

# Hospital Nurses' Work Activity in a Technology-Rich Environment

## A Triangulated Quality Improvement Assessment

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The aim of this project was to describe hospital nurses' work activity through observations, nurses' perceptions of time spent on tasks, and electronic health record time stamps. Nurses' attitudes toward technology and patients' perceptions and satisfaction with nurses' time at the bedside were also examined. Activities most frequently observed included documenting in and reviewing the electronic health record. Nurses' perceptions of time differed significantly from observations, and most patients rated their satisfaction with nursing time as excellent or good. **Key words:** *electronic health record, nurses' work, nursing time, patient satisfaction, technology, workflow*

**N**URSING has long been recognized as a central force in hospital care delivery. Providing a constant presence on the

frontline and critical connection at the bedside, nurses are uniquely positioned to foster wide-reaching improvements in patient-centered care, quality, and safety. Although nurse staffing and actual time spent directly caring for hospitalized patients have been associated with better patient outcomes and enhanced nurse satisfaction,<sup>1–4</sup> observational time-and-motion studies show that direct care constitutes only about 19% to 37% of a nurse's shift.<sup>5–9</sup> Comparative examination of work measurement approaches reveals mixed results with nurses' self-reports of direct care time being higher than (40.5% vs 32.7%,  $P < .006$ ),<sup>8</sup> lower than (33% vs 40%,  $P < .000$ ),<sup>10</sup> and similar to (25.4% vs 22.7%)<sup>11</sup> observed behavior.

During the past decade's explosion of health information technology (HIT) in support of clinical care, nursing workflows have been pushed into unique and different patterns, and activity in this newly modernized environment is not well understood. Technologies such as the electronic health

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record (EHR), computerized provider order entry, patient-monitoring systems, and barcode-assisted medication administration strive to streamline workflow, reduce inefficiencies, and enhance information access for point-of-care decision making.<sup>12</sup> The EHR information system in particular has notably influenced the way a patient's situation is understood and the way in which care is delivered.<sup>13</sup> In addition, mounting evidence suggests that HIT applications incorporating patient-centered care components can positively influence health outcomes.<sup>14</sup> However, for nurses to effectively adopt and integrate these technologies, attitudes and perceptions must align.<sup>15</sup> Across the nation, nurses have expressed some dissatisfaction with the EHR and its sometimes cumbersome electronic processes,<sup>16,17</sup> yet at the same time, have acknowledged it as a valuable care resource.<sup>16,18</sup> A systematic review of nurses' attitudes toward overall HIT revealed generally positive perspectives that improved over time with increased computer experience.<sup>19</sup>

The accelerating movement toward care propelled by patient preferences and values guides nurses to put patients first. Nursing courtesy, respect, listening, and explaining have risen as patient satisfiers in the national standardized, publicly reported Hospital Consumer Assessment of Healthcare Providers and Systems survey<sup>20</sup> and present opportunities to advance nursing practice. Yet, patients' perspectives on how much time nurses spend in direct care and their satisfaction with that time have remained unexplored. To our knowledge, no published empirical work has examined these factors.

## **LOCAL PROBLEM**

Amid a growing technological presence and ubiquitous commitment to patients in our own health care system, we were unsure exactly how nurses were spending their time or how patients felt about it. Anecdotal reports from our nurses suggested that possibly too much time was being allocated to charting in the EHR, keeping them away from

direct care of patients, but no quantitative data were available for validation. When exploring dynamic nursing activities, the tasks performed and the time spent performing those tasks, triangulated work sampling approaches can provide a more comprehensive picture of the intricacies of the workflow and help to mitigate methodological weaknesses of any single approach.<sup>21</sup> With this in mind, we conducted a quality improvement project that aimed to elucidate hospital nurses' work activity through observations, nurses' perceptions of time spent on tasks, and EHR time stamps. Nurses' attitudes toward technology and patients' perceptions and satisfaction with nurses' time at the bedside were also examined.

## **METHODS**

### **Improvement team**

In the summer of 2014, an improvement team was convened consisting of quality and nursing leaders as well as quality improvement specialists and analysts, nurse clinicians, and technology and health policy consultants. Our Chief Quality Officer served as project champion and led regular meetings that guided the development and implementation of the project. The University of Pittsburgh Medical Center (UPMC) Quality Improvement Review Committee approved the project.

### **Context**

UPMC is an integrated global, not-for-profit academic medical center housing more than 20 hospitals with over 5100 licensed beds and 400 clinical locations including outpatient sites and doctors' offices. Our nursing leaders chose 4 inpatient units to serve as observation sites as they provided a diverse representation of nonintensive care units within our health care system. Two units (family medicine and interventional cardiology) were housed in a 517-bed, tertiary care hospital and 2 (telemetry step-down and medical-surgical with stroke and oncology patients) in a 249-bed acute care, teaching

hospital; both facilities hold Magnet designation. At the time of the project, all quality team members were part of the Wolff Center at UPMC, an entity that coordinates and advances high-quality, safe care delivery for patients and members through system-wide partnerships.

### Design and observer training

We used a mixed-methods design and triangulated data capture approach that included prospective observations automated response time measurement system time stamps of EHR nurse activity, and nurse and patient surveys to produce a fruitful representation of the nurses' workflow. Data collection occurred between February 2015 and July 2015.

Eleven observers shadowed nurse activity. They included 9 trainees, 7 junior-level baccalaureate nursing and 2 certified registered nurse anesthesia students, and 2 Wolff Center staff member nurses who had extensive experience conducting real-time workflow observations. To enhance consistency of the observations, these same staff members prepared the students by conducting 2 training sessions. The first was a 3-hour classroom session that included an overview of the project and introduction to observational data collection methods. Students learned how to record nursing workflow activities using a time log and digital watch. Further instructions guided the students to log entries whenever the nurse changed activity or location, note interactions with other people, record equipment used, and avoid interrupting the nurse. Trainees watched a video simulation to allow them to practice recording observations using the data collection tool and received a list of standard abbreviations to reference when logging activity. A debriefing ensued at the conclusion of the video viewings, and if the students omitted an entry or recorded an activity incorrectly, the trainers reviewed that content and provided explanations and a rationale for the correct approach.

The second set of training sessions occurred at 1 of the 2 hospitals, and each lasted 3½ hours. During these episodes, train-

ers partnered with the students to complete nurse observations in real time on test units that were not being used for the project observations. Trainers directed the students to observe unobtrusively and in a nonjudgmental manner. During a single session, each trainer and trainee simultaneously completed individual logs of 30 to 45 minutes of the same nurse's activity, after which comparisons were made to reconcile the entries and provide critique and feedback. The process was repeated up to 3 times for each trainee until observation logs matched, and students' entries successfully captured the timing and detail of the work. Prior to starting data collection, students toured the units on which they would be observing and met with the unit leaders. To further enhance the reliability of the observations, trainers accompanied students the first time they were scheduled for a shadowing experience to ensure that techniques were performed consistently and according to training guidelines.

### Measures

Observers used standardized logs for itemizing activity and recording nurses' time spent performing specific tasks. To evaluate nurse characteristics and perceptions, we developed a questionnaire that included demographic questions as well as items about perceptions of the percentage of a work shift spent in each of 4 a priori defined categories (direct patient care, indirect care, waste, and unit-based/professional development activities), derived from categorizations of nurse work described elsewhere.<sup>6-9</sup> Category definitions and subcategories are presented in the Supplemental Digital Content Table, available at: <http://links.lww.com/JNCQ/A309>, and further detail about development of the subcategories is outlined in the Analysis section. The questionnaire also contained 1 item about the nurses' perceptions of the percentage of shift time spent charting in the EHR, two 5-point Likert items assessing their attitudes toward technology, and an open-ended question asking about factors that enhanced or interfered with their use of

technology. We provided a definition of technology that included medical/monitoring devices, communication systems (phones and pagers), and information systems (the EHR and computers).

Through the Cerner Lights On Network, an analytic cloud-based solution, we gathered active EHR nurse time via 2000 response time measurement system timers built into the Cerner Millennium<sup>22</sup> platform. These timers allow for examination of workflow and detect how long a user spends in various application functions such as reviewing or adding patient information or entering orders. The platform measures active time according to prespecified guidelines. We sought to compare Cerner time stamps with total observed time in the EHR and compare observational data with nurses' perceptions of time spent charting in the EHR.

Observers surveyed patients by asking how much time they recalled their nurse spending with them and how satisfied they were with that amount of time. Patients rated their satisfaction on a 4-point Likert-type scale with anchors of excellent and poor.

### **Data collection procedure**

Our team prescheduled observation days with each of the 4 unit directors who in turn selected nurses for participation. The only criterion for nurse selection was that the individual had not been previously shadowed in this project. Each nurse was observed only once to avoid overrepresentation by any 1 individual, and we aimed to capture approximately half of the nursing staff on each unit. At the beginning of a shift, observation team members explained the aims of the project to participating nurses and, using a script, described details of the shadowing activity.

To control for variability across different shifts, we restricted nurse shadowing to daylight hours during the week or on weekends, and to minimize observer fatigue and enhance accuracy, we limited continuous observational time to 7 hours or less. Two observers shadowed 1 nurse across all patient assignments during a daylight shift (either

8- or 12-hour), with each observer being responsible for half of the shift.

Throughout the shift, observers followed the nurses, recorded descriptions of activity on the observation logs, and timed activities using the digital watches supplied by our team. Consistent with the training session guidelines, the collected information included the location and nature of the activity as well as time spent in that activity. Interactions with patients, families, and health care workers were noted as were interactions with technologic devices including their nature and use. We instructed observers to position themselves close enough to the nurses to accurately record activity yet far enough away to maintain an unobtrusive presence. Nurses were assured that the project results would be used for learning and improvement.

The self-report portion of the project began at the end of the daylight shift. At that time, team members asked each observed nurse to complete the nurse questionnaire and surveyed patients cared for by an "observed nurse." Only patients willing to participate and without cognitive deficits were included.

### **Analysis**

Raw data were transferred from the observation logs to excel spreadsheets. We then assigned each line item to a preestablished subcategory that rolled up to the broader categories (direct patient care, indirect care, waste, and unit-based/professional development activities) outlined in the nurses' questionnaire. Experienced Wolff Center staff created the original set of subcategories by drawing from prior experience observing nurses in the hospital setting; they also guided category assignment during the data transfer activity. During the initial phase of the data analysis, our statistician conducted a second independent check of all categories and marked questionable categorizations for review and possible reassignment. Feedback from the first few data transfers guided the refinement of the subcategories. After reviewing the full complement of observations, we added

2 additional broad categories, break and miscellaneous to account for activity not covered by the 4 predefined categories. Breaks included meals, bathroom, and other personal breaks, and the miscellaneous category encompassed communication not involving patient care, trash removal, downtime (period where nurses were caught up and waiting for their next activity), and varied nonclassifiable tasks

We performed data analysis using Stata 13.1 (StataCorp, College Station, Texas). Descriptive statistics were generated to analyze the performed tasks and to describe the amount of time nurses spent on specific tasks and the proportion of time spent in various categories of activity. We used Wilcoxon signed-rank tests to compare direct observations with self-reports and Cerner Lights On Network data. In addition, we generated themes for open-ended responses about factors that facilitated or impeded technology use. Together, 2 reviewers examined the short responses looking for word repetitions and conducted line-by-line analysis to discover emerging patterns. With 14% of the observed nurses working 8-hour shifts, we normalized data reported in minutes to a 12-hour shift for ease of interpretation.

## RESULTS

### Nurse characteristics

A total of 79 nurses participated in this project. Nurse demographics for the overall sample were similar across the 4 units. The mean age was 33 years and most nurses (82%) were female with a bachelor's degree (36%) or diploma (36%) in nursing. Race and ethnicity broke down according to the following pattern: African American (3%), Caucasian (95%), and Hispanic (1%). The mean years of RN experience was 5.6, and the only characteristic that differed was the length of time that they worked on their respective units. Nurses tended to work on the interventional cardiology unit for a significantly longer period (median = 4) than did nurses on the other units (median = 2.5) ( $P = .002$ ).

### Observation sites

The units averaged 32 beds, varying from 23 to 36 in size. Case mix index (CMI) provided a picture of the units' clinical complexity, with higher values indicating more complex patients and greater levels of resources used. CMI ranged from 1.07 to 1.66, and differed significantly across the 4 locations ( $P < .001$ ), although the profiles for the family medicine and telemetry units were similar. Nursing assignments varied from 2 to 6 patients, and all sites produced an average assignment of 4 patients per nurse. Furthermore, average daily census and nurse and patient care technician turnover data remained stable over the data collection period.

### Observations

Observers collected more than 900 hours of observations over 79 nurse shifts and logged approximately 35 000 activities. The nursing tasks spanned 33 subcategories, which bundled into 6 high-level groupings. The most commonly observed nursing activities were documenting in the EHR (11.5%) and reviewing the EHR (9.1%) and, when combined, yielded an average of 20.6% (148 minutes) of a 12-hour shift. Patient assessment and interaction (8.9%), in-person communications with health care workers about patients or patient care (7.5%), and patient care and bedside procedures (7.2%) rounded out the nurses' top 5 activities. Patient assessment and interaction covered physical or verbal nursing assessments as well as patient teaching and conversations with patients. In contrast, patient care and bedside procedures included performing nursing care procedures such as inserting or checking intravenous lines and changing dressings as well as bathing, ambulating, or helping patients to get out of bed. Macrolevel analysis revealed that indirect care constituted approximately 58% of the nurses' work, whereas direct patient care comprised only 22% of a 12-hour shift.

Nurses spent an average of 33% of a shift interacting with technology including time in the EHR. Nearly 86% of that time involved employing the technology for patient care

delivery. Observers logged nurses using intravenous infusion pumps, heart monitors, pulse oximetry, bladder scanners, sequential compression devices, bed alarms, automated vital sign measures, portable phones, and the AcuDose-Rx<sup>23</sup> automated dispensing cabinet for high-risk medications and controlled substances. Other nonmutually exclusive activity bundles of interest included communication about patients (face to face with health care workers and families, phone and paging activity, and report), total EHR time (documenting, reviewing, and medication preparation), and medication-related activity, which accounted for 19%, 26%, and 12% of the nurses' shift work respectively. Examining the relative percent contribution to medication-related activity, we found that nurses engaged in medication preparation 56% of that time and in medication administration 44% of the medication-related time.

**Comparisons of observations to nurses' self-reports and Cerner Lights On Network**

When surveyed at the end of the shift, nurses perceived spending significantly more time in direct patient care activities (52%,  $P < .0001$ ) and significantly less in indirect patient care activities (32%,  $P < .0001$ ) compared with observations. Direct and indirect care between the 2 assessment methods exhibited an inverse relationship. Additional comparisons of self-report to observed workflow

highlighted that nurses also perceived spending significantly more time in wasteful activities (searching, gathering, waiting, and traveling) (15% vs 4%,  $P < .0001$ ) (Table) and charting in the EHR (26% vs 11%,  $P < .001$ ).

Cerner Lights On Network technology displayed nurses ( $n = 41$ ) spending an average of 2 hours and 50 minutes in the EHR, equating to 24% of a 12-hour shift. Similarly, the observed EHR bundle for that group of nurses showed an average of 3 hours and 2 minutes of EHR activity (25% of a 12-hour shift) and validated the nurses' total time in the patient record ( $P = .106$ ). Because of technical application issues, Lights On captured activity for only 52% of the nurses, and data were missing for the entire medical-surgical unit.

**Health information technology attitudes**

Ninety-one percent of nurses agreed or strongly agreed with the statement "Health care technologies help me to provide higher quality, safer care for my patients," whereas only 27% of nurses agreed or strongly agreed with the statement "Health care technologies are difficult to use." Sixty percent of nurses in the upper quartile of age ( $\geq 49$  years) agreed with the latter statement compared with 22% of younger nurses ( $P = .019$ ), showing a significant difference in attitude by age.

When asked to identify factors that facilitated technology use, 35% of the nurses noted convenience and 22% identified accuracy/

**Table.** Time Spent in Various Activities: Nurses' Perceptions Versus Direct Observation

Activity	Nurses' Perceptions Mean (Range), %	Direct Observation Mean (Range), %	P
Direct patient care	52 (15-85)	22(8-42)	<.0001
Indirect patient care	32 (10-70)	58 (42-75)	<.0001
Waste	15 (0-50)	4 (1-10)	<.0001
Unit-based and professional development activities	3 (0-32)	3(0-19)	.348
Miscellaneous	a	9 (0-31)	
Break	a	7(0-19)	

<sup>a</sup>Nurses were not asked to recall time spent in these categories.

safety. Other facilitators included efficiency, providing information, facilitating communication, reliability, and familiarity. The most frequently mentioned factors that impeded technology use were lack of reliability (64%) and interruptions (26%). The nurses also listed inefficiency, inconvenience, lack of communication, and failure to provide information as barriers.

### Patients' perceptions

Seventy percent (215) of the 307 patients cared for by the observed nurses met the criteria to be surveyed. We conducted patient interviews at the end of each observation day regardless of when the patient arrived on the unit. Patients reported spending an average of 74 minutes with their assigned nurse, and 90% rated their satisfaction with that amount of time as excellent or good. In comparison, observers logged nurses spending an average of 158 minutes directly caring for their full assignment of patients. Given an average patient assignment of 4, and if time was equally distributed, nurses could be estimated to have spent about 40 minutes with each patient.

### DISCUSSION

Data collected through observation and self-report produced significantly different characterizations of the nurses' work. Consistent with the range of time reported in previous observational studies,<sup>5-9</sup> shadowing in the current project revealed that direct time with patients constituted about 22% of a nurse's shift. This was a significantly smaller proportion of time than our nurses' perceived it to be. Others have shown similar discrepancies where nurses tend to overestimate their time at the bedside.<sup>8</sup> When considering the extent that time at the bedside matters, we are pointed to a strong body of evidence that connects a greater RN presence to fewer hospital complications.<sup>1-4</sup> Further attention has been directed at nursing surveillance as a strategy integral to preventing and identifying medical errors and adverse events.<sup>1,24</sup> This strategy relies on frequent nurse-patient interac-

tions to synthesize information for effective clinical decision making and provision of safe care.

Nurses also significantly overestimated the percentage of the time they spent charting in the EHR. On average, they perceived over a quarter (26%) of a shift devoted to that activity alone but were observed to do so only 11% of the time. This perception corresponds to past anecdotal accounts where our nurses expressed frustration about devoting excessive time to charting, a frustration that, in part, sparked the development of this project and which has been echoed by others in the profession.<sup>25</sup> In addition, nurses overreported their time spent in "waste activities," with observers logging only 4% or 29 minutes of a 12-hour shift in that category. Although the actual time interval may appear minimal, identification of wasteful activities in our setting, including waiting, searching, and gathering, should be targeted for improvement. Understanding the observed inefficiencies can lead to changes in resource planning and allocation aimed at producing more value at lower costs.

The inaccuracy of the nurses' estimations suggests that self-report may not be a dependable approach for quantifying nursing care activities. At the same time, it also underscores the need to reconcile perceptual awareness with data-based information. Internal views of workflow evolve over time and may not automatically align with changing patterns in the chaotic and intense in-patient environment. Providing empirical feedback may help to cultivate a keener awareness of workflow among our nurses and may even enhance the way they allocate their time, the efficiency they achieve, and the care they deliver. Exploring the rate of interruptions may also lend some insight into the discrepancies.

Overall time in the EHR (documenting, reviewing, and medication preparation) of about 3 hours per 12-hour shift was corroborated by observations and the automatically generated computer time stamps. This volume of time is supported by other studies in various settings. Douglas and colleagues<sup>9</sup> and

Battisto's group<sup>26</sup> reported similar percentages (24% and 25%) in a pediatric intensive care unit and general medical-surgical unit, respectively. Although total time in the EHR was substantial, nurses also spent nearly a fifth of their time communicating about patient care. Our nurses' time in medication-related tasks (12% of a shift) was less than the 17.2% reported in the seminal work by Hendrich et al<sup>5</sup> and the 19% to 20% by Westbrook et al,<sup>6</sup> both noted during time periods when paper medical records and medication charting systems were still in use. When focusing only on medication preparation and administration, our findings converge with those of others<sup>27</sup> who tracked medication activity after implementation of a medication management system, suggesting the possibility of enhanced efficiency with a computerized approach.

Attitudes about technology were mostly positive and consistent with other literature<sup>13,19,28</sup>; younger nurses possessed more positive attitudes compared with older nurses. As might be expected, nurses frequently identified convenience, usability, and accuracy as factors that facilitated their use of technology and lack of reliability and interruptions as key barriers. Similar factors have been uncovered by others.<sup>14,19</sup> Recognizing technology's potential to accelerate care and the expectation for nurses to keep abreast of technological advances, we are presented with an opportunity to foster the nurses' favorable perspectives. Ways in which this can be achieved include investing in smart, point-of-care solutions, providing necessary training and support, and addressing barriers in a timely manner.

Alarming absent from the published data-based literature until now have been patient perceptions of time spent with the bedside nurse. Ninety percent of our patients surveyed rated the amount of time with the nurse as either excellent or good even though they estimated an average of 74 minutes of direct care time. Quality of time, in addition to perceived duration, may be fundamental to the patient experience, and consideration of timing and sequence of interactions might

help to override physical time constraints. Jones<sup>29</sup> presents a conceptual framework that describes 3 interdependent properties of nursing time, physical, psychological, and sociological, essential to the nurse-patient relationship. Physical time assessed by hours of nursing care may not adequately capture psychological nursing time in which history, experience, and expectations influence both patient and nurse perspectives. Likewise, physical time may not always reflect the sociological time context that includes shared structures such as established shifts, medication times, and ancillary service routines within which nurses are required to execute decisions and organize care. This triad of nursing time dimensions warrants exploration.

Time spent with physicians has been shown to be a determinant of patient satisfaction,<sup>30</sup> and provider posture (sitting or standing) has been shown to impact patient perceptions of time with both physicians and nurses.<sup>31,32</sup> In a recent study of nurse leaders' rounding, posture did not impact patient perceptions of interaction quality, patients overestimated the time spent with leaders, and although the overestimates were greater for the sitting group than the standing group, the difference was not significant.<sup>32</sup> Consideration of these findings is pertinent as we pursue new ways to enhance the patient care experience, explore how much nursing time our patients actually need and want, and customize care. Do our patients want as much time with the nurse as possible, or do they simply want time with the nurse when they need it?

Notably, most results for the full sample of shift observations were mirrored by each of the individual nursing units. Despite differences in CMI among the units, the distribution of the nurses' time looked similar, and the same perceptual patterns emerged among the nurses and patients.

### **Action plan**

After sharing the project findings with leadership and staff, our team facilitated an action plan. We decided to operationalize a Clinical Practice Improvement Unit that will

focus on the care and needs of our patients and their families and strive to improve our nurses' experiences and perceived workload. The first test of change will be implementation of a 6:00 AM to 10:00 AM nursing support shift to facilitate less interruptions for the nurses working full shifts. In turn, this may help to align the nurses' perceived psychological time in various work activities with elapsed time. We also plan to test patient-guided suggestions and evaluate technology use barriers to promote HIT reliability and efficiency.

### Limitations

We recognize several limitations in the methods of this project. The results from each data collection source (observation, self-report, and Cerner Lights On Network) captured slightly different sample sizes, making exactly matched comparisons impossible. Also, tracking nursing activity only by full patient assignment rather than by individual patients precluded a robust statistical comparison of patient perceptions to either nurses' perceptions or observations. The triangulated data collection approach allowed for some cross-verification of the same information, yet each data source held unique drawbacks. During direct observation, nurses may have changed their behavior as a result of being shadowed, and both nurse and patient self-reports may have been subject to recall bias whereby disclosures are vulnerable to distortion, either intentional or unintentional. However, the fact that we found similar results across all 4 units supports the cogency of the data despite the weaknesses of each unique data collection method. In addition, although we sought to develop clear and useful categories and subcategories of nursing activ-

ity, our grouping choices could be challenged, and the consistency of our observations could have been strengthened by formal interrater reliability testing. Although findings from this quality improvement project cannot be generalized to other settings, we have learned important lessons worthy of sharing with the outside community.

### SUMMARY

This project aimed to understand how hospital nurses from a large academic medical center spend their workdays in the current technology-rich health care environment. Ours is the first quality improvement effort to assess nursing workflow from various standpoints that include that of the patient. The triangulated approach provides a far-reaching understanding of the complex and dynamic nature of nurse work activity. Our findings demonstrate a discord between nurses' perceptions of time spent in direct care, "waste" activities, and EHR charting compared with observations. In contrast, observed EHR activity converged with time stamps of activity generated by the Cerner Lights On Network technology. Although use of the EHR was the most time-consuming activity (followed by patient assessment and interaction, in-person communications with health care workers about patients or patient care, and patient care and bedside procedures), nurses reported mostly positive attitudes toward technology, and patients' indicated general satisfaction with the duration of direct nursing care time. Open-ended responses most commonly specified that convenience and safety facilitated the nurses' use of technology, whereas lack of reliability and interruptions impeded its use.

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