Leveraging to measure, evaluate, and

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Nurses are faced with the challenge of prioritizing their time according to patients' needs. Time at the bedside can become limited based on the quantity and acuity of patients in nursing assignments. The multiplying demands and increasing complexity of patients in the hospital have magnified the need for nurses who are highly skilled with time management.[1] By optimizing the use of today's advances in healthcare technology, organiza-

technology adjust nursing interventions

tions can provide useful data for determining best practices, or proven initiatives, to improve various metrics, including patient satisfaction.

Hospitals continue the transition to becoming Accountable Care Organizations that are held responsible for delivering low-cost, high-quality care. Through changes derived from the 2010 Affordable Care Act, Medicare reimbursement is now directly tied to individual hospital performance, and this includes patient satisfaction.[2] Patients' ratings of care account for a quarter of the criteria used to determine up to 3% of Medicare reimbursement.[3] It's critical that hospitals maximize reimbursement by achieving superior patient satisfaction, and the quality of nurse-patient relationships and time spent with patients has an impact on patients' perceptions of care.[3,4]

To demonstrate the use of technology to measure, evaluate, and adjust nursing interventions, a study was conducted using a real-time location system

(RTLS) at a Midwestern 286-bed community-based acute care hospital. These systems have the ability to display physical locations of people and equipment within a building and can record the actual amount of time that nursing staff members spend in patient rooms.[5,6] The aim of the study was to determine if a relationship exists between the amount of time nursing staff members spend at the bedside and patient satisfaction. Using RTLS technology, nurse leaders can track and trend how caregivers spend their time, identify barriers, and suggest new initiatives to increase time spent directly with patients.

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Literature review

Patient satisfaction. The Centers for Medicare and Medicaid Services' Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey is intended to measure patients' perspectives of their medical and nursing care.[7] Patient satisfaction is greatly influenced by nurses and can be tied to communication and relationship building during time spent with patients.[8]

The importance of nurses attending to patients' needs using a proactive approach was highlighted in a case study regarding patient rounding.[9] A structured rounding program was evaluated during an 8-month period and showed a steady improvement in HCAHPS survey results. Nurses also perceived rounding as useful and associated it with reduced patient call lights. The study reinforced the need to facilitate increased caregiver time with patients.

Another study of 311 acute care hospitals in California showed a positive correlation between nurse staffing percentages and patient satisfaction.[4] In contrast, the use of contracted nurses had a significantly negative impact on patient satisfaction. The retrospective analysis demonstrated that access of nurses to patients in hospital settings has a positive impact on patients' perceptions of care. The study supported the idea that making nurses more available to spend time with patients improves patient satisfaction.

On a medical telemetry unit, a "commit to sit" initiative was introduced to improve nurse-patient communication, listening, and relationship building.[10] Nurses took time to deliberately sit down with patients to build trust and improve communication. Over the course of 1 year, the nursing unit saw an increase from the 9th percentile to the 43rd percentile in the "communication with nurses" questions on the HCAHPS survey.

The underlying theme found when reviewing the literature about nursing impact on patient satisfaction supports the development of nurse-patient relationships. These relationships can be achieved in a variety of ways; however, facilitating time for caregivers to spend with their patients is a key takeaway.

RTLS. Within healthcare, RTLS technology has most commonly been used to track and locate various pieces of equipment.[11] RTLS technology consists of locator badges that can be attached to equipment or worn by staff members to communicate their location via a series of sensors throughout the facility.

A study to evaluate patient outcomes using RTLS technology was conducted in 2002.[12] It demonstrated that nurses' work shifts were comprised of 54% direct patient care; the other 46% was found to be spent on indirect patient care, or noncare-related activities. The RTLS was used to track the time that nurses spent with patients and how it impacted patient outcomes. Documentation wasn't defined as direct or indirect patient care. There was no significant correlation between time spent on direct patient care and adverse events. Patient satisfaction wasn't specifically addressed in this study.

A pilot study conducted in 2014 measured the accuracy of

RTLS technology and it was determined to be 75% consistent with direct continuous observation.[13] Although direct observation was shown to be the more accurate measurement of location, it was found to be an unrealistic method based on the amount of required manpower to deliver continuous observation. This more recent study was a positive demonstration of the improvements made in the reliability of RTLS technology since 2002.

reliability. A study in 2016 utilized RTLS technology to measure patient ambulation.[14] Accuracy of measured ambulation was evaluated by comparing RTLS data with clinician-reported data. RTLS data were determined to be 96% accurate. In some cases, this was more accurate than the clinician. Another study conducted a hand hygiene adherence review using a radio-frequency identification (RFI) system.[15] RFI systems have

pital and university Institutional Review Boards approved the study proposal.

Discussion occurred between the researcher and staff participants about the desire for nursing staff members to spend more time with patients to allow for improved opportunities to build meaningful relationships. The study intervention was welcomed by the staff members because the goal involved increasing time in patient rooms.

The purpose of the intervention was to increase the amount of time caregivers were directly accessible to patients with the intent to improve communication, assist patients, and foster relationship building.

One RTLS manufacturer cited several case studies from hospitals utilizing the technology.[5] The Johns Hopkins Hospital in Baltimore, Md., installed a large RTLS when it opened a 1.6 million-square-feet hospital in 2012, with the installation of 3,200 sensors and activation of 8,900 asset tags and 3,550 staff locator badges. The Johns Hopkins Hospital chief network officer stated that there was a great potential for return on investment due to reducing previously wasted time searching for misplaced items or locating coworkers. Additional studies completed by the manufacturer include a 94% response to call lights within 3 minutes at one healthcare facility and the use of RTLS technology to trigger visual indicators for hourly rounding programs at another large hospital system.

More recently, RTLS technology has been shown to increase

the ability to track time, motion, and activities using continuous monitoring. Results showed that only 22.6% of healthcare workers properly cleansed their hands before entering patient rooms. However, when exiting patient rooms, 67.8% of healthcare workers performed hand hygiene. This study adds to the body of knowledge about the use of healthcare information technology to improve patient care.

Methods

This study was a quasi-experimental design consisting of data points before and during the intervention. Baseline data were collected from the RTLS on the units involved in the study to determine average amounts of time spent at the bedside by RNs and patient care assistants (PCAs). In addition, baseline data were collected from unit HCAHPS survey scores. The hos-

Without the addition of more staff, participants agreed that documenting at the bedside was a realistic way to increase time spent with patients. Informed consent of all participants was collected before the start of the intervention.

Participants included a convenience sample of 83 RNs and 20 PCAs on 3 inpatient nursing units. The patient population consisted of adults admitted to one of the three units: medical-surgical, orthopedic, and progressive care. A participant survey was conducted before the intervention to establish demographic information and raise self-awareness of how much time participants were documenting at the bedside. Ninety-six participants completed the presurvey.

The intervention took place over a 30-day period. Participants were asked to conduct at least 80% of their documentation

in the electronic health record while in patient rooms. The purpose of the intervention was to increase the amount of time caregivers were directly accessible to patients with the intent to improve communication, assist patients, and foster relationship building. All patient rooms were equipped with a bedside computer. Participants were reminded to wear their hospital-issued RTLS devices to ensure RTLS data collection.

At the end of the 30-day intervention period, participants were asked to assign a percentage to the amount of time spent documenting in patient rooms during the intervention period. All 103 participants completed the postsurvey. Data were collected postintervention from the RTLS to identify average times spent in patient rooms during the intervention. HCAHPS scores were also collected and analyzed for the corresponding month of the intervention.

Evaluation

Time at the bedside. Baseline data consisted of average minutes spent in patient rooms per patient during the 3-month period before the intervention. The data were collected from reports generated by the RTLS system. Only sensors located inside patient rooms were included in the reports. To determine the amount of time per patient, the total amount of time spent in patient rooms was divided by the midnight census, resulting in an average per patient.

RNs averaged 91.2 minutes/patient/day in patient rooms preintervention. (See *Table 1.*) PCAs averaged 19.4 minutes/patient. Combined, this set of caregivers spent an average of 110.6 minutes in patient rooms preintervention.

During the intervention time frame, RNs improved time spent in patient rooms by 11.5 minutes/patient (12.6%). PCAs improved by 19.4 minutes/patient (62.5%). Combined, there was an increase of 23.6 minutes/patient (21.3%). Using a two-sample *t*-test, the improvement in time spent at the bedside was proven to be a significant change at a 5% significance level ($t = 5.34$, $P < .001$).

Survey data. Pre- and postsurvey data indicated a subjective improvement in the percentage of documentation completed at the bedside. (See *Table 2.*) Before the intervention, 9.4% of participants felt that they completed 80% or more of documentation at the bedside. The postsurvey indicated that 20.4% of participants felt they completed 80% or more of documentation at the bedside during the intervention phase (11% improvement). Worth noting, participants self-reported a 37.3% improvement in completing more than 60% of documentation at the bedside, from 21.9% to 59.2% during the intervention phase. A potential contributor to this improvement was that managers and staff members were provided weekly data throughout the study period to encourage continued efforts to document in patient rooms.

Patient satisfaction. Consistent with the RTLS data, baseline patient satisfaction

Table 1: Survey key findings

	RN data only			PCA data only			Total caregiver data		
Unit	3-month average baseline minutes/patient	Difference during invervention	Percent difference	3-month average baseline minutes/patient	Difference during invervention	Percent difference	3-month average baseline minutes/patient	Difference during invervention	Percent difference
Medical-surgical	78.3	(+)7.1	9.0%	14.5	18.4	126.8%	92.8	25.5	**27.4%**
Progressive care	97.4	14.9	15.3%	15.8	-1.5	-9.6%	113.2	13.4	**11.8%**
Orthopedic	98.0	12.4	12.7%	27.8	19.5	70.1%	125.8	31.9	**25.4%**
Average of units combined	91.2	11.5	12.6%	19.4	12.1	62.5%	110.6	23.6	**21.3%**

data were collected and averaged from the 3 months before the intervention. (See *Table 3*.) Baseline data showed an average combined overall rating of care of 82.4. Overall rating of care during the intervention time frame decreased to 69 (n = 48). This was thought to be due to increased patient volumes and high patient acuity. The "help from hospital staff" section of the HCAHPS survey asks questions about responsiveness of staff and assistance to the bathroom when needed. Two of the nursing units experienced an increase in their scores for this section, but the sample size didn't demonstrate significance (n = 29).

Table 2: Pre-and postsurvey data completed by project participants

	Pre		Post	
	Frequency	Percentage	Frequency	Percentage
Role				
PCA	20	20.8%	20	19.4%
RN	76	79.2%	83	80.6%
Unit				
Medical-surgical	28	29.2%	28	27.2%
Progressive care	20	20.1%	30	29.1%
Orthopedic	44	45.8%	39	37.9%
Iflex (float pool)	4	4.2%	6	5.8%
Gender				
Female	88	91.7%	91	88.4%
Male	8	8.3%	8	7.8%
Prefer not to answer	0	0.0%	4	3.9%
Years of experience				
<1 year	14	14.6%	11	10.7%
1–3 years	42	43.8%	44	42.7%
10–15 years	5	5.2%	7	6.8%
4–9 years	26	27.1%	28	27.2%
>15 years	9	9.4%	13	12.6%
Level of education				
Diploma	4	42.2%	0	0.0%
High school	18	18.8%	12	11.7%
Associate degree	33	34.4%	34	33.0%
Bachelor's degree	38	39.6%	45	43.7%
Master's degree	2	2.1%	1	1.0%
Other	1	1.0%	11	10.7%
Perceived percentage of documentation at bedside				
<20%	7	7.3%	3	2.9%
20–40%	29	30.2%	10	9.7%
41–60%	39	40.6%	29	28.2%
61–80%	12	12.5%	40	38.8%
81–100%	9	9.4%	21	20.4%

Strengths and limitations

The strengths of this study are the design and use of technology to produce quantitative data that can be replicated in future projects. The study can easily be tested with different interventions to improve time at the bedside. The use of the RTLS to demonstrate clinical processes and associated outcomes was beneficial and has sparked additional projects and initiatives utilizing the technology at the hospital.

The study demonstrated success in improving time spent at the bedside. This indicates that the participants understood the intervention and were committed to participating. Time at the bedside will continue to be measured to identify additional trends and opportunities. By using the RTLS for the study, there's now an increased understanding of the system functionality. Because of this, recommendations for further use of the RTLS to measure and evaluate current and new initiatives have been made.

There are also identified limitations. First, the low sample size of patient satisfaction surveys wasn't statistically significant. Another limitation is the inability to control extraneous variables that may have impacted overall patient satisfaction scores. Although the study focused on three specific nursing units, the entire hospital's patient satisfaction performance was lower than expected during the intervention month. This indicates that there were other variables that may have impacted the scores other than the study intervention.

Another limitation is the inability to prove the reliability of the RTLS. Although the system was tested on each unit and verified for accuracy based

Table 3: Patient satisfaction data

	3-month average: December to February	Project: March	Difference from baseline
Medical-surgical			
Overall rating of the hospital	80.7	46.2	-34.5
Help from hospital staff	50.6	52.2	1.6
Number of surveys	34	13	
Progressive care			
Overall rating of the hospital	83.7	87.5	3.8
Help from hospital staff	66.6	80.1	13.5
Number of surveys	43	16	
Orthopedic			
Overall rating of the hospital	82.8	73.7	-9.1
Help from hospital staff	69.3	63.3	-6.0
Number of surveys	71	19	
Units combined			
Overall rating of the hospital	82.4	69.1	-13.3
Help from hospital staff	62.2	65.2	3.0
Number of surveys	148	48	

on multiple single interactions, it's impossible to know if every staff interaction in patient rooms was recorded by the RTLS. This same limitation applies to the locator badges that staff members wear. Although all batteries and functionality were tested before the start of the study, there was a potential for the devices to malfunction or lose battery charge during the intervention phase.

Recommendations

There are several recommendations that can be made from this study. The first is to increase the amount of time that the intervention is in place. It's recommended to increase to at least a 3-month time frame to allow for a larger sample size of patient satisfaction surveys.

In addition, improvements to the intervention and staff instructions should be made. It became apparent that quality of time is most likely more important than quantity of time spent with patients. As part of the evaluation, the researcher spoke with multiple study participants seeking recommendations to improve the intervention. Participants thought that some patients may have considered the time spent documenting at the bedside unbeneficial to their care. Because the development of nurse-patient relationships is fostered by effective communication, both the researcher and study participants recommended providing an explanation to patients. One suggestion is to provide staff members with conversational scripting to improve patient understanding of the purpose of their presence in the room. It's also advantageous to use the increased time with patients in an interactive manner. Participants suggested achieving this by incorporating questions throughout documentation at predetermined points and intermittently providing patient education about disease process or new medications. The "commit to sit" initiative is another recommendation to improve patients' perceptions of time spent at the bedside and can be integrated with bedside documentation.

Outside of the immediate study, RTLS technology can be used to collect other data to help improve processes. For example, hourly rounding adherence can be monitored, in addition to the number of times patients use their call light and associated staff response times. These data can be helpful to demonstrate the impact of hourly rounding and, when done purposefully, how it correlates with decreased call light use. Additionally, new initiatives can be introduced to drive improvement based on call light response times.

Meaningful data

RTLS technology has the potential to produce meaningful data that nurse leaders can use to adapt processes and positively impact patient care delivery. The utilization of healthcare technology provides objective tools to share data across interdisciplinary teams. Today's nurse leaders are encouraged to understand, embrace, and adapt the extensive capabilities of technology to facilitate process improvement. NM

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