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Evaluating Clinical Information Systems

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As members of organizational committees to evaluate and select clinical information systems, nurse executives must identify a system that not only has the core functionality to support necessary changes in workflow and optimize nurse productivity and patient safety but that also is embraced by the nursing staff. There are specific features that nurse executives must demand to help nurses at the bedside reap the greatest benefit from the technology.

Ten years ago, executives at PeaceHealth, an integrated delivery network serving 3 states in the Pacific Northwest, set out to achieve a demanding goal: improve the quality of patient care by analyzing and reorganizing workflow and processes system-wide. A key component of this strategy involved selecting an integrated clinical information system—one with the functionality and technical capabilities to support the wide-ranging needs of all clinical groups.

From the beginning, PeaceHealth made a commitment to involve nurse executives, managers, and staff members throughout the design, selection, implementation, and training phases of the project. The decision was a major factor in the organization's success; instead of focusing primarily on computerized physician order entry (CPOE) and the effect of the implementation on physicians, PeaceHealth recognized the importance of gaining the front-line support and valuable insight of the nursing staff.

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As members of PeaceHealth's steering committee to evaluate and select a system, nurse executives and managers led the charge to find technology that would support the nursing staff in providing care throughout inpatient, ambulatory, and home care settings. After a yearlong evaluation process, PeaceHealth selected IDX LastWord, an integrated enterprise clinical information system. The organization's efforts were successful, reducing the number of adverse drug events (ADEs) and resulting in more time for nurses to spend on patient care—not paperwork.

The idea that healthcare information technology (IT) can help streamline processes for clinicians while enhancing patient safety and the quality of care is gaining momentum. From reports such as *To Err is Human*,[1] which cites IT as an important tool that can help to reduce medical errors, to concerns about the nursing shortage driving efforts to increase productivity, numerous industry-wide issues have converged to create a critical mass of support for the adoption of clinical information systems.

Recognizing the enormous potential to save patient lives and manage staffing issues, what role can nurse executives play in helping their organizations reap the greatest benefits of clinical information systems? The answer is complex, because successful implementation depends on creating buy-in at all levels for major changes in workflow, developing clear goals, and communicating those goals and the achieved outcomes to the nursing staff and other clinicians.

Because nurses interact with the software as much as or more than any other group of clinicians, the system must have the core functionality to support nursing workflow to be effective for the organization overall. It is up to the nurse executive to demand the features that will optimize both nurse productivity and patient safety and ensure that staff members embrace the system.

Role of the Nurse Executive

As the leader of those on the front lines of healthcare, the nurse executive has an exceptionally important role on the committee to select and implement a clinical information system. Nurse executives are responsible for selecting a system that will support and be embraced by the nursing staff—the early adopters of the clinical team. Based on the experience of many healthcare organizations, if nurses don't have a firm grasp on the processes and functionality involved with online clinical documentation and other clinical systems, the subsequent rollout of CPOE and other functions will be more difficult.

Getting nurses on board with the major changes in workflow that are necessary for a successful implementation is just as important as selecting the right features and functionality. Nurse executives must involve their staff members throughout the change process, asking for and acting on nurse feedback, communicating clearly the goals and outcomes for the project, and providing solid technical training.

The nurse executive brings to the table an in-depth understanding of the nursing staff's needs. At the highest levels, it's a significant opportunity to serve as a champion of effective systems by judging the potential for acceptance and examining how the technology will enhance the way nurses do their jobs.

Nurse Workflow

A significant component of successful implementation is developing new procedures that will be more efficient and effective with the use of healthcare IT. If an organization attempts to simply automate its paper-based practices, the endeavor will achieve few goals. To reap the patient safety and timesaving benefits of clinical systems, the organization must first undergo major process reorganization.

With a clear understanding of the definitive steps each nurse will take to complete a task, the nurse executive should then cross-reference those activities with the flow of the systems that are under evaluation. The first question to ask is, "Can this system be configured to support the way my staff will operate?" Remember that although the implementation requires procedural changes, the system should still support the basic underpinnings of providing care. In short, the system should think like a nurse thinks.

Online clinical documentation and other systems designed for nurses should be designed for nurses—not retrofitted CPOE programs designed to support physician workflow. Although physician interaction with the system may be linear and/or intermittent, a nurse's shift involves interruptions, unexpected events, and repetitive tasks.

Imagine this scenario: The nurse performs a shift assessment and is sitting at the patient's bedside recording findings in the electronic record. Before he finishes recording and selects "save," the patient begins to vomit and the nurse rushes from the keyboard to the head of the bed. During this unexpected 5-minute encounter, the system performs an auto-log-off—an appropriate safeguard to protect data privacy in the event that a clinician steps away from the system for too long. However, think of the nurse's frustration at returning to the computer to find all the data entered have been lost, simply because there was no time to hit save before assisting the patient.

In this case, because the system was not programmed to automatically save data before shutting down, the privacy feature resulted in lost productivity and quality and, on a larger scale, could lead to staff-wide dissatisfaction with the technology. To help save time and support efficiency, the system design should consider these types of interruptions, which are a common occurrence in nursing workflow.

On the other hand, the system may sometimes add steps to a process but offer a reasonable trade-off, such as patient safety improvements. For example, using wireless barcode capabilities for medication administration may increase the number of steps necessary to administer a prescribed drug and may initially take more of the nurse's time, but it also creates important safeguards at a critical juncture in the medication cycle.

Administration is the second most likely stage in the medication cycle (after ordering) for errors to occur. Barcode charting helps prevent medication errors by confirming the "5 rights" of medication administration—the right dose of the right drug administered to the right patient via the right route at the right time—and alerting the nurse if there are any discrepancies.

These systems also should be capable of streamlining nursing administrative processes—for both scheduling and financial activities. On the financial side, by automatically generating charges as a by-product of charting clinical events, a well-designed system can both save time for nurses and increase accuracy in patient billing. Thus, when a nurse charts that a Foley catheter has been inserted, a charge is triggered without additional intervention on the part of the nurse.

Interaction With Other Clinicians

Nurses play a central role in hospital settings—they serve as the hub between the patient, physician, pharmacist, and virtually all other clinician groups. As a member of the organization's committee to evaluate and make purchasing decisions for clinical information systems, it is vital that the nurse executive bring a clear understanding of the dynamics of those relationships.

Just as nurses work collaboratively with several clinicians, they also interact with other clinical information systems, at least peripherally. If a physician runs into a snag when using CPOE the first few times, the nearest nurse is likely to be an easier resource than calling technical support.

Because of nursing's central position in the organization, the nurse executive should be prepared to provide input about other types of systems, such as order entry and pharmacy systems. To ensure safety and productivity, it is important to raise questions about how the systems will interact with nurses and nursing clinical systems. The nurse executive will bring different questions to the pharmacy system review than those posed by the pharmacy staff; for example, to explore how the pharmacy system will present supplementary information or alerts to the nursing staff or how the information will sequence with established nursing workflow.

Managing Expectations

During the selection process, healthcare IT vendors usually walk committee members through a comprehensive system demonstration, displaying functionality from wireless barcode medication administration to biometric system log-ons. It is important for organizations to see *all* that is available so that they can make good choices about sequencing their purchasing and implementation decisions.

However, once the pilot system is in place, sometimes nurses are disappointed that their systems don't have all the bells and whistles they saw at the demonstration. Most often this happens because the organization doesn't purchase or implement all the modules the selection committee researched.

Nurse executives can mitigate the risk of dissatisfaction and avoid unpleasant surprises during implementation. Analyze what each module offers and how it will support nursing processes and champion those systems that will help to achieve nursing goals. Once the organization has made its decision, educate the nursing staff so they have a clear idea of what functionality to expect. Plan for—and discuss with the team—the add-on modules considered for the future that will allow the system to grow with the organization.

Team Building

Not even the most dynamic executive can—or should—manage system selection and implementation alone. Nurse leaders, both formal and informal, at all levels of the organization have distinct roles in the selection and implementation processes, and as part of the change management process that is vital to gain staff buy-in. The first step to success is to engage nurses early in the process. Everyone within the organization—from the executive team to front-line nurses—must view this as an organization-wide transformation to accomplish a strategic goal, such as improving the quality of patient care. Even with the most advanced technical features, a clinical information system will not deliver results if no one uses it.

The nurse executive can develop even greater momentum for the system adoption by understanding what each team member brings to the table and how that knowledge is best used and by empowering nurse leaders to take ownership of these roles.

- Chief nursing informatics officer (CNIO): performs a significant function in meeting the information needs of patients, staff, management, and executives. In a large organization, nurse informaticists may focus specifically on the operational needs of the clinical staff while a CNIO provides executive-level strategic direction. A nurse informaticist may occupy the CNIO position in an organization, similarly offering strategic leadership at the highest level of the organization.[2]
- Director of nursing informatics: helps to serve as a translator between nurses and the technical staff, ensuring that the 2 groups can successfully communicate with one another. Often, the director of nursing informatics performs this function for other disciplines as well, including pharmacists, therapists, and other clinicians.
- Nurse manager: brings a comprehensive understanding of the practicality of workflow and nursing processes at the bedside.
- Advanced practice nurse (APN): may practice in primary care provider roles (nurse practitioner), expert practice roles (CNS), or a combination of both. As such, APNs may have unique needs surrounding their work-

flows. APNs who are responsible for introducing research-based best practices can evaluate system support of protocols and guidelines. The APN also may develop the specifications for expert rules, outlining the logic that will define them when written into the system.

- Nurse educator: asks the question, "How will nurses with different learning styles best absorb this information?" and then assists in developing effective training materials. They may query the database to analyze quality and compliance trends that signal the need for new educational programs. In its 2003 report, *Health Professions Education: A bridge to quality*, the Institute of Medicine (IOM) argues that all health professionals should be educated in informatics.[3] As this new educational outcome is added to nursing curricula, hospital nurse educators may begin to see changes in the entry-level skills and interest of new nursing staff in nursing technology.
- Quality-management staff: provide expertise in identifying and measuring current workflow processes and helping staff design new, more efficient processes.
- Staff nurse: serves as a champion of the system within his or her own unit. These informal leaders encourage their peers to understand and embrace the goals behind the change management process and system implementation.

Those at the bedside will know best what functionality is absolutely necessary and which features will get in the way. At PeaceHealth, key management and staff nurses were included in site visits to observe how other organizations used *LastWord* and other systems. During the site visit, nursing representatives should question front-line staff nurses who are familiar with the systems to get their beliefs on the features and functions that enhance or detract from patient care activities. It is vital to involve nurses who deliver direct patient care and who are opinion leaders among their peers.

To determine which features will best support nurse workflow, it is essential to analyze your organization's current practices with an eye toward how they will need to be transformed and optimized with an automated system. Simply automating existing paper-based processes does not allow the organization to shed inefficiencies. Nurse input is also invaluable at this stage to replace wasteful paper-based practices with technology-supported processes that will be more efficient and meaningful for staff members.[4]

Clearly communicate the goals of the implementation. If nurses assume that the only reason for the new documentation system is to save them time, then they may be disappointed if they don't realize efficiencies right away. However, with a clear understanding that the technology is in place to reduce errors or improve patient safety, they will be more likely to tolerate minor disruptions in workflow as they become accustomed to the new system.

For example, PeaceHealth's main goal for its clinical information system was to put complete information in the hands of those providing patient care, regardless of the time of day or the location of care delivery. It wanted the staff in any PeaceHealth location to have immediate access—with appropriate safeguards—to the patient's complete medical record. If a patient is seen in the emergency department (ED) in the evening after a visit to the doctor earlier in the day, the ED staff can quickly access the patient's most up-to-date medication list, allergies, history, and problem list, without calls to the medical records department. During implementation, PeaceHealth emphasized how this 24/7 access would improve patient care by increasing access to patient information.

Communicating the goals of the project should not end once the system is in place. When your organization begins to make strides toward your goal, share definable results with staff members to encourage enthusiasm and support.

Nurse executives must be prepared to stress to the executive team just how important it is to allocate appropriate training resources for all clinicians who will be using the system—not just physicians. Training represents a substantial investment of time and resources, from providing 24-hour technical support during the initial rollout to making scheduling adjustments to reduce patient load while nurses are getting used to the system. This is a level of commitment that can present challenges to an institution that is also confronting the nationwide nursing shortage, but it will pay off in increased return on investment by ensuring that staff can fully use the system. Dillon et al, in a study of factors affecting nursing self-efficacy or confidence in the use of new technology, suggest that although it is desirable to have high self-efficacy before adopting a new system, the organization should make a sustained commitment to developing this confidence.[5]

PeaceHealth developed a training program that featured "20-minute modules," bite-sized chunks of

information that nurses could easily absorb and then practice on the training system. It is important to focus on need-to-know aspects of the system during training, rather than trying to include every feature available in the system all at once.

Core System Functionality

Clinical Documentation

Online clinical documentation is defined as a technology that automates the capture of clinical care data. In the nursing realm, this can include assessment data, clinical findings, nursing plans of care, nursing interventions (along with results), patient progress toward goals, critical pathways, medication administration, risk assessments, discharge planning, patient education, and more.

According to a 2002 study conducted at PeaceHealth St. Joseph Hospital, a 253-bed 2-campus medical center in the PeaceHealth network, clinical documentation capabilities can significantly increase the amount of time available for nurses to spend with their patients. The study showed that by using online clinical documentation, the nursing staff cut in half the time required to perform charting functions, freeing up 1.5 hours per nurse per 12-hour shift to spend at the bedside.

Documentation systems such as *LastWord*, the one used by nurses at PeaceHealth, should help to increase patient safety and save time by more accurately and efficiently documenting nursing activities, interventions, and patient problems. The system functionality must support the streamlined workflow developed as part of a successful implementation.

For example, creating digital templates for patient assessments allows nurses to chart by exception, entering only the information that has changed since the last evaluation. Instead of filling out 10 fields on a new sheet of paper, the nurse can simply review what the previous nurse entered, update 1 or 2 data points, capture the information, and move on to the next activity.

The ability to streamline workflow takes on added importance in the intensive care unit (ICU). Rather than spending hours documenting on a paper flow sheet, an ICU nurse can quickly enter clinical data at the bedside. She can then instantaneously use the system's reporting functions to view the patient's progress over time. Advanced systems may offer capabilities to interface directly with patient monitoring equipment and automatically record validated patient data, which can dramatically reduce the documentation requirements for nurses while increasing the accuracy of a patient's recorded information.

Medication Administration

Automating medication administration is key to patient safety. From the physician's initial order to a final note in the medical record that the order has been completed, it's imperative that the system creates a connected circle of events around the administration of a drug. One significant issue is the capability for orders to travel through and show up in the system quickly enough for nurses to administer and chart against. Automated medication orders speed the delivery of medications to the nursing unit, making them available to patients more quickly. Old-fashioned methods of order communication with the pharmacy, including fax or hand-delivery, are the cause of many delays in the initiation of patient treatment.

Some organizations have adopted barcode medication administration systems, which raise the level of safety a step further. By requiring the nurse to scan the medication and the patient, wireless barcode systems electronically verify the 5 rights of medication administration.

Screen Design

The goal of usability, which encompasses how a user interacts with a system, is to develop interfaces that are so intuitive and transparent to the user that they enable the nurse to think more about the patient and less about the documentation task. Usability is important because it can affect the outcome of system implementation. A system that is not designed with usability principles in mind will, at best, not be used and, at worst, will interfere with workflow. On the other hand, a well-designed interface will make charting easier and will provide real-time benefits to aid in patient care.

The cornerstone of usability is user-centered design. Consistency of design makes the system easier for users to learn; for example, navigation bars should be in the same place on all screens. Buttons and menus should be labeled with easily recognizable nursing terminology, not generic language or highly technical jargon. A nurse will know almost instinctively what a "Kardex" is and when to use it, whereas the more generic "records file" could be almost anything.

Another key to usability is simplicity. This means removing extraneous information from screens and sharing only the essential elements nec-

essary to support a particular nursing encounter. On a vital signs flow sheet, for example, nurses may find it helpful to see the patient's name, age, and diagnosis, whereas it might be unnecessary to find his address and next-of-kin listed on the same screen. Nurses and other clinicians can always scroll down for additional details.

The interface must present clinical information logically, consistent with the way nurses will view and use it. The ability to view related information together is important. For example, when a nurse records insulin dosage in connection with blood sugar levels, he or she should be able to document everything in one area. If the system requires a user to pass through multiple screens to perform a task, it makes the process inefficient and costs the nurse time. Presenting selected information together also can help nurses notice subtle associations between health problems.

Finally, although the intuitiveness and simplicity of a well-designed user interface is important, it shouldn't be used to mask an inefficient or incomplete system. When evaluating different options, avoid the temptation to be swayed by pleasing graphics; flashy design that can make an interface appear more attractive on the surface may be camouflaging user obstacles underneath.

Decision Support

Automated decision support tools help to promote patient safety and maintain uniformly high quality of care across the healthcare organization. By automating rules-driven procedures, nurses can save time while significantly reducing or eliminating errors in administering medications, implementing proper treatments, and monitoring patient conditions.

A decision-support system crosschecks orders, nursing notes, and other patient information against rules and alerts developed for any healthcare process that relies on the consistent application of instructions. For example, decision support can provide real-time best practice advice triggered by specific patient findings, such as a suggestion to implement a skin care protocol when nursing assessment documentation identifies a patient at risk for skin breakdown. When the system identifies a potential error or safety issue, such as a medication allergy, an on-screen alert quickly notifies the nurse, who can then take appropriate actions to ensure patient safety.

Although decision support has significant implications for nursing practice improvement, the alerts, if left unchecked, can become a double-edged sword that interrupts workflow. To prevent this, the organization should be able to tailor the system to best fit its policies and procedures. One option includes establishing alerts for specific user groups. For example, a recent graduate may need more guidance than a veteran RN. With a unique login, the novice nurse may receive a reminder to check the hospital's procedural policy the first time she performs a blood transfusion—an alert that would be superfluous to the seasoned caregiver. PeaceHealth also focuses on providing quick access to information for novice nurses. With a single click of the mouse, nurses can obtain best practice information directly from the screens they use to receive orders and document work.

Good nursing decision-support design will ensure that only appropriate alerts disturb nursing workflow by popping up on-screen messages. Nonurgent messages instead can be sent to the nurse's inbox, an area of the system he or she can access at will.

Additional decision-support tools that can aid nursing productivity include the ability to automatically generate a request for specific activities based on organizational policy or best practice. An organization that provides automatic social service referrals for pregnant teens might trigger this referral automatically on the nurse's entry of a patient's age alongside of a diagnosis of pregnancy. The autogenerated request results in 1 less telephone call for the nurse to make.

Reporting

Nurses serve as the gatekeepers of information; if a patient's condition changes, it is the nurse's job to notice and take appropriate action. Nurses analyze data to identify conditions to be reported to other clinicians. This analysis may require that the nurse trend patient information over time to evaluate the changes in a patient's blood pressure over the past hour, throughout the day, or throughout the hospital stay. The system should allow nurses to create flowcharts and graphs to easily track patient progress against expected plans of care, view timelines of critical paths, and gain a more complete picture of the patient's progress.

The benefits of snapshot reports are also visible in areas such as the ICU. For example, the system can assist with fluid management, a major concern for patients with heart disease. With reporting capabilities, the system uses the flow sheet created by the nurse to automatically calculate a patient's fluid balance, allowing appropriate orders to be initiated.

System Database

The system's database stores all the patient information that nurses and other clinicians will enter, view, and report. There are numerous ways to configure a repository, from multiple databases designated for each clinical group or application to a single repository of information that all users can contribute to and query.

Systems that run from multiple databases often create unnecessary complexity for the clinical team, inviting the possibility that information won't be transferred from one silo to another; that a nurse's charting notes entered into the repository are delayed or never make it into the database a physician may be viewing. In addition, separate logins also make it more difficult and time intensive for clinicians to switch from one application to another.

Conversely, systems built on a single database collect and maintain information from multiple encounters and sources in one place, establishing one lifetime patient record. When a nurse documents patient information, all members of the clinical team see the exact same information and can access these important details immediately.

However, the system database is much more than a simple storage area. It can provide the building blocks for care practice and care delivery models or even for conducting research on entire communities. For example, leveraging its Community Health Record (CHR) built on *LastWord*, PeaceHealth has developed sophisticated disease registries to track the health progress of entire populations of patients who are chronically ill.

With support from a "Pursuing Perfection" grant from the Robert Wood Johnson Foundation, PeaceHealth has used this data to conduct 2 pilot disease management programs for diabetes and congestive heart failure. Since implementing the program, adherence to guidelines for diabetic care has tripled among patients in 3 of its facilities. The organization plans to report on community-acquired pneumonia and congestive heart failure within the next year.

The CHR provides a patient's complete medical record, both inpatient and ambulatory, to all members of the patient's care team. The information can be accessed from any PeaceHealth facility or from a doctor's office or home, providing a comprehensive history of emergency room visits or other events that may signal noncompliance.

This enables clinicians to work together to help patients understand the warning signs related to their disease and administer the appropriate intervention methods, from preemptive tests to behavioral change, to help patients manage their illness, avert trips to the emergency room, and prevent further decline in health.

System Reliability

Reliability is a significant factor in selecting clinical applications, because nurses depend on the system in mission-critical environments every day of the year. In addition to patient safety, system availability and speed can make a huge difference to nurses' and other clinicians' willingness to adopt the technology.

As part of the selection committee, nurse executives must demand a guaranteed 99.9% uptime from the system vendor. Just 2 percentage points of downtime translate to a difference of 10,000 minutes or 6.9 days each year, and each percent could cost a 1,400-bed integrated delivery network $10 million per year in additional operating costs and an average 500-bed hospital more than $1.4 million per year.[6]

During site visits, nurses must ask, "How often do you experience system downtime, and how disruptive are these episodes?" PeaceHealth has experienced almost no *unscheduled* downtime because of the reliability of the HP NonStop platform on which *LastWord* runs. Scheduled downtimes are minimal and have no negative effect because nurses are prepared well in advance.

Subsecond response time also is key to ensuring that the system can handle the number of simultaneous transactions the organization requires and do it quickly to keep up with nurses. It may not seem like a large difference until you're standing there waiting for the system to catch up, and nurses who want to enter information and quickly move on to the next task certainly will feel the delay. The system must think as fast as a nurse thinks.

Administration

With the right features, clinical information systems also can be helpful for administrative needs, including scheduling and financial functions.

In the course of capturing thorough patient information, the system can report on nursing activities, illustrating what staff members accomplish on a shift and how often they perform specific tasks. The information is valuable for a range of administrative decision making, from determining how processes can be improved to identifying common nursing needs in an organization for hiring and education decisions.

For example, if the system indicates that "anxiety" or "powerlessness" are nursing diagnoses found

on the majority of nursing care plans throughout an acute care hospital, an executive may want to consider the effect of adding a psychiatric clinical nurse specialist to the team to assist the staff in identifying best practice management of these commonly occurring nursing problems.

In addition, an integrated system that comprises clinical, financial, and administrative functions can eliminate redundancy in billing, shorten the payment cycle, and increase the accuracy of submitted claims. Charges that are generated as a direct result of clinical care eliminate lost or misposted entries and provide easy access to clinical documentation to substantiate claims. The integrated approach also enables organizations to perform sophisticated charge capture and analysis and to keep up with changing federal regulations.

Cost Analysis

From the selection process to system purchase to implementation to training, clinical information systems represent substantial investments for healthcare organizations. However, when weighed against significant improvements in patient care, reduced medical errors, and other quality outcomes, the value of the system becomes clear. Add to that the potential savings from reduced turnover rates and greater retention among nurses, increased staff efficiency from realigned workflow processes, and improved billing accuracy with charges generated from clinical events, and the argument changes from "We can't afford to do this" to "We can't afford *not* to do this."

PeaceHealth knew from the outset that this would be a pricey venture but that the benefits to patients and clinicians would overshadow the expense. At the highest levels, PeaceHealth looked at this as a "value on investment" project; it's nearly impossible to put a price on the value to a nurse of having a comatose patient's medical history and allergy and drug information immediately available when they are admitted to the ICU.

Site Visits

During the selection process, nurse executives will be involved in 2 types of site visits. During vendor demonstrations, vendor representatives visit prospective customers to introduce the system to the selection committee and clinicians. For reference site visits, the nurse executive and other team members travel to one of the vendor's current customers to view the system in practice.

Before vendor demonstrations, the nurse executive should insist on speaking by telephone with a counterpart from one of the vendor's reference sites. This is a good opportunity to ask about working with the vendor, the organization's experience with the system and whether the nurse executive would select the system again, and to glean advice from a nurse leader who has been through the selection process.

During reference site visits, request a closed meeting with the nurse executive, without the vendor representative present. The opportunity for you to gain additional unbiased opinions about the system from a current customer should not alarm a vendor that is confident in the value of its product. Reference site visits also present the chance to start gathering information about training methods, device placement, and other details involved with implementation and change management.

Here is a suggested checklist for the nurse executive to use during both site visits to evaluate which systems provide the best functionality to support the nursing staff:

Clinical documentation
- Does the system feature templates for patient assessments that allow nurses to chart by exception?
- Can the system interface directly with patient monitoring equipment and automatically record validated patient data?

Medication administration
- Do orders travel through and show up in the system quickly enough for nurses to administer and chart against?
- How are nurses notified of new or changed orders?
- Does the system offer capabilities to adopt wireless medication barcode administration, either now or in the future?

Screen design
- Is the basic screen design user-centric? This means that navigation bars are in the same place on all screens, and button and menu labels feature recognizable nursing terminology.
- Is the screen layout simple, without extraneous or superfluous information that would slow down nurses?
- Is it as easy to retrieve information from the system as it is to enter it?

- Does the interface present information logically, offering the ability for nurses to view related information together?
- Does the vendor offer opportunities for the organization to tailor screen design to support nursing workflow?

Decision Support

- Does the decision-support function cross-check data against best practices in real-time so nurses can use the advice immediately?
- Can the organization tailor on-screen alerts to provide meaningful warnings without overwhelming nurses with too many signals?
- Does the system offer the option to create alerts for specific groups of users?
- Are autogenerated requests available to help aid productivity and reduce the number of on-screen alerts?

Reporting

- Does the system allow nurses to analyze data meaningfully, helping to gain a more complete picture of the patient's progress?
- Does the system allow nurses to look at specific patient populations to identify key areas for care improvement?
- Can nurses create flowcharts and graphs to track patient progress against plans of care and view timelines of critical paths?

System database

- Does the system feature a single database to collect and maintain information in one place, establishing one lifetime patient record?
- Can all members of the clinical team view and access the same information immediately and concurrently?
- Is the database configured to allow the organization to conduct research on patient populations, build care delivery models, or pursue other initiatives?

System reliability

- How reliable is the system? Does the system vendor guarantee at least 99.9 percent uptime?
- How fast is the system? Does it feature subsecond response time? If not, you must determine whether it can realistically handle simultaneous transactions and do it quickly enough to keep up with nurses.

Administration

- Will the system capture and report on nursing activities to aid staffing decisions and provide data to improve workflow?
- Does it feature integrated clinical, financial, and administrative functions? Can the system generate charges as a direct result of clinical care?

Conclusion

There are significant opportunities to dramatically increase patient safety and streamline nurse productivity by embracing process change throughout a healthcare organization, and clinical information systems are important tools to support streamlined workflow. As key members of their organization's committee to evaluate and make purchasing decisions, nurse executives must identify a system that not only has the core functionality to support clinical processes but also that will be embraced by the nursing staff. By examining all clinical components of a system with a clear idea of how the functionality will directly affect nurse workflow, the nurse executive can champion a system that will enhance the quality of care for patients while maximizing nurse productivity.

References

1. Kohn LT, Corrigan JM, Donaldson MS. *To Err is Human*. Washington, DC: The Institute of Medicine, National Academy Press; 2000.
2. American Nurses Association. *Scope and Standards of Nursing Informatics*. Washington, DC: American Nurses Publishing; 2001.
3. Greiner A, Knebel E. *Health Professions Education: A Bridge to Quality*. Washington, DC: The Institute of Medicine, National Academy Press; 2003.
4. *Future of Hospital Nursing: Sustaining the Workforce in the Decade Ahead*. Washington, DC: The Advisory Board Company; 2003.
5. Dillon T, Lending D, Crews T, Blankenship R. Nursing self-efficacy of an integrated clinical and administrative information system. *CIN Comput Informatics Nurs*. 2003;21:198-205.
6. Anderson MR. The toll of downtime. *Healthcare Informatics*. 2002;19:27.