thus generate benefits from reduced medical records, transcriptionist, and data entry staff time. Incentives had a major effect on behavior in the few practices that tried them.

VI. Suggestions for Purchasers, Public Policymakers, and Funding Agencies

EMPLOYER HEALTH CARE PURCHASERS, government agencies, and foundations could adopt policies to facilitate more EMR adoption and more effective EMR use.[5, 9] Potential policies include promoting quality performance reporting and financial incentives that disproportionately benefit EMR users, encouraging the development of community-wide electronic clinical data exchange and new support organizations, and funding demonstrations and evaluations of alternative initiatives to determine what helps EMR users achieve success more quickly.

Private and public funders have a particularly important role to play in financing and assessing demonstrations of experimental support service organizations. Such organizations can coordinate the EMR support already provided by various vendors, fill holes in technical support, and provide insights into how to reorganize workflows and make other changes to best use EMRs. Funders can also help create easy-to-use, community-wide clinical data exchange systems among health care providers and organizations so that a clinician can electronically view and use all clinical data on a given patient. Developments in Santa Barbara, Indianapolis, and Washington state point towards the increased feasibility of such systems, and lessons from experiments could be helpful in other areas.[10, 12]

Also needed is increased qualitative and quantitative research on users of EMRs. Foundations and the Agency for Healthcare Research and Quality (AHRQ) could fund research into what can move a viewer, basic user, or striver to an arriver status more quickly. More basically, it is important to know whether it is realistic to expect that a majority of physicians could become arrivers in the foreseeable future, given their characteristics, or whether it will take a long time for even the best policies to improve quality of care by transforming most physicians into EMR users.

An "Open-source" EMR as Alternative to Current EMRs

Another alternative to current full EMRs is to try to change EMR capabilities and price—for example through the creation of a public EMR with open-source code, analogous to programmers world-wide developing Linux as an alternative to Windows. If successful, this approach might lower the initial EMR software cost. However, it would not lower other financial costs, and does not address the time investment and complementary change challenges that are so daunting for small practices. Furthermore, any lower initial costs for less expensive, open-source EMR might be partially negated by higher time costs, and possibly higher maintenance costs, unless integrated capabilities and ease-of-use were the same as or better than current products. The open-source approach remains unproven.

Endnotes

1. Miller R.H., J.M. Hillman and R.S. Given. "Expected Physician Use of IT: Results From the Deloitte Research Survey." *Under review* 2003.
2. AAFP. *AAFP This Week* Jan 29. 2003.
3. C. Dower, T. McRee, and K. Grumbach, et al. *The Practice of Medicine In California: A Profile of the Physician Workforce.* San Francisco, CA: California Workforce Initiative at the UCSF Center for the Health Professions; 2001.
4. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century.* Washington, D.C.: National Academy Press; 2001.
5. Institute of Medicine. *Fostering Rapid Advances in Health Care: Learning from System Demonstrations.* Washington, D.C.: National Academy Press; 2002.
6. Rogers E.M. *Diffusion of Innovations.* 4th ed. New York, NY: The Free Press; 1995.
7. Cain M. and R. Mittman. *Diffusion of Innovation in Health Care.* Oakland, CA: California HealthCare Foundation; 2002.
8. Yin R.K. *Case Study Research:* Design and Methods. Applied Social Research Methods Series. Thousand Oaks, CA: Sage Publications, Inc.; 1994.
9. Miller R.H. and I. Sim "Using Electronic Medical Records for Quality Improvement in Physician Practices: Barriers and Potential Solutions." *Forthcoming in Health Affairs.*
10. Karp S. Santa Barbara County Care Data Exchange. *www.mahealthdata.org/forms/events events*2003/HIT_20030207.
11. Overhage J.M. The Indianapolis Network for Patient Care. *www.ehealthinitiative.org/HIPAA/presentations/*
12. Walker J. An Overview of the Washington State Project. *www.ehealthinitiative.org/HIPAA/presentations*

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