Quality and Efficiency Successes Leveraging IT and New Processes

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ABSTRACT

Today, healthcare annually invests billions of dollars in information technology, including clinical systems, electronic medical records and interoperability platforms. While continued investment and parallel development of standards are critical to secure exponential benefits from clinical information technology, intelligent and creative redesign of processes through path innovation is necessary to deliver meaningful value.

Reports from two organizations included in this report review the steps taken to reinvent clinical processes that best leverage information technology to deliver safer and more efficient care. Good Samaritan Hospital, Vincennes, Indiana, implemented electronic charting, point-of-care bar coding of medications prior to administration, and integrated clinical documentation for nursing, laboratory, radiology and pharmacy. Tenet Healthcare, during its implementation and deployment of multiple clinical systems across several hospitals, focused on planning that included team-based process redesign. In addition, Tenet constructed valuable and measurable metrics that link outcomes with its strategic goals.

KEYWORDS

■ Processes ■ Re-engineering ■ Bar code ■ Robot ■ Leadership
■ Medication errors ■ Patient safety ■ Quality

Introduction

Because of the increasing empowerment of patients, consumers now demand ever-increasing levels of quality and safety from their providers, even as these organizations struggle with increasing costs and declining levels of reimbursement. For many years, experts pointed to clinical information technology as the solution to solve the vexing problem of managing costs while enhancing quality. In response, increasing numbers of organizations are investing millions of dollars in clinical information technology systems such as computerized practitioner order entry, electronic medical records, clinician portals, wireless networks and medication administration systems.

Results from the implementation of clinical information technology systems reveal an inconsistent pattern of both successful and failed deployments. Many clinical IT vendors

concede privately that they have struggles to get systems running, while organizations lament low levels of clinician adoption.

In some cases, clinical information technology systems produced additional medical errors and higher costs. In a study published in the *Journal of the American Medical Association*, Koppel et al reported how a computerized practitioner order entry (CPOE) system installed at an academic medical institution facilitated medication errors. The authors attributed many of the 22 types of errors to a variety of factors, including poor system design coupled with incompatible care delivery processes, therefore highlighting the importance of processes in delivering outcomes.[1]

In another study published in the same issue, Garg et al reviewed 100 controlled trials of the impact of computerized clinical decision support systems on a variety of measures. The study revealed clinical decision support improves practitioner performance while its effect on other outcomes is unclear. The researchers found few studies documenting the value of clinical decision support, and those that they found documented evaluations completed by the same experts who designed and developed the decision support application.[2]

Path Innovation

The failure of these clinical IT tools to deliver safer, more efficient care is a result of many factors, yet all of them originate in the concept inherent in the phrase "path innovation." Although many of the theories and concepts that form the basis of path innovation are not new, their interaction, combination and application that subsequently affect clinical IT are.[3]

Path innovation depends on three key factors—process improvement, or re-engineering; clinical guidelines, clinical paths and evidence-based medicine; and IT system design. Although subject-matter experts exist in all of these areas and have worked on clinical IT problems for many years, it is unclear how well these experts historically have worked together in the design and implementation of clinical IT systems.

Process improvement experts understand how processes affect outcomes and what analytical steps are needed to evaluate processes. They are able to suggest changes in processes and predict the potential improvements such changes will deliver. Experts in clinical content understand what various clinical paths deliver as outcomes. They are able to link various interventions with probabilistic results. Designers of IT systems understand the flow of digital information within computer systems and the user interfaces that receive and deliver data to users. They are able to conceptualize how a data point can be stored or reformatted with other data points.

Almost universally, these experts work and apply their expertise independently of each other. IT system designers develop clinical IT systems using specifications developed by product managers who attempt to bridge IT with healthcare. These product managers are rarely experts in clinical medicine or clinical processes.

Clinical content experts develop clinical content focused solely on clinical issues, rarely incorporating IT system design or clinical process considerations in their work. This is evident in the effort invested by many organizations to modify existing guidelines to fit their newly implemented clinical IT systems. The struggles they have reported are indicative of the difficulty of this type of work.

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Process re-designers often appear on the scene late in implementations, if at all. Working within the environment presented to them, they try to change existing processes without the advantage of being able to change the inputs, such as the clinical path, or tools, such as the clinical IT system and its functionality, of the processes.

Integrating Subject Matter Experts

To implement and effectively leverage clinical IT systems, a new approach in the use of experts is required. Path innovation integrates different subject-matter experts in unique ways to leverage their expertise throughout the design and implementation of clinical IT systems. Even for systems already built, path innovation can be used to better leverage existing functionality in these clinical IT systems. It can help enhance outcomes while reducing the probability of unacceptable results such as system-related medical and medication errors.

Path innovation requires the formation of a team of subject-matter experts that apply their skills during an entire clinical IT system project. During the system design phase, clinical and process design experts share their understanding of their discipline with the IT system developer.

During the implementation phase, the IT system designer and the clinical content expert act as consultants to the process re-designer to develop new processes that are both

radically different from existing processes and that could only be implemented utilizing functionality made available by the new clinical IT system. In addition, the clinical content expert can use this functionality to conceive of clinical paths impossible without this digital capability.

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Although path innovation builds upon existing approaches, it reflects a new way of thinking and approaching problems. Instead of looking at how an existing process could be modified, path innovation requires the birth of brand new processes, formerly impossible in the institution before the installation of the new clinical IT system. To accomplish this, organizations need to identify subject-matter experts who also are able to achieve a basic understanding of the disciplines of their expert colleagues. Then together, these experts work to create new processes that incorporate the needs of the institution with the promise of new IT systems and clinical content.

A New Way of Thinking

It is well known the application of best practices and evidence-based medicine can significantly improve clinical and financial outcomes. Many informatics experts have long thought the implementation of clinical IT systems would bring these best practices more effectively to the physician, thereby reducing unnecessary variation in care, accelerating the adoption of new, proven diagnostic and therapeutic approaches, and decreasing costs associated with ineffectual or inappropriate care. However, the results delivered by this new technology are falling far short of their promise.

Only when individuals and industries modified processes to effectively leverage new technologies did they see huge leaps in productivity, efficiency and quality.

In *The World is Flat*, Friedman quotes Paul Romer, a Stanford University economist, who said, "The new way of doing things makes the information technologies more valuable, and the new and better information technologies make the new ways of doing things more possible."[4]

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Results at Good Samaritan Hospital

Good Samaritan Hospital (GSH) is a 262-bed not-for-profit hospital in Vincennes, Indiana. With more than 1,600 employees and 90 medical staff, GSH offers cardiovascular surgery, oncology and women's imaging, trauma, inpatient and infant centers, rehabilitation and mental health units. The hospital treats more than 10,000 inpatients and 250,000 outpatients annually.

Patient safety is a major focus of the hospital's strategic plan. Increasing regulatory accreditation and safety requirements, along with escalating demands for efficiency, reinforced its decision to re-examine core processes. GSH believes the adoption of clinical automation helps caregivers make more informed decisions, thereby extending their ability to provide quality service.

GSH achieved its most significant progress in providing safer patient care by utilizing a patient safety management plan, bar-coded medication administration, a safer environment of care and an improved medication reconciliation process. Efficiencies gained through automation of the medication dispensing process enable GSH to reallocate pharmacist time to clinical units.

Because of the deep commitment to patient safety, the medical staff and senior management collaborated on an organization-wide strategic initiative to improve medication safety and patient satisfaction. GSH implemented pharmacy robots and bar-coding technology as part of its plan to assure accurate medication dispensing and administration.

Objectives of the GSH initiative included reducing significant medication errors by 25 percent; reallocating pharmacy staff to the clinical areas to support physicians and nurses in reducing medication errors; scanning bar codes of 95 percent or more of all medications before administration to patients; and increasing patient satisfaction with the admission and discharge processes by 10 percent.

GSH implemented technology solutions for electronic charting and point-of-care bar coding of medications before administration. A computerized clinical documentation system integrated nursing, laboratory, radiology, pharmacy and other information making it accessible online anywhere in the hospital as well as remotely. In addition, software provided alerts to nurses on any overdue medication doses.

A pharmacy robot was installed to increase the efficiency and accuracy of dispensed medications. Software coupled the dispensing of medications, as documented in the electronic patient medication profile, with bar-coded medications available to the robot. Information in the electronic patient profile drove the robot to pick medications using the

bar codes and route medications to the patient. This approach eliminated the need to maintain central medication carts and enabled the storage of patient-specific medications in locked cabinets in each patient room, thereby reducing the probability of medication errors.

The facility implemented two software modules that document a patient's home medications, leading to the enhancement of both the admission and discharge processes. In cases of readmission, the clinicians are able to review the previous medication and allergy history with the patient and make updates as necessary.

Using query tools, GSH provides physicians who are discharging patients with medication reconciliation reports that include a patient's home medication history, as obtained on admission, as well as a list of the current pharmacy medication orders. After the physician reconciles the two lists into the patient's discharge medication list, a nurse uses software to update the patient's medication history profile. A printed copy is given to both the patient and physician as part of the discharge process.

The hospital uses a point-of-care bar-coding system that helps ensure the correct patient is receiving the right medication. Handheld scanners are used to scan the bar codes that identify both the patient and the medication. This information is cross-referenced automatically in a database that contains active orders for patients. After confirmation of a match, clinicians then administer medications.

GSH regularly queries the data to monitor staff compliance with bar code scanning. Monthly results, presented in a graphical format, are compiled and sent to all nursing unit managers and directors. Results are reviewed during unit meetings and GSH's regular nurse management council meetings.

Coalition of Practitioners

The key success factor for GSH was fostering a coalition of practitioners from nursing, pharmacy, respiratory care, senior management and information systems that led the redesign of the medication dispensing and administration process.

A design and build team was created using staff nurses and pharmacists who later became the expert users and educators for each of their units. Part of the design process involved creating flowcharts of the medication administration process for each unit to identify obstacles and potential problem areas. After the review identified the size and number of medication storage carts as a major issue, the process was subsequently redesigned to include the use of bedside nurse servers as storage areas for patient medications.

Critical care, a medical/surgical unit and respiratory care were selected to begin the implementation because these units used the greatest variety of medications and administration routes. To ensure a smooth implementation, around-the-clock support was provided to each unit during the rollout. Pharmacy addressed any bar code problems as they arose.

The medication safety improvement committee meets monthly to review medication errors and identify opportunities for improvement. This multidisciplinary committee reviews every error and uses process improvement tools to investigate processes and causes of errors. A non-punitive approach to identifying errors is used to encourage open communication.

In addition to the teamwork shown by senior management and physician leaders, both clinical and non-clinical managers and staff embrace the concept of working collaboratively. Early in the process, nursing leadership advocated improving the medication administration process and worked to create a climate conducive to identifying and resolving process errors in medication administration. While making safe medication practices a key objective for all nursing units, leadership acknowledged and rewarded improved performance.

Unit managers provided a work environment that encouraged communication and debate regarding opportunities for improvement in medication administration. While monitoring quality performance indicators and sharing them with their unit staffs, they facilitated physical changes needed to support new medication administration processes.

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Staff nurses assisted in process design while being fully committed to the change process. In addition, they actively monitored and reported problems while offering solutions.

IT nurses collaborated with nursing leadership to support strategic initiatives. They supported the change process through participation in process redesign; collaboration with nursing management in support of strategic initiatives; collection of quality performance indicators; and partnering with pharmacy to resolve technical and process issues.

Welcome Results

Medication errors were classified according to the system of the National Coordinating Council on Medication Errors Reporting and Prevention. This included four major categories and several subcategories. The major categories are: No Error; Error, No Harm; Error, Harm; and Error, Death.[5]

From the start of bedside point-of-care medication bar coding, GSH achieved a trend of decreasing errors causing patient harm with a decline from 7.1 percent in 2002 to 2.4 percent in 2004. Errors resulting in patient harm decreased to 4 percent in 2004 from 12 percent of all errors in 2002. Significant medication errors as a percentage of total medication errors dropped from 4.8 percent in 2002 to 1.6 percent in 2005. These results describe a system that prevents errors from reaching the patient, ensuring a safer environment for patients and staff.

Efficiencies gained with the pharmacy's dispensing robot enabled the deployment of pharmacists to patient care areas to enhance the safety and cost-effectiveness of medication use. Since 2002, pharmacist interventions enabled GSH to avoid 86 true drug allergy errors, 56 adverse drug events, 88 significant drug interactions and almost 700 instances of incorrect dosing.

In March 2003, the percent of medications scanned before administration was 64 percent, well below the organization's target, which was then 85 percent. Regular distribution of reports to nurse managers and staff on the use of medication bar-code scanning equipment at the point of care increased the percent scanned to 94 percent by March 2004. By January 2005, the percent scanned rose to and remained at 97 percent, above the new GSH goal of 95 percent.

Utilizing the Press Ganey National Patient Satisfaction Survey, GSH linked its patient's satisfaction scores to its admission and discharge processes. With the change in processes, GSH's percentile ranking from 2003 to 2005 improved from 65 to 90 for speed of admission, and from 22 to 75 for the speed of discharge. Patient satisfaction with home instructions improved from 51 to 81.

In addition to the measurable changes described, Good Samaritan Hospital reports a change in its culture of care, with pharmacists talking regularly with nurses about medication use. Caregivers often collaborate on patient care units with the shared experience of working through the improvement of the medication administration process. These have combined to truly transform GSH into a patient care team that understands the issues and difficulties of all clinicians.

Planning at Tenet Healthcare System

Tenet Healthcare Corp. owns and operates general hospitals and related healthcare services in communities across the United States. Currently, Tenet owns 70 acute care hospitals with more than 17,800 licensed beds in 12 states. An investor-owned company, in fiscal year 2005 it handled more than 668,000 admissions, 5.1 million outpatient visits and had net operating revenues of $9.6 billion.

Tenet strives to distinguish itself as a leader in redefining healthcare delivery through its efforts to provide quality, innovative care to the patients it serves in each community. As Tenet views information technology as a key tool used to innovate care, it started the IMPACT Project to direct and monitor the deployment of IT in core systems throughout the organization. The IMPACT Project objectives include enhancing patient medication safety; increasing productivity, facility asset utilization and job satisfaction; communicating important clinical information faster and more accurately; improving clinical decision-making at the point of care; and improving patient and physician satisfaction.

Tenet chose to implement six commercially available clinical information technology products throughout the organization. Phase one of the project encompassed the creation of a standardized laboratory, pharmacy, radiology, orders, surgery and electronic medication administration record system. Future phases include clinical documentation and computerized practitioner order entry.

However, vendor computer tools alone do not transform clinical care unless they are tightly coupled with the design of new processes and a change in organizational culture. In addition, a standardized approach to new systems and processes helps to both implement and maintain any changes, and all their concomitant benefits, post implementation. As new processes can sometimes introduce new types of errors, Tenet planned to monitor for potential new issues, document these issues and communicate them to the appropriate staff for resolution.

Tenet utilizes work flow optimization techniques to adequately leverage the utility of its chosen clinical IT systems to ultimately deliver improved patient safety, patient and clinician satisfaction, operational effectiveness and improved clinical outcomes.

During development of the clinical standard design, multidisciplinary advisory groups collaborated to make key decisions. Their guidance paralleled standards from industry, professional organizations and regulatory bodies, and supported Tenet's requirement for a standardized design.

Developing Performance Metrics

To guide the implementation, deployment and maintenance of the clinical IT systems, Tenet developed various performance metrics. These metrics provide objective feedback on the value of existing systems by linking various outcomes to organizational strategic goals. Tenet utilized clinical standards team leads, as well as specific Tenet staff involved with patient safety, clinical risk management, pharmacy and surgery to validate proposed metrics.

Tenet's metrics focus on several key areas including:

- Quality of care, such as outcomes and identification of variances.
- Quality of documentation and information management, such as consistency of format, thoroughness, accuracy and timeliness.
- Cost reductions, such as reductions in labor costs and outside services, and malpractice expenses.
- Patient service, satisfaction and loyalty, such as improved response time and patient communication.

- Provider and clinician satisfaction and quality of work life, such as an improved ability to provide quality care and reduced paperwork.
- Revenue improvement, such as increased patient volume, improved charge capture and improved collections.
- Strategic impact on competitive position, such as improved cost, quality and service measures.

Metric development considered the balance between the value of the metric compared with the resources required to obtain it. Tenet avoided choosing metrics solely based on their ease of collection. The organization regularly ties metrics to their value in management reports and various balanced scorecards before beginning to collect them. Factors considered in selecting metrics included existing measurement, manual collection, future measurement, electronic collection, data source, staff resources for analysis, reliability of data source and comparison periods.

Lastly, Tenet collected pre-implementation baseline data to be used as a comparison to measures that it collects in the future.

Currently, Tenet is beginning the implementation of its clinical information technology systems across multiple locations. Tenet believes the IMPACT Project, with its focus on process redesign linked to measurable, strategically meaningful metrics, will deliver successful implementation and deployment of its clinical systems. In addition, the inclusion of those metrics in balanced scorecards and standardized reports will guide the organization as it works to optimize healthcare delivery.

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References

1. Koppel R, Metlay JP, Cohen A, Abaluck B, Localio AR, Kimmel SE, Strom BL. Physician Order Entry Systems in Facilitating Medication Errors. *JAMA.* 293,10:1197-1203.
2. Garg AX, Adhikari NK, McDonald H, Rosas-Arellano MP, Devereaux PJ, Beyene J, Sam J, Haynes RB. Effects of Computerized Clinical Decision Support Systems on Practitioner Performance and Patient Outcomes. *JAMA.* 293,10:1223-1238.
3. Chaiken, B. P. Path innovation: Transcending Automation. *Patient Safety and Quality Healthcare.* 2005;2, 3:46-47.
4. Friedman, T. L. *The World is Flat.* New York: Farrar, Straus and Giroux. 2005:178.
5. NCC MERP Taxonomy of Medication Errors. © 1998 NCC MERP. Available at www.nccmerp.org.