

Information Systems & Technology

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The Ultimate Health Care IT Consumers: How Nurses Transform Patient Data into a Powerful Narrative of Improved Care

Executive Summary

- ▶ The health care industry's growing adoption of electronic medical records is giving rise to a new perspective on the role of nurses and other health care providers.
- ▶ Nurses are key to making the electronic medical record a longitudinal patient story, a meaningful tool that helps them provide safer, more efficient, and more effective care.
- ▶ It is nurses' interactions with information systems that in large part determine the efficacy of the system in promoting patient safety and improving outcomes.
- ▶ Through nursing leadership combined with an effective clinical information system, organizations can create a comprehensive narrative not only about individual patients but about entire populations.

“NURSES ARE THE LARGEST ‘CONSUMERS’ of healthcare I.T., and they are not looking at bits and pieces of data – they are looking at the big picture. They are not just entering numbers into a patient chart, they are writing a story about that patient. Many CIOs and I.T. vendors haven’t appreciated that fact.” — Carol Bickford, RN, senior policy fellow in the department of nursing practice and policy at the American Nurses Association, quoted in the September 2004 issue of *Health Data Management* magazine.

The health care industry's growing adoption of electronic medical records (EMRs) is giving rise to a new perspective on the role of nurses and other health care providers. In addition to delivering direct patient care, nurses are also “knowledge workers” in that they must accurately record, interpret, and act on a voluminous amount of data every day. Nurses are key to making the EMR a longitudinal

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patient story, a meaningful tool that helps them provide safer, more efficient, and more effective care.

For nurses, health information technology's (HIT's) ground-level issues fall into three basic categories. First, *quality and efficient care delivery*: how do we incorporate HIT as a tool that enhances — not inhibits — nurses' complex and demanding workflow? Second, *supporting the continuity of care*: how can these systems streamline the flow of information from the physician's office through hospitalization and discharge? And finally, *outcomes*: how can the information be leveraged to help patients maintain a better quality of life after they leave the hospital, as well as to benefit the health care organization itself?

To open this discussion, we explore how nurses at leading institutions are using the latest HIT tools as part of a comprehensive clinical information system (CIS) to support preventive care, manage the demands of the inpatient and ambulatory experience, and streamline reporting and billing responsibilities. Throughout the discussion, we can see measurable outcomes in patient safety, efficiency, and cost savings as a result of this automation.

QUALITY AND EFFICIENT CARE DELIVERY

When HIT is truly integrated into nursing workflow, it becomes a tool that enables nurses to improve the quality of patient care and to reduce time spent on administrative tasks. Organizations that have not been successful in getting nurses to embrace HIT are those that have tended to treat the technology as an overlay on existing processes. Reaping the full benefits of a CIS requires a multifaceted approach of which the technology itself is only one aspect.

Change Management

Any discussion of successful CIS implementation and use must begin with change management — the process of evaluating and redefining workflows to develop new procedures that will be more efficient and effective with HIT. As some organizations have learned, simply automating paper-based practices will not produce the patient safety, cost savings, and productivity outcomes that providers hope to realize.

Rather than view the change management

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process as a laborious precursor to CIS implementation, some nurse leaders welcome the disruption as a positive opportunity to leverage comprehensive planning, design, and training resources to create nursing procedures that support higher quality care delivery.

Innovative early adopters have engaged interdisciplinary teams of clinicians to evaluate work processes, analyze needed changes, and set goals to ensure their systems provide true value to clinicians and patients. And most recognize that value comes in many forms, from helping to reduce costs and increase revenue to providing greater efficiencies to decreasing the risk of medical errors.

By setting and clearly communicating goals for the IT initiative as part of the change management process, nurse leaders can greatly improve the chances for success. Lehigh Valley Hospital and Health Network (LVHNN), a network of community hospitals in Pennsylvania, has built a sophisticated electronic safety net that leverages wireless medication barcode administration capabilities as well as decision-support tools during computerized physician order entry (CPOE) and dispensing in the pharmacy. With the system, LVHNN prevents 50 medication errors out of every 10,000 doses given, or about 50 errors per month on a single 30-bed unit.

When the organization first implemented its medication barcoding functionality in 2003, nurse leaders recognized that barcoding systems actually add steps to the process. But the technology's potential to improve patient safety, and the high likelihood of errors occurring at the medication administration stage, far outweighed the minimal time increase.

With this in mind, the organization purposefully stressed to its nursing staff that the goal for the technology was patient safety, not time savings. That helped encourage patience among nurses just getting up to speed on the system. Once nurses received their first alerts warning them of a potential error, they were able to see and appreciate that the system was supporting patient safety; in fact, during roll-out many were reluctant to administer medications on units not yet live on the technology.

The Electronic Medical Record

The foundation for an integrated clinical IT system is the EMR, a tool that captures comprehensive patient information over a lifetime of care and makes it available for all members of the care team to view simultaneously.

By compiling and housing patient data electronically, the EMR can provide numerous productivity and time-savings benefits to the nursing staff and other clinicians, including eliminating the need to search for lost or misplaced paper charts, or flip through volumes of pages to find and compare data.

In addition, the EMR makes a significant impact on patient safety and organization-wide efficiency, with decision support tools that automatically check for potential medication errors during order entry, dispensing or administration, and authenticate physician orders and nursing documentation. Because a real-time CIS has the most up-to-date information about a patient, clinicians are also alerted by the system to avert ordering unnecessary or duplicate tests (Wilson & Anderson, 2004).

North Carolina Baptist Hospital (NCBH) of Wake Forest University Baptist Medical Center implemented its EMR in 1995, and since then has seen marked results in terms of patient safety, as well as with efficiency and cost savings.

The Magnet-recognized facility in Winston-Salem, NC, houses its EMR in a single database so that all information is entered into and retrieved from one common source, to ensure that all clinicians can access identical, current data. Nurses, physicians, and pharmacists each access the system via a user interface designed specifically for their specialty, with screens tailored to provide each discipline with a high-level overview of relevant data, and the ability to drill down for additional information as necessary (Wilson & Anderson, 2004).

The EMR has enabled the organization to:

- Prevent more than 65,700 duplicate or conflicting tests per year.
- Avoid \$2,673,989 annually in direct expenses.
- Save \$4,322,445 in medical records costs each year.
- Reduce \$149,000 annually in outcomes management administrative costs.

CONTINUITY OF CARE

By standardizing documentation and information capture, EMRs enable nurses — in their varying roles across the continuum of care — to create a single narrative for each patient, tracking progress from admission through discharge and within ongoing care in the ambulatory environment. Throughout the process, the system also ensures adherence to best practice guidelines so that the patient receives consistently high-quality care. Clinicians have access to not just one piece of information, but the entire patient record, ensuring the treatment is not just for a single event in time, but a holistic approach to care across the continuum.

The Emergency Department

For many patients, the emergency department (ED) is the first encounter with a health care organization. In the ED, nurses must quickly and accurately gauge the acuity of each patient, prioritize patients accordingly to allocate beds and other resources, and direct physicians to those most in need of care.

Incorporating expert rules into the triage assessment can help simplify the process. Scripps Health, a not-for-profit, community-based health care delivery network in San Diego, created expert rules that automatically populate specific fields in online triage documentation, depending on the patient's age, sex, and other details. As a result, the nurse can move quickly through the triage assessment — only the most vital information needed in an urgent situation — and get the patient in front of a physician as soon as possible.

This type of simplification is seen at other organizations that use an integrated system, where, if a patient arrived with chest pains, for example, the triage nurse need only complete a few predetermined fields to register and enter him on the online ED whiteboard, and assign an attending nurse. In addition, if the patient has been seen at the ED or the hospital before, the nurse can access his history of care including physiologic, laboratory, and other clinical data to obtain a more complete picture of the patient's health and make more informed decisions.

A dynamic electronic whiteboard enables nurses and other clinicians to monitor patient flow and throughput in real-time. At any time they can instantly see how many patients are in the ED, review their chief complaints and their status in the care process, including progress and results.

Memorial Healthcare System, the public non-profit health care network serving South Broward County in Florida, has initiated a project to assess and streamline all of its ED workflows, using sophisticated tools to track patients, eliminate long wait times for treatment and tests, and help clinicians avoid asking patients redundant questions.

In addition to capturing information about the patient's status from clinical activities, Memorial uses infrared tracking to note each patient's exact location at any time. On arrival, each patient receives a badge. Then, as a patient travels throughout the ED — from the waiting room or triage to a treatment room and finally to discharge — sensors affixed to the walls pick up on badge signals, feed information to the CIS, and show clinicians the patient's physical location in diagram form. Once the patient has been discharged, clinicians simply clear the badge file so it can be reassigned to another patient.

Another enhancement involves giving nurses the tools to improve the speed of laboratory and radiology results and help expedite patient flow. Memorial created Advance Nursing Interventions, or standard-of-care protocols, that have been approved by ED physicians and enable nurses to order necessary laboratory work or radiology tests based on the patient's medical complaints. Advance Nursing Interventions allow a patient's test results to be available the first time the physician examines the patient at the bed-

side, improving turnaround times as well as the physicians' decision making.

According to nurses on the unit, the ability to see at a glance exactly how long a patient has been waiting at a certain stage, and knowing in advance about his or her initial health status based on tests ordered by triage nurses, helps all clinicians sound more informed when they speak with patients. Stopping by to say, "I know that you've been in the treatment room for 20 minutes, and just wanted to let you know that your lab tests are almost ready," emphasizes to patients that the nurse and other caregivers are closely monitoring their progress.

Admission

Automation has valuable applications for time savings and improved patient satisfaction during the admitting process. Typically, the hospital admitting process can be initiated in the emergency department, in the admitting department, or on the nursing unit. The use of standardized electronic assessment forms enables nurses to document their admission findings according to department standards regardless of whether the process begins in one location and is completed in another. The benefit is in capturing the data efficiently and having it available for all providers to view as quickly as possible.

The typical admission may take anywhere from 45 minutes to an hour to complete, due to the significant amount of information required by hospital and regulatory protocols. Required items may include documentation of screening, patient facts, medical history, medication reconciliation, full physical exam, discharge planning, education, and initiating a plan of care.

Online assessment within a clinical information system can feature a checklist of standard items with radio buttons or check boxes to facilitate quicker selection of patient findings and enhance the speed in which a nurse is able to document the entire assessment process. Rather than having the patient repeat his clinical history with every encounter, the nurse is also able to pull information from prior assessments and simply verify that data with the patient. Of course, if there are additions or changes to the data, the nurse can easily enter the new information and move on with the assessment.

Nursing Unit

On the nursing unit, the CIS provides nurses with access to complete patient information, leverages decision support tools to prevent errors in medication administration, streamlines documentation and administrative tasks, and, having access to protocols and care plans at the point of care, supports standardized care delivery within nursing and across disciplines.

With a CIS, nurses can use online clinical docu-

mentation to electronically capture assessment data, medication administration, clinical findings, work lists, care plans, interventions, results, and other activities — essentially streamlining their workflow. In fact, nurses at the PeaceHealth St. Joseph Hospital in Bellingham, WA (part of an integrated delivery network with six acute care hospitals, physician clinics, and a range of other facilities in the Pacific Northwest) found that using online clinical documentation reduced the amount of time they spent on tasks such as charting by as much as 50%. This translates to a time savings of 1.5 hours per nurse per 12-hour shift that staff members can spend on direct patient care.

In an automated organization, at the beginning of a shift a nurse logs on and immediately goes to the patient assignment list, a single screen that provides a snapshot of all individuals under her purview. Once the nurse selects a specific individual, the patient summary (essentially, an online Kardex®) provides an overview of the patient's needs and allows the nurse to quickly formulate a plan of care for the shift. The summary includes the patient's problem list, active orders, identifies clinicians who are providing care, contact information, and the most recent clinical data.

In administration of medications, the nurse is assured that the CIS' decision-support capabilities have already vetted the orders twice: at physician order entry and when the pharmacist verifies the medications.

When a physician enters an online medication order, the system performs conflict checking for allergies and current medications. If the system detects a potential problem, it immediately produces an on-screen alert for the physician to review and change the order as necessary.

Prior to dispensing, the pharmacist, in verifying the order, also receives the same alerts as the physician, creating a second point of defense against errors. The ability to view orders online eliminates the need for pharmacists to decipher a physician's illegible handwriting; and the pharmacist knows that each order has been verified based on the patient's medical history, other medications, and other risks.

With barcode-assisted medication charting, the nurse scans barcodes affixed to each drug and the system issues a pop-up alert if there is any concern regarding the medication; for example, an advisory that the ordered dose of morphine is 2 mg, when the amount of medication preloaded in the syringe is 4 mg. Or, an alert might be triggered notifying the nurse that the medication scanned has expired. Once the medication has been successfully scanned (no alerts or any alert has been resolved), the nurse then scans the patient's barcoded wristband to ensure proper patient identification. As a third and final

safeguard in the medication cycle, the barcode charting checks the "five rights" of medication administration: the right drug and dose are given via the right route at the right time to the right patient.

At LVHHN, the pharmacy's goal is to dispense all medications with barcodes, to support wireless medication barcode administration on the nursing unit. Every nurse has received at least one medication safety warning through the barcode application, which provides an instant reminder of the technology's value at the final step in the medication cycle. Following implementation, nurse-driven errors on units using barcode scanning technology have dropped to zero.

Discharge

For health care organizations today, bed management and turnover are key issues in terms of managing patient flow. In addition, patients admitted to the hospital today are sicker than ever before and their length of stay is shorter, something that all caregivers are acutely aware of on a daily basis. Appropriate patient education during discharge and efficient management of the discharge process are significant concerns.

With a paper system, a physician had to be physically present at the hospital to issue discharge orders. In organizations with an EMR, this is no longer the case. The physician has the means to discharge the patient from any remote location, including his home. The physician can electronically access the latest patient information and enter orders online. In so doing, patients can be discharged when they are medically ready, freeing up a bed and saving costs for both the patient and the hospital.

Due to the need for hospital beds to turn over quickly and efficiently, nurses expend resources to track the number of "discharged" patients who remain in the hospital after checkout time (essentially 11 am. in most institutions). A CIS enhances nursing management of this process through reporting capabilities or utilization of worklists — data displayed to aid the tracking of patient status. The nurse would be able to run a report to query "all patients who have active discharge orders," or view a worklist specifically designed to display patients with discharge orders. Either of these choices allows the nurse to access information quickly so prompt action can be taken to troubleshoot delays and/or resolve bottlenecks in the process thereby making beds available more quickly. This process, enabled by the CIS, can benefit patient satisfaction, resources, and hospital revenue.

When the patient is ready for discharge, the discharge nurse can review the goals for the hospitalization to ensure that these have been met. If any goals had not been met, variances can be documented. The capture of patient findings from admission

(which began in the ED) up through discharge can be incorporated into data points for which outcomes can be measured for the patient, population, and hospital. In addition, a copy of the discharge instructions can be printed for the patient to take home at time of discharge. If the hospital provides an online patient portal, email communication can also be a valuable tool for post-discharge communication.

Clinic Followup

With the EMR, providers have at their fingertips the complete story of the patient's hospitalization, giving them the background they need to provide more proactive and effective followup after discharge.

At PeaceHealth, clinicians can view the community health record to obtain a complete picture of the care a patient has received at any one of the organization's inpatient or ambulatory facilities across three states. To further improve the convenience of this access, the organization built a sophisticated program within its CIS that electronically provides primary care physicians and their staff members with personalized, HIPAA-compliant daily lists of patients who have been hospitalized, visited the ED, or have seen a PeaceHealth specialist.

Automatically generated electronic patient lists save time by eliminating the need for hard-copy reports or telephone calls to notify ambulatory clinicians about hospitalizations or other events. Physicians and nurses use the lists as a tool to proactively followup on hospitalized patients during daily rounds, make phone calls to check in on the patient's progress, or encourage them to stop in for a clinic visit. They also can view notes from specialists regarding the care of referred patients, and take appropriate steps before or during the patient's next scheduled appointment at the clinic.

In addition to improving the continuity of care, the ability to view complete information about care at various facilities and the electronic notifications support better communication between inpatient and outpatient environments.

REGULATORY REPORTING AND AUDITS

The reporting capabilities of a sophisticated CIS place comprehensive documentation and patient information at an institution's fingertips, which can be used by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and other regulatory agencies to review care delivery. Outcome analysis for clinical improvement initiatives is another key benefit realized by the organizations using EMR.

One of JCAHO's key patient safety goals is positive patient identification. Recognizing this, and with the goal of preventing medication and other types of errors, Thomas Jefferson University Hospital

in Philadelphia developed an expert rule within the CIS to identify patients on the same unit with the same or similar names. Nurses on a unit see the advisory when they view orders, so that they can take special care to ensure they are treating the appropriate patient.

For Iowa Health System (IHS), a seven-facility organization based in Des Moines, the desire to streamline documentation and retrieve required information regarding restraint assessments prompted an organization-wide program to standardize protocols. In the past, the organization had to manually collect paper forms from all seven facilities, and review nursing documentation to compile evidence for JCAHO.

Last year, IHS convened a team of clinicians from all of its facilities, who reviewed each paper assessment form, which included discrepancies in timing of various assessment criteria, and created a single, consistent online assessment that complied with JCAHO standards and met the approval of clinical quality staff members from all seven facilities.

With the single assessment complete, the organization now is continuing with the second phase of its project: completing the reporting criteria that nurse leaders will use to pull data from the EMR to share with JCAHO, and streamline the ability to monitor restraint documentation on an ongoing basis.

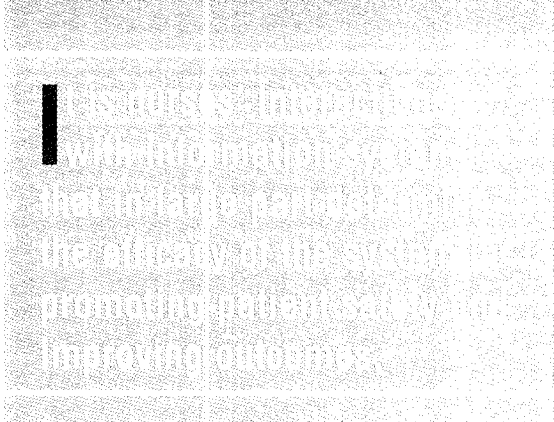
NCBH, the hospital in North Carolina, gathered preliminary data about adverse drug events (ADEs) by chart review prior to and after its CPOE implementation on two cardiology units. Statistics show that the organization reduced preventable ADEs by as much as 72% as a result of CPOE. A 1997 study published in the *Journal of the American Medical Association* determined that each preventable ADE adds an average of \$4,685 in patient care costs; making NCBH's reductions in preventable ADEs significant for both patient safety and cost savings.

CLINICAL AND FINANCIAL OUTCOMES

The benefits of the EMR extend far beyond treating individual patients in acute care settings. As the foundation of a clinical IT system, the EMR is essential to creating data warehouses that can be queried to measure outcomes for specific conditions or create disease registries that enable nurses to help patients manage chronic conditions. When integrated with the financial system, the CIS also helps maintain the organization's fiscal health by ensuring accuracy of billing and reducing payment delays.

Population Management

The nurse's ability to use the CIS as a tool to improve efficiency and effectiveness with care delivery begins before the patient even reaches the hospital or clinic. PeaceHealth has developed a sophisti-



cated disease management program that relies on specially appointed nurses called *care managers* to facilitate outreach.

Building on the community health record it first implemented in 1996, PeaceHealth has developed a disease registry to capture and monitor the health status of patients with diabetes and congestive heart failure (CHF) across three states. Since implementing the diabetes program in 1998, adherence to guidelines for care has tripled among patients in two of PeaceHealth's facilities. Building on this success, last year the organization began a parallel program for patients with CHF.

At the outset of the program, a team of PeaceHealth clinicians developed a set of protocols, built directly into the CIS, to more effectively identify patients with diabetes. Data analysts then pull metrics defined by the protocols, such as patient demographics, laboratory results, physician orders, medications, and other information, from the EMR directly into the disease registry.

Care managers responsible for coordinating the disease management program at the regional level query the disease registry to obtain an overview of the health progress for their local diabetic population, and identify items that may signal noncompliance. For example, the care manager can run a report that shows all patients (and their contact information) whose most recent hemoglobin A1c level was over 7%, and have not been in for a clinic visit within 3 months.

With this information, the care managers then contact patients by phone, or use PeaceHealth's secure Web portal, PatientConnection, to e-mail a reminder for the patient to schedule a checkup. The disease management program also enables care managers and physicians to monitor proactive interventions — from laboratory draws to weight management programs — to help patients better manage their illnesses, avoid trips to the emergency room, and prevent further decline in health.

The Clinically Automated Revenue Cycle

With a CIS that integrates clinical and financial activities, clinical events automatically generate charges to the patient's account, reducing the need for nurses and other clinicians to manually input billing information, increasing the accuracy of data and streamlining the cycle.

Inova Health System in Falls Church, VA, increased medication-related revenue capture by automating the tracking of PRN doses through an interface between its CIS and automated medication dispensing systems. The result was a significant

improvement in revenue capture. The interface also increased Inova's compliance with regulatory requirements for medication documentation.

Lehigh Valley Hospital and Health Network, in Pennsylvania, implemented its integrated clinical financial system in 1993, and in only 18 months realized a \$14 million return on its investment — half the time it had originally estimated (Wilson & Anderson, 2004). It also reduced accounts receivable (A/R) days from 70 to 41 (below the national average) and has maintained that level in the decade since. In addition, the organization achieved a \$1.5 million reduction in late and lost charges, which are now a novelty at LVHNN.

The organization has achieved these milestones by using the system to generate charges automatically from clinical activities, reducing A/R days and decreasing inpatient and outpatient bill hold days from 5 to 3. In addition, it uses tickler messages to monitor federal or state-mandated payment compliance regulations, and stay on top of requirements from third-party payers. LVHNN also leverages automated tools to check claims accuracy and prevent duplicate records, and gives administrative staff online access to clinical documentation to quickly and easily obtain medical records required for claims submission.

Writing the Electronic Patient Story

With carefully designed workflows and a system that supports them, nurses in an automated care environment can move beyond simply gathering data, shedding unnecessary steps in workflow, and instead focus on applying that information to improve patient outcomes.

Only by understanding what happens at this very hands-on level can we really begin to appreciate the radical impact that IT can make on health care. As the above examples illustrate, it is nurses' interactions with information systems that in large part determine the efficacy of the system in promoting patient safety and improving outcomes. Because they have the greatest amount of interaction with patients, nurses are responsible for accurately documenting the greatest share of the raw data. Through nursing leadership combined with an effective CIS, organizations can create a comprehensive narrative not only about individual patients but about entire populations. \$

REFERENCE

Wilson, J., & Anderson, M.A. (2004). Casting electronic safety nets across care continuums. *Nursing Management*, 35(Suppl. 5), 4-7.