



The Leading Innovations from the
2006 CHIME-CHT
Transformational Leadership Award Applicants

About the College of Health Information Management Executives (CHIME)

The College of Healthcare Information Management Executives (CHIME) was formed with the dual objectives of serving the professional development needs of healthcare CIOs and advocating the more effective use of information management within healthcare. With membership of over 1,000 CIOs, CHIME has established itself as the premier organization serving the needs of healthcare CIOs. CHIME's educational initiatives are supported by the CHIME Foundation, a group of 54 providers of healthcare IS products and services. To learn more about CHIME and the CHIME Foundation, see www.cio-chime.org.

About the Center for Health Transformation

The Center for Health Transformation, founded by former House Speaker Newt Gingrich, is a unique collaboration of leaders dedicated to accelerating the adoption of transformational solutions in order to create a 21st Century Intelligent Health and Healthcare System that saves lives and saves money for all Americans. For more information, please visit www.healthtransformation.net.

Introduction

by Newt Gingrich

The innovations described in this publication offer a glimpse into a future that is within our grasp. These pioneers prove beyond any doubt that health information technology has the power to help improve the quality and delivery of care, and at the same time, improve its administration and efficiency.

Health systems and hospitals do not invest in health information technology because they *hope* it will save lives and save money. They invest because they *know* it does. And when it is designed and managed by strong, integrated team processes, health IT is a powerful tool that can transform healthcare.

The innovations described here will help educate other hospital executives and convince them that change is possible. These innovations will also help move key decision-makers to make further investments in health IT a top priority. From policymakers in Washington to other hospital executives to independent physicians, they all say they need to see proof that it works—and these testimonials and documented results are powerful evidence. We are therefore grateful to those organizations who gave us this opportunity to share their stories.

On behalf of the College of Health Information Management Executives (CHIME) and the Center for Health Transformation (CHT), I extend my many thanks to not only the pioneers included here, but to every leader across the country that has begun to transform health and healthcare through health information technology. Change is possible. And it is the work of such leaders that will make that brighter future a reality for America.



The 2006 CHIME-CHT Transformational Leadership Award

The CHIME-CHT Transformational Leadership Award honors an organization that has excelled in developing and deploying transformational information technology that improves the delivery of care and streamlines administrative services. The award is given to both the organization's Chief Information Officer and Chief Executive Officer, as transformation within a hospital or health system can only happen with a strong partnership between its technology team and executive leadership.

Award Criteria:

The transformation must be large-scale, significant, and demonstrated sustainability at the member's organization or in the community, as applicable. Examples can include deploying electronic prescribing tools, CPOE, personal health records, electronic health records, data mining, community or RHIO efforts, and others.

The organization must have documented results in quality improvement, efficiency gains, and/or positive financial returns.

The specific process changes and benefits should be replicable in other organizations.

The CEO must validate the change, the process, the benefits, and the role of the CIO in the transformation efforts.



The Leading Innovations from the
2006 CHIME-CHT
Transformational Leadership Award Applicants

Winner

The University of Texas M. D. Anderson Cancer Center
Houston, Texas

Honorable Mentions

Foote Health System
Jackson, Michigan

Inland Northwest Health Services
Spokane, Washington

H. Lee Moffitt Cancer Center & Research Institute
Tampa, Florida

Somerset Medical Center
Somerville, New Jersey

Winner

2006 CHIME-CHT Transformational Leadership Award



The award was presented by former Speaker Newt Gingrich, Founder of the Center for Health Transformation, and

Bill Spooner, Senior Vice President and CIO of Sharp Healthcare, and
Chair of CHIME

To

**Lynn H. Vogel, Ph.D., Vice President and CIO, and
Kevin W. McEnery M.D., Professor of Radiology, Associate Division
Head, Diagnostic Imaging – Informatics**

The award was presented on November 14, 2006, at the CHIME LEAD Forum held near Washington, DC

The University of Texas M. D. Anderson Cancer Center
Houston, Texas

Lynn H. Vogel, Ph.D., Vice President and CIO
John Mendelsohn, M.D., President

**Organizational Transformation Through
Information Technology Investment¹**

Transforming healthcare through information technology (IT) investments must of necessity be a two-pronged approach:

1. Down from the top

- Federal initiatives regarding pay for performance and other forms of outcome-based reimbursement
- Federal initiatives to drive standards for interoperability, privacy and security
- Employer-based initiatives focusing on quality improvements (e.g., Leapfrog standards)
- Federal and state initiatives for regionally-based cooperation and collaboration among healthcare providers (e.g., RHIOs)

2. Up from the bottom

- Provider-based initiatives focused in technology adoption and workflow transformation
- Payer contracts with providers which emphasize prevention and outcomes
- Standards organizations (e.g., JCAHO) focusing on patient safety and the quality of care provided

This application focuses on efforts at The University of Texas M. D. Anderson Cancer Center's efforts to transform "from the bottom up" through the use of workflow-driven information technology investments.

Transforming an organization through information technology investments must, of necessity, involve more than changing one or two business processes—even though they may be of great importance themselves. If we really want to transform an organization, we must undertake fundamental changes in several business processes at once. In this way, information technology investments, acting in

¹The following is the actual application submitted by The M. D. Anderson Cancer Center

concern, have the greatest opportunity to transform how an organization actually functions. In our case, we focused on changing how our physicians and their support staff actually work, recognizing that in many ways physicians are our most important and expensive resource. Making their work more efficient and more effective, therefore, has been the key to our transformational efforts.

The diagnostic process in most areas of medicine is strongly influenced, and therefore can be transformed, by information technology investments in two major areas: access to clinical data—particularly clinical laboratory and pathology data, and access to radiological reports. In cancer medicine today, it is the combination of pathology data and images that in most cases confirm the presence of cancer. Transforming access to these two fundamental sources of data leads to a fundamental transformation of the diagnostic process. However, clinical transformation does not end with the diagnosis; we must also transform our communications process with patients and with referring physicians and, finally, must transform how we document the care we provide. M. D. Anderson's transformation through information technology investments, therefore, has over the past year focused on these four fundamental areas of the physician's role in the care process:

1. Access to clinical laboratory and pathology data,
2. Timely access to radiology reports,
3. The capture of appropriate information in order for a facility to be reimbursed for the care it provides, and
4. Communications between patients and their data, and between our physicians and those physicians who refer patients to us.

Each of these areas of transformation has been overseen by a non-IT Executive Sponsor. It is our firm belief that none of these projects are "IT Projects" as such. In fact, any truly organizational transformational effort, and especially those using information technology, must involve a partnership between the business owners and the IT staff. In the cases presented below, this has been a partnership between the Executive Sponsor and the Chief Information Officer.

While specialty facilities such as M. D. Anderson do have unique qualities that distinguish their role in the market place, they typically lead developments that impact generalized providers of acute care. At M. D. Anderson, our specialty focus has actually provided an opportunity to demonstrate more clearly the transformational impacts of IT.

Transforming an organization through information technology investments must, of necessity, involve more than changing one or two business processes—even though they may be of great importance in themselves. If we really want to transform an organization, we must undertake fundamental changes in several business processes at once. In this way, information technology investments, acting in concert, have the greatest opportunity to transform how an organization actually

functions.

The criteria for the Transformational Award highlight the expectation that returns on investment need to be identified in financial terms. While this process is relatively straightforward for investments that transform financial processes, transformations in service processes such as clinical care and enhancements in patient safety and care quality are often not easily expressed in financial terms. At M. D. Anderson, our IT investments proposals for the clinical operations areas, for example, include several specific priorities:

1. End of Life for an Application
2. Regulatory Requirements
3. Patient Safety and Quality of Care
4. Financial Returns

Vendors typically expect customers to keep current with software application versions, and this takes the form of phasing out ongoing maintenance of the product. When no more updates or “bug fixes” are available, it becomes too risky for a customer to continue using the product, particularly for one that supports patient care, and the product’s life effectively ends. A second example (for B above) is HIPAA. The IT investments made by M. D. Anderson, as well as other hospitals, to document and support compliance with HIPAA requirements, have not been subjected to a formal ROI analysis. The investment must be made simply to comply with federal regulations.

Although these investments do not bring formal financial benefits to the institution, they are not any less important—or transformational in nature.² In our discussion of investment returns for each of the transformational projects below, we highlight financial returns wherever possible, but also present returns that are not necessarily quantifiable in purely financial terms.

This highlights the four areas of transformational IT investment, and illustrates the important role each plays in supporting the physician’s role in the care process. Our intention with IT investments in each of these areas was not simply to change a few business and communications processes or to transform a single area. Rather it was our intent to transform an entire set of relationships and processes supporting physicians, with a focus on metrics that would document the transformation as well as, where possible, delivering a financial Return on Investment. IT investments in each of these four areas, coordinated through an institution-wide IT governance process, have transformed the way in which medicine is practiced at the M. D. Anderson Cancer Center. While investments in a single area might result in a

² See, for example, Vogel, Lynn H., “Finding Value from IT Investments: Exploring the Elusive ROI in Healthcare”, *Journal of Healthcare Information Management*, V 17, No 4, Fall 2003. This article was named “2003 Article of the Year” by HIMSS.

focused transformation, an institutional transformation through IT is only possible if investments are made in several pivotal areas at once. M. D. Anderson has proceeded with such an integrated transformation program, driven “from the bottom up.”³

Access to Clinical Laboratory and Pathology Data

Executive Sponsor: Dr. Mark Routbort, Assistant Professor of Hematopathology

During the past year, M. D. Anderson has completed development of SPiDR, a Shared Pathology Data Repository for clinical laboratory and pathology data. The College of American Pathologists has observed that 70% of the data points for clinical decision making stem from laboratory data, and that laboratory data is used in 70% of clinical decision making (the so-called 70/70 rule of thumb).

M. D. Anderson has historically faced numerous challenges regarding access to and provisioning of pathology and laboratory data, including meeting the disparate needs of our clinical and research community. Separate (“siloes”) data repositories were in use to support pathology and laboratory operational data, each one with limited query capabilities. Locating a patient’s clinical laboratory and pathology results was a challenge as the data were stored in two different systems, neither of which has the capability to do historical searches—an important challenge when dealing with cancer patients.

In addition, the promulgation and expansion of disparate pathology and laboratory related data repositories over time, based on multiple HL7 version 2.x interfaces, presented further challenges including:

- Complexity of message (transaction) processing,
- Maintenance of multiple data models,
- Maintenance and stewardship of information, frequently presenting compliance issues, and
- Multiple and often conflicting “sources of truth.”

In recent response to these challenges and the adverse impact of these barriers to the clinicians’ ability to reach definitive diagnoses, M. D. Anderson embarked on a transformational effort to create a Shared Pathology Data Repository (SPiDR) as a single, institution-wide, authoritative source for *all* clinical laboratory and pathology data. We concluded that it was not sufficient to simply make recent data available (most commercial laboratory applications only retain data for a limited time span), so we decided to build a repository that would incorporate all clinical and pathology laboratory data reaching back to 1980—the year that such data was first collected in electronic form. This was accomplished even though this data has

³ For each case described below, we have calculated a three-year Return on Investment (ROI) based on the estimated cost of the initial investment, two years of support and maintenance estimated at 12% of the initial cost (a typical maintenance rate for commercial IT products), and an estimated return from that investment over a three-year period. Estimates have not been adjusted for inflation.

historically been stored not only in different systems, but was collected over a time period during which electronic formats, software standards and application versions changed substantially. During the past year, under the leadership of an informatics-trained pathology faculty member and a small dedicated team, M. D. Anderson developed a robust, querable repository.

Based on state-of-the-art Service Oriented Architecture (SOA) concepts, SPiDR creates an integrated repository of pathology and laboratory information that is fed by the various (disparate) applications. While the internal data model is fully normalized and complex, in keeping with the heterogeneous nature of the source data, the introduction of SPiDR has significantly transformed our delivery of patient care by providing pathology and laboratory information needed for clinical decision-making and diagnosis when and where needed across our campus.

Estimated Investment Costs⁴:

\$1,038,260 (FY06) + \$124,591 (FY07) + \$124,591 (FY08) = \$1,287,422

Estimated Annual Returns:

\$113,000 (FY06) + \$401,650 (FY07) + \$871,650 (FY08) = \$1,386,300

Source of Financial Returns:

Primary source of financial return is from the de-commissioning of legacy systems (~\$113,000) which have been the source of electronic clinical laboratory and pathology data. In addition, there is a significant cost avoidance return from research nurses not having to search archival manual records in order to retrieve historical laboratory data (~\$288,650). Finally, beginning in FY07, there will be considerable staff savings from research nurses not having to look up laboratory data manually and re-enter it into departmental databases or spreadsheets. Conservatively, and based on a sample of 5 departments with 28 nurses spending about 30% of their time re-entering data, the savings would approach \$470,000 per year. Total estimated financial return, therefore, would be \$1,386,300.

Sources of Non-Financial Returns:

Having all of the clinical laboratory and pathology (and eventually blood bank) data in a single repository makes all of this data much more accessible for both current decisions that clinicians need to make and for historical review that is so important to cancer research.

Estimated ROI After 3 Years⁵: 7%

⁴ Note on Investment Costs: Investment costs include programming staff, hardware acquisition, and software licensing costs.

⁵ The implementation of SPiDR cannot be justified on a strictly financial basis, since after 3 years the calculated financial ROI is only slightly positive. However, as the returns continue to accumulate in future years, we would expect this ROI to increase significantly. This fact points to the challenge we face with many transformational IT investments—while the initial costs may be high, the returns may take several years to develop.

Ease of Transferability:

Relatively high, depending on technical capabilities of IT staff, interest of pathologists and expectations of clinicians. Primary challenge is not so much the creation of the data repository itself as the availability of clinical laboratory and pathology data beyond the time period typically used in commercial systems, and the ability to convert electronic data collected in legacy systems over a 25-year period. M. D. Anderson had retained copies of all laboratory and pathology data since 1980, when it was initially available in electronic format, but conversion was still a significant challenge due to need to convert all of this data to a single format.

Increased Availability of Diagnostic Images

Executive Sponsor: Kevin W. McEnery M.D., Professor of Radiology, Associate Division Head, Diagnostic Imaging – Informatics

Images play a critically important role in the diagnosis of cancer, particularly for solid tumor cancers. As a major center for cancer diagnosis and clinical care, M. D. Anderson typically performs over 600 CT scans in a single day and, in fact, are of critical importance to clinicians for diagnosing solid tumor cancers.. But CT scans (our highest volume radiological modality) by themselves are of little value to clinicians in the absence of having these scans interpreted by radiologists skilled in rendering interpretations of these scans; the same is true for the hundreds of other types of images performed at M. D. Anderson.

Historically, as CT scans (and most radiological examinations) are performed, radiologists interpret the exams on a “First in-First Out” basis. Since patient visits with their physicians were not necessarily scheduled in the same sequence as their radiological procedures, radiological reports were often not available at the time the patient was actually scheduled to see their physician. For “Body CT” scans, for example, the radiology reports have historically been available to the patient’s physician at the time of appointment only 80% of time, which meant that 20% of the time, the radiologists’ interpretation was only available *after* the patient had seen their physician. In addition, there were numerous calls from physician offices to “expedite” the reading of the film in order to have the interpretations available at the time of the patient’s appointment.

The intention of this transformational investment was to replace the typical PACS work list process with a customized workflow engine that would be sensitive to a patient’s scheduled appointment time and whether the particular case was considered a priority. The information technology solution (in this case, a workflow engine) was developed that would be updated every 10-17 minutes throughout the day, with a re-prioritization process determined by the patient’s scheduled appointment and case priority.

Two baselines of CT report availability were used for comparison, one each from August and October 2005. It was determined that in the absence of any prioritization of cases, the mean success rate for readings prior to appointment was 78% for the first baseline. When this metric was identified, the decision was made to add resources so that body CTs could be read on weekends as well as during the week. However, it turned out that adding people to solve the problem only made

things worse, and the result was that the success rate for readings completed prior to appointment actually decreased to a mean of 66%

After the development and implementation of the workflow engine and linking it to patient appointment time and priority, radiologists in the CT body area were achieving a rate of 95% of reports completed prior to a patient's visit with their physician. In addition, the workflow-prioritization engine eliminated more than 100 calls per day with requests to "expedite" readings, which at an average of 5 minutes per call, corresponds to an increase in efficiency of over 630 hours annually. Figure 3 provides the overview for the three phases of data we collected: 1) historical experience; 2) adding people to try to resolve the problem; and 3) implementing an information technology solution. (Note: Chart on page 9, Percentage Daily Reports Dictated Before Patient Appointment, indicates actual data, mean % for each phase, Upper and Lower Confident Levels at 3 standard deviations; and the level of 2 standard deviations from the mean.

Estimated Investment Costs⁶:

\$50,000 + \$6,000 + \$6,000 = \$62,000

Estimated ROI After 3 Years: 215%

Estimated Annual Returns and Sources of Financial and Non-Financial Returns:

- 7 FTEs no longer needed to handle requests for expedited exams - \$210,000 each year
- Reduction of calls with "expedite" requests (100 calls per day @ 5 minutes / call x \$3.00 x 250 days / year = \$375,000 each year)
- Reduced interruptions of radiologist work flow due to expediting requests
- Increased availability of CT reports available at time of appointment

East of Transferability:

Relatively high, depending on ability to link PACS worklist to patient scheduling system.

Enhanced Charge Capture and Documentation

Executive Sponsor: John Tietjen, Vice President for Patient Business Services

M. D. Anderson has made a significant investment in the information technology required to improve the charge capture and service documentation process. Through this investment, the institution has transformed this process by providing physicians with handheld personal digital assistants (PDAs) which serve as "point-of-service" dictation devices as well as a "point and click" documentation device to register the treatment code for the particular service provided. At the end of rounds, the data are uploaded to a file server for processing.

⁶ Note on Investment Costs: Costs were primarily for programmer time to develop interface between PACS and patient scheduling system.

During the past year, eight groups of providers began using PDA devices for documentation and coding and were compared to eight control groups who continued to provide documentation with paper and charge tickets. This new technology has enabled the institution to begin migration from a traditional, paper-based environment in which physicians write their progress notes on pieces of paper, at least one of which (a “charge ticket”) is sent to the billing office as a documentation for care given.

During the past year, eight groups of providers began using the new process for documentation and coding and were compared to eight control groups who continued to provide documentation with paper-based progress notes and charge tickets. This initial implementation yielded an over 50% return on investment, realized through an over \$3 million revenue increase as a result of the transformed process.⁷ One provider group experienced a 111% revenue increase when compared to the corresponding control group. Additionally, a \$42,000 average increase in revenue per physician was experienced by the provider groups using MedAptus.

In addition to these measured, financial benefits to the institution, many other advantages have been seen as a result of the MedAptus rollout, including:

- Physician time savings both in terms of point-of-service dictation and less rework due to lost charge tickets,
- Reduction of up to six days of lag time between the date of service and the date of posting in billing system,
- More specific diagnosis code selection,
- Improved coder efficiency and effectiveness resulting from the transformed workflow,
- Reassignment of data entry staff, and
- Reduced paper and document imaging costs.

These benefits clearly illustrate the impact of an IT investment that has transformed the ways physicians document and code for the services they provide; M. D. Anderson is currently expanding this project throughout the institution.

Estimated Investment Costs⁸:

$\$2,029,404 + \$243,528 + \$243,528 = \$2,516,460$

Estimated Annual Returns:

$\$3,090,451 \times 3 = \$9,271,353$

Sources of Financial Returns:

Primarily additional revenue recognized due to physicians entering charges

⁷ The calculation of the return on investment is based on annual revenue comparisons, adjusted for patient volume and rate increases.

⁸ Note on Investment Costs: First year start-up costs included purchase of PDAs for physicians, licensing of MedAptus software, hardware costs, staffing.

immediately after seeing the patient.

Sources of Non-Financial Returns:

Returns from this transformation investment are primarily financial rather than non-financial.

Estimated ROI After 3 Years: 368%

Ease of Transferability:

Relatively high. The implementation of the commercial product itself is relatively straightforward; the challenge is developing the linkages between the hospital billing system and the PDA, and most significantly, the clinician leadership demonstrating the effectiveness of a new system.

Communications Transformations

Executive Sponsor: Lyle Green, Associate Vice President for Physician Relationships

The institution's information technology-based transformational efforts would have significantly less impact if they were viewed as "silos" of transformation without enhancing how M D. Anderson interacts with its referring physician community. The institution is continually transforming key communications processes that link an external referring doctor to the experience the patient is having at M. D. Anderson.

The fundamental IT investment that has enabled the needed transformation of such communications is the development of the *myMDAnderson* website. Initially piloted during 2002, *myMDAnderson* is a secure, personalized web portal for registered patients and community physicians. Developed using industry and institutional standard web-based tools, the portal is refined on an ongoing basis to meet changing expectations of both the patient and physician communities.

Beyond enhanced (and more reliable) messaging, patients who register for the *myMDAnderson* program can now complete the following online, in the convenience of their home, while traveling – anywhere they access the internet:

- Complete pre-registration documents,
- View upcoming appointments,
- Review customized patient education materials (including videos),
- Presentation of responses to Frequently Asked Questions,
- Enter personal demographic information updates,
- Order prescription refills,
- View personal drug history,
- View online billing statements, and
- Pay their bills online.

Metrics from the use of *myMDAnderson* for Patients provide a glimpse into how the internet has begun to transform our relationships with our patients:

- 35,922 patients are registered to use the system, with over 60% logging in at least once,
- 7,138 unique patients log in each month—an increase of 47% compared to the previous year,
- 6,645 secure messages are sent each month between patients and their physicians or their support staff,
- 4,535 patient education documents viewed each month, and
- On average, 800 appointment reminders are sent online each day.

myMDAnderson for Physicians

Physicians who have referred or plan to refer patients to M. D. Anderson can enroll in a similar (HIPAA compliant) physician-specific portal known as *myMDAnderson for Physicians*. Built on the very successful and well-received foundations of the patient portal, and, in fact, serving as an excellent example of code re-use and utilizing the same underlying database structure, this program has addressed several historic challenges of communication and collaboration between community physicians and a large, academic medical center such as M. D. Anderson, including those related to: patient referral, follow-up, continuity of care, and overall referring physician satisfaction.

Designed in response to referring physician satisfaction surveys, physician focus groups, and a facilitated session between internal staff and community physicians, the physician portal is focused on new patient referral and patient follow-up communications.

Key Metrics about *myMDAnderson for Physicians* (as of September 2006):

- 567 external physicians are registered to use the system,
- 3,227 logins to date,
- 278 new patient referrals made,
- 2,093 transcribed reports viewed online by external practitioners.

The *myMDAnderson for Physicians* website is configured in a manner that customizes patient referral processes by care center. This design accommodates preference of referring physicians by disease, service, satellite location, or selection of preferred M. D. Anderson physician.

myMDAnderson for Physicians also enables external physicians to:

- View their patients' M. D. Anderson appointment schedules,
- Access their patients' (transcribed) clinical results and reports,
- Send and receive secure messages to/from M. D. Anderson practitioners, and
- Easily maintain up-to-date physician contact information.

The success of the *myMDAnderson for Physicians* program can best be measured by significantly increasing utilization (i.e., a six-fold increase in total logins over the past year) and very improved external physician satisfaction with the new referral

process along with the quality, completeness and timeliness of communications. While the initial rationale for the investment was not strictly financial, there have been clear financial results even in the short time that the site has been operational.

Estimated Investment Costs⁹:

\$300,000 + \$36,000 + \$36,000 = \$372,000

Estimated Annual Returns:

\$721,500 + \$721,500 + \$721,500 - \$2,164,500

Sources of Financial Returns:

We are finding that 70% of physician referrals become registered patients, compared with 40% of those who self-refer via the M. D. Anderson website. We also know that, on average, online self-referred patients generate about \$74,000 in revenue, and that on this revenue we target a margin of 5%, the net financial gain to the institution from 195 new patients would be \$721,500.

Sources of Non-Financial Returns:

Significantly increased ability of external physicians to refer patients to M. D. Anderson, and to follow their care while the patients are in M. D. Anderson's care.

Estimated ROI After 3 Years¹⁰: 582%

Ease of Transferability:

Standards and practices for website development are well established. However, the low cost of this investment is due primarily to the code reuse and database integration that came from the initial development of the *myMDAnderson* patient portal. Nevertheless, significant functionality was added by interfacing this portal to internal systems in which the patient data needed by the referring physicians is stored.

Concluding Observations

Each of the transformational IT investments described above generated financial as well as non-financial returns. Although all of the projects were completed during the past year, there will be system maintenance (and no doubt new features and functions added) during the next several years.

What is truly transformational about these projects is that they were implemented within a common framework of how physicians work, so each supports a close integration of the IT investments with the clinicians' workflow. This is how

⁹ These costs are primarily for programming staff and expansion of hardware to support the *myMDAnderson* physician portal.

¹⁰ This is a marginal ROI which does not factor in the investment for the *myMDAnderson* patient portal; factoring in initial investment costs from patient site would likely result in this ROI being reduced by a factor of 2 or 3, which would still leave a net positive ROI.

organizations should be transformed—not by a focus on individual projects, but by an investment in fundamentally changing how our physicians work and communicate.

In our experience, the size of the initial investment has little to do with the financial return from that investment, nor in some cases how the investment actually transforms how the organization functions. For example, the financial ROI from SPiDR is minimal, but our clinicians see the impact of this investment every day. On the other hand, transformations that impact how revenue is collected can have a substantial and immediate financial ROI. In each case, the transformational impact of these IT investments has changed how we operate on a daily basis, and over the long run, has clearly helped us become both more efficient and a more effective organization.

Foote Health System

Jackson, Michigan

Richard D. Warren, Vice President and Chief Information Officer
Georgia Fojtasek, Chief Executive Officer

Organizational Transformation: The Community Electronic Medical Record¹¹

Information systems have played a major role in transforming W.A. Foote Memorial Hospital and its affiliates over the last 20+ years. These systems have resulted in increased patient safety and increased efficiency of operations. However, this CHIME-CHT award nomination focuses on Foote's Health Information Systems under the direction of Richard (Rick) Warren and the transformation that is occurring within the greater Jackson area through the development of an Electronic Health Record (EHR) system. The EHR system connects independent physician offices and Foote Health System, improving the availability of current patient information at the point of care; thus increasing quality and patient safety as well as reducing costs.

W.A. Foote Memorial Hospital is a 411 bed regional healthcare provider serving over 247,000 individuals in the Michigan counties of Jackson, Hillsdale, Lenawee, Ingham, Calhoun and Washtenaw. Along with the hospital, Foote Health System includes five family medical centers, nine diagnostic centers, two express care centers, home care services, an outpatient surgery center, women's services, rehabilitation services, a diabetes center, behavioral health services, Carelink of Jackson (LTACH), Foundation for a Healthy Community, a sleep disorder center, a hearing clinic, Physicians Health Plan of South Michigan (PHPSM) and numerous other services. There are 40 hospital employed and 289 board certified physicians providing care within the Foote Health System in our six county service area.

Foote's software application portfolio consists of over 200 applications touching both clinical care and administrative services. From the time a patient enters the Foote Health System, information systems including admission, scheduling, care management, monitoring, clinical documentation, computerized physician order entry, lab results, PACS radiology imaging, pharmacy, physicians portal, billing, insurance interface and many other systems work behind the scenes to ensure patient safety, privacy and quality care. While each application in the Foote portfolio addresses specific information needs within the health system, the comprehensive integration of applications provides the infrastructure to support

¹¹ The following is the actual application submitted by Foote Health System.

Foote's mission to "lead our community to better health and well being at every stage of life."

In 2004 a vision was cast to extend the integration of health information beyond the boundaries of Foote Health System to include the greater Jackson community. Rick Warren and the president of Jackson Physician Alliance, Dr. Lynn VanWagnen, joined together to champion a community electronic medical record connecting physician and hospital information systems so that all licensed providers with appropriate permission can immediately access the coordinated health history of their patients. The group was committed to real-time integration of health information resulting in increased quality of care, a reduction in clinical and administrative errors, increased patient safety, and reduced costs.

Jackson Community Medical Record, LLC was formed in January 2005. JCMR ownership is split between Foote with 51% and Jackson Physician Alliance (JPA) with 49%. JPA is an association of 160 independent physicians. The partnership between Foote Hospital and JPA was formed with the objective of making the community electronic health record a reality. The electronic health record (EHR) project incorporated four key elements: (1) practice management (PM), (2) ambulatory electronic medical record (A-EMR), (3) extensive hospital interfaces, and (4) a shared database with community access by authorized users. JPA objectives included improved patient care, timesavings for physicians, and cost savings. Foote objectives included improved patient safety, decreased medication errors, and cost savings. The EHR is open to all providers that want to subscribe. They need not be members of JPA to join JCMR.

JCMR's strategy to achieve its objectives involved selection and implementation of a fully integrated Electronic Health Record system that supports the clinical and business needs of physician practices in the community and that begins to build a community health record. Physician practices benefit from the Practice Management system through its patient scheduling, arrival, billing, and insurance functionality. The electronic medical record replaces paper charts by automating the workflow of clinicians for documenting, coding, prescriptions, referrals, and results review; thus increasing the accuracy of coding and reducing transcription costs. Interfaces to Foote Health System significantly increase productivity both in physician offices and the hospital by eliminating the need to handle paper and pull charts. Patient care is improved as the results of patient tests and procedures are available electronically to the physician, making follow-up both more convenient and timely. The shared database allows primary care physicians and specialists to leverage the work of each other. Data entered by one physician is viewable by others caring for the patient. Emergency Room and hospital physicians (including hospitalists and intensivists) have access to their patients' information such as allergies, medications, problems, and treatments while under their care. The systems are HIPAA compliant, maintaining patient confidentiality.

The goal of JCMR's interfacing efforts is to optimize workflow for all users. A list of the interfaces currently in place or anticipated follows:

1. Information for hospital admission or outpatient procedure from A-EMR

- Problems
- Allergies
- Medications with electronic medication reconciliation process
- Immunization record
- Advanced directives
- Admission orders
- History and physical

2. Electronic updating of A-EMR with hospital information

- Lab results
- Radiology interpretations
- Hospital discharge summaries
- Surgical operation notes
- Pathology reports
- Other transcription
- Discharge medications with electronic medication reconciliation process

3. Physician Portal integration within patient context

- Access to EHR from Foote Physician Portal
- Access to Foote Physician Portal from EHR

4. Administrative data

- Shared medical record number for patient identification
- Demographics
- Insurance information
- Advance beneficiary notifications

As the community based EHR is fully deployed, all providers will have access to the same electronic health record from their offices, homes, and the hospital. Patient care improves because providers always have the most current patient information. Patient satisfaction increases when they are not asked for their health information over and over again when seeing multiple providers. Cost savings result when tests are not duplicated.

The JCMR, LLC business model provides low entry costs and economies of scale in terms of software acquisition and implementation for participating providers. Software licenses and services are negotiated and held by JCMR. This group purchasing power saved the community an estimated \$2.4 million over just the first five years compared to individual purchases. JCMR has a line of credit with local bank to finance the upfront costs. Providers pay a \$2,000 down payment and sign subscription agreements with JCMR agreeing to pay \$1,000/month/provider for all the above listed licenses, interfaces, support, and services once they are live. This business model allows physicians to better match their savings to their cash outlays, making it affordable for most practices. The interface between hospital systems and providers is maximized for all JCMR subscribers. JCMR also provides training and

implementation assistance easing the transition to the EHR systems. JCMR user groups facilitate communication among providers and provide a means for solving joint issues and identifying improvements.

Implementation of the electronic health record requires an investment by providers. JCMR's goal is for all community healthcare providers to participate in the EHR, improving the quality of care for all residents in the greater Jackson area. JCMR recognizes that the financial commitment is difficult for practices serving low-income patients and is negotiating with vendors to extend the benefits of JCMR to encompass all patients and providers. JCMR is actively engaged in work with vendors and donor foundations to allow the local Federally Qualified Health Center to join JCMR.

Currently JCMR has 51 providers as subscribers. All are live on the practice management system and 41 are live on the A-EMR. A-EMR usage ranges from 1% to 100% of the patients for any given provider. The first physician practice went live in July 2005. JCMR plans to continue to add subscribers. As the primary care base grows, additional market pressure will drive greater adoption by specialists. PCPs are already encouraging their preferred specialists to join JCMR to gain the benefits of electronic referrals, etc. Preliminary conversations with PHPSM and other payors indicate a willingness to consider reimbursement for e-visits in the future. JCMR is also contemplating greater integration with Foote's health improvement and disease management efforts via electronic Personal Health Records. As the use of JCMR spreads, one or two physician practices understand that some of their administrative and support staff no longer need to be in their offices. The concept of physician offices without walls starts to become a reality for greater efficiency. The transformation of the Jackson community has only just begun.

IT and CIO's Role in the Transformation

Rick Warren's impact as Foote hospital's CIO is clearly seen in the Health Information System (HIS) and Health Information Management (HIM) departments, hospital clinicians, and the greater Jackson community. Over the last 21 years under Rick's leadership hospital information systems have moved from the initial financial systems to a comprehensive portfolio that encompasses all hospital clinical and administrative functions.

The solid base of applications supporting Foote Health System served as a foundation on which to build the community EHR. In particular the inpatient medical records systems have made significant progress in eliminating paper records and making patient information electronically available to clinicians within the hospital. Physicians are able to access patient hospital data online from inside or outside the four walls. Other systems supporting the EHR include Computerized Physician Order Entry (CPOE), which increases the accuracy of orders and Clinical Documentation used by nurses to document patient care. Of particular significance to the EHR are the laboratory and radiology systems that both accept orders from the A-EMR system and pass results back into in the A-EMR. Physicians have immediate access to patient test results and are able to respond quickly. Central to Foote's information systems is an interface engine, which ensures seamless transfer

of patient data throughout all hospital systems. The successful interfacing of systems from numerous vendors set the stage for HIS to expand and make pertinent patient data available to physicians through the community EHR. HIS has maintained high availability for the information systems it supports which in turn has contributed to the high level of confidence of healthcare workers and their openness to continue expansion of the application portfolio. A comprehensive network connects Foote and its affiliates making application access conveniently located at the point of care.

Rick Warren, the chief information officer, demonstrates several qualities that have contributed to the transformation of information systems internal to the Foote Health System and these same qualities have been critical to the transformation of health information in the greater Jackson community with the EHR. First, Rick views information systems as ways to serve the constituents, not as an end to themselves. Thus all applications are developed collaboratively with clinicians. A project sponsors group that includes HIS analysts, clinicians, and hospital administration is identified for each project. Systems are never implemented without understanding the needs of the users and how the systems will impact their workflow. Rick has ensured Clinical Information Systems (CIS) and HIS resources are allocated to assist in training and rollout of applications.

Second, Rick has taken a leadership role in health information systems through his work with vendors and healthcare information professionals on a state and national level. Rick served on the international board of the McKesson Insight User Group for several years and most recently provided leadership for the CIO track at the 2006 conference. On a state level, Rick served on the Governance Committee of the Michigan Health Information Network MiHIN, which is working to articulate a path to develop a health information network connecting the State of Michigan. In addition, Rick was a charter member of CHIME and continues to be an active member.

Third, Rick is very effective in vendor management and contract negotiations. His breadth and depth of understanding of the healthcare industry enable him to lead negotiations to win-win results. Rick is not territorial in terms of providing effective solutions. Once JCMR, LLC was established and its objectives defined, the decision was made to host the EHR with an application service provider. Although electronic records could have been successfully implemented within Foote's data center, Rick supported JCMR's decision for a third party vendor and worked to negotiate vendor contracts to move the EHR forward. Given Foote's extensive experience with interfacing, they were able to successfully interface with the ASP.

Finally, throughout his 18 years as CIO of Foote, Rick has developed long-term relationships with the greater Jackson healthcare community. In all his interactions it is clear that Rick's primary concern is improving patient safety and quality of care. He is highly respected by healthcare providers both internal and external to Foote. Rick's longevity in the community, his history in casting a vision for healthcare information systems within Foote Health System, and his leadership in directing successful implementation of this vision provided confidence to move forward with the development of an EHR in the greater Jackson area.

Rick's collaboration with Jackson Physicians Alliance, his experience with healthcare systems, his understanding of trends toward regional health organizations, his effectiveness in working with multiple vendors, his commitment to patient safety and quality care, and his long term relationship with Foote and community healthcare professionals all contributed to the EHR and Jackson's healthcare transformation.

Positive Results of JCMR

The greater Jackson community is just beginning to experience benefits from the EHR system from multiple perspectives: patient, physician and healthcare provider. At this early stage of deployment, we have mostly anecdotes. We will be developing metrics and accumulating data as we go forward. The scenarios in Exhibit B help to describe some of the benefits we're starting to see. A list of benefits follows:

- Improved accuracy in e-prescribing, pharmaceutical coding and documentation, automated formulary and interaction checking
- Improved referral process
- Increased accuracy in patient history information for specialists, due to shared database with primary care physicians
- Increased quality, patient safety, and efficiencies through the ability to share data between clinical appointments
- Increased customer satisfaction (for both providers and patients)
- Improved timeliness of laboratory and testing results to physicians
- Reduced duplication of testing due to information that is readily accessible with no paper chase
- Automated medical necessity checking, which reduces the callbacks required from the hospital lab and radiology departments to physicians for reasons for exams
- Increased efficiency with the ability to see more patients per day
- Increased reimbursement due to more accurate coding of the work done by the provider avoiding the typical undercoding
- Reduced costs by placing Foote owned practices on the JCMR model
- Increased physician interest in joining JCMR

Sustainability and Replication of Transformation

The creation of JCMR, LLC is critical to the sustainability of the community EHR. Capturing patient medical records requires cooperation from numerous healthcare providers. No one organization would be as successful in representing both the patients' best interests and its own interests when creating a mechanism for sharing patient health histories. Through Rick Warren's and Dr. Lynn VanWagnen's (JPA) leadership in forming JCMR, LLC the project ownership is not tied to a single participating provider. There is an organizational structure to represent all interested parties, to capitalize on the synergy of the EHR adopters, and a support structure to assist with deployment of the EHR and resolve issues. The decision to host EHR data with a third party service provider helps reduce bias as to the

ownership of the data. Foote Health System together with physicians and other health care providers all contribute to the capture of patient data at the point of care and making it available on a secure basis. This model can work extremely well in community hospital settings, especially in one-hospital communities. Additionally, several elements are applicable elsewhere.

Foote Health System and JPA through JCMR are transforming healthcare in the greater Jackson area. There is excitement within the hospital, its affiliates, area physicians and providers, and patients knowing JCMR's electronic health record has made a major step toward a regional health information organization. Although the specifications for information flow between regions are not yet defined, the healthcare providers in the greater Jackson area have demonstrated their ability to adopt electronic health records in their practices and have demonstrated how to effectively and securely share this data. JCMR mitigated the cost for providers to adopt electronic medical records and assisted in the transition from paper records to electronic shareable records. Jackson area healthcare has overcome the major hurdle of bringing isolated islands of patient data together and is prepared to evaluate healthcare initiatives for sharing data between regions. The current EHR system is the beginning of a transformation that will continue to increase in value within the community. Plans are in place to incorporate clinical decision support systems leading to certification in areas such a diabetes and stroke treatment into the EHR as well as making e-visits and personal health records available to patients. JCMR serves as a model for other communities. Establishment of a separate organization to coordinate a community electronic health record project, adoption of purchased software, and hosting of the system on an ASP coupled with strong technical support and leadership from major providers can be successfully replicated in other communities.

Scenario 1: Simple patient encounter in a traditional environment

The patient, Mary, arrives at the orthopedic surgeon's office for her scheduled pre-op appointment for left knee replacement surgery. The surgeon, Dr. Smith, is made aware that Mary is waiting in the exam room. He plans to view Mary's left knee films and laboratory results that were completed two days ago. The x-rays are available, but the surgeon cannot find Mary's laboratory results. The surgeon asks the nurse to call the laboratory to obtain the patient's results. The nurse calls and the line is busy. After several attempts, the nurse finally reaches the lab, and after waiting for the results to be located, the nurse now awaits a fax copy of the results. Due to the unavailability of the laboratory results, Mary's appointment time is now past, she is anxiously waiting for clearance for surgery, and the surgeon's schedule has to be adjusted to see Mary once the results are received.

Scenario 1: Simple patient encounter in the JCMR environment

Dr. Smith has ordered a complete blood count (CBC) in preparation for Mary's upcoming knee surgery. Dr. Smith's order for a CBC is electronically transmitted to the Foote laboratory. The lab performs the test and delivers the result, electronically, to Dr. Smith's electronic inbox. When Mary arrives in the exam room, Dr. Smith brings up Mary's EHR. The lab results are available. The prior x-

rays reports are available. The radiology images are available online via the Foote physician portal. Mary does not have to wait. Dr. Smith stays on schedule.

Scenario 2: Patient encounter with specialist as referred by another JCMR subscriber in a traditional environment

The patient, John, arrives at the urologist's office because he was referred by his primary care physician due to a high PSA lab result. The urologist, Dr. Jones, is made aware that John is waiting in the exam room. He plans to view John's lab results, but he cannot find them. The urologist asks the nurse to call the primary care physician's office to obtain the patient's results. The nurse calls and the line is busy. After several attempts, the nurse finally gets through, and after waiting for the results to be located, the nurse now awaits a fax copy of the results. Due to the unavailability of the laboratory results, John's appointment time is now past. Dr. Jones likely still sees John, but he is now behind schedule for his clinic hours the rest of the day. Another, not uncommon, variation of this scenario is that the primary care office cannot locate the chart with the PSA result, so the urologist reorders the test and reschedules John for a future visit.

Scenario 2: Patient encounter with specialist as referred by another JCMR subscriber in the JCMR environment

When John arrives in the exam room, Dr. Jones brings up John's EHR. Because John is now under the care of Dr. Jones, Dr. Jones is authorized to access John's EHR. He can see John's family history, problems, allergies and medications. He can also see John's PSA lab results as they are already in the shared database. John does not have to wait. He gets an immediate plan of treatment or relief of the fear of the unknown. Dr. Jones documents his actions and electronically sends a letter back to John's primary care physician to keep him informed. Dr. Jones stays on schedule.

Scenario 3: Emergency department visit in a traditional environment

Jane presents to the Emergency Department (ED) with her niece. She is lethargic and confused and the niece can offer only limited information. The patient is a widow living alone at home who overall is functioning well until she calls the niece and appears somewhat confused and out of breath. When the niece arrived at Jane's home, she found Jane in her current state. An ambulance was called and the patient transported. Unfortunately, the niece is not aware of what medications her aunt is currently taking or her medical history. When Jane arrives at the hospital she is noted to be minimally conversant, and is short of breath with a fever. Diagnostic tests suggest that the patient has an infection and a chest x-ray confirms she has pneumonia.

Without having the patient's history available the emergency room physician needs to get her started on an antibiotic in anticipation of admission. Jane is given a commonly used intravenous antibiotic that she, unfortunately, is allergic to. This causes a moderate allergic reaction that prolongs her stay, causes many additional tests to be performed and at the least, causes Jane some discomfort and

inconvenience and adds to her recovery time.

Scenario 3: Emergency department visit in the JCMR environment

Jane presents to the Emergency Department (ED) with her niece. She is lethargic and confused and the niece can offer only limited information. The patient is a widow living alone at home who overall is functioning well until she calls the niece and appears somewhat confused and out of breath. When the niece arrived she found Jane in her current state. An ambulance was called and the patient transported. Unfortunately, the niece is not aware of what medications her aunt is currently taking or her medical history. When Jane arrives at the hospital she is noted to be minimally conversant, and is short of breath with a fever. Diagnostic tests suggest that the patient has an infection and a chest x-ray confirms she has pneumonia.

The ED physician has decided on admission to start an antibiotic. Upon Jane's consent the physician has accessed the EHR where he has noted all of Jane's medications, who her primary care physician is, and most importantly that she has allergies to specific antibiotics. With this in mind, he arranges for the admission with the patient's own primary care physician, is able to make sure that she gets all her routine medications, and places her on an appropriate antibiotic. Jane improves quickly and is able to go home in a few days. (In the future JCMR plans to send electronically both the ER record and the inpatient discharge summary to the admitting physician's EHR for their records).

Scenario 4: A look into the possibilities beyond the current shared EHR

JCMR will have the prerequisite infrastructure to begin using e-visits and to export the patient's data to a personal health record (PHR) on an ongoing basis. PHR is a software application which individuals can use to maintain and manage their health information in a private, secure and confidential environment. The individual consumer is the primary user of the PHR and provides access to their personal health record. That consumer may allow access to all or part of the PHR to anyone - a doctor, family member, employer, summer camp, or insurance company.

As patients begin to take a much more active role in health care treatment decisions, it becomes important to empower them with access to and control over their personal health information. For the last five years Foote has coordinated in collaboration with the University of Michigan a health improvement initiative called "It's Your Life". This program begins with a formal health risk appraisal and tracks healthcare expenses to health risks year over year. We have demonstrated that health care costs due in fact correlate to risk factors. Coaches are engaged with all participants to help them improve their HRA scores. In addition, Foote is currently piloting home based monitoring and health management assistance, which JCMR will explore in the future. These programs introduce a whole new level of patient information to accumulate and share with caregivers.

Today's Scenario

Tom is an insulin-dependent diabetic who is recording his diabetic information in a notebook. He has a visit with the diabetic nurse at the endocrinologist's office and brings along his notebook. The nurse takes the notebook and begins writing details from it into Tom's medical record.

Tomorrow's Possible Scenario

Phase 1: Tom is documenting his diabetic information in an electronic personal health record over the Internet while at home. At his place of employment, he wants to enroll in a new health and wellness program being offered. As part of the program, they have a diabetic nurse and nutritionist coming in every other Wednesday. Tom gives the nurse authorization in order to view his diabetic information prior to Tom's initial visit.

Phase 2: Tom gets routine communication from his "It's Your Life" coach to counsel and encourage his healthy behaviors. If Tom's home administered lab values exceed normal thresholds, his caregiver at the diabetes center is notified electronically and calls Tom to give him the guidance he needs to avoid a physician office visit or an ER visit.

Inland Northwest Health Services
Spokane, Washington

Frederick L. Galusha, Chief Information Officer
Thomas M. Fritz, Chief Executive Officer

Transforming a Health Care System Across a Region¹²

Inland Northwest Health Services (INHS) has successfully transformed an entire regional health care system through the creative application of information technology, the strategic use of shared services, and the leadership and drive of an innovative CEO and CIO team.

INHS was established by two competing hospital systems in 1994 as a non-profit organization that would provide shared services to support the hospitals in and around Spokane, Washington. Initially focused on air medical transport and inpatient rehabilitation services, in 1996 INHS was tasked with implementing a common hospital information system in the six facilities belonging to the two parent hospital systems. The end result was six hospitals utilizing common data and technology standards, incorporating a single master patient index, and supported by a centralized information technology staff. This common information system provided a critical foundation for an unprecedented regional transformation.

In 1998, a new Chief Executive Officer, Thomas M. Fritz, and Chief Information Officer, Frederick L. Galusha, arrived to provide new leadership for INHS. They recognized the potential of the foundational information system to improve operational efficiencies in the region's hospitals and also to provide the basis for a variety of patient safety and health care quality initiatives. They began seeking new applications and technology that would leverage the base system. Based on the proven success, other hospitals in the region, independent of the INHS sponsoring hospitals, approached INHS about joining the emerging network and implementing systems from the expanding list of Information Technology Applications and shared services provided in the INHS Service Model.

Between 1998 and 2006, 28 more hospitals joined the INHS network. The common hospital information system has been implemented in facilities ranging from 25-bed critical access hospitals in rural communities to a 623-bed Level 2 trauma hospital in Spokane. While the majority of hospitals are in eastern Washington and northern Idaho, hospitals in western Washington and southern Idaho have also joined the network. In mid-2006, four hospitals in southern California became the first outside the region to adopt the INHS model.

¹² The following is the actual application submitted by Inland Northwest Health Services.

The INHS network has seen such phenomenal growth because hospitals and ambulatory care providers have come to recognize the benefits of a common, integrated information systems operated by a shared services organization. These benefits include predictable implementation, effective use of resources, efficient internal operations, and improved ability to care for patients. Participating in the INHS network has also enabled hospitals to implement new technology, including patient safety and quality improvement initiatives, which they would have real difficulty implementing on their own. Hospital administrators have been willing to make the commitment to join the INHS network because of the repeated successes they have observed at other facilities and because of the faith they have in the INHS executive team and staff. The growing regional collaboration benefits not only the hospitals that participate, but also the patients and the entire health care system.

Additional Information Technology Functionality Contributing to Transformation

The following technologies represent a sample of advanced solutions included in the INHS Shared Services provided:

1. Extensive Regional Clinical Data Repository which includes hospital, ambulatory, five of the industry leading Physician Office System EMR's either integrated or interfaced, multiple laboratory systems and reference labs, multiple Radiology and PAC's systems.
2. Spokane Emergency System which provides a real-time "at a glance" view of the area Emergency Department Bed Status to ambulance, air ambulance, and hospitals to ensure efficient access to care.
3. Tele-ER which provides 24 by 7 access for rural hospitals to ED physicians at tertiary hospitals.
4. Tele-Health Network, deployed at 76 sites, including the Washington Department of Health, Mental Health agencies and Prison Clinics, providing access to clinical consults in neurology, dermatology, psychiatry, and educational CME courses for nurses.
5. Tele-Pharmacy which provides Clinical Pharmacy consultation to rural provider settings.
6. Operating Room Telephony and IVR systems, accessible by physician offices and patients to aid in the pre-surgical screening, with alerts when not completed.
7. Extensive Administrative and Clinical Dashboards which provide real-time status and pro-active procedures and plans for mitigating high-census or low staffing events both within hospitals and in some case across competing hospitals.

Examples of existing dashboards are: 1) ED Census and Telemetry which can be viewed across hospitals and by ambulance and air ambulance services; 2) Radiology to provide availability and status; 3) Hospital Activity Status Board which shows census vs. staffing, bed availability, high census protocols, and other requested status.

Results

Linking Rural and Urban Hospitals

The INHS network links rural and urban hospitals across the region through the integrated information systems. This serves not only to strengthen the relationship between these facilities, but also to improve patient care by giving health care providers access to a common electronic medical record. Patients in the region often move between rural and urban facilities to receive care. With a common clinical data repository, physicians who are receiving patients due to a referral or an emergency can access the patients' medical records from across the region, assuring that they have the most current information for making clinical decisions about treatment.

Improving Hospital Operations

Each hospital participating in the INHS network is able to implement an integrated information suite that links up all parts of the hospital, including clinical, financial and administrative functions. This improves hospital operations and enables more efficient management of patient information. INHS has also been able to leverage the integrated system to create new applications that allow for more effective oversight and administration of hospital activities and resources. INHS staff have collaborated with a large area hospital to develop web-based tools that extract key information from the systems and display it as dashboards showing staff and administrators the current status of every unit in the facility. This technology tool, coupled with hospital policies that provide quick resolution to any resource problems which may arise, enabled the hospital to reduce its emergency room wait times by 90 minutes, and to admit 1000 more patients in 2005 than in prior years, without any increase in the number of staff.

Improving Patient Safety

The INHS shared services model, coupled with the integrated information system, greatly facilitates implementation of patient safety initiatives in the region. With support from INHS, one hospital in the region became the first in the country to implement a bar-coded medication verification system throughout the facility. This has dramatically improved the hospital's ability to manage and safely administer medications. Based on this experience, INHS is now implementing this technology at other facilities in the region. INHS is also implementing other critical new patient safety initiatives including computerized physician order entry. With INHS' support, all hospitals in the Spokane area now have CPOE in the emergency rooms. One rural hospital on INHS' network has implemented CPOE throughout the facility. INHS is now enabling other hospitals in the region to expand their use of CPOE.

Improving Relationships between Hospitals and Physicians

The INHS integrated information system provides a tremendous resource for physicians practicing in the region. INHS has established a variety of mechanisms

for physicians to receive patient data, including viewing the information on the web via a virtual private network and receiving it electronically via HL7 messages. Utilizing another tool that INHS implemented, physicians are also able to view patient data wirelessly via their personal digital assistants when they are conducting rounds in the Spokane area hospitals. This saves both the physicians and the hospitals significant time each day by eliminating the need to track down and manage a paper record for each patient. The tools provided by INHS for physician access to patient information have helped to improve the relationship between physicians and the area hospitals. Physicians appreciate the rapid access to patient information and also the opportunity to participate in the development of tools that are being implemented in response to their needs and concerns.

Sustainability and Replication

The INHS model is completely sustainable, as all participating hospitals pay for the services they receive. INHS has proven sustainability since its inception in 1994. Because the services are being provided by a shared services organization, which is able to leverage resources and to obtain discount pricing on purchases of hardware and software, the cost to participating hospitals is considerably less than they would pay if they were trying to accomplish the same achievements on their own.

The model is also completely replicable. The key to success is standardization of technology and utilization of shared services. Both of these can be accomplished by any group of hospitals in the country. The model is particularly effective for rural hospitals, which generally do not have sufficient resources to implement advanced information technology. However, as INHS has demonstrated, technology standardization and shared services are beneficial to both urban and rural hospitals. These two strategies can significantly improve the operation of hospitals in a region, resulting in better financial health and better health care services.

CEO and CIO Role in the Transformation

Thomas M. Fritz and Frederick L. Galusha have been critical to INHS' success. Together they have developed a common vision for the region's health care system, a vision where information technology is strategically implemented to improve the delivery of health care. Mr. Fritz analyzes the status of the current health system and provides the long-term direction for where the system needs to go. Mr. Galusha assesses the current and future science of information technology and defines strategies for applying that technology to health care problems.

In addition to a shared vision, Mr. Fritz and Mr. Galusha share energy and drive. They both work tirelessly to spread the message about the role of technology standardization and shared services in health care. They assure that the needs of current network members are met, and that new implementations are completely successful. Their energy and drive serve to inspire members of the INHS staff, who strive to fulfill the vision that Mr. Fritz and Mr. Galusha have established.

Finally, Mr. Fritz and Mr. Galusha share a common attitude – no limits. They fully believe that anything can be accomplished in health care with the right planning

and the right technology. The success of INHS and the transformation of the health care system that it serves have demonstrated how much effective leaders with this attitude can achieve.

H. Lee Moffitt Cancer Center & Research Institute
Tampa, Florida

Edward Martinez, Vice President and Chief Information Officer
William Dalton, Chief Executive Officer

Preventing and Curing Cancer with Information Technology¹³

The H. Lee Moffitt Cancer Center is committed to the prevention and cure of cancer, working tirelessly in the areas of patient care, research and education to advance one step further in fighting this disease. As part of an elite group of 39 National Cancer Institute (NCI)–designated Comprehensive Cancer Centers, Moffitt focuses on the development of early stage translational research aimed at the rapid translation of scientific discoveries to benefit patient care. Since the first patient admission in October 1986, Moffitt physicians, scientists and staff members have worked together to establish a tradition of excellence offered in an atmosphere characterized by kindness, caring and hope. The Cancer Center's future growth in clinical care and research rests firmly on this tradition.

As a national leader in cancer care, Moffitt recently implemented a revolutionary program designed to assist researchers and clinicians in creating personalized cancer treatments based on the proven efficacy of various therapies administered to patients with specific genetic profiles. The anticipated result is significantly improved outcomes for patients suffering from a wide range of cancers.

Called the Total Cancer Care (TCC) Initiative, this program is highly dependent upon a sophisticated technology platform, which has transformed Moffitt's data collection processes, and provides far-reaching administrative, clinical and research benefits. A significant component of this platform is the automated kiosks and wireless computer tablets that streamline patient check-in and standardize the data collection process, which greatly enhances the consistency and quality of research data.

While deploying self-service devices to automate patient registration is not new, Moffitt's use of the technology is groundbreaking. It is a pioneer in the application of self-service technology for use in cancer research protocols, resulting in the development of more personalized cancer treatments and, ultimately, a higher standard of care.

¹³ The following is the actual application submitted by the H. Lee Moffitt Cancer Center & Research Institute.

Background and History

Moffitt took a significant step toward fulfilling its research and clinical mission in 2004 when it introduced TCC, a program designed to enable researchers to create personalized cancer treatments and administer them through a targeted delivery system of community hospitals, patients and oncologists.

Integral to TCC is the collection and analysis of blood, tissue and clinical data from cancer patients throughout the state. Moffitt Cancer Center researchers use this information to develop genetic profiles for many different tumor types to assist in the prognosis and diagnosis of various cancers. New clinical trials can then be developed to test the efficacy of specific drugs on patients with known genetic characteristics. As data is collected and findings analyzed over time, hematologists and oncologists will be able to match a patient to the most appropriate therapy regimen, which greatly enhances the likelihood that the treatment protocol will be effective.

The initiative is highly dependent upon the creation of a longitudinal data repository, which will store vital molecular data, as well as medical history, treatment regimes, patient self-reported responses regarding risk factors, quality of life and other variables. To optimize the value of the repository, IT leaders recognized that the Moffitt Cancer Center must develop a process through which it could capture normalized data sets on patients seen in the cancer center itself and at any of its Affiliate Network locations (15 hospitals and 300 oncologists) throughout the state.

To accomplish this, IT leadership at Moffitt enhanced its state-of-the-art technology platform in 2006 by incorporating patient self-service kiosks and wireless computer tablets to improve the quality and efficiency of data collection. This effectively automated significant portions of the facility's patient check-in and registration process, as well, which has yielded great dividends in operational efficiency and patient satisfaction.

Functionality

Moffitt partnered with Galvanon, Inc. (an NCR company), selecting its secure patient self-service MediKiosk™ solution. When patients arrive at Moffitt or one of its Affiliates, they can swipe their credit card or driver's license to check in and register for their appointment. For security, the software prompts the patient for additional patient identification like a birth date or home zip code. Using the touch screen interface, patients then verify or update demographic, insurance and medical history information.

From there, patients can accomplish a number of tasks:

- *Extensive patient history.* On paper, these forms fill 26 pages – but are greatly streamlined when completed electronically. The software application has allowed Moffitt to develop a personalized method for gathering data

through its adaptive screening technology, which dynamically generates questions based on previous patient responses. In other words, Moffitt patients are asked only those questions relevant to their disease and care, and are not required to fill out endless surveys – which might ultimately be discarded because they had no value to the patient’s individual treatment or to Moffitt’s ongoing research endeavors.

- *Clinical intake forms.* Each patient is presented with a customized set of electronic forms at time of check in. Systematically applied business rules present only the forms applicable to each individual patient. For example, Medicare beneficiaries will receive forms relevant to Medicare, but no other plans. In addition, the application suppresses forms the patient previously completed – HIPAA forms filled out during the initial visit, for instance, will not appear again.
- *Demographic information.* Patients are able to verify and update demographics, as well as emergency contacts and insurance information, as necessary. They are also prompted to verify contact information for their external referring physicians and specialists to assure Moffitt can send up-to-date treatment notes and test results to other physicians involved in the patient’s ongoing care and wellbeing.
- *Patient surveys.* Some questionnaires focus on research issues, others probe patient satisfaction, while still others are being developed that gather relevant clinical data (e.g. whether or not a patient has a tattoo, which might compromise safety during certain diagnostic tests like an MRI).

While many patients use some components of the automated registration application, those specifically enrolled in the voluntary TCC initiative also supply critical information for use in clinical trials. Initial surveys, for instance, may gather information about patient lifestyle and family history as it relates to their cancer diagnosis.

In addition, patients use the kiosk or tablet to complete the informed consent process electronically. Clinical trial candidates are able to watch a video on the computer tablet or kiosk that explains the TCC initiative, read a detailed description of the study and, with the help of Moffitt clinical personnel, provide consent signatures. Because it is automated, consent information is presented consistently, whether patients receive care at Moffitt or at one of the Affiliates. Patient and witness signatures are executed and stored electronically, eliminating the need for Moffitt personnel to manage and track paper-based consent forms. Updates to consent forms can now be deployed within 48 hours of Institutional Review Board approval (prior to automation, the process took several weeks). As a result, Moffitt can easily achieve regulatory compliance and distribute documents electronically throughout the network as needed.

IT Leadership

Moffitt’s CIO, Edward Martinez, recognized an exceptional opportunity when the facility identified the need for enhanced data collection at Moffitt. His strategic vision encompassed a technology solution that would not only enrich Moffitt’s research efforts by normalizing data sets, but would also alleviate administrative

pressures resulting from increased patient volume at Moffitt's facilities.

After evaluating a number of approaches, Martinez was able to present a comprehensive and robust patient self-service strategy to Moffitt leadership – who immediately recognized its potential to change the way medicine is practiced. In addition, leadership appreciated the synergy that could result from a single, proven technology solution that equally supported disparate clinical and research priorities.

Leadership also recognized that implementing the patient self-service technology represented a paradigm shift for the organization and implemented a comprehensive change management program. Supervisors and managers were involved throughout the process – evaluating workflow, providing input as the technology infrastructure was developed, and undergoing training relevant to the new approach. A comprehensive communication program was initiated, to ensure that staff was comfortable with, and supportive of, the solution.

Once this strategic approach was embraced by leadership, Moffitt's IT department spearheaded the implementation of the patient self-service technology. The department's primary responsibilities included vendor evaluations, vendor selection, redefining business process workflows, building interfaces between the kiosk application and existing technology systems, rolling out the technology throughout the facility, and overall project management.

Among the most significant challenges was ensuring that the patient self-service application integrated with the existing technology solutions – including an electronic medical records (EMR) system, as well as a patient check-in and registration system. IT staff collaborated with the vendor's implementation team to build the necessary interfaces by using the existing integration framework and the SeeBeyond integration engine, which facilitates a seamless flow of data between the systems.

Moffitt's IT and support personnel were also tasked with reengineering the existing business processes in a way that would complement this new electronic platform, which was dedicated to capturing patient information and enhancing the patient experience. Clinical staff, supported by IT analysts and the vendor, created a clinic rollout training manual, accompanied by a comprehensive training process to optimize successful implementation of the self-service platform with minimal disruption to the every-day treatment flow of patients.

Introducing the self-service technology to Affiliates, which operate as independent organizations, added to the complexity of the implementation project. To mitigate the impact to the Affiliates and obtain their buy-in, the Moffitt Cancer Center is bearing the full cost of deploying the solution – including a wireless network to support the tablets in the areas of facilities where they are needed. In addition, The Cancer Center's IT personnel have worked in close cooperation with Affiliate IT personnel to ensure a smooth implementation and will continue to provide support to further reduce the burden on the Affiliates.

Minimizing disruption to normal patient flow at a working cancer center while

introducing new technology also proved challenging. To reduce any interference, Moffitt's IT department worked with the business teams at each facility to develop detailed workflows documenting various care scenarios. In addition, staff conducted extensive prototyping and testing to ensure a smooth implementation process.

Organizational Goals

From the outset, Moffitt wanted to ensure that the implementation of the new technology would not only advance its objectives of excellence in research and treatment, but would also meet other organizational goals. To that end, IT leaders sought technology that would:

- Reduce the amount of time staff spends collecting, entering and distributing patient data. Since the application automates these processes, staff can devote less time on data collection and more time assisting patients one-on-one. The system also significantly reduces data entry errors and eliminates redundant paperwork.
- Assure that Moffitt has the most current demographic, emergency contact, insurance and external physician information on file for each patient. Business rules incorporated into the system prompt the patient to verify this information only if it has not been reviewed in the previous 30 days. This saves patients considerable time, especially when they have multiple appointments on the same day, week or month.
- Eliminate the need for the patient to fill out the same form in various parts of the organization – or complete lengthy medical history questionnaires multiple times. Each patient is presented with a customized set of electronic forms, which asks only for the specific information required for his or her treatment.
- Fulfill Moffitt's mission to conduct scientific research that ultimately is translated into better care and improved outcomes for greater numbers of patients.

The automated system has achieved high acceptance where deployed during the six months it has been in place. In addition, it has earned wide-spread acclaim throughout the organization, as a result of the application's numerous administrative, financial and clinical benefits.

From an administrative perspective, the use of patient self-service kiosks reduces the number of forms patients must complete at each visit, resulting in reduced congestion at the front desk, shorter wait times and less paperwork. Additional benefits include:

- *Lower costs:* Use of the kiosks reduces printing paper and storage expenses.
- *Improved patient flow:* Streamlined data collection speeds patient flow throughout the facility, enabling clinical personnel to treat more patients in the same amount of time.
- *Data quality:* Electronic data intake helps capture more accurate patient health information at check-in.
- *Enhanced business flow:* Automation eliminates the need to scan the

- completed forms into the official EMR system at Moffitt.
- *Efficiency*: Moffitt will reduce the amount of staff time it takes to gather patient information and eliminate the need for duplicate data entry. It is anticipated that the technology will ultimately decrease staff time spent filing and managing paper forms easily by 50%. In one month alone, more than 1,000 multi-page forms were captured electronically and interfaced directly into the EMR system.
 - *Improved customer service*: Without numerous paper forms to manage or tedious demographic verification to gather, staff members have more time to focus on patients who require attention.
 - *Patient satisfaction*: Patients appreciate the convenience of the kiosks, the reduced wait times and minimized paperwork. The data intake process is tailored to each patient's stage within the treatment cycle so they need to provide information only once. In the near future, Moffitt will provide access to the system via a secure Web portal, so patients can complete paperwork from the comfort of home for added convenience.
 - *Safety*: Accurate patient identification at check-in eliminates the potential for error and ensures regulatory compliance.
 - *Discrete data*: Availability of 800 discrete data elements that are self-reported by the patient improves the quality of scientific/clinical research and analysis.

From a clinical and research perspective, the kiosk provides a secure system for managing electronic data capture, disseminating data, and tracking information to provide instant access to updates of multiple data elements and study information for immediate analysis of adherence, quality, safety and compliance. Plus, automated collection of medical histories and clinical records, as well as the documentation of blood and tissue samples from thousands of patients, speeds the process for bringing experimental therapeutics to market and expands Moffitt's ability to expedite research that delivers new clinical trials and technologies to cancer patients in the state.

Sustainability and Expansion

The automated solution is extremely replicable and transportable, as proven by the implementation of the patient self-service technology at multiple Affiliate facilities. Because most hospitals and cancer centers have similar registration, consent and discharge processes – as well as patient satisfaction and service challenges – the application can be easily leveraged within virtually any healthcare setting. The common CVM Enterprise Server platform serves as the “control center” for these solutions and is easily implemented via an ASP model or directly from the health facility's data center. In addition, the Interface Manager Module uses HL7 and other interface protocols to share information with existing hospital information systems.

In the near future, the data captured and managed through the self-service kiosks will continue to be used to enrich clinical trials and clinical systems, and additional clinical trials will utilize the platform. Investigators can develop new clinical trials based on target discovery and target prevalence data obtained in previous analyses.

Researchers will also be able to identify patients with specific genomic targets. Patients may be contacted to determine if they are willing to participate in future studies that may benefit them. Trial enrichment can potentially improve the specificity and success rate of target-specific trials, ultimately improving the delivery of cancer care throughout the state.

Perhaps most importantly, however, is the effect the new technology platform will have on optimizing care and patient satisfaction. By utilizing this information infrastructure, Moffitt can integrate research data with the latest technology at every step of a patient's disease, from diagnosis to therapy to long-term follow up. In addition, it has had a significant and positive impact on how Moffitt approaches all workflow. The self-service functionality has transformed the way leadership views innovation, facilitating change that is patient-centric and supported by automation for enhanced efficiency and effectiveness.

Somerset Medical Center
Somerville, New Jersey

David P. Dyer, Vice President and CIO
Kenneth Bateman, Chief Executive Officer

Somerset Medical Center's Project Millennium¹⁴

Over the last several years, health care professionals from more than 60 hospitals throughout the country have visited Somerset Medical Center (SMC) to see the future. Many more are expected in the years to come. That says a lot about SMC and the health care advances it is making in Somerset County, New Jersey—important advances for the community for which planning began five years ago.

The intrigue focuses on SMC's unique and innovative information technology system, a system that gives physicians, nurses, pharmacists and other health care providers access to one Electronic Health Record (EHR) for each patient. Rather than having separate and distinct databases for various hospital departments, the system enables cross-functional communication that streamlines medication orders, reduces health care costs, enhances clinical decision-making, and ensures appropriate patient testing. It is the future of quality healthcare, available in just 2% of community hospitals across the country, and it is "live" in Somerset County.

In phase one of the program—dubbed "The Big Bang" because it was completed in less than one year—SMC replaced its core ancillary clinical systems and added the EHR feature, converting a record 14 applications on the "go live" day. Having automated patient records, nursing departments, hospital lab, radiology, pharmacy, and surgery, the hospital moved onto phase two of the project, which involved deploying an electronic medication administration record and Computerized Physician Order Entry (CPOE) with advanced point-of-care clinical decision support tools. Phase III was completed by adding an integrated Picture Archiving and Communication System (PACS) solution to the portfolio of information available to clinicians on campus and by remote access.

Currently, David Dyer, Somerset Medical Center's Vice President and CIO, and his team are in the optimization phase of the project: raising CPOE adoption to 100%, deploying additional clinical alerts, building interdisciplinary plans of care and implementing electronic medication reconciliation.

Dyer and the IT staff at SMC liken the EHR to a kind of patient global positioning unit. Officially named the Powerchart, it tracks each patient's progress from scheduling to registration to follow-up care. A full medical history is stored.

¹⁴ The following is the actual application submitted by the Somerset Medical Center.

Through the CPOE system, physicians enter orders into a computer, which are then sent electronically to appropriate and password protected departments and nursing units, as well as to the SMC pharmacy.

Concurrent with the efforts to transform SMC's clinical operations through the use of an EHR, Dyer and his Information Systems Team did not ignore the financial side of the house. SMC launched new internal and external web sites and replaced its core financial systems. SMC provides its employees access via a web-based portal to their personal financial information and managers have access to all departmental budget and expense information, resulting in overall reduction in supply costs.

The Role of IT and the CIO

David Dyer, SMC's CIO, personally recruited by SMC's CEO in June 2000, is a member of SMC's Executive Council and reports directly to the CEO. Upon his arrival, Dyer immediately designed an overall governance structure, began systems selection processes, and developed and gained board approval of a five-year Information Technology strategic plan. By May 2001, all suppliers had been selected, contracts negotiated and signed, staffing plans put into place, and hiring begun. Project Millennium kicked off on August 1, 2001, with an organizational-wide meeting conducted by the board, CEO, CIO, and Cerner Corporation, the selected technology supplier. During implementation, Dyer presented dashboard status report updates to the Information Services Oversight Committee on a monthly basis.

Dyer plays a key role on two committees essential to SMC's IT transformation. The committees engage organizational management on information technology strategy and keep IT momentum moving forward.

The Information Services Oversight Committee is chaired by a board member who is President of his own IT consulting firm, and consists of the Executive Team, three board members and board chair, five physicians, the Director of Clinical Informatics, and the Director of Medical Informatics. The latter two representatives, a registered nurse and M.D. respectively, report to the CIO and are full-time employees of the Information Services department.

The second key committee is the Medical Informatics Committee chaired by the Medical Informatics Director. This committee consists of doctors from all disciplines and specialties within the medical center and its charter is to drive the use of the EHR within the physician community and provide Dyer and his team guidance on how to develop and deploy system functionality.

Dyer and his team did a needs assessment up front to determine the computer literacy of many individuals and provided Windows training for those who had not touched a mouse before. The IT team also provided training for those who scored poorly on computer-related tests and on-the-spot training for per-diem staff and physicians who did not receive enough training prior to go-live. "A lot of people didn't believe we were going to go live and waited until the last minute," Dyer said.

“IT staff rounded the units 24/7, and where we noticed gaps, we set up special classes.”

Results from the new system were fast and obvious. SMC has quite a few patients who are admitted frequently, and the clinical staff quickly saw the benefit of having an electronic medical record for these people. There was much less rework when patients returned. The patient’s data from the previous admission, even if it was recent, was right there in front of them with a right click of the mouse.

These types of events helped tremendously with adoption. In a very short period, SMC went from people mourning change to seeing what the system could do for them and requesting new features.

Currently, 61% of all orders are entered into the electronic system by the independent physician’s staff with patients at Somerset. Dyer’s goal is to get that figure to as close to 100% as possible. To that end, the hospital CEO meets regularly with the chairs of the departments with lower adoption rates.

Results and Documented Improvements to Delivery

For patients, the most obvious difference in care practices experienced as part of SMC’s IT transformation is the absence of paper charts. Instead, doctors and nurses detail essential medical information into a “rover,” one of the many portable computers. Patients may also recognize speedier scheduling and registration processes.

It is, however, the less obvious benefits made possible through CPOE that make all the difference in care quality and why so many healthcare professionals are eager to watch and match SMC’s progress. CPOE systems can facilitate the reduction of serious medication errors, as well as reduce turnaround time for pharmacy, radiology, and laboratory orders, and can lead to a decreased length of stay.

CPOE systems have been shown to reduce error rates by 55 percent, and rates of serious medication errors by 88 percent, according to a survey at Boston’s Brigham and Women’s Hospital. CPOE is far more than just having physicians enter their orders electronically. Hospitals using CPOE have better quality care than those without it. At SMC, physicians have all the clinical information they need in front of them, allowing them to make treatment decisions more quickly and accurately.

Dyer notes that SMC has seen reductions in length of stay, in FTEs per adjusted occupied bed, and in commercial insurance and Medicare denials. Since the goals of the changeover were to improve patient safety, be seen as competitive in a highly wired community, and facilitate recruitment, the cost reductions are merely icing on the cake.

With the hospital’s patient volume growing between 3% and 10% per year, the new systems will be critical to SMC’s ability to compete effectively. As SMC employees become more knowledgeable about how to use the system, they become more efficient, which translates into being able to do more with less.

“More importantly,” Dyer notes, “we want physicians to understand the quality and safety improvements that result from the system and for them to be the ones that push the CPOE initiative within the physician population.”

“CPOE is much more than an IT project; it’s an organizational initiative and is physician driven,” says Dyer. “The reductions in length of stay and improvement in resource utilization improve our cost per case, but that’s a side benefit—it’s safer for the patient, and that’s the main reason to do it.”

Quantifiable Benefits

- Doctors utilizing Somerset’s EHR to treat patients = 100%
- Inpatient medication orders placed via CPOE = 61%
- Drug-food/drug-allergy alerts fired per month = 11,000
- Average length of stay reduction = 0.33 days
- Reduced inpatient pharmacy doses dispensed / patient day = 0.9 (14,000 doses per year)
- Reduced inpatient X-Rays / patient day = 0.04 (700 exams per year)
- Reduced FTEs/adjusted occupied bed = 0.97
- Reduced nursing unit secretarial staff by 1.0 FTEs / unit (with two on days)
- Reduced outpatient radiology pre-certification denials = \$500,000
- Improved Press Ganey patient satisfaction raw score for registration & scheduling by 2.0 points
- Eliminated \$1 million out-of-balance situation between general ledger and materials management systems
- Reduced annual supply increase by 3%
- Information Services staff retention > 92%; Total FTEs = 37
- Systems availability > 99.9% (excludes scheduled downtime)

Maintenance and Replication

SMC is one of only 2% of the community hospitals in the country to have implemented hospital Electronic Health Records (EHR) on the latest state-of-the-art technology. Two thirds of the hospitals in the country have not begun a CPOE project. While SMC had the foresight to invest in technology earlier than most, many are interested, as evidenced in the number of visitors to SMC to witness the benefits of the transformation.

The key to success was executing Dyer’s project implementation philosophy of rapidly “replacing the core” and then “adding the intelligence” utilizing integrated, single database systems from known commercial suppliers for both general financial and clinical systems.

Holding the gains and keeping the technology current while deploying new functionality is always a challenging balancing act. Dyer and the SMC Team have succeeded in both by establishing solid change management processes and committees. All enterprise systems are on the current level of application code provided by the suppliers.