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How Providers Can Lower Costs and Improve Patient Care Using Evidence Based Medicine

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"More widespread application of evidence-based medicine could help health care workers make better use of the medical technology they already have to improve patient outcomes."

Ben Bernanke, Federal Reserve chairman, June 2008 Senate Finance Committee Summit on Health Care Reform

Executive Overview

Nearly a decade ago, the Institute of Medicine (IOM) Committee on the Quality of Healthcare in America released its first report, *To Err is Human*, finding that an estimated 44,000 to 98,000 Americans could die each year as a result of a medical error. The first report was followed by a second, *Crossing the Quality Chasm* which focused on safety and patient-centered care. Although these reports led to a better understanding and realization that evidence on what is effective, and under which circumstances is often absent from care at critical decision-making points, they did not trigger immediate change. Since release of these reports, the healthcare industry in the United States continues to suffer the distinction of being globally recognized for providing less-than-optimal service and outcomes at a very high cost. US healthcare costs per capita are among the highest in the world[1], but various studies conclude that a significant portion of the healthcare provided is redundant or ineffective, and a major portion of costs goes toward administrative processing.

Equally important to US patient care delivery outcomes to cost ratios versus the rest of the developed world are the large and rapidly increasing ranks of the uninsured. One in three under the age of 65 were uninsured at some point in 2007 and 2008[2]. The situation is so dire that despite the significant deficit and deep recession, President Obama and a majority of the congress are attempting to close the gap in health insurance through some combination of public and private programs and incentives. A starting principle for this effort is that cost must be contained for the insured populations to free up funds to partially or fully pay for the uncompensated care pool – but, without reducing the quality of care.

[1] *World Health Statistics 2009: Global Health Indicators*. World Health Organization, 2009

[2] "*Americans at Risk: One in Three Uninsured*," Families USA, March 2009

One of the most significant obstacles to improved patient care, at a reasonable cost, is the relative lack of real-time access to current, comprehensive patient medical information that is easily retrievable for patients, healthcare providers, and healthcare payers. To impact the quality of US healthcare, patient information must be captured, updated, and shared with all stakeholders in a timely and effective manner to not only ensure universal access to quality data, but also to extend essential information to key clinical decision makers.

While some small-scale regional efforts to capture and leverage this information are under way, the healthcare industry as a whole requires encouragement to adopt and better utilize information technology (IT) in both the near term and the long term. Government agencies could and have begun to facilitate this greater adoption of technology by considering a number of alternatives:

Work with industry to develop standards for medical records, including content, terminology, interoperability, and code sets implemented as a network of networked electronic health records

Identify higher-cost disease management and clinical treatment areas and prioritize IT investments in areas that show the most likelihood of reduction to regional variation in cost per patient and medical outcome

Consider developing and implementing financial incentives for payers that reduce the cost burden of collecting and maintaining comprehensive information

Examine the regulatory environment in the US healthcare industry to determine which legislative or policy actions promote wider and more effective deployments or greatest meaningful use of information technology.

Introduction

One could easily argue that the United States has the most advanced healthcare delivery of any country in the world. Per capita we spend roughly $8,000 annually, more of our GDP (16.4% or roughly $2.4 trillion) on healthcare than any country in the world[3]. Based on our current trajectory, this number is expected to grow to 18.8% of GDP and $11,000 per capita by 2015.

We have the most sophisticated teaching hospitals and medical research centers in the world, replete with the most advanced medical equipment on the planet yet we rank 33rd in the global rankings for longevity (tied with Cuba). Earlier in 2009, many Americans were glued to their TVs in fascination regarding the story of a women who delivered eight children as a result of fertility treatments, resulting in premature births, intensive care support in a neonatal facility, and speculation of bills ranging from half a million to $3.5 million[4]; but the US infant mortality rate is 36th in the global rankings[5].

Clearly, overall healthcare spend and care delivery prowess are not the only terms in the equation. Additional factors significantly impact how healthcare spend is allocated; a few diseases comprise the bulk of healthcare expenditures and 5% of the population account for almost half of every healthcare dollar spent annually (and two-thirds of these expenditures are by those over 50 years old), significant variations in spending can also be mapped by regional, race and socio-economic status – even diet has a major impact

[3] Centers for Medicare and Medicaid

[4] Jennifer Harper, "*'Octo-Mom' gives birth to fertility ethics debate*," Washington Times, February 4th, 2009

[5] Average of World Health Organization 1990, 2000 and 2006 rankings (Longevity & Infant Mortality)

(we also happen to be the most obese nation on the planet). In essence, just throwing money at the problem will not fix it.

Until recently, the vast majority of studies that identified these issues were done in research settings by care delivery providers or by policy-reviewers at a macro-level with their findings published but not prescriptive – not applied in a way that impacts patients as consumers, not guiding the decisions of how much and when payers should reimburse or which treatments should be offered by care delivery providers. The reason for this is simple: IT technology has been applied in very sophisticated ways to deliver better care but not in a way that makes the cost and decisions as to when and how to deliver it more efficient and transparent.

This White Paper provides an Information Technology approach that can deliver the situational awareness and decision support necessary for the healthcare industry reform movement to meet the challenges and opportunities faced by a country with the greatest healthcare infrastructure and largest expenditures in the world to deliver more effective care delivery across a broader patient community. This paper also highlights two case studies that demonstrate how technology can serve as a key component of effective healthcare delivery by creating the necessary data framework for practicing evidence-based medicine (EBM).

The theory behind EBM is one in which caregivers deliver patient-centered care in an open environment that provides access to systematic analysis of all available evidence in electronic format from an extensive, ever-changing, continually updating, reliable statistical set. Data sets may include standard clinical trial models, publications on medical protocols and their efficacy, demographic and genetic data, and day-to-day in-field observations. This would allow physicians to balance their experience and training with EBM comparative data, which could provide real-time situational awareness and decision support.

There are, however, two substantial hurdles to realizing this vision. First, there is no vast data set that can be searched in real time and filtered using domain-specific medical protocol intelligence (with implied semantic mapping of terminology), and second, physicians and healthcare administrators are not currently prepared to easily adapt to this new clinical decision-making paradigm. Yet, despite these hurdles, EBM is gaining traction among providers for two major reasons:

1. Its promise as a tool to help contain continually rising healthcare costs and;

2. Its potential to dramatically improve healthcare quality

The US Healthcare Landscape

The healthcare industry in the United States is operating at a level of quality and efficiency below the desired standards of patients, healthcare professionals, and industry watchdogs. The majority of concerns focus around access to care, quality of care, prevalence of incorrect medical diagnoses and rising costs. In its original report, the IOM found that medical errors were in fact high enough to be considered a leading cause of death, and in 2004, Health Grades reported that an average of 195,000 people in the US die annually due to potentially preventable, in-hospital medical errors.

Key Indicators

Supporting text should contain benefit/solution information such as which business problems exist and how they are solved, the ROI/value produced by addressing the problem, and which solution(s) or pieces of the solution Oracle provides.

- The 15 most expensive health conditions account for 44% of total health care expenses – mostly chronic conditions and patients with multiple chronic conditions cost up to seven times as much as patients with only one chronic condition[6].
- About 30% of the total annual US expenditure on healthcare is spent on ineffective or redundant care[7].
- Healthcare premiums have risen nearly 84% between 1999 and 2009, from $5,791 to $12,680 for family premiums[8].
- The United States spends more money per capita on healthcare than any other country; in 2009, per-capita expenditures were $8,300[9].

[6] Agency for Healthcare Research and Quality, Mark W. Stanton, M.A., "*The High Concentration of U.S. Health Care Expenditures*," June 2006

[7] US Senate Finance Committee Roundtable Proceedings on Healthcare Delivery System Reform, Allan Korn, M.D., Senior Vice President and Chief Medical Officer Blue Cross and Blue Shield Association, April 2009

[8] Employer Health Benefits, 2008 Annual Survey, Kaiser Family Foundation and Health Research and Educational Trust

[9] Centers for Medicare and Medicaid Services, latest postings, June 2009 http://www.cms.hhs.gov/NationalHealthExpendData/25_NHE_Fact_Sheet.asp#TopOfPage

In 2004, President George Bush set a goal of universal Electronic Medical Records (EMRs) by 2014, outlining a detailed plan designed to increase meaningful IT use in healthcare and to create national standards that would enable medical information to be digitized, stored, and shared electronically. Progress toward this goal was not realized under the Bush administration and President Obama has aggressively renewed this charge through the HITECH Act and the American Reinvestment and Recovery Act of 2008. According to its most recent calculations, the US Government Accountability Office (GAO) estimates that the percentage of GDP spent on healthcare in the United States will change from 16% to 20% by the year 2015.

Obama invested in Medical IT Little return on investment

Despite all of the expenditures on healthcare described earlier, the United States scored a mere 66 out of a possible 100 in a 2006 Commonwealth Fund report that measured 37 key indicators for quality, based on national average performance against top performance benchmarks. In addition to performance measurement, the report called for adoption of technology to enable better handling of patient records to improve patient safety, quality of care, and healthcare provider productivity.

One example of rising healthcare costs amid poor outcomes is tied to Nosocomial or hospital-acquired infections (HAIs), i.e., patient infections contracted during a hospital stay through exposure to resistant strains of bacteria such as methacillin resistant staph aureus that can live almost anywhere in the hospital, including medical charts. Other high cost conditions, according to the New England Journal of Medicine, include psychiatric, cardiovascular and cancer care.[10]

In a March 2008 GAO report, the Centers for Disease Control (CDC) reported that 10% of all hospital deaths result from HAIs.[11] The same GAO report went on to state that "multiple Department of Health and Human Services programs collect data on HAIs, but limitations in the scope of information they collect and a lack of integration across the databases maintained by these separate programs constrain the utility of the data." About two thirds of hospital-acquired infections affect elderly patients who rely on Medicare as their primary source of healthcare funding. The long-term prognosis is poor for a favorable outcome or standard cost treatment

Challenges

While better leveraging and utilizing electronic health information can help the healthcare industry to improve performance and outcomes, a few key challenges remain.

[10] http://healthcarereform.nejm.org/?p=691#more-691

[11] U.S. Government Accountability Office, "*Health-Care-Associated Infections in Hospitals,*" March 2008

Resistance to Cultural Change

A major challenge of IT adoption as a cost savings measure is provider resistance to change. A recent report by the Congressional Budget Office noted that per-capita annual spending in 2004 on healthcare by state ranged from under $4,000 to over $8,000 without any significant correlation to positive healthcare outcomes.[12] Physicians cannot practice medicine outside of Standard Operating Procedure and FDA approved drugs as this constitutes malpractice. Where ambiguity or multiple options for treatment exist, local and regional physician cultural norms tend to dictate variations to specific elements of a medical protocol delivered (e.g., lab test ordered, imaging exams performed).

In summary, care delivery providers must rely on the clinical trials and limited follow-on information available to them even though evidence that documents the efficacy of care delivered through the clinical practices across large and varied demographic sets in a variety of care delivery settings would provide a fuller, richer set of data upon which decisions could be made. Furthermore, standards could be periodically revised and possibly driven by an ever growing and changing set of statistical data; this can only be achieved by extraction from electronic records backed by collaborative decision support systems.

Currently, deployments of fully functional electronic health records (EHRs) across the clinical enterprise, i.e. crossing practice and provider boundaries, are rare. Two reasons are the wide variety of different EHRs in current use and the use of many disparate systems in the healthcare enterprise. Another significant factor is the lack of consistent standards across health records in a number of pertinent areas (e.g., content, terminology, clinical relevancy, interoperability, code sets, and clinical practice). Until a set of base standards can be developed and implemented across the set of health records in current use, healthcare information will continue to exist in siloed data sets that cannot be accessed and used across a broad range of healthcare stakeholders or the broader healthcare ecosystem.

Implementation Costs

Organizational costs to acquire and implement electronic healthcare information systems are significant, particularly to individual medical practitioners and most of the technology solutions currently available are not mature due to the lack of standards described earlier and other factors. Cumbersome workflows and ongoing training and maintenance costs are other barriers to acceptance.

[12] Peter R. Orszag, Director Congressional Budget Office, *"Opportunities to Increase Efficiency in Health Care,"* Statement at the Health Reform Summit of the Committee on Finance, United States Senate, June 16, 2008

Misaligned cost burdens for individual practitioners are also an impediment to implementing electronic health information in the current environment. For EHRs to be fully functional, EMRs and clinical information systems (such as computerized provider order entry [CPOE] systems) must already be in place. However, a 2005 study by the Medical Group Management Association showed that less than 10% of physician practices surveyed had a fully implemented EMR. One reason is that while the cost of the EMR system is fully borne by the healthcare provider, the healthcare payer actually recognizes many of the benefits of the EMR system. As an example, the Center for Information Technology Leadership reported that physicians realized a mere 11% of the savings associated with implementing an ambulatory CPOE system, while the other 89% of the savings was realized by private sector and government payer organizations.

The Health Information Technology Policy Committee work group, in its meaningful use role, recently recommended a series of stringent requirements between 2011, the first payment year of the Stimulus Act subsidy program, and 2015, the final year that the government will make payments before imposing financial penalties (decreased Medicare payments) on professionals not adopting qualified EHRs.

Care goals

Draft proposals from the HITPC workgroups identify care goals for eligible professionals seeking to qualify for incentives in 2011[13]:

- Provide access to comprehensive patient health data for patient's health care team;
- Use evidence-based order sets and computerized patient order entry (CPOE);
- Apply clinical decision support at the point of care;
- Generate lists of patients who need care and use them to reach out to patients (e.g., reminders, care instructions, etc.);
- Report to patient registries for quality improvement, public reporting, etc.;
- Provide patients and their families with the data needed to manage care; and Ensure privacy and security protections

In addition to these monetary costs, physician productivity is negatively impacted in the short term as new systems and new processes are put in place, and some estimates put the drop in productivity at around 20%. While the hope is that these costs are recovered in the long term, the short-term impact should not be ignored and may serve as a barrier to physician/practice acquisition of these systems, not to mention the burden of physician training and running duplicate systems during implementation.

[13] MGMA "*Government takes first step in defining meaningful-use requirement for EHR incentives,*" July 2009

Opportunities for Transformation

Earlier sections have primarily focused on some of the current issues and challenges in the US healthcare industry. In this section, we discuss some of the potential opportunities for transformation that exist if the industry can leverage information technology to a greater extent in building the infrastructure to support EBM.

Not Your Father's Doctor

To some extent, a portion of the provider resistance to adoption of electronic health information systems can be credited to a generational gap. Many physicians in practice today began their careers before the current advances in information technology were available; thus, they are accustomed to providing patient care without incorporating electronic information in decision-making and disease management in a significant manner. However, current (and all future) generations of physicians have grown up in a fully "connected" society. These generations have grown accustomed to the benefits provided by technology and will be receptive to leveraging technology to better serve their patients and manage their medical practice. As they begin to embrace electronic healthcare records that enable a component of evidence-based medicine, some of the entrenched justifications for variations in medical protocols are likely to break down. According to Dr. Carolyn Clancy, former Director of AHRQ, speaking at the 2005 American Medical Informatics Association on Health IT[14], "if (physicians) are going to avoid injuring patients—and succeed in giving them the right treatments—and spend dollars effectively—then (physicians) need the best information (they) can get about which treatments really work, and for whom. "In a word, (physicians) need the strongest foundation possible, of evidence and results in health care."

Not all applications of technology to healthcare problems save money or improve care. And, while younger care practitioners are open to and very comfortable with technology, it can easily lead to irrational exuberance around its adoption and use in situations that do not have clear ROI. Furthermore, even where the aptitude and inclination to use HIT exists, healthcare professionals are no different than any other group of knowledge workers tasked with on-the-job but off-the-clock training and continuous learning.

[14] http://www.ahrq.gov/news/sp102505.htm

Patient Heal Thyself

Healthcare providers are not the only group associated with rising healthcare spending who require cultural changes. Healthcare consumers, who are not fully practicing wellness and maintenance of care, contribute to healthcare spending inflation. The CBO[15] estimates that healthcare cost for the obese to be 34% higher than for those not obese (adjusted for all other demographics). Smoking, high alcohol consumption, lack of exercise, poor eating habits, and other patterns contribute to higher costs and declining health. Historically, with the exception of children and adults with chronic conditions, most healthcare consumers have not maintained a relationship with a primary care practitioner unless they are initiating an illness appointment. This model of care and level of interaction does not promote healthcare literacy or provide opportunity for reinforcement of prevention messages.

With the wave of transformation unfolding through Health Reform, comes an enormous opportunity to focus on consumer healthcare literacy. Self education is growing through use of knowledge sites such as WebMD, Medscape, NIH.gov and others. These sources have led to a new-found healthcare consumer empowerment. Recent surveys have found that 59% of healthcare consumers go online to find healthcare information and, after their own physician, many consumers trust the information from these on-line sources far more than other sources[16]. As consumers age, a higher level of expectation will be realized concerning availability and adoption of information technology as a part of individual care and the framework for care delivery.

For many consumers, their inclusion in surveys that give ratings to measure their perception of care are an important part of ensuring that only the highest ratings are received by providers and facilities offering the highest quality of care. One such system is administered under Press Ganey, a healthcare consulting organization most prominently known for issuing ratings for children's hospitals. Since 2002, Press Ganey has partnered with a number of government agencies to conduct the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS). Among its partners are the Centers for Medicare and Medicaid Services (CMS) and the Agency for Healthcare Research and Quality (AHRQ) who helped to develop an instrument to measure patient perceptions of care. The reports are then made public and can impact other hospital rankings. Another powerful rating survey for children's and adult tertiary care hospitals

[15] Congressional Budget Office, "*Technological Change and the Growth of Health Care Spending*," January 2008

[16] Eric Slack, "*Technology: Web Matters*", Inside Healthcare, March 25th, 2009

is the US News and World Report Best Hospitals ranking which is released annually and is typically a featured part of each facility's annual quality report and marketing campaign[17].

In essence, healthcare consumers are changing the paradigm of care, making sure that when they become ill they are empowered patients, not with an expectation that they will heal themselves or change the odds but change the care delivery process, setting and decision-making dynamics in their favor.

Transforming the Decision-Making Dynamics

Acquiring and implementing secure and effective information technology that spans the patient home, ambulatory care clinic inpatient facility, diagnostic lab, provider practice, policymaker, and payer communities should lead to improved quality of care through a more comprehensive decision-making process and better-informed decision making at all stakeholder levels. Physicians can perform diagnoses based on more current and comprehensive background healthcare data through comparative analysis with other practitioners, and their patients can benefit from improved quality of care through this information exchange. One of the tremendous patient benefits stems from the fact that the information data-sets will include both provider and payer information from both public and private sources, including care maps or prescribed care pathways for relevancy. Patients can also begin to build their own ancillary records: logs of their adherence to medication schedules, exercise routines and dietary plans. They can even begin to form social networking based collaborations around their efforts with like-minded or afflicted individuals.

Healthcare public policymakers can rely on this data to develop and implement more effective healthcare delivery and payment policies, and report patient care outcomes based on statistically accurate clinical practice and demographic information. With the adoption of privacy and security enabled technologies, patients will have greater access to their personal health records, and can confidently help to maintain and update their personal information.

This information network and exchange represents a significant opportunity to create decision-making under a new Evidence-Based paradigm, by integrating individual care delivery across vast yet specific demographic sets to more accurately and holistically address care delivery and treatment decision-making. A person with a given illness in a specific region of the country and within particular age or ethic group can be compared against their counterparts who were treated at a series of healthcare providers and payers and a list of medical protocols and procedures used

[17] http://health.usnews.com/sections/health/best-hospitals

to diagnose and treat that illness. The results enable providers to determine when they are charging appropriately, leveraging clinical practices correctly and competing with other care delivery organizations effectively. This level of access to and transparency of information would have the same value to payers, enabling them to see what other providers are charging and what payers are reimbursing. What is transformative is that the information used is patient-centric and decisions are then based on EBM-driven justification instead of how common (provider-centric) or expensive (payer-centric) a procedure is. The net result would be to drive down cost through competitive pressures amongst payers and amongst providers instead of simply between payers and providers. Furthermore, the dynamic between payers and providers, would be more fact-based, centered on the actual patient outcomes.

Evidence-Based Medicine Can Drive Improved Patient Safety and Quality of Healthcare Provision

In the current care delivery environment, industry estimates indicate that paper-based medical records in hospital settings are unavailable approximately one-third of the time they're needed by decision-makers, and about 18% of medical errors are attributed to inadequate, incomplete or outdated patient information. When properly developed and implemented in treatment settings, IT — and electronic health information systems and health informatics — have the potential to dramatically decrease instances of patient records being unavailable and to eliminate or significantly reduce the occurrence of medical errors that result from inadequate, incomplete or outdated information.

If, at the critical point of decision-making, physicians can access comprehensive, current medical information for their patients, — including past comprehensive medical history, drug allergies, medications, laboratory results, and other relevant information — they can include EBM as a part of their disease management regimen. They can also confidentially conduct rapid research through specific networks where additional practitioner information is needed for decision-making and disease management. This would result in more wide-spread practice of patient centered care, and improve the level of patient safety in care delivery, while at the same time, eliminate unnecessary treatment redundancies.

In addition to practicing effectiveness medicine, providers can leverage deployed EHR technology to enable advanced clinical decision support and drug/allergy, drug/food, or drug/drug patient alerts. However, such practitioner tools must be monitored in terms of thresholds and/or costs and benefits for care delivery since excessive alert frequency might cause less confidence among physicians and elevate frustration levels, serving to hinder adoption.

In recent reports released by the Institute of Medicine, EBM also has a component of required study related to the care delivery setting, which in some instances, may have a relationship to

disparities of care. New findings are prompting a component of EBM to view not only the decision making surrounding patient care, but also the location in which the care was rendered[18].

Reduced Overall Cost of Care

If properly populated, secured and leveraged, electronic healthcare information should help to reduce the overall cost of healthcare and improve patient quality. In addition to reduction in errors and redundancies, a much higher level of patient satisfaction and confidence in care delivery settings should be realized, serving to improve overall patient outcomes.

Since a majority of healthcare spending is borne by public sector organizations, most notably CMS (The Centers for Medicare and Medicaid Services), leveraging IT and gaining access to current, accurate electronic health information could potentially reduce or eliminate a portion of the cost of care assumed by Medicare and Medicaid expenses for a number of chronic conditions for a defined population group. In recent congressional hearings on healthcare cost containment, IT has consistently been cited as a major part of any successful reform.

Finally, when all parties of the healthcare ecosystem have access to comprehensive, current, accurate health information in a timely fashion, the incidence of misrepresentation and the need for resolution of claims disputes by providers, payers, and patients over treatment billing and reimbursement justification should be significantly reduced. The availability of relevant patient information and treatment history compared with demographics can assist with this and more quickly resolve questions that arise from decision-making and course of treatment planned.

Evidence-Based How Do We Get There?

Evidence-based medicine or comparative effectiveness research is not a new concept in medicine. Other countries have successfully deployed this aspect of care in their care delivery settings and found favorable quality and cost benefits. These countries include Canada, Germany, Australia and the UK. As a part of the Stimulus Act, AHRQ, the NIH and DHHS were allocated a total of $1.1 billion dollars for comparativeness effectiveness research initiatives. Recipients of funds conducting these studies will look at not only how care is delivered, but also where it is delivered.

Despite the implementation challenges and concerns cited above, the majority of studies point to significant savings and improvements in quality. A study published at the beginning of the year based on a role out of health information technologies (HIT) inclusive of CPOE systems, EMRs

[18] NEJM June 2009

and EHRs at 41 hospitals in Texas found a 10% increase in HIT usage by care delivery practitioners resulted in 15% fewer deaths and 16% fewer complications in its study group versus the general population as well as a reduction of the cost burden for the study group of across their hospital admissions[19]. Studies such as this begin to put real world testimonial behind more theoretical estimates such as the Rand study cited earlier. There are three major steps for adoption of HIT on a grand scale.

One of the most important and critical first steps is the standardization of data-sets across care delivery organization (CDOs) networks (hospitals, clinics, private practices, VA, etc.), between CDOs and public and private payers - even to medical instrumentation, pharmaceuticals, government regulatory bodies and policy makers. This first step creates a grid for sharing the information and automating execution of processes based on decisions made around the information. The second is to deploy decision-support clinical information systems, or health informatics, that is, systems attached to the grid that provide care delivery providers – for the most part physicians of course – to collect data, rapidly analyze it and make a more informed decision. This step makes the grid intelligent because it injects the physician's decisions into the process – and the grid. The third and final step is to create avenues for practitioners and patients to collaborate leveraging the grid and their past decisions and experience. In no way would these steps replace the physician's role but simply augment the decision making process by providing a far larger, near-real-time, intelligent *Evidence Base* to support their practice of *Medicine*.

Modernizing the Healthcare Infrastructure to Support Electronic Record Sharing

Modernization of the healthcare industry will require agreement on hardware and software minimum standards as well as a controlled medical vocabulary within the software and EHRs/EMRs that standardizes clinical terms to process, analyze, share, and store data. Organizations including Office of the National Coordinator of Health Information Technology (ONCHIT), Clinical Data Systems Interoperability (CDSI), are striving to make standards available and building reference architectures and reference implementations based on them. Standards such as HL7 for medical information in message packet format has been standardized as well as schemas for transformation of legacy records from a vast array of systems and formats into a common XML-based schema and record. Comprehensive records assembled from disparate information can then be consumed and viewed by Commercial-off-the-shelf (COTS) applications and portal environments.

[19] David W. Bates, MD, MSc, "*The Effects of Health Information Technology on Inpatient Care*," Archives of Internal Medicine 2009;169(2):105-107

Of course medical records are bound to patients and must remain private. Connecting healthcare information for a single patient from multiple healthcare clinicians, providers, and payers requires a master patient index at the enterprise level. The master patient index would connect identifiers that healthcare organizations have on record (e.g., medical record number, health plan ID or patient ID number, social security number) with patient demographic data such as name, birth date, gender, and address. The master patient index would be a critical component in ensuring that all healthcare encounters are linked to the correct patient. Representative efforts in support of such an index are under way in the form of the US National Patient ID and Provider ID programs.

In order for healthcare information systems to be enthusiastically accepted across the healthcare industry, the systems must ensure the security and privacy of patient information. Clinical data would be available only to those with the appropriate permissions based on role and need-to-know. The Health Insurance Portability and Accountability Act (HIPAA) provides strict regulations concerning access to medical information, and full compliance with HIPAA requirements is a key component of any healthcare information system.

While overcoming the challenges and obstacles described earlier may appear extensive, the potential benefits are many, and specifically related to quality of care. Demonstration of this is found in a number of widely read case studies including a review of the Healthcare IT system deployment in the VAMCs (Veteran's Affairs Medical Centers).

Turning EBM into Patient-Centric Decision Support

As EHR systems are integrated together and new ones are built to replace older ones, the good news will be that information will become extensive and widely available – the bad news is that information will be vast and potentially unfathomable. The difference will be to turn that health information and associated demographic and financial information into knowledge that feeds decision support systems useful to healthcare providers, payers and policy makers. Decision support systems for Healthcare - or Health Informatics - are comprised of databases, data mining and analytics, and business intelligence tools, commonly found in rules-driven, knowledged-based environments such as financial services.

With trillions of clinical laboratory tests, diagnostic images and prescriptions filled and millions of pages of logs of patient visits in hospitals and practice settings written each year in the US, the data storage requirements alone for just the healthcare data are daunting; proper storage encryption, compression and aggregation techniques are required to build the base EHRs for each individual at a reasonable cost. This represents just the start towards the data necessary to build better decision making. In addition to this information, metadata on financial transactions, provider and payer details, temporal, demographic, even spatial information must also be incorporated into the EHR making it a multi-modal dataset which for a large hospital network or RHIO could generate EHR data warehouses in the high petabyte ranges.

The right analytics and healthcare intelligence tools can be attached to the EHR data warehouse to look at critical areas from a totally different perspective.

Healthcare Social Networking Closing the EBM Loop

As mentioned above, healthcare consumers are increasingly turning to the Internet for healthcare information. In the same study cited above, those in the 18 to 35 group not only use online sites to pull static information but have moved into the social networking space, specifically around healthcare information. Yet physician-only social networks, for example Sermo, iMedExchange, MeshMD and Osmosis are just starting off. All are voluntary and some, like sermo, provide options for anonymous socializing while others, like Osmosis, take a linkedin-like approach where the development of voluntary closed-knit communities of known members can be created and extended. The biggest issue with these social networking sites is that they are not connected to the EHRs and to business intelligence tools that could be used to build hypothesis worth socializing. A recent article in the New York Times pointed to the lack of content available on these sites. Furthermore, they do not have any guidelines, training or mandate for use nor are they embedded in the diagnosis process in such a way that a doctor would think to leverage the community as part of their SOP.

For EHRs and decision making tools to be fully applied while at the same time safe guarding patient information, social networking tools must be modified and built on top of RHIOs and other networks that will serve as the basis of EBM platforms.

Case Studies

US Department of Veterans Affairs, Veterans Health Administration — My HealtheVet Portal- VAMCs

In this case study, it was found that launch of "My HealtheVet Portal," a powerful tool that enabled veterans to better understand and manage their personal healthcare and helped VA healthcare providers to make decisions based on accurate, current, and comprehensive patient information, generated a significant patient benefit to veterans.

In addition to the general healthcare industry challenges described earlier, the Veterans Health Administration (VHA) faces other hurdles in providing quality healthcare to U.S. veterans. The majority of the VHA's patients are over 65, in less than good health, and typically not affluent. Historically, no means existed for VHA caregivers to rapidly receive broadcast announcements regarding changes in medications, treatments, diagnoses, or other information for veteran-specific illnesses such as Gulf War syndrome or Agent Orange. Since the traditional records process was paper based, documenting and processing any health event could take weeks.

A long-time U.S. trendsetter in terms of integrating information technology into the healthcare system, the Department of Veterans Affairs (VA) has grown from an organization of 48 hospitals and 30,000 employees into the nation's second-largest federal agency.

Today, approximately 237,000 VA professionals provide healthcare to more than 5 million veterans through 157 hospitals and more than 850 community clinics, and pensions and disability compensation are paid to over 3.4 million veterans through regional VA offices.

In response to these unique challenges, as well as a 2001 survey that showed 62% of veterans use the Internet, the VHA set out to develop a patient-centric health information system that could be accessed by the veteran, the veteran's caregivers, or anyone the veteran deemed appropriate through a secure portal, from any public Internet connection.

The task facing VHA was to develop a secure portal that could: 1) provide the veteran with full control over who had access to the veteran's health records, 2) enable role-based and user-based access (as defined by the veteran) to be available both inside and outside the VA network, 3) create a system that doctors felt would provide them with faster and more comprehensive access to patient information at a realistic investment level, and 4) handle all logistical items including appointment scheduling, prescription ordering, and tracking and provide a consolidated repository of health information to support decisions related to particular aspects of the veteran's health.

All of these challenges had to be addressed with the expectation that the vast majority of the systems that would hold or originate the veteran's medical profile and data would be siloed and distributed across military hospital record systems (prior active duty records), private records from pre- and post-military service, and the VA records.

My HealtheVet portal, launched on Veterans Day, November 11, 2003, is a secure portal that provides the gateway to veteran health benefits and services. It provides access to trusted health information, links to federal and VA benefits and resources, the Personal Health Journal, and online VA prescription refill. Electronic refill of prescriptions is the number 1 requested service by veterans, and 2.5 million prescriptions have been refilled through the My HealtheVet portal. In the future, registrants will be able to view appointments, co-pay balances, key-in portions of their medical records online, and much more.

Since My HealtheVet portal has requirements to scale to a broad and diverse population, the technology solution needed to scale must also be adopted accordingly. From a technology perspective, MyHealtheVet portal leverages Oracle's WebLogic Portal and a service oriented architecture (SOA) infrastructure for integration to back-end systems and healthcare data repositories. The portal and service infrastructure supports over 377,000 registered veterans and has supported over 9 million user visits since August 2005.

My HealtheVet portal is a powerful tool that enables veterans to better understand and manage their personal healthcare and helps VA healthcare providers to make decisions based on accurate,

current, and comprehensive patient information. President Bush has pointed to MyHealtheVet portal as a model for what needs to occur in the private sector.

Centers for Medicare & Medicaid Services — Physician Quality Reporting Initiative

2009 PQRI The Medicare Improvements for Patients and Providers Act of 2008 (MIPPA) (Pub. L. 110-275) made the PQRI (Physician Quality Reporting Initiative) program permanent, but only authorized incentive payments through 2010. Eligible Physicians who meet the criteria for satisfactory submission of quality measures data for services furnished during the reporting period, January 1, 2009 - December 31, 2009, will earn an incentive payment of 2% of their total allowed charges for Physician Fee Schedule (PFS) covered professional services furnished during that same period (the 2009 calendar year)[20].

Since its inception in December of 2006, PQRI has served to provide a financial incentive to participate in the voluntary quality reporting program with the primary goals of promoting and supporting evidence-based medicine, increasing the overall quality of care provided under Medicare, and transforming the Medicare program from a passive payer to an active purchaser that rewarded professionals for quality healthcare provision and effective outcomes.

As a part of promoting physician participation, CMS worked to develop an automated system that was easy for the participants to access and use. In addition, the system needed to ensure the protection of private healthcare information from inappropriate access, and be able to sort through submitted information and generate reports that would allow CMS to assess the submitted claims and identify those claims that qualified for the bonus payment.

Oracle's WebCenter Interaction portal and Oracle's WebLogic Application Server enable "Quality Net," the CMS PQRI Portal that serves to accomplish this. CMS recently announced more than $36 million in bonus payments to many of the more than 56,700 health professionals who satisfactorily reported quality information to Medicare. The average incentive paid for individual professionals was more than $600, and the average incentive payment for a physician group practice was more than $4,700, with the largest payment to a physician group practice totaling more than $205,700.

As participation in PQRI grows and emphasis on patient quality is highlighted over time, both patients and providers can benefit.

[20] http://www.cms.hhs.gov/pqri/

"Just as investment in railroads, air traffic control, and interstate highways facilitated economic development and national prosperity in the 20th century, so too will the spread of health IT and the development of a national health information network bring long-run benefits and gains to the nation in the 21st century. It is crucial that our federal leadership move now to harness the power of information technology and put the nation on a path to high performance."

Karen Davis, Commonwealth Fund President

Conclusion

When combined, adoption of Healthcare Information Technology, the practice of Evidence-Based Medicine, and the deployment of quality initiatives, tremendous gains can be realized in the healthcare ecosystem. Technology built on Oracle's WebLogic, Web Center Interaction and other Fusion Middleware, SOA-based IT platforms have been successfully deployed in many healthcare settings and can offer great potential to promoting "Meaningful Use of IT." Additionally, these technologies can reduce healthcare costs and increase the overall quality of patient care by providing access to current, comprehensive healthcare information for both patients and healthcare providers across public and private healthcare settings. While there are potential pitfalls with any new technology and disease management strategy, there is a growing body of evidence that Evidence-Based Medicine can lead to cost savings, better care and better outcomes.

There are significant challenges to the widespread deployment and adoption of EHRs and there will be resistance on all fronts to the yet-to-be-determined facts yielded from EBM, facts that will be backed by a preponderance of evidence that only a healthcare data grid of the magnitude described above can provide. There are concerns that the decision-making authority - the art of the science - could erode. But the humanity of medicine will not perish, doctors will not become subordinate to a massive artificial brain – the smart in the EBM grid are the practitioners themselves. Patients will not decide they can evaluate all the information and request even more expensive care. Administrators concerned with the bottom-line will not block all subsequent spend on new treatments and technology. Instead, we will see the same results we have seen in other industries with highly skilled knowledge workers who have integrated IT into their decision making process; the art of their science continues to flourish. The vast reservoir of data will lead to new hunches, generate new hypothesis for practitioners and researchers – the difference is one can immediately find out if someone has a similar ideas, has seen like results and instantly collaborate with them. Patients and administrators will not become practitioners nor will looking at the data diminish their appreciation or reliance on parishioners; instead, it will make them better consumers and partners in the quest to improve patient care and – along the way, as a by-product - reduce the cost.

How Providers Can Lower Costs and Improve Patient Care Using Evidence Based Medicine
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