The Real Action Is Still at the Bedside
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In a perfect world, all stakeholders—consumers, providers, payers, communities and government agencies—would realize a return on the technological investments in healthcare information technology. The digital revolution in healthcare started in earnest with the availability of electronic medical records (EMRs) and electronic health records (EHRs), and has been further fueled by the adoption of wireless infrastructure to support the use of mobile devices, intelligent medical devices and telehealth services along the continuum of care. Early adopters have reported incremental improvements in operational efficiencies, better health outcomes and enhanced patient safety as they roll out EHR platforms that support health information exchange across healthcare settings. Whether the accrued and near-term benefits exceed the accrued costs is not known and will require additional time and investigation to determine.

What is known is that both early and late EHR adopters increasingly have the opportunity to create a data-rich environment that facilitates the provision of care by arming providers with real-time actionable data. However, many healthcare organizations are struggling to implement timely and accurate data capture processes within new and existing workflows and achieve clinical adoption of these practices. Therefore, one of the key early lessons common across candidate healthcare organizations is that they must strategically and proactively integrate data capture and collection processes within workflows to successfully enhance the patient experience and clinical efficiencies during this period of change.

By enabling mobility with electronic data capture, healthcare providers can not only advance the goals of cost-effectively improving quality of care and patient safety, but they can, in fact, accelerate them. They can progress along the various stages of the EHR adoption path, securing additional financial incentives (e.g., Meaningful Use) and avoiding penalties (e.g., quality ratings). Along with the clinical and financial benefits, operational benefits can be accrued as well, while simultaneously enjoying additional operational and reputational benefits.

**ACCELERATING THE JOURNEY TO BETTER PATIENT CARE THROUGH ELECTRONIC DATA CAPTURE**

EHR adoption rates in the United States will increase dramatically over the next four to five years, largely due to the enactment of the Health Information Technology for Economic and Clinical Health Act (HITECH) in 2009. The HITECH Act provides incentive payments to healthcare providers that meet Meaningful Use milestones determined by the U.S. Federal Government. Frost & Sullivan estimates that EHR adoption in U.S. hospitals will increase from 12 percent in 2009 to 90 percent in 2016.

Healthcare IT systems and EHRs are becoming an increasingly important part of the nurse’s daily job. “The technology is going to be as essential a part of patient care as the stethoscope or heart monitor,” according to Melissa Barthold, an IT leader and member of the HIMSS Nursing Informatics Task Force. EHRs and the IT systems that support them will continue to impact the daily lives of nurses and the face of healthcare delivery.
Healthcare IT investments and the adoption of EHRs are intended to enhance the quality of care through improved internal tracking of patients, increase coordination and improved communication along the care continuum and provide better analysis of patient outcomes. The adoption of EHRs represents a significant shift in the day-to-day delivery of healthcare in the United States, especially when focusing on the expected impact it will have on nurse interactions with patients at the bedside.

While hospitals are moving forward with EHR installations across the enterprise, timely and accurate entry of data in the EHR is required to reap the benefits of information analysis and exchange. Nurses can be distracted during their patient interactions and may enter information inaccurately, or they may wait to enter information after returning to the central nurse station or at the end of shift, increasing the chance that information will be left out or entered incorrectly.

The process of entering patient data into an EHR can interrupt the clinician-patient interaction and add delays to traditional clinical workflows. Healthcare administrators will need to develop systems that enable clinical and allied staff, nurses in particular, to deliver better care to patients while improving job satisfaction and promoting the shift from paper to electronic documentation.

**The Importance of Nursing Staff to Successful EHR Implementations**

As IT professionals and operations managers are well aware, a major factor in deployment of a new system, especially one that potentially requires changes to workflows, is the level of acceptance and proper usage of the new system by field staff. While no one suggests that the EHR wave can be turned back, realizing the full potential of deploying these systems, in both quality of care as well as cost and efficiency benefits, depends on adoption and acceptance of workflow changes that are seen as positively impacting patient care and supporting ease of use. Creating buy-in among users of the new technology is often a major challenge in the deployment of EHR/EMR systems, and many lessons learned from successful deployments are exchanged among hospital CIOs at industry events.

Sharon McLane, CNIO and Director of Clinical Transformation at Lakeland Regional Medical Center, has led IT implementations and researched the impact of health IT systems and nurses in hospital settings. As McLane noted in a study of staff attitudes toward EMR implementation, “Electronic medical record (EMR) systems have been in use for more than two decades. Studies documenting nursing satisfaction with an EMR system, the benefits of an EMR, implementation barriers, user acceptance, the importance of staff buy-in in addition to the importance of attitudes toward and expectations from user buy-in are in the literature. Central to many studies is the importance of nursing staff buy-in to the successful implementation and ongoing use of an EMR, as well as the dependency of buy-in on staff attitudes and expectations. Buy-in is a precursor to effective use. Consequently, staff buy-in is a prerequisite to collecting and making optimum use of the data contained in an EMR.”
McLane goes on to note the crucial role that nurses play in EMR implementations in hospital settings. “[T]he attitudes of nurses who regularly interact with all other care providers have been found to be critical to successful implementation. Nurses contact nearly every other care provider, and the attitudes and perceptions of nurses significantly influence the perceptions of other providers and how they use the EMR. Nurses are quite often the resource other providers access when they have questions about use of the EMR.”

Learning from other industries where IT solutions have been deployed among mobile field staff, these solutions will be most readily adopted when they solve problems of the individual user in their daily work, i.e., the system creates convenience, efficiency and access to knowledge that may not be otherwise available. Clinicians would likely agree that EHRs meet the last of these criteria, but many debate the convenience and efficiencies that are created, especially in the early stages of adoption.

While clinicians generally accept that having access to information in an EHR/EMR will improve the quality of care delivered, “[A]cceptance of EMR applications has been slow and application designers attempting to solve this problem face several hurdles. First, the structured nature of electronic interactions takes longer than paper-based interactions. Second, full-time clinicians are very busy…an EMR that introduces inefficiencies will not be well received.” Additional reasons cited for resistance to EMR adoption are decreased interaction with patients and lack of integration with clinician workflows.

Given these facts, hospitals should strive to implement solutions that meet the following goals:

- Incorporate EHR usage into efficient workflows
- Support easy-to-use EHR data inputs
- Incorporate workflows and usage patterns that do not interrupt or diminish patient interactions
- Create an environment that results in higher levels of patient satisfaction and confidence resulting from use of an EHR

**Real-Time Data Capture in the EHR**

Real-time data capture is recording work when and where work is performed. Real-time data capture in the EHR involves updating the patient’s electronic health record when the patient’s data is collected at the point of care or work is performed on the patient’s behalf. Using technology that captures patient data in the EHR in real time ensures the patient’s record is always updated and displays the most current information on the patient’s status.

Real-time data capture in the EHR has important applications in delivering better healthcare to patients. Medication dispensing, lab tests and radiology results are three important areas where real-time data capture improves patient safety, accelerates turn-around times and improves communication between nurses, physicians, hospital staff and patients.
Adoption of technology that supports real-time data capture has a major impact on nurse's workflow and daily tasks. Before administering medication or a transfusion, nurses can validate a patient's identity at the bedside with bar code technology to ensure the right medication and dose is being delivered to the right patient. Patient notes are recorded electronically at the bedside and uploaded to a patient's EHR. Nurses can see lab and x-ray orders from physicians, eliminating the need for nurses to read handwritten notes or transcribe verbal commands from face-to-face interactions with physicians.

Physicians' workflows are improved with real-time data capture. Physicians can enter electronic orders for medication and lab tests through computerized physician order entry (CPOE) systems, eliminating the need for physicians to write handwritten orders that could be misread. Lab test and radiology results are put online as soon as they are ready and made available for the physician to review. Physicians can also review a patient's EHR, updated with real-time information from the nurse, to assess their patient's response to a medication.

Real-time data capture in the EHR improves patient interaction through faster communication of results across the continuum of care while giving nurses access to complete records when interacting with patients. A nurse supervisor at a large medical center in the northeast stated, “Having a complete patient record at my fingertips is essential to giving patients informative answers to their questions” and since implementing their real-time data capture for the radiology department “turn-around time for x-rays has reduced significantly. Results for x-rays are uploaded immediately as the information comes in and I can address the patients’ concerns much faster.” These advances improve nurses’ responsiveness to patients and serve to elevate the overall patient experience.

Data integrity is improved with electronic data capture in the EHR. “In the past with paper records, boxes wouldn’t be checked and information would be missing on patient's records. Today, the nurses enter the information electronically at the bedside on mobile computers, and the software prompts the nurse when data is missing,” states a nurse supervisor at a medium-sized hospital in Florida.
**Advancements on the Path to EHR Adoption**

Real-time data capture at the point of care helps drive and sustain EHR adoption among clinicians and assists hospital administrators in their journey along the HIMSS adoption model. Many nurses struggle with adapting to the integration of an EHR into their daily work routines. Nurses complain that entering information into an EHR adds time to their shift compared to checking boxes on a paper sheet. This is especially true when nurses are busy, as taking time to enter patient information in the EHR can be a serious challenge to EHR adoption.

According to Pamela Cipriano, Nurse Scholar in Residence, Institutes of Medicine at the National Academy of Sciences, “Nurses want devices that are integrated, voice activated, handheld, use biometrics, provide translation, are portable, are wireless, auto populate and are smart.”

Mobile devices with real-time data capture can be a solution to this issue. The more data and steps that are automated at the point of care, the more that the burden of the nurse to enter patient data in the EHR is relieved. Information that is automatically updated to the EHR saves nurses time and makes it more likely they will be compliant. According to a nurse supervisor at a small hospital in New Jersey, “When we first implemented our EHR, nurses had to enter the IV bag manually into the EHR. Many nurses were non-compliant. Now we have reduced the steps with bar coding and automatically updating the HER; non-compliance is down significantly.”

**Steps to achieving improved outcomes**

1. **Patient Data Capture**: Real time at point of care
2. **Data Collection in EHR**: Collection of patient data along entire care continuum
3. **Clinical Analytics**: Improved outcomes
The Importance of Real-Time Data Capture in EHR Adoption

The HIMSS EHR adoption model is a framework to track and objectively score a hospital’s journey along the EHR adoption curve. The HIMSS adoption model is comprised of eight stages (Stage 0-7) that represent a hospital’s progress in implementing an EHR. The stages range from incomplete coverage of ancillary departments, Stage 0, to a fully electronic medical record, Stage 7. Progression to a higher stage requires that all lower stages are complete.

The HIMSS EHR adoption model is an important tool for hospital administrators to judge their progress in implementing EHRs and achieving Meaningful Use criteria. There are many alignments between the Meaningful Use criteria set forth as requirements to receive government incentive payments and the increasing implementation of modules (e.g., CPOE) needed to move towards more advanced stages of EHR adoption. According to HIMSS Analytics, U.S. hospitals have made some progress in implementing EHRs. In 2009, over 80 percent of U.S. hospitals were in Stage 3 or lower compared to 72 percent at the end of 2011. However, according to HIMSS Analytics, as of January 2012, only 1.2 percent of U.S. hospitals had attained Stage 7. Significant work remains ahead of hospital administrators to reach the goal of a fully operationalized electronic medical record.

Hospitals and administrators are focused on implementing technology solutions that move them along the path to more advanced levels of EHR adoption. At the same time, hospitals struggle to implement interactions with the EHR into daily workflows in a way that makes clinicians more efficient in both patient interactions and data entry.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cumulative Capabilities</th>
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<tbody>
<tr>
<td>Stage 7</td>
<td>Medical record fully electronic; CDO able to contribute to ICEHR as byproduct of SEHR</td>
</tr>
<tr>
<td>Stage 6</td>
<td>Physician documentation (structured templates), full CDSS (variance &amp; compliance), full PACS</td>
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<tr>
<td>Stage 5</td>
<td>Closed loop medication administration</td>
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<tr>
<td>Stage 4</td>
<td>CPOE, CDSS (clinical protocols)</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology</td>
</tr>
<tr>
<td>Stage 2</td>
<td>CDR, CMV, CDSS inference engine, may have Document Imaging</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Ancillaries—Lab, Rad, Pharmacy</td>
</tr>
<tr>
<td>Stage 0</td>
<td>All three Ancillaries not installed</td>
</tr>
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Reducing Errors and Enhancing Patient Safety: Getting the Right Medications, the Right Tests Ordered, the Right Care

Electronic data capture improves patient safety by removing mistakes introduced by paper records and human error. CPOE allows physicians to send electronic orders to the pharmacy, lab and radiology. This eliminates the need for physicians to hand write notes or communicate face-to-face with support staff. Both methods can lead to mistakes from illegible handwriting of physicians or transcription notes from verbal orders.

With barcode technology, nurses can check the patient’s identity and verify medication with a simple scan of the patient wristband at the bedside. This practice ensures the medication about to be administered at the point of care aligns with the care plan prescribed by the doctor through the CPOE. Brigham and Women’s Hospital reported that medication errors were reduced by 41 percent after they implemented a barcoding system in their hospital.7

Physicians can monitor a patient’s response to their care plan from the real-time updates on their EHR (entered by nurses using mobile technology or streaming autonomously from wirelessly-equipped diagnostic and monitoring equipment), allowing physicians to better understand underlying causes of and respond most appropriately and quickly to an adverse event. This technology, implemented into healthcare delivery, improves patient care and safety and allows physicians to be more connected with patients.

This feedback mechanism to physicians, enabled by nurses with real-time data capture in the EHR, is the last step in a closed loop medication administration. Physicians enter a patient’s prescriptions in a CPOE system and the prescriptions are sent electronically to the
pharmacy. Nurses collect patient-specific medications, usually dispensed from the pharmacy to a decentralized cabinet, and administer the medications at the bedside. Ultimately, nurses are responsible to ensure the right drug is administered at the right time and right route; using barcoding technology simplifies this validation process and reduces the chance for human error. Patient response to the medication is recorded by the nurse at the point of care and updated on the patient's EHR for the physician to observe. Nurses and hospitals have a quality control process that is verifiable at the point of care, simple to execute and verifiable in an auditing process.

This workflow describes the basic requirements to achieve a closed loop medication administration, which responds to Stage 5 of the HIMSS adoption model. This stage of EHR adoption is an important step to leveraging healthcare IT to improve patient care. Based on HIMSS Analytics information, only 16.8 percent of U.S. hospitals have reached Stage 5 or higher on the HIMSS adoption model (at the end of Q1 2012).

**Impact on the Patient Experience on Quality Ratings and on Overall Customer Experience of Patient, Family**

An EHR improves the experience of the patient and family members. Improving nurse responsiveness and access to a comprehensive record allows the patient's family to feel more secure and engaged in their loved one's care. A nurse manager whose hospital implemented EHRs three years ago notes, “Family members feel much more secure with us double checking the medication before administration, and they like the fact I have access to a comprehensive and fully up-to-date patient record to answer questions about their loved ones. EHRs [with real-time data capture] also foster better interaction with the patients and family because results come back to us faster.”

A security rich wireless infrastructure can improve nurse interactions with patients. Voice over IP (VoIP) and mobile phone technology give patients instant access to nursing staff and can improve communication between patients and hospital guests. Wireless broadband services, supplied by healthcare organizations, will serve as the foundation for a widely accessible EHR. A widely accessible EHR is the expected future in healthcare delivery with the promise of better engaging patients and their families in healthcare delivery.

**Impact on the Caregiver Experience**

Some nurses still talk about the glory days of paper records; however, many nurses in front line care recognize the value EHRs combined with real-time data capture bring to their profession. A nurse supervisor at a large hospital in Pennsylvania stated, “There have been some challenges with implementing our EHR but looking at the nurse's overall job experience, I believe our system has made the nurses more efficient and effective care givers.”

Clinical decision support systems (CDSS) assist clinicians in making important healthcare decisions. These systems combine patient data with known medical knowledge to provide alerts, such as drug-to-drug interactions, and reminders for best-in-care practice to physicians
to improve healthcare delivery. Studies have shown the benefit of these systems in improving patient care. A 2005 article in JAMA by Garg, et. al., reviewed 100 clinical trials assessing the effect of CDSS on physician performance. The review found that CDSS improved physician performance in 64 percent of the studies reviewed. Combining CDSS with real-time data capture at the point of care makes these systems more effective, as they are operating on the most current information about the patient.

**MOBILITY WITH DATA CAPTURE DRIVES EFFICIENCY IN HOSPITAL OPERATIONS**

Mobile devices utilized in healthcare delivery include barcoding devices, tablet computers, mobile workstations and mobile phones. These devices allow nurses to move from room to room and record patient data at the site of interaction. They also free nurses from fixed workstations and enable them to access patient information from any location. “One of the great benefits of my mobile computer is that I can access a patient’s record anywhere and answer a doctor’s question about a patient without having to run up and down different floors to find patient records,” states a nurse supervisor and infection control specialist at a medium-sized hospital in California. Mobile devices have the potential to truly connect nurses to patients at all times.

Mobile devices, with data capture, free nurses from entering patient information into the EHR at fixed desktop computers. “Before we got our mobile computers, I would have to enter in patient data after I completed my rounds. Now, I do it right at the bedside.” These devices have the potential to improve nurses’ efficiency over standard desktop workstations and they help to ensure patient data is recorded with reminders and prompts embedded in the EHR.

Although these devices can increase nurses’ efficiency, hospital administrators must adopt strategies to integrate the multiple devices. Mobile computers, tablets and bar scanning equipment are most effective when they are integrated together and share information. IT administrators will need to develop networks that can expand the range of mobile devices and both collect and deliver critical information from and to these devices. Real-time information will need to be updated in a patient’s EHR from a mobile device and available to all members of the coordinated care team.

Deficiencies in the interaction of mobile devices with the network could cause significant delays in updating of patient records and offset the advantages gained through mobility. The mission of healthcare providers is to provide the highest quality care to patients. Mobile devices that incorporate data capture offer the potential to improve care for patients and add efficiencies to nurses’ workflow. However, reliable operation of these devices is critical to achieving this end. Healthcare administrators will need to take great care in providing a mobile infrastructure that is reliable and secure and easily managed and maintained, and go through the additional steps to ensure that these hardware components have been tested and configured to support the medical mobile applications with minimal risk to paramount patient safety and limited IT resources.
The infrastructure needed to support mobility with data capture involves a variety of components, both wired and wireless. In addition to mobile computers and handheld scanners, other hardware and software components are needed, including RFID readers and tags, wireless LAN and security solutions, servers, printers (mobile and fixed) and a wired backbone network. Integration with EHR and other clinical systems is required, along with network design and business process support to ensure the solution delivers ROI in terms of process benefits and efficiencies in care provision and workflow.

**MOBILITY WITH DATA CAPTURE IS A FOUNDATION NEEDED TO LEVERAGE HEALTH IT INVESTMENTS MADE AND IMPROVE QUALITY OF CARE, PATIENT SAFETY AND PROVIDER AND PATIENT SATISFACTION**

Mobility devices with data capture improve the experience of the patient and family. Patients are reassured knowing nurses are using the mobile devices to double check their medication before administration. Families of patients feel more secure knowing the right tests and medications are being ordered and administered to their loved ones. This lessens the anxiety families feel when they see medical care being delivered and when they leave their family member in the hands of the care team.

These devices also improve a nurse’s interaction with patients by reducing the time spent entering data into EHRs thus increasing face time between nurses and patients. Mobile devices increase nurse efficiency by freeing them from a fixed desktop location to access EHRs.

Nurses are able to instantaneously input needed data into the EHR, enhancing the information flow needed in today’s collaborative care models. Nurses also have access to the details of information for all patients and are able to provide timely and accurate feedback to patients and their families, enhancing bedside interactions and increasing job satisfaction and customer satisfaction.

Mobile devices with data capture can accelerate EHR adoption in hospitals and amplify its benefits. Mobility with data capture has the potential to reduce the burden of EHR adoption on daily tasks of nurses. Reducing the impact on nurses’ workflow will increase staff adoption of EHRs and assist healthcare organizations in moving along the HIMSS EHR adoption model and meeting Meaningful Use criteria.

With EHR deployment a priority for all hospital systems, increasing the efficiency and accuracy of data capture is a key operational success factor in hospital operations, as well as in the transition to a data-driven healthcare system. In this period of transition, mobility with data capture contributes to fluid workflows and increased efficiency, increases in patient and clinician satisfaction as well as the quality of data captured, supporting the goal of improved quality of care. Hospital executives looking to leverage the benefits of EHR deployment must examine the infrastructure needed to support mobility with data capture in order to accelerate the operational and clinical gains these systems are capable of providing.
REFERENCES

3. Ibid

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