

Electronic Medical Records in Family Practice: The Time Is Now

Steven M. Ornstein, MD
Charleston, South Carolina

As we approach the new millennium, information technology will catalyze dramatic changes in many aspects of medical care delivery and education. Easy to use, affordable computer-based tools will bring relevant clinical information to the point of patient care and to patients in their homes. E-mail communication between health care providers and patients will alter the traditional doctor-patient relationship. Many undergraduate, residency, and continuing education activities will occur in the "global village," using the Internet as the communication medium. Family physicians in the next century will actively use these tools, but they need not wait to join this computer revolution. Electronic medical records (EMR) are useful tools that are available today.

Concurrent with changes in information technology are changes in the health care environment. Family physicians are challenged simultaneously to increase productivity and improve the quality of care they provide. Clinical information management is critical in this environment, and EMR systems are superb information management tools ideally suited to help family physicians meet these challenges.

LIMITATIONS OF TRADITIONAL MEDICAL RECORDS

Traditional paper records are impediments to optimal information management and have an adverse impact on both productivity and quality. Productivity is affected, since paper records are often unavailable, missing important information, eg, a recent visit note or laboratory data, or written illegibly. Valuable staff time in many practices is wasted looking for information previously recorded. Even when available, paper records can be in only one place at a time, resulting in time-consuming work when information is needed. Paper records are not integrated with financial or appointment scheduling systems and require duplicate or triplicate

entry of standard demographic and transaction data. Paper records are also expensive. Assuming a cost of \$4.00 per chart, a 4000-patient, two-physician practice will spend \$16,000 on paper records plus additional costs for chart racks and storage space. Considerable ongoing expenses are also required for personnel to manage the paper records.

Paper records are also impediments to quality patient care. Besides lack of access, which obviously affects quality, paper records have inherent limitations. Maintaining accurate problem lists, medication lists, and preventive services information requires triplicate entry on paper (as orders or on a billing form, in the visit note, and on the lists themselves). Consequently, many physicians do not maintain accurate information about patient problems, medications, or preventive services. Paper records cannot provide reminders, such as provider or patient reminders for needed preventive services or disease-state monitoring. Nor can they provide point-of-care decision support or support for practice guidelines, test ordering, drug prescribing, drug-drug interactions, encounter documentation, and other actions. Finally, paper records are barriers to optimal quality assurance and quality-improvement activities. Data gathering from paper records for many process and outcome variables that are important quality markers can be extremely time-consuming or even impossible.

ADVANTAGES OF EMR SYSTEMS

Electronic medical records overcome essentially all these limitations of paper records. Productivity is improved in several ways. Searching for information is greatly simplified, reducing provider costs. Once data have been recorded in an electronic record, they are always available simultaneously to all authorized users and at all locations that have access to the computer system. Through a standard, inexpensive telecommunication link, busy physicians can access their records at the hospital, at home, or while traveling.

In the office several productivity gains accrue. Preparing for a patient encounter is simplified, since a physician can review a chart at the same time as a nurse or other provider. Finding information in a

From the Department of Family Medicine, Medical University of South Carolina, Charleston. Requests for reprints should be addressed to Steven M. Ornstein, MD, Medical University of South Carolina, 171 Ashley Ave, Charleston, SC 29425. E-mail: ornstesm@musc.edu

computerized chart is simplified, since records can be searched and displayed in many ways. For example, visit notes can be displayed chronologically, by problem, by provider, or in other formats. Laboratory data can be viewed in text form, in tables, or graphically.

Electronic records can also simplify data entry. Prescription writing tools can greatly reduce the time required for medication renewals, particularly for patients taking multiple medications. Documentation support tools can simplify charge capture, through electronic coding systems and superbills. Support tools can also assist providers with direct visit note entry, eliminating both the cost and time delays inherent in dictation and transcription. Even when charts are dictated and transcribed, electronic records simplify the process, since notes to be reviewed can be flagged, read, and edited electronically.

Administrative tasks are also simplified. Internal messaging within the electronic record can reduce time-consuming "phone tag" and manual chart transfers. Electronic records can be linked with financial and appointment scheduling systems, streamlining information entry, retrieval, and reports. Outside requests for charts are greatly simplified, since records can be sent electronically or by facsimile directly from the record, eliminating the need for chart copying.

Although the initial capital outlay for electronic charts can be significant (\$15,000 per full-time physician to fully automate a physician's office is a reasonable estimate), incremental costs are modest. Indeed, computer storage at current prices of \$.20 per megabyte for a typical magnetic hard drive are far less than that of paper. In addition, storage space for computers is minimal, and reliable modern computers and software require little personnel time.

QUALITY IMPROVEMENT

Electronic records can also help improve quality apart from the obvious gains of ready access. Maintaining accurate problem lists, medication lists, and preventive services information is greatly simplified, since data need be recorded only once. Reminders for needed preventive services or disease-state monitoring can easily be provided to physicians and patients. Practice guideline information, test ordering, and drug-prescribing decision support are easily incorporated in computerized

records. Results-reporting functions can help ensure that abnormal findings are addressed. Quality assessment and improvement activities are greatly eased, since practice-level process and outcome data on clinical variables are readily accessible.

At our Family Medicine Center, we are using data from the EMR to increase the recognition of tobacco abuse, intensify care for patients with poorly controlled hypertension or diabetes, decrease use of antibiotics and increase use of bronchodilators in patients with acute bronchitis, increase the use of inhaled anti-inflammatory medications in patients with persistent asthma, and improve adherence to the recommendations of the US Preventive Services Task Force.¹

PRACTICE-BASED RESEARCH

EMR systems permit busy family physicians to participate in important practice-based research. Since most EMR systems permit searches on their underlying database, identifying patients appropriate for research projects is relatively simple for physicians. Subjects can be found with specific disease states, clinical or laboratory findings, medication use, or other criteria required by the study. In addition, it is relatively easy for the physician to provide data for the study that can be accessed directly from the EMR. These capabilities can support research within both the practice and practice-based research networks. A newly formed, novel practice-based research network, which I am privileged to coordinate, links more than 300 physicians who use an EMR system across the United States and will likely be a model for other research networks.

INTEGRATION WITH OTHER COMPUTER-BASED APPLICATIONS

Use of an EMR system can catalyze, at minimal cost, the incorporation of other useful computer-based applications in practice settings. Such applications include physician and patient education software, electronic mail, and access to the wider resources available on the Internet. In our clinical practice, clinical workstations include access to our EMR, our hospital's clinical data repository, scheduling and electronic mail functions, a World Wide Web browser, and other functions. Novice computer users have learned to communicate with their colleagues worldwide by E-mail. Some physicians are communicating with their patients by E-mail and noting immediate

advantages in terms of increased patient satisfaction. Some patients have come to expect printouts from "the Web" as part of their encounter in our medical center.

MOVEMENT TOWARD EMR SYSTEMS

The advantages of electronic medical records compared with traditional paper records have been described previously in this Journal² and are well recognized by the prestigious National Academy of Science Institute of Medicine. In a 1991 report, the Institute of Medicine called for a national effort to develop a comprehensive computer-based patient record system.³ Such a system would be a distributed, longitudinal, information database with features such as access to patient information across an individual's life span, comprehensive decision-making support, flexible reporting, a defined vocabulary and coding system, and transparent connectivity with other systems. At present, work is ongoing in many academic settings, government agencies, industrial settings, and coordinating groups such as the Computer-Based Patient Record Institute (Schaumburg, Ill) to realize this vision, which remains years away.

Of more practical interest to the practicing family physician are four recent developments. First, there is increasing empirical evidence of the clinical value of EMR systems.⁴ Second, despite an occasional contrary report,⁵ many case studies describe the successful application of EMR systems. The reports are from a broad spectrum of practice settings, including a small private practice,⁶ an academic family medicine center,⁷ and a health maintenance organization.⁸ Third, several reports document the favorable response that patients have to electronic records.⁹⁻¹¹ Physicians need not fear that the doctor-patient relationship will be adversely affected by EMR systems. Finally, the marketplace and our professional organization, the American Academy of Family Physicians (AAFP), have responded to the need for EMR systems. At the October 1996 AAFP national assembly in New Orleans, more than a dozen vendors had exhibits showing their EMR systems, and a computer "petting zoo" gave physicians hands-on experience with several of these systems. In addition, 3 days of computer lectures and demonstrations were offered, both in small group hands-on and larger group formats. Prices for computer hardware continue to plummet, and more software vendors enter the EMR

market monthly.

Despite these developments, it is widely accepted that only 2% to 3% of office-based physicians and approximately 5% of family medicine residency programs use EMR systems. Family physicians, practice managers, and group administrators need additional exposure to these systems. Several options are available for this purpose. First, national and some statewide AAFP meetings have both presentations and vendor displays of EMR systems. Second, journals such as the AAFP's *Family Practice Management* have already published¹² and plan to update reviews of available systems. Third, electronic resources are available. A discussion group (fam-med@gac.edu) provides a lively discussion about EMR systems and other computer applications in a practice setting. A comprehensive listing of EMR vendors, ("The Web Directory of EMR Vendors") can be found at the Universal Resource Locator (URL): <http://www.telemedical.com/Telemedical/Products/emr.html>. Other information, including comments from vendors and users, is available in "The CPR Foyer" at URL: <http://www.whcat.com/cpr.htm>. Finally, some organizations that have successfully implemented EMR systems provide opportunities for others to learn from their experiences. Our department of family medicine offers a monthly symposium, "The Computer-Based Patient Record as a Continuous Quality Improvement Tool," for this purpose.

It is my belief that the advantages of electronic records are clear, and that they can be successfully used in a variety of family practice settings. Family physicians and practice administrators can learn more about EMR systems in a variety of forums. It is time to implement electronic records on a widespread scale in family practice.

REFERENCES

1. DiGiuseppi C, Atkins D, Woolf SH, Kamerow DB, eds. Guide to clinical preventive services. Report of the US Preventive Services Task Force. 2nd ed. Baltimore, Md: Williams & Wilkins, 1996.
2. Spann S. Should the complete medical record be computerized in family practice? An affirmative view. *J Fam Pract* 1990; 30:457-64.
3. Dick RS, Steen EB, eds. Institute of Medicine (US) Committee on Improving the Patient Record. The computer-based patient record: an essential technology for health care. Washington, DC: National Academy of Sciences, 1991.
4. Balas E, Austin SM, Mitchell JA, et al. The clinical value of computerized information services. A review of 98 randomized clinical trials. *Arch Fam Med* 1996; 5:271-8.
5. Lawler F, Cacy JR, Viviani N, et al. Implementation and termination of a computerized medical information system. *J Fam*

- Pract 1996; 42:233-6.
6. Brenner S. High tech solutions double productivity for local solo family practice. MD News, 1996. In press.
 7. Ornstein SM, Garr DR, Jenkins RG. A comprehensive micro-computer-based medical records system with sophisticated preventive services features for the family physician. J Am Board Fam Pract 1993; 6:55-60.
 8. Churgin PG. Introduction of an automated medical record at an HMO clinic. MD Comput 1994; 11(5):293-300.
 9. Legler JD, Oates R. Patients' reactions to physician use of a computerized medical record system during clinical encounters. J Fam Pract 1993; 37:241-4.
 10. Ornstein S, Bearden A. Patient perspectives on computer-based medical records. J Fam Pract 1994; 38:606-10.
 11. Solomon GL, Dechter M. Are patients pleased with computer use in the examination room? J Fam Pract 1995; 41:241-4.
 12. Ornstein S, Schaeffer E, Jenkins RG, Edsall RL. A vendor survey of computerized patient record systems. Fam Pract Manage 1996; 3(2):35-49.