EHR and the Return on Investment

Is healthcare IT ROI an oxymoron? There are many professionals who believe return on investment (ROI) in healthcare technology is a figment of someone's imagination. Others struggle daily to define to the value of potential information technology installations and upgrades. There is no easy answer. The pressure is significant for all aspects of the healthcare delivery system, from hospitals to private practices, to invest in electronic medical records (EMR). A growing body of evidence, supports the conclusion that clinical applications improve quality, boosts patient safety, reduces lengths of stay, increase efficiency and timeliness of care. These potential benefits are fueling the conversion from paper-based medicine to EMRs. Yet, an Institute of Medicine report issued in 2001 commented that "IT has barely touched patient care."[1] In light of this evidence, why has healthcare been so slow to adopt lifesaving information technologies?

The price tag for these technologies is high and comes at a time when healthcare facilities and physician practices are struggling to keep financial bottom lines in the black. Additionally, IT investments must compete with many other business opportunities for a facility, such as expanding services or upgrading . Healthcare organizations spend less than 3 to 4 percent of their budgeted capital on IT, far less than other information-intensive industries.[2] Investment analyses might reveal all risk and little reward. Yet, clearly the rewards have been documented; the question to be answered is how do we address the business case for IT investment?

A traditional ROI analysis weighs the financial impact of operating expenses with the revenue gains from service delivery. If projected revenue gains exceed costs, the

investment is justified, and if funds are available, then capital is provided for the investment.[3] In healthcare, benefits are usually found in cost avoidance rather than revenue enhancement.[4] Many of the early healthcare applications were easily justified on the basis of ROI because they performed office functions quickly and efficiently, helping an organization to become more efficient. Scheduling, billing and results reporting were easy sells to a board of directors intent on quick approval. ROI analysis is not as easily calculated with clinical and decision-support applications, which while clearly adding value to the patient encounter, don't necessarily add revenue to the bottom line. How can the value of these applications be measured?

When the Computer-based Patient Record Institute (CPRI) first conceived of the Nicholas E. Davies Award of Excellence for computer-based patient record (CPR) implementations in the early 1990s, a work group was created to develop the evaluation criteria to assess CPR. Four major sections were included in the criteria: management, functionality, technology and impact. "Impact" was chosen as the descriptor rather than "value" (today's criteria heading) because quantitative measurements resulting from the implementation of the CPR were very limited. Despite the lack of measurable financial outcomes in the early years, one goal of the Davies Program consistently has focused on applicants' documentation of the costs and benefits of the CPR that could be used as a guide for other organizations in anticipating costs and expected returns. In the early years of the program, quality of care dominated the reported benefits. These reported benefits included avoidance of adverse events, such as medication errors, improved treatment protocols and improved continuity of care.

During the intervening years, CPRs have evolved into electronic medical records (EMRs), and the "impact" criteria has been changed to "value." Applicants are expected to outline the business case for the EMR and show how they achieved or plan to achieve a full return on investment (ROI). The Davies winners of 2002, Maimonides Medical Center, Brooklyn, NY, and Queens Health Network

, Queens, NY, both achieved a documented full return on investment; a first for the Davies program.

Measuring value in healthcare is difficult. This inexact science has traditionally examined utilization of services as a primary driver of healthcare expenses. The 1999 Institute of Medicine Report, *To Err is Human: Building a Safer Health System*, drew the nation's attention to several disturbing issues.[5]

- Preventable medical errors result in 44,000 to 98,000 deaths among hospital patients each year---a number greater than those killed in workplace accidents, motor-vehicle wrecks, breast cancer and AIDS.
- These medication errors cost the nation $2 billion in terms of lost income, lost household production, disability and healthcare cost.

Clearly, the measurement of value needs to be expanded to include patient safety, the quality of the delivered service, differences in treatment and their associated costs as well as the provider's ability to prevent illness or morbidity.[6] Any examination must include tangible benefits, including reductions in lengths of stay, staffing efficiency gains, improved adherence to medication protocols, easier regulatory reporting, simplified physician referrals, and increased capture of allowed billable expenses.[7] The need to determine the business impact of clinical systems and decision-support tools have finance

departments attempting to quantify benefits such as eliminating misinterpretation of orders resulting from indecipherable physician handwriting, reduced instances of "phone tag" as physicians and pharmacists or nursing personnel attempt to clarify prescriptions, avoidance of incorrect medication dosages, the impact of clinical guidelines and treatment prompts. It will be necessary to consider the monetary benefits for avoiding medication error-related death or injury as well as the cost of compensating the victim for a valid malpractice claim.[8] This paper will examine how ROI has been calculated utilizing tangible and intangible benefits in hospital organizations and in private practice.

The Center for Information Technology Leadership (CITL) value framework identifies three different types of tangible healthcare IT value: financial, clinical and organizational.[9] The financial value dimension includes cost reductions from decreased administrative, clinical staffing, and resource requirements. Financial gain is reflected in revenue enhancements from improved billing practices and charge capture as well productivity gains from increased volume.[10] For example, the introduction of Ohio State University Health System's EMR, a 2001 Davies winner, reduced the time for getting medication to patients by 65 percent from 5.28 hours to 1.51 hours. Radiology turnaround experienced similar improvements; prior to the EMR, the time from order entry to completion of a radiology procedure was 7:37 hours, but after implementation of the EMR, it was cut to 4:21 hours.[11] A well-established and widely accepted measure of ROI has been length of stay (LOS). Even fractional reductions in lengths of stay can be measured in dollars and cents and have a significant impact on an organization's financial picture.[12] Maimonides Medical Center, a 2002 Davies Award winner, reported a 30.4% reduction in average length of stay, resulting from timeliness and completeness of clinical

data, which produced quicker diagnosis and treatment. The LOS at Maimonides decreased to 5.05 from 7.26.[13] In addition, Maimonides realized organizational efficiencies through the prevention of duplicate ancillary tests. In the laboratory, chemistry tests decreased by 48.9%, urinalysis by 41.6% and microbiology by 40.6% at a time when there was a stable admission and case mix index.[14]

The clinical value dimension of ROI is achieved through care process advances from better adherence to clinical protocols and improvements in clinical decision making. Improved quality of patient outcomes through real-time alerts, and clinical decision support generates reductions in medical errors, resulting in declines in morbidity and mortality.[15] In the early 1990s, Brigham and Women's Hospital in Boston implemented a computerized physician order entry (CPOE) application of its own design. After implementation, serious medication errors decreased by 55%, and there was a 17% reduction in preventable adverse drug reactions (ADEs). [16] Medication errors that cause an ADE are expensive. The IOM reports the cost of treatment for ADEs averages $4,600 per incident nationwide. The IOM has further analyzed costs indicating that ADEs add $2.8 million annually to the costs of a 700-bed teaching hospital.[17] Dr. David Bates and his colleagues at Brigham and Women's reported that the average cost of an ADE at their institution was $2,595. Hospitalwide savings from preventable ADEs was projected to be $480,000 a year. "For our institution, the costs of developing and implementing CPOE have been estimated to be $1.9 million, with maintenance costs of $500,000 per year. The net savings are estimated to be from $5 million to $10 million per year."[18] These savings reflect the prevention of ADEs, cost-efficient drug selection and use of laboratory and clinical pathways. [19]Maimonides experienced equally remarkable quality improvements.

With 774,168 medications ordered in 2001, clinical outcomes naturally improved as the organization realized a 55% decrease in medication discrepancies and a 58% reduction in problem medication orders. Pharmacy transcription errors and errors such as incorrect date, time, quantity, route or frequency were completely eliminated.[20]

The organizational value of ROI can be measured by improved stakeholder satisfaction with improved access to healthcare information, a decrease in wait times and increasing positive perceptions of improved care quality.[21] The Ohio State University Health System noted significant gains in provider satisfaction in formal surveys conducted before and after implementation. Clinical treatment protocols were incorporated into the EMR, expediting the ordering of radiological tests, chemotherapy and medications.[22] Heritage Behavioral Health enhanced the organizational value of their EMR by reducing costs associated with the documentation of client encounters in the clinical record. Before implementation, caregivers dictated notes that other employees transcribed into the paper record. The associated costs for this process was $103,400 annually. Following implementation, costs dropped to $33,150, a 70% reduction.[23] The length of time needed to post the clinical note to the record dropped from an average of eight to ten days to instant availability following completion of the patient encounter.[24] Repayments to payers for non-compliant documentation or ineligible services at Heritage decreased from $49,477 in 1994 to $774 in 2001.[25]

The University of Illinois at Chicago Medical Center conducted an assessment of the organizational value of their EMR in October 2000. The assessment looked at quantitative benefits from project onset to early 2001. Nursing reaped a significant benefit, with an approximate $1.2 million of nurse time reallocated from manual

documentation tasks. Registered nurses in the charge nurse role were able to spend 2.75 hours less per shift in the medication administration process, while nurses in direct caregiver roles gained an hour each shift. Time gains were reinvested into direct patient care.[26]

Intangible organizational benefits accumulate in error prevention, reduced risk mitigation, and organizational goodwill.[27] During eleven weeks of use from October 2002 to January 2003, the EMR at Cedars-Sinai Medical Center, Los Angeles, processed about 600,000 physician orders. For about 30,000 of these orders, the decision support component triggered alerts informing clinicians of possible cross-drug interactions, patient allergies or other medication risk factors. In about 10,000 of these orders (1.7% of the total orders written), physicians cancelled or changed their orders, suggesting that a potential error was avoided.[28] During 2001, Maimonides EMR decision support feature identified 164,250 drug-drug, drug-allergy, drug-food, and drug duplication alerts. This potential problem identification resulted in 82,125 beneficial changes in treatment that year.[29] Queens Health Network, a 2002 Davies winner, is utilizing their EMR to move from patient-specific to population-specific disease management. Queens annually treats approximately 5,700 diabetics; a population they expect to double in the next five years. Their EMR enables physicians to examine lab values and other parameters across the population, resulting in earlier intervention in identified disease trends.[30]

Regulatory compliance is an organizational benefit that is frequently overlooked in calculating ROI. The ambulatory care EMR at Maimonides Medical Center improved regulatory compliance for the current problem list from 67% to 97%, and completed medication list improved from 67% to 100%. Allergy documentation experienced a

similar gain, moving from 88% to 100%, while quality of pain assessment documentation has improved to 95%.[31] The Ohio State University EMR has built-in compliance specifically with respect to DNR (do not resuscitate orders), restraint orders, and advance directives.[32] Medicare compliance issues are supported automatically by prompting charge entry clerks when a modifier needs to be added to a particular charge and Advanced Beneficiary Notice (ABN) implemented to inform a patient that Medicare does not cover a specific test.[33]

Increased satisfaction of healthcare organization stakeholders contribute to a positive ROI. Maimonides has been tracking inpatient satisfaction since September 1997. After the installation of its EMR, satisfaction with admissions/registration rose from 63% to 80%, information/communication/education jumped 15 percentage points and overall patient satisfaction rose 5 percentage points.[34] Provider satisfaction is not an instant reality. The first several months following an EMR implementation can be difficult for physicians, because extra effort is required to create the chart. The value is realized on the second or perhaps third and subsequent visits, when all documentation is instantly available, and physicians don't have to waste time thumbing through pages in a paper chart.[35]

ROI on healthcare IT investments is not limited to large healthcare facilities. Although minimally documented in the literature, small practices throughout the United States are beginning to reap tangible benefits from their EMRs. Financial benefits related to improved office efficiencies were most frequently documented. Accessibility of records was often mentioned. There was no waiting for a chart; no lost or misfiled documentation. Charts could be easily accessed for audits and printable copies made it

easy to accommodate record requests. Bergen Medical Alliance studied the productivity of four physicians before and then after the implementation of an EMR. While working the same amount of hours, the four physicians were able to see from four to eight more patients per day.[36] Expenses were reduced because of reductions in the need for manpower and transcription while revenues were enhanced through timely billing and thorough charge capture.[37] Several types of EMR software automatically remind providers when they omit entries for visit documentation, such as associated diagnoses that payers require for claims processing.

Clinical benefits in small practices are clearly evident in reducing drug costs and preventing adverse drug events.[38] Additional gains are reaped from the accuracy and completeness of notes, which gives physicians more confidence that charges are justified by documentation, sparing huge fines from CMS for coding or charging irregularities.[39] Primary Care Associates in Cape Coral, FL, estimate a savings of $152,000 when the practice was audited. The 120-patients-per-day practice includes a primary care clinic and laboratory. When coding levels triggered an audit, a two-day review of electronic records generated a 99.997% accuracy rate with the EMR; a rate that could not have been achieved through paper-based documentation.[40]

EMRs enable disease management by gathering extensive data quickly and efficiently on patient populations. A three-physician practice in South Carolina has 3,000 diabetics among its 25,000 patients. Diabetics' long-term control is monitored by tracking hemoglobin levels and using those levels to determine patients' risks for complication.[41] An EMR for a four-physician practice in Evans, GA, closely follows childhood immunizations and alerts providers for appropriate follow-up.

Organizational ROI for small practices was accrued by increased provider satisfaction resulting from multiple workflow enhancements found in the EMR. Immediate provider access for nurses or physicians enabled rapid and informed response to patients' telephone questions. Refill request encounters were easily accomplished and documented. Communication and education modules enhanced patient understanding and satisfaction.

EMR ROI is not an oxymoron. Multiple healthcare organizations and private practices have achieved and will continue to achieve significant returns on their investments. As with clinical healthcare, financial ROI best practices should be observed. In the past, IT investment in many organizations has not provided measurable results, creating the myth that the value of IT was questionable. Chief Information Officers still can be heard at times glibly indicating they don't believe in ROI for IT investments. This is no longer acceptable practice. IT healthcare technologies are effective tools in the safe medical management of patients in all settings. Their purchase for a healthcare facility or small practice can be justified by a financial model that explores both tangible and intangible benefits to the organization. CEOs and Boards must require information on metrics, payback, and an explanation of how each application will contribute to the ROI. Metrics and clinical benchmarks must be created for each project. Financial and information officers must know and have measured the starting point prior to implementation. Continued adherence to financial best practices will destroy the myth that there is no ROI for healthcare technologies.

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