Electronic Health Records Lifecycle Cost

Steven R. Eastaugh

Abstract:
We have overestimated the ability of electronic health records (EHR) systems to enhance efficiency by eliminating transcription and the need to physically pull charts. Hospital managers typically underestimate the costs of upgrade fees and support. To avoid this problem, hospitals must develop a full total cost of ownership (TCO) analysis to independently forecast total lifecycle costs for EHR information technology. Vendor information must be checked for validity and a milestone payment schedule must be devised to pay for results (outcomes) not promises. Vendors vary widely in their capacity to set up a fully functional inpatient-outpatient EHR system. Documentation programming will help to control hospital costs while enhancing service quality and staff morale. This study presents cost analysis from 62 hospitals in 16 cities during the period 2012–2013.

Key words: electronic health records, lifecycle cost, information technology.

One previous study of electronic health records (EHR) in this journal suggested a short-run gain in productivity of 1.6 percent, with no net cost savings.1 Fiscal and quality enhancement benefits of health information technology (HIT) have been limited. Hospital boards and managers too frequently consider only the initial cost of acquisition plus initial annual maintenance fees when considering EHR bids. One needs to analyze the full lifecycle cost for each and every significant capital information technology purchase. Managers have often become complacent towards EHR costs because of the huge federal investment in new systems. The Obama administration has invested over $20 billion in EHR through the American Recovery and Reinvestment Act of 2009. Now is the time for all good managers to come to the aide of their country (and their bottom line) and construct a total cost of Ownership (TCO) model to independently forecast total lifecycle costs (upgrades and all support costs) for their EHR systems.

A more global advanced HIT vision of cost analysis has to look beyond the basic interoperable system (IS) that enables many providers in various locations to access a patient’s data no matter who created the medical record. A mature EHR system (best 10 percent) allows the integration of evidence-based medicine profiles and lexicons. The 2013 Rand study outlined two reasons why EHR systems have yet to achieve any cost savings. First, providers failed to re-engineer care processes to reap full benefits of HIT. Secondly, the systems are neither interoperable nor easy to use.2

It is often cited that over one million Americans are injured each year by medical errors. With evidenced-based medicine and lexicons for re-engineered care processes the American public can benefit from improvements in the quality of care. To date the quality benefits of her investment in EHR are insignificant. The American public is restless for results. The September 18, 2012 Wall Street Journal (page A16) concluded from sifting through 36,000 studies of HIT, quality benefits and promised cost savings by vendors and government are
little more than hype. The academic community of health services researchers agree with this negative assessment. Many hospitals and health care providers are “behind the curve” in HIT adoption, and simply trust the first vendor to simply assemble a best-of-breed hodgepodge of complexity-confusion-software (CSS). Many taxpayer dollars have been wasted on CSS.

Congress has created incentives to acquire EHR systems, but the systems are often not very useful. The crawl towards the digital future has to emphasize results: enhanced quality of care, plus significant cost savings. In July 2008, Congress passed a law providing Medicare bonuses to physicians who use electronic prescribing, and for penalties beginning in 2013 to those who do not. The United States must learn from the experience of other nations. With a 10-year head start on the United States, France and Germany placed EHRs in all hospitals and clinics. EHR adoption, along with universal coverage has allowed France and Germany to enhance productivity, do 80–90 percent more patient visits per capita than the United States, at a system wide 40 percent cost savings per capita compared to the United States. The cost savings have produced price reductions to help fuel exports. In the decade 2000 to 2012 exports as a portion of gross domestic product (GDP) has grown 31 percent in Germany, but only 1.9 percent in the United States. According to the World Health Organization, France and Germany rank in the top five for quality of health care, whereas the United States ranks number 31.

Background

Productivity is the first test of a manager’s competence. A hospital manager seeking the best level of productivity should get the greatest output for the least inputs, therefore, better balancing all factors of care delivery to achieve the most with an optimal level of quality. Hospital managers must be change agents. The hidebound, tradition-based hospital that does not adopt then aggressively require all members of medical staff to improve, will not survive in the new world of accountable care organizations (ACO) and value-based purchasing. The hospital medical staff must work as a team to re-engineer processes and follow the goals of evidence-based medicine. This transition has been accomplished in two dozen academic medical centers. Will HIT achieve optimal benefits of EHR beyond the world of academic medical centers like Harvard and Johns Hopkins?

With time, as physicians become familiar with their EHR system, the medical staff can actually use the query tools and improve the quality of patient care, as reported in a study by Romano and Stafford. Providers require a screen format that is easy to navigate, with good content and efficient clinical order sets. Enhanced business intelligence software and dashboards help enhance communication across various departments. HIT has both a strategic impact, and a potential productivity improvement impact that prove cost beneficial for hospitals, physicians, and ACOs. Cost savings will ultimately be generated with the help of HIT decision support systems such as patient scheduling, physician scheduling, nurse scheduling, and computerized order entry.

Managers must closely evaluate the long-run TCO rather than focusing solely on the initial cost of acquisition and annual maintenance. TCO includes not only the initial software and infrastructure costs but also
implementation resources, training and integration fees, as well as ongoing costs such as upgrade fees, annual maintenance, and support costs including a dedicated staff of FTEs. The author has written two previous articles with the HIMSS Analytics Healthcare Information Management Systems Society database. The unique contribution of this current paper is surveying the nonrespondants who do not report to the HIMSS survey.

Data and Limitations

As an individual with a background in accounting, one can happily live with the Pareto principle of 80/20, if one knows 80 percent of the possible respondents’ information, the sample is sufficient. We contacted 100 nonrespondants to the HIMSS survey with two possible theories as to why certain chief information officers (CIO) had not responded. In this study, 62 percent of the 100 hospitals responded to our aggressive promptings. We entered the study with two possible null hypotheses. Hypothesis number one suggested that late adaptors or facilities with poor experience implementing their EHR system, would not respond to the HIMSS survey. Hypothesis number two, which was confirmed by the data, suggests early adopters to EHR were most likely to not respond to the HIMSS survey. One respondent offered a typical rationale: “as CIO I have the scars and success stories to teach others, so I want to sell my consulting expertise to other hospitals just like Henry Ford Hospital does so that I can maximize financial benefits from knowledge acquisition.” The philosophy of this group is simple: if we can sell it (knowledge, experience), do not give it away.

Across our sample of 62 hospitals: (1) EHR/HIT expenses represented 4.3–8.1 percent of the hospital’s total revenue, and (2) 22–39 percent of the hospital’s available capital. The hospitals underestimated the high number of personnel required to support a EHR/HIT system by 19–44 percent in 2009–2013. Vendor selection appears to be a major determinant of the ongoing costs of a EHR/HIT system.

In Figure 1, we outline the EHR support staff levels, now and in the future (10 year FTE costs) for hospitals in the sample. In considering the performance of EHR vendors (vendors A, B, and C), we control for organization size (beds). Many factors contribute to the long-run (decade-long) cost of implementing an EHR system, the cost of support staff is a convenient proxy for assessing an EHR’s ongoing support costs minus software upgrade fees. In our sample of 16 cities, the expense per FTE for EHR support staff ranges from $55,000 to $75,000 to $95,000 annually (New York City the highest).

The sample includes 15 hospitals that utilize vendor A, the most efficient supplier of EHR in terms of TCO. The sample has 31 hospitals that use vendor B, a vendor that is 30 percent higher cost than vendor A. The sample includes 16 hospitals that utilize vendor C, a vendor that is 105 percent higher cost relative to vendor A. These three vendors, A,B,C, were on a par in terms of system functionality and usability, and exhibited leadership by 2010 in CPOE adoption in the hospital industry. In considering the peer hospitals by revenue and bed size, the significant variance in total cost of variance is obvious. If we contrast the most efficient install by a 500-bed hospital for vendor C, it is twice as expensive as using vendor A.
Vendor A offers superior cost performance. The incremental cost of selecting vendor C over vendor A at a typical 500-bed hospital with annual expense per FTE annually of $75,000 annually, is $25 million versus $12 million (TYIC, Ten Year Incremental Cost). A multiple regression analysis suggested that for a 900-bed hospital, vendor C would require over 10 years, 27 FTEs more support staff than vendor A. The incremental additional FTEs required by vendor C is 15 FTEs for a 500-bed facility, 9 FTEs for a 300-bed facility, and 3 FTEs for a 100-bed facility. Figure 2 outlines the 10-year incremental support costs for vendor C relative to vendor A within three labor markets ($55,000, $75,000, and $95,000 per year for EHR support staff). In line one, last column, the New York City marketplace suggests a $28 million excess expense from selecting vendor C over 10 years. In the most low cost, rural, 100-bed marketplace, vendor C still wastes $1.75 million compared to the most efficient benchmark, vendor A. Vendor A offers the superior cost performance to hospitals of all bed size.

The choice of a EHR vendor may determine in large part the total cost of ownership of the system. Selecting vendor A could lift hospital operating margins 3.9–5.5 percent. Consider a quick calculation for the median urban teaching hospital that currently uses

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<td>3.5–5.5</td>
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Est. Decade = Estimated 10-year FTE labor costs of EHR system ($ millions)
vendor C. This facility has 591 beds and $888 million in annual revenue. The 2012 operating margin (total operating revenue—total operating expenses)/total operating revenue is 3.59 percent. With vendor C, the EHR support staff is 37, but if they convert to vendor A, the new support staff would be 18.5, thus lifting the operating margin 5.5 percent to 3.79 percent. This example is for an urban setting with EHR support staff expense of $95,000. If the expense per FTE were $75,000, the lifting of the operating margin would be 4.7 percent. In the rural setting, the expense per FTE were only $55,000, the lifting of the operating margin would be 3.9 percent.

Should hospital managers seek a 4–5.5 percent lift in their operating margin? Obviously, the answer is yes. In the next decade hospitals must contend with a rising inability to raise prices, a less profitable payor mix, and technological inflation pressures to remain state of the art (e.g., robotic surgery). In two years the nation will have but four health care systems: ObamaCare, Medicaid, Medicare, and private employer-provided insurance. We must continuously scan for opportunities to improve operating margins while enhancing the quality of care in the eyes of our patients, the insurance exchanges, and other third parties.

Some additional factors are needed in selecting an EHR vendor. Indeed, the benefits of vendor A might be understated. Why? Because the pool of skilled engineers supporting older languages is much smaller, and therefore more expensive than mainstream programming languages like Microsoft or Oracle. Vendor C, ranked second for usage in the hospital sector, uses MUMPS, an old programming language ranked 91 on the business-standard prevalence list. Vendor A uses Microsoft.NET framework, which supports multiple mainstream programming languages including C#. Vendor B is built on a mainstream Oracle database and programming language.

There is one final point concerning flexibility. Vendor A is not only 30 percent less costly than vendor B over a 10-year lifecycle, but it also allows extra applications like enterprise scheduling, clinical analytics,
outsourced IT services, and access management. Such value-added applications will earn substantial benefits in the long run, enhancing productivity and the quality of service. One California chief information officer said his 40-month EHR system had achieved 30 percent of what he hoped it would achieve. Productivity gains may emerge in two years, whereas a net cost-saving return on investment may take five to seven years to emerge.

Too Much Hype—Searching for Solutions

Better HIT can reduce unnecessary activity flow, reduce unit costs, improve patient satisfaction, and reduce waiting time for both providers and patients. A good EHR system can reduce costs through reducing downtime (wasted time). Evidence-based medicine lexicons need to be implemented facility wide across all departments. These systems have been outlined in the popular press by Soumerai and Koppel. Department managers need to identify quality problems and sources of waste, emphasize team building, and implement successful HIT remedies with lexicons approved by the medical staff. By avoiding mistakes and useless activities, gains in productivity are followed (maybe in two to four years) by cost savings, and quality is enhanced.

The benefits of HIT investment are often slow to emerge. One Oregon CIO reported EHR system implementation costs gobbled up 35 percent of the hospital’s capital budget each year for four years. A California CIO remarked that the EHR system used 5.5 percent of the systems total revenues ($111 million). Partners HealthCare in Boston is completing an enterprise-wide EHR system for $615 million. Duke University Health System out of Durham, North Carolina, is spending $707 million for their system. Many players are impacted by EHR cost escalation. In 2012 to 2013, Sutter Health trimmed $924 million from its budget through layoffs and suspension of raises to finance their enterprise-wide 24-hospital EHR system version 2.0. The question emerges—are we getting our money’s worth? With an appropriate clinical analytics solution package, lexicons linked to evidence-based cost-effective medicine, one can report to CMS the performance outcomes for 30-plus quality measures. The number of quality measures will soon expand to 65, and other third-party payors like Wellpoint and United Healthcare will demand the same metrics. Simple applications like CPOE will reap their full potential benefits as the payment system changes, and we pay more for quality through value-Based purchasing.

A fully functional EHR system has been defined as having the capability to:

1. Record patients’ clinical and demographic data.
2. View and manage results of laboratory tests and imaging.
3. Manage order entry, including electronic prescription and the ability to order tests and imaging.
4. Support clinical decisions, including warnings about drug interactions or contradictions.

A basic EHR system is one that allows just some of the first three functions. The fourth function of an ideal EHR is computerized physician order entry (CPOE). When a physician uses CPOE to enter a
prescription, the system alerts him or her to potential interactions with other drugs the patient is taking. Common dosages, contradictions such as pregnancy, and patients’ allergies are also flagged. Goals set by the federal government call for EHRs to be standardized and interoperable, meaning that multiple clinics and hospitals should be able to access and update them as patients seek treatment at multiple locations. The Rand Corporation Study suggests reducing 404,000 unnecessary deaths through EHR improvements, disease management, and prevention would save hospitals $51.7 billion. To reap these benefits may take us to 2024.

Substantial efficiency gains through HIT are visible to many managers. For example, the medication cycle time, the time it takes for an order to be filled and administered to the patient has been reduced from 68 minutes to 7.5 minutes in one of our sample hospitals. Physicians enjoy the productivity gains. After physicians make hospital rounds in the morning, they do not have to call the nurse in the afternoon or at night to see how their particular patient is doing. They can look it up themselves on the computer and see the current patient information. Physicians desire an integrated delivery system so the manner in which they enter an order is the same as their office and at the hospital. The EHR incentive program will expedite the use of digital records.

The evolving plug-and-play applications, such as those found on the iPad or Android devices, enable organizations to optimize care by reducing integration and maintenance cost. The 2011 Institute of Medicine digital infrastructure study recommends these practical smart technologies to promote a patient-centered, knowledge-based, system-minded model of health services delivery. One CFO noted the vendor with the lowest total cost of ownership for HIT systems was also the best at trimming wasted units of activity. Their HIT system reduced redundant lab tests and imaging studies by using advanced clinical decision support (ACDS). The ACDS prevented duplicate tests and studies when physicians were notified that the test/study was unnecessary, and offered the past results, and verified the duplicate test/study would not be reimbursed. Only ACDS alerts with a just-in-time, point-of-care focus, allows cost-effective clinical decision making. This type of ACDS will thrive in our new era of value-based payment, because the old world of volume-based reimbursement is dead. Managers that reposition the hospital to optimize HIT applications, select the best vendors, and develop effective accountable care organizations, will capture market share.

The largest impact that EHR may have in the long run is on quality. EHR allows for the creation of virtual warehouse for health data, as initiated by Kaiser and the state of California. Soon we can develop community health measures applicable not just to a single hospital or physician, but across an entire geographic population cohort. We can finally ask what treatments work, and what risk factors matter. As a young finance professor at Cornell I learned from a sage physician, Lewis Thomas, the importance of those two issues. Doctor Thomas observed that data mining like innovation itself, is a chaotic disturbed beehive. Then suddenly a pattern emerges with the purity of the best classical music, and a seminal new truth about the system emerges, revealing new benchmarks for quality and content.
REFERENCES