White Paper

COMPUTERIZED PATIENT RECORDS:
Positive Impact for Medical Practices, Patients, and Profit
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I. Introduction: The Why of Computerized Patient Records

Hippocrates practiced medicine without the need or benefit of clinical records in 400 B.C. Even at the start of the twentieth century, neither physicians nor hospitals routinely kept such records. Patient records are a comparatively recent phenomenon, having gradually evolved over the past 80 years. To meet the increasing complexities involved in patient care, physicians began maintaining paper records of their patients' clinical visits, (Ornstein, 1992). The ever expanding quantity of new and sophisticated medical information continues to challenge practicing physicians in several ways; not the least of which is the time involved to complete the myriad tasks involved in providing quality care, documenting the appropriateness of those tasks and correctly coding those tasks for billing purposes. The paperwork involved in providing health care has become voluminous and burdensome for physicians; especially in light of the ever changing health care insurance benefit terms, the continual patient flux from plan to plan, increasing availability of new diagnostics, therapeutics and devices, and regulatory requirements for documenting the appropriateness of care. For nearly all doctors, increased patient load, coupled with the increasing complexities of new diagnostics and therapeutics, combine to significantly increase the burdens associated with paper records (Nelson, 1998).

Computers have undeniably infused numerous aspects of daily life, including the provision of health care. Advances in computer technology and artificial intelligence have enabled the development of medical informatics tools that are designed to improve both the efficiency and accuracy of health care delivery by automating certain care provision tasks. The earliest generation of computerized medical records stored data as text. These records were, however, unable to achieve improvements in information manipulation. The use of relational database management systems has largely solved this problem, (Frenot, S., 1999). In recognition of the benefits in efficiency and accuracy that computerization offers, government agencies, computer giants and medical organizations continue to work towards standardized computer-based medical information systems. The computer-based medical record is designed to address numerous deficiencies of the paper record, enhance workflow within the medical practice, and improve the quality of patient care.

II. What is the computerized patient record?

The computerized or electronic record is essentially a paperless patient chart and is often referred to by varying terms, the computerized patient record (CPR), the electronic medical record (EMR) or the electronic patient record (EPR). For some, these terms specifically denote levels of complexity in functionality. Five such levels of functional complexity are thought to encompass the universe of types of paperless charts, and correspond to level of implementation. The first level refers to automated medical records. Automated medical record systems are records that are still in paper format, but are computerized to the point where specific automated tasks can be conducted. Computerized medical records, the 2nd level, are records created by traditional means (being either handwritten, dictated or transcribed), and then indexed or scanned into an electronic system that offers the same functions as a paper-based system, namely recording the health care process and providing accessibility to previously recorded information. The 3rd level is the electronic medical record (EMR) -- an upgraded version of the former. While it contains the same scope of information, the information is arranged for computer use and typically contains document imaging and interfaces to core components of care delivery, i.e. ordering and retrieving laboratory tests, prescription writing, consultation/referral notes, and billing. Specifically, a common format for information accessing and recording is mandatory. Access must be controlled; computer signature mechanism and data integrity are key. The 4th level also called the EMR or computerized patient record (CPR), focuses on the patient and contains information from one or more provider enterprise. It combines several medical records concerning one patient and assembles a record that goes beyond the enterprise-based retention period. This level requires an identification system that goes beyond the enterprise, inter-operability between various provider systems, as well as practice standards and legislation that allow interstate or international operation. Level 5, the electronic health record, is a more comprehensive collection of the individual's health information. This level includes a network of provider and non-provider settings based on the patient's health and wellness. This level requires an information infrastructure that involves homes, providers and other sites.

III. Why paper medical records are increasingly inadequate.

Paper medical records increasingly reveal themselves to be inadequate in several ways. Just a decade or two ago, physicians began dictating their medical notes for secretaries to transcribe and type. Typed records would go into paper folders, labeled with the patient's name or some other identifying factor. The accuracy of this type of clinical record depended on the quality of the physician's memory, (which typically is reasonably accurate), and the secretary's accurate transcription. The accessibility of the chart depended on making sure that the new paper record was put into the correct chart and that the chart was correctly filed. The labor and time involved in this process, as in pulling the chart at the time of a patient's visit or telephone need, are non-trivial. At the same time there is the constant risk of system failure when charts (or parts of charts) are misfiled or lost, inaccurate or illegible; the consequences of which can be life threatening for those patients involved, not to mention the astronomical loss of time and potential revenue.

The American College of Pathologists contends that, "while incredible advances are made each year in patient care, the healthcare industry continues to suffer from a lack of integrated information, especially in light of the need for providers, researchers, administrators and vendors to share healthcare knowledge across clinical specialties and sites of care." "Whether data is retrieved from a single patient or group of patients or an entire population", the College maintains, "EMRs improve the coordination of patient care and potentially reduce the occurrence of medical errors. When you put medical information in a chart, you're not sure of all the questions that may be asked later. But if the information is stored in an electronic form and the databases are all relational, you can answer any conceivable question". [i] Such permits the possibility of truly achieving a continuum of care.

Paper-based patient records are proving increasingly inadequate to meet the modern information needs of group and solo practices alike. Computerized medical records can improve doctors' access to patient information, better ensure the accuracy of information contained in the record, but also facilitate improvements in patient care and outcomes management. As the practice of medicine grows in complexity, and the public demands demonstrated value at decreased cost, improving the effectiveness of patient care and evaluating patient outcomes is increasingly imperative.

EMRs are likely to become standard in the next five years for several reasons, not the least of which is their capacity for producing increased revenue while simultaneously reducing costs. Substantial cost savings are seen in various types of medical practices; labor savings in clerical, front desk, transcription, nurse and medical assistant and physician personnel, as well as malpractice premiums, and storage and supplies. In addition, the time savings obtained enables physicians to see more patients (Renner, 1996). The EMR has become financially feasible for even very small medical practices (Prince, 2000). General practice databases have shown themselves to contain more accurate charting and consultation notes than paper-based records, thereby validating their superiority as bases for analyzing health care quality parameters and outcomes, (Neal, 1996). Furthermore, EMRs permit more accurate coding for billing and thus potential increased revenue.

IV. Electronic Patient Records Offer Substantial Benefits to Physician Practices of Various Types and Sizes

1. <u>The electronic medical record addresses many of the deficiencies of paper records by</u>:

   - Reducing time and labor costs associated with paper records
   - Providing easily verifiable documentation of care according to billing code requirements
   - Improving the quality of care by providing point-of-care reminders and clinical alerts
   - Interfacing with key aspects of care provision; laboratory ordering/result retrieving, prescription writing, test/document imaging, correspondence generation, consultation/referral notes and billing agencies, thereby generating a database designed to substantiate the effectiveness of care
   - Being accessed from various locations (home or office) permits different providers to work on the same record simultaneously.

The integration of EMR systems facilitates knowledge representation in differing formats to decision makers. This capacity promotes more accurate and appropriate decision-making with subsequent

improvements in health care delivery, (Hannan, 1999). The EMR's ability to integrate data repositories -- storage of existing and evolving information and applications (information management tools) -- permits streamlining of daily operations, such as prescription writing, consultation notes, hospitalization paper work, ordering, reviewing and in-putting lab results. The EMR offers vast improvements to traditional paper medical records, in reporting, organizing and locating clinical information, as well as easy support of clinical decision making and improvements in managing and coordinating patient care, (Anderson, 1994).

Many of the systems evaluated permitted interactive documentation via voice recognition and gisting technology, and most produced paper-based output, (Conn, 2000), (Information Week, 1998). Communication services were integrated to the EMR, permitting ease of correspondence and other communicative activities. Documentation improved in 4 of 4 studies! Specifically, electronic medical records containing clinical guideline reminders (appropriate clinical specific activities that should occur in specific clinical situations) delivered at the point-of-care, facilitated the following improvements in physician documentation (the collection, recording or storage of observations, assessments or interventions related to care):

- The average number of pre-surgical authorization data items went from 4 to 28.8
- The mean percentage increase for common pediatric complaints was 58%
- The mean percentage increase for back pain management was 30.2%
- The mean percentage increase for management of exposure to bodily fluids was 42%

Most systems evaluated used computer- or paper-based prompts to remind clinicians to document critical information. (Shiffman, 1999)

Studies indicate that CPRs could produce substantial savings in reducing manual functions, eliminating paper charts, and reducing physician documentation time. A 5-physician model practice was assessed to estimate expected cost savings of an effective EMR system. The requirements of an effective system were taken to be the following:

- Making medical records readily available at all times from all destinations
- Providing accurate, up-to-date patient status and care management information
- Creating automatic, up-to-date graphs and flow sheets that show test-result trends
- Providing immediate notification of test results and status changes
- Performing insurance verifications/pre-authorizations
- Facilitating timely and reliable health maintenance screening, planning and scheduling, and
- Flagging allergies and possible drug interactions automatically.

Ancillary administrative functions, such as managing patient registration and scheduling, would add value to overall effectiveness. Time and motion studies conducted at the model practice (a 5-physician primary care clinic in Massachusetts with roughly a 14,000 patient population) found that an effective system (as defined above) could result in the following cost savings, based on automating the following manual tasks. (Note that anecdotal evidence suggests that these estimates are substantially lower than what is true for most practicing physicians)

- 22 patient encounters per physician per day triggered 44 filing activities per physician or 220 daily file-related activities for the practice.
- 6 test results per physician per day resulted in 60 total file-related activities per day for the practice.
- 3 pieces of correspondence per physician per day caused 30 total file-related actions to be performed (for the entire practice).
- 8-phone messages/ physician per day resulted in 80 file-related actions/day for the practice.
- 3 phone consults per physician per day resulted in a total of 30 file-related actions per day for the practice.

Combined, a total of 360 file-related activities were generated by each physician in the five-physician practice per day, or 1800 file related activities per week for the practice, *if the practice is operating at maximum efficiency.*

The study estimated that physicians spend 4-10 hours per week on documentation; updating patient records, ordering tests and prescriptions, writing progress notes, consultations and referrals. In clinics with fully implemented computerized patient record systems, most of these documents are generated as a by-

product of the patient encounter. Using the model clinic as the reference, researchers estimated that by the end of *the first six months, an 80% reduction in documentation time* is reasonable to expect. For a physician who spends 4 hours a week on documentation, he/she saves 3.2 hours per week with a CPR. (Note that this estimate is considered low as many physicians spend much more than 4 hours/week on documentation and hardware costs have dramatically decreased. Thus the estimated time saved and projected increased revenue are likely to be significantly higher in reality). The physician can use this freed-up time to see 13 more patients (15 minutes per patient) and at $55/visit, gain an average of $715 in weekly revenue. (Bingham, 1997).

See Table 1:

TABLE 1: ESTIMATED 5-YEAR NET PAYBACK FROM IMPLEMENTING A CPR	
Costs:	
Hardware	
15 Workstations, 16 mb Pentium processors with 17 inch monitors	$ 33,000
1 Server, 64mb with 2 gigabyte disk drive, modem, tape back	$ 8,000
Network, including managed hub	$ 5,000
Software	
SQL server	$ 3,500
Application software	$ 43,500
Installation	$ 6,500
Training	$ 5,000
Maintenance (5 years @ $2,000/yr)	$ 18,000
Estimated 5 year costs	$122,500
Savings*:	
Staff Reductions (One filing clerk salary @ $26,000/yr for 5 years)	$130,000
Supplies for 5 years	$ 42,000
Estimated 5-year savings	$ 172,000
Estimated 5-year savings- estimated 5-year costs= Estimated total 5-year net savings	
$172,000-$114,500= $57,500	
Additional Earnings:	
9 additional patient visits per week for 50 weeks**	$ 123,750
($55 per visit X 5 physicians)	
Estimated 5-year additional earnings	$ 618,750
Estimated 5-year savings and earnings growth	$ 790,750

2. All Types of Physician Practices can Benefit from Using EMRs

Studies of EMR use have been conducted on a wide range of physician practices; solo, small group, large group, managed-care organizations, networks of preferred providers and hospital-based practices. Results indicate that regardless of the type of medical practice, EMRs offer a wide range of benefits. Studies of a *five-physician model clinic* in Massachusetts reveal that manual workloads are enormously reduced with the use of a computerized record system[ii].

Recent evidence indicates that *primary care physicians in community-based practices* have overcome organizational and individual barriers to become devoted EMR users. An analysis conducted by researchers at the Department of Health Administration and Policy, Medical University of South Carolina, assessed five primary care practices to determine the impact an EMR system had on the daily workflow of the various users in the groups. Results showed that physicians and their staff used EMRs to change how they managed patient records, to communicate amongst themselves, to provide patient care services and to

perform other job responsibilities. Users reported that the EMR reduced practice costs while not sacrificing the quality of care. These results specifically demonstrated that the organizational context in which a system is implemented is important. A system champion, effective leadership, availability of technical training and support are essential elements to successful use.

A large prospective cohort study of *geriatric practitioners* shows that EMRs captured accurate medication data directly from both clinicians and data entry clerics. During clinic visits, treating physicians easily determined whether the medical records for patients were in fact accurate. The primary cause of error was *the patient* who misreported a medication at a previous visit, and the second most frequent cause of errors was failure to capture changes to medications made by outside clinicians. Overall, accuracy was high; 83% accurate representation of compound dose and medication schedule, 91% accurate compounds with 0.37% missing medications per patient. Researchers concluded that the most efficient and effective way to alleviate errors would be to expand the scope of EMR use to all physicians who could potentially change medication. Recent adoption experiences improved operations at a student health center and a family clinic, (Burgess, 1999) particularly the accuracy and efficiency of chart-related activities.

3. EMRs have demonstrated themselves as key to improving the quality of care provided.

    - Several aspects of care delivery have been improved through the use of an EMR. At least 25 studies (including 10 controlled and 10 time series correlational) document the effectiveness of EMRs in improving information management, guideline adherence, documentation, and patient outcome

    - ADRs and inappropriate administration of medications account for poor patient outcomes, if not life-threatening situations, leading to increased and arguably unnecessary health care costs. EMRS have demonstrated their ability to improve ADR detection, enhance clinical compliance to ADR management, improve patient outcomes and reduce health care costs, (Hannan, 1999)

    - Payers, regulators and physicians for years have battled over who best defines and controls medical quality. Many believe physicians ultimately are the final arbiters and that the use of EMRs can validate and ensure that power, keeping the system in check. (Willy, 1999)

    - Computer-generated prompts on the fronts of patient charts have been shown to increase the quality/quantity of health maintenance/prevention measures performed by physicians. For example, such computer-generated clinic alerts have been shown to prompt increases in giving influenza vaccinations, pap smears, breast exams, mammograms when compared to card reminders, (Turner, 1994).

4. Using EMRs to share information about patients and knowledge about practice guidelines with allied physicians through the electronic patient record can help strengthen and maintain referral relationships.

    - Electronic records can support specialty physicians in *managing care across the continuum.*

5. Perceived burdens of EMRs Versus the Reality of Use = User Satisfaction and Disinterest in Returning to Their Old Ways.

While many different systems exist in the market, there have been relatively few formal usability studies of experienced physician users in routine clinical practice. A recent study of primary care doctors showed that user satisfaction was most highly correlated with screen design and layout, *not with computer response time.* This result was surprising because physicians perceive response time as a substantial deterrent to use. Convincing doctors that EMRs will not increase their time burdens is therefore key to assuring adoption into daily practice. Furthermore, more human-computer interaction studies can help focus design efforts as we strive to increase clinician use of information technology.

Physician's adoption of information technology is curbed by age-old foes: time and money. However, those who overcome the perceived obstacles find that they don't want to return to their old ways of managing information (Health Data Management, 2001)

V. The Future

Few would deny that health care is in need of reform. Despite lack of agreement on what reforms are necessary, it is widely recognized that, increasingly, data will accompany practice decisions and the ability to store medical data in electronic form will be a key factor in quality health care delivery. The EMR will constitute the core of the computerized health care system in the near future. The storage of clinical information will permit computer-based tools to help clinicians significantly enhance the quality of medical care as well as increase the efficiency of medical practice. Tools may include clinic alerts identifying patients who are due for preventive care interventions, alerting systems to detect contraindications among prescribed medications, coding systems that facilitate the selection of correct billing codes for patient encounters and calculated codes for level of care provided. These benefits will be obtained not from "word processed" patient charts, but rather systems with internal models that cohere with workflow and daily practice tasks. (Sjuansky, 1998).

Furthermore, medical data in electronic form will fuel the interaction of not only patients with their providers, but also providers with hospital, government organizations, and private health care management. Aggregate data undoubtedly will be collected and used to generate outcome studies designed to examine the clinical utility and cost effectiveness of medical resource consumption, to track prescribing practices, to monitor the implementation of new practice guidelines, to promote patient follow-up, and monitor disease management and wellness programs. General practice databases have shown themselves to contain more accurate charting and consultation notes than paper-based records, thereby validating their superiority more as bases for analyzing health care quality parameters and outcomes, (Neal, 1996). Based on these proven advances, in the not too distant future only those medical practitioners whose practices have an electronic infrastructure that allows comprehensive billing, scheduling, inclusive patient charting, and data reporting to third parties will be successful.

In sum, the promise of the automated patient record is instantaneous access to a patient's information when needed, along with historical and current clinical information from any location. The value that automation can have for managing the demand for health services is immense, though not yet realized by all organizations. Furthermore, the benefits of the EMR are not limited to simple cost containment. The proactive nature of the tools embedded in the EMR can be one of enormous long-term benefits to case managers and patients alike (Davis, 1997).

Practices that want to successfully meet the future have compelling business reasons for adopting EMRs (Royer, 1996). EMRs are likely to become standard in the next five years for the several reasons mentioned above, as well as their capacity for producing increased revenue. The EMR has become financially feasible for even very small medical practices (Prince, 2000). Substantial cost savings are seen in various types of medical practices; labor savings in clerical, front desk, transcription, nurse and medical assistant and physician personnel, as well as malpractice premiums, storage and supplies. In addition, as previously noted, the time saved from automating manual tasks enables physicians to see more patients (Renner, 1996).

Yet, of all the reasons to use EMRs, they will be adopted primarily for one reason alone, to make the caregiver's life easier.

VI. Why are Physicians Slow to Adopt EMRs?

While physicians increasingly use computers for various purposes and indicate a growing interest in adopting electronic medical record systems, evidence suggests that few have incorporated these innovations into daily practice. Studies show that physicians and their support staff do not yet embrace this new technology. Computer experience, computer anxiety and perceptions of organizational support predict the degree to which physicians and mid-level practitioners view the EMR effort positively. However, perhaps the most limiting factor in realizing the full potential of electronic medical records is physician reluctance to adopt these applications.

Cost and the time involved in changing ingrained ways of practicing medicine, as well as computer illiteracy, are reported as the main barriers to adopting EPRs, and yet the current market for hardware and software provides more incentives than disincentives. Upfront costs of moving to an EMR are far lower than they were just a few years ago. Hardware prices have dropped considerably. EMR software is

greatly improved from what it was, and continues to improve, as feedback from physician users has prompted developers to add features or change design. Many physicians resist the prospect of data entry as an insurmountable hurdle. However, drop-down menus built from customized templates and pen-driven technology can resolve some of the data entry issues. Speech recognition applications have greatly improved in recent years and are becoming more reliable adjuncts to such systems.[iii]

Other more subtle barriers may well explain why so few physician practices readily adopt the EPR. First is the myth that for a practice to be efficient and accurate, it must eliminate paper. The need to immediately destroy one system and replace it with a newer system is illusory and flawed. Total computerization requires a large initial outlay in labor and equipment costs. This commitment is typically unacceptable for most practices. Furthermore, a focus on needing to completely and immediately replace a paper system with an electronic system detracts from appreciating the benefits that computerization can offer; for example, parts of existing records can be stored in computer retrieval form. But this is not to say that some computerization is useless.

Rather, realizing that the elements of the electronic patient record can be computerized so as to permit the unique power of retrieval and analysis, computerization can be implemented in a modular step-by-step fashion, rather than all at once or none at all. Moreover, there are distinct advantages to computerizing only certain key patient data. For example, patient summaries containing patient's demographics, medical problems, allergies, medications, health maintenance status and recent laboratory test results can be used to generate needed prevention reminders as well as to do management (such as comparing utilization of various laboratory tests). Computer searches of this data alone can be used to create patient target groups and produce individualized labels and letters for patient contact (important, for example, when a drug that several of one's patients are on is recalled). *Recognizing how computerized patient records can complement, not obliterate, a traditional practice is a key step in adopting this innovation.* This realization can create a cognitive shift in viewing the goal of computerization as being more effective care of patients, instead of just fascination with technology, (Rodenick, 1990).

A second subtle barrier is the perception that the computer disrupts clinical workflow, (Buffone, G., Moreau, D., 1997). In fact, most systems are built precisely on the medical care process and use a design and delivery format approved of by clinicians, (Hofdijk, 1996). An electronic visit system (EVS), for example, has been shown to support the care process thoroughly and efficiently by automating processes like scheduling next appointments, examinations, reporting results and correspondences (to patients, physician consultants or other third parties such as insurers, laboratories etc.). A medical documentation system (MDS) is based on the concept of episodes. It is not restricted to outpatient delivery, but rather can be used across different care boundaries, hospitals, departments within hospitals, ancillary outpatient care facilities, etc.

Research has indicated several factors that influence the successful implementation of EMRs into ambulatory settings. System expense and an office champion whose interest in facilitating successful use extends beyond short term benefits, as well as accurate user understanding, are factors that influence acceptance of EMRs, (Berkowitz, 1997, Bingham, 1997, Dansky, 1999). Strategies that engage physicians and their staff in computer activities prior to implementation, while also providing strong organizational support before and during the effort, facilitate successful adoption, (Dansky, et al., 1999). Community-based physicians were evaluated for their perceived and actual needs in using EMRs. Results indicated that physicians believed that use of EMR would improve patient care and that key functions of an EMR were labs, medications, consultations, hospital follow-up and health maintenance, (Strasberg, 1998).

Many providers are initially resistant to adopting electronic records, feeling that their meager computer experience is inadequate to master a system and that adoption would require too much time. They also fear that the system will crash and all data lost. Offices have successfully dealt with these fears head-on in the following ways:

- Purchasing typing/keyboarding programs enabled physicians to sharpen their typing skills.
- A number of test patients were loaded into the EMR allowing staff members to play with the system
- A few major power outages were planned to demonstrate how the back-up file server ensures against lost data (Burgess, 1999)

VII. Return on Investment:

Hard numbers on cost savings are in short supply because EPR use is relatively new and few studies have measured cost-effectiveness, so substantial empirical evidence upon which to base payback

calculations is scarce. A recent study of a five-physician primary care clinic to determine where efficiencies and cost savings could be realized through the use of a CPR showed that CPRs could return productivity gains and help physicians attain their patient care and financial goals.[iv] To maximize the payback of the system, study results conclude that most, if not all, transactions should be captured during the patient encounter. Activities that should be recorded in the computerized patient record include patient history, physical exam information and progress notes. Other transactions, such as ordering prescriptions, procedures and diagnostic tests, should automatically trigger issuance of reports, referral letters and other types of communications. An effective system should also offer real-time processing of information which can eliminate double and triple handling of patient forms, repetitive dictation, manual note-taking and reduce the trial of activities that usually follows a patient visit. In addition, an effective system should allow practice personnel on-line access to hospital information and other systems at other facilities to retrieve billing and accounting information and laboratory results, and to order tests and schedule procedures. Connecting to diagnostic monitoring instruments of home-care patients is also possible. All these applications can save time, money and reduce errors. Studies estimate that CPR systems typically yield a data entry office salary savings of $26,000/yr (Bingham, 1997)

See Table 2.

TABLE 2:

SAVINGS FROM COMPUTERIZED MEDICAL RECORDS
. Online progress notes can save $35/day in staff and physician time
. Online access to services and tests can save about $65/day in controlling costs and eliminating redundant testing
. Online access to patient records can save:
-$330/day looking for charts
-$20/day in photocopies (not including cost savings in copy machine maintenance)
-$70/day in filing and retrieving costs
-$10-$30 day in staff time to process patient medication refills
-$850/query on outcomes research to measure effectiveness of treatments
-$12/day in charge posting
-$10-$30 day in faxing savings

*Savings extrapolated from a study of 6 group practices. Specialties included family medicine, otolaryngology, urology, internal medicine, mental health and orthopedics. (Nelson, 1998)

In addition, efficiency and productivity are usually improved because charts no longer have to be moved or risk being misplaced, and because more than one person can work on a chart at a time. Studies have confirmed that CPRs can produce substantial savings in reducing manual functions, eliminating paper charts, and reducing physician documentation time. Both empirical research and anecdotal evidence indicate that EMR use, even in the short term, can generate substantial savings in both time and money. For starters, EMRs can streamline daily care-related operations. For example, as previously discussed, physicians spend 4-10 hours a week on documentation, such as updating patient records, ordering tests and prescriptions, and writing progress notes. The totality of manual clerical tasks associated with 5 primary care physicians providing clinical care is roughly 360 per day or roughly 1800 tasks per week. Automating these tasks not only frees up physician time (to generate additional revenue), but also better ensures the accuracy of information contained in charts, as well as easy accessibility to charts from various locations. Furthermore, admitting a patient to the hospital in the middle of the night, for example, becomes far less burdensome to physicians whose automated systems permit them to access the necessary patient information (specifically, past and present care relevant to hospital admission, considerations related to medical history, diseases, treatments, allergies, dietary and other contraindications) from their laptops, at home, and hit a send button to hospital staff, who then have all the information they need to admit, in a readable and organized manner.

Investing in a computerized patient record system can enable physicians to optimize revenues by saving labor costs associated with record retrieval, photocopying, filing and other processes, (Nelson, 1998).

Furthermore, prescription legibility errors go away with an automated system, and doctors can get immediate alerts to adverse drug-to-drug interactions, or adverse experiences with particular drugs.

Up-front investments in purchasing, implementing and maintaining a system is non-trivial for even the largest of practices, and is often perceived as a major deterrent to adoption. The University of Texas M.D. Anderson Cancer Center undertook a cost-benefit analysis, determining its quantifiable and non-quantifiable benefits, estimating initial costs, projects costs and benefits over 10 years, and found substantial benefits in cost savings and patient care (Kian, 1995). More recent data shows that despite the up-front cost obstacle, the number of successful ambulatory electronic medical record implementations (using EMRs as the primary means of accessing and recording medical information) is steadily increasing (Khoury, 1997). Success has come from practices' adapting systems that do not decrease physician productivity. At Kaiser Permanente, Cleveland, Ohio (a 200,000 member HMA), cost savings have included $750,000/year from lack of forms, $400,000/year in automating the collection of billing data, and salary savings due to reduced need for medical record and support staff.

In addition, there are unquantifiable savings such as efficiencies in patient communication due to the instant availability of medical information, and decreased need to build space to store paper medical records.

See Table 3:

TABLE 3: Annual Savings and Expenses of Electronic Medical Records

	AREA	AMOUNT
SAVINGS	Medical Record Room	$2,800,000
	And support staff	
	MARS Generation of	$ 500,000
	Clinical Forms	
	MARS Generation of Billing	$ 400,000
	Data	
	Total	$3,700,000/year
EXPENSES		
	Personnel	$ 600,000
	Printing	$ 200,000
	Network Expense	$ 150,000
	Memory	$ 70,000
	License, Renewals	$ 80,000
	Total	$1,100,000/year

* Based on 200,000 member HMO (Khoury, 1997)

In 1994, a Houston-based practice expanded from six to 14 physicians, with support staff growing from 30 to 80. "Though five staff were dedicated to verifying patient eligibility for benefits, 10 wouldn't have been enough," recalls Tim Thomas, managing director of the multi-specialty practice. Investing in a system was their only way of "freeing itself from the quagmire" according to Thomas. By linking the practice to payers via the Internet and streamlining its cumbersome paper- and phone-based processes, Thomas anticipates saving $20,000/month in labor costs. Furthermore, Thomas says he didn't need to enlist the support of the practice's accountant to make projections. "It didn't take an Einstein to figure out the issues. We faced more risk not changing". (Baldwin, 2000)

More and more physician groups are investing in information technology for tasks more advanced than billing and scheduling. According to the 2000 Modern Physician/Pricewaterhouse Coopers survey of physician use of information technology, by 2003 computers will be well on their way to taking over *most* administration functions, such as patient record-keeping, prescription authorizations, laboratory requisitions and reviews. The survey found significant payoffs for automation. For example, the 125 physicians at

Austin (Texas) Regional Clinic used a notebook-based system to enter diagnosis and procedure codes, as well as order prescriptions and tests. The computer systems were implemented in 1993. The multi-specialty clinic spent $500,000 to develop the system and $200,000 for notebook computers. Subsequently, the clinic reduced its data entry staff by 70%, resulting in an annual savings of $250,000, and $200,000 savings in eliminating paper forms. A four-physician family practice in WA implemented an automated system linking accounts receivable, patient records, and prescribing and test results. The group's initial outlay was $115,00 for 17 computers and two major software updates. In the year since automation, the expected financial savings have not been realized. However, the system is speeding basic tasks, particularly authorization of prescription refills, and the physicians maintain that the investment was a good move and will prove better over time.[v]

Not surprisingly, larger groups have greater capital for Information Technology (IT) investments. The 2000 Modern Physician/Pricewaterhouse Coopers survey found that 61.4% of groups reported that their IT investments equaled 1-4% of operating expenses. Just 13.6% of the groups reported spending 4% of their operating budgets and 15.2% said they spend less than 1%. "With the exception of small practices, 1-4 doctor groups, 53-55% of practices surveyed (where practice sizes ranged from 5-49 doctors) reported that they expected to adopt EMRs within three years. 41-44% of those expecting to implement EMRs also reported that they expected to adopt computer-based prescribing." The survey also found that respondents expected to need to devote some of their IT investment in compliance with the Health Insurance Portability and Accountability Act (HIPPA) regulations. Compliance with the first HIPPA regulations governing electronic transactions is required by next year, 2002. Given the complexities of compliance, some claim that there's little time left to ensure successful completion. However, CPRs enable physicians to more easily to comply with regulatory requirements, (Modern Health Care, 1999, Modern Physician, 2000), (Veling, 1998).

Some practices estimate the return on investment by creating a flowchart that describes their workflow. This exercise can be useful in implementing an electronic patient records system. Before patient charting can be automated, a practice needs to analyze its manual record keeping. Rosemarie Nelson, a physician group practice expert, says "each visit may generate 10 pieces of paper and that means 40 hand-offs' of documents for each patient".

David McCarthy, MD, served as a clinician for the U.S. Air Force, which used paper charts and was resistant to electronic medical records. But after the Air Force, he didn't want to look at paper records again—"they're just too many problems –like availability and legibility." In 1998, when he and five other physicians established a group practice, they knew automation was the way to go, especially since under-coding can cost group practices $100,000 annually.

Benefits of using EMRs can be gained even at the initial stages; particularly reducing overhead costs and professional liability rate reduction. A two-physician practice in NH eliminated chart pulls completely, saving $24,500 per year. Atlina Health System, a nine-physician clinic, realized a 51% in transcription costs, resulting in a savings of roughly $150,000. Prior to implementing the system, physicians had not billed consistently for services. By documenting visits they were able to charge for codes 140 times between Oct. 1997 and Sept. 1998, representing additional charges of $10,640 for the practice.

Anecdotal confirmation of CPRs return on investment is easier to come by.

Englewood, NJ Chief Operating Officer John Masiello of Bergen Medical Alliance, expects that SmartClinic will pay for itself in less than two years purely based on the elimination of charts and office paper. Since using SmartClinic they have received the added benefit of noting that several of the physicians in the practice were under coding by as much as 50%.

Albany, GA Internist Brian T. Keefe used to spend $1,400 a month on transcription services. Now he spends $250 and is confident he can reduce his bill even more. Since January, he has been documenting patient encounters on a laptop computer, using an application provided via the Internet.

Another plus for his primarily Medicare practice is a program feature that helps him nail the right evaluation and management code. He often had trouble deciding whether he had completed, say, a level 3 or level 4 visit. Now the software decides for him. It analyzes the information he enters, and then indicates which level he can justify and whether he's missing any documentation.

"Sometimes, you can cut too many corners when you're dictating," says Keefe. "Other times, you can foolishly spend as much as $8 or $9 on transcription services for a very long note, and still not satisfy HCFA requirements. This program forces you to do it correctly each time."

Fort Lee, NJ Cardiologist Howard Rothman, who's mastered not only the basics but the system's elegant nuances as well, and is continually upgrading his system with the latest available improvements, cannot sing enough praise for EMRs. He says that pre-EMR, his practice's patient records were nearly useless. He could hardly ever discern his partners' handwriting, and so practiced primarily on the basis of memory. He admits that SmartClinic eliminates the possibility of forgetting to address any of the patients' problems.. Furthermore, in addition to being more certain about the accuracy of all information contained in each patient's record, he's been freed up to spend more time communicating with patients. His 4 doctor practice has trained medical assistants to enter ancillary patient information, such as updated medications, change of status, vitals, and to identify from progress notes what is pertinent to the patient visit. The system has enabled him to increase his weekly volume of new patients and new consults, and to admit a patient to the hospital in the middle of the night in about 20 minutes, as opposed to an hour or more previously. In addition, his doctor-to-doctor consults are vastly improved. Referred patients usually came with little documentation and little to no information existed as to the referring physicians' precise questions. His system, SmartClinic, enables him to incorporate notes on referred patients from telephone calls with his colleagues and utilize the information during the consultation, the physician's exact questions are specifically addressed, resulting in infinitely better care in a more efficient manner. Correspondences to both doctors and patients are vastly easier and delivered in a timelier manner. This is particularly important for recalled medications. In a matter of minutes, all patients in his practice on a recalled medicine will be selected to have a letter generated and in the mail to them. All in all, he works faster, smarter and happier. He reports that his patients also feel better cared for. Regarding cost savings, Rothman says, "third party payers used to downgrade visits, but they don't now, because we give them documented complexity".

FP Sean Gaskie, who practices in Santa Rosa, CA, and uses the same system as Keefe, says he has reduced his transcription costs from $350 to about $50 a month and increased his fee-for-service charges by more than 30 percent compared with the same quarter last year. "I was under-coding like crazy," he explains.

He's even happier about a feature that allows him to organize patient information online. He can search his electronic files and know in minutes which of his patients are on a drug that has just been recalled, or whether they are receiving the care that their condition requires. "This makes it easy for me to look at special populations and make sure they're getting the treatments we know improve outcomes," Gaskie says. "The search function isn't perfect, but it's much better than what I had before, which was nothing."

The program also allows Gaskie to know his practice better. For example, he tallied his most common diagnoses and learned--to his great surprise--that he has more hepatitis C patients than diabetics.

The experiences of these practitioners are not unique. Many medical practices and health care organizations are streamlining operations to meet the demand for demonstrated quality of care, particularly by third party payors. The Health Care Financing Administration (HCFA) continues to increase its enforcement of its new Evaluation and Management guidelines. The guidelines are designed to ensure that documentation in the medical record is consistent with the level of service billed by health care providers. The purpose of the new guidelines is to crack down on medical group practices that bill Medicare for services not rendered, meaning that services have not been documented. Reimbursement is based only on documented services. Auditors determine whether or not the information in patients' medical records justifies the billing code entered. The guidelines require extensive detail for the most intensive levels of care. The documentation required to comply with guidelines has deterred some physicians from billing for the more complex levels, and many physicians are under-coding or billing for less services than what was actually provided, just to avoid the potential consequences involved in non-compliance. A CIO of the publicly funded Erie County Medical Center Healthcare Network found that the medical center could gain $375,000 through improvements to their charge capture. They built a complete list of procedures they do into the system and gained at least that amount in revenue. Under the old system it was more difficult to charge for all the procedures they do. Most systems come equipped with lists of ICD-9 codes and CPT procedure codes, so that users don't have to think twice about which diagnostic or procedural code, except for evaluation and management (E & M) codes. This feature has helped doctors charge appropriately for their visits. Dwight Eichelberger says, "I've coded many more visits as 99214s than as 99213s since I've been using the system", (Terry, 1999)

Under-substantiated codes could result in punitive actions as severe as prison sentences. Studies indicate that under billing is a known problem for many medical practices, with annual loses between $40,000 - $60,000 per year, (Health Data Network News, Thomson Information Services, Inc., April 6,

'98). Dr. McCarthy, mentioned above, started his practice with an EMR primarily because "Under-coding can cost physician practices $100,000/year" (Baldwin, 2000). A four-physician practice at Carilion Health System in Roanoke, VA, increased revenue for home and health hospice oversight charges. Prior to implementing the system the practice had not billed for these services. By documenting the visits and monitoring their activity they were able to document and charge for these codes 140 times between October 1997 and September 1998, representing additional annual charges of $10,640 for the practice, (MedicaLogic, 1999). Many medical groups have begun to audit their medical records prior to billing, to ensure they are coded correctly. Adopting EMRs has been a key step in meeting documentation requirements. EMRs offer substantial help to providers by making coding accurate and efficient, thus promoting both compliance and accurate billing. EMRs typically ensure that coding documentation is complete and accurate. In fact, one system, SmartClinic enables physicians to document records correctly and completely, as well as avoid under billing by automatically calculating in real-time the E/M levels of service provided – according to either 1995 or 2000 HCFA guidelines.

Computer literacy has grown amongst physicians and the general public. The 2000 Modern Physician/Pricewaterhouse Coopers survey found that Internet usage among physicians continues to increase over each previous year. In 1999, The AMA found that only 37 percent of physicians surfed the Web, and only about 20 percent of ambulatory care offices had Internet access. While experts claim that the percentage of practices with Internet-capable PCs in their billing departments is smaller, perhaps as low as 5 percent, they predict that the cost-effectiveness of web-based ASPs will drive greater use. Patients are changing the nature of their clinic visits by arriving with health information downloaded from the Web, thus spurring physicians to being familiar with what the Web provides. A Pew Research Center found that 40 million of the 74 million that logged onto the Internet in 1999 did so at least once for health reasons. [vi] Dr. Cheneven of the Austin practice mentioned above says, "There no doubt in my mind that (Web-assisted medicine) is the way the world is going to end up. The only question is whether it will be in 10 months, 10 years or 10 millenniums".

VIII. Conclusion

Although paper-based medical records have served clinical medicine well, needs are changing. There is a growing need to be able to access components of patients' records for audit, research, and management purposes, as well as patient care, routinely and *rapidly*. Patient notes can grow to many volumes, especially in chronic disease care, like diabetes, COPD, and coronary artery disease. EMRs offer opportunities to improve clinical follow-up, medical screening and health promotion/disease prevention. These features, coupled with the transfer of large parts of chronic care to the primary sector, mean that general practitioners increasingly need to access EMR systems, if not also adopt one for their own practice needs.[vii]

Predictions for the proliferation of EMRs are being realized. While no U.S. hospital is paperless today, the Mayo Clinic's new Scottsdale hospital hopes to become virtually paperless by 2005, based on adopting internet connectivity, which offers a low-cost architecture of "intranets" and "extranets" that link internal and external provider sites, including physician offices, nursing homes and in-home electronic monitoring equipment for the chronically ill.

In sum, computer-based medical records that integrate financial and clinical information are important tools for improving the quality and lowering the cost of care. Realizing this, some small and very large practices would love to invest in EMRs, but fear the short-term return doesn't justify the expense, particularly in light of the need for both paper and electronic records during a transition of roughly one to two years. While the goal of the EMR is to produce a paperless office, the conversion from paper to electronic storage need not be completed immediately. Transitioning to electronic storage can start the accrual of long- term savings. Furthermore, as information technology advances, more and more medical practices will use CPRs because of the substantial advantages they offer over paper-based systems.

Physician users are increasingly realizing that technology is not a necessary evil, but rather a necessary part of running a successful medical practice. While most physicians, in private or group or hospital practices, acknowledge the potential benefits of automating aspects of their practice, many remain reluctant to do so. Getting past their concerns about time and money or other perceived substantial burdens is the challenge. No system works by itself and effort is required to transition from paper to electronic storage. However, as Lucy Newell, President of the Stellar Group, a Chicago based health care information technology consulting firm, says, "if physicians don't already have a standardized pattern of care, how are they going to meet regulatory requirement?" Even if one elects to delay recognition of the upcoming

regulatory requirements, most of all we should keep in mind the comment from Dr. Walter Berkowitz, cardiologist who states that "SmartClinic just helps to improve the practice of medicine."

About The Author

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