
COST-BENEFIT ANALYSIS OF IMPLEMENTING AN EHR IN AN OUTPATIENT SETTING

W. RAY CROSS, MBA AND CHRIS MADDEN, MD

ABSTRACT

Affinity Health Group, a multi-specialty, 27-physician group with 75,000 active patients in rural South Georgia, documented the economic impact of implementing an Electronic Health Record (EHR). The net benefit to Affinity of implementing an EHR was more than \$2.5 million over one year and nearly \$12.7 million over five years.

KEYWORDS

Electronic Health Record (EHR), Electronic Medical Record, Cost-benefit, Return-On-Investment (ROI), Document Imaging, Coding, Healthcare, Information, Technology

Electronic Health Record (EHR) systems have demonstrated their ability to improve the quality of patient care and safety [1,2,3]. But far less is known about the potential of EHRs to provide financial benefits to physicians, clinical practices and healthcare organizations. That is changing, due to a growing body of recent studies that compare the costs and benefits of EHRs at healthcare institutions large and small. Their results are almost universally promising, ranging from estimated net benefits of \$86,400 per provider (over five years) [4] to institutional benefits of up to several million dollars annually.

Even with such well-documented evidence that EHRs can achieve a positive financial impact, some medical groups are hesitant to commit significant sums of money to acquiring one. In addition to the investment required, their hesitancy is due to at least two additional factors: (1) historical reliance on paper records because of their simplicity, low implementation cost, and widespread acceptance and (2) historical resistance to the adoption of information technology (the U.S. healthcare industry invests only two percent of gross revenues in information technology, compared with ten percent for other information-intensive industries [5]).

Yet recent developments - including President Bush's public support for a National Health Information Infrastructure - are supporting a shift by medical groups towards the widespread use of information technology to improve care and reduce costs. This trend was influential in convincing the twenty-seven physicians at Affinity Health Group in Tifton, Georgia to acquire an EHR for our multi-specialty

group. We hoped that the EHR would position Affinity to survive in an increasingly competitive marketplace amid declining reimbursements from Medicare, which covers sixty percent of our 150,000 patients. We were cautiously optimistic about our chances of experiencing a positive return on investment (ROI) similar to that reported by several healthcare groups following their implementation of an EHR [4, 6, 7].

Because we were admittedly skeptical about the reliability of the numbers reported in previous studies, we decided to be extremely conservative in assessing our own ROI. We would avoid the industry-wide estimates commonly found in previous ROI studies - such as estimated savings from reductions in adverse drug reactions due to clinical decision support systems. Instead, we decided to focus strictly on measurable increases in revenue or reductions in costs that could be directly traced to the transition from a paper-based record to an electronic record.

The result is a traditional cost-benefit analysis, irrefutably based on hard numbers and not estimates.

METHODS

We performed a cost-benefit analysis of electronic health record usage by primary care and specialty physicians in a combination of ambulatory and hospital settings. The primary outcome measure was net office charge revenue or expenses during one-year and five-year periods. The model was framed from the perspective of the health care organization and the reference strategy was the traditional paper-based medical record.

Data on costs and benefits came strictly from primary data collected from our accounting department (in the case of costs) and our electronic health record system (in the case of benefits). Coding figures came from daily audits of the EHR system performed by an on-staff certified coder.

COSTS

Implementation of an EHR, like that of any IT project, carries two categories of costs: system costs and secondary costs. System costs include the cost of software, hardware, training, implementation, and ongoing maintenance and support. Secondary costs are those that are indirectly caused by the transition from a paper record to an electronic record, such as a temporary decline in provider productivity following implementation.

EHR system costs are expensed per month covering the full cost of the system, including Affinity technical staff and ongoing customer support from the vendor. Secondary costs have proven to be minimal. Affinity budgeted for a thirty percent reduction in office visits due to the expected high learning curve of physicians. The actual reduction was a mere five percent and the rate of visits returned to normal in less than one month. Because the impact was negligible over the one-year scope of the study, the temporary reduction in office visits is not calculated as a cost.

BENEFITS

The Center for Information Technology Leadership (CITL) value framework identifies three types of tangible healthcare IT value: financial, clinical, and organizational [4]. The framework recognizes two categories of financial benefits: averted costs from reductions in administrative, clinical staffing and resource requirements and increased revenues from improved billing practices and charge capture, as well as productivity gains from seeing more patients. In the CITL model, clinical value is achieved through improvements in the care process, such as better adherence to clinical protocols and more reliable clinical decision-making. Organizational value is achieved by leveraging real-time alerts and clinical decision support to improve the quality of patient outcomes and in turn reduce medical errors, morbidity and mortality.

Because clinical and organizational benefits are notoriously difficult to measure, in producing this analysis we chose to focus solely on the financial benefits of the EHR. Benefits were divided into three categories: net office charge revenue, total office expense savings and total savings on salaries and benefits. Again, whenever possible we avoided estimates, such as the projected benefit from reductions in paper chart pulls based on the average cost of a chart pull. Instead, in keeping with the CITL model for financial benefits, we measured only net revenue increases and net averted costs.

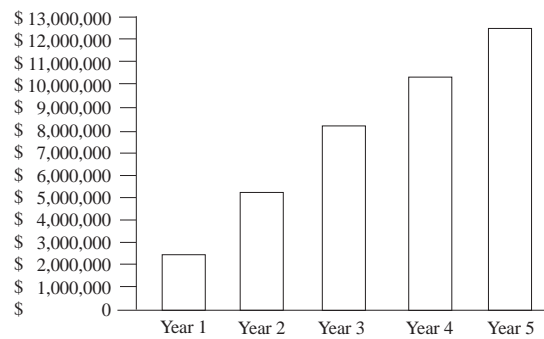
RESULTS

Soon after Affinity implemented the EHR in September of 2003, the clinic's management of patient records began to dramatically improve. For the first time, Affinity physicians were consistently able to access appropriate clinical information instantly from anywhere in the main clinic, the local hospital, nursing home, or even from home. As a direct result of implementing the EHR, Affinity has dramatically reduced its transcription expenses, cut its staffing requirements for chart pulling, chart filing, collections and reception, eliminated the cost of building charts for new patients, and generated increased revenues through improved evaluation and management (E/M) coding.

In the one-year and five-year cost-benefit model (Figure 1), the net benefit to Affinity of implementing the EHR was \$2,532,951.20 and \$12,664,756, respectively. These figures represent roughly 12% of Affinity's \$21.8 million 2004 bud-

get. The most significant proportion of benefits came from increased reimbursements due to more accurate E/M coding. The increase was calculated by comparing office visits in the first five months of 2003 (pre-implementation) to visits from the same period in 2004 (post implementation). Our analysis reveals an average post-implementation increase in charges per visit (including ancillary services) of roughly 16%, or \$60. Average office charges per person, per visit prior to implementation were \$382 compared to \$444 after implementation (Figure 2). These figures are statistically significant and cannot be accounted for by any non-EHR related change in office charge rates.

FIGURE 1. BENEFIT AND FINANCIAL IMPACT



The size of the EHR-related increase in revenues speaks to the challenges that Affinity's physicians faced in using a paper-based system for documenting the appropriate level of care. In general, the more highly compensated interactions (and thus codes) require the most stringent documentation. Prior to the implementation of the EHR, Affinity's physicians often lacked confidence in their documentation and as a result, were likely to "downcode" choosing the less restrictive (and lower compensated) reimbursement codes, thereby causing significant monetary losses. Leveraging the EHR's templates during the course of the study, Affinity's physicians were able to better document the level of care they rendered, enabling an increase in coding levels. The EHR includes an automatic E/M code calculator that recommends the proper code based on the level of care that they have electronically documented.

FIGURE 2. AVERAGE OFFICE CHARGES PER VISIT - PRE AND POST EHR

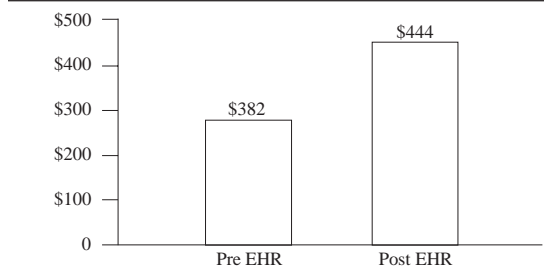
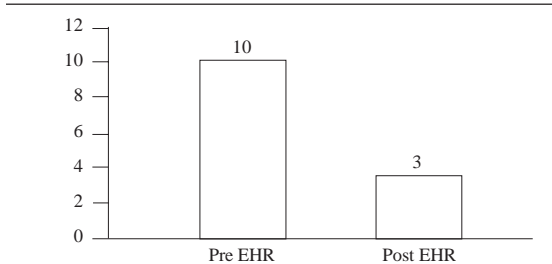


FIGURE 3. STAFFING RESOURCES FOR CHART MAINTENANCE - PRE AND POST EHR



In addition to benefits accrued from improved coding, our analysis revealed several forms of averted costs:

Savings from Reductions in Staff Related to the EHR

Implementation of the EHR allowed Affinity to cut or reassign several positions directly related to the old paper medical record. In the medical records department, decreased reliance on paper medical charts enabled a reduction from 10 FTEs to 3 FTEs (Figure 2). The seven eliminated positions were previously responsible for creating, filing and retrieving paper clinical charts. Today, the remaining three employees are responsible for scanning paper records into the EHR and when requested, pulling paper charts that have not yet been digitized. Most of the seven employees were reassigned to other jobs, while others were eliminated entirely for a savings of nearly \$250,000 annually (\$1.2454 million over five years).

One of the key components of the system that enabled Affinity to transition to a completely paperless environment was document imaging, the conversion of paper documents to electronic images. The EHR allows Affinity staff to electronically scan into the computer system existing paper charts and other non-automated documents, such as written correspondence. Scanned documents are available to physicians via the EHR instantly - a significant improvement over the old system, which required up to three months for paper documents to make it into a patient's chart. In addition to simplifying access to information, scanning has proven to be more efficient from a resource perspective.

The other site of EHR-related staff reductions was in the business office. During the implementation process, while analyzing the efficiency of the group's various workflows related to the paper chart, the project team discovered that several staff members were performing tasks that would prove unnecessary once the EHR was deployed. In the business office, EHR efficiencies allowed the group to outsource its collections department and cut seven FTE positions - five in collections, one at the front desk and one employee who processed claims. The reductions in business office staff were possible because of the increased efficiency of processing medical records electronically. The net savings from the change (after outsourcing costs) is \$100,000 annually.

Savings From Reduction in Overtime Pay

Prior to implementation of the EHR, the documentation load required one nurse per physician to stay late each night to complete the day's paperwork. This created a heavy dependence on overtime hours. In 2003, prior to the full implementation, overtime averaged 6,892 hours per year. In 2004, following full implementation, because the clinical record was updated electronically during each office visit, total overtime hours fell to 5,520 per year. The difference between pre- and post-implementation overtime, then, amounts to an average of 1,372 hours per year, an annual savings of nearly \$30,000.

Savings from Reduced Need for Transcription Services

Before implementation of the EHR, caregivers dictated notes that other employees transcribed into the paper record. To avoid creating a dual-charge system (in which charges would be determined by both the paper record and the EHR), Affinity pre-loaded into the EHR critical portions of the existing paper record and closed the paper chart the day the EHR went live (June 16, 2003). As a result, we reduced our monthly transcription hours by 50%, from an average 80 hours per month prior to implementation to an average of 40 hours per month post-implementation. The change allowed Affinity to eliminate four part-time transcription positions, for an annual savings of \$28,773. As physicians' comfort levels with the EHR further increase, we expect Affinity physicians will reduce their use of dictation even further.

The EHR has reduced the need for transcription by allowing physicians multiple options for documenting a patient encounter. They can use both structured and unstructured note templates to record certain elements of the patient encounter and limit dictation to more complex citations. The templates have proven to be a vast improvement over handwritten notes. They leverage the MEDCIN® database of 250,000 medical terms, utilize structured data entry for standardized clinical terminology and searchable clinical findings, and automatically calculate E/M codes. Additionally, the application automatically populates components of the note as a by-product of caring for the patient. For example, when writing a prescription, the medication list is automatically updated in the note. In cases where physicians dictate, the EHR captures the dictation electronically, automatically routes it to the transcription service and stores the completed transcription in the electronic patient record with an electronic signature. Physicians can then access their completed notes from virtually anywhere, even using a PDA. Where dictation is still used, it is combined with templates to create a compound note. This further limits spending on dictation.

Savings from Decreased Office Expenses

By reducing its reliance on paper documentation, Affinity saved approximately \$60,000 in annual office expenses, including \$49,000 for printing and supplies, \$3,000 for copier counts, and \$7,800 on transcription phone lines.

DISCUSSION

A cost-benefit analysis is only one part of a complete analysis of the effects of implementing an electronic health record system. The many benefits of an EHR are not all measurable in financial terms. For instance, anecdotal evidence suggests that Affinity's patient satisfaction has increased now that the group has implemented the EHR. Physicians can now access a patient's entire medical record immediately via a wireless Tablet PC, update the chart on the spot, review current prescribed pharmaceuticals, check for standard drug interactions or lab results, alert the physician if the patient's insurance does not cover a particular brand of medicine, and send electronic prescriptions to the patient's pharmacy. Patients also leave with documentation of exactly what services they received during the visit and what amount will be charged to their insurer.

While patient satisfaction was not a metric in this study, we believe that the EHR will drive improvements in patient satisfaction that will help Affinity remain competitive in an increasingly tight healthcare market. For example, when Vioxx was recently recalled, we instantly ran a report identifying 2,000 patients that were on the medication and then sent them notification letters that same morning. This is something that is simply not possible with paper records. In recent months, the group has experienced an increase in the number of patient referrals from area physicians, a phenomena that we attribute to the community's perception that the EHR has improved our quality of care.

At Affinity, the electronic health record is a key component of a strategic goal of clinical system integration to allow providers to move between sites in the network to deliver seamless care at the most appropriate location. We intend to use a portion of the savings from the EHR for our next IT project, the purchase of a Picture Archiving and Communication System (PACS).

Overall, our study suggests that implementation of an EHR can quickly produce a significant economic benefit for a healthcare institution, resulting in substantial savings and increased revenue. Moreover, the benefits may be far larger, as in the case of Affinity, than previous studies have projected. But it is important to note that investment in information technology does not guarantee the success of an EHR nor positive ROI. The investment requires not only capital, but a significant commitment from the entire healthcare organization requiring changes throughout the work process and throughout the organization. In our view, if the commitment is present, then the economic benefit will soon follow.

AUTHOR CONTACT INFO:

W. Ray Cross
(229) 391-4100
wrcross@affinity-health.com

Chris Madden, MD
(229) 391-4100
cmadden@affinity-health.com

AUTHOR BIOGRAPHIES

W. Ray Cross is Chief Executive Officer of Affinity Health Group.

Chris Madden, MD, is a practicing physician at Affinity Health Group and the physician lead for the group's EHR implementation.

REFERENCES

- 1 Elson RB, Connelly DP. Computerized patient records in primary care. Their role in mediating guideline-driven physician behavior change. *Arch Fam Med.* 1995;4:6598-705.
- 2 Shea S, DuMouchel W, Bahamonde L. A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting. *J Am Med Inform Assoc.* 1996;3:399-409.
- 3 Hunt, DL, Haynes RB, Hanna SE, et al. Effects of computer-based clinical decision support systems on physician performance and patient outcomes: a systematic review. *JAMA.* 1998;280:1339-1346.
- 4 SJ, Middleton B, Prosser LA, Bardon CG, Spurr CD, Carchidi PJ, Kittler AF, Goldszer RC, Fairchild DG, Sussman AJ, Kuperman GJ, Bates DW. A cost-benefit analysis of electronic medical records in primary care. *Am J Med* 2003 Apr 1;114(5):397-403.
- 5 Raymond B, Dold C. Clinical Information Systems Achieving the Vision. Prepared for the Meeting "The Benefits of Clinical Information Systems," sponsored by the Kaiser Permanente Institute for Health Policy, 2001.
- 6 Barlow S, Johnson J, Steck J. The Economic Effect of Implementing An EMR In An Outpatient Setting. *JHIM.* 2004;18:1
- 7 Renner K. Cost-justifying electronic medical records. *Healthc Financ Manage* 1996;50:63-64.
- 8 Johnston D., Pan E., Middleton B., Walker J., Bates DW: The value of computerized provider order entry. *CITL Executive Preview*, Wellesley, MA: Partners Healthcare System 2003.