ACCURATE VITALS TO YOUR EMR FROM THE BEDSIDE!

Welch Allyn Connex® Electronic Vitals Documentation System

Proof Points
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Lafayette General Medical Center

Giving Nurses the Gift of Time

Overview

Customer
Lafayette General Medical Center

Location
Lafayette, LA

EMR Partner
Cerner Electronic Medical Record

Customer Profile
With over 350 beds, Lafayette General Medical Center (Lafayette) is part of Lafayette General Health (LGH), a regional healthcare network serving south central Louisiana.

Key Business Outcomes
The facility standardization on Welch Allyn Connex Vital Signs Monitors was aimed at improving patient safety, care and efficiency, while also maximizing an investment in the Cerner Electronic Medical Record (EMR) and meeting the requirements of Meaningful Use.

Introduction

With over 350 beds, Lafayette General Medical Center (Lafayette) is part of Lafayette General Health (LGH), a regional healthcare network serving south central Louisiana. The facility has standardized on Welch Allyn Connex Vital Signs Monitors (VSM) in an effort to improve patient safety, care and efficiency, while also maximizing its investment in the Cerner Electronic Medical Record (EMR) and meeting the requirements of Meaningful Use. According to the staff at Lafayette, utilizing the Connex VSM has resulted in benefits in all of these areas. However, the benefit that has been most noted is a simple one: Welch Allyn Connex VSM gave nurses at Lafayette General Medical Center the gift of time.

Making an Impact on the Med/Surg Floor

A nurse’s time is valuable—and there’s quite simply never enough of it. This is particularly true on the average medical/surgical floor, an area that serves the majority of patients, driving significant revenue and generating the majority of patient satisfaction opinions from patients and their families. Med/Surg nurses often make up the majority of caregivers in any given facility, and they juggle a staggering variety of responsibilities—all of which consume valuable time. Med/Surg nurses manage many patients daily—with a variety of different, and increasingly more acute, conditions. Hospitals realize the benefits of increasing nurses’ time at the bedside, caring for and educating patients, informing families and using their training to identify important changes in patient health. However, this can’t happen effectively when nurses are bogged down...
with time consuming tasks—such as the manual capture and recording of patient vital signs. This was the situation at Lafayette until the introduction of Welch Allyn Connex gave the nursing staff more time.

In Lafayette’s experience, the time given back to nurses has helped to enhance patient care. “The Connex system has definitely improved patient outcome for us because it has given us back time. You need more time as a healthcare provider. Patients are getting sicker and sicker. When you’ve given nurses back 30 minutes through a system that actually downloads the information immediately—there’s no writing down the information and having to go back and input that information because you’ve taken out that step. You’ve added time to their plates, which means you’ve given patients back time when healthcare providers are at their bedside,” said Jamie Gonzales, nurse clinical educator. “Everybody needs this system. It’s that important.”

“We are caring for patients who come to us sicker than ever before, so we’re putting a lot on healthcare providers to get their jobs done in a timely manner,” continued Gonzales. “Giving nurses back 30 minutes from a system that downloads information immediately—without having to write anything down or go back and input information—is adding time to their plates. This means it’s giving patients back time when healthcare providers can be at the bedside. This improves outcomes. It helps meet Quality Care measures, and it makes nurses available when patients need them, which, in turn, improves patient outcomes.”

Importance of Vital Signs

Vital signs are the building blocks of everything nurses do. They are just that—vital to painting a picture for healthcare providers to give excellent care to the patient. Vital signs deliver information that might otherwise not be so easily delineated just by looking at a patient and can give information that is sometimes unknown. They are key to identifying changes in patient health or determining when and if medications are required. Physicians, too, depend on vital signs to make sound medical decisions. Often, physicians are frustrated if vital signs information is not immediately and accurately available to them.

“A physician is going to start with vitals. When a patient presents in an acute care setting, a physician wants to know ‘What are the vitals?’ That’s always the first question,” said Gonzales. “Physicians use vital signs when they prescribe medication. They use them when they determine whether or not to give certain treatments or whether or not to give blood. They don’t just go by a lab value. It may look like a patient needs blood, but a physician will use vitals to see if the patient is truly symptomatic. He or she will ask, ‘Does this patient truly need that treatment?’ based on the patient’s vital signs.”

Since Lafayette converted to Welch Allyn Connex VSMs, the facility has observed a significant increase in staff and patient satisfaction. Most importantly, use of the Connex VSM helped free up nurses time. Nurses quickly experienced a significant time savings on labor-intensive tasks, and that savings translated into more time for patient care. The quick and accurate capture of patient vitals and the automatic data transfer to the EMR is designed to help all but eliminate the possibility of human error—to save time and enhance safety. Once nurses started using the Connex VSM and saw how easy it was to use, they immediately wanted more. They didn’t want to use anything else.

“My advice to other sites considering this system would be to buy a lot of them,” said Gonzales. “They are such an asset to the floors. Since we’ve had the Connex System, we’ve found that not having enough monitors and forcing staff to revert to using older models has actually decreased employee satisfaction. Everyone loves these monitors, and they really want more of them. Certainly, every
You’ve given nurses back 30 minutes through a system that actually downloads the information immediately—there’s no writing down the information and having to go back and input that information because you’ve taken out that step. You’ve added time to their plates, which means you’ve given patients back time when healthcare providers are at their bedside.

Post-Op: Keeping Patients Out of the ICU

The Welch Allyn Connex System also was incorporated into the post-op areas at Lafayette, where quick and accurate vital signs are especially critical for patients just recovering from surgical procedures as both inpatients and through one-day surgeries. Post-surgery, patients need to be closely and accurately monitored for a short period of time before being safely discharged or transferred to another unit. Often, patients are monitored as often as every three minutes—which consumes a large portion of a nurse’s time. The Connex System allows nurses in post-op areas to set specific time intervals and other parameters, so vital signs are automatically captured and recorded into the EMR as often as deemed necessary. Eliminating manual documentation of vitals on patients who typically spend only an hour on the post-op unit allows nurses to spend more time on patient education, support and discharge planning.

“You've given nurses back 30 minutes through a system that actually downloads the information immediately—there’s no writing down the information and having to go back and input that information because you’ve taken out that step. You’ve added time to their plates, which means you’ve given patients back time when healthcare providers are at their bedside.

Vital signs are important in the perioperative area because a lot of our patients are going to sleep, so we need this information to let us know the patients’ status, as often they are not able to communicate with us. It’s very important that we get the base line vital signs before the procedure, and then we are able to continue monitoring for any changes in their status, especially if they are not able to give us verbal information,” said Kim Dooley, RN, clinical nurse manager. “Electronic vital signs monitoring has helped us to improve efficiencies for the nurses who might have three or four patients post-operatively. They are able to spend time with each patient—still checking vital signs frequently but not having to run to a computer each time to chart. It has definitely improved the workflow. And, patients have been discharged much more quickly because we haven’t had to spend time charting and all the paperwork is complete.”

Accurate Vitals Help Prove Meaningful Use

The adoption of the Welch Allyn Connex System assists Lafayette General with meeting the criteria for Meaningful Use under the American Recovery and Reinvestment Act of 2009. Automated vitals are particularly helpful in validating if a facility is using its EMR in a meaningful way. “This system has improved several things for us. The efficiency alone, having that readily available to healthcare providers, is a big piece of it, but the accuracy is also another big piece. You’re cutting out a person accidentally documenting the wrong vitals on the
wrong patient. Meaningful Use in so many ways depends on the accuracy of information and information availability—and the fact that you know the information is getting to that patient’s chart,” said Gonzales. “You’ve got the patient at the bedside. You’re using the patient identifiers. You know it’s accurate and efficient. The margin of error is almost non-existent with this system, which improves Meaningful Use tremendously.

Information Systems: “Go Ahead and Take That Plunge.”

The Information Systems (IS) Department at Lafayette was an important player in making the transition to the Welch Allyn Connex System. IS understood the need for using connected devices to maximize the hospital’s investment in the Cerner EHR, but, initially, its staff had reservations.

“At first, the idea of interfacing medical devices with the EMR was somewhat intimidating for us, but it went very smoothly,” said Joanie Foss, applications manager, information systems. “My advice would be to go ahead and take that plunge. It’s certainly worth the investment of time and resources.”

According to Foss, the conversion to Welch Allyn Connex required only a minimal commitment compared to other IS projects the facility has tackled. This was thanks to a close working relationship with Welch Allyn representatives, who were on site to convert to the Connex System and make sure all devices worked properly and seamlessly with the existing Cerner EMR. Welch Allyn representatives remained on site to assist in quickly orienting the nursing staff on the use of the Connex VSM.

“The training for nurses was short. It was not extremely involved,” said Foss. “The screens are easy to read and understand. Our nurses deal with devices all day long and are extremely familiar with our technology, so it went quickly. However, we did train nurse extenders who had less training on electronic devices, but, because the Welch Allyn device is so easy to use, we didn’t have a lot of issues. It’s very user-friendly.”

From bedside to the IS Department, Lafayette feels that the Welch Allyn Connex has provided a host of benefits to their Center, including giving nurses time to spend with their patients, providing up-to-date and accurate data to the Cerner EMR and helping the hospital to meet the requirements of Meaningful Use. The Center has experienced positive differences in efficiency and patient care, thanks to a system that gave nurses something truly valuable—time.

“With the Welch Allyn Connex System, being accurate with vital signs is a huge piece of making sure you’re developing the right plan of care. So again, you’re taking away the margin of error. You’re taking away the possibility of not having the right information. Your data is accurate, it’s at your fingertips, and it’s available to multiple healthcare users at the same time,” Gonzales said. “You don’t care about where you are. You could be a physician at home. You could be a nurse at a computer or at another patient’s bedside. That alone is going to ensure that you make the right choices for your patients—and that’s a huge win for us with the Welch Allyn Connex System.”

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The healthcare industry is under ever increasing pressure to control costs. Of the many tools used to manage capital and operating costs, medical device standardization and supply chain optimization are widely used in acute care and ambulatory settings. Because of continual advancements in technology and evolving manufacturer product strategies, provider organizations must reevaluate the scope and breadth of medical device standardization at every purchase cycle to wring the maximum savings and operational efficiency from standardization and supply chain optimization strategies. This document describes the components of a comprehensive standardization strategy and demonstrates the process by which such strategies may be applied to ensure maximum cost savings at the time of new medical device purchases. As a sample application of these standardization optimization strategies, a case study is presented, and the various components, strategy elements, and tools are applied.

The Case for Medical Device Standardization

Few industries are under as much pressure to lower costs as healthcare. This cost reduction imperative is further complicated by investments effectively mandated by the federal government by way of the Health Information Technology for Economic and Clinical Health Act, which requires substantial capital investments in areas that touch upon medical device standardization. A variety of methodologies have been developed to assist provider organizations in minimizing costs and maximizing value.

Prior to the evolution of device standardization and supply chain optimization strategies, many medical devices and supplies were purchased based on personal preference. This preference, especially for the more expensive items such as balloon catheters or artificial joints, is most often based on physician preference. Technicians, caregivers, or purchasing agents drove lower cost device and supply preferences. Variables driving SKUs include the consistency of options and features (eg, physiological sensors) across medical devices or procedures in a provider organization. This preference, especially for the more expensive items such as balloon catheters or artificial joints, is most often based on personal preference. Technicians, caregivers, or purchasing agents drove lower cost device and supply preferences.

Value-based purchasing is a methodology developed for evaluating pharmaceuticals and medical devices with extensive clinical trial data. The relative value of the products being evaluated is determined by a review of clinical efficacy and complications as reported in clinical trials and the costs of those devices or drugs. This approach is suitable for physician preference items with associated clinical trial data such as implantable devices (stents, balloon catheters, pacemakers, etc), drugs, and other class III medical devices. The greatest numbers of medical devices used at the point of care are class II devices for which there are no clinical trial data available. Consequently, value-based purchasing evaluations are not suitable for devices used at the point of care, such as patient monitors, infusion pumps, ventilators, and similar devices.

Conventional healthcare technology management is broadly focused on technology life cycle management. When applied to medical device purchase evaluations, this methodology starts with a needs analysis and then evaluates alternative products based on human factors and usability; specifications are intended to determine potential supplier's build quality, reparability, and data quality. The potential benefits of medical device standardization are also considered in healthcare technology management, but typically do not extend to supply chain optimization issues such as minimizing SKUs* and required inventory levels.

Materials management and purchasing departments often take the leadership role in evaluating supply chain implications of various manufacturers’ product offerings. Typical supply chain considerations include minimizing the total number of SKUs required to support a category of medical devices or procedures in a provider organization. Variables driving SKUs include the consistency of options and features (eg, physiological sensors) across medical devices and the ability of sensors, supplies, or consumables to be utilized across a wide number of devices within use in the enterprise.

A manufacturer’s ability to provide meaningful cost savings in this area is greatly impacted by the breadth of product line and the existence of a product strategy to minimize SKUs and inventory requirements. For example, most

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* SKU: stock keeping units, a unique identifier for each distinct product and service that is purchased in the enterprise. Various costs as associated with incremental SKUs, such as the operational overhead from managing individual SKUs and suppliers, plus the additional inventory, service and training required for each SKU used in the enterprise.
device manufacturers do not also manufacture all the sensors and consumables used with their products, thus limiting the actual extent of standardization that can be achieved.

Redefining the Standardization Landscape

Healthcare providers have been standardizing on medical devices for many years. Early standardization efforts centered on selecting a single supplier for a device used in multiple diagnostic or care delivery areas, rather than having each area select different devices based on their preferences. Simple devices such as electronic thermometers and sphygmomanometers were the first to be standardized. As more complex medical device categories matured, and buyers became more sophisticated, medical devices and medical device systems, such as infusion pumps, patient monitors, and ventilators, became standardized.

Several factors have impacted the standardization landscape in recent years. Initial standardization focused on a rather narrow specification of devices and accessories has transitioned to a broader consideration of workflow and patient care delivery.

Consequently, the scope of standardization—both the set of products and operational areas captured by a standardization effort—has changed over time. Advances in product design and manufacturing have enabled new capabilities that are also reflected in new standardization strategies. How these technological advances are leveraged by manufacturers’ and applied to product line strategies has served to limit or enhance the standardization potential of individual product lines.

Potential Workflow Standardization

- Wireless versus wired connectivity
- Patient context management
- Clinician context capture
- Capture of any nonmedical device data (eg, pain level, position, pupil response, etc)
- Data validation process (when needed)
- Availability and presentation of unvalidated and validated data

Standardization Variables

Standardization strategies are based on commonalities found to exist across several different domains that impact operating or capital costs. These domains include

- Information technology (IT) infrastructure and systems integration
- Common medical device connectivity workflows
- Staff training requirements (clinical users, biomed, IT)
- Support and maintenance requirements
- SKUs for accessories, supplies, and consumables required across the standardized products

IT Infrastructure and Systems Integration

As medical devices become information appliances incorporated into the enterprise IT infrastructure, the IT components, features, and specifications of medical devices become an important factor in standardization—either limiting or extending the standardization potential of a product or manufacturer’s product portfolio.

Effective standardization in the IT realm is based on the following cost factors: the purchase of IT components, license fees and support contracts, installation and implementation costs, and the effort required to implement and maintain systems integrations. Key variables include how much of this burden is carried by the manufacturer versus born by the enterprise.

The IT capabilities of medical devices are highly variable, and some devices will not conform to enterprise IT requirements. Sometimes, this is due to the life-critical nature of the medical device, but more often these requirements gaps are the result of product development choices made by the medical device manufacturer. For example, does the device operate on the facility enterprise network or on a proprietary network? Wireless enablement is another IT capability that has a significant impact on workflow. It is important to include in the IT cost analysis any accommodation or adjustments required of the enterprise due to medical device IT requirement gaps, such as requiring a dedicated VLAN or SSID.

Common Medical Device Connectivity Workflows

The operational expression of the medical device IT features is the workflow automation that those IT features enable, and it is this resulting clinical workflow that also is a growing factor in standardization strategies.2

The relative efficiency of clinical workflows provided by the medical devices under consideration should be assessed. This process entails developing a somewhat detailed understanding of the workflows supported by the medical device and how that maps to the enterprise environment and existing workflows. There are a variety of tools for documenting and assessing workflow, but the easiest to implement for this application is the use case.3

Various connectivity design decisions can either enhance or restrict workflow automation. Consider that in addition to the historical decision about “fixed” (wall or bed mounted) or “mobile” (on a roll stand), today’s technology frequently adds the additional connectivity decision of wireless versus hard wired, which can support or limit clinical workflows. Connectivity that relies on a user connecting and disconnecting a cable, USB drive, or any other IT component, to enable data transfer, results in new
manual tasks for the user that did not exist prior to connectivity. Connectivity features that require additional workflow steps should be identified and included in any standardization analysis.

The breadth of workflow standardization is naturally limited by the preexisting manual workflows found in the relevant care delivery areas and the suitability of the standardized workflow to each impacted care delivery area. Automated workflows are most effective when they match manual workflows native to the care delivery area; forcing workflows into care delivery areas that are a poor fit, for the sake of standardization, is counterproductive. A key criterion for determining the appropriateness of workflow standardization across different care delivery settings is whether staff migrates across the different care delivery areas specified (and would thus benefit from standardization).

Besides the obvious impact on the delivery of care, workflow has a big impact on staff training requirements for clinical staff above and beyond the operation of any single medical device. The more complex the automated workflow implemented by the medical device, the greater the staff training requirements. Conversely, standardized workflows deployed more broadly than the staff tends to migrate provides no actual standardization benefit.

Staff Training Requirements
The standardization potential of training naturally extends to the actual use of the medical device. Common training across products implies common method of operation, similar or identical maintenance and service procedures, and related activities that drive labor costs and staff efficiencies. Training of IT and biomedical engineering also extends to the maintenance, support, and repair of medical devices.

Products with common product line architectures and theory of operation can greatly extend the standardization potential of a set of products. This commonality contrasts with product lines made up of dissimilar products that required dissimilar training. Consequently, training represents a substantial medical device cost component that factors into standardization.

Support and Maintenance Requirements
Besides training, there are direct costs associated with the actual maintenance, testing, and recalibration of the medical devices under consideration. Variation across medical devices in the estimated mean time before failure, efficiency and effectiveness of troubleshooting procedures, frequency required for maintenance, and recalibration all figure in to the cost estimates required to optimize standardization strategies.

SKUs Required for Accessories, Supplies, and Consumables
Beyond the medical device itself, the accessories, supplies, and consumables used with the medical device can have a substantial impact on developing an optimal standardization strategy.

Mapping standardization strategies to the enterprise entails framing the scope of standardization and evaluating various manufacturers’ solutions. Framing the scope starts with considering the products and services to be standardized. The process starts with the identification of the target group or category of devices, which can be expanded or contracted during the standardization process based on other factors that affect the standardization strategy. The selection of medical devices for standardization is also influenced by the departments and care delivery areas to be included in the standardization strategy.

Case Study: Low-Acuity Vital Signs Capture
Low-acuity vital signs monitors (VSMs) are nonelectrocardiogram, spot check, or continuous patient monitors for capturing basic physiological parameters intended for use in low-acuity patient care areas. These devices are generally used on general care floors in which are located 70% of nurses and 95% of patients. Thus, there are many more VSMs in the average hospital than there are critical care or perioperative monitors, and they are used on many more patients.

Data source: Milliman & Robertson.

The importance of VSMs has increased recently with the rapid adoption of electronic medical records (EMRs) and the resulting need to acquire vital signs data from VSMs and transfer that data into the EMR. Electronic medical record data integration, in turn, drives automated data collection workflow (which includes patient and clinician ID as well as patient vital signs data) to ensure error reduction and timeliness of data delivery. As a consequence of these and other recent market demands, and shifting manufacturer product strategies, the resulting change in product offerings makes the VSM a good choice for a case study.

Common practice is to standardize in medical-surgical areas on the same brand of patient monitors as those used...
in critical care, even though the patient monitors used in the 2 areas are very different. As patient monitoring manufacturers have broadened their patient monitoring product lines with VSMs, standardization strategies must be reevaluated to ensure maximum benefit in low-acuity care areas for provider organizations.

**Scope of Standardization**

Workflows and medical device requirements for clinics and outpatient settings have some similarities to those in medical-surgical units and could be considered as part of the standardization decision. Greatly extended standardization has recently become easier across the healthcare delivery system continuum from hospital to clinic around VSMs and some other diagnostic parameters.

The advent of integrated diagnostic systems that mount on the wall and include the vital sign monitor as well as otoscope, ophthalmoscope, and so on allows the integration of devices typically found in clinic examination rooms and emergency department receiving areas into a single device. This new product configuration enables standardization of VSMs and other technologies more broadly across the continuum of care.

The scope of standardization has a significant impact on the potential savings. Generally, the broader the geographic standardization across care delivery areas and facilities in the healthcare delivery system, the greater the impact of standardization. The other pertinent standardization category is the categories and numbers of devices included in the standardization framework.

**Product Architecture and Design**

Product line engineering can be defined as a method for creating an underlying architecture for a manufacturer’s product platform. This common architecture provides a framework for common features and functionality that exist across different models across a product line, as well as anticipate the variation of features across products. The resulting product line architecture becomes a set of building blocks that can be added, subtracted, and combined in different ways to create numerous different products that meet the differing requirements of various market segments. The product line architecture method contrasts with the more common approach of designing each product separately as if it were a standalone device. Although creating a product line architecture is initially extra work for the manufacturer, it enables the development of new products based on the resulting architecture much more quickly than conventional product development methods.

Besides advantages for the manufacturer, the use of product line architectures can also benefit buyers. Product line architectures result in numerous products that use the same underlying technologies and theory of operation. These product building blocks also tend to rely on a common user interface and the software required to implement that user interface.

When evaluating a manufacturer’s products, query the manufacturer about underlying technology such as microprocessors, memory, input/output components, and the circuit boards that make up the various models of the product line. The greater the commonality among these variables, the greater the standardization benefits with regard to troubleshooting, maintenance, recalibration support, training, and lower cost.

**User Interface Design**

Staff training represents a substantial “hidden” cost of medical devices. These devices can be complex to use and are often used in applications that represent significant patient safety risk. Consequently, both usability and the broader overall training burden are important standardization considerations.

A resulting benefit of designing products based on a product line architecture is that resulting products utilize a common user interface and theory of operation. The broader a standardization framework extends across products used in your enterprise, the greater the avoidance of onerous training costs—not to mention the potential for operator error resulting from confusion resulting from a profusion of devices that operate differently.

User interface design and the resulting impact on training from standardization impact both support services provided by biomedical engineering and actual use by clinicians.

**Service and Maintenance**

Service and maintenance are important cost components when evaluating medical devices. Besides the potential impact of product line architectures in creating a common set of service and maintenance processes and procedures across a group of products, numerous design decisions can impact service and maintenance costs.

The key criterion when evaluating service and maintenance for standardization is the degree of commonality across the products under consideration. There are 4 characteristics to consider when evaluating products for standardization:

- configuration and configuration management
- troubleshooting and diagnosis
- ease of repair and downtime
- recalibration

The ease and efficiency of these 4 service and maintenance characteristics are important purchase criteria. However, it is the commonality of how service and support features are implemented across products that is key for standardization.

**Accessories**

The number and variety of accessories required for a medical device or medical device product line have a big impact on
supply chain costs, in addition to convenience and usability. Accessories include physiological sensors such as electrocardiogram lead sets, SpO2 sensors, electronic thermometry probes and covers, and EtCO2 sampling systems. Another common and widely used accessory are blood pressure cuffs. Some accessories are durable and intended for use with multiple patients over time, whereas others are single-use or disposable. These single-use items include supplies and disposables such as specialized printer paper and disposable sensors or tube sets. Some accessories are one-size-fits-all, and others come in a variety of sizes.

To complicate matters, many provider organizations standardize on certain physiological parameters, most often SpO2 and temperature. The ability to use the same oximeter or thermometer—and sensors/accessories—as those found in other devices in use in the hospital becomes a standardization requirement. Devices that do not support existing enterprise physiological parameter standardization have higher operating costs due to reduced standardization, may have compromised clinical performance, and are often eliminated from consideration for purchase.

Supply chain costs tend to be gauged by a cost per SKU calculated by the enterprise. The purchasing department will have a cost-per-SKU figure for use in assessing standardization frameworks. As noted above, some accessories can carry a substantial SKU burden. A good example of this is blood pressure cuffs. Blood pressure cuffs can have as many as 5 different connectors between the blood pressure tube and the medical device. Cuffs are available with 1 or 2 tubes. The cuffs themselves can be reusable, soft, or vinyl. Finally, cuffs are available in 10 different sizes, from small infant to cuffs for adult thighs. All of this variation totals up to 201 different blood pressure cuffs that may need to be purchased, stored, and used by the enterprise.

Reduction in blood pressure cuff SKUs requires a product line solution from the cuff manufacturer that actually makes standardization possible across the enterprise to achieve significant SKU reduction. Accessory standardization is often an afterthought when considering medical device standardization, but as seen above accessories can have a significant impact on the standardization framework.

Information Technology

Because of the broad adoption of EMRs, IT features also figure into standardization strategies. Information technology features are a byproduct of product line architectures and are commonly consistent across a number of products within a manufacturer’s overall product offerings.

Unlike continuous patient monitors, VSMs are most often used to take “spot” readings where the user takes the VSM from patient to patient capturing vital signs readings and conveying them electronically to the EMR. This contrasts with a very different workflow where continuous patient monitors are attached to the same patient for a significant portion of their length of stay. The IT features and design available to users to establish patient context, review and edit data, and transmit data to the EMR are all key variables in determining standardization potential. The goal, as always, is to standardize on workflow across the optimal set of products and care delivery areas in such a way as to minimize costs.

Besides workflow, the IT components and architecture should be considered as any other feature of the overall medical device. Requirements for proprietary networks compared with the enterprise network and wired or wireless network enablement are examples of important IT features to be considered. This means that IT features are analyzed with the overall medical device’s other features when considering product architecture and design, user interface design, service, and maintenance.

Recommendations

When purchasing a category of products, such as the VSM case study example above, it is essential that any existing
standardization frameworks be reassessed for continued suitability. The scope of standardization regarding both what sets of devices are to be standardized and the departments and care delivery areas to be included should be made on a per-manufacturer basis. For example, the standardization of manufacturer A’s products may compare poorly with how manufacturer B’s products are standardized, yet an assessment of manufacturer A’s product within their own context may offer considerable advantage in reduced costs from a standardization perspective.

Assess and evaluate each product’s characteristics such as design architecture, theory of operation, or user interface to validate manufacturer’s claims.

When evaluating product architecture and design, look for commonalities and breaks in common features across products. These breaks often indicate the effective limits of standardization, and products that fall outside these breaks may offer little or no standardization benefits.

A similar approach is recommended for evaluating device user interfaces. To minimize training requirements, the user interface across products must be identical for most operations, with differences limited to the variations in features inherent in different models in a common product line. Often product lines are built out of products purchased from original equipment manufacturers and resold by the medical device manufacturer or from products gained through acquisitions. Such products are poor candidates for standardization.

For service and maintenance, evaluate the manufacturer’s estimated mean time between failures, recommended service periods, and any recalibration requirements. There is also a training component in service and maintenance much as there is for end users of the device. Assess a manufacturer’s products serviceability by evaluating what can be repaired in house or by the manufacturer, the estimated downtime, and associated costs.

Evaluating accessories and supplies requires creating a matrix of the various accessories and supplies against associated medical devices. This is based on identifying core or original equipment manufacturer technologies in the devices and ensuring that standardization is possible with critical consumables. The resulting number of SKUs will be the key factor for determining standardization suitability.

Workflow automation and IT have become important features in evaluating medical devices. Workflow ties into training requirements and this factor should be included when determining training requirements for a product under consideration. When compared with the previous workflow that is replaced by connectivity features, any resulting gains or losses of productivity should be documented as part of the workflow and IT assessment.

References
Eliminating Errors in Vital Signs Documentation

VICKIE K. FIELER, PhD, RN, AOCN
THOMAS JAGLOWSKI, BSN, RN
KAREN RICHARDS, DNP, RN, NE-BC

BACKGROUND

Documentation of vital signs (VS) is an important nursing function. Although a simple procedure, there are several steps in the process and errors are not uncommon. The frequency of errors has begun to be documented in the literature. An assumption is that incorrect VS data may lead to inappropriate medical interventions or a lack of intervention when one was necessary for patient care.

There are multiple methods for transferring VS into a medical record. They can be handwritten on a paper form and then handwritten into a paper record. They can be handwritten on a paper then typed into an electronic medical record (EMR). They can be entered into a mobile device (such as a person digital assistant [PDA]) at the bedside and downloaded into an EMR. They can be typed directly into an EMR at the bedside, or they can be transmitted wirelessly directly from the VS machine into an EMR. Each method of transferring VS has possible risks for error. The errors can be from transcription or transposing numbers when written by hand or typed. There can also be errors of omission, for example, when VS are written on paper and not entered into the medical record or one of the VS measures are not recorded. A failure to transmit the data is also possible (ie, failure of the interface), leading to missing VS.

Several studies were found in the literature that described efforts to improve VS documentation by using different types of data entry devices (for entering VS into an EMR), improving the configuration used in the EMR, or in improving nursing processes. One study reported that nurses spent about 12 minutes per patient per day documenting VS in the ICU when using a paper system and found that after the implementation of a wireless system, the time dropped to 2 minutes per patient per day. In contrast, an ethnographic study found that nurses who worked at a hospital with an EMR spent more time documenting VS than did nurses who worked at hospitals that had paper records. In both types of hospitals,
the nurses recorded VS on paper before rewriting or keying in the VS into the medical record. The error rates for recording on paper then transcribing into a paper record were between 10% and 25.6%. The error rates for typing in VS at the bedside were 0.08% to 5.6%. The error rate for wireless transmission was 3.3%. Combining the results of the four studies that compared VS before and after implementation of an EMR was not possible because the studies used different definitions to describe what constitutes an error and used different methods of documenting VS. Table 1 provides the types of transmission methods and their associated error rates for the four studies.

The purposes of this study were to determine (a) the difference between the frequency of errors and omissions when VS are documented and transcribed manually into the EMR and when they are recorded automatically into the EMR using Connex Vital Signs Monitors and Connex Vitals Management (VM) implementation and (b) the difference between the time it takes to manually document, transcribe, and have access to VS data in an EMR and the time it takes to document and have access to the data using Connex Vital Signs Monitors and Connex VM.

**METHODS**

When the study hospital needed to purchase new VS machines, the hospital had the opportunity to work with Welch Allyn (a company that makes VS machines with the capability to wirelessly transmit VS to an EMR, based in Skaneateles Falls, NY) to look at VS errors before and after implementation of a wireless VS data transfer system. Prior to the implementation of the wireless system, RNs or licensed nursing assistants (LNAs) documented VS on paper and later typed the VS into the EMR. The baseline error rate was unknown; however, the research team assumed that a wireless transfer of data would decrease overall errors and would allow the VS data to be immediately available in the EMR. This study used Welch Allyn Connex VM software. Connex VM was compatible with the hospital EMR and had the capability to download patient data directly from the point of care via the Connex Vital Signs Monitor. The research team hypothesized that transitioning to wireless connectivity would provide a more timely delivery of accurate patient VS data, which would promote patient safety.

**Setting**

This study was conducted at a small community hospital. The study was reviewed and approved by the hospital’s institutional review board. Patient written consent was waived.

**Design**

A pretest and posttest design was chosen. An informatics (IS) nurse familiar to the staff observed nurses and LNAs taking VS on a general medical/surgical unit. Phase I of the study was baseline data collection before implementing the new wireless VS system.

During phase I of the study, the staff used older, automatic VS machines that could measure and display heart rate (HR), blood pressure (BP), and oxygen saturation (O2). Each VS machine also had a separate thermometer. The machines were capable of printing out HR and BP, although in day-to-day practice, this feature was not used by the RNs and LNAs. The printouts did not have the capability of recording patient names, locations, temperature, respiratory rate (RR), or O2. The nursing staff would routinely write the patient name and VS on a paper form that they carried as they took VS on their patients on the unit. Once the staff finished with their rounds, the VS were keyed into the EMR. During the study, the IS nurse followed the staff, recorded the VS as the staff obtained them, documented the time the VS were taken, and printed the VS from the machines. The VS printouts were used by the research team to compare to the data entered manually into the EMR. The staff was not aware of the true reason for the IS nurse shadowing them during both the pretest and posttest observations. It was not unusual for the IS nurse to shadow staff as different components of the EMR system were introduced or modified.

Later, the IS nurse searched the EMR for the VS and documented any discrepancies between the EMR compared

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**Table 1**

**Errors in VS Documentation**

<table>
<thead>
<tr>
<th>Author</th>
<th>No. of VS Sets</th>
<th>Type of Transmission</th>
<th>Error Rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith et al</td>
<td>1514</td>
<td>Paper to paper</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paper to EMR</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PDA to EMR</td>
<td>0.08</td>
</tr>
<tr>
<td>Gearing et al</td>
<td>613</td>
<td>Paper to paper</td>
<td>25.6</td>
</tr>
<tr>
<td></td>
<td>623</td>
<td>Paper to EMR</td>
<td>14.9</td>
</tr>
<tr>
<td>Wagner et al</td>
<td>113</td>
<td>Paper at point of care</td>
<td>16.8</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>Paper to EMR</td>
<td>15.2</td>
</tr>
<tr>
<td></td>
<td>124</td>
<td>EMR at point of care</td>
<td>5.6</td>
</tr>
<tr>
<td>Meccariello et al</td>
<td>52</td>
<td>Paper to EMR</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>92</td>
<td>Wireless transmission</td>
<td>3.3</td>
</tr>
</tbody>
</table>

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with the printed VS and his observations. The IS nurse also compared the time the VS were taken with the time the VS were available in the EMR via the time stamp on the EMR.

Phase II included the implementation of Connex Vital Signs Monitors and Connex VM using a wireless workflow. After the clinicians were trained on the hardware and software, the same IS nurse observed the staff obtaining and documenting VS. The IS nurse observed the staff taking VS, recorded the VS, and printed the VS as they were being collected. The IS nurse then verified the VS entered into the EMR and documented any errors or omissions. The IS nurse compared the time stamp from when the VS were saved in the Connex Vital Signs Monitor and the time stamp from when the data were available in the EMR.

After phase II of the study was complete, the staff was asked to complete a questionnaire about taking VS.

Sample

A convenience sample of patients on a medical/surgical unit participated in the study. A desired sample size was calculated using the midpoint of previously published data on error rates for recording VS on paper then transcribing to a paper record (10% and 25.6%)\(^1\)\(^2\) and comparing this to the published error rate for the wireless transmission (3.3%).\(^3\) It was determined that a sample of 60 VS sets per group had a power estimate of 0.83, which is considered adequate by most researchers who assess the power of their tests using \(n = 0.80\) as a standard for adequacy. A total of 64 VS sets were collected for phase I of the study and 66 for phase II. The VS sets were obtained from patients in a random order using a random assignment table. All patient beds on the medical/surgical unit were listed randomly and the IS nurse observed the VS being taken according to the list. If the bed was empty or if the patient was excluded, the IS nurse would skip VS observation and proceed to the next bed on the list. When the end of the list was reached, the IS nurse would go back to the top of the list and continue collecting VS information until at least 60 observations were completed. Only patients who needed routine VS obtained were included. Patients who were not able to have routine VS taken were excluded (ie, postoperative patients who needed frequent VS, blood transfusion patients, bilateral mastectomies, or bilateral upper extremity deep vein thromboses). Patients who required frequent VS were excluded from this study because the Connex VM system was designed for intermittent VS and because the IS nurse could not observe the frequent VS and follow the staff person doing routine VS at the same time.

Equipment and Instruments

The Connex Vital Signs Monitor is intended to be used by clinicians and medically qualified personnel for monitoring noninvasive BP, pulse rate, oxygen saturation, and body temperature. The most likely locations for patients to be monitored are general medical and surgical floors, general hospital, and alternate care environments. Connex VM is intended for the collection and review of patient data and the transmission of the data to information systems. It provides notifications when data deviate from preset ranges, allows manual entry of data, and provides a means to identify and manage patients. Connex Vital Signs Monitors and Connex VM are Class II devices and received FDA clearance prior to the start of data collection. Devices that are registered with the FDA are classified into three groups. A Class II device is a “medium risk.” Study risks were minimized by using procedures that were consistent with sound research design and were already being performed on the patients.

A data collection form was created that included

- The patient’s room number
- The patient’s medical record number (used to retrieve the EMR data)
- Date
- The staff identification number (to identify the staff member taking the VS)
- The VS observed and printed
- The VS collection time
- The VS from the EMR
- A space to document any errors
- A space to write in comments
- The IS nurse’s signature

To compare the error rates for the two methods, \(\chi^2\) tests were used, and \(t\) tests were used to compare the elapsed time, that is, the time between the VS being taken and the time the VS were available in the EMR. All analyses were performed using SAS, version 9.2 (SAS, Cary, NC). The research team also devised a follow-up questionnaire to understand the staff’s perception of the equipment and process. The follow-up questionnaire included some basic demographic information, such as RN or LNA, and length of time on the unit. Analysis of the open-ended questions on the follow-up questionnaire was conducted using a card-sorting technique. Individual responses to the questions were written on sticky notes. The notes were sorted into categories, each expressing a theme. There were several rounds of sorting until all responses were included into categories/themes.

RESULTS

Fifteen clinicians participated in phase I of the study, and 64 patients were included. For phase II, 13 clinicians participated and 66 patients were included. Data on systolic BP (SBP), diastolic BP (DBP), HR, temperature, oxygen saturation, and RR were collected. Therefore, each
VS set had six measurements that could potentially have errors.

In phase I, the mean (SD) number of errors per VS set was 1.12 (0.98) and ranged from 0 to 4. The overall error rate was 18.75% in phase I. There were no errors in phase II (P < .001). Table 2 summarizes the error rate by VS and the method of documentation.

With regard to error rate between phase I and II, HR and O₂ were the most significantly different VS. Both RR and DBP were marginally significant; neither temperature nor SBP was statistically significant.

The mean (SD) elapsed time between collecting the VS and documenting the VS in the EMR for phase I was 38.53 (32.87) minutes and ranged from 3 to 172 minutes. For phase II, the mean (SD) elapsed time was 5.06 (6.59) minutes and ranged from 1 to 32 minutes (P < .001).

In addition, for phase I, the VS stamp differed from the time recorded 17 times (a 26.56% error rate). The mean (SD) difference was 15.47 (19.31) minutes. For example, the staff person might have recorded that VS were taken at 8 am but they were actually taken at 8:15 am. In phase II, the data were automatically time stamped when they were stored in the Connex Vital Signs Monitor, so there were no discrepancies.

An analysis of the questionnaire was conducted to understand the staff’s perception of the new equipment and process. See Table 3 for demographic information. All 23 respondents collected BP, HR, temperature, and O₂, but only nine collected RR. As shown in Table 4, most of the staff was comfortable using both the old paper to EMR process and the new wireless VS process.

The most commonly listed benefits of the new system were “speed,” which was mentioned by 16 (69.6%) people; “accuracy,” which was mentioned by eight (34.8%); and “ease of use,” which was mentioned by seven (30.4%) people.

A common concern with the new system was the “inability to enter oxygen data,” that is, to document whether the patient was receiving oxygen and how much, which was entered by six (26.1%) participants, and the worry that “data might not send,” which was also entered by six people. The staff was concerned that data might not be transmitted. Using the wireless system, VS are not recorded on paper. If the interface fails or if the EMR is down, the VS might be lost. The staff pointed out that new processes need to be followed, such as checking the EMR to be sure the VS were received. Concerns about “wireless” were recorded by two (8.7%) people, and concerns about “forgetting to report the results to the RN” were recorded by two others.

Of note is that the Connex Vital Signs Monitor does have the ability to store VS, so the chance of VS actually being lost is small. Depending upon how long the system is down, perhaps the patient would be discharged and the data never sent. However, the staff did bring this up as a concern for them.

The most common suggestion for improving the new system, which was submitted by nine (39.1%) people, was to include the ability to document whether the patient was on oxygen and, if so, how it was being administered and what the flow rate was. No other suggestion was entered by more than one participant. The Connex Vital Signs Monitor does have the ability to document the method of oxygen administration and the flow rate; however, this feature was not implemented at the time of the study.

### Table 2

<table>
<thead>
<tr>
<th>Vital Sign</th>
<th>Phase 1</th>
<th>Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4.69</td>
<td>0</td>
</tr>
<tr>
<td>DBP</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>7.81</td>
<td>0</td>
</tr>
<tr>
<td>HR</td>
<td>39</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>60.94</td>
<td>0</td>
</tr>
<tr>
<td>Temperature</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>O₂</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>32.81</td>
<td>0</td>
</tr>
<tr>
<td>RR</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>6.25</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>18.75</td>
<td>0</td>
</tr>
</tbody>
</table>

All P values are from χ² tests, and those less than .05 are statistically significant.

### Table 3

| Demographic Information of Staff Completing the Questionnaire (N = 23) |
|--------------------------|--------------------------|
| %                        |                          |
| RN                       | 34.8                     |
| LNA                      | 65.2                     |
| Years of experience      |                          |
| <5                       | 34.8                     |
| 6–10                     | 39.2                     |
| >10                      | 26.1                     |

### Table 4

<table>
<thead>
<tr>
<th>Comfort With Documentation System</th>
<th>Paper to EMR, n (%)</th>
<th>New Wireless System, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very comfortable</td>
<td>13 (56.5)</td>
<td>12 (52.2)</td>
</tr>
<tr>
<td>Moderately comfortable</td>
<td>3 (13.0)</td>
<td>6 (26.1)</td>
</tr>
<tr>
<td>Comfortable</td>
<td>4 (17.4)</td>
<td>1 (4.4)</td>
</tr>
<tr>
<td>Moderately uncomfortable</td>
<td>1 (4.4)</td>
<td>3 (13.0)</td>
</tr>
<tr>
<td>Extremely uncomfortable</td>
<td>1 (4.4)</td>
<td>0</td>
</tr>
<tr>
<td>Failed to answer</td>
<td>1 (4.4)</td>
<td>1 (4.4)</td>
</tr>
</tbody>
</table>

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DISCUSSION

Our results were similar to those of previous studies. The total error rate of 18.75% compares with the 25.6% error rate that Gearing et al\textsuperscript{2} found in a paper-to-paper system. The Connex Vital Signs Monitors combined with Connex VM reduced the documentation errors to zero. The average elapsed time from the point when VS were taken until they were recorded in the EMR dropped from 38.53 to 5.06 minutes. Although these data indicate a very successful outcome, there were difficulties in implementing the system.

The study was projected to take approximately 4 months but took more than a year for the IS department of the hospital, Welsh Allyn, and an interface company to be able to transfer the data over the wireless network into the EMR. It required wireless LAN connectivity for Connex Vital Signs Monitors to connect to the Connex VM server located in the hospital's data center and two HL7 messages (admission, discharge, transfer [ADT] and results data). An interface was required to convert the information from Welch Allyn into the EMR. Prior to “go-live,” an upload of all patient data within the EMR was sent from the EMR’s ADT server to Connex VM (Figure 1).

The steps in the process to obtain the VS were as follows. The staff person scanned his/her identification barcode on his/her employee badge and then scanned the patient's ID band before setting up the Connex Vital Signs Monitor. The VS were taken, and once validated, the patient information was sent to the Connex VM by the staff person pushing a button. The Connex VM validated the patient information and created an HL7 interface file, which flowed to the interface server. The interface server received and processed the data and sent the interface files to the Scriplink server. The Scriplink server then posted the data in the EMR.

Alerts were created in the event that data did not come across the interface. For example, if the script stopped, and no VS data were uploaded into the EMR, a page would go out to the IS staff on-call or help desk staff to alert them and a manual reboot of the Scriplink server would be required. Another type of alert was set up for a clinician ID not in the database. Information for new staff members had to be manually entered into the Connex VM. If this was not done, the Connex VM system would not recognize the user and an alert would be sent to the support staff.

This study, and most others in the literature, did not address the risk of harm to patients caused by documentation errors. The error rate in this study and in others is alarmingly high. Most errors are likely to be clinically insignificant. Documenting an HR of 68 instead of 69 is clinically meaningless. However, larger errors are unpredictable, and an SBP of 106 instead of 160 may be very significant for an individual patient. With the high rate of errors, it is also likely that any one patient may have

**FIGURE 1.** Steps in the wireless VS process.
several documentation errors during an inpatient stay. These errors may contribute to clinically significant consequences. While we may not be able to eliminate all VS errors, with improved technology, we can certainly reduce errors significantly.

## LIMITATIONS

Limitations of this study include the pretest and posttest design. A parallel arm study would have been more desirable. There was a long delay between phase I and phase II data collection because of the time it took to set up the interfaces properly.

When collecting data on omitted VS, the researchers were able to record only omissions of individual VS within the set of VS. It was beyond the scope of this study to capture entire sets of VS that were missing or not collected. For example, a patient who is ordered to have VS done every 4 hours and is off the floor when the LNA is doing his/her VS rounds may not have the VS done. We did not compare the ordered frequency of VS with the actual recorded VS. Presumably, the LNA or RN would obtain the VS when the patient returned to the unit; however, this was not part of our data collection plan. The actual number of VS errors may be higher than what was reported in both phases if these data had been captured.

## CONCLUSIONS

Although implementing the wireless system was more difficult than expected, it eliminated documentation errors and greatly reduced the time for VS to be available in the EMR. The new VS documentation required changes in nursing practice, such as making sure that the documentation assessments had been added to the patient profile before obtaining VS. This is particularly important for new admissions and in-house transfers from departments that do not use this functionality. Other practice changes included scanning employee IDs and patient ID bands and the need to check the EMR to see if the data crossed the interface. A follow-up quality study could be done in the future to ensure that errors continue to be minimized. Further research can also be done on other types of VS documentation systems.

## Acknowledgments

We acknowledge the support of the Clinical Research Council at Exeter Hospital. Our statistical consultant was Paul C. Stark, MS, ScD, founder and chief executive officer of Crimson Statistics, Cambridge, MA (paul@crimsonstats.com).

## REFERENCES

St. Luke’s Rehabilitation Institute Partners with Welch Allyn to Upgrade Technology and Increase Staff Efficiency

Facility uses Welch Allyn connected solutions to help it become a Stroke Rehabilitation Center of Excellence

Skaneateles Falls, NY, March 25, 2013— Welch Allyn, a leading medical diagnostic device company that focuses on helping clinicians to improve patient outcomes, recently partnered with St. Luke’s Rehabilitation Institute to improve efficiency and workflow at its 102-bed rehabilitation hospital in Spokane, Washington. As a part of its journey to become a Stroke Rehabilitation Center of Excellence, St. Luke’s replaced existing equipment with Welch Allyn Connex® Vital Signs Monitors (VSM) and integrated Connex® Vitals Management (VM) Software into its existing electronic health record (EHR) system.

Now featured on every patient floor at the facility, Welch Allyn Connex VSMs allow nurses to save valuable time by wirelessly sending patient vitals directly to MEDITECH, St. Luke’s EHR. Welch Allyn Connex VM Software automates the documentation process, eliminating manual steps and errors, to help improve nurse efficiency. The Welch Allyn monitors also help improve efficiency with two-way confirmation that the vitals were sent and received. This end-to-end system, designed specifically for lower-acuity floors like the Med/Surg environment, frees nurses up to spend more time with their patients.

With its full-color touch display, the Welch Allyn Connex VSM provides fast and comprehensive patient vital signs measurement, including spot check or continuous monitoring of heart rate, blood pressure, and pulse oximetry, as well as the ability to take a temperature using thermistor or tympanic technologies. It allows health care professionals the ultimate in flexibility with the ability to fully customize alarms, select automatic or programmable blood pressure intervals, and customize the look of the home screen based on workflow needs. The device also comes connectivity-ready, allowing integration and communication with many popular EHR software systems.
St. Luke’s Rehabilitation Institute Partners with Welch Allyn to Upgrade Technology and Increase Staff Efficiency

Designed specifically for low-acuity floors, Welch Allyn Connex VM Software automates the vitals documentation process to eliminate manual steps and the errors that go with them. With Connex VM integrated into an EHR, users can document accurate patient data right from the bedside—giving clinicians instant access to patient data anytime, anywhere and allowing them to identify abnormal vital signs more quickly and make better informed decisions.

About Welch Allyn
Welch Allyn is a leading global healthcare company that offers a complete range of digital and connected diagnostic solutions that help reduce risk and enhance workflow in a variety of clinical settings. Founded in 1915 and headquartered in Skaneateles Falls, NY (USA), Welch Allyn is a family-owned business that employs nearly 2,500 employees in 26 different countries. The company specializes in helping doctors, nurses and other frontline practitioners across the globe enhance care by developing innovative products, breakthrough technologies and cutting-edge solutions that improve patient outcomes, safety and satisfaction. More information about Welch Allyn and its complete line of connected products and solutions may be found at www.welchallyn.com. Like us on Facebook and follow us on Twitter.

About St. Luke’s Rehabilitation Institute
St. Luke’s Rehabilitation Institute is the region’s largest free-standing physical medicine and rehabilitation hospital and the only Level I trauma rehabilitation hospital in the Inland Northwest. St. Luke’s serves more than 7,000 patients each year in inpatient and outpatient settings - people who have suffered a stroke, lost a limb, suffered a brain injury, spinal cord injury or one of many other illnesses or injuries. Accredited by the Joint Commission and Commission on Accreditation of Rehabilitation Facilities, St. Luke’s is a division of Inland Northwest Health Services (INHS). For more information on St. Luke’s, visit www.st-lukes.org.

- St. Luke’s on Twitter: http://twitter.com/stlukesrehab
- St. Luke’s on YouTube: http://www.youtube.com/thebuzzinhs

# # #
Rice Memorial Hospital Improves Vital Signs Accuracy and Efficiency with Welch Allyn Connex® EVD Through Seamless Epic EMR Integration

Rice Memorial Hospital recently implemented the Welch Allyn Connex Electronic Vitals Documentation (EVD) system in an effort to improve patient care, patient safety and efficiency through the use of electronic vital signs capture and monitoring. Rice Memorial had previously been live with Connex 1.0. Having had this workflow in place benefited the hospital’s conversion to its new EMR, resulting in more immediate and accurate patient data, a reduction in instances of human error, efficient workflow, cost savings and overall nursing satisfaction during a stressful “go-live.” Nurses and physicians supported the Connex EVD for the benefits of the systems, which made them more efficient and provided better access to patient vital signs data.

The Challenge:

With patient safety a priority, Rice Memorial sought to continue a solution that would improve overall staff workflow, provide physicians with real-time patient data, eliminate unnecessary overtime costs and work seamlessly as they transitioned to the Epic EMR.

Rice wanted a system that would provide the most accurate and up-to-date vital signs data available, thus eliminating instances of human error that can result from manual documentation process and delayed data entry. Prior to introducing the Connex EVD system, nurses were taking vital signs manually, often delaying data entry until the end of a shift, which in turn increased overtime costs. Nurses in the post-op unit were particularly interested in finding more accurate and efficient ways to take and record frequent vital signs from multiple patients over short periods of time. In addition, physicians routinely expressed concern that manual methods could result in having to track down the most current vital signs data and had potential for inaccurate patient information.

The conversion to Epic required significant effort for the nurses, and the hospital did not want to add tasks to nurses’ already heavy workload. So, the Rice Memorial team wanted to continue to utilize an automated process and eliminate unproductive documentation tasks.

The Solution:

Rice Memorial Hospital has a long-standing relationship with Welch Allyn and has been using its devices for years. Staff was familiar and confident with the Welch Allyn team, its products and its ability to provide innovative solutions.
The hospital began with a trial of the Welch Allyn Connex Vital Signs Monitor—one element of the overall Connex EVD system—and the nursing staff quickly responded positively to the device’s ease of use and the prospect of automated vital signs documentation.

After a brief trial of the device, the hospital began planning its rollout of the complete EVD system. This includes the Connex VM server, which provides end-to-end connectivity between individual devices and the Epic EMR. The hospital performed a phased implementation that focused on the post-op, medical-surgical and women’s health floors.

Staff members—particularly the post-op nurses—were impressed with two specific workflows of the Connex EVD: 1. the ability to capture and transcribe monitored vital signs readings with the push of a button; and 2. the ability to quickly and efficiently document spot check vital signs. The system made such an impression that nurses on other units not participating in the initial rollout were asking “When do we get this on our floor?” and “When is it our turn?” Physicians, too, were impressed with the accuracy of data made available using the Connex EVD.

The Benefits:

As Epic went live at Rice Memorial Hospital, the continued benefits of the Connex EVD became even more apparent, allowing providers immediate access to a steady stream of accurate vital signs and providing value to its new EMR as a source of accurate and up-to-date information. Nurses and physicians were impressed with the ability of the Welch Allyn Connex EVD to efficiently and accurately capture and record vital signs at the point of care. And, physicians also commented on the improvements in data accuracy and timeliness.

Rice acknowledged that changes in workflow—even those with clear benefits—presented challenges, especially to the nursing staff. Involving nurse managers from the beginning was key to success and promoted ownership by the entire nursing staff. While change is hard for nurses, they found that their processes were improved by strongly encouraging complete compliance with the new protocol.

Implementing our new Epic EMR was stressful on everyone. Nurses were pleased that the Connex EVD...made their jobs easier.

Kathy Dillon, MA, RN, Director of Information Management

One of the specific selling points was the immediate data transfer from the Connex VSM to Epic, which not only saved time at the bedside but reduced the need for nurses to stay after their shift to document patient data. This was a great benefit to Rice Memorial as a whole, as it reduced additional hours spent on documentation and subsequently decreased overtime.

Physicians at Rice Memorial also were pleased with the capability of the device to provide quick access to vitals, which gave them the data necessary to provide even better patient care and greatly reduced frustration in seeking out the most current vital signs information.

Rice Memorial now has expanded its deployment of Connex EVD system and had immediate requests for the device from other departments not included in the initial phase. Plans include inpatient behavioral health.

“Implementing our new Epic EMR was stressful on everyone, but Welch Allyn offered us leading-edge solutions for the emerging world of EMR-connected vital signs devices that made the whole process go much more smoothly,” said Kathy Dillon, MA, RN, Director of Information Management. “Nurses were pleased that the Connex EVD did not add to that stress but actually made their jobs easier. And, we couldn’t be more pleased with the feedback we’ve been getting from our physicians. Connex is truly helping us reap the rewards of our Epic conversion. We made a great choice.”
Interfacing of Vital Signs Monitoring with the Electronic Medical Record

For over a year, a multi-disciplinary system-wide team has been meeting regarding the issue of medical device connectivity. Medical device connectivity in part refers to the integration of medical devices with the electronic medical record (EMR), taking physiologic data measured by the devices and electronically placing it into the record without having to be read by a caregiver, written on a piece of paper, then entered manually at a keyboard.

The team consisted of representatives from The Patient Care Division, Information Services, Clinical Engineering, and Materiel Management. The team discussed several medical device connectivity issues such as automatic communication of data from devices to the caregivers at the point of care, interfacing of various instruments with the EMR and requisite workflows, use of proprietary interfaces versus multi-vendor third-party interfaces. The team also listened to numerous presentations from many vendors regarding their products which in some way could support medical device connectivity. A consensus was reached to interface vital signs monitors (VSMs) with the EMR as the first project for monitoring medical device interfacing with the EMR.

VSMs measure some basic physiologic parameters such as heart rate, temperature, SpO2, and NIBP, or “the vitals.” They are used throughout the health system in various settings, but one of the primary uses is in the general med/surg areas. The medical equipment inventory has approximately 170 existing devices listed. The average life of a unit is about 7 years. The workflow for use in med/surg areas is very similar from one unit to another compared with other monitoring processes and is relatively straightforward. Therefore, this application lends itself well to the first interfacing of monitoring with the EMR. It is sometimes called “spot monitoring” of the vitals as it provides a snapshot of these parameters as opposed to continuous monitoring. The team further came to a consensus of using a proprietary solution for the interface, being Welch Allyn.

The advantages of the Welch Allyn Connex® Vitals Management system includes the following:

- A solution that requires no additional hardware at the point of care.
- A superior method of ensuring that the data associated with a particular patient is the data being stored in the EMR (ADT interface and bar code scanning).
- Utilizes good authentication and encryption methods for protection of ePHI, WPA2/AES PSK.
- Operates on our existing wireless network.
- Caches data during network downtime for later transmission, so may be used normally during network downtime.
- Fits within the existing workflow of spot vital signs monitoring.
- Received the highest rating of all Vital Signs Monitoring Connectivity Systems evaluated by a highly credible organization.
Additionally, the Connex® Vital Signs Monitor (Connex VSM), was evaluated and rated very highly by Patient Care and Clinical Engineering staff members. It utilizes a touchscreen, is configurable to manually enter additional data, such as height and weight. Comes with built-in wireless capability, and barcode scanners, utilizes either Nellcor® or Masimo® pulse oximetry technology and sensors. The benefits of interfacing spot vitals to the EMR include:

The Connex Vital Signs Monitor, was evaluated and rated very highly by Patient Care and Clinical Engineering staff members.

- Improves accuracy of patient data. It replaces the current process (making rounds, measuring the vitals, jotting down values and room numbers, and then later manually entering data into the patient record) with a process where data is measured, validated and sent directly to the patient record at the point of care.

- Improves care giver efficiency by virtue of the same change of process. Data are validated and sent with the press of a button at the point of care.

- Improves the timeliness of data availability in the patient record. Data are sent immediately at the point of care rather than collected until the care giver (sometimes at the end of the shift) enters the data. This will prevent the scenario of physicians looking for data in the record which has been taken, but not yet recorded.

- Can help DCH qualify for HITECH incentives. To demonstrate meaningful use hospitals are required to record and chart changes in vital signs such as height, weight, and blood pressure in the EMR. Stage 3 of Meaningful Use will require medical device connectivity.
In August 2012, White Memorial Medical Center in Los Angeles, Calif., began using Cerner’s CareAware VitalsLink™ to provide electronic transmission of vital sign data into the electronic health record (EHR) from the point of care. Using the Welch Allyn CVSM mobile vitals devices, the solution enables clinicians to take and chart patient vital signs at the bedside, eliminating the need for manual transcription. White Memorial is currently using 92 Welch Allyn CVSM devices integrated with the CareAware VitalsLink solution across all units in the hospital.

Pre-implementation workflows
Prior to using CareAware VitalsLink, clinicians at White Memorial were subjected to the inefficiencies typically present with a non-integrated vital sign collection and documentation process. Certified Nursing Assistants (CNAs), who are primarily responsible for the collection and documentation of patient vital signs, were required to take patient vital signs using mobile equipment and then manually enter the data into the EHR.

The workflows of CNAs varied, as some read the vital sign data from the face of the device and entered it at the computer workstation in the room, while others transcribed the vital sign data from the face of the device onto a piece of paper and then moved to the computer workstation to enter it into the EHR, creating a double-transcription event.

After conducting an onsite time and motion study at White Memorial, it was found that CNAs were spending an average of 3 minutes 58 seconds to complete a single vitals assessment, with 1 minute 23 seconds of this time spent solely on documentation activities. For a typical vitals round with 10 patients, this extrapolates to over 13 minutes of time spent on documentation per CNA per vitals round.

Post-implementation workflows
Since going live with CareAware VitalsLink, the vital sign collection and documentation process has been greatly enhanced. CNAs are no longer required to transcribe any data from the face of the device, nor are they required to manually enter any of the vital sign data into the EHR.

Using the Welch Allyn CVSM devices, CNAs simply log into the device, scan the patient’s wristband, take vitals, confirm the data on the screen and press “send” to sign and chart the data into the EHR. This new workflow eliminates the need to manually document, saving significant amounts of time.

A follow-up assessment of the new workflows with CareAware VitalsLink was completed shortly after the project’s go-live in order to understand the impact of the new solution. It was found that CNAs are now spending an average of only 2 minutes 20 seconds per vitals session, as the need for manual documentation is eliminated. This new workflow represents a 41 percent gain in efficiency when compared to the baseline.

Conclusion
Comparing the baseline and the post-conversion data, the CNAs at White Memorial are saving an average of 1 minute 38 seconds per vital session. As vitals are collected typically by two CNAs every four hours, this time savings is significant. Extrapolating for a typical 20-bed floor at White Memorial experiencing 120 vitals checks during a 24-hour day, the figure balloons to 196 minutes, or over 3.25 hours of CNA time saved per 20-bed floor per day, which can be directed back to providing patient care.

For more information, please contact Michael Swanson by e-mail at Michael.Swanson@cerner.com.
Introduction
NCH Healthcare is an alliance of more than 500 independent physicians and medical facilities throughout Collier County and southwest Florida. The two Naples, Fla., hospitals, NCH Downtown Naples Hospital and NCH North Naples Hospital, provide personalized care for over 30,000 patients each year. NCH Healthcare is consistently ranked as a top organization in many specialties by independent rating organizations, and was recently recognized by U.S. News and World Report as the Best Regional Hospital in four specialties.

Implementation Overview
In April 2012, NCH’s North Naples Hospital began using Cerner’s CareAware VitalsLink™ to provide electronic transmission of vital sign data into the electronic health record (EHR) from the point of care. The solution enables clinicians to take and chart patient vital signs at the bedside using a mobile vitals collection device, eliminating the need for manual transcription. “We’ve had the ability in the critical care arena to have the vital signs automatically downloaded,” says Michele Thoman, Chief Nursing Office for NCH. “But to be able to do it in a Med-Surg environment is unique.”

Clinicians at NCH simply associate the patient to the device through barcode scanning, take the patient’s vitals, view the results and electronically sign them into the EHR via a touch-screen display. This simplified workflow removes the need for manual transcription and also greatly reduces any latency in time between when vitals are taken and when they are documented into the EHR. “It’s as though it’s an extension of PowerChart® right there on the screen,” explains Thoman.

Workflow Analysis
In order to evaluate the impact of the CareAware VitalsLink technology on clinical workflows at NCH, data was collected before and after the project go-live. On the units observed at North Naples Hospital, patient vital signs are taken every 4 or 8 hours, depending on patient acuity. The nurses on the floors take patient vital signs at the beginning of the shift as part of the morning rounds. Following the morning vitals rounds, patient care technicians complete the mid-day and afternoon rounds.

Pre-implementation
Prior to implementing CareAware VitalsLink, the majority of nurses and care technicians at NCH were taking patient vital signs at the bedside
using mobile vitals equipment, recording the vital sign data on paper, and moving to the next patient room to complete the same process again. Once the vital signs for all patients under that clinician’s care were taken, the nurse or patient care technician would enter all the data into the EHR from a computer workstation. This manual transcription workflow subjected NCH clinicians to an inefficient process of duplicating documentation for each patient.

Across the units observed, nurses and patient care technicians spent an average of 1 minute and 42 seconds documenting vital signs. For nurses with the typical five patients, this was an average of over eight minutes spent solely on documenting patient vital sign data for one vitals round. The inefficiencies extrapolated with the patient care technicians, who were required to complete vital sign assessments for a larger volume of patients in a single round. In one observation onsite, a patient care technician was subjected to over 22 minutes of vital sign documentation for the 11 patients under her care.

Conceivably more important than the documentation inefficiencies was the significant gap in time between when patient vital signs were taken and when they were actually charted into the EHR. The majority of nurses and patient care technicians at NCH completed vitals assessments for all patients under their care prior to documenting in the EHR. Additionally, clinicians would often fulfill patient requests after taking vitals, further delaying the actual charting of the data. When the clinicians were ready to batch chart all the vital sign data into the EHR, a significant gap in time had elapsed.

This latency created a knowledge gap for providers making care decisions based on clinical data. In the observation previously mentioned, the patient care technician waited until vitals had been taken for all 11 patients under her care before documenting. For those 11 vitals sessions, the average gap in time between when vital signs were taken and when they were charted was over 75 minutes, with the first set of patient vitals data charted 95 minutes after it was originally captured. For all of the clinical observations witnessed, there was a 46 minute average gap in time between vital sign capture and charting into the EHR.

**Post-Implementation**

After the implementation of CareAware VitalsLink at NCH, nurses and patient care technicians are now using the integrated technology to take and chart patient vital signs at the bedside. Workflows are optimized as the clinicians are no longer required to complete manual documentation into the EHR. Patient safety and data integrity has also improved, as vital sign data is charted into the EHR immediately after being taken, virtually eliminating data latency.

Since conversion, nurses and patient care technicians are now spending an average of only 18 seconds per patient on vital sign documentation (defined as the time spent making modifications and pressing “Save” on the face of the vital sign device). Additionally, the latency gap in time between when vital signs are taken and when they are charted in the EHR is now averaging only 27 seconds per vitals session.

**Benefits Analysis**

The average time spent documenting patient vital signs for nurses and patient care technicians at NCH has been reduced from an average of 1 minute and 42 seconds to an average of 18 seconds. This equates to a time savings of 1 minute and 24 seconds per vitals session, and represents an 82 percent efficiency improvement in the documentation process.
Benefits Achieved:
- 14 minutes saved per clinician per vitals round
- 82% efficiency gain in charting patient vitals
- 99% improvement in data latency

Extrapolating for a 10-patient vitals round, clinicians are now saving an average of 14 minutes per vitals round by using CareAware VitalsLink.

Prior to implementation, there was also a substantial gap in time between the taking and charting of patient vital signs. With CareAware VitalsLink, this data latency has been reduced from an average of 46 minutes and 20 seconds to an average of only 27 seconds. This change represents a 99% improvement in data latency, ensuring clinicians have the correct patient information at the correct time. "It just speeds up the process," says Erica Szczepkowski, Nurse Manager at North Naples Hospital. "Physicians on the floor are not trying to track down the staff saying, 'Hey, what are the last sets of vitals?'... they are already there."

In addition to the efficiency gains realized with CareAware VitalsLink, the solution has also enabled clinicians to have access to the most correct and up-to-date patient information, improving care decisions. Thoman explains, “No longer are vital signs written on paper towels or on the pant leg of [nurses’] scrubs, but automatically transcribed directly into PowerChart, which gives that much more power to the clinicians at the bedside to see real-time data. That certainly was a win for us."

Looking Forward
NCH Healthcare System in Naples, Fla. is using Cerner’s CareAware VitalsLink to optimize patient vital sign capture and documentation in a non-ICU setting. The solution provides electronic transmission of vital sign data into the EHR in real-time, eliminating the need for manual documentation. The implementation of CareAware VitalsLink was the first phase in the multi-solution Cerner Smart Room™ project at NCH. The CareAware® platform has been leveraged to implement other workflow-enabling solutions native to the architecture, providing true system interoperability and enabling the best possible patient outcomes.
Survey Results

Ruby Memorial Hospital, the largest facility in the WVU Hospitals family evaluated Welch Allyn Connex Vital Signs Monitors for a trial over a period of about six weeks—as well as several competitive devices. The following are the unedited hospital survey results of the 58 nursing and technician evaluators.

Was the product easy to utilize?  
Yes 98.3%  
No 1.7%

Does this product meet clinical needs for patient care?  
Yes 96.6%  
No 3.4%

How satisfied would you be with this product as a permanent patient care tool?  
<table>
<thead>
<tr>
<th>Very Satisfied</th>
<th>Satisfied</th>
<th>Dissatisfied</th>
<th>Very Dissatisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>86.2%</td>
<td>10.3%</td>
<td>0%</td>
<td>3.4%</td>
</tr>
</tbody>
</table>

Was the monitor screen clear, easy to read and easy to understand?  
Yes 98.2%  
No 1.8%

Additional comments on next page.
Please provide any additional comments:

• The monitor is very easy to use. Love the lighted cubbies underneath the monitor. Also like that thermometer and pulse oximetry are attached and the ability to wirelessly download to the EMR. Touchscreen is great as well. I feel this product is superior to the Philips dynamap.

• Like the touch screen and how fast the BP reads specially for our kids. It’s great!

• Light is very useful, obtains VS fast

• Very much preferred by patients as the b/p cuff does not need to squeeze as hard to obtain b/p. also the light offers just enough additional light to do the work at night without turning on overhead lights.

• Liked the touch screen. liked the capture of bp on the inflation of the cuff and not to have to wait after it pumped up tightly to get the bp. Very easy to use.

• This product has all the patient care tool easily combined within one unit which helps reduce the incidence of misplacing the 3 care tools in the system (SpO₂, BP, and THERMOMETER). Also the ability of the unit to take BP and give a reading very quickly in HIGHLY valuable in the acute care setting.

• I really like the touch screen and the clip on for the blood pressure cuffs!

• The only thing I don’t like is the blood pressure cord is so short that for isolation rooms you have to take the entire machine in the room instead of just the cord.

• Love it

• The only thing I did not like about this was the fact that the information would disappear after sitting a while and when you go to the history to find the last vitals it was not there unless you had saved it.

• Great product

• I loved this new monitor. it is so much faster, so it saves us a lot of time. plus, it is very easy to use!

• Excellent, love the speed at which it is able to take BPs, very compact, and appreciate its setup and touch screen.

• Very nice piece of equipment love the touch screen and accuracy of machine one of the best vitals machine i have used the company did a fantastic job on this one
Once we received an extra long cord for the blood pressure cuff we were good to go!

The bp cuff worked much faster and patients stated that it did not hurt their arms as much as the older model. Having all of the equipment conveniently ready to use made taking vital signs much more efficient. The bright monitor was very helpful as well.

This product was very nice to use. It takes blood pressures and temperatures very quickly. It’s very easy and convenient to change out the blood pressure cuffs. The touch screen monitor is easy to use. The screen is clear and easy to see.

This machine is wonderful. It makes the task of getting vitals and patient information quick and efficient.

I love how easy and accurate obtaining b/p and vital per this machine, menu easy to understand, cuff fast and painless for the patient. easy to program a frequency for this machine.

The cord for the blood pressure cuff needs to be longer.

The thermometer is on the base unit and you have to have the unit in front of you in order to know if the temp. is done registering and most of the time the unit is behind us and the blood pressure machine beeps that’s how we know it’s done. The thermometer we hold in our hands which we can see and hear beep, which let’s us know it’s done.

Like how you can assign the vitals to patients and print it off. Touch screen very easy to use.

Much faster.

These machines were very user friendly and I like that the thermometer, pulse ox, and blood pressure cuffs are all attached and built into one machine. I also think it was easier to read and review multiple blood pressures because they appear on one machine.

Loved this. easy to use. very efficient. easy to read. Fast

Some issues with touch screen, buttons used most frequently do not always respond immediately when pressed, it sometimes takes several times of pressing the button.
How a unique connectivity solution from Welch Allyn and Cerner helped UAB Hospital to experience significant increases in satisfaction, efficiency and savings.

Presented by: Chris McKay, Systems Analyst at UAB Hospital & Lori P. Silva, Registered Nurse at UAB Hospital

UAB Hospital // Birmingham, AL

Welch Allyn, a leading medical device manufacturer, and Cerner, a premier EMR software provider, have partnered to create a unique data integration. Tune in to learn how UAB hospital used this unique connectivity strategy to improve patient medical records and experienced improvements in patient safety, workflow, accuracy of data and time at bedside. Targeted to clinical staff charged with ensuring accurate and timely patient data in the electronic medical record, these brief, educational presentations will also provide information about the Welch Allyn Connex® Vital Signs Monitor and related Cerner services.

About UAB Hospital

UAB is among the largest academic medical centers in the nation, and UAB Health System is providing the highest quality of health care to its state and region, treating well over one million patients annually. With its rich history of medical breakthroughs, UAB excels at not only delivering, but also developing leading-edge care—effectively translating discoveries made in its laboratories into the newest generation treatments and therapies.

Over the past few years, UAB has used the data integration technologies of Welch Allyn and Cerner to improve patient medical records. As a result, their caliber of care and services continues to attract patients in increasing numbers, as physicians, researchers and staff work in a unique culture of collaboration and innovation that continues to earn international renown.

Chris McKay, Systems Analyst, UAB Hospital

Chris holds a BS in Biomedical Engineering and a Masters in Health Administration. His UAB career began in 2005, as a Clinical Engineer in the Biomed department where he managed the purchase and install of medical devices for multiple ICUs.

Lori Silva, Registered Nurse, UAB Hospital

A Registered Nurse with a Bachelors of Science in Nursing, Lori graduated from the Capstone College of Nursing at the University of Alabama in 1994.

Key Clinical Issues at UAB Hospital Before Implementing Welch Allyn Connected Devices with Cerner EMR

- The time and effort it took for nurses to manually document vital signs was a drain on productivity and nurse satisfaction
- Nurses were more focused on vital data entry than on caring for their patients
- There was a need and desire to align to the Transforming Care at the Bedside (TCAB) framework, which could best be met by implementing an integrated EMR with connected devices

The Benefits of Implementing Welch Allyn Connected Devices with Cerner EMR

- Nursing authentication and positive patient identification are valuable for improving patient safety
- Immediate access to confirmed vital signs readings improves staff productivity
- An end-to-end solution with integrated devices is critical to the overall efficiency and effectiveness of patient care

Measuring the Benefits of Implementing Welch Allyn Connected Devices with Cerner EMR

- Vital signs capture times in the trial environment were reduced by 50%
- Small savings add up—the 49 nursing units are predicted to save 9800 hours or more per year
- UAB hospital is experiencing significantly increased financial outcomes, improved patient safety and happier nurses
Automating vital signs can be a valuable enhancement to your facility. Tune in to hear Bernadette Medve and Maureen Cywilko discuss their experiences with automating vital signs – from life before connected devices and EMR to today. You’ll hear the inside story on how connected devices have reduced vital signs errors, reduced infection and alleviated the heavy burden on nursing in their facility.

Bernadette Medve, RN at St. Joseph's Hospital & Maureen Cywilko, Nurse Manager

St. Joseph's Hospital // Syracuse, NY

Presented by: Bernadette Medve, RN at St. Joseph's Hospital & Maureen Cywilko, Nurse Manager

A Nurse’s Perspective:
The Benefits of Electronic Vital Signs Documentation

A Nurse Manager’s Perspective:
Before Electronic Vital Signs Documentation

A Nurse Manager’s Life:
After Welch Allyn Electronic Vitals Documentation
Documenting Vital Signs—Can it really be this simple?

Presented by William Arnold RN BSN, Nursing Informatics Manager

Erie County Medical Center // Buffalo, NY

Automating vital signs can be a valuable enhancement to your facility. Tune in to hear Bill Arnold, Nursing Informatics Manager at Erie County Medical Center discuss his facility’s experience automating vital signs - from the early hopes and goals, to their current state three years after go-live. You’ll learn tips, tricks, and strategies to reduce vital signs errors and instill people’s confidence in your EMR, all while reducing the heavy burden on nursing.
Vital Time Savings
Evaluating the Use of an Automated Vital Signs Documentation System on a Medical/Surgical Unit

By Meg Meccariello; Dave Perkins; Loretta G. Quigley, RN, MS; Angie Rock, MBA, CCRP; and Jiejing Qiu, MS

ABSTRACT
Vital signs documentation was the focus of this study, because multiplication errors, transcription errors, illegible results, late data entry, misidentification of the patient, undocumented readings and missed readings can lead to faulty data, as well as unnecessary and potentially dangerous interventions or withholding of treatments. Technology is now available to medical/surgical units that automate the vital signs documentation process.

This study compared the accuracy and time efficiency of manual-entry vital signs documentation with workflows that use a data management system to automatically transfer vital signs assessments from a bedside vital signs device into the electronic medical record. The study found that the automated vital signs documentation system was more accurate than manual documentation and errors were reduced by 75 percent. The wireless automated vital signs documentation system saved time compared to manual documentation: and combined vital-signs acquisition/documentation times were reduced on average by 96 seconds per reading.

At Anywhere Hospital it is 7:30 a.m. and the day shift is just beginning. Sue, a nurse’s aide, begins to collect patients’ vital sign assessments. She starts with room 5106 and moves through her assignment. She gathers the results and writes them on her assignment sheet to be documented in the electronic medical record (EMR) after she completes each of her five patients. Mr. Couldbeu is in room 5108 by the window. Sue notes that some of Mr. Couldbeu’s readings are above his baseline, however the patient looks fine. She will mention it to the charge nurse when she sees her. Sue moves on to her next patient, but she is interrupted by Joan, a nurse taking care of patients on the other side of the unit. Sue is asked to help move a patient on the other side of the unit to a chair. At 7:39 a.m. Mr. Couldbeu pushes his call button. He has chest pain. The RN who answers his call takes his vital signs, administers his medication and checks the EMR to compare his current status to his morning assessments. They have not been charted and she cannot find Sue.

Vital signs (blood pressure, pulse, respiration, oxygen saturation and temperature) are indicators of body system health. They provide information on how patients are adapting to the changes brought on by illness and disease. Treatment decisions are routinely made subsequent to the assessment of vital signs, one of the hallmarks of nursing care.
In addition, “Vital signs are a tool used to communicate patient deterioration to healthcare providers”, 2 (p479) Endacott, Kidd, Chaboyer, and Edington found that both nurses and doctors relied on vital signs when identifying patient deterioration. 3 Assuring accurate and timely vital signs documentation may lead to improved patient care.

Vital signs documentation accuracy and clinician time efficiency were the focus of this study because technology is now available to medical/surgical units that automates vital signs documentation, transferring results from the automated bedside vital sign machine to the electronic medical record.

REVIEW OF LITERATURE

Hospitals have applied medical technology to reduce errors, but until recently have focused on the most critical care areas. Experience has shown that many hospitals undertake the move to new technology without fully understanding the impact on workload, patient safety and data accuracy. Healthcare providers are often told that a new piece of equipment will be safer for patients and a time saver for staff, only to find out that the system has a steep learning curve or takes more time than the “old way.” This often results in frustration for frontline staff and a waste of scarce resources.

In an era of spiraling costs, competition and the advent of evidence-based practice, healthcare practitioners expect research studies to aid them in their clinical practice decisions. Evans, Hodgkinson, and Berry 4 found little evidence of study in the area of use of advanced technology in vital signs measurement and noted that these technologies have the potential to change current practice. Lockwood, Conroy-Hiller and Page 5 (p208) also noted the need to research “the role of new technology in patient monitoring.”

ACCURACY IN DOCUMENTATION

While the vital signs acquisitions and documentation process is taught in the early weeks of most nursing programs, the documentation of vital signs can be fraught with problems. Patient identification is completed by asking the patient his or her name, and comparing one of two long series of numbers (potential patient misidentification). Results are gathered in 15- or 30-second timeframes and are documented as per-minute results (potential multiplication error). Clinicians memorize vital sign results (potential for forgetting result or remembering incorrectly), then, after the measurements are complete, write them down on scrap paper or paper towel (potential illegible result), later transferring them to paper forms or manually entering them into the electronic medical record (potential transcription errors and transposition of results).

When documenting a full set of vital signs (blood pressure (systolic/diastolic), pulse, respiration, oxygen saturation and temperature), there are six potential areas or errors. Further, what is often double documentation, first documenting on paper then in the electronic medical record, creates even more chances for human error.

The most precise vital signs assessment may not lead to an accurate response if it is not documented correctly and in a timely manner. Cioffi, Salter, Wilkes, Vonu-Borceanu and Scott, in their study of an emergency department, found that inadequate documentation was one of the main reasons clinicians failed to respond to patients with abnormal vital signs. 6 McGain et al., when looking at vital signs documentation during the first seven days after surgery, found significant levels of incomplete documentation. 7

Multiplication errors, transcription errors, illegible results, late data entry, misidentification of the patient, undocumented readings and missed readings can lead to faulty data, as well as unnecessary and potentially dangerous interventions or withholding of treatments.

Chen et al., evaluating the Merit Study investigators, found in their randomized multi-site study “even in the hospitals that knew they were a part of clinical trials monitoring, documentation, responses to changes in vital signs were not adequate.” 8 (p2096)

The authors further evaluated the Merit Study data and found that 77 percent of the patients’ studied were missing one vital sign measurement prior to an adverse clinical event. The use of technology may help decrease these errors.

Technology has been applied to prevent errors in other areas of nursing care. Bar-coding is now being used to decrease the human error factor at the point of care, preventing misidentification of patients. Foote and Coleman found that, when used for medication administration, bar code technology reduced errors by 80 percent. 9 Adding the use of bar code technology to vital signs documentation could assure correct patient identification, making certain results are charted in the correct electronic medical record.

The advent of the electronic medical record system has helped the accuracy of patient documentation. Gearing et al., evaluated the use of the electronic record in vital signs documentation. 10 They found that out of 613 sets of vital signs taken on a medical/surgical unit and manually documented using paper records, 25.6 percent of the medical records had at least one error related to transcription or result omission. As for a cardiac step-down unit that utilized an electronic medical record system, 14.9 percent of the 623 records had one or more errors related to transcription or result omission. Smith et al. completed a post implementation study to using the Gearing results to determine the accuracy of an automated system that sends the vital sign measurements from the vital sign monitor to a PDA and then uploads them in the medical record. 11 They found that the error rate decreased to less than 1 percent.

CLINICIAN TIME

Clinician time is one of the most valued and costly resources in healthcare. “Because vital sign measurement in hospitalized patients is a frequently performed procedure, investigating the potential of cost containment in this practice is clearly warranted.”12 (p244) A recent time and motion study showed that nurses spent 35.3 percent of their working time completing all types of documentation.13
Storfjell, Omoike, and Ohlson looked at the costs of nurses completing patient care activities in 14 medical/surgical units in three hospitals.\(^4\) They identified activities that did not benefit patient care and their associated costs. They found clinical record management was one of the activities with the highest amount of time wasted. There were different reasons for the wasted time for electronic and paper documentation, but no time difference. It was determined that the wasted time included in the clinical record task was $210,853 annually for an average medical/surgical unit.

The time associated with vital signs documentation was evaluated by Donati et al. while they were researching the impact of clinical information systems in the intensive care unit.\(^5\) They found that the ICU nurses spent 12 minutes per patient per day manually charting vital signs results. After the implementation of the clinical information system that automated vital sign documentation, the time spent dropped to two minutes per patient, per day. Time spent on double documenting vital signs is time away from patients.

**RESEARCH DESIGN**

A quasi-experimental design was used to gather data pre- and post-implementation of a comprehensive automated vital sign capture and documentation system. This study included a review of current hospital procedures, observations of current practices and a workflow analysis as it relates to vital sign capture and documentation.

The study compared automated documentation workflows with the manual entry documentation workflow currently in use on the unit as they related to the accuracy of documentation and timeliness. Factors evaluated were workflow time studies and documentation error identification.

**PROCESS**

Time and motion studies were chosen for accuracy in obtaining more precise times for each activity.\(^6\) It was felt that this method, although time intensive, would provide the most accurate and consistent results. Finkler, Knickman, Hendrickson, Lipkin and Thompson compared work sampling and time and motion techniques, finding that “the work-sampling approach, as commonly employed, may not provide an acceptably precise approximation of the result that would be obtained by time and motion observations.”\(^7\)

Potential errors in vital sign documentation were researched and quantified.

- Prior to the study, the potential errors were categorized as:
  - Transcription error. Transposed digits: e.g., writing 15 instead of 51.
  - Typographic error. Types in computer incorrectly.
  - Needed to repeat VS due to forgetting result which includes omission of result.
  - Picked wrong patient on computer.
  - Other. Unanticipated issuers resulting in errors.

Research documentation sheets were created for each workflow, and checkboxes were created to assure inter-rater reliability. For the purpose of this study, a set of blood pressure, pulse, respiration, temperature, and oxygen saturation is considered as one data point.

Setting

The study was conducted on an acute care medical/surgical unit at a midsize hospital from December 2007 to January 2008. The time and motion study was completed during two time periods—7 a.m. to 8:30 a.m., and 10 a.m. to 12 p.m.—four days a week for four weeks. The hospital’s institutional review board approved the study prior to enrolling any subjects. As required, informed consent was obtained from the participating patients and unit staff prior to performing any study-related procedures.

**SAMPLE**

A convenience sampling of unit clinicians was invited to participate. There were no repercussions for not participating and no clinician names were collected during the study. An attempt was made to utilize the same clinicians for each documentation method; some clinicians did not participate in each of the workflows due to shift swings or staffing needs, while others utilized each method.

A convenience sampling of hospitalized patients was invited to participate. In order to be included in the study willing patients had to be capable of giving informed consent. Consent was valid until revoked and several patients participated more than once.

The unit clinicians, registered nurses, licensed practical nurses and nurse’s aides were observed, and time studies were completed during routine vital sign assessments on consenting patients. Fifty-five patients were enrolled and 25 unit clinicians participated.

**METHODS**

The study compared the accuracy and time efficiency of:

1. The current vital sign machine and manual documentation workflow.

   This involved the use of a vital sign machine to obtain blood pressure, pulse, temperature and oximetry readings. Pain and respiration results were obtained manually. Paper and pen were used to record vital signs assessments, which were then manually transferred into the electronic medical record using a bedside computer. Handheld devices were available for manual input and automated transfer into the electronic medical record, but they were not preferred by the clinicians thus only one reading was completed with this tool.

2. The study vital sign machine and automated vital signs documentation system.

   The vital sign machine’s bar-code scanner was used to identify the patient and clinician, and the machine was then used to obtain blood pressure, pulse, temperature and oximetry readings. The pain and respiration results were obtained manually and entered into the vital sign machine. The clinician had the opportunity to verify the accuracy of the vital sign readings, and then pressed a button to send the results to the electronic chart. This system automatically transferred the vital sign results from the bedside to the electronic medical record, eliminating the need to manually document.

**AUTOMATED VITAL SIGNS DOCUMENTATION SYSTEM**

The automated vital signs documentation system utilized in this study was a commercially available product that has received 501(k) clearance from the FDA. With the software, vital signs assessments are automatically transferred from the bedside vital
sign machine into the electronic medical record. The method utilizes bar code technology to scan the patient's ID bracelet and an automated vital sign machine to capture the heart rate, blood pressure, temperature and oximetry.

The clinician assesses the patient's pain level, and observes and measures the patient's respirations, entering them both using the automated vital sign machine or laptop. The automated vital signs documentation system uses three methods to transfer vital signs results from the bedside vital sign machine to the electronic medical record - wireless, computer based and batch.

The automated vital signs documentation system sends the information to the patient's electronic medical record in one of three ways:

1. Wireless method. Wireless transfer of vital signs from the device to the electronic medical record.
2. Computer method. A mobile computer with a vital sign machine mounted on it transfers vital signs to the electronic medical record with bedside computer entry of pain and respiration assessment.
3. Batch method. Readings are stored in the vital sign machine, which is later manually docked at the computer station, allowing all readings to be imported into the electronic medical record.

The hospital's clinical systems analysts and information technology department, along with the manufacturers' representatives, worked together to interface the hospital's EMR with the automated vital signs documentation software. Methodical testing was completed in both test and live environments prior to research implementation.

Research assistants, staff educators and college of nursing faculty members were masters-prepared clinical experts, and not linked to the clinical unit staff in any way. They adopted a nonparticipant role when observing for errors in vital sign documentation. All research assistants were provided with descriptions of each error category, and the principal investigator was available during each observation session to answer questions concerning the categories. Research assistants spent a maximum of two hours and 30 minutes per observation session.

The research assistants used stopwatches to measure the time from application of the cuff to the end of the vital sign acquisition and documentation activities occurring in the patient room. Some of the workflows required leaving the patient's room for final documentation. For workflows requiring documentation outside the room, a second time testing occurred. For these workflows, the timing began when the unit clinician logged into the system and ended when they signed off. If the unit clinician was documenting for more than one patient, the total documentation time was measured and divided by the number of patients for which they were documenting. The documentation result was added to the vital signs acquisition time to create the total time (Total Time = Vital Sign Acquisition Time + Documentation Time Outside the Room, if applicable). The time lag between the acquisition of the vital sign measurements and final documentation for those methods requiring the unit clinician to leave the room to document was not timed.

A complete study record included information on the accuracy in documentation of each vital sign (blood pressure, pulse, respiration, temperature and oxygen saturation), notation of the method that was being evaluated, and time result for vital sign acquisition and documentation as the method required. For the purpose of this study, a set of blood pressure, pulse, respiration, temperature and oxygen saturation is considered as one data point.

**TRAINING**

Participating clinicians did not have experience with the study vital sign machine and automated vital signs documentation system prior to the study. Training occurred on the unit the day prior to the start of testing; clinicians attended a one-hour orientation and educational session, which included a brief demonstration and hands-on session. All staff members had utilized other brands of mobile vital sign devices in the past.

**STATISTICAL METHODS**

The documentation error rate of the manual vital sign documentation system was compared with that of the automatic vital sign documentation system by a Fisher's exact test since one expected cell frequency is less than five.

Descriptive statistics were calculated for all time variables, followed by the Kolmogorov-Smirnov test to check the normality. Comparisons of total time by different methods were analyzed using t-tests if the data follow a normal distribution. For time variables with skewed distribution, the Mann-Whitney U test was employed to compare the medians.

The SAS® for Windows, v9.1.3. Cary, NC was used to conduct the data analysis. All statistical analyses were based on the significance level of 0.05.

**RESULTS**

**Accuracy in Documentation**

**Manual Documentation Method**

Out of 52 sets of vital sign, with each set including blood press-
sure, pulse, respiration, temperature and oxygen saturation, seven (13.5 percent) errors occurred in the manual documentation method—four when manually documenting utilizing the current computer system present on the unit (two typographical error, one transcription error and one need to repeat due to forgetting the result), and three when the clinician documented on scrap paper and left the patient’s room to manually enter the results using current computer systems in the hallway (one typographical error, one transcription error and one need to repeat due to forgetting the result).

Automated Documentation System
Out of 92 sets of vital sign, with each set including blood pressure, pulse, respiration, temperature, and oxygen saturation, three errors (3.3 percent) occurred in the automated documentation system, one error in each of the three workflows—wireless (other error—one difficulty scanning patient ID bracelet), batch (one typographic error) and computer method (other error—one omission, failure to enter required vital sign assessment).

SOFTWARE
During the study, the software transferred vital signs results from the bedside vital sign machine to the electronic medical record with 100 percent accuracy.

When compared to current manual documentation workflow, the automated documentation workflows overall reduced documentation errors by 75 percent (13.5 percent vs. 3.3 percent, Table 1, p = 0.02).

CLINICIAN TIME
The study evaluated whether the time required for vital signs acquisition and documentation was different between the methods. Documentation for workflows requiring vital signs entry outside the room required separate time testing. The result was added to the vital signs acquisition time to create the total time (Total Time = Vital Sign Acquisition Time + Documentation Time Outside the Room, if applicable). If the clinician was documenting for more than one patient, the total documentation time was measured and divided by the number of clients for which they were documenting.

On average, clinicians spent the least time on capturing and documenting the patient’s vital signs by using the wireless workflow (107.50 seconds ± 41.87). The manual documentation method—documenting on paper and manually transferring the results to the electronic medical record—was the most time intensive (203.69 seconds ± 62.88). The order of total time by different methods is presented in Figure 1.

Combining vital signs acquisition and documentation times, the wireless automated entry was the most time-efficient. On average, it saved significantly more time than the paper transfer method (107.50 seconds ± 41.87 vs. 203.69 seconds ± 62.88; p < 0.0001).

LIMITATIONS OF THE STUDY
The timeframe for the post-implementation time and motion outcome evaluation was one day after a one-hour training session. This timeframe is less than ideal, as Butler and Bender emphasized the need to allow a six-month learning curve for adults prior to post-implementation studies. The resulting time savings in the automated documentation wireless method suggest a shorter than average learning curve.

The computer hardware in which the automated vital sign documentation software was loaded in the computer-based workflow was new to the clinicians. A tablet-style computer was chosen for use in the study, which required the use of an electronic pen to move through the application. It proved to be difficult for the clinicians to utilize and was not needed for the software to function. This factor may have affected the documentation times. Repeating the study with a computer system that clinicians are more familiar with may lead to different results.

SUGGESTION FOR FUTURE STUDY
The time lag between the acquisition of the vital sign measurements and final documentation for those methods requiring the clinician to leave the room to document was not timed in this study, but would be of interest for future studies. Delays in entering the vital sign results into the electronic chart impede the ability of others to access the information and evaluate the results.

DISCUSSION
This study looked at potential improvements that can be made...
in the care areas where the majority of the hospital’s patients reside—medical/surgical units. This study found that the wireless automated vital sign documentation system saved time and was more accurate than the manual documentation methods.

The automated vital sign documentation system utilizing bar code technology at the point of care may decrease the potential for human error. Although clinicians who participated in this study only had one hour of training on the use of the automated documentation software, the vital signs process showed significant time savings. In this study, the automated documentation method reduced errors by 75 percent when compared to manual documentation. Automating the vital signs documentation process may reduce the labor required to document the results, as well as providing more accurate and timely data.

The wireless method was the most time-efficient in capturing and documenting vital signs. On average, it saved 96.19 seconds per reading over the manual documentation method. On a 36-bed unit with vital signs ordered on average of four times a day, this method could save almost 120 hours of staff time per month.

Changes in vital signs have been linked with increased risk for clinically adverse events. If the documentation of patient vital signs is incorrect or missing, these changes will not be identified. In an era where medical mistakes make front-page news, automating the vital signs documentation process may speed vital sign results to care providers, allowing clinicians to more quickly react to important changes in patient health status.

REFERENCES


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Meg Meccariello is an Associate Professor and Clinical Learning Lab Manager at St. Joseph’s College of Nursing at St. Joseph’s Hospital Health Center.

Dave Perkins has designed Welch Allyn medical devices for 22 years, currently as marketing director for vital signs systems focused on reducing effort and errors for general care floors.

Loretta G. Quigley, RN, MS, is the Associate Dean of St. Joseph’s College of Nursing at St. Joseph’s Hospital Health Center.

Angie Rock, MBA, CCRP, is the Clinical Operations Manager at Welch Allyn and Chair of the Oregon State Chapter Society of Clinical Research Associates.

Jiejing Qiu, MS, is the Senior Biostatistician at Welch Allyn Inc. Ms. Qiu was formerly a Biostatistician at the Biostatistics Research Center at the Tufts Medical Center in Boston, MA.
Automated Vital Sign Documentation for Medical Surgical Units: Saving Time and Increasing Accuracy

Fact or Fairytale? Meg Meccariello RN MS, Jennifer Johnstone RN MS

The vital sign (VS) capture and documentation process is the focus of this study because the most precise vital sign assessment will not lead to an accurate response if it is not calculated and documented correctly. Lockwood, Conroy-Hiller, & Page (2004) also noted the need to research “the role of new technology in patient monitoring.”

Technology is available to automate VS documentation, transferring results from the bedside vital sign machine to the electronic medical record. The purpose of this study was to compare the accuracy and time efficiency of: Manual documentation of vital signs with, a comprehensive automated vital sign documentation system.

Research Design:

This non-randomized observational study took place Dec, 2007 – Feb 2008, on an acute care medical surgical unit. Quasi-experimental design was used to gather data pre and post implementation of a comprehensive automated vital sign capture and documentation system.
Implications for Practice:

In an era of spiraling costs, competition and the advent of evidence based practice; health care practitioners expect independent studies to aid them in their product purchasing decisions.

- **Accuracy:** Vital Signs (VS) are a tool used to communicate patient deterioration to healthcare providers (Andrews & Waterman, 2005, p. 478). The automated vital sign documentation system decreased errors by 75%. During the study, the software transferred VS results from the bedside to the electronic chart in seconds with 100% accuracy. The system utilizes bar code technology at the point of care, which decreases the potential of human error in the vital sign capture and documentation process. Use of this system could speed VS results to care providers and improve patient care.

- **Clinician Time:** Clinician time is valuable. A recent time and motion study showed that nurses spent 35.3% of working time completing documentation (Hendrich et al., 2008, p. 30). VS documentation wastes time and the frequent duplication of effort wastes more. In this study the automated vital sign documentation system saved about 30 seconds when compared to the manual bedside entry into the electronic chart and about 60 seconds when compared to the paper and pencil method. Time savings that could be better used meeting the needs of our patients.

Methods:

The RN's LPN's and nurses aides were observed and time studies were completed during routine vitals on consenting patients. VS documentation errors were cataloged in pre-specified categories. This study compared to:

- **Current Vital sign acquisition and documentation workflow:** Use of a vital sign machine to obtain blood pressure, pulse, temperature and oximetry readings and manually obtained the pain and respiration results. All readings were manually documented with a mobile computer or the results were written on paper and the clinician left the patients room to manually document into the electronic chart using computers in the unit hallway.

- **Automated Vital Sign Documentation System.** This system when coupled with a mobile vital sign machine that sends vital sign assessments from the bedside to the electronic chart. The vital sign machine's bar code scanner is used to identify the patient and clinician, and it is used obtain blood pressure, pulse, temperature and oximetry readings. The pain and respiration results are manually obtained and programmed into the vital sign machine. All results are transferred to the electronic chart eliminating the need to manually document.
Automated Vital Sign Documentation for Medical Surgical Units: Saving Time and Increasing Accuracy

Results:

The wireless automated vital sign documentation system was the most time efficient. With one hour of clinician training during its first three days of use, on average, it saved significantly more time than both the paper transfer method (107.50 sec vs. 203.69 sec; p<0.0001, t test) and direct entry method (107.50 sec vs. 131.63 sec; p=0.01, t test.)

During the study, 10 out of 144 records had documentation errors. The automated documentation method decreased documentation errors by 75% compared to the manual entry methods (13% vs. 3%, p=0.02,).

Conclusions:

As healthcare care providers we are often told fairytales about how a new piece of equipment will be safer for patients and a time saver for staff only to purchase it and find out that the system has a steep learning curve or takes more time than the “old way”. This often results in frustration for front line staff and a waste of scarce resources. In this study we found that the wireless automated vital sign documentation system saved time and was more accurate than the manual documentation methods.

For further information, please contact:

Meg Meccariello RN MS
(315) 448-6357

References


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3:10 P.M.
Susan, an RN on the med/surg floor of a midwestern hospital, has just begun her shift. She’s been off for a few days; tonight she’ll have nine patients, one-third of whom were admitted in the last 24 hours—and there are no nursing aides to assist her tonight. Susan’s patient load has grown steadily throughout the past few years, and this has been a source of some concern to her. Still, the hospital seems to be heading in the right direction in other ways. For example, it has been using electronic medical records (EMR) for over two years now.

First on Susan’s to-do list: check in on George S., a 68-year-old diabetic who was admitted to the floor just two hours ago following hip-replacement surgery.

3:35 P.M.
George appears stable, though he is complaining of thirst. Susan gives him a sip of water, then proceeds to check his IV and take his vitals: blood pressure (120/90), heart rate (95 bpm), SpO₂ (96%) and temperature (98.7 °F). They all seem reasonable, but his heart rate’s a little high. She makes a mental note to “keep an eye on him.” Susan scribbles the vitals data onto a scrap of paper; she’ll enter the data into the computer later.

5:05 P.M.
Susan is delivering meds when she’s interrupted by George’s wife—frantic because she’s been unable to wake George. Susan hurries down the hall to find George unresponsive; he looks pale—and grabbing his hand, she sees there is a lack of perfusion to his fingers. She suspects dehydration or hypovolemic shock due to post-op hemorrhage. Susan pages the attending, who orders an ECG. The attending is busy and a second-year resident arrives just as the first ECG traces scroll across the monitor’s display. George is tachycardic.

The attending immediately orders George moved to the ICU for monitoring and treatment. And there’s a very real chance he’ll be back in the OR shortly.

6:36 P.M.
While in the ICU, George is continuing to receive fluids intravenously. Fortunately, he has also responded to the cardiac meds—his heart rate has dropped and his condition has stabilized. George will be okay. But back down on the med/surg floor, Susan is visibly shaken and confounded—what went so terribly wrong?
Vitals Are Vital

What Susan didn’t know when she recorded George’s vitals at 3:35 P.M. is that George is severely hypertensive; as such, his blood pressure of 120/90—a “normal” reading for most of us—was dangerously low, and an indicator of a critical change in his condition. If Susan had had access to his most recent vitals at the bedside, she would have seen that his blood pressure at admission to the floor was an elevated 170/80. Armed with that information, Susan would have immediately called a consult with the attending for probable causes.

In this instance, George was suffering from severe post-operative dehydration; the extensive time delay in treatment resulted in lowered blood pressure and tachycardia—and a potentially catastrophic outcome.

According to Hal Wasserman, M.D., eICU medical director at Columbia Presbyterian Hospital, vitals can be an important leading indicator of health. “Clinical deterioration caused by serious infection, internal bleeding or respiratory failure is often preceded by subtle alterations in blood pressure, heart rate, and oxygenation. When such basic indicators drift toward the abnormal, they may be signaling a dangerous new direction in a patient’s clinical course.”

The unfortunate reality is that near misses (and far worse) due to inaccurate or missing vitals data occur far too frequently in the clinical environment. And ironically enough, the overriding reasons are often preventable. Consider the following:

- Today, nurses are handling more and sicker patients. In fact, patient workloads are a full 25% greater than just 10 years ago.
- At the same time, nurses are spending more and more of their workday documenting clinical data, due to larger patient workloads and more stringent regulatory requirements (e.g., JCAHO). Some estimates show nurses spend 25% of their time collecting data or transcribing it.

The dire consequences—a decrease in data integrity (with nurses relying on scraps of paper and their memory), coupled with an increase in data latency (the time lag from when the data is captured to when it is available in the medical record)—both contribute to poorer patient outcomes.

And if you think the introduction of point-of-care computing and electronic medical records (EMR) are the answer to the nursing documentation dilemma—think again. Because the vitals often are not integrated with the EMR, the piece-meal introduction of technology in the clinical environment can have the unintended consequence of expanding the nursing staff’s workload. On Susan’s floor, vitals data are first written on paper, then later manually transcribed to the EMR—producing a “double documentation” scenario and all the concomitant opportunities for transcription, patient identification and clinical errors due to data latency.

At a Minneapolis hospital, Clinical Engineer Mike P. shared his thoughts on the data capture and documentation dilemma: “We need a point-of-care workstation that provides the total solution—one that incorporates vitals to make patients safer, improves workflow, and integrates with our [electronic medical record] system.”

And so it was with a clear understanding of the critical and pervasive need for a better way to capture and record clinical data at the bedside that Welch Allyn embarked on a groundbreaking project. The objective: to identify and quantify the improvement in patient care in various hospital settings through automated vitals capture and integrated data access.

In collaboration with clinicians at two mid-sized hospitals, a team of engineers from Welch Allyn took on the daunting task of identifying, measuring and fully characterizing the complexities of the nursing workflow in various patient care settings. Then, armed with this systems view of the nursing environment, the team set out to marry technology, process modifications and a truly interdisciplinary mindset to produce an automated point-of-care data capture technology that fully integrates with hospital information systems (HIS).
According to Doug Linquest, group vice president of Monitoring & Defibrillation, "While much attention is being paid to automated vitals capture and point-of-care computing solutions—particularly for the OR and Intensive Care units—Welch Allyn is unique in its commitment to understanding and optimizing the entire nursing workflow in the medical/surgical clinical environment. We can say with confidence that few if any of the other major medical device manufacturers are as keenly focused on improving the workflow for this critical segment—where 80% of the hospital patient care is delivered."

Through its two pilot projects—each spanning many months—the Welch Allyn team demonstrated how the judicious use of technology can significantly reduce errors (including patient identification, transcription and data latency errors) while improving efficiencies (in vitals data capture and transcription). The net effect: dramatically improved patient outcomes and a lightened workload for overburdened nurses.

Welch Allyn’s automated point-of-care data capture technology is embodied in Welch Allyn Connex: a state-of-the-art solution that seamlessly links vitals devices with software to completely document patient care at the bedside.

Welch Allyn Connex uses barcode technology for clinician and patient identification, and works with various vitals devices—often allowing hospitals to use their existing monitors. And Welch Allyn Connex can operate as a stand-alone database or can link to the hospital electronic medical record system.

To Err Is Human

The Welch Allyn team recognized that capturing a "snapshot" of the hospitals’ current vitals capture processes was a critical first step in optimizing the nursing workflow at the point of care. And by quantifying errors and latency problems, the team would have an unequivocal baseline from which to measure the improvements realized through Welch Allyn Connex.

For example, at one hospital the Welch Allyn team shadowed clinicians during their vitals capture and documentation rounds, and studied 54 documentation events covering several departments and caregivers. In total, they witnessed 26 errors—implying that 48.1% of the actions had an error. In this study, all the errors were eventually corrected, but many in the real world are overlooked.

The types of errors (such as misidentifying patients and typing data into the wrong fields on the medical record) give a useful feel for the deficiencies of the vitals documentation processes typically used in most hospitals.

The Welch Allyn team also measured the time it took vitals data to make it from the measurement site to the electronic chart. In the study, 22% of vitals readings took more than 51 minutes to reach the official record, where all caregivers have access. And a sizable portion (10%) took longer than three hours. The “Susan Scenario” demonstrated just one of the many reasons why immediate access to the patient’s vitals data record is of paramount importance.

Said one nurse in the study (echoing the feelings of many), “I can recall many times taking vitals and scribbling them on a paper towel. They then went into my pocket where they often stayed until I got home. The reality was that many of these ‘pocket’ vital signs never got documented into the medical record.”

A Vital Solution

The nature of the data accuracy errors and latency problems revealed in the direct observation and time-trial studies—almost all of which were the result of human error and time limitations—convinced the Welch Allyn team to tackle the ambitious task of streamlining the complete bedside documentation process.

And Welch Allyn Connex does just that. Here’s an example of how Welch Allyn Connex transforms the entire vitals documentation workflow:

Vitals are often captured on standard rounds, several times per day (more often as patient acuity increases). Using the Welch Allyn Connex system, a nurse or aide captures vitals much as they typically do. But instead of having to document the readings manually, users can capture the complete patient data at the bedside through a focused software
application running on a wireless computer. In addition to the typical automated vitals data, users can capture manual measurements (such as pain or respiration rate) and modifiers and qualifiers of the results. These modifiers are important; for example, pulse oximetry readings will vary significantly—if the patient is on or off oxygen therapy—and will guide different types of care based on the complete information—both data and modifiers.

Additionally, since Welch Allyn Connex is wirelessly connected to a central database, previous readings and alert levels for specific patients are available at the time of measurement—immediately highlighting abnormal readings.

Through an easy-to-use interface, nurses can document their care as quickly as they capture it. And once they press SAVE the data is immediately sent to a networked database (e.g., an electronic medical record) for all to see.

Since information is no longer limited to those who have access to the single paper patient chart, nurses and physicians can always view the most complete and up-to-date data.

Through the automation of the vitals capture process and integration with the EMR, Welch Allyn Connex virtually eliminates transcription errors.

And the good news doesn’t stop there.

The Welch Allyn team measured time saved through automatic patient identification and by eliminating transcription. The team studied 219 vitals capture events before and after Welch Allyn Connex implementation.

The study results revealed that Welch Allyn Connex saves 0.92 minutes for every vitals capture reading (p<0.0001) through reduced documentation time. For a typical floor, these savings translate to nearly two hours per day—a $19,376 savings per year in nursing time for a typical 30-bed floor. This can add up to over $150,000 per year for a 300-bed hospital.

Nurses aren’t trained as typists, and it’s safe to say that documentation is among the least favorite parts of any nurse’s workday. With Welch Allyn Connex, nurses can focus more on taking care of their patients, improving both patient outcomes and nursing staff morale.

Welch Allyn Connex provides other time savings as well, including reducing time spent tracking down data and transferring data between people, and the cost of repeated vitals capture events. Though not measured in these studies, these are not insignificant parts of the typical nursing day.

Says RN Sharon S., “[The system] automatically puts the vitals into [the EMR]—placing my patients’ vital signs in a central location. The handheld we were using prior was very difficult to use. [The Welch Allyn system] is much simpler to use. Barcoding decreases errors in patient ID, and transcription errors have decreased.”

The Susan Scenario Revisited with Welch Allyn Connex

3:35 PM

Susan begins her rounds by checking in on George S. First step—scan George’s patient wristband, and George’s vital record appears. Susan notices that George is hypertensive; his BP reading at 1:03 P.M. was 170/80. She captures current vitals with the attached device. An alert signals a precipitous drop in BP to 120/90.

Susan calls for a consult with the attending physician, who reviews the patient’s data from another floor. Post-surgical dehydration is suspected; at the attending’s request, Susan adjusts his IV flow rate for treatment for dehydration.

4:45 PM

George’s BP has returned to normal. Patient is resting comfortably.

Patient crisis averted via Welch Allyn Connex.

Not exactly the spellbinding stuff of an “ER” episode, but in the real world, it’s the perfect ending.


Due to the sensitive nature of the following error findings, the trial hospitals will not be disclosed.

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Welch Allyn
Advancing Frontline Care®
Overview

Customer
Trinity Medical Center

Location
Steubenville, OH

EMR Partner
MEDITECH MAGIC

Customer Profile
Trinity Medical Center is a 471-bed facility in eastern Ohio.

The Challenge

Vital signs provide an important leading indicator of patient health, and often yield the first clues to a patient’s diagnosis and treatment options. In surgical units in particular, where blood components are regularly administered, access to timely and accurate vital signs readings is of paramount importance in identifying and treating potential transfusion reactions.

Traditionally, clinicians on the med/surg floors at Trinity Medical Center manually documented patient vital signs data in the EMR and/or the patient charts. Many times, patient vitals readings written on a scrap of paper would never make their way into the patient record. Becky Piko, RN, clinical manager, explains: “We would often end up searching for patient vitals—sometimes they’d turn up in a nurse’s pocket on a paper towel scrap—and then we’d have to go back and get that record into the EMR, or transcribe it manually on the paper charts. Our documentation process was inconsistent, and often not timely.” Piko further commented that the potential for patient ID errors, transcription errors and lost vital signs readings that are a consequence of manual documentation methods was always a source of concern because of the potential impact on the quality of patient data—and therefore patient care.

So when planning and budgeting activities began for two new 20-bed med/surg units at Trinity Medical Center, the cross-functional committee charged with evaluating prospective technology improvements placed an automated vital signs documentation system high on the list of desired upgrades. Says Piko, “We had been talking for some time about going to paperless vital signs documentation—and so we were thrilled to have the opportunity to achieve our vision as part of our hospital expansion. But with the limited budget dollars that were ultimately allocated for this new technology, we knew we had to choose wisely.”

Trinity Medical Center achieves its vision of efficient and accurate documentation with Connex®

Trinity Medical Center uses the Welch Allyn Connex Vitals Management System to automatically transfer patient vital signs to its electronic medical record system, MEDITECH MAGIC. Clinicians in the hospital’s newly opened state-of-the-art med/surg units use Welch Allyn Spot Vital Signs® LXi devices to capture patient vital signs and then wirelessly send the data to the EMR, giving hospital staff access to complete, accurate and real-time patient assessments on demand.
After a thorough review of the competitive options, the Welch Allyn Connex system quickly rose to the top as a vital signs documentation system that would provide the desired workflow option for the new med/surg floors at the best value. With the installation of a wireless network on the new floors, the Connex wireless workflow option using Spot Vital Signs® LXi devices—one of six workflow options available with Connex—was an attractive and logical configuration choice. Technical personnel from Welch Allyn worked in collaboration with key nursing, IT and biomedical engineering staff at Trinity Medical Center to install and integrate the Welch Allyn solution with the hospital’s 802.11b wireless local area network, its admit/discharge/transfer (ADT) system and the EMR’s standard results interface. Cheryl Cook, clinical coordinator, Information Systems, and part of the installation team, reflects on the Connex installation: “The process went more quickly than I originally expected, and we quickly worked through some preliminary challenges. You don’t usually expect upgrades like this to go so smoothly—and it was great having Welch Allyn tech support on site for the installation.”

Today, nurses and nursing aides on the new med/surg floors log onto the Spot Vital Signs LXi devices by scanning their barcode ID at the start of their rounds. They then identify patients by scanning their ID bracelet. After capturing and storing the patient’s vital signs and manually entering the patient’s pain and respiration levels directly into the Spot Vital Signs LXi devices, the nurse or aide confirms the data and presses “send,” which wakes the radio up from its low-power mode and enables transmission of the data to the Connex software application. A direct feed from the ADT system to Connex updates patient demographics in real time, enabling Connex to validate the vitals data against patient records to ensure that only data for current patients are uploaded to MEDITECH MAGIC.

The automatic transfer of patient vital signs data to the EMR system via Connex has produced dramatic time savings for the nursing staff on the new med/surg floors at Trinity Medical Center. Says Piko, “We capture a minimum of one vital signs reading per patient per shift. But usually, we’re taking significantly more readings per patient: for example, patients receiving transfusions have their vitals checked every 30 minutes. Patients returning from surgery are checked every hour for the four-hour period following surgery. With just four nurses and two aides caring for 20 patients per floor per shift, you can imagine the volume of readings that each nurse and aide is responsible for documenting every day.”

In fact, even a conservative estimate of the nursing time savings realized through Connex is striking: by eliminating the time required to transcribe and document just two sets of vital signs readings per patient per shift, the nursing staff on the two new med/surg floors at Trinity Medical Center is saving 1,460 hours per year on a tedious though necessary task—and can instead spend more time with their patients.

Furthermore, the automated documentation of patient vitals data into the MEDITECH MAGIC EMR system has strengthened the value of other EMR applications by facilitating timely clinical decision-making and patient treatment recommendations. For example, as the hospital prepares to implement computerized physician order entry (CPOE), the availability of real-time, complete and accurate vital signs data in the EMR takes on even greater importance. Says Piko, “When we go live with CPOE, the availability of vitals data in the EMR—right there at the physician’s fingertip—will be a huge timesaver to both the physicians and nursing staff, who would otherwise have to go searching for the latest vitals data before deciding on their treatment recommendations.”

Piko summarizes the benefits of Connex this way: “Our process now using Connex for automated vital signs documentation is absolutely better. It’s unquestionable. With Connex, we have the benefit of improved vital signs accuracy along with significant savings in nursing time. And of course all this translates to better care for our patients—the most important benefit of all.”

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Connex® Vitals Management Software Helps Meadville Medical Center Improve Patient Safety

Meadville Medical Center allows physicians to view vital signs data four to eight hours sooner in their MEDITECH MAGIC electronic medical record (EMR) system using Welch Allyn Connex software. Clinicians use Welch Allyn Spot Vital Signs® LXi devices to capture patient vital signs and then wirelessly send the data to the EMR, giving hospital staff on-demand access to accurate and timely patient assessments.

The Challenge

Before the introduction of Connex Vitals Management Software to Meadville Medical Center, clinicians were taking vital signs every four hours and handwriting the results on clipboards. Then a secretary would transcribe the 250 to 450 sets of data each day into the MEDITECH MAGIC health care information system, which took four to eight hours or sometimes even longer after the readings—introducing the risk of transcription and data latency errors.

“It was a potential patient safety issue. Physicians were basing clinical decisions such as blood pressure medications, what labs to order and things like that on outdated vital signs,” said Kimberlie Bovard, BSN, RN, Nursing Informatics Specialist. “Nurses were administering medications without access to the most recent patient vitals. There was a potential for medications not being given appropriately, or inappropriate medications being ordered based on inaccurate vital signs,” she added. And both doctors and nurses were wasting time running around looking for the clipboards.

The Solution

After reviewing the competitive options, the Meadville team selected Welch Allyn Connex vital management software for its ability to provide an efficient link between their existing Spot Vital Signs LXi devices and the MEDITECH MAGIC health care information system. With the new workflow—one of six available with Connex—nurses use the optional barcode reader on the Spot Vital Signs LXi to scan their ID, then they scan the patient’s ID bracelet, take the vital signs automatically, enter pain, weight or respiration rate as needed, then press “send.” Minutes later, the vitals signs data become available in the MEDITECH patient record, easily accessible to all clinicians. The system is being used in Meadville’s three med-surg units, as well as the Pediatrics, Transitional Care, Rehab, Inpatient Mental Health, and Drug & Alcohol Recovery departments.
Once the system was installed, training took less than a week. “The installation support team from Welch Allyn was wonderful to work with,” reports Bovard. “They were very accommodating and they gave excellent training sessions. I knew everyone got the same information and had a competency checklist. So now on those rare occasions when someone on staff tells me, ‘They didn’t teach me that,’ I say, ‘Do you want me to get the checklist?’” she laughs.

“Having the vital signs go directly into the patient record so they’re readily accessible and there is really no chance of a transcription error is an enormous benefit.”

The Benefits

Automated vital signs documentation with Spot Vital Signs LXi and Connex software has dramatically streamlined the process and resulted in better patient care. “Now the nurses aren’t running around looking for clipboards—that was significant,” says Bovard. “The latest set of vital signs is always right there in front of them whenever they’re looking at their patient information in the EMR.”

The Connex system also saves time at the point of care, since the nurses no longer have to manually transcribe vital signs readings onto a clipboard. The time savings add up to at least 30 minutes per nurse per shift for up to 20 nurses every day, Bovard estimates. That’s more time nurses can spend with their patients.

The new workflow is also helping Meadville’s doctors save time and provide better patient care, since now they can quickly find up-to-date data for each patient and make more informed decisions. Having all the data for each patient in one place also makes it easier to spot trends and see how blood pressure and other vitals have changed over time.

For Bovard, one benefit stands above all others: “Patient safety. Absolutely. Having the vital signs go directly into the patient record so they’re readily accessible and there is really no chance of a transcription error is an enormous benefit,” she said. “Overall, it’s been easy, and the nurses love it.”
Through the Welch Allyn Connex® Vitals Management System, clinicians at Erie County Medical Center (ECMC) automatically transfer patient vital signs captured at the point of care to the electronic medical record (EMR) system, Meditech Client Server. By eliminating manual transcription, Connex has dramatically reduced the time required by ECMC staff to acquire and document patient vitals data, enabling them to spend more time with patients at the bedside. Moreover, the direct transfer of vitals data from Welch Allyn Spot Vital Signs® LXi devices to the EMR has virtually eliminated opportunities for errors in patients’ vitals data, giving clinicians access to near real-time assessments in the EMR anytime, anywhere.

The Challenge: Choosing the Right Point-of-Care Technology

Vital signs provide an important leading indicator of the health of a patient, and often times yield the first clues to a patient’s diagnosis and treatment options. However, even the most meticulous vitals assessments are of little help to clinicians if they are not documented correctly or in a timely way. Traditional manual workflows for documenting patient vitals data are both time-consuming and fraught with opportunities for patient ID and transcription errors. Delayed data entry into a patient’s medical record can also arguably contribute to poorer patient outcomes when clinicians prepare treatment recommendations without the benefit of up-to-date vitals data for the patient.

At ECMC, vitals are typically captured at the start of each of the three nursing shifts; approximately 400 vitals signs readings are captured every day. Historically, clinicians at ECMC would document vitals on a daily worksheet or, frequently, a simple scrap of paper. At the end of rounds, nurses would manually enter the vitals signs records into the EMR through a computer workstation—a tedious process that could take up to 30 minutes for each nurse for the morning rounds alone.
According to Peter Hazen, Assistant VP, Clinical Business Services, the decision to automate the vitals signs process was driven largely by the desire to improve nursing productivity by eliminating a necessary but burdensome task from their workday. Says Hazen, “Today, the demands on nurses are greater than ever. Typically when new point-of-care technology is introduced on the floors, the improvements it brings to patient care usually result in even more work for our nurses. So in selecting an approach to automate the vitals signs process, we wanted to make sure that it truly would make nurses’ lives easier.”

The Solution: Eliminating Manual Transcription of Vitals Data While Streamlining Workflows with Welch Allyn Connex

With its flexible workflows for vitals capture and recording, coupled with the ability to integrate with ECMC’s existing EMR system, Meditech Client Server, Connex was the logical vitals connectivity solution for ECMC. Dawn Walters, Assistant Director of Nursing and part of the IT evaluation task force, explains: “The decision to invest in Connex was a natural technology progression for us. We were already using the Welch Allyn Spot Vital Signs® LXi devices for vitals capture, and the nurses love them. Welch Allyn’s track record and responsiveness made us confident that we could go live with Connex relatively quickly, with minimal disruption to the staff during the transition period.”

Connex takes a flexible approach to technology by recognizing the differing infrastructures that exist for lower-acuity settings. As such, Connex relies on standard technology in place in most facilities, and accommodates a variety of workflows for collecting and assessing vitals signs, such as spot-check readings and bedside monitoring. Connex also provides a number of options for recording patient vitals records to the EMR, such as batch uploads, bedside monitoring, and wireless connectivity.

At ECMC, Welch Allyn worked in collaboration with key nursing and IT staff to select a workflow where clinicians use Spot Vital Signs LXi devices to capture patient vitals signs during their rounds, and then transfer them to the Meditech EMR system via batch uploads.

Today, clinicians at ECMC use barcode scanners to identify patients and themselves. In addition to traditional vitals, clinicians can also document pain level and respiration rate directly into the Spot Vital Signs LXi—further streamlining the workflow. Clinicians take the device from room to room during rounds. (The Spot Vital Signs LXi can store up to 50 unique vitals assessments). At the conclusion of rounds, the clinician connects the Spot LXi to a computer workstation via a USB, calls up the Connex web application using a standard web browser, and transfers the data to the EMR system. All the information is captured automatically without transcription.

“Today, the demands on nurses are greater than ever. Typically when new point-of-care technology is introduced on the floors, the improvements it brings to patient care usually result in even more work for our nurses. So in selecting an approach to automate the vitals signs process, we wanted to make sure that it truly would make nurses’ lives easier.”

– Peter Hazen, Assistant VP, Clinical Business Services
Connex uses standards-based interoperability, and leverages HL7 messaging to transfer patients’ vital signs and other data to the EMR. A direct feed from ECMC’s Admit Discharge Transfer (ADT) system updates patient demographics in real time, enabling Connex to validate all vitals data against current patient records and ensure that only data for current patients is uploaded to the EMR.

According to Lynn Whitehead, Nursing Education Director at ECMC, the complete transition to Connex was one of the fastest technology upgrades she’s ever observed. “Adoption by our clinicians was rapid—everyone was so eager to start using Connex because the benefit to them personally was obvious and so significant. I actually had unit managers asking to move up their scheduled ‘go-live’ dates.”

As of December 2008, ECMC has deployed approximately 55 Spot Vital Signs LXi devices across 14 Med-Surg and patient behavioral health units, all of which are now connected to the Meditech EMR system via Connex.

Training for the new connected workflow is hands-on and in real time on the floor; no special classes are typically needed. Says Whitehead, “Most of our care providers learn the new procedure after only one demonstration. Training has been remarkably quick and frustration-free—not the typical outcome when new technology is introduced on the floor.”

“We’re saving so much nursing time...”

The Benefits

*Increased Nursing Efficiency and Satisfaction*

According to Bill Arnold, Nursing Informatics Manager at ECMC, clinicians on the Med-Surg floor at ECMC are now able to capture and document patient vitals data in a fraction of the time previously required. Says Arnold, “With Connex, we’ve eliminated anywhere from 20 to 30 minutes of vitals data documentation time per nurse, per shift. Our nurses are spending less time at computer workstations and more time at the patients’ bedsides. And that’s had a direct impact on the quality of care we’re able to provide our patients, as well as on nursing staff morale.” Dawn Walters adds, “Connex has reduced our vitals documentation time by at least 95%. Our nurses are thrilled—that’s not something we typically experience when we introduce new technology on the floor. And patient care has improved, because vitals assessments in the EMR are now readily available to clinicians.”

ECMC is currently sending approximately 12,000 vitals records per month to the Meditech EMR system via Connex.
Improved Patient Safety via Timely and Accurate Vitals Data

When manually documenting a full set of patient vital signs (blood pressure, systolic/diastolic pulse, respiration, oxygen saturation, heart rate, pain, respiration, and temperature) into the EMR, there are numerous potential opportunities for patient ID, transcription or omission errors. Manual transcription also increases the potential for clinical errors due to data latency (i.e., the time lag from when vitals data are captured to when they are available in the medical record).

Through the automation of the vitals capture process and integration with the EMR via Connex, physicians can have full confidence in the integrity of their patients’ vitals assessments: errors associated with manual transcription are virtually eliminated, and up-to-date vitals data in the EMR are now readily available to physicians. Explains Dawn Walters, “Connex has strengthened the value of our EMR in supporting computerized physician order entry (CPOE), meds administration through the electronic meds administration record (EMAR) and other EMR applications.”

Flexibility for Expansion

As ECMC works toward completion of a wireless infrastructure, the transition to a wireless workflow for vitals documentation is just on the horizon. “We’re saving so much nursing time with our current Connex vitals documentation workflow. The wireless approach will increase our time savings even more by enabling nurses to send a patient’s vital signs results directly to the EMR at the point of care,” says Arnold.

Peter Hazen agrees and adds, “I have been very pleased with our partnership with Welch Allyn. Their connectivity team is highly capable and tremendously responsive. We’re eager to make the transition to the wireless solution knowing that Welch Allyn will be with us every step of the way.”