CALIFORNIA
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Measuring the Costs and Benefits of Health Care Information Technology: Six Case Studies

Prepared for
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by
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PricewaterhouseCoopers provides industry-focused assurance, tax, and advisory services for public and private clients primarily in four areas: corporate accountability, risk management, structuring and mergers and acquisitions, and performance and process improvement. More information is available at www.pwc.com.

About the Foundation

The **California HealthCare Foundation,** based in Oakland, is an independent philanthropy committed to improving California's health care delivery and financing systems. Formed in 1996, our goal is to ensure that all Californians have access to affordable, quality health care. For more information about CHCF, visit us online at www.chcf.org.

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Introduction

THE PRESSURE NEVER STOPS FOR HEALTH CARE executives. Grappling with limited budgets, strict regulations, and intensive oversight, they must be able to demonstrate the expected business value of every decision. This includes the value of any proposed investments in information technology (IT). Simply asserting that IT "keeps the business running" is no longer enough; executives must clearly state IT's contribution both to the bottom-line and clinical outcomes.

Health care IT executives understand the difficulty of delivering accurate, relevant numbers to support a pure business case for IT investment. Standard IT performance measurements assess the efficiency of specific functions such as data center and network management, help desk, and application support services, but they fail to capture some of the real value of IT in a health care environment. Health care executives need to evaluate and measure IT investments from a perspective that goes beyond financial performance to look at all the ways IT affects health care.

To help provide that perspective, the California HealthCare Foundation (CHCF) commissioned PricewaterhouseCoopers (PwC) to interview health care executives across the spectrum of the industry. PwC conducted more than 20 interviews, including six case study site visits to:

- Partners HealthCare (Boston, Mass.)
- Northwestern Memorial Hospital (Chicago, Ill.)
- St. Joseph Health System (Orange, Calif.)
- Sharp HealthCare (San Diego, Calif.)
- Sarasota Memorial Health Care System (Sarasota, Fla.)
- Central Valley Health Network (Sacramento, Calif.)

These interviews yielded valuable insights into the IT decision process and how to make it a key part of an integrated financial and patient safety improvement strategy. Readers may find the resulting summaries useful in discussions of how to plan for IT investments and gain the most value from IT capital budgets.

Background

No one doubts that the health care environment will continue to become more complex. The Institute of Medicine's reports

on medical errors, employer groups such Leapfrog, "pay for performance" schemes, and increasing consumerism are external factors that are increasing the pressure to improve IT capabilities as one way to enhance the performance of health care providers. Couple these external factors with the internal dynamics of physicians building competing outpatient facilities, capital access issues, aging facilities, rising medical equipment costs, and clinician shortages, and the pressure on executives to use technology effectively are apparent.

Faced with these internal and external forces, health care executives are changing what they expect their IT investments and personnel to do. IT is becoming a key driver of effective business and clinical enterprises, playing an integral role in health care organizations' efforts to enhance patients' lives, comply with regulations, and operate profitably. Health care organizations that use IT to help meet these goals can create competitive advantages in keeping patients, blocking new market players, and satisfying stakeholders.

For most health care organizations today, IT value measurement and management begins and ends during the project approval cycle. Most health care organizations have conducted, for large projects at least, a traditional return-on-investment (ROI) study that projects cash flow along the IT value life cycle. However, ROI studies are typically used only to achieve project approval. After the project is launched, few organizations use the studies to guide implementation or to benchmark post-implementation results against the forecasted business and clinical benefit.

Given that the purpose of traditional ROI studies is project approval, they focus only on "hard dollar" revenue enhancement and cost savings. Furthermore, many health care providers and health care information system vendors have published studies identifying tangible efficiency and financial benefits from clinical information systems, mainly computerized physician order entry (CPOE). However, IT investments produce significant "soft dollar" and intangible benefits. Health care executives acknowledge this but have not had a well-defined methodology to account for these benefits.

The lessons learned in the case studies that follow suggest that there are critical success factors to effective IT value measurement and management. The six organizations that participated in the studies were asked to identify these factors as they applied to their individual sites, along with the philosophy they use in gauging the value of their IT investments. Although each example presents a slightly different set of lessons, common themes include:

- The need to focus on outcomes and performance, not just implementation milestones.
- The importance of physician acceptance, or "buy-in."
- The value of involving all interested parties within the organization, rather than just those connected with IT.

Case Studies

Partners HealthCare

Organization profile. Partners HealthCare (Partners) was founded in 1994 by Brigham and Women's Hospital and Massachusetts General Hospital. Today, Partners also includes primary care and specialty physicians, community hospitals, specialty facilities, community health centers, and other health-related entities, including Brigham and Women's/Faulkner Hospital, McLean Hospital, Newton-Wellesley Hospital, North Shore Medical Center, Partners Community HealthCare, Partners Rehabilitations and Continuing Care Services, Dana-Farber/ Partners Cancer Care, and the Harvard Clinical Research Institute. As a non-profit organization, Partners is focused on developing an integrated health care delivery system that offers patients a continuum of coordinated high-quality care.

Clinical systems environment. Partners uses a best-of-breed clinical application suite, including a well-known custom-developed clinical patient record and CPOE application. Individual entities are responsible for implementation of solutions, and their application portfolios are somewhat different; however, Partners is moving toward a standardized set of core applications.

Defining value. Determining the value to be realized from an IT solution necessitates a multifaceted value proposition and requires wrestling with numerous intangible and interdependent aspects. Partners' IT value philosophy acknowledges that return cannot always be distilled into a typical financial ROI, although Partners does require rigorous financial and process performance analysis for significant and certain types of IT investments. Although Partners does not try to quantify value attributable to intangible benefits, its executive team believes intangible value is real, achievable, and worthy of investment.

A few examples of intangible value that Partners considers when reviewing IT projects are: contribution to brand equity, potential improvement in patient safety and outcomes, and improved flexibility in IT or process infrastructure. To assist in understanding and making capital allocation decisions, Partners informally stratifies IT projects into the following categories: 1) infrastructure, 2) mandated (e.g., regulatory), 3) economic gain, 4) service, 5) new business, and 6) transformational. This categorization process accounts for the need to invest in infrastructure, flexibility improvement, experimentation (e.g., physician-patient communication), standardization, and other types of IT projects where value is instinctive but difficult to quantify. In essence, Partners considers factors beyond the traditional ROI analysis, including strategic alignment, conversion effectiveness, and risks.

A crucial IT question Partners considers is whether to build or buy. Given its IT capabilities, Partners considers the following build-vs.-buy questions when evaluating an IT project:

- Can Partners be more effective than the market (quicker or cheaper)?
- Does the project provide a strategic advantage?
- Is there uncertainty in the end-state process domain and solution (e.g., ambulatory electronic medical record)?
- Does the organization have "unique" requirements?

Another basic tenet of Partners' IT philosophy is the way in which it deploys applications and technologies. In Partners' view, the typical mantra of speed-to-value is only valid when the end-state process domain is stable and, therefore, the technology solution is fairly certain. Thus, many of Partners' strategic and significant IT projects are considerably longer than many would estimate. For example, the Partners electronic medical record (EMR) project has taken five and one-half years to deploy to 2,500 users and is

expected to take another four and one-half years to deploy to 3,500 more users. Equating this to a typical community hospital might imply a one-year pilot and four-year rollout.

Critical success factors. Partners identified the following factors as vital to the success of managing and achieving value from IT investments:

- Establish an IT governance framework anticipating difficult decisions regarding periodic reprioritization of IT investments and the IT project portfolio.
- Do not try to quantify every IT investment into a financial return.
- Build project management and organization change capabilities across the entire organization (not just within IT).
- Do not treat IT investments differently than other organization investments.
- Define what success will be and how it will be measured.
- Understand the fundamental reasons for making IT investments: infrastructure requirements, mandated (regulatory), economic gain, service, new business, and transformational.
- Functional champions, not IT leadership, must fight for and defend IT investments.
- Deploy incremental change, controlling the pace to enable organizational learning.
- If there is a question about value, employ an incremental approach and retain the ability to "pull the plug."
- Obtaining physician buy-in and involvement is a must and is the key is to make it easier/better for them to practice medicine.

Lessons learned. Throughout Partners' long and well-known IT history, the company has gleaned valuable information others can benefit from, including:

- IT value is very real and significant.
- IT value is very diverse, and much of the value is intangible.
- Value has to be managed; it does not just happen.
- Be wary of large-scale IT projects where there is questionable accountability and the scope is unclear.
- Where possible, support the value proposition with quantifiable measurements during the business case and approval process, implementation process, and post-implementation validation process.
- Be conscious of organizational change factors that have to be managed through an iterative learning process.
- Factor in the risk of a "speed-to-value" approach.
- Recognize, that for large-scale projects such as CPOE, you will never stop implementing and the implementation team will never disband.
- Provide abundant education and transition support, especially to physicians and clinicians.

Northwestern Memorial Hospital

Organization profile. Northwestern Memorial Hospital (NMH) is one of the nation's pre-eminent academic medical centers and has numerous centers of excellence. Its reputation is founded on a long tradition of leadership in patient care, education, research, and improving the quality of health care services in Chicago. NMH is affiliated with Northwestern HealthCare Corporation, Northwestern Memorial Home Health Care, Northwestern Memorial Physicians Group and Northwestern Memorial Foundation.

Clinical systems environment. NMH views information systems, in particular advanced

clinical systems, as an essential enabling technology to achieve its corporate strategic goals of the "Best Patient Experience" and "Best People." NMH is in the process of implementing several advanced clinical information system applications. Currently, online clinical documentation at the point of care is performed throughout the organization, and new systems have been implemented for surgery, anatomic pathology, and physician practice EMRs. Much of the foundational work to date is a precursor to achieving evidence-based clinical decision support and effective medication administration processes.

Defining value. NMH has dedicated a significant amount of thought to IT cost-benefit management, focusing on achieving the highest level of value from IT investments. The hospital has developed an approach that uses a process/value decomposition framework. First, NMH has embedded IT vision and accountability into the organization, enabling IT to become a core competency of the senior leadership team through a sponsorship model of execution (described below). NMH does not produce a separate technology strategic plan but rather identifies IT solutions necessary to achieve stated business strategies and objectives. This prevents a differentiation between the success of IT and the corporate strategy and provides a direct link between strategic initiatives and IT planning.

Subsequently, IT initiatives are "owned" and driven by functional owners (sponsors), with emphasis placed on appropriately chartering projects, including identification of expected outcomes and performance measures. Once the project has been appropriately chartered, NMH manages the project to the planned outcomes, holding project sponsors and IT project leaders accountable for reporting the results through regular monitoring of the performance measures. NMH has instituted senior level strategic implementation committees to ensure that major initiatives are linked to the organization's mission and strategy, to develop implementation plans, to resolve business and project issues, and to monitor project progress effectively. As a result, NMH has developed four committees focused on achieving the four strategic goals of the organization.

Critical success factors. NMH identified the following factors as critical to the success of managing and achieving value from IT investments:

The executive leadership team must:

- Have a clear understanding of the difficulty involved in large-scale clinical projects and the related requirement for perseverance.
- Establish an IT governance framework anticipating difficult decisions regarding periodic reprioritization of IT investments and the IT project portfolio.
- Consistently apply a disciplined planning process by appropriately chartering IT projects. This includes identification of project sponsors, strategic alignment, problem definition and solution, scope, deliverables, required resources, desired outcomes, and key performance measurements.
- Define the project time line focused on achieving desired outcomes and important performance measurements, not system implementation milestones.
- Focus on managing organization change and risk mitigation.

St. Joseph Health System

Organization profile. St. Joseph Health System, a ministry of The Sisters of St. Joseph of Orange, is a not-for-profit Catholic health care system established in 1982. St. Joseph's vision is to be recognized as a leader in providing regional integrated health care, promoting health

improvement, and creating healthy communities. Serving communities in Northern and Southern California, West Texas, and East New Mexico, St. Joseph consists of 15 hospitals, three home health agencies, and multiple physician groups. All hospital and home health entities are accredited by the Joint Commission on Accreditation of Healthcare Organizations, and ten of their entities received scores of 90 or higher, many with commendation. St. Joseph employs about 19,000 full-time equivalents and has 3,559 licensed beds.

Clinical systems environment. Employing a best-of-breed approach, St. Joseph Health System uses Meditech Healthcare Information System (HIS) and CPOE systems while partnering and integrating with other vendors for ancillary systems. St. Joseph uses systemwide order sets and alerts but allows some customization at the entity level.

Defining value. St. Joseph focuses on value on investment, rather than the more traditional ROI, and stresses that numerous quantitative and qualitative measurements need to be considered beyond the standard financial considerations. A critical factor in St. Joseph's approach is that care redesign is one of three primary strategic initiatives across the health system; in other words, this technology-enabled business/clinical initiative is very visible and well supported at the executive level. This visibility and commitment is supported by accountability for benefits achievement through financial incentives for health system and local entity executives. St. Joseph believes, and to some degree is beginning to demonstrate, that the value derived from clinical systems will include increased savings in pharmaceuticals expense, reduced length of stay, duplicate-test reduction, improved patient outcomes, and improved patient safety. Furthermore, the health system expects to realize value through improvement in patient, physician, and employee satisfaction, as well as in staff recruiting and retention. In addition, advanced clinical systems will provide visibility into individual physician practice patterns, enabling intervention and education with fact-based, quantitative performance measurements. A key to realizing value from St. Joseph's IT investments is understanding and improving IT capabilities. To measure, manage, and continuously improve IT capabilities, St. Joseph uses a monthly survey/report card consisting of five primary IT delivery categories, including service and financial value. This process allows St. Joseph to identify entity and enterprise performance as well as provide guidance and corrective action. Using this report card approach has encouraged functional ownership of IT initiatives.

St. Joseph uses a mature governance model that consists of structured health system and entity-level teams that guide and adjust IT priorities and spending. At the health system level, the IT Strategic Investment Council is responsible for determining IT strategy, exploring new IT investments, and integrating business and technology planning. Each entity has an Information Services Planning Council that is responsible for local, tactical IT planning.

Critical success factors. St. Joseph identified the following factors as critical to the success of managing and achieving value from IT investments:

- Identify, understand, and perform relevant current state performance measurements.
- Focus on improving patient care as opposed to financial benefit.
- Use a structured and staged roadmap for deploying care delivery transformation:
  - Foundation—Technology-enabled process redesign with heavy involvement of clinical/business owners
  - Opportunity assessment—Identify, measure, and craft current state and target performance measurements

based on business strategy and objectives

- Transformation—Physician and clinician-led care delivery process change

Lessons learned. Through its experience implementing advanced clinical systems, St. Joseph has gained these insights about what makes for a successful IT investment:

- Do not buy "bells and whistles"; focus on integration with ancillary information systems (i.e., pharmacy, lab, radiology) that optimize current IT investments.
- Use a highly collaborative approach to attain buy-in and assign accountability for achieving projected benefits.
- Focus on changing culture and care delivery processes first, then enable with technology.
- Ensure an adequate number and the right mix of resources and competencies (e.g., implementation, process facilitation, and organization change specialists).
- Do not be held captive by a time line; allow time for learning from incremental implementation progress.
- Foster leadership, ownership, and accountability at the local entity level (which requires a strong leadership team, a strong and involved board of directors, and a unified and well-understood vision).

Sharp HealthCare

Organization profile. Sharp HealthCare (Sharp) is an Integrated Delivery Network (IDN) consisting of four acute care hospitals and four specialty hospitals covering the greater San Diego area, including Grossmont Hospital, Sharp Cabrillo, Sharp Chula Vista Medical Center, Sharp Coronado Hospital, Sharp Mary Birch Hospital for Women, Sharp Memorial Hospital, Sharp Mesa Vista Hospital, and Sharp Vista Pacifica. Sharp also has more than 1,500 affiliated medical group physician members, including Sharp Community Medical Group, Sharp Mission Park Medical Group, and Sharp Rees-Stealy Medical Group. In addition to hospital and physician practice facilities, Sharp includes the Sharp Health Plan, the largest locally based health plan in San Diego, covering more than 100,000 people. Recently, the University of Arizona and Sharp HealthCare were awarded a U.S. Department of Health and Human Services Agency for Healthcare Quality and Research grant of $1.3 million for a three-year study to determine the impact of hospital computerized provider order entry systems on adverse drug events. This study will be one of the first comprehensive CPOE studies performed in a community health network setting.

Clinical systems environment. Sharp HealthCare uses a variety of clinical information systems, employing a best-of-breed approach. Sharp uses IDX Flowcast for order entry, patient accounting, medical records, and radiology. Sharp is upgrading to IDX's CareCast application suite for order entry, pharmacy, and CPOE. In addition, Sharp uses the Cerner Classic Laboratory and MSMeds pharmacy applications; CliniComp's paperless chart; Fuji PACS, EmStat for emergency room management; and Lawson for financials, human resources/payroll, and materials management. To provide an integrated desktop view of these varied applications, Sharp is currently deploying the Sentillion product, which is based on Clinical Context Object Workgroup (CCOW) standards, and Identix biometric (fingerprint) authentication.

Defining value. Sharp has adopted six "pillars of excellence" as the foundation for its vision to transform the health care experience, which it dubs "The Sharp Experience." The pillars—quality, service, people, finance, growth, and community—are the basis for everything from strategic planning, organization goal setting, priority setting, management performance evaluations, and meeting agendas. Targets are

set for each pillar that align individual leaders' goals with those of their department, division, entity, and, ultimately, with the entire Sharp health system. With the pillars as a guide, communications and work planning are made more manageable, and outcome measurements are enhanced. Measurements used to determine performance targets under each pillar include:

- **Quality**—Accreditation and licensing scores, infection-control measures, patient safety, and measurements for disease management in the areas of diabetes and cardiac care.
- **Service**—Overall patient and physician satisfaction in Sharp hospitals and medical groups.
- **People**—Increasing employee satisfaction and retention and reducing employee turnover.
- **Finance**—Increasing available cash on hand to reinvest in operations and reducing workers' compensation claims.
- **Growth**—Increasing total net revenue to reinvest in operations.
- **Community**—Commitment by management to donate at least 4,440 hours annually toward community service programs.

As a symbol of commitment to these pillars, nearly 1,000 Sharp leaders have signed eight-foot pillars that are now displayed in the lobby of Sharp's corporate offices in Kearny Mesa.

Measuring and realizing value. Following the six pillars approach, Sharp examines IT investment through objective measurements. For example, during the rollout of the Fuji PACS system, the project team used a standardized template to determine project goals before commencement, and then developed tools to track performance. This is a relatively new process for Sharp, and the leadership recognizes that there is a need to introduce even more rigor in the outcomes planning and measurement process. Sharp plans to use the six pillars as the highest level of value for the organization, determining appropriate performance measurements that bear on one or more pillars in order to achieve the desired outcome of IT projects. This approach will allow Sharp to accurately identify, plan, construct, and realize the value of IT projects at each organizational level, as well as across the entire enterprise.

Critical success factors and potential barriers. To enable its organization to achieve the intended value of clinical systems, Sharp identified the following as critical success factors and potential barriers:

- Any large-scale clinical process change and technology project must be driven and owned by functional areas, not Information Services.
- Physician acceptance and buy-in is critical.

In addition, it is essential to:

- Deploy user-friendly solutions, which "think" like clinicians and improve their workflow.
- Use a widespread cultural and operational change-management program.
- Avoid a "watered down" effect from over-integration, causing decision support and other reporting capabilities to be shallow because of a lack of available detailed data.
- Collect baseline process performance measurements and plan for ongoing measurement and reporting mechanisms.
- Ensure uptime and system-response times through effective infrastructure design and capability.
- Carefully develop an effective deployment strategy that includes physician and clinician input and provide comprehensive testing, abundant training, and frequent communication.

Sarasota Memorial Health Care System

Organization profile. Sarasota Memorial Health Care System (SMHCS) is a community-based health care system that encompasses Sarasota Memorial Hospital, Sarasota Memorial Health Care Center at University Parkway, Sarasota Memorial Care Center at Blackburn Point and the Clark Road Campus. There are additional outpatient sites, as well as home health and long-term care services, a network of primary and specialty-care physicians, a health information and resource hotline, a Physician Hospital Organization insurance network, and a primary care center and community medical clinic for the uninsured and underinsured. Sarasota Memorial Hospital, licensed for 828 beds, is the second largest public hospital in Florida. As the second largest employer in Sarasota County, SMH is staffed by 690 credentialed physicians and more than 3,000 employees.

Clinical systems environment. In June 1997, SMHCS installed the HealthVISION clinical suite, which was acquired by Eclipsys Corporation and became part of the Eclipsys' Sunrise Clinical Manger (SCM) product, which is now part of Sunrise XA. The original installation included all major interfaces to ancillary applications (e.g., laboratory, radiology).

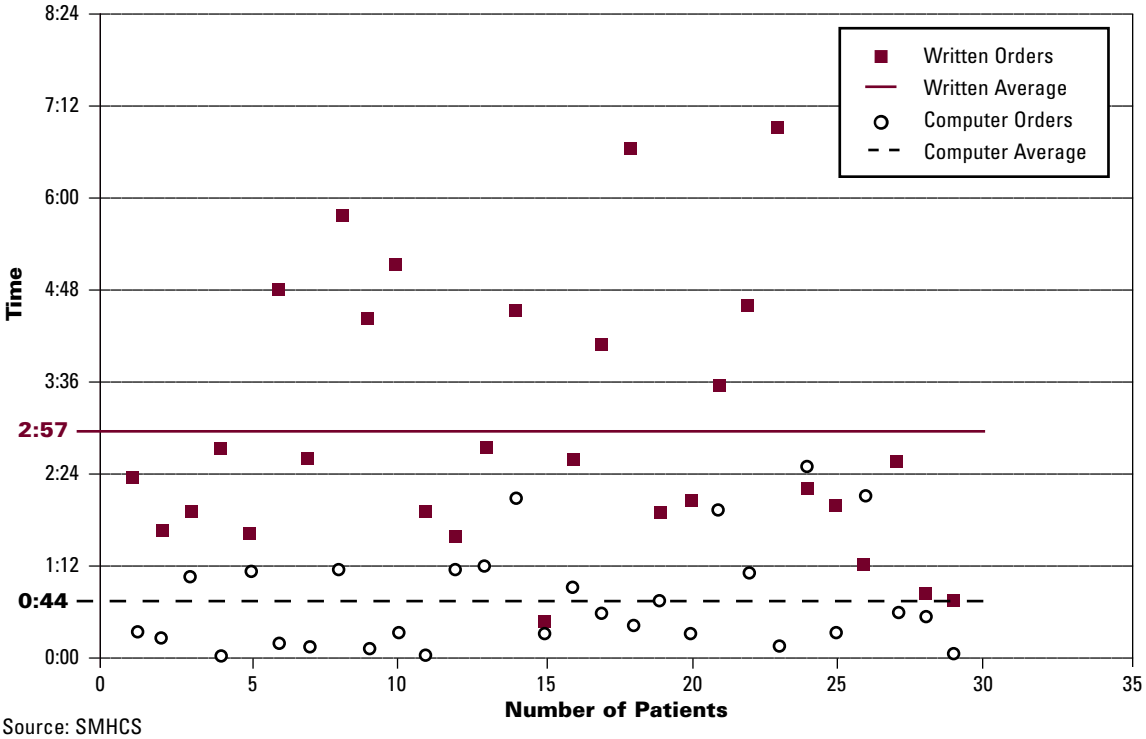
Using a cross-functional team consisting primarily of clinicians, SMHCS built the system and conducted a trial. After the successful pilot, SMHCS deployed the HealthVISION application, by functional unit, beginning in January 1998. Each unit rollout took about six weeks and included the construction of orders and order sets to support specific unit function requirements. To date, physicians enter about 30 percent of all orders, with roughly 50 percent of the physician staff entering some orders. Sarasota implemented SCM version 3.0 in 2000 and currently uses version 3.03. In September 2003, SMHCS will begin a unit-by-unit phased mandate to achieve 100 percent compliance with CPOE.

Defining value. To achieve success with its clinical systems, SMHCS knew extensive planning was necessary before implementation. To that end, SMHCS identified areas of potential improvement that could be enabled through the use of clinical applications. Furthermore, the executive and project team understood that both SMHCS and physicians using the technology would realize the value of clinical systems and CPOE in particular. According to SMHCS, the overall value of advanced clinical systems and, specifically, CPOE is derived from:

- Supplying physicians with context-sensitive and relevant clinical data at the right time, in the right format, and in the right place (e.g., at home or in physician office).
- Providing rules and alerts to warn doctors of potential issues with the desire to reduce adverse medical events (AMEs).
- Evaluating clinical practice patterns of physicians and comparing them to accepted evidence-based medicine standards.
- Improving patient care.

Measuring and realizing value. Once SMHCS defined, at a high level, the value it wants to derive from the clinical system, it has been able to effectively conduct and analyze discrete, targeted studies. These studies are presented to various committees within the organization, with the intent of continuous streamlining and improvement of patient care processes, practices, and outcomes. Furthermore, to evaluate the long-term value and appropriateness of clinical applications, SMHCS performs studies on the effectiveness of care alerts as well as efficiency studies to demonstrate the individual physician value from computerized clinical information systems. For example, Figure 1 depicts results

Figure 1. Comparing Elapsed Time Between Written and Computer Pharmacy Orders and Pharmacy Verification



Source: SMHCS

from an SMHCS study regarding the variance in elapsed time for pharmacy verification between written and computer medication orders.

Critical success factors and lessons learned. To enable the organization to achieve the intended value of clinical systems, SMHCS identified the following as critical success factors. The executive leadership team should:

- Have a clear understanding of the difficulty involved in large-scale clinical projects and the related requirement for perseverance.
- Realize that the implementation is never "complete" and, therefore, requires continuous commitment of clinical and executive leadership.
- Anticipate and expect the need for flexibility when implementing large-scale clinical applications.
- Ensure that a robust and redundant technology infrastructure is in place.
- Implement core and ancillary clinical systems first, with CPOE as the final increment of functionality.
- Provide remote access to clinical applications (access to clinical data from anywhere) because this is critical to rapidly increasing value to physicians and, therefore, accelerating physician adoption.
- Identify, encourage, and foster physician "evangelists" who champion the new processes and related technology; they are critical to increasing the probability of success and physician adoption.
- Ensure that large-scale clinical process change and technology project must be driven and owned by functional areas, not Information Services.
- Pace the change; use an incremental rollout approach instead of a "big bang."
- Recognize that for large-scale projects, such as CPOE, implementation will never

stop and the implementation team will never disband.

- Provide abundant education and transition support, especially to physicians and clinicians.

Central Valley Health Network

Organization profile. The Central Valley Health Network (CVHN) is a consortium of 13 community health centers with 94 sites located in 18 counties throughout central and southeastern California. As safety net providers, member affiliates largely serve a population of migrant farmworkers and patients below 200 percent of the federal poverty level. CVHN supports member health centers to provide high-quality, accessible health care while increasing efficiencies through collaboration and integration. CVHN is spearheading an innovative EMR project that will enable member health centers to access and maintain accurate patient records and to collect epidemiological data.

Clinical systems environment. CVHN is in the process of implementing Cerner's ambulatory EMR solution, piloting the system in two member community health centers. The model being deployed is a single database instance, which will enable effective patient data gathering and sharing between member affiliates. CVHN is an early adopter of EMR technology and is considered a pilot for community health centers across the United States.

Defining value. The goal of CVHN's EMR project is to provide access to electronic patient records for a primarily transient and migratory population, enabling a continuum of patient care and effective chronic disease management. Additional specific value to be realized from the EMR project has been identified by CVHN, including physician and staff satisfaction, recruiting and retention enhancement, medical records and transcription expense savings, charge batch entry time savings, paper forms cost savings, and expense avoidance for records storage space. Initially, a small group of executives and IT personnel developed a simplified business case, primarily identifying estimated costs and high-level, narrative value expectations. Early value studies were performed by individual pilot affiliates. These studies will be used to project anticipated value upon installation at the remaining affiliates.

To achieve its vision, CVHN formed a wholly owned IT subsidiary, Community Health Tech, responsible for planning, implementing, training, and deploying the EMR solution. Furthermore, CVHN formed the Integrated Systems Steering Committee (ISSC), which consisted of three chief medical officers, one assistant medical officer, one chief operating officer, once chief financial officer, and three IT team members. The ISSC meets twice per month, focusing on planning and issue management, and works closely with Community Health Tech leadership. Additionally, member affiliates have their own super-user groups, acting as local application experts that buffer support and issue resolution requirements.

Critical success factors and lessons learned. Throughout its implementation of an ambulatory EMR solution, CVHN has learned these lessons:

- Know your desired outcomes and what is required to deliver them.
- Institute a strong governance structure that consists of operational, clinical, and IT team members.
- Develop detailed work plans with clear expectations and milestones.
- Develop effective communication channels within the team and with the solution vendor.
- Provide abundant application and process training.

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