

Effects of Patient Care Unit Design and Technology on Nurse and Patient Care Technician Communication

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ABSTRACT

The current study described RN and patient care technician (PCT) communication in centralized and hybrid decentralized workstation designs using hands-free communication technology and infrared locator badge technology to facilitate communication. New construction of an oncology unit provided the opportunity to compare staff communication in two different workstation designs. Observations and questionnaires compared nurse and PCT communication in the two-unit designs. Descriptive statistics were used to analyze the differences. The hybrid decentralized unit had increased use of hands-free communication technology and hallway communication by nurses and PCTs, and increased patient room communication by nurses. Perceptions of communication between nurses and PCTs and congruency of priorities for care were similar for both units. The locator badge technology had limited adoption. Replacement of nurse workstations with new construction or remodeling impact staff communication patterns, necessitating that nurse leaders understand the impact of design and technology on communication. [Journal of Gerontological Nursing, 44(4), 17-22.]



Agging hospital infrastructure necessitates that aging patient care units be replaced with new construction or extensive remodeling that

includes up-to-date communication technology for care team members. Choice of communication technology is influenced by how communi-

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ation flows among team members and a patient care unit's design. The Centers for Medicare & Medicaid Services places high value on communication for patient safety and includes questions about the patient safety experience in the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. Nurses are communication leaders in the dimensions of responsiveness to staff, pain management, and communication about medications in the HCAHPS survey (Dempsey, Reilly, & Buhlman, 2014). Due to nurses' role in communication, it is essential that patient safety be considered when planning and designing a workplace that will impact communication about treatment and decision-making among health care team members, patients, and families; and about organization performance within teams (Dempsey et al., 2014).

Historically, hospitals were built using centralized workstations, which became the hub of communication on a patient care unit where all health care team members eventually

Several studies of decentralized models found patients were more satisfied and safety improved because nurses spent more time in patient rooms, but nurses felt more isolated (Gurascio-Howard & Malloch, 2007; Hua et al., 2012; Zborowsky, Bunker-Hellmich, Morelli, & O'Neill, 2010). It is important to note that physical environment and layout as well as tools to facilitate communication directly affect communication patterns among health care team members. Centralized versus decentralized unit designs have an impact on health care team members' and patients' perceptions of noise, congestion, clutter, and nurse-to-nurse communication and nurse community (Dunphy, Finlay, Lemaire, Macnairn, & Wallace, 2011; Gurascio-Howard & Malloch, 2007; Hua et al., 2012; Newcomb, 2011).

PURPOSE

The purpose of the current study was to examine the effect of centralized and hybrid decentralized workstation design and technology on RN

CONTEXT

A community hospital, first built in 1921, originally had patient care units designed with centralized workstations. These units had only one workstation in the center of the unit, with computers and seating for eight to 10 care team members such as the unit secretary, nurses, PCTs, and providers. Most medical-surgical rooms were semi-private. In 2009, the hospital began to design a new tower with all private rooms and the goal of improving safety, privacy, and patient-centered care. The tower was an angled, two-wing design, resulting in an expansion considerably larger than current units. The new 132-bed tower on four floors with all private room patient care units was opened with two shelled floors.

During design of the new tower, there were concerns regarding communication between health care team members and patients given the size of units due to the all-private room footprint; therefore, an interprofessional health care team worked with architects to create a decentralized workstation model for the new tower. The decentralized model has a small central workstation for a unit secretary and charge nurse to work at the entrance of the unit, and two workstations on each wing of the unit with three to four computers and seating for nurses, PCTs, and providers. These decentralized workstations allow care team members to work near the location of their assigned patients. In addition, three medication rooms were created, with one next to the central workstation and one in each wing of the unit. Clean and soiled supply rooms are also located on each wing.

The design included Vocera® hands-free communication technology to improve staff accessibility and communication. This technology was selected for its hands-free features. This wireless (WIFI) technology involves a care team member

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gathered (Hua, Becker, Wurmser, Bliss-Holtz, & Hedges, 2012). The centralized design has given way to smaller, decentralized workstation models that rely on advanced technology to facilitate communication, thus allowing nurses increased time with patients (Bayramzadeh & Alkazemi, 2014; Ulrich, Quan, Zimring, Joseph, & Choudhary, 2004).

and patient care technician (PCT) communication patterns on an oncology unit. Specifically, the study sought to describe communication of RNs and PCTs in terms of where and how often they communicated, the patient's plan of care, and their perceptions of frequency of communication with other health care team members.

wearing a small, voice-activated badge and allows caregivers to speak with each other in real time, rather than having to be face-to-face. Care team members can have call lights come directly to the badge, ask other members for assistance, or have a telephone call transferred to them. This technology was implemented in clinical areas 1 year before the new tower opened. This delay allowed for adoption prior to moving patient care units and created an easier adjustment to the decentralized workstation design.

In addition, Hill-Rom® infrared locator badge technology was implemented in the new bed tower, which allowed staff to locate each other more easily. WIFI tracks the infrared signals from each badge so that small monitors located in patient care rooms, workstations, and support rooms, such as medication rooms, can be viewed for the location of staff members. If a patient call light is activated, it is cancelled the moment a caregiver wearing the badge enters the room, thus allowing for a quieter environment that is efficient for staff.

It was within this backdrop of change that there was an opportunity to study the influence of workstation design on RN and PCT communications. An oncology nursing unit that had previously used a centralized workstation was moved to the new tower with a hybrid workstation design comprising one small centralized workstation with two decentralized workstations of various sizes located on each wing of the unit.

METHOD

Design

The current article was a field study using observations and questionnaires. The researchers compared RN and PCT communication using a centralized workstation design with Vocera hands-free technology and a hybrid workstation design with

Vocera technology and Hill-Rom infrared locator badge technology.

Setting and Sample

A Mid-West, 399-bed, not-for-profit community hospital had expanded over the course of 80 years. Existing patient care units were built in the 1920s, 1959, and 1971 with centralized workstations. The oncology unit was scheduled for transition from a 25-bed unit with a centralized workstation design (i.e., centralized unit) to a 32-bed unit with a hybrid decentralized workstation design (i.e., decentralized unit). Oncology unit staff included RNs educationally prepared at the baccalaureate or associate degree level and PCTs. The staffing plan for day shift was four to six nurses with a typical nurse to patient ratio of 1:4 and two to three PCTs with a PCT to patient ratio of 1:8.

Data Collection

An observation tool was developed by an expert nurse clinician (M.D.) and a nurse leader (M.S.B.) for use by study staff. The study staff observed and recorded data on staff member conversations that included the location, mode of communication, and parties involved. Each staff member participating in an observation was asked to complete a survey following the observation titled *Nurse Communication During Shift Questionnaire* or *Patient Care Technician Communication During Shift Questionnaire*. The questionnaires captured information regarding nurses' or PCTs' perception of the number of communications with other staff nurses and PCTs and the method of communication (i.e., in person, via Vocera, via telephone, other). Additional questions included whether communication occurred between nurses and PCTs regarding the top three priorities of patient care, vital signs assessment, and need for increased monitoring of specific patients, assessing the extent

to which nurses and PCTs agreed on these questions. Following the move to the new tower, an additional question asked whether the locator badge technology was used. Tools and questionnaires are available from the authors upon request.

Prior to beginning the study, approval was obtained from the hospital Institutional Review Board. Study staff gave an introduction about the proposed study to the oncology unit staff during a planned inservice. Each staff member had the opportunity to decline participation. Study staff communicated with the clinical supervisor prior to the start of an observation to identify assignments of RNs and PCTs who shared two or more patients. Each observation period (old unit and new unit observations) occurred from 9 a.m. to 2 p.m. throughout a period of 8 days and consisted of following four nurses and four PCTs and noting locations and individuals involved in communication. The observations on the decentralized unit did not occur until 6 months after relocating the oncology unit. This delay allowed for nurses and PCTs to establish routines in a new environment.

Data Analysis

Quantitative data were analyzed using descriptive statistics to describe differences in communication patterns between the centralized and decentralized unit. For the observation (**Table 1**), data were evaluated by how often a nurse or PCT talked on the telephone at the desk, talked verbally to someone at the desk, talked on their Vocera at any location, talked verbally in a patient's room, or talked verbally in the hallway.

RESULTS

The observations were compared between the centralized and decentralized units to determine if there were differences in communication modes and locations. Verbal communication at the desk occurred 10%

TABLE 1
OBSERVATION OF COMMUNICATION FREQUENCIES OF RNs AND PATIENT CARE TECHNICIANS (PCTs)

Location/Mode	Centralized Communications (N = 219)		Decentralized Communications (N = 242)	
	RN % (n)	PCT % (n)	RN % (n)	PCT % (n)
Telephone communication at desk	4.6 (10)	0.9 (2)	3.7 (9)	1.2 (3)
Verbal communication at desk	20.5 (45)	16.4 (36)	15.3 (37)	7.0 (17)
Vocera® in all locations	6.4 (14)	10.0 (22)	16.1 (39)	10.7 (26)
Verbal communication in patient's room	9.6 (21)	24.7 (54)	16.9 (41)	19.0 (46)
Verbal communication in hallway	2.7 (6)	4.1 (9)	5.8 (14)	4.1 (10)
Total	43.8 (96)	56.2 (123)	57.9 (140)	42.1 (102)

less often by the RN and 35% less often by the PCT in the decentralized unit compared to the centralized unit. Use of the Vocera technology for communication was 47% greater by the RN and 8% greater by the PCT on the decentralized unit compared to the centralized unit. Patient room communication by the RN was increased in the decentralized unit, whereas PCTs' communication decreased by 8%. RN hallway communication occurred 40% more often and PCT hallway communication occurred 5% more often on the decentralized unit.

Responses to the Nurse Communication During Shift and Patient Care Technician Communication During Shift Questionnaires (Table 2) were analyzed using descriptive statistics. There were 19 shared patients assigned in the centralized unit, and 20 in the decentralized unit. In both units there was 100% agreement between the RN and PCT of speaking directly to each other regarding the assignment. A consideration of the other responses presented in Table 2 was whether the paired RN and PCTs' answers were congruent (i.e., in agreement). In the centralized and decentralized units, the top three priorities of patient care had 84% congruence between the RN and PCT. In the centralized unit, there was agreement 84% of the time between the RN and PCT regarding

the RN asking for information about vital signs, but in the decentralized unit there was agreement 68% of the time. In the centralized unit, 83% agreed that the RN asked the PCT to increase monitoring of a patient, and in the decentralized unit, agreement occurred 95% of the time. The top three priorities of patient care listed by the RN and PCT were congruent between the RN and PCT 62% of the time on the centralized unit and 64% of the time on the decentralized unit. On the decentralized unit, only one of eight RNs reported using the locator badge during the shift, whereas three of eight PCTs indicated using it during the shift. It is noted that one question asked was not specific as to which communication it was referencing; thus, it was not included in the final data analysis.

DISCUSSION

It is imperative that organizations implement a strategy to maintain communication among caregivers when patient care units are redesigned. Although there was no difference in the telephone communications at the desk in either unit for the RN and PCT, the Vocera technology proved effective in maintaining adequate communication in the transition from a centralized workstation model to a hybrid decentralized workstation

model. In the current small study, increased Vocera use by nurses and PCTs in the decentralized unit was an effective way to maintain communication. In addition, the amount of nurse communication in patient rooms also increased in the decentralized unit, which may positively influence patient-centered care. These results are comparable to a nursing home (NH) study in which NHs with higher information technology sophistication had a higher incidence of communication among RNs/licensed practical nurses and certified nurse assistants in patient rooms and other locations in the NH. There was less face-to-face communication required to discuss patient concerns or orders (Alexander, Steege, Pasupathy, & Wise, 2015).

There were two interesting findings from the questionnaires completed by RNs and PCTs. First was use of the additional locator badge technology by only one fourth of participants. Although all staff participated in a competency-based assessment on use of technology in the decentralized unit, there was a lack of adoption of the locator badge technology. Perhaps the importance of when to use the technology and how it could impact workflow, including demonstrating the efficiency of using locator badge technology to find other health care team members,

TABLE 2
RESULTS OF NURSE AND PATIENT CARE TECHNICIAN (PCT) COMMUNICATION DURING SHIFT QUESTIONNAIRES

Questions	Centralized Workstation (Pre-Move) Frequency % (n) of Yes Response	Hybrid Decentralized Workstation (Post-Move) Frequency % (n) of Yes Response
For RNs	8 RNs to 19 Paired Patients	8 RNs to 20 Paired Patients
Did you use the locator badge monitor to find a staff member prior to communication?	NA ^a	12.5 (1/8)
Did you speak directly to the PCT taking care of this paired patient today?	100 (19/19)	95 (19/20)
If yes: Did you share the top three priorities of care of this paired patient?	63 (12/19)	50 (10/20)
Did you ask the PCT for information regarding vital signs of the paired patient?	46 (6/13)	53 (10/19)
Did you ask the PCT to provide increased monitoring of this paired patient today?	16 (3/19)	10.5 (2/19)
What are the top three priorities of care of this paired patient today? ^b	Congruent with PCT 62 (34/55)	Congruent with PCT 64 (30/47)
For PCTs	8 PCTs to 19 Paired Patients	8 PCTs to 20 Paired Patients
Did you use the locator badge monitor to find a staff member prior to communication?	NA ^a	37.5 (3/8)
Did you speak directly to the nurse taking care of this paired patient today?	100 (19/19)	90 (18/20)
If yes: Did the nurse share the top three priorities of care of this paired patient?	74 (14/19)	56 (10/18)
Did the nurse ask you for information regarding vital signs of the paired patient?	53 (10/19)	44 (8/18)
Did the nurse ask you to provide increased monitoring of this paired patient today?	21 (4/19)	5 (1/18)
What are the top three priorities of care of this paired patient today? ^b	Congruent with RN 62 (34/55)	Congruent with RN 64 (30/47)

^a Locator badge not available in centralized workstation unit pre-move.

^b Answers of the paired patients were compared for congruency.

was not part of the education provided. An alternative explanation is that Vocera had become the first line of communication; thus, a behavioral change would be required to use the badge technology.

The second and more interesting finding was the >35% lack of congruency between the RN/PCT regarding the three patient care priorities for the plan of care for the shared patients in both units. When considering the role of RNs

in overseeing PCTs' work, questions must be asked regarding the type of communication that is or is not occurring at the beginning of a shift regarding care of patients. This finding is concerning for ensuring patient safety and quality of care, and needs further evaluation.

Anecdotal observations by the chief nurse executive (M.S.B.) were two-fold. First, when entering the unit to speak to a specific nurse, she would ask the unit secretary to

locate the nurse and the unit secretary would use the locator badge monitor to identify the specific location of the nurse. Second, if a patient or family member expressed concern that staff members were not responding timely to a call light or completing hourly rounding, a report could be created with a list of times a staff member was in the room. The ability to create this list proved beneficial in follow-up conversations with patients or family.

LIMITATIONS

There are several limitations to report. The current study used a small sample and number of observations. The actual observation window of 2 hours per staff member was short for each observation. Variability in patient acuity during the observations could impact the modes and frequency of communications for RNs and PCTs. The observation tool and questionnaires were not tested for validity and reliability.

CONCLUSION AND IMPLICATIONS FOR IMPLEMENTING TECHNOLOGY

The time invested to implement Vocera technology prior to moving patient care units to a hybrid decentralized unit was effective in maintaining communication among caregivers. Because staff were closer to patients, more communication occurred in the patient rooms in the decentralized unit. The surprise finding was lack of use of the locator badge technology by staff in the decentralized unit. When implementing new technology, it is important to understand and educate staff on not only the technology's use, but

also why it should be used and how it will be beneficial in providing care and/or enhancing safety for patients and staff. It is unknown if lack of use was due to lack of perceived need to find other staff members' location or lack of awareness of the value of this technology to support the care team.

Finally, discrepancies in the three priorities of the patient plan of care between the RN and PCT is of interest and has implications for assuring appropriate and safe care of patients. This finding warrants further study on a larger scale to determine methods of communication of the plan of care and oversight by RNs.

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