

Planning and Implementing an Electronic Medical Record in an Ambulatory Setting

by Eric A. Pifer, M.D.
Assistant Professor of Medicine
University of Pennsylvania Health System

Executive Summary

Despite the availability of commercial electronic medical records (EMRs) for all sizes of healthcare organizations, many obstacles to their diffusion remain. For one thing, the EMR fundamentally changes the way the clinician interacts not only with patients but also with every member of the office staff. EMRs can decrease clinician productivity for weeks to even months, creating lots of frustration. These problems only increase given that clinicians are busier than ever with administrative burdens and increased patient loads. While most clinicians ultimately recognize the EMR's overwhelming benefits, they're likely to initially experience stress and frustration unless implementation is well managed.

The need to address such issues as funding, reliable infrastructure, senior-management support and clinician involvement in EMR development and implementation are well known. However, scant attention has been paid to the detailed planning required at a local level. This issue of Information Edge describes the successful implementation of a comprehensive EMR in a physician office setting.



Teams

In our experience, implementation of an ambulatory EMR requires a strong two-part team comprised of technically skilled professionals and physician leaders from the individual practices. (See Figure 1)

Our technical support was well managed by our information services division, but the software vendor or outside consultants may also provide such support. This report focuses on roles played by practice-team members, but will also address issues of communication with the technical support team members.

Workflow analysis

Workflow analysis includes the process of identifying operational bottlenecks at each implementation site early and managing them proactively.

A CEO Resource
for Managing Clinical
Information Systems

November 1999
Volume 5, Number 9

Stanley R. Nelson,
CHAIRMAN

Chuck Appleby,
EDITOR

EDITORIAL PANEL
Erica Drazen
G. Ward Keever
Larry Koch
Mitchell Morris, M.D.
Robert Pickton
David Selman
Bruce Smith

SCOTTSDALE INSTITUTE

MEMBERSHIP SERVICES OFFICE

1660 SOUTH HIGHWAY 100

SUITE 140

MINNEAPOLIS, MN 55416

(612) 545-5880

FAX (612) 545-6116

EMAIL scottsdale@fcgnet.com

For more information,
contact Eric A. Pifer,
M.D., at 215-662-9233
or via e-mail at:
pifere@mail.med.upenn.edu

This analysis proved to be the most important part of our preparation for the EMR at the local level.

Performing the office workflow analysis requires the implementation team to interview members of the physician practice, a task driven by a trio composed of the physician champion, office manager and systems analyst. The office manager first gave us an overview of both patient and information flow through the practice from the perspective of secretaries and nurses. Key factors include such items as patient check-in time on the scheduling computer and the location at which telephone notes are written. We refined the detail further via interviews of individual secretaries and nursing staff and then interviewed individual clinicians to document their perspective.

Figure 1

IS Team

Project Leader: Responsible for oversight of the project from a technical perspective.

Clinical Analyst: Responsible for customization of clinical content and analysis of workflow in the office.

Interface Analyst: Responsible for construction and maintenance of the technology necessary to interface the scheduling and laboratory systems to the EMR.

Network Analyst: Responsible for deployment and upkeep of the network and all hardware.

Trainer: Responsible for training all members of the office and providing on-going support for daily activities.

Practice Team

Physician Champion (EAP): Primary contact person for the IS Team, primary source of information on local practices. Responsible for customization of clinical content, workflow and general oversight of the implementation from the practice perspective.

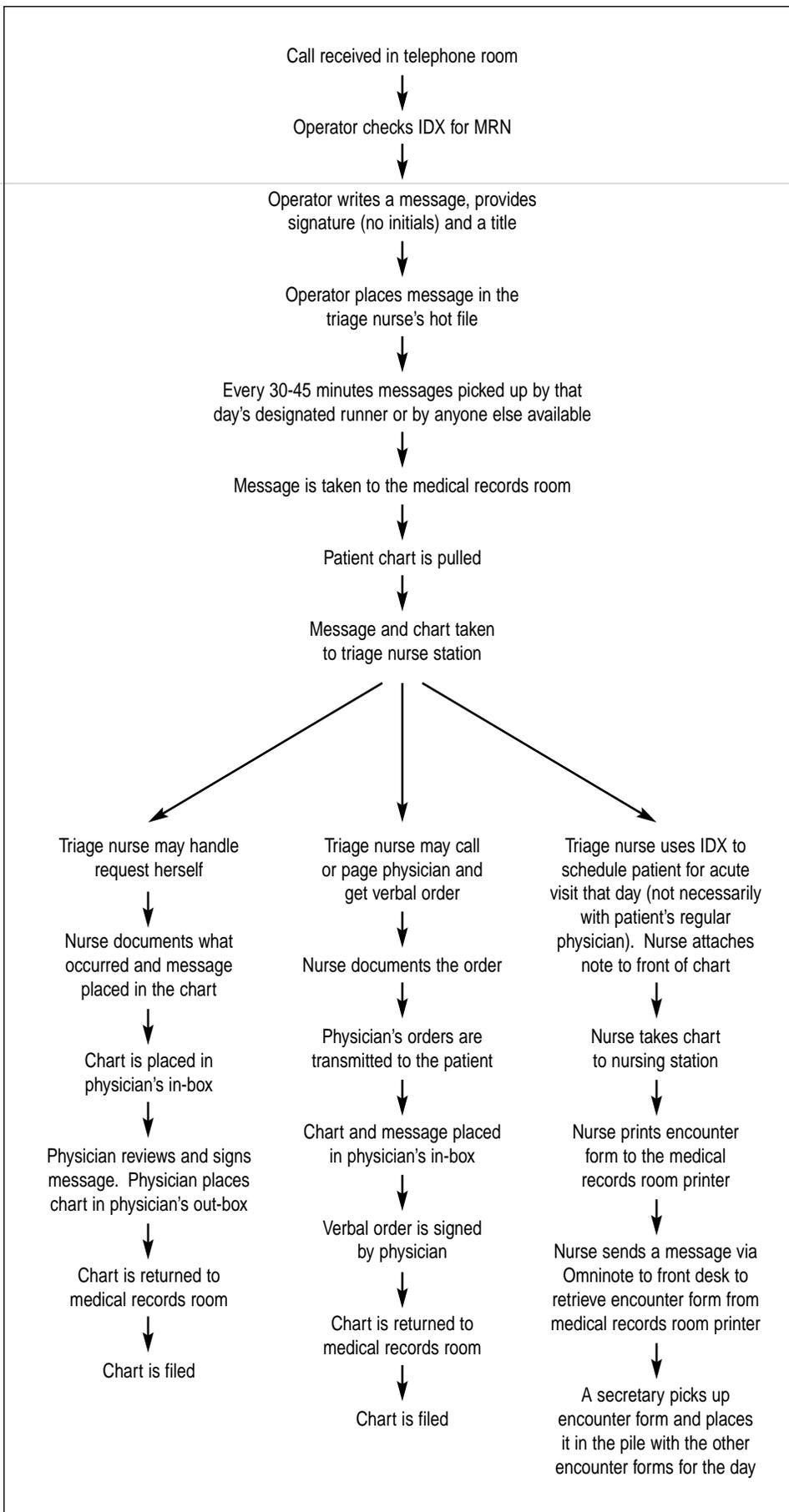
Office Manager: Secondary contact person for the IS Team, primary source of information on office staff practices and capabilities. Responsible for general oversight of the implementation from the office staff perspective.

Abstraction Coordinator (JAO): Responsible for the personnel and processes needed to input existing patient information into the system.

The final product was a map of office information and patient flow from several points of view. We used "initiators" of the office workflow as our entry points on the workflow map. These initiators included patient arrivals, telephone calls and arrival of mail and laboratory information. We created a map of the flow of these initiators, passing through each area and job description in the office. We then used the computer to create a proposed map of the flow in the office. An example from the Penn Center for Primary Care is depicted in figure 2.

While workflow redesign around an EMR eliminates many redundant tasks, computer automation does not cure all office inefficiencies. Indeed, unless properly used, automation will amplify underlying problems within the office workflow.

Figure 2: Typical Patient "Sick Call" at PCPC



The EMR fundamentally changes the way the clinician interacts not only with patients but also with every member of the office staff.

The workflow involved in collecting and distributing educational materials in one office is a case in point. Prior to start-up, staff collected materials either from an education room in the front of the office or from a PC in the clinician offices, after which clinicians or nurses gave the materials to patients. Initially, staff did not use the new EMR to distribute educational materials even though the system had the ability to print an order transmittal for educational materials or embed educational materials into visit summaries printed at the end of each patient encounter.

At the start, no clear distinction was made as to whether nurses or clinicians were supposed to collect and provide the educational material. Some clinicians printed transmittals for educational materials while some did not. As a result, patient discharge materials had to be collected from even more locations, increasing an already inefficient process. A pre-implementation analysis of the workflow with respect to educational materials would have exposed this problem and prompted more efficient use of the computer system.

We found that workflow analysis affected three major aspects of implementation at the local level: training, security levels and ergonomics.

Security levels

Office-workflow analysis helped define the level of system access required by each office member. Each user's sign-on code grants access to only certain parts of the system. For example, only a few staff might have access to order entry, while most staff could access chart review. The process is never black or white, because it may at times be desirable to give secretaries limited access to order entry subject to clinician approval.

Ergonomics

By providing a guide to activities and their location in the paper-based world, workflow analysis also helped in strategic placement of computer and other hardware around the office. Nursing staff helped us scrutinize the office and look at each workstation using the workflow map as a guide to these activities. This approach also helped us to manage capital investment.

Training

While it proved impossible to change the training materials for every site linked to our EMR, we felt it was important to incorporate some aspects of the individual workflow analysis into the training classes. Office members needed to know how to do their jobs, as opposed to simply being trained to use software. Wherever possible, we tried to use scenarios that fit with the specific office workflow. In the case of the sick-call example (Figure 2), we trained telephone operators how to use the system's e-mail functions as opposed to training them in electronic "telephone encounters" they'd never use.

The physician champion and office manager gave daily reminders to members of the practice as to how the office workflow was to proceed,

Most clinicians recognize the EMR's benefits, but are likely to initially experience stress and frustration unless implementation is well managed.

Scant attention has been paid to the detailed planning required for an EMR at a local level.

with the goal to be as consistent as possible.

Much of the EMR-user training occurred after conclusion of the training classes. As the practice continued to care for patients, scenarios arose that may not have been reviewed in the workflow map, which then required updating. Each person providing support for the system, including the physician champion and office manager, should provide consistent answers to questions as they arise.

Historical data conversion

Historical data conversion (HDC) is the process of populating the electronic chart with previously collected patient data. The transition from paper to electronic records will be faster and more efficient if historical data is pre-loaded into the EMR prior to start-up. Pre-loading is also likely to facilitate acceptance and use of the EMR. The system will be more functional and easier to use with all relevant data already present at each patient's first visit.

Historical data can be loaded into the EMR in one of three ways: scanning, backloading, or abstraction. Backloading is the computerized extraction of any patient data—labs, pathology and radiology reports, for example—that already reside on another computer system. Abstraction refers to manual review and entry of data into the EMR, which is preferable to scanning in most EMRs because it allows organization of data into structured fields that can be logically searched. It is the main method of HDC and the primary subject of the rest of this section.

Abstraction requires specific roles and presents several challenges on both an administrative and clinician-user level. Both should be addressed when planning for data conversion.

Administrative issues

Abstraction is an administratively intense process that defines procedures to coordinate personnel, identify data to be abstracted, handle increased chart movement, track charts that have been abstracted and prevent errors in data entry. At the Penn Center for Primary Care, we adequately planned for most administrative issues with the exception of increased chart movement, which caused a great deal of frustration on the part of our clerical staff, who often spent twice as long trying to find charts that could now be in two or three extra locations.

Do not underestimate the administrative burden of abstraction. Some questions to consider include:

- Who will be doing the abstraction? How will they be trained? Who will manage their schedules? How will feedback be consistently given to all personnel in a timely manner?
- Where will abstraction be performed? Is that room/computer easily accessible at all times? Do physical constraints require more intricate scheduling of personnel and workload?

Workflow analysis proved to be the most important part of our preparation for the EMR at the local level.

Unless properly used, automation will amplify underlying problems within the office workflow.

- How will charts needing abstraction be identified? Who will pull charts to be abstracted? How will they be re-filed? How will personnel know that charts have been taken and where to find them?
- Should abstraction keep pace with the clinic schedule? How will this be done? How often will the schedule be printed? How will walk-ins/last minute appointments be handled? Do you have the personnel to maintain this pace?
- How will incomplete or illegible data be handled?
- How will abstraction be audited? Who will check for errors? How will clinicians report problems?
- How will you keep track of which charts have been abstracted? Do you need a master list of all patients from which to work? What is the end-point of your abstraction and how will you know when you have reached it?

Clinical user issues

Abstraction provides an opportunity for clinicians to become involved in the implementation process. One of the challenges of abstraction is determining how to extract the most valuable data for the least amount of money. Several options exist to streamline abstraction and reduce its cost, and the clinicians in your practice are the best qualified to choose among these options. No system is without fault, but clinicians will be much more likely to accept limitations if they are the ones making the decision. We recommend that the clinicians in your practice determine 1) what data will be entered, 2) how the data will be collected, and 3) which patient charts will be abstracted.

What data

When deciding what historical data to enter into the new system, it is important to determine what data will give the most "bang for your buck." Data to consider for abstraction include: ongoing problems, medications, allergies, past medical history, past surgical history, family history and social history. These are all baseline medical data that should eventually reside in every patient's record. Immunizations and health maintenance data are quite useful if rule-based reminders are to be built into the computer-based patient record, but may require a significant increase in resources if entry of this data is not straightforward on your system. If data other than those listed above are to be entered, such as consult reports, op notes, discharge summaries, EKGs, radiology or pathology reports, old labs and old notes, scanning or backloading may be the best option.

At PCPC, we initially abstracted only active problems, current medications and allergies, taken from the paper chart's face sheets. However, clinicians found this approach inadequate because the face sheets were not updated and the information proved unreliable. Further, the physicians wanted more complete data, including family history, social history, past medical history and past surgical history. We ultimately abandoned the face sheets and entered a more complete data set by reducing the number of charts being abstracted.

Data collection

Data can be gathered from chart reviews, cover sheets already present in the chart or pre-formatted forms created specifically for the EMR implementation. By abstracting only data on cover sheets or pre-formatted forms filled out by providers, it's possible to cut down on time, cost and confusion. Abstracters can save significant time if they don't have to read through the chart to gather data. Also, it may not be desirable to have the abstracter making decisions regarding which data are pertinent. The use of cover sheets and forms, however, must be consistent in order to have a significant impact on abstraction cost, a point that may be difficult to impress upon providers, especially before the system is in place.

At PCPC, we abandoned the forms on the front of the chart a month after startup. The time increase to switch from forms to full chart abstraction was substantial (from five minutes per chart to 15 to 45 minutes per chart) but significantly improved provider satisfaction and data accuracy and completeness.

Which charts

An organization can cut abstraction costs not only by restricting data items, but also by limiting what charts to abstract. For example, charts of patients who are no longer receiving care or taking medications, have few, if any, problems or have limited histories should probably not be abstracted, freeing up staff to perform thorough abstraction of more complicated charts. Abstracting only charts of patients with impending appointments is more efficient, but does not eliminate thin charts or charts of patients who require a visit and no follow-up. One option: have providers select the charts to be abstracted by check-off on a patient batch list, or by selecting them at daily or weekly intervals from the schedule. At our pilot, providers choose patients from a batch list, which has substantially reduced the workload and allowed us to do full chart reviews and abstract more data per chart.

Scanning

The ideal of a completely electronic patient record and paperless office may be a pipe dream if only because it's almost impossible to stop the flow of paper into the office. While use of an EMR integrated with other systems can greatly decrease paper flow, there's little chance paper will disappear completely. Conventional mail will continue to bring in such documents as referral letters from other physicians, colonoscopy reports, echocardiogram reports and pathology results, providing a strong temptation to revert back to paper systems. It cannot be overemphasized that the EMR is most useful when it is the primary source of patient data.

Both the physician champion and office manager need to play an active role in deciding what data will be scanned and how that data will be catalogued in the EMR. The office manager will need to decide how to re-arrange staffing needs to accommodate scanning and develop a method to archive or otherwise dispose of scanned documents. One of the issues we encountered during our pilot involved multiple-page documents.

Workflow analysis affected three major aspects of implementation at the local level: training, security levels and ergonomics.

The transition from paper to electronic records will be faster and more efficient if historical data is pre-loaded into the EMR prior to start-up.

Many of the reports that arrived in the office after start-up contained cover letters with several pages of supporting documentation below. To cut down on the time spent scanning unneeded documents; we devised office procedures delineating which pages of each document type were to be scanned. Because of this (and some legal concerns) we were forced to archive these scanned documents rather than destroy them.

Customization

An attractive feature of many commercial EMR products is their ability to be customized to a particular practice. The implementation team should identify potential areas of customization and define procedures for handling what will be an on-going process of change. Two areas of possible customization are coding synonyms and documentation.

Order entry, diagnosis codes and synonyms

If the EMR is to gain clinician acceptance, it must help minimize the time it takes to enter orders for lab tests, x-rays and medications. In the paper world, this happens by quick check-off of a few boxes on a lab form. If the form lacks the name of the lab, you just write it in. Someone, probably a secretary, then looks up that lab test in a book of CPT codes and writes it in for you prior to sending it to the lab. In some cases, it will be written-in upon arrival at the lab.

EMR order-entry systems require the ordering clinician to find the test with the appropriately associated code, saving the secretary from searching for the test. However, if the system is improperly set up, it will waste clinician time. A similar problem occurs when selecting coded diagnoses for a patient encounter. To search for a code the clinician can use one of several methods:

1. Selecting from "drop-down" lists or menus
2. Using a search program
3. Using a combination of the two

Most clinicians prefer a search tool because of the tedium involved in scrolling through long lists of codes and diagnoses—and they typically have a good idea what test they want. So, the system must be prepared to search for codes and diagnoses based on the standard vocabulary that a clinician would use. Synonyms such as "BPH" for "Hyperplasia of the Prostate" are often required to speed the data-entry process. The key is to use synonyms that match the language the clinicians at your practice use. Although it is technically possible to embed a standardized vocabulary into an EMR, our system did not come with a "pre-loaded" list of synonyms, a fact that frustrated clinicians searching for diagnostic codes.

While we built as much of our synonym lists as possible prior to start-up, it was also important to update them afterward. When multiple users began using the system, requests for synonyms soared. It was more important to have a good collection method for the synonym lists than to input them all into the system before start-up. We provided synonym

Abstraction provides an opportunity for clinicians to become involved in the implementation process.

forms in each exam room and collected them at the end of each day, for review by the physician champion prior to submission to the technical team.

Documentation

Without question, the most difficult aspect of the comprehensive EMR for clinicians is documentation of office notes. Most EMR's enable clinicians to do this task through tools like macros (small blocks of text that represent larger blocks), templates, integrated voice recognition and written recognition, the last two of which are just beginning to mature for mainstream adoption.

Our system offers a combination of macros and templates, which we found were the most useful to clinicians. (See Figure 3)

Figure 3: Recommendations for documentation tools

- They must be learned and used early when behaviors are changing
- They must be easily customizable
- They must be easily shared among physicians
- Templates should be short
- Templates should have areas for "free text"

Structured office-notes entry is desirable because of its inherent ability to search the notes for research purposes. While a detailed discussion of these issues is beyond the scope of this report, Figure 3 refers specifically to issues that improve ease of use and clinician satisfaction.

General Tips for Local Champions

This final section details some general observations on successful implementation behavior on the part of local champions.

Have a method for collecting complaints and concerns. After start-up, there will be no shortage of feedback on various aspects of the system and its use in the office. Creating a database to log this feedback and respond to it is important. Even a quick note or e-mail to let the clinician know that it can't or won't be done, and why, is enormously helpful in getting clinicians' buy-in. In our experience, most complaints and concerns required attention from the technical team, but members of the practice were more willing to open up to the physician champion and office manager. We kept a database to log these concerns and communicate them back to the technical team in a timely manner.

Respond to concerns, but not too quickly. Not all of the ideas that you will get after start-up will be beneficial to the practice. You will need to filter the ideas and think through each of them before making any changes. For example, moving a PC or printer may initially seem like a good idea until its impact on other workflow areas is understood. Implementation-team members with good knowledge of both office

One of the challenges of abstraction is determining how to extract the most valuable data for the least amount of money.

workflow and the system should meet periodically to discuss feedback and decide which ideas to use.

Concentrate on those who need it the most, but don't forget the others. People deal differently with stressful situations, some more vocally than others. The key is to try and elicit feedback from everyone by having, at the minimum, periodic meetings to discuss problems. It may be useful to have these meetings with very few members of the technical team present so clinicians can speak their minds openly. The physician champion or office manager can then communicate these concerns back to the technical team.

Relax, this will take some time. Based upon some studies, clinician acceptance can take as long as four months. The EMR represents a tremendous cultural change in how the office does business and how doctors relate to patients. This kind of change does not happen overnight no matter how enthusiastic the doctors are. Implementation should be thought of as a process filled with pitfalls and some stress, but the ultimate outcome should be better charts, more efficient office staff, well informed patients and satisfied clinicians.



The most difficult aspect of the comprehensive EMR for clinicians is documentation of office notes.

Mark it down ...

SI Membership Conference April 13-15, 2000

**Camelback Inn
Scottsdale, Arizona**
