



**Section Editor:** Deborah Lewis, EdD, RN, MPH

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## SUMMER INSTITUTE IN NURSING INFORMATICS 2007: “SKILLS AND SYSTEMS FOR TODAY AND TOMORROW”

**Darryl W. Roberts, MS, RN**  
**Christine L. Ward, MS**

The University of Maryland School of Nursing's 17th Annual Summer Institute in Nursing Informatics (SINI), held July 18–21, 2007, shone a spotlight on the shadows of change, challenges, and choices facing all healthcare providers. The keynote address by Gail Wolf, DNS, RN, FAAN, Professor and Program Director, Nursing Administration, University of Pittsburgh School of Nursing, set the tone for this motivating 4-day event.

Nearly 500 participants including nurse informaticians, executives, educators, and other providers attended SINI either in person or via Web cast. Those who took advantage of the Web cast had access to all plenary sessions as well as several distinguished concurrent sessions. Organized into six tracks, the concurrent sessions addressed Standards and Interoperability, Informatics in Organizational Leadership, What Nurses Need to Know About IT, Evidence-Based Practice, Evaluation in the IT Life Cycle, and Redesigning Work Processes.

Plenary speakers Stephanie Reel, MBA, BS; Hyeoun-Ae Park, PhD, RN; Angela McBride, PhD, RN, FAAN; Jim Jirjis, MD, MBA; and Robert Kolodner, MD offered diverse perspectives on the transformative changes informatics is bringing to nursing and healthcare. Their talks started each day on a positive and anticipatory note, whereas Dr Kolodner's thoughtful address on Making Health IT Personal ended SINI with a call to action.

Those who attended SINI in person were led by historian Wayne Schaumburg on a walking tour to Baltimore's Historic West Side, including visits to the nation's oldest

continually used medical school, Edgar Allan Poe's gravesite, and the Hippodrome Theater. The Maryland Historical Society provided a backdrop for the opening evening's social and networking event, which included a Western theme, dancing, and dinner. The Exhibitor Evening combined the talents of 33 corporate vendors with event participants, presenters, and local healthcare organizations to exchange information about current and forthcoming informatics products and services over the delights of the Taste of Baltimore dinner. Some attendees ventured off on their own to enjoy the city's other offerings, such as Baltimore's Inner Harbor, Fell's Point, the National Aquarium, and Oriole Park at Camden Yards.

Many participants took the opportunity to attend the Nursing Informatics Graduate Programs' Information Sessions to learn more about the School of Nursing's Master of Science, Post-Master's, Doctor of Nursing Practice (DNP), and PhD programs. The DNP program, the newest academic program offered at the School, prepares nurses to develop and integrate evidence to achieve the highest level of nursing practice. Clearly, this is an arena for applied nursing informatics!

The chairperson of the SINI Program Committee was Judy Ozbolt, PhD, RN, FAAN, FACMI, FAIMBE, professor and program director for Nursing Informatics at the University of Maryland School of Nursing.

"I'd like to express my appreciation to all who made this exciting program possible," said Ozbolt. "The

presenters, the exhibitors, the staff, the Program Committee, and the participants brought amazing energy to SINI. Together, we are expanding the limits of our knowledge and abilities in nursing informatics. Special thanks go to the sponsors, who enable us to assemble an extraordinary program, at a reasonable price, for our participants. We would particularly like to recognize our Platinum Sponsor, Siemens Healthcare, and our Gold and Silver Sponsors, GE Healthcare, McKesson, and Eclipsys. We are also grateful to our many Bronze Sponsors. Thanks to the generosity of all these sponsors, we were able provide amenities to all participants and award more than \$20,000 in SINI scholarships and cash prizes to presenters whose abstracts received top scores in the peer review.

"We are already planning the 2008 program, Building Connections for Patient-Centered Records," continued Ozbolt. "Ms Stanlie Daniels, of the Veterans Health Administration will give the keynote address. We encourage future presenters to watch our Web site ([www.nursing.umaryland.edu/informatics](http://www.nursing.umaryland.edu/informatics)) for details and due dates for abstract submission. We hope that everyone who reads this article will save the date for the 18th Summer Institute in Nursing Informatics, July 16–19, 2008. We look forward to seeing you here next summer."

## AWARD-WINNING PAPERS

VOTED WINNER OF THE  
SHARON COLEMAN MEMORIAL  
SCHOLARSHIP FOR MOST INFLUENTIAL  
TO THE FIELD AND HIGH  
SCHOLARSHIP WINNER

### *Wireless Networks and Point-of-Care Technology: Implications for Interdisciplinary Collaboration*

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**Background:** Complexity and rapid change are natural components of the current health information technology landscape. Wireless technology has emerged as a means to enhance timely data collection, transfer, accessibility, and retrieval. There is a dearth of literature on the clinical experience of end users with wireless point-of-care technology. Clinicians depend on devices supported by network technology, such as the Department of Veterans Affairs, the Bar Code Medication Administration, and the Computerized Patient Record System. Current plans call for implementation of enterprise health technology for expansion to wireless point-of-care technology (bar code expansion) that will include blood collection, blood transfusion documentation, code blue interventions, and wireless medication administration.

**Strategies:** The development of collaborative interdisciplinary strategies assists in the management of wireless networks and is critical to the delivery of timely and safe healthcare. Seamless care delivery occurs in environments in which stakeholders address and respond to clinical issues that have an impact on patient care with the use of this emerging technology. The assessed sustainability of dynamic wireless technology as a safe, reliable, and efficient point-of-care technology must continue to be evaluated and explored. Clinical examples provided a baseline for programmatic wireless program development and evaluation. Ongoing assessment of physical plant, equipment, wireless system reliability, security, and stakeholder and end user knowledge is needed.

**Evaluation:** Observation of clinical nursing practice, documentation of wireless service interruptions, and impact on patient care were systematically analyzed by the nurse lead multidisciplinary team. Wireless signal strength, roaming history, access point load, wireless phone interference, noise, and type and location of antenna were critical factors assessed in the wireless site survey. "Lessons learned" led to the development and implementation of rapid response methods and "best practices."

**Conclusion:** Synergy is crucial in the development and maintenance of the inner workings of all stakeholder relationships because issues of network stability, robustness, and reliability have an impact on efficient, effective, and timely patient care delivery. The development of collaborative interdisciplinary strategies assists in the management of wireless networks and is paramount in the delivery of timely and safe healthcare. Nurses in organizational leadership positions with an informatics focus need increased awareness of the potential impact that networks and wireless technology has on nursing care workflow and technology-dependent operational systems.

## SCHOLARSHIP WINNER

### *Improving Patient Health Outcomes in Acute Care Hospital Units Using Mobile Wireless Technology and Handheld Computers*

MAUREEN FARRELL  
IAN MCGRATH  
MARG D'ARCY AND  
ELLIE ABALUZ

This report describes current research investigating the use of wireless handheld computers at Southern Health and the Royal Women's Hospital (two major teaching hospitals in metropolitan Victoria, Australia) to determine the impact on patient safety and quality of care. There is a need for real-time point-of-care access (and input) to patient information, nursing reference information, and drug information for nurses in Australian hospitals. The use of mobile technologies including personal digital assistants and both laptop and tablet computers for healthcare personnel has increased exponentially. Since their introduction in the early 1990s, handheld computers, also known as personal digital assistants (PDAs), have become the most frequently used of these

technologies, providing access to diagnostics, references, and decision support systems as well as e-prescribing of patient information and dictating of notes. The increasing complexity of the healthcare system makes the PDA a necessary work tool for clinicians because it provides an effective system for preventing errors and adverse events. Patient safety is a national and international problem, and many countries are identifying strategies for achieving substantial improvement in the quality of healthcare. In all developed countries, mobile information technology is seen as a way of improving patient safety and quality of care by enhancing communication and delivering clinical decision support in real time. However limited research has been undertaken in this area, and more research is needed to evaluate the effects of the technology on important patient health outcomes in various health settings.

The specific research questions are these:

1. Does the use of wireless PDAs enhance information and decision support by nurses in real time with the patient?
2. Does the use of wireless PDAs assist nurses in detecting or preventing adverse events?
3. What factors influence implementation of the wireless PDAs by nurses in the clinical units? This project aims to address this need by providing nurses with wireless handheld access to such resources.

Both quantitative and qualitative methods are being used to collect data. The quantitative method is quasi-experimental, using a nonequivalent experimental group design to provide data for measuring the effectiveness of PDAs in improving patient safety and quality care outcomes and for addressing research questions 1 and 2. The PDAs will be used for a 12-month trial period, and nurses in the experimental group will have access to a PDA on every shift. Focus group discussions will be conducted to ascertain how the nurses have embraced using the handheld computers and the difficulties they may have encountered in addressing research question 3.

The project is meeting its time lines. It will be completed over a 3-year period and is currently in the implementation phase. This project is extremely significant because the outcomes will provide nurses in Australia and overseas with a set of guidelines for managing wireless handheld computers in clinical units to enhance patient safety and quality of care.

#### SCHOLARSHIP WINNER

### Setting Metrics for Identifying Point-of-Care Documentation Devices: Experiences From the Field

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LESLIE SCHIRMER, BSN, RNC AND  
ALICEMARY ASPELL ADAMS, MBA, BSN, RN

**Background:** The current state of technology adoption related to patient safety and clinical organizational efficiencies include strategies for point-of-care (POC) documentation, bedside medication verification (BMV), and electronic medication administration record (eMAR). These solutions

have been well studied, and all have been identified as key factors in reducing errors.<sup>1,2</sup> Particularly BMV and eMAR are designed to assist with alerts, notifications, and documentation related to medication delivery, and they are currently being deployed in hospitals throughout the United States.

**Process:** This presentation provides a comprehensive and detailed review of the patient care environments within two U.S. acute care institutions/systems preparing for POC, BMV, and eMAR. This review aimed to understand clinical informatics documentation device types (personal digital assistants [PDAs], laptops, tablet PCs, stationary PCs, and/or workstations on wheels) required to provide the safest and most efficient care delivery in organizations embracing POC documentation. The review, completed throughout each care delivery area within each organization, included assessment of current device use as well as new device needs anticipated with the adoption of POC, BMV, and/or EMAR.

Each patient care area was assessed by a survey team for consideration of workflow and any specific physical space, wireless connectivity, and/or power limitations that could dictate the type of computing device that could be used. Previous budgetary counts of devices and other data were validated or changed given any new discoveries. Metrics describing each patient unit were captured to provide understanding of the care provider environment and to provide the team with the ability to analyze similar care units.

**Outcomes:** The assessment data gathered were placed into a costing tool for evaluation. Metrics for device selection were developed to limit subjectivity in selection. Given the somewhat fragile nature of the computing equipment, strategies including spare devices, warranties, and policies to maintain infection control were included in the criteria for device selection. The project teams within the two organizations highlighted in the presentation were both greeted with great enthusiasm by the organizations' boards of directors and executive teams for formalizing and structuring the device selection process and for identifying the need for care delivery, maintenance, and operational process improvements.

#### References:

1. Langowski C. The times they are a changing: effects of on-line nursing documentation systems. *Qual Manage Health Care*. 2005;14(2):121-125.
2. Poissant L, Pereira J, Tamblyn R, Kawasumi Y. The impact of electronic health records on time efficiency of physicians and nurses: a systematic review. *J Am Med Informatics Assoc* 2005;12(5):505-516.

#### SCHOLARSHIP WINNER

### Using Technology to Facilitate a Patient-Centered Care Delivery Process

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**Background:** Progress West HealthCare Center (PWHC), a recently opened (February 2007) 72-bed green field hospital, is a member of the BJC HealthCare System in St. Louis, Missouri. Plans made to open the facility emphasized leveraging the use of technology to design and implement patient- and family-centered processes that were safe, efficient, and effective.

**Program Plan:** With the implementation of multiple technologies at PWHC, reliability of software solutions and processes proved critical to success. A key consideration in planning and development was integration of the various technologies with each other and with clinical processes. To facilitate better patient learning and educational opportunities, ceiling-mounted patient touch devices were installed in every room. These devices allowed patients to search and choose education based on their diagnosis. Implementation of radiofrequency identification technology was implemented to support better patient flows. Communication issues were addressed with a hands-free device allowing clinicians and patients to communicate with a touch of the button or a command of the voice. This system was integrated with physiologic monitors and the patient call system. The plan was to facilitate easy computer access without the need to remember multiple passwords through RFID technology. Installation of proximity cards increased efficiency and enabled staff to log in quickly to multiple applications.

**Evaluation:** Innovative process changes included increased nurse-to-patient ratios, justified by technology providing support in place of departmental, assistive personnel. Pharmacy processes were changed to be interactive at the point of care rather than centralized in the pharmacy. Patient registration processes were streamlined with the use of kiosks and computerized registration.

**Impact:** Although it is too early to measure outcomes, these are expected:

- Reduced medication errors
- Increased patient satisfaction
- Best in class
- Decreased average response time for call lights
- More clinician-to-patient interaction and time spent by clinician at the bedside.

The interdependence of process and technology at PWHC has brought its own challenges. As PWHC becomes fully operational, we will continue to evaluate and measure the effectiveness of our processes and the underlying technology allowing for better management of patient and staff delays.

#### HIGH SCHOLARSHIP WINNER

### *Semantic Interoperability in HIT—Finally! Get Ready! It Is Coming Soon to Electronic Healthcare Records*

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**Background:** Make no mistake about it—this country is on a mission. The mission, set forth by the President, is to have “an interoperable EHR for most Americans by 2014...to improve the quality and efficiency of healthcare.” So you hear the term “interoperable” a lot, but you might not totally understand the profound impact of “semantic interoperability.”

**Current Problem:** For years, there have been unresolved issues involving technical and semantic interoperability of healthcare information systems. This has stemmed from lack of a standardized vocabulary among clinical information systems. For more than 50 years, healthcare delivery has centered around the “visit,” with a focus on what is happening to the patient only in today’s visit or at the current admission. To be sure, there have been old records, but did anyone ever actually read them, to say nothing of comparing the data with the current visit.

**Current Federal Initiatives:** Giant strides are taking place in the HIT market with regard to HL7V3, clinical document architecture (CDA), continuity of care document (CCD), and Integrating the Healthcare Enterprise (IHE) profiles and actors. There is momentum like never before since the department of Health and Human Services (HHS) created the American Health Information Community (AHIC) and contracts were won by the Healthcare Information Technology Standards Panel (HITSP). These are feeding into the requirements for the Certification Commission for Healthcare Information Technology (CCHIT) to accomplish the mission.

**Cornerstones of Semantic Interoperability:** The cornerstones of achieving semantic interoperability at last involve discussing IHE profiles, SNOMED, LOINC, HL7 V3, CDA, CCD, and ultimately certification by CCHIT, making sure that vendors comply with the mission of “an interoperable EHR for most Americans” by 2014...to improve the quality and efficiency of healthcare.”

**Impact:** Semantic interoperability has huge implications for nurses who waste so much time asking patients questions they have answered 100 times before, but about which the data were not shared. When semantic operability is achieved between providers and between visits, nursing will be validating information, not collecting it for another round of redundant data entry. Nurses actually will have access to information from the previous visit including the patient’s problems, medications, allergies and history before they ever see the patient.

#### HIGH SCHOLARSHIP WINNER

### *Implementation of a Critical Care Telemedicine System With Smart Data Analysis and Electronic Documentation*

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MARGARET MULLEN-FORTINO, MSN, RN



**Background:** The Penn E-lert eICU program is a state-of-the-art electronic ICU (eICU) that provides an additional layer of expert medical and nursing support for critically ill patients located in the University of Pennsylvania Health System. The Penn E-lert eICU is staffed by Penn faculty intensivists from the Department of Anesthesiology and Critical Care and the Department of Internal Medicine and Surgery, as well as by experienced critical care nurses. Our mission is to establish a uniform, data-driven, benchmark critical care standard in our health system. By using trended data and intelligent software, the Penn E-lert eICU can identify early, subtle changes in a patient's condition. The eICU aims to improve patient mortality and hospital length of stay (LOS) using the eICU telemedicine program and to improve cultural and institutional change across the health system.

**Methods:** Implementation of the eICU program involved installation of an eICU software package across the health system, conversion to an all electronic bedside documentation system, and development of new care paradigms including eICU communications with the bedside team. A precedent was developed for eICU personnel in their involvement with patient care. Interinstitutional standards were developed for critical care benchmarks: quality and safety. Workflow processes were developed around the newly implemented technology for MD and RN electronic medical record documentation.

**Results:** Unit A, a 24-bed surgical ICU, has shown a marked improvement in observed and predicted ICU LOS and mortality despite a rising case mix index (CMI). Units B and E saw improvements in observed and predicted ICU mortality. Units C and D remain unchanged or regressed since implementation of the eICU program.

**Conclusions:** Variations in individual unit governance are proving to be more challenging than the technology itself. Individual unit successes are evident, in which physician acceptance and engagement are strong. An agreed upon strategic roadmap for individual units with the key physician and nursing stakeholders needed to market and deliver the process is essential for obtaining measurable outcomes. When the eICU system is used in the clinical setting to document and oversee patients in the ICU, transparent documentation and staff acceptance may prove to be the most important indicators for successful implementation. Further study is needed to determine conclusively the variations from unit to unit and hospital to hospital in the use of eICU telemedicine programs.

## AWARD-WINNING POSTERS

### HIGH SCHOLARSHIP WINNER

### *Pneumococcal Vaccine Process Gets a Shot of Success*

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**Background:** Pneumococcal vaccination, a state core measure, has shown efficacy of 56% to 81% in protecting against pneumococcal infection. However, despite this compelling motivation, our hospital had poor and variable results until the process was redesigned. Our redesign has given us a shot of success, with the current rate bordering on the state benchmark of 63%.

Over the past 2 years, our compliance rate has ranged from 4% to 45%. Success has been dependent on the vigilance of the staff in monitoring and encouraging physicians to address vaccine status. Neon stickers and notes have been used to cue them. Historically, the compliance rate has always been viewed, but there were no tools to monitor or modify compliance concurrently.

**Process Redesign:** In August 2006, the process was redesigned completely to be dependent on nurses' assessment and order initiation. The patient's risk factor assessment was incorporated into the initial online assessment, and the questions were mandatory. Currently, appropriate risk factors initiate a care plan that prompts further follow-up assessment. Once the care plan is completed and the vaccine date of administration is entered, these data are recalled at the next admission. Without availability of an electronic medication record, creation of a care plan that addressed this was a novel approach to recalling the data.

Perhaps the most valuable part of the redesign was the development of a report that provides current salient data. This report allows unit managers to pinpoint patients at risk, those who have their care plan activated, and those who have the pneumococcal vaccine in the pharmacy profile. If any of these indicators do not all display "yes," the manager can pinpoint who is at risk and whether a piece of the process has not been fully deployed. This enables management to be proactive in addressing this initiative. Managers have found this extremely valuable.

**Impact:** Since the redesigning, we have been on a steady upward trend of success. At this writing, we are achieving a rate of 63%, the highest for our hospital to date. Process redesign and the use of tools to monitor or modify compliance have given us a true shot at success.

### HIGH SCHOLARSHIP WINNER

### *Information Systems Use, Benefits, and Satisfaction Among Ohio Registered Nurses*

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SARA DOUGLAS, RN, PhD AND  
ALAN DOWLING, PhD

**Background:** Contemporary forces are increasing the pressure on healthcare facilities to use information systems (IS) to achieve better outcomes. Among these forces, the increasing nursing shortage, the aging population, and the emphasis on patient safety are particularly important ones. The use of IS improves nurses' ability to make sound clinical decisions in a timely manner, eliminates the amount of time spent on clerical

work, and gives nurses more time for direct patient care. Studies indicate that nurses still are reluctant to use IS in their work or avoid it. Yet there is little information about factors that facilitate IS use, nurses' perceptions of benefits, and satisfaction from IS use. This study aims to explore the relationships among inputs: individual characteristics (age, nursing education, and computer experience), organizational factors (user involvement in implementation and management support for the use of IS), process of nurses' IS use, and IS outcomes (benefits and satisfaction).

**Methods:** Donabedian's quality assessment model and Holzemer & Reilly's conceptual framework were used with a descriptive correlational cross-sectional design. A random sample of 540 staff nurses recruited from the Ohio Nurses Association mailed the study questionnaire. Data were analyzed using descriptive statistics and multiple regression analysis.

Nurses working in hospitals spend at least 50% of their time providing direct patient care and use at least one IS, to be included in the study.

**Results:** The rate for nurses' responses to the questionnaire was 37.22% (N = 201). The average age of the nurses was 48.49 ± 9.14 years, and their average experience was 23.11 ± 9.98 years. Most of the nurses were women (N = 186, 93%), and 36% had a BSN (N = 72), whereas 35.5% (N = 71) had an associate degree, and only 22% had a diploma in nursing. Nurses worked full time (N = 132, 65.7%), averaging 35.51 hours per week. They had about 9 ± 4.21 years of computer experience at work, and 31% of them worked in critical care units. The use of IS was significantly explained by computer experience, user involvement, and management support. Nurses' benefits and satisfaction were significantly explained by IS use.

**Conclusion:** The results of this study will assist hospital administrators and nurses' leaders in changing and/or restructuring the appropriate work environment to enhance nurses' IS use and increase their satisfaction, thereby improving patient outcomes.

**Acknowledgments:** The authors thank Sigma Theta Tau International and Alumni at Frances Payne Bolton School of Nursing.

#### SCHOLARSHIP WINNER

### *A Step in the Right Direction: Electronic Clinical Documentation Improves Nurse Charting, Efficiency, and Satisfaction*

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**Purpose:** Implementation of an electronic health record system (EHRS) into healthcare settings is an inevitable change for the management of healthcare information. Due to the relative newness of EHRS, monitoring the effectiveness of EHRS is necessary to ensure that the technology enhances the care and safety of patients.

As part of its initiative to be recognized as the top heart facility in the southeastern United States, Pepin Heart Hospital and Dr. Kiran C. Patel Research Institute is implementing a clinical information system to support more efficient and effective care

delivery. The overall purpose of our study was to assess the effectiveness of our newly implemented EHRS by measuring changes in efficiency, quality of care, and nurse satisfaction in a progressive cardiac care unit.

**Methods:** *Efficiency* was measured with a time-in-motion study (adapted from Wong et al, 2003). *Quality of care* was measured through an evaluation of chart audits in terms of quality indicators. *Nurse satisfaction* with the EHRS was measured using a developed instrument specifically for EHRS implementation (instrumentation development was presented at the 2005 Magnet Conference). Pre-EHRS implementation measurements of efficiency, quality of care, and nurse satisfaction were completed by October 15, 2005. Post-EHRS measurements were completed by November 5, 2006.

**Results:** Electronic clinical documentation improved the quality of nurse documentation in 56.6% of the indicators studied. Nurses spent less time on administrative tasks and more time on patient care activities. Researchers saw an increase in nurses' satisfaction with the quality of patient data available and with the effect of their documentation activities on patient care.

**Conclusion:** These results have created a framework for our organization to use in focusing its education initiatives, implementing changes in workflow and protocols, and continuing to improve the efficiency and effectiveness of nurses.

**Acknowledgments:** We thank Dr. Linda E. Moody, PhD, MPH, FAAN, and Laura Smith, MSN, RN, GE, Healthcare, Clinical Project Leader, for their assistance. We also thank Pepin Heart Hospital & Kiran C. Patel Research Institute, University Community Hospital; Dana Alexander, RN MSN MBA, Chief Nurse Officer; GE Healthcare Integrated IT Solutions; and Intel for funding of this project.

#### SCHOLARSHIP WINNER

### *Connected Care: Enhancing Patient Safety Through Automated Vital Signs Data Upload*

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**Background:** Vital signs are a fundamental component of patient care. Omitted or inaccurately transcribed vital sign data could result in inappropriate, delayed, or missed treatment. A previous baseline study determined that the error rates for vital signs captured on plain paper then entered into a paper chart or electronic medical record (EMR) were 10% and 4.4%, respectively.

**Methods:** This study evaluated the impact of automated vital signs capture using a personal digital assistant (PDA) with bar code technology for patient identification. The system was implemented in a 20-bed cardiac step-down unit in a large Florida hospital. The PDA enabled wireless capture and transmission of data directly from the GE DINAMAP ProCare vital signs monitor into the EMR. Researchers reviewed 1 514 sets of vital signs

collected electronically for accuracy and for comparison of the error rate with those for the previous paper and EMR systems.

**Results:** Automated upload of vital signs directly into an EMR reduced the documentation error rate to less than 1%. This represented an 85% to 93% reduction in vital sign documentation errors with the use of mobile technology, as compared with traditional charting methods ( $P < 0.001$ ).

**Conclusion:** The automated vital signs data upload system helped to promote a culture of patient safety by significantly reducing documentation error rates. Additional safety benefits may include improved timeliness of vital sign data and clinical workflow processes.

**Acknowledgment:** This study was sponsored by GE Healthcare.