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<td><strong>Required Attendees:</strong></td>
<td>Donnelly, James; Eury, Lisa; Totzke, Rebecca; Crawford, Jennifer; Thompson, Thomas</td>
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Effect of bar-code-assisted medication administration on nurses’ activities in an intensive care unit: A time–motion study

NILANJANA DWIBEDI, SUJIT S. SANSGIRY, CRAIG P. FROST, ANANDAROOP DASGUPTA, SHEEBAM M. JACOB, JOYCE A. TIPTON, AND ANGELA A. SHIPPY

Medication administration is a critical process that requires multiple steps to ensure patient safety. More than 30% of preventable adverse drug events occur during the medication administration stage, and only about 2% of administration errors are intercepted before reaching the patient. Traditional paper-based medication administration (PBMA) systems do not proactively decrease opportunities for human error in the delivery of medications, which can compromise patient safety. Depending on the number of medications a nurse has to administer, the PBMA system may take 30 minutes to process. Technology such as bar-code-assisted medication administration (BCMA) is increasingly used at the patients’ bedside to improve patient safety and streamline clinicians’ workflow.

Purpose. The effect of bar-code-assisted medication administration (BCMA) on nurses’ activities in an intensive care unit was evaluated.

Methods. A prospective, observational, time–motion study was conducted by considering two approaches to medication administration in an intensive care unit: paper-based medication administration (PBMA) and BCMA. The time spent on nursing activities was measured using a prevalidated time–motion observation instrument and categorized based on workflow factors such as direct patient care, indirect patient care, administration, and miscellaneous or other. A descriptive analysis was conducted with the amount of time spent on each of the nursing activities. A multivariate analysis of covariance was conducted to assess the difference between the two approaches for the amount of time spent on various categorized nursing activities. Covariates included in the analysis were patient characteristics, medication administration characteristics, and number of nurses involved in medication administration.

Results. A total of 101 PBMA and 151 BCMAs were reviewed. The mean duration of total medication administration time was higher in the BCMA phase compared with the PBMA phase, as was the mean time spent on direct patient care activity. However, nurses spent less time on administration activity during BCMA. Statistical analysis revealed that the medication administration approach (BCMA versus PBMA) had a significant effect on time spent on direct patient care and medication administration activities.

Conclusion. The implementation of BCMA led to a reduction in the time spent by nurses on medication administration activities and increased the time spent on direct patient care activities.

Index terms: Codes; Drug administration; Hospitals; Nurses; Patient care; Time studies

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With BCMA, medication administration errors are less likely to occur because a bar code on both the medication label and the patient’s wristband is scanned at every stage of the medication administration process and at the point-of-care. At its fundamental level, BCMA is predicated on authenticating the “five rights” of medication administration: right patient, right drug, right dose, right route, and right time.9

When a nurse administers medications to a patient, the electronic system records the details of the medication administration and provides a warning if there is any mismatch of the five rights of medication administration. At Beloit Memorial Hospital in Wisconsin, medication administration errors were decreased by approximately 86% after the first year of implementing a BCMA system.9 The Department of Veterans Affairs reported an 86.2% reduction in errors after implementing bar-code-point-of-care systems in all 172 of its medical centers.10 A 2009 study on the implementation of a BCMA system in the medical–surgical units indicated improved adherence in checking two forms of patient identification, while in the intensive care units (ICUs) there was improved compliance seen in documenting medications and labeling medications at the patient’s bedside.11 Fowler et al.12 found that nurses were more satisfied with BCMA compared with PBMA because BCMA was safer for patients, easier to use, user-friendly, and effective in reducing medication errors. However, a thorough understanding of the scope of nurses’ workflow in the inpatient environment is critical to the successful implementation of BCMA technology.5,13 For example, if BCMA technology causes nurses to take longer to administer medications, this may divert nurses from other important patient care activities; likewise, if BCMA reduces the medication administration time, nurses must reallocate their remaining time.14 One study found that after BCMA implementation, nurses spent about 25% of their time on medication administration and roughly 25% on communication with patients, families, and direct patient care providers.7 Another study revealed that the percentage of time nurses spent on documentation decreased by 30% after installation of an ICU information system.15 However, studies evaluating the workflow improvements associated with the implementation of a BCMA system in an ICU setting are lacking.

We conducted an observational time–motion study to compare the amount of time nurses spent performing medication administration activities before and after the implementation of a BCMA system.

Methods

Study design. This was a prospective observational before-and-after time–motion study. Medication administration activities conducted by nurses in the ICU and time spent on workflow factors in the ICU associated with PBMA and BCMA were observed. Workflow factors measured included direct patient care activities, indirect patient care activities, administration activities, and miscellaneous or other activities.

Consent from the nurse manager was obtained before initiating data collection. The nurse manager informed all nurses in the unit about the scope of the study. PBMA data were collected from April 18 to May 16, 2008. BCMA technology was implemented in July 2008. BCMA data were obtained from May 6 to June 26, 2009. A 10-month period was considered adequate for nurses to become accustomed to the BCMA process.

This study was approved by the committee for the protection of human subjects at the University of Houston and the institutional review board at our institution. Data collectors and investigators were educated about the Health Insurance Portability and Accountability Act and protection of human subjects before data collection was initiated.

This study was conducted in a large tertiary care hospital. The hospital has 627 staffed beds, 127 of which are in the ICUs. This study was conducted in one of the ICUs with 12 patient beds and 12 nurses where patients were mainly those with cardiology-related diagnoses. The PBMA sample was collected by reviewing and evaluating medication administrations documented by nurses in the medication administration record. The BCMA sample included medication administrations documented by nurses in the medication administration record. The BCMA software is bidirectionally interfaced with the pharmacy information system.

Data collection. A prevalidated data-collection instrument12,15 was used to record all tasks performed by individual nurses. The instrument consisted of two parts. The first part consisted of three sections. The first section was used to obtain information specific to the medication administration, such as date, start time, end time, total time, study phase (i.e., PBMA or BCMA), and number of nurses involved in the medication administration process. The second section was used to record patients’ demographic characteristics, and the third section was used to obtain information on the characteristics of the drug administered. The second part of the data-collection instrument included a tool to document activities and tasks performed by nurses during the medication administration process.

Five nursing activities were listed in the data-collection instrument: direct patient care, indirect patient care, administration activities, miscellaneous activities, and other activities. Direct patient care was defined as tasks performed by nurses at the patient’s bedside and involved five tasks: taking vital signs, programming or checking i.v. pumps, prepar-
ing drugs, inserting i.v. catheters, and hanging i.v. fluids or medications. Indirect patient care was defined as tasks performed by nurses not at the bedside but enabled the direct patient care activities and involved four tasks: observing monitors, observing i.v. flow, assisting physicians, and performing tasks related to universal precautions. Administration activities were clinical activities related to medication administration and involved administering medication, documenting medications, documenting other information, and crosschecking drugs with orders. Miscellaneous activities were nonclinical and peripherally related to medication administration and included hand washing, spending time with the patient, and conversing with other personnel on the unit. Other activities were activities related to medication administration not categorized by the abovementioned activities. These activities were documented as they happened and included viewing warnings in the BCMA technology and reacting to warnings during the BCMA observation period. During the PBMA observation period, other activity was recorded when nurses would leave the patient room for obtaining medicines or were positioning patients before administering medications. This part of the instrument was designed to measure the time spent on each activity.

Before the start of the study, data validation for medication administration time was accomplished by simultaneously obtaining data using three data-collection assistants for the same process. Data collectors were graduate students who had at least six months of experience in observing and recording information in the ICU. Data from five medication administrations were collected using this process, and the interrater reliability calculated was 0.96. Care was taken in calibrating all watches used by data collectors to minimize any variation existing in the measuring instrument.

Data collection began by observing a particular nurse during a medication administration process. Using a systematic random process, every second nurse who entered the room was selected for observation. The data collector was anticipated to work with four or five nurses per shift each day. An informed-consent document was used to explain the purpose and data-collection process to the nurses. Nurses were informed that their performance measures would be kept confidential. The names and any other identifiers of specific nurses were not recorded. The data collector observed the nurse from outside the patient’s room and recorded all pertinent information in the standardized data-collection instrument. Nurses were requested to ignore the presence of the data collectors and perform their duties in a normal manner. Data collectors were instructed not to interfere with the activities of the nurses. Further, to acclimatize with the ICU setting and reduce the Hawthorne effect, data collectors interacted with nurses in the ICU for over two months before initiating data collection.

Medication administration time for each activity was noted using two electronic stopwatches. One stopwatch measured overall medication administration time, and the other measured the specific time spent on each task. Medication administration was defined as the agenda of activities performed by nurses during medication administration to patients; it included all activities described previously from direct patient care activity to other activity. Total medication administration time for a specific patient began when the nurse started medication administration-related activity inside or outside the patient’s room and ended when the nurse exited the patient’s room and finished the medication-administration-related activities.

Patients’ demographic characteristics, the length of stay in the ICU, the number of comorbidities present during admission, and detailed information about drugs administered were obtained from the hospital’s data-management system.

**Statistical analysis.** Data were entered into an Excel (Microsoft Corp., Redmond, WA) spreadsheet and analyzed using SAS 9.1 (SAS Institute, Cary, NC). The mean ± S.D. duration of time spent on each activity was calculated, and descriptive statistics were reported. Chi-square tests were conducted to assess the effect of covariates. Multivariate analysis of covariance (MANCOVA) was performed to determine the difference in time related to all workflow factors across both groups. Dependent variables for the MANCOVA included the amounts of time spent on direct patient care, indirect patient care, administration, and miscellaneous or other activities. All statistical analyses were conducted addressing a number of factors acting as covariates, such as patient’s characteristics, medication administration characteristics, and nurse performing the medication administration.

**Sample size.** For this study, an α of 0.05 was deemed significant. Different values of effect size and power were considered using G-Power software to obtain the needed sample. The sample size for multivariate analysis of variance was 138 for an effect size of 0.15 with an α of 0.05 and a power of 0.95 for the two groups with five dependent variables.

**Results.** The characteristics of the medication administrations observed are provided in Table 1. During both the PBMA and BCMA periods, there were interruptions while nurses performed medication administration activities. An interruption was defined as the suspension of a current task or activity due to managing an unexpected event. Interrupted ad-
ministrations (n = 15 during PBMA, n = 5 during BCMA) were deleted from the final sample considered. The total number of medication administrations observed was 252 (101 during PBMA, 151 after implementation of BCMA).

The distributions of patients’ age, number of drugs administered, number of nurses involved, and length of stay of the patient in the ICU were significantly different in the PBMA and BCMA groups (Table 1).

The mean ± S.D. duration of total medication administration time was 313.3 ± 224.3 seconds during PBMA and 377.8 ± 232.8 seconds during BCMA. Time spent on various medication administration activities during the two periods is provided in Table 2. During the PBMA phase, nurses spent the most time on administration activities, followed by direct patient care activities. This changed in the BCMA phase, with nurses spending the most time on direct patient care activities, followed by administration activities. A MANCOVA controlling for covariates indicated that there was an overall significant effect of approach (PBMA versus BCMA) on the time spent on the four different medication administration activities (Table 3). None of the covariates showed any overall significant effect on medication administration time; therefore, an analysis of variance was conducted to assess which activity was influenced by the BCMA intervention. Approach had a significant effect on the time spent on direct patient care activity (F = 154.88, p < 0.0001) and administration activity (F = 6.35, p = 0.01).

Discussion

As hospitals consider implementing BCMA, it is vital for administrators to know how nurses spend their time so that new technology supports medication administration workflow and maximizes the time spent at the patient’s bedside. Time–motion studies are considered a practical way to systemically understand activities of nurses during medication administration,17 and this study found that the time spent on direct patient care activities increased with the use of BCMA technology, while time spent on administration activities decreased. Although the number of drugs administered increased during the BCMA phase and the number of nurses involved decreased, the differences in time remained significantly different in the BCMA phase compared with the PBMA phase.

In a BCMA system, nurses have direct access to a patient’s clinical and pathological results, a patient’s comorbidities and allergy informa-

| Table 1. Characteristics of Medication Administrations with PBMA Versus BCMAa |
|---------------------------------------------|------|-----|
| Variable                                   | PBMA (n = 101) | BCMA (n = 151) | p<sup>b</sup>  |
| Patients’ age, yr                          |      |     |     |
| <25                                        | 1 (1.0) | 0 | <0.0001 |
| 25–34                                      | 8 (7.9) | 3 (2.0) |     |
| 35–44                                      | 15 (14.8) | 2 (1.3) |     |
| 45–54                                      | 9 (8.9) | 19 (12.6) |     |
| 55–64                                      | 23 (22.8) | 34 (22.5) |     |
| ≥65                                       | 45 (44.5) | 93 (61.6) |     |
| Male                                       |      |     |     |
| Male                                       | 71 (70.3) | 105 (69.5) | 0.8974 |
| No. drugs administered                     |      |     |     |
| <6                                         | 48 (47.5) | 95 (62.9) | <0.0001 |
| 6–10                                       | 47 (46.5) | 29 (19.2) |     |
| >10                                        | 6 (5.9) | 27 (17.9) |     |
| No. nurses involved in medication administration |      |     | <0.0001 |
| 1                                          | 38 (37.6) | 151 (100.0) |     |
| 2                                          | 63 (62.4) | 0 |     |
| Length of ICU stay, days                   |      |     | <0.0001 |
| ≤10                                        | 85 (84) | 100 (67) |     |
| 11–20                                      | 8 (8) | 26 (17) |     |
| 21–30                                      | 4 (4) | 14 (9) |     |
| 31–40                                      | 4 (4) | 11 (7) |     |

<sup>a</sup> PBMA = paper-based medication administration, BCMA = bar-code-assisted medication administration, ICU = intensive care unit.

<sup>b</sup> Chi-square test.

| Table 2. Mean and Median Duration of Medication Activities During PBMA Versus BCMAa |
|---------------------------------------------|------|-----|
| Activity Type                             | PBMA (n = 101) | BCMA (n = 151) |
| Administration                            | 59.8 (29) | 45.5 (30) |
| Direct patient care                       | 47.4 (20) | 182.3 (154) |
| Indirect patient care                     | 13.0 (0) | 9.2 (0) |
| Miscellaneous                             | 29.1 (18) | 32.7 (24) |
| Other                                      | 2.3 (0) | 1.1 (0) |

<sup>a</sup> PBMA = paper-based medication administration, BCMA = bar-code-assisted medication administration.
tion, drug information, drug–drug interaction information, and hospital policies related to medication administration, which may partly explain why nurses were able to conduct administration activities faster during the BCMA phase. According to the Agency for Healthcare Research and Quality, more time spent by nurses on direct patient care is associated with a decreased risk of hospital-related death and a shorter length of stay.18

According to the American Society of Health-System Pharmacists statement on bar-code-enabled medication administration technology, “Pharmacists should take the lead in ensuring that implementation of BCMA systems and the re-engineering of the medication-use system addresses the complexities of the process and that the goal of improving patient safety is achieved.”19

Certain limitations were identified while conducting this study. First, nurses may be subject to the Hawthorne effect, as they were observed during the medication administration process, though this effect was similar between the PBMA and the BCMA phases. Further, the effect was minimized by ensuring that the data collectors spent enough time with the nurses before the start of the study to acclimate them to their presence. Second, this study was conducted in an ICU; therefore, findings cannot be generalized to other patient care units. Third, the nature of a time–motion study does not allow the assessment of the quality of interaction between patients and nurses. Further research is needed to determine if the increase in direct patient care activity increases the quality of interactions between patients and nurses, thereby improving patient care and safety.

Future studies on medication administration time should evaluate the specific tasks conducted by individual nurses in the medication administration process. The perception of ICU nurses regarding the timeliness of care and ease of medication administration after implementation of BCMA can be studied to evaluate whether there is a need to change nursing activities. The impact of BCMA on medication error rates should be evaluated for its long-term effect on patient care.

Table 3. Multivariate Analysis of Covariance

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<th>F</th>
<th>df</th>
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<td>PBMA vs. BCMA</td>
<td>0.907</td>
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<td>Patient’s age</td>
<td>0.851</td>
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<td>Patient’s sex</td>
<td>0.976</td>
<td>0.96</td>
<td>4,162.0</td>
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<td>Length of ICU stay</td>
<td>0.951</td>
<td>0.68</td>
<td>12,428.9</td>
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<td>No. comorbidities</td>
<td>0.986</td>
<td>0.55</td>
<td>4,162.0</td>
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<td>Total no. drugs administered</td>
<td>0.935</td>
<td>1.38</td>
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<td>No. oral drugs administered</td>
<td>0.947</td>
<td>2.23</td>
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<td>No. topical drugs administered</td>
<td>0.963</td>
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<td>4,162.0</td>
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<tr>
<td>No. nurses involved</td>
<td>0.965</td>
<td>1.43</td>
<td>4,162.0</td>
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<td>Nurse performing medication administration</td>
<td>0.689</td>
<td>0.84</td>
<td>76,640.5</td>
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PBMA = paper-based medication administration, BCMA = bar-code assisted medication administration, ICU = intensive care unit. Multivariate analysis of covariance where dependent variables were logarithm of time spent on direct patient care activity, indirect patient care activity, administration activity, and miscellaneous activity. Independent variable was effect of intervention (PBMA versus BCMA). Covariates were patient’s characteristics (age, sex, length of stay, comorbidities) and medication administration characteristics (total number of drugs administered, number of oral drugs administered, number of topical drugs administered, number of nurses involved, nurse performing medication administration).

Conclusion

The implementation of BCMA led to a reduction in the time spent by nurses on medication administration activities and increased the time spent on direct patient care activities.

References


Remote monitoring improves heart patients' health, may reduce hospital readmissions

A remote monitoring program can improve the condition of heart failure patients who are mobile and may reduce hospital readmissions. According to the study, conducted by the Center for Connected Health, a division of Partners HealthCare, included 150 heart failure patients admitted to Massachusetts General Hospital in Boston, MA.

"The goal of our Connected Cardiac Care program for this group of patients is to reduce hospital readmissions, provide timely intervention and help them understand their condition using home telemonitoring," said Ambar Kulshreshtha, M.D., M.P.H., lead author of the study and a research fellow at Harvard Medical School and Massachusetts General Hospital.

Patients in the remote monitoring group experienced lower average hospital readmission rates (31 readmissions per 100 people) compared to patients in usual care (38 readmissions per 100 people) and non-participants (45 readmissions per 100 people). Patients in the remote monitoring group also had fewer heart-failure related readmissions and emergency room visits than usual care and non-participating patients.

Patients received telemonitoring equipment to monitor vital signs such as heart rate, pulse and blood pressure. They also weighed themselves daily and answered a set of questions about symptoms every day. That information was transmitted through the telemonitoring device to a nurse, who would call weekly or more often if a patient's vital signs were outside normal parameters. Researchers also monitored patients' re-hospitalization rates and emergency care use. "Patients could see the fluctuation in their vitals and realize they hadn't taken their medications or weren't eating right or exercising," Kulshreshtha said. "A weekly call from the nurse reinforces lifestyle management of the patient's heart failure."

Ninety-five percent of participating patients in the intervention group said the program improved their heart failure control and helped them stay out of the hospital. All participating patients said the equipment was easy to use. Ninety-five percent believed they were able to manage their heart failure better. All participants said their health improved and they received adequate interactions with a homecare nurse.

This program has the potential to have "a dramatic impact on improving the lives of heart failure patients and reducing hospital admissions," Kulshreshtha said. An estimated 5.3 million Americans have heart failure. Hospital discharges for heart failure rose from 400,000 in 1979 to 1.08 million in 2005, an increase of 171 percent. The estimated direct and indirect cost of heart failure in the United States for 2008 is $34.8 billion, according to the American Heart Association's Heart Disease and Stroke Statistics - 2008 Update. Connected Cardiac Care creates an interaction between patients, nurses and doctors that allows for timely medication changes based on a complete clinical picture and helps heart failure patients feel empowered. This study was funded by Partners HealthCare.

operators room

Mobile workstations gain traction

Portable units boost accuracy, efficiency and care

by Julie E. Williamson

These days, most would agree that time is of the essence. Often, there aren't enough hours in the day to accomplish every task, and even if there were, we'd likely find ourselves scrambling to cram even more into that already narrow time slot.

Perhaps no other industry is more keenly aware of time limitations and the need to do more with less than healthcare. Each minute — or even second — that passes can mean the difference between good outcomes and bad, and even life or death. And while providing quality patient care remains the primary focus, as it should, it would be a bit naive to believe that time doesn't factor into the bottom line. Although the "time is money" mantra is one that may not leave a good impression with the media or general public, it's nonetheless become a part of doing healthcare business, particularly in light of caregiver shortages, increasing patient acuities and ever-shrinking reimbursement rates.

One way facilities are aiming to streamline efficiencies and improve outcomes is by adopting products and practices that allow for better data capture and care at the patient's bedside. As more and more healthcare organizations can attest, mobile workstations — fast becoming the gold standard for point of care computing and charting — can go a long way toward reaching those goals.

"Mobile carts allow a nurse or clinician to have real-time access to patient information in a convenient and mobile platform, while also providing a work surface and optional storage drawers that enable them to make fewer trips back and forth to the nursing station," explained Phil Smakula, national sales manager for IT Solutions, Lionville Systems Inc., Coatesville, PA.

In terms of investment, mobile workstations also provide more bang for the buck. Because computers can be moved where needed, facilities don't have to purchase a computer for every room and a workstation for every user. They can invest in fewer devices, yet still benefit from flexibility and mobility, according to Keith Washington, vice president and general manager, Flo Healthcare, Norcross, GA. "In this sense, mobile workstations are the productivity-enhancing devices for the lowest cost of ownership."

Convenience and efficiencies aside, perhaps the biggest perk afforded by mobile workstations is that they allow the clinician to spend more time with the patient. Nurses select nursing as a profession because they are passionate about providing care for patients, stressed Brad Blackwell, senior product manager for Mountain View, CA-based Omnicell Inc.

"Their highest satisfaction comes from direct time and care at the bedside, and patients feel the highest level of comfort and care when the nurse is with them. Finding efficient and effective workflows that can be performed at the bedside is crucial to improving a nurse's ability to provide the highest quality patient care," Blackwell noted, adding that a well-designed mobile workstation meets a large number of those objectives.

Brains — and brawn

As the name implies, mobile workstations primarily center around computing. Depending upon the model — and a facility's unique needs and budget — these workstations can support all software platforms and accommodate virtually any size and type of existing computer hardware (including barcode technology), or if preferred, can be outfitted with an integrated computer system and built-in network.

In terms of connectivity and integration capabilities, some mobile workstation "smart carts" are really living up to their name.

"The ability to add optional equipment [such as] vital signs [equipment] and data collection devices has become a regular expectation," Smakula noted. Lionville designs and engineers its carts for such integration. With this added power and IT capabilities comes the need for better and longer-lasting power supplies. More and more,
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Manufacturers are incorporating improved batteries and power supplies into their mobile workstations, allowing for longer run times and rapid recharging. Remote battery management software is also available to extend the life of a cart’s power system, pointed out Steve Reinecke, global director of healthcare, Ergotron Inc., Eagan, MN.

Patricia Moore, vice president of marketing and sales, CompuCaddy, Louisville, KY, explained the push for advanced power this way: “At the end of the day, if a workstation isn’t functional because its power supply fails it really doesn’t matter how many other features the cart has. A good, reliable power system is a must-have. CompuCaddy’s DC power design allows maximum computer runtime (between 8 and 24 hours depending on technology configuration, application, battery age, and usage pattern). The company’s X2 Power Option— for use with CompuCaddy’s X2 Series carts—implies a direct DC to DC connection, thereby omitting the need to invert the energy from the battery. This allows more efficient use of power when transitioning power from the battery to the computer.

When comparing workstations and power capabilities, Omnicell’s Blackwell said customers should look for those that “provide wireless connectivity and come equipped with a battery that can last 12 hours” and recharge quickly. Beyond that, he said a nurse should also be able to easily change the battery without the use of tools.

Battery monitors, an option on many of today’s workstations, display real-time battery power status and remaining runtime, meaning clinicians won’t be left stranded. Omnicell’s BatteryPro, for example, even allows clinicians to configure alerts to sound when the charge dwindles to a preset percentage. Users can also set BatteryPro so that data will be saved if the system shuts down. “This is a big deal for someone who has just spent two hours documenting,” Blackwell explained.

Form meets function

These days, workstations manufacturers are providing power in other ways as well, most notably in terms of their products’ durability and improved construction.

Not surprisingly, customers are generally seeking smaller, more lightweight—yet sturdy—workstations that are easy to maneuver and flexible enough to accommodate a broad range of needs and upgrades.

“Several years ago, the average cart weighed 180 pounds and had an overall base of 21 by 21 inches,” said Washington. Today, Flo Healthcare’s most popular workstation.
**OPERATING ROOM**

**WORKSTATIONS from page 26**

the Flo 1750, weighs just over 100 pounds with a 17 by 17 inch base, he said, explaining that during this transformation, Flo’s displays have become bigger, its computers faster and with more memory, and its battery system more powerful. We have also added peripheral devices, such as printers, scanners, enabling devices, and storage.

Customers are also looking for workstations that are easy on the eyes, as well as a slew of ergonomic design elements. And the models on the market today deliver.

“Carts today have a sleek, pretty design that really appeals to today’s nursing staff,” said Reinecke. “Advancements in ergonomic functionality, such as height adjustability and negative tilt keyboard trays, are now being incorporated into workstations.”

One change CompuCaddy recently made was moving the handle from the side of the cart to the front. “This makes it easier and more comfortable to maneuver. We also offer sturdy, six-inch casters – the largest in the industry – to make it easier for clinicians to push the cart down the hallway,” said Moore. A pull-out keyboard tray saves space and improves comfort, while a slide-through mouse pad tray accommodates both left- and right-handed clinicians.

Infection control is also catching on with mobile workstation manufacturers. CompuCaddy’s new Cynergy workstation, for example, features a new antimicrobial work surface, as well as an antimicrobial cord compartment that allows cords and wires to be tidily tucked away.

Mobile workstations are also offering unsurpassed flexibility and customization, allowing facilities to tailor the design and features to the unique needs of their end users – whether they’re used in admissions, the emergency department, operating room, at the bedside, and virtually everywhere in-between. Drawers and compartments that can house supplies come in a wide range of sizes and configurations, and can feature sturdy, tamper-resistant key- or combination-entry locks.

Understandably, carts that can blend computing and patient care delivery functions are gaining momentum. Workstations with medication storage and dispensing capabilities are a prime example. In April, RMS launched its Medication Expansion Pack for its M8 Mobile Computer Cart line, thereby creating a secure storage system that is essentially a hybrid of traditional computer and medication carts. Carts can be configured with two to six drawers. A patent-pending drawer system allows on-the-go customization for changing nurse-patient ratios (California legislation stipulates that patient to nurse ratios be limited at 5:1 or less).

“Our research shows there is a capacity and size gap between traditional computer and medication carts. One of the goals in creating this system was to eliminate that gap and provide a global platform that services any part of the hospital,” Chochinov noted. Flexibility is key. Customers have the option of

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buying the M38 cart now, and then upgrad-
ing with the Expansion Pack in the future.

The Mobile Cart Solution by Omnicell comes with and without medication draw-
ers (up to eight), and offers individual lock-
ing drawers, allowing for a nurse to be
directed to the appropriate patient’s medi-
cation, explained Blackwell. Further, cus-
tomers who purchase Omnicell’s Smart Mobile Cart Solution benefit from SafetyMed, a bedside point-of-care software
solution that’s integrated into the cart. “Cus-
tomers using Omnicell’s Smart Mobile Cart Solution will often remove medications from existing Omnicell medication cabinets lo-
cated on the nursing floor and then load
them into patient-specific medication draw-
ers on the mobile cart,” he continued, add-
ing that once at the patient’s bedside, a nurse
can then scan the patient’s barcoded identi-
fication band, which will simultaneously un-
lock that patient’s medication drawer(s).

What lies ahead?
While today’s mobile workstations are in-
deep sophisticated, vendors agreed that the
industry has just begun to scratch the sur-
face of advanced capabilities. In the future,
look for workstations to allow for greater au-
tomation of repetitive tasks.

Having a workstation become a “partner”
of the nurse is one possible future scenario,
Blackwell said. He reasoned that a cart could
automatically move to the first patient’s
room where the nurse is going to need it.

“It would pleasantly and audibly let the
nurse know it was time to perform an activ-
ity, such as medication administration. The
software would then guide the nurse
through the appropriate process and best
practice, while allowing flexibility and hu-
man judgment whenever appropriate. The
cart would then automatically move to the
next room,” envisioned Blackwell. Beyond
that, mobile workstations of the future could
also ensure that nurses complete all activi-
ties, know when new orders exist for pa-
tients, when lab specimens are to be obtained
and when results are available.

Lionville’s Smakula predicts the market
will see even more lightweight workstations
(less than 100 pounds, including technology
and power supply). Workstations that can
integrate with the hospital’s software appli-
cations – including clinical and pharmacy
data – are possibilities for the future, he ex-
plained, as is a battery or power system that
can be recharged over a wireless or radio
wave-type signal.

In the next ten years or so, Reinecke pre-
dicts that inputting of information by a
caregiver will also start to disappear. “In the
future, we will see more clinical informa-
tion gathering integrated into the patient’s
bed, medical equipment and room. These
will monitor and record the information
and activities that are taking place auto-
matically.”

Such high-level advancements aside, the
adage of today - one size does not fit all –
will be one that carries into the future. Ac-
cording to Washington, mobile workstations
will probably always start with a common
foundation, allowing every department and
user in the hospital to configure a worksta-
tion to their own unique requirements.

“Although the hardware of future work-
stations will change very little, the software,
systems and processes around data manage-
ment will evolve,” Washington explained.

“For instance, we will see more Web-based
applications, as well as increased visualiza-
tion, where servers and data centers will
handle applications more often than mobile
deVICES, which will make devices more effi-
cient and effective.” HPN