# **Can a Large Institution Go Paperless?**

# Daniel Z. Sands, MD, MPH, David M. Rind, MD, MS, Cynthia Vieira, and Charles Safran, MD, MS

Division of Clinical Computing, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts, USA

#### Abstract

Since 1989, Beth Israel Hospital has been deploying an extensive online patient record (the OMR), which augmented a heavily used integrated hospital information system. Initially begun in a large primary care practice, the system is now used to share patient records among 36 practices on three campuses. Although the system was intended to eliminate the need for paper, we have found that it has, in the short term, increased the amount of paper produced. Elimination of paper record in ambulatory care has saved us \$56,000, but we have yet to realize the savings of an additional \$200,000 per year. We explore the factors that contribute to this "paper paradox" and discuss the costs associated with increased paper production, areas in which we have reduced paper handling, and strategies for reducing our reliance on paper.

### Keywords

Electronic Patient Records; Computerized Patient Records; Paperless Systems; Cost Saving

# Introduction

Computerized patient records can improve the quality of care, increase practice efficiency, and decrease reliance upon paper records and documents.[1] Is paper reduction also possible in a previously paper-driven organizations? Although many have promised paperless offices with computerized records, [2,3] others have quipped that the paperless office is as likely as the paperless bathroom.

A number of organizations have succeeded in deploying computerized patient records, [4,5,6,] yet little is written about measuring progress toward the goal of paper reduction. But since this is one of the possible goals of computerization of records, we need to know if we've achieved that goal.

# Methods

We have previously described the OMR, [4,7] a computerized patient record developed to expand the functionality of a heavily-used integrated hospital system. [8] We began using an early form of the OMR in a large hospital-based primary care practice in 1989, and by 1991 the program had evolved into a full-featured electronic record.

# OMR Team

We developed a team of clinician informaticists (both doctors and nurses), programmers (with program managers), and user liaisons. This team meets for one hour biweekly to discuss deployment strategies and training issues.

### **Data Acquisition**

We wrote programs on our legacy system that could be run using a begin date and end date as parameters. The programs run through the scheduling system and/or the OMR system files to identify providers, patients, and entries into the OMR. Because there is no link between documentation and scheduled patient visits, a note was felt to be pertinent to a given visit if it was written by a provider in the same clinic within 5 days of a scheduled appointment. This allowed for human error in provider dating of notes.

It is inefficient to utilize mainframe computing resources for data filtering and analysis. Therefore, comma-delimited text data files created by these programs are transferred via FTP (Internet file transfer protocol) to a networked Windows NT file server. Authorized users on the network can then read these files directly into analytic programs such as Microsoft Excel.

### **Cost Estimates**

We based our cost estimates on 1996 costs of supplies and wages for medical records workers in our institution.

# Results

## Practices Using OMR

The first non-primary care specialists to adopt the OMR were the mental health and infectious disease specialists who sometimes saw patients within the primary care practice. Later, others in these specialties began entering data into the OMR. By 1995, growth was very rapid: by the end of 1996, 1001 providers in 36 practices had entered OMR information into the records of 67,604 different patients.

Three of these practices, including the pilot site, were primary care practices. The two off-site primary care practices were part of multidisciplinary health centers that were geographically distant from the medical center. The directors of one of the centers decided soon after it opened to adopt the OMR as their standard of care.

Table 1 lists the 19 main campus practices with highest use of the OMR in the final quarter of 1996 are listed along with the year the OMR was introduced in the practice and data on the proportion of patient visits documented, as well as the practice's contribution to the visit volume of the medical center. Overall, these 19 clinics accounted for 39 percent of visits to the medical center.

Table 1 - Top main campus clinic users of OMR, fourth quarter, 1996

Clinic	Visits with Notes	% Total Visits	Year Started on OMR
HCA MEDICAL UNIT	98.0%	18.8%	1989
MUSCULOSKELETAL	97.9%	1.4%	1995
PODIATRY	94.1%	1.5%	1995
FACULTY ID	92.9%	0.0%	1991
SLEEP	92.0%	0.7%	1995
SOCIAL WORK HCA	90.9%	2.5%	1995
RHEUMATOLOGY	88.9%	0.1%	1995
PSYCH HCA	88.0%	1.2%	1990
GI	87.5%	0.0%	1996
ENDOCRINOLOGY	87.3%	1.6%	1995
HEME/ONC	85.2%	6.2%	1994
RHEUM	81.6%	1.0%	1995
EYE (PRIVATE)	81.1%	0.1%	1993
PULMONARY	80.8%	0.6%	1995
BEHAVIORAL NEURO	79.3%	1.7%	1995
PSYCHOPHARM	79.2%	1.3%	1995
PSYCHIATRY	73.1%	0.3%	1995
INFECT DISEASE	70.9%	0.1%	1991
SIGMOIDOSCOPY	53.5%	0.1%	1996

#### New Documentation by Year

New notes entered into the OMR each year is shown in Figure 1, new medications ordered is in Figure 2, and new problems entered is in Figure 3. In each, the dark part of each column represents specialist use, while the lighter part is primary care use.

In 1996, 653 providers (of which 76 percent were physicians) entered new data into the records of 30,508 different patients. Compared with 1995, the number of providers had increased 16 percent and the number of patients increased 34 percent.



20.000

1989 1990 1991 1992 1993 1994 1995 1996

Figure 1 - New notes entered into OMR by year



Figure 2 - New medications ordered through OMR by year



Figure 3 - New problems entered into OMR by year

## **Cost Savings and Potential**

Although it is difficult to estimate the cost of a paper record that is not delivered in a timely manner (in some institutions, this proportion is 30%), is not legible, or is incomplete (more than 40%),[1] some savings are more concrete.

### **Realized Savings**

The cost is about \$1 per paper record request in the main campus of our institution. This includes retrieving, tracking, delivering, retrieving, and refiling the record. Based upon this figure, in 1996 our savings in the medical records department alone was \$56,000:

- Twenty thousand paper records were not delivered to the primary care practice for phone messages, for a savings of \$20,000.
- Thirty-six thousand paper records were not delivered to the emergency unit or to the floor of hospitalized patients for a savings of \$36,000.

• Total savings for 1996 was \$56,000.

## Potential savings

If we stopped delivering paper medical records to the 19 practices that have at least 50 percent of their notes online we would save an additional \$109,000 per year.

Our medical records department prints more than 367,000 sheets of paper each year for filing in records of ambulatory patients. That is roughly 1000 sheets per day. Seventy-one percent of this is printouts of patient results reports for filing, 20 percent is OMR notes, and 9 percent is operative notes and discharge summaries. The cost for supplies to print this (and thus the potential cost savings) is \$20,000.

Filing these papers requires about 6000 hours, which is worth \$69,000.

These documents occupy 187 linear feet of file space. This space requirement causes the medical records department to move records off-site more frequently. This extra storage and retrieval costs the organization \$10,000.

The total potential savings is therefore \$200,000 per year.

Overall, the total of realized and potential cost savings from not having to manage paper records in our institution is \$250,000 per year.

# Discussion

### The Paper Paradox

We have achieved success in making much of our institution paperless, but the organization (like many others) has thus far been unable to give up paper entirely. Despite our hopes, the computerization of medical records has not led to paperless medical care. Worse than that, it has increased the amount of paper produced which must be managed by our organization. What are some of the reasons for this?

## **Comfort and Convenience**

The first, and perhaps most important, factor in reluctance to abandon papers is that paper is comfortable. Paper is easy to look at and we are comfortable holding, scanning, and flipping through paper records. It is difficult for computerized records to compete with this.[1]

Paper records, if they are legible, can always be read, transferred, copied, and stored. Because of this, we may never be able to give up printing documents, at least on demand.

#### Legal Issues

Legal requirements force us to store patient records for long periods (up to 20 years in the case of psychiatric hospitals in some states). We know that paper will still be legible 20 years hence, but what about magnetic media? Will the hardware and the programs necessary to view these records still be around?

### **Difficulty Making Transition**

How does an organization move to a culture in which the patient record is no longer paper, but is entirely computerbased. One attractive solution might be to permit *hybrid* records that are part online and part printed. Is this efficient? In a paper-based environment clinicians need only read the paper record if they wish to review it. In a totally online environment there are no paper records, so clinicians are forced to turn to the online record. In a hybrid system, however, clinicians must be taught that the complete record is a composite of the paper-based and online information. If the organization cannot adapt to this, authors of computer-based documents will be forced to print copies for insertion into the paper record. This will have the effect of delaying the transition to a paperless system.

Can a fully online record exist, given that some documents and images are generally not incorporated into the electronic record? [9] Organizations must develop strategies for the incorporation of the content of paper documents from outside the institution. This might involve scanning (ideally with optical character recognition), transcription of relevant data, or maintenance of a paper record just for these types of documents. Images (such as drawing, photographs, and radiography) not yet stored online must be dealt with through analogous techniques.

The severity of the difficulty with the transition to paperless records is probably directly proportional to the size and age of the organization. A small group practice just starting up will have an easier time moving into a paperless environment than a large, well-established health center.

# Conclusion

Computerization of patient records is a laudable goal, and one that many organizations are pursuing. Although electronic systems promise us paperless offices, increased documentation in successful systems such as ours can actually increase paper production. Organizations must anticipate this and design strategies for managing this paper burden.

In our medical center we have been successful in deploying a computerized patient record, and we are developing a timeline to stop the printing and unnecessary delivery of paper records.

#### Acknowledgments

Supported part by a cooperative agreement award from the Agency for Health Care Policy and Research (HS08749) and the National Library of Medicine (U01 LM 05877)

# References

- Institute of Medicine. The Computer Based Patient Record: an essential technology for health care. National Academy Press, Washington, D.C., 1991.
- Purves IN. The paperless general practice [editorial]. BMJ 1996;312:1112-3.
- [3] Batson E. The paperless office: what office automation holds in store. Postgrad Med 1983;74:231-4.
- [4] Safran C, Rury C, Rind DM, Taylor WC. A computerbased outpatient medical record for a teaching hospital. MD Comput 1992;8:291-9.
- [5] Van der Lei J, Duisterhout JS, Westerhof HP, van der Does E, Cromme PV, Boon WM, van Bemmel JH. The

introduction of computer-based patient records in The Netherlands. Ann Intern Med 1993; 119:1036-41.

- [6] Skinner RI, Leavitt MD, Bentz C. Ambulatory systems for managed care. HIMSS Proceedings, March 1996.
- [7] Safran C, Rind DM, Sands DZ, Davis RB, Wald J, Slack WV. Development of a knowledge-based electronic patient record. MD Computing 1996; 13:46-54,63
- [8] Bleich HL, Beckley RF, Horowitz GL, Jackson JD, et al. Clinical computing in a teaching hospital. N Engl J Med 1985;312:756-64.
- [9] Rind DM, Safran C. Real and imagined barriers to an electronic medical record. Seventeenth Annual Symp Comp Applic Med Care 1994:74-8.