



The challenges facing CentraState HealthCare System in Freehold, NJ, USA, are surely familiar to hospitals across the globe. Staffing is tight, regulatory requirements for documentation are growing, and delivering medical care is becoming increasingly complex. In 2007, the 271-bed medical facility implemented Siemens Soarian® Clinicals workflow management technology to help coordinate tasks among clinicians, synchronize handoffs, expedite communications, and provide automated notifications and alerts if critical process steps are not completed. A year later, after the implementation of several workflow

processes, CentraState has shown measurable results, including significant reductions in nosocomial pressure ulcers, peripheral intravenous (IV) related infections, and fractures from falls. The communications features of Soarian, such as immediate alerts that are sent to pagers, together with CentraState's efforts in workflow redesign, have also helped reduce the amount of time clinicians spend on the phone, and increased the amount of time available to spend with patients.

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Chief Information Officer Indranil 'Neal' Ganguly. "Without it, I think you're going to find that healthcare organizations are just not going to be able to compete." The implementation of Soarian Clinicals at CentraState was preceded by the implementation of Siemens Pharmacy and Med Administration Check™ (MAK), a point-of-care approach that combines barcode and workflow technologies to help providers reduce medication errors. The combination of those systems and workflows led to an astounding 42-percent reduction in avoidable medication errors. "I can say without equivocation that this hospital is safer today than it was before we deployed the barcoding," says President and Chief Executive Officer John T. Gribbin. "And that has been terrific and enormously significant in our minds."

Workflow Explained

The principle behind Soarian Clinicals is Healthcare Process Management – a variation of business process management that helps organizations promote efficiency and the use of best practices guided by evidence-based medicine. Ganguly says administrators commonly confuse workflow applications such as Soarian Clinicals with simple rules engines. While rules engines give users prompts based on 'if-then' scenarios, workflow engines immediately alert the appropriate person to take action and to follow a predefined workflow process. If the clinician does not take action, the system escalates the request further. Rather than forcing medical facilities to make their workflows consistent with the software, Soarian Clinicals allows the organizations themselves to create workflows that are specific to their needs and objectives. CentraState has created 11 live workflows, including Admission Assessment, Fall Risk Assessment, Heparin Protocol, IV Restart, and Deep-Vein Thrombosis (DVT) Prophylaxis. "Building workflows is complex, and we never minimize that," says Ganguly. "But the act of defining the workflow and building it electronically helps redefine the process, which in and of itself brings huge value."



A New Level of Patient Safety

Medication errors are a serious and widespread problem in healthcare, occurring at a rate of one in every five doses according to a study from 2002.¹ Another study estimated that adverse drug events cause as many as 7,000 deaths each year in the United States alone.² Up to 38 percent of those errors occur during the administration process.³

Recognizing the threat to patient safety that medication errors pose, CentraState HealthCare System implemented Siemens Med Administration Check (MAK) in 2006. The application uses barcode technology to help ensure that the five rights – right patient, right time, right dose, right route, and right drug – are met. The nurse scans his or her identification badge, the patient's identification bracelet, and the drug before administering it. In the case of any mismatch, the system instantly alerts the nurse to the exact nature of the problem.

"My nurses will tell you they love MAK because it helps prevent them from inadvertently doing harm to patients," says CentraState's Linda Geisler. Senior Vice President and Chief Operating Officer Daniel J. Messina, PhD, adds that the system also helps improve satisfaction among patients and increases their confidence in the facility. "The employment of this software sends a very powerful message to patients about the commitment that CentraState has to providing the best patient care in the safest possible manner," he says.

MAK is integrated with Siemens Pharmacy, an application that uses drug/drug and drug/allergy checking content from First DataBank to help alert pharmacists to contraindications as soon as an electronic order is received. CentraState is also beginning the implementation of Soarian computerized physician order entry (CPOE), a system that is delivered with model 'picklists' that can dramatically affect the velocity and time in a project. "We've laid the groundwork for CPOE, and they [clinicians] are really looking forward to having it," says Peg Kauth, Director of Information Systems at CentraState. CentraState's investment in Siemens Pharmacy and MAK has led to a 42 percent reduction in avoidable medication errors and has resulted in a 90 percent reduction in undocumented charges. The medical center estimates that it had two million US dollars in lost charges per year before implementing MAK, and that the system has saved them half a million dollars in annual revenue by dramatically reducing undocumented charges. Messina also credits the system with improving CentraState's inventory and supply chain management. "We've always been a high-performing organization," says Messina. "I think this has now taken us to the next level."

¹Medication Errors Observed in 36 Health Care Facilities, Barker et al., *Archives of Internal Medicine*, 2002, 162: 1897-1903

²*To Err is Human*, Institute of Medicine, 1999. Last accessed at February 21, 2008. <http://www.iom.edu/Object.File/Master/4/117/ToErr-8pager.pdf>

³*Reducing and Preventing Adverse Drug Events to Decrease Hospital Costs*. Agency for Healthcare Research and Quality. Last accessed at February 21, 2008. <http://www.ahrq.gov/qual/aderialaderia.htm>

CentraState's Chief Nursing Officer Linda Geisler, RN, explains that the gateway to the Soarian Clinicals workflows is the admissions assessment. Like all Soarian workflows, it is customizable to meet the institution's specific needs and can be updated to meet procedural and regulatory changes. The Joint Commission (an independent, not-for-profit accrediting and certification body for healthcare organizations and programs in the United States), for example, recently required that hospitals conduct a suicide risk assessment on patients. CentraState altered its Admission Assessment Workflow accordingly, ensuring that busy nurses do not forget to conduct the new risk assessment. Just six months after implementing the Admission Assessment Workflow, CentraState has seen a 9.2 percent improvement in satisfying admission assessment requirements.

The Admission Assessment immediately triggers other workflows, such as the Pressure Ulcer Prevention Workflow. When an inpatient meets risk factors related to albumin levels, whether he or she is able to eat, the workflow notifies nurses to put the patient in a bed with a pressure-relieving mattress. Every two hours, the workflow notifies the appropriate nurse to turn the patient. Geisler credits the workflow, along with training sessions for staff, with keeping the nosocomial pressure ulcer rate at CentraState well below the benchmark rate set by the American Nurses Association National Database of Nursing Quality Indicators. The most recent data from CentraState shows a nosocomial pressure ulcer rate of 1.86 percent. "This is all automatic, and that's the beauty of it," says Geisler. "It's not an extra task – it's just reminding nurses when they need to take action."

Similarly, the Fall Risk Assessment Workflow takes into account factors such as whether the patient has recently lost a significant amount of weight, exhibits weakness, or has fallen at home. If the risk factors are present, the system alerts nurses to take preventive measures such as moving the patient closer to the nurses' station and placing a yellow bracelet on the patient's wrist so that the

staff is aware of the risk. CentraState realized an 88 percent reduction in fall-related fractures from 2006 to 2007. As a result of the Heparin Protocol, which reminds the nurse when to order lab tests and change dosages, nurses have consistently responded to critical lab values within ten minutes. Before the implementation of Soarian Clinicals, the hospital was unable to accurately track how long it took nurses to get the appropriate dose to patients.

The IV Restart Workflow immediately alerts the IV team via pager to change peripheral IV sites within 72 hours of insertion to reduce the risk of infection. Before implementing the workflow, CentraState had an infection rate of two per 1,000 peripheral IV days. After implementing the workflow, the hospital has shown a 100 percent improvement, with a peripheral IV infection rate of zero. In addition, the workflow has improved efficiency and employee satisfaction by eliminating phone calls to the IV team. Geisler adds a recently implemented workflow that alerts nurses and physicians to consider removing urinary catheters after three days to reduce the risk of nosocomial urinary tract infections has already reduced the number of days in

which Foley catheters have been in use at CentraState.

Another new workflow developed to reduce the risk of DVT immediately assesses a patient's risk based on the Admission Assessment. If the patient is at risk, it reminds the nurse to use sequential compression devices on the patient. When a patient is at high risk, it reminds the physician to consider putting the patient on anticoagulant medication. Another recently implemented workflow alerts nurses when patients are NPO (nothing by mouth) because of pending radiology exams. Geisler says hundreds of patients a week are NPO, and before the workflow was implemented, staff would, on occasion, mistakenly give these patients food trays. The result was that these patients would need to have their tests delayed for a day – disrupting the radiology schedule and incurring costs. Geisler estimates that the workflow will save CentraState US\$31,000 per year.

Intuitive Interface, Positive Reaction

Geisler says the improved patient outcomes associated with the use of Soarian Clinicals makes the workflow engine



CentraState Healthcare System is a private, not-for-profit health organization founded in 1971.

popular among nurses at CentraState. Siemens sought input from linguists, human-factors engineering specialists, and graphic artists when designing Soarian's role-based smart user interface. Images, electrocardiograms, and physiological waveforms can be viewed alongside patient data, and a simple point-and-click allows clinicians to move from one image to another. Web-enabled links allow clinicians to connect seamlessly to applications such as Soarian HIM (Health Information Management), which provides instantaneous access to complete online medical records, and even to systems from other vendors.

Geisler says CentraState has a low nursing staff vacancy rate (just four percent), but on the occasions that the hospital does employ agency nurses, the newcomers have no trouble using Soarian. "These outside people come and they say, 'Oh, this system is so intuitive – it's so easy to learn.'"

Senior Vice President and Chief Medical Officer Benjamin Weinstein, MD, PhD, says physicians like the ability to have all of the patient's information readily accessible and the ability to customize their interfaces to meet their preferences and needs. "The docs absolutely love the idea that all of the information is so readily available to them," he says. Ganguly says the involvement of the clinical staff in designing the workflows ensured that they were aligned with the hospital's larger goals of improving patient safety and productivity. He says Siemens facilitated information sharing sessions with other early adopters and worked directly in partnership with CentraState to help implement the workflows. "Our prior vendor had one or two physicians in their entire organization – and maybe three or four nurses," Ganguly notes. "We had that many working on this project alone from Siemens, and it really spoke well of the knowledge base that's supporting this product. You have real clinicians behind this who are bringing real-world experience."

Significant Savings

The implementation of Soarian Clinicals, Siemens Pharmacy, and MAK has led to

significant and measurable improvements in patient safety at CentraState. Ganguly says a concurrent goal is to have each workflow produce measurable financial benefits, and he reports that CentraState has been very satisfied with its results. Prior to the implementation of MAK, for example, nurses would document medications on paper but not always in the computer system, resulting in approximately US\$2 million in lost charges annually. After implementing MAK, CentraState saw a 90 percent reduction in undocumented charges. Gribbin estimates that the reduction in lost charges has translated to US\$0.5 million in increased annual revenue for the medical center.

Gribbin says it is difficult to measure the financial benefits of the reduced number of phone calls to the pharmacy, the IV restart team, and other clinicians as a result of the immediate notification and alert features of Soarian Clinicals. Still, he says the streamlining of processes and handoffs inherent in the system undoubtedly increases the amount of time nurses spend at the bedside and decreases the use of overtime and agency nurses.

"These are things that are otherwise extremely expensive and also lead to greater error," says Gribbin. "And a lot of that is driven by the demands of work intensity, driven by documentation, and driven by handoffs from one staff member to another. All of these things, Soarian software can help us improve."

Sameh Fahmy, MS, is a freelance medical and technology journalist based in Athens, GA, USA.

Further Information

www.siemens.com/Soarian

Summary

Challenge:

- Work intensity resulting from inefficient handoffs and limited coordination of tasks among clinicians
- Threats to patient care caused by deviations from best practices
- Costly medication errors that threaten patient safety

Solution:

- Siemens Soarian Clinicals workflow management technology allows healthcare facilities to create workflows that are specific to their needs and objectives
- Immediate notification and escalation features of Soarian Clinicals expedite communication and confirm that best practices are followed
- Siemens Pharmacy automatically alerts pharmacists to contraindications, allergies, and other problems as soon as the order is received
- Siemens Med Administration Check uses point-of-care barcode technology to confirm that the five rights of medication administration are met

Result:

- Immediate alerts and notifications synchronize handoffs and decrease phone calls to pharmacy, IV restart team, and other clinicians
- Improved quality of care for patients evidenced by decreases in nosocomial pressure ulcers, fractures from falls, IV-related infections, and several other measures
- Improved patient safety through a significant decrease in preventable adverse drug events. Financial benefits through a significant reduction in lost charges and increased efficiency through better inventory and supply chain management