

3-2-2016

Relationship of Hospital Architecture to Nursing Staff Caring for Self, Caring for Patients, and Job Satisfaction

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Recommended Citation

Hozak, Mary Ann; Nelson, John; and Gregory, Debbie (2016) "Relationship of Hospital Architecture to Nursing Staff Caring for Self, Caring for Patients, and Job Satisfaction," *Interdisciplinary Journal of Partnership Studies*: Vol. 3: Iss. 1, Article 5. Available at: <http://pubs.lib.umn.edu/ijps/vol3/iss1/5>



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RELATIONSHIP OF HOSPITAL ARCHITECTURE TO NURSING STAFF CARING FOR SELF, CARING FOR PATIENTS, AND JOB SATISFACTION

Mary Ann Hozak, Debbie Gregory, and John Nelson

Abstract

Historically, the fields of architecture (design) and nursing (health) have been separate disciplines without much intersection. In recent years, the healthcare building boom has created a specialty practice for architects, focusing on healthcare design. With this new focus and specialty within architecture, the science of evidence-based design and the collaboration with clinical care staff have created a new partnership paradigm that is improving the built environment.

Ten dimensions of caring have been espoused by Watson's Caritas Theory to comprise the construct of caring, which in turn facilitates healing for both the care giver and care recipient (Nelson & Watson, 2012). This article describes a study that examined the relationship between selected elements of architectural design and other factors (recent architectural change, unit size and shape, intersecting hallways, number and proximity of bathrooms and supply rooms, availability of nourishment, number and availability of computers, and rooms for staff gathering, for solitude, and for practice of Watson Caring Factors) and outcomes of caring that are important to nursing, including clinical staff caring for self, caring for others, and job satisfaction. The study took place in a hospital that was implementing Watson's concepts of caring within their framework of care delivery. Statistically significant relationships were:

Caring for self was negatively related to number of supply rooms and number of Watson rooms or boxes. Caring for patients as reported by staff was negatively related to number of Watson rooms or boxes. Job satisfaction was positively related to number of bathrooms and negatively related to number of supply rooms. A small sample size required adjustment of the alpha to .15 and an effect size of .25, suggesting that replication studies with larger sample sizes may assist with development of a model of architecture that promotes behaviors as proposed by Watson and better outcomes for both patient and staff.

Keywords: Watson's theory of caring, caring, self-care, job satisfaction, architecture, evidence-based design

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ORIGINS OF STUDY

A recent study using Watson's Theory of Human Caring revealed a statistically significant correlation between nursing staff members' care for self, job satisfaction, and perceived competence in caring for patients (Nelson, 2014). What has not been studied using Watson's theory is the relationship between the design of the physical structure within which nurses work, and caring for self, caring for others, and job satisfaction. Adding architectural design factors to the body of caring science was deemed important to more fully understand the model of caring and outcomes within the profession of nursing. This study of caring in relation to architecture grew out of informal discussions between architects, designers, and nursing professionals. The content of the discussion centered around the perceived relationship that structure and design of units was perceived to have with facilitating and/or impeding nurses' ability to care for self and others, as well as its effect on nurses' satisfaction with their jobs in patient care. Subsequent evaluation of the literature was conducted to understand this conversation more empirically and to see if a study would make a contribution. A better understanding of how structure and design of units affect nurses' work of caring would help nurses provide more effective empirical input into architectural planning.

REVIEW OF LITERATURE

A recent review of the literature revealed increased partnerships between nursing and architectural design design (Cardoso, Presado & Nascimento, 2015). Attarian, Wahl, Wellman, and Bolognesi (2013) identified that architecture does impact the efficiency of staff. Two landmark reports, *To Err is Human: Building a Safer Health System* (Institute of Medicine, 1999) and *Crossing the Quality Chasm: A New Health System for the 21st Century* (Institute of Medicine, 2001), focus our attention on the gap in health care between the built environment and patient quality and safety outcomes.

This growing body of knowledge, called Evidence-Based Design (EBD), has emerged as a new science and discipline (Center for Healthcare Design, 2013).

A recent systematic review of 193 studies of architecture and design in mental health facilities revealed 13 themes of study (Connellan, Gaardboe, Riggs, Due, Reinschmidt & Mustillo, 2013). Themes, in order of frequency, included security (38 studies), therapeutic milieu (34 studies), light (24 studies), gardens (21 studies), impact of architecture on health outcomes (15 studies), nursing stations (12 studies), interior design (11 studies), post-occupancy evaluations (11 studies), psychogeriatric (7 studies), model of care (7 studies), adolescents (6 studies), art (5 studies), and forensic psychiatric facilities (2 studies). A review of these themes identified by Connellan et al. reveals aspects of the architectural environment, but not purely examination of structure. The 15 studies that did review the impact of architecture on outcomes showed that the most significant architectural factors were lighting, views of nature, and single-bed rooms. Outcomes impacted by any one of these three factors were patient communication, patient privacy, patient confidentiality, reduced pain, and reduced stress. Other outcomes that were studied, including job satisfaction, were not proposed by Connellan et al. as empirical evidence, due to questionable scientific rigor. None of the studies reviewed by Connellan et al. examined caring as an outcome.

Another review of outcomes of architectural design in health care revealed only 28 of 165 studies that were deemed to be scientifically rigorous (Huisman, Morales, van Hoof & Kort, 2012). Most of those 28 studies examined outcomes related to view and sound. Authors did identify reductions in incidence of errors by staff related to improved lighting and similar room layout for all rooms (Huisman et al.).

Studies that examined the work flow of care did so to understand productivity (Attarian, Wahl, Wellman & Bolognesi, 2013; Zadah, Shepley, & Waggener, 2012) and functionality - specifically, lighting and ergonomics of environment (Huisman et al., 2012).

STUDY METHODS

A non-experimental descriptive study was conducted to examine the relationship between architecture and outcomes for both patients and staff members.

Statistical analysis

Spearman's rank correlation coefficient, Pearson's correlation coefficient, and regression equations were used to examine the relationships between variables. Dummy codes were used for non-parametric variables. Prior to running any regression equation for variables with more than two groups, an ANOVA procedure was run using Games Howell as the post hoc procedure, to evaluate for statistically significant differences. If no differences were found in the ANOVA procedure, a regression procedure was not pursued. All descriptive statistics were evaluated for normality of distribution, as the sample size was small and thus more influential in the results. Scatter plots were used to assess for outliers. Only mean scores or total scores were used, and no imputation of data was conducted.

Definitions of terms

In this study, caring for self was defined as the perception of enacting ten behaviors of caring toward self as described in Watson's Theory of Caring (2008). Self-care is defined as the application of Watson's 10 Caritas (caring) behaviors to one's self.

Watson's ten specific processes of caring have been defined elsewhere and are replicated here in full (Nelson, DiNapoli, Turkel, & Watson, 2012).

1. *Cultivating the practice of loving kindness and equanimity toward self and others.* Loving kindness includes listening to, respecting, and identifying vulnerabilities in self and others.
2. *Being authentically present: Enabling, sustaining, and honoring faith and hope* which is future-oriented and includes self-discovery.

3. *Cultivating one's own spiritual practices and transpersonal self, going beyond ego-self.*
4. *Developing and sustaining a helping-trusting caring relationship.*
5. *Being present to, and supportive of, the expression of positive and negative feelings.*
6. *Creative use of self and all ways of knowing as part of the caring process; engaging in the artistry of caritas.* At the core here is creative problem solving.
7. *Engaging in genuine teaching-learning experience that attends to unity of being and subjective meaning-attempting to stay within others' frame.*
8. *Creating a healing environment at all levels.*
9. *Administering sacred acts of caring-healing by tending to basic needs.*
10. *Opening and attending to spiritual/mysterious and existential unknowns of life-death.* This is belief in the impossible (miracles), even when others may assert doubt.

(Nelson, DiNapoli, Turkel, & Watson, 2012).

In this study, job satisfaction is defined as the satisfaction with social and technical dimensions of the job. This definition is based on sociotechnical systems theory which asserts that if staff members have the social and technical resources to do the job requested of them, they will be satisfied with their job (Nelson, Persky, Hozak, Albu, Hinds, & Savik, 2015).

Nine selected architectural dimensions were assessed:

- recent major architectural change
- unit size and shape
- intersecting hallways
- number and proximity of bathrooms
- proximity to available nourishment
- number and proximity of supply rooms
- rooms for staff solitude
- staff gathering rooms

- rooms for practice of Watson Caring Factors

Number and availability of computers, while not an architectural dimension, was also assessed as an element of work flow.

Twenty-seven items relating to these nine architectural dimensions and the additional work flow factor were included on the data collection sheet. Specific dimensions and definitions are noted in Figure 1.

Figure 1. Dimensions and Items in Architectural Assessment

Dimensions	Item Number	Dimension	Definition
Major Architectural Change	1.	Recent major structural change.	Change to some structure of the unit, with impact on processes of care delivery, not simply aesthetic change such as painting, within the last five years.
	2.	Number of years since structural change.	Years were counted for each of last five years. If more than five years, categorized as “more than five years”.
Intersecting Hallways	3.	Number of intersecting hallways.	Hallway used as walkway for people that intersects with another hallway and creates opportunity for unplanned social interaction.
Staff Gathering Places	4.	Number of places to gather.	Includes conference room, lounge, breakroom and other areas designated that staff can use for social or professional engagement.
	5.	Distance to gathering space.	The distance, in number of yards, that must be traveled by staff during hours of patient care to reach a space designated for staff gathering. The patient care room furthest from the gathering space was used for measurement.
Places for Staff Solitude	6.	Number of spaces for solitude.	Space was included in count if the space was designated as a place for staff to gather thoughts or to have a moment of quiet and/or meditation if needed.
	7.	Distance to space of solitude.	The distance, in number of yards, that must be traveled during hours of patient care to reach a space designated for solitude. The patient care room furthest from the space of solitude was used for measurement.
Computers	8.	Number of	Both stationary and mobile computers used for charting were

		computers.	included in count.
	9.	Distance for anyone staff to get to computer.	Distance, in number of yards that must be traveled during hours of patient care to reach a computer. For mobile computers, distance traveled to where mobile computers are stored.
	10.	Number of mobile computers.	Mobile computer were examined separately from stationary computers.
Bathrooms	11.	Number of staff bathrooms.	Bathroom on unit designated for staff use and not used publically or by patients or the patients' family.
	12.	Distance to bathroom.	The distance, in number of yards, that must be traveled during hours of patient care to reach a bathroom. The patient care room furthest from the bathroom was used for measurement.
Proximity to Available Nourishment	13.	Number of unit places for nourishment.	Places staff can get nourishment on the unit. Nourishment could be provided by the organization, for the unit, or what the employee brought for themselves (e.g. lunch or snacks).
	14.	Distance to nourishment.	The distance, in number of yard, that must be traveled during hours of patient care to reach a space designated for nourishment. The patient care room furthest from the space for nourishment was used for measurement.
	15.	Number of places for nourishment off unit.	Places for nourishment off the unit such as a cafeteria or restaurant close enough to get nourishment.
	16.	Is nourishment centralized or decentralized?	Centralized means all nourishment is kept in one place on the unit; decentralized means staff can get nourishment at multiple places on the unit.
Shape and Length of Unit	17.	Shape of unit.	Capital letters were used to describe general shape of unit (e.g. "H" shaped, "I" shaped, "U" shaped, "T" shaped, etc.).
	18.	Total length of unit.	Distance in yards from one end of the unit to the other. The longest possible distance was selected for measurement.
Supply Rooms	19.	Number of supply rooms.	Rooms in which supplies used for patient care are stored (i.e. equipment, linens, and patient care supplies other than medications).
	20.	Distance of supply rooms.	Distance, in number of yards, that must be traveled during hours of patient care to reach a supply room. The patient care room furthest from the supply room was used for measurement.

	21.	Number of medication rooms	Rooms in which patient medications are kept.
	22.	Distance of medication rooms.	Distance, in number of yards, that must be traveled during hours of patient care to reach medication rooms. The patient care room furthest from the medication room was used for measurement.
	23.	Are supplies centralized or decentralized?	Centralized means that all supplies are in one place on the unit; decentralized means that supplies are in the patient rooms, or the units have multiple supply rooms.
Watson Rooms and Boxes	24.	Are there Watson Rooms?	Watson rooms are designed to be a healing environment where staff members can go during patient care (e.g. music of healing; art; comfortable place to sit or kneel; options for aromatherapy, meditation, and prayer, etc.).
	25.	Distance to Watson room.	Distance, in number of yards, that must be traveled during hours of patient care to reach a Watson Room. The patient care room furthest from the Watson room was used for measurement.
	26.	Are Watson Boxes used on unit?	Boxes that contain similar items for a healing environment that are found in the Watson room. This is intended to be used for units that are not able to have a designated Watson room, or if portability is desired. Items may include music of healing, option for aroma therapy, resources for meditation and prayer, etc.).
	27.	Distance to Watson Boxes.	Distance, in number of yards, that must be traveled during hours of patient care to reach a Watson Box. The patient care room furthest from the Watson Box was used for measurement.

Sample

The sample of staff who responded to perception of caring for self and patients were from two hospitals, a 650-bed hospital in an urban setting and a 300-bed community hospital, in a health system in the Northeastern U.S. A total of 2,614 staff were asked to respond to surveys regarding caring for self and others; 615 responded, a 23.5% response rate. Of the responders, 56% (n=346) were registered nurses, 33% were support staff (n=202), and 11% (n=67) were in managerial roles. Patients invited to respond were all in-patient on 13 of the 27 study units. There were 260 patients who responded.

Instruments

Caring as perceived by the patient was assessed using the Caring Factor Survey (CFS), a 7-point Likert scale with higher scores indicating perception of more caring by care providers. This 10-item tool has been psychometrically tested (DiNapoli, Turkel, Nelson & Watson, 2010). Caring for self was assessed using the Caring Factor Survey - Caring for Self (CFS-CS), a 7-point Likert scale with higher scores indicating more caring for self. The CFS-CS has been tested psychometrically (Johnson, 2012). Caring for others was assessed using the Caring Factor Survey - Care Provider Version (CFS - CPV), a 7-point Likert scale with higher scores indicating more caring for others. For all three tools, scores are summed and divided by 10 to calculate the mean score. The CFS-CPV has been tested psychometrically (Nelson, Thiel, Hozak & Thomas, 2016).

Job satisfaction was assessed using the Healthcare Environment Survey (HES), a 50-item instrument which has been shown to be psychometrically sound to measure this latent construct in samples of health care workers (Drenkard, 2008; Hozak & Brennan, 2012; Persky, Nelson, Watson & Bent, 2008). Social dimensions measured include satisfaction with relationship with coworkers, nurses, doctors, unit managers, and patients. Technical dimensions include satisfaction with executive leadership, workload, autonomy, professional growth, and distributive justice (organizational rewards for education and experience).

Physical properties of the participating hospital units were measured using an instrument developed by the authors of this article. Architectural features were selected based on the experience of the authors, all of whom are nurses with experience in acute care. Features were selected by authors as important to caring for self and others in an acute care setting.

Procedures

After Institutional Review Board approval, nursing leadership from each unit was contacted to assist with identification of the 27 items in the architectural assessment.

Yards were calculated by measuring the length of a normal step. This strategy was used to replicate the normal walking of a staff member from point to point while calculating the distance.

Staff data regarding their perception of caring for self, caring for patients, and job satisfaction was gathered electronically using secure methods from a HIPAA-compliant survey software and data management company. Staff members who responded to the surveys by selecting an electronic link were able to save their responses and return as often as they liked if time was limited to respond in one sitting. Staff were also able to download a copy of their own data if desired. Submission of the survey was considered staff consent.

Patients were asked to respond to their perception of being cared for by staff using hard copy surveys. Hard copy surveys were then sent to the data management company for manual entry of all patient responses.

Data was examined using SPSS 21.0; power analysis was conducted using G-Power 3.2. In consideration of the small sample size of 27 units, power calculations used were power of .85, alpha of .15, and effect size of .25.

Pearson's correlations were used to examine the relationships, except for non-parametric independent variables (i.e. shape of unit). Non-parametric independent variables were dummy-coded and examined in regression equations. The F-value in the regression equation is the same as an ANOVA procedure but examined on a slope and thus more informative of the relationship, in contrast to an ANOVA procedure that simply looks for differences.

RESULTS: DIMENSIONS OF ARCHITECTURE

This section will review the results of the 27 survey items that evaluated the nine architectural dimensions and access to computers. One unit (same-day surgery unit) was identified as an outlier in one measure, CFS-CS, and the mean score for this one unit was removed from the data set.

1. *Major Architectural Change*

Four units had undergone major architectural change in the previous five years. No statistically significant relationship was found between architectural change and any dependent variable studied. Direction of the relationship between major architectural change and dependent variables of caring as reported by patient and job satisfaction of staff, despite non-significance, was noted to be positive, indicating that major architectural change contributed to patient and job satisfaction. Both of these positive relationships were close to statistical significance using an alpha of .15. These responses are noted in Figure 2

Figure 2. Relationship between Major Architectural Change and Outcomes

Dependent Variable	Frequency, Mean Score of Dependent Variable	Mean Score	SD	Spearman's rho	p-value
CFS	No major change, n = 10	5.72	.71	.415	.158 (ns)
	Major change, n = 3	6.27	.28		
CFS-CS	No major change, n = 22	6.20	.48	-.03	.894 (ns)
	Major change, n = 4	6.27	.17		
CFS-CPV	No major change, n = 22	6.34	.35	-.05	.809 (ns)
	Major change, n = 4	6.42	.13		
Job Satisfaction	No major change, n = 23	5.27	.42	.241	.226 (ns)
	Major change, n = 4	5.59	.24		

2. *Intersecting Hallways*

Fourteen of 27 units had no intersecting hallway. Those 14 units were either straight like a capital letter “I”, or had single-direction hallway turn like the capital letter “L”. The range of points of intersection of two hallways was from 1 to 6. Correlations of dependent variables with number of intersecting hallways were all negative, but

none were statistically significant. The strongest relationship was between number of intersecting hallways and job satisfaction ($r = -.138, p = .492$).

3. Staff Gathering Spaces

The mean number of gathering spaces was 1.3 (SD .86), with a range of 0-3. None of the dependent variables were found to have a statistically significant relationship with number of gathering spaces. The strongest relationship was between number of gathering spaces and the mean score of caring for others as measured by the CFS-CPV ($r = -.121, p = .555$).

The mean distance from furthest patient room to gathering spaces was 41.5 yards (SD 23.2), with a range from 10-102 yards. None of the relationships of the dependent variables were found to be statistically significant with distance from gathering space. The strongest relationship was with the CFS ($r = .193, p = .593$).

4. Places for Staff Solitude

Nineteen of 27 units did not have a place for solitude. Staff members on several of those 19 units reported that their place of solitude was the bathroom, but bathrooms were not included in the definition of a valid place of solitude. Six of 27 units had a place of solitude that was not the bathroom and did provide a place for staff to be alone and think. Two of the rooms for solitude were Watson rooms with several resources to practice self care using Watson's 10 behaviors; one of the rooms was a lactation room that was also used for a place of solitude; the remaining 3 of 6 solitude rooms were comfortable rooms that could be made private when needed. Places of solitude had no relationship that was statistically significant with any of the outcomes measured. These data are noted in Figure 3.

Figure 3. Relationship between Room of Solitude and Outcomes

Dependent Variable	Frequency, Mean Score of Dependent Variable	Mean Score	SD	Spearman's rho	p-value
CFS	No major change, n = 10	5.72	.73	.152	.620 (ns)
	Major change, n = 3	6.02	.43		

CFS-CS	No major change, n = 18	6.29	.30	-.092	.669 (ns)
	Major change, n = 6	6.24	.23		
CFS-CPV	No major change, n = 19	6.36	.37	-.066	.753 (ns)
	Major change, n = 6	6.31	.22		
Job Satisfaction	No major change, n = 20	5.29	.41	.002	.994 (ns)
	Major change, n = 6	5.29	.40		

5. *Computers*

Total number of computers, stationary and mobile combined, ranged from 3 to 31 per unit with a mean of 13.65 (SD = 7.52). Stationary computers ranged from 0 to 12 with a mean of 6.21 (SD = 3.64). Mobile computers ranged from 0 to 25 with a mean of 7.72 (SD = 7.06). Total number of computers, number of stationary computers, and number of mobile computers had no statistically significant relationship with the CFS, CFS-CS, CFS-CPV, or job satisfaction using an alpha of .15. The strongest relationship found among these variables was the relationship between number of stationary computers and report of caring for self ($r = .166$, $p = .460$), indicating that the more stationary computers available, the higher the scores of staff members caring for self.

For units with mobile computers, there was no distance for staff to walk, as the computers could be used directly at the bedside; some of the units had mobile computers that did not leave the patients rooms and thus were more like stationary computers. For units that did not have mobile computers assigned to rooms or that were stationary, the distance required to access a computer ranged from 3 to 13 yards. Six of the 27 units had no mobile computers; staff members were required to walk a short distance to chart. In consideration of only six units having variance distance, the groups were categorized as mobile and non-mobile computers. Using Spearman's rho, no statistically significant relationship was found between any of the four outcome variables and having mobile computers versus stationary computers. The strongest relationship was between the CFS and having mobile computers ($r = .156$, $p = .611$).

6. *Bathrooms*

Number of bathrooms per unit ranged from 1 to 5, with a mean of 1.67 (SD = 1.04). Number of bathrooms did have a statistically significant relationship with job satisfaction ($r = .335$, $p = .087$). The only other outcome that was close to statistical significant was the CFS score, which is caring as reported by the patient ($r = .328$, $p = .274$).

Furthest distance for nurses to travel to reach a bathroom ranged from 10 yards to 73 yards (mean 36.33, SD 17.83). No outcome measured has a statistically significant relationship with distance to bathrooms. The strongest relationship was between the distance to bathrooms and the patients' report of caring as measured by the CFS ($r = -.313$, $p = .297$), which means that the further away bathrooms are for staff, the less caring the patient perceives.

7. *Nourishment*

Six units had no areas for nourishment on the unit; staff members needed to go to the cafeteria or another off-unit location for nourishment. Eighteen units had one location for staff to get nourishment, and three units had two locations for nourishment. Number of nourishment locations did not have a statistically significant relationship with any of the outcome variables measured in this study, using an alpha of .15. The strongest relationship was with job satisfaction ($r = .17$, $p = .395$).

Distance for the 21 units with nourishment on the unit ranged from 10 to 84 yards (mean 37.00, SD 19.47). No outcome variable had a statistically significant relationship with distance. The strongest relationship was with caring for self ($r = -.318$, $p = .184$), which means that the further away the nourishment, the less self-caring was perceived by staff.

8. *Shape and Length of Unit*

The most common unit shape was a square with rooms in the middle, which made it impossible to see all the rooms at once ($n=7$ units). The second most common shape was an "H" shape ($n=6$ units) followed by an "I" shape ($n=3$ units), "U" shape ($n=2$

units) “C” shape (n=2 units), “T” shape (n=2 units), “F” shape (n=1 unit), “L” shape (n=1 unit) and “P” shape (n=1 unit). Two units had shapes that were not describable using capital letters; they were generally parallel hallways with rooms and hallways between and had intersecting hallways at both ends of the hallways. Due to several small frequencies, the units were grouped into the largest two types of units, square and “H” shaped units, and the rest grouped as “other”. An ANOVA procedure revealed no difference in shape of unit.

Distance of the 27 units ranged from 18 to 94 yards at the longest point, with a mean of 48.48 yards (SD = 20.23 yards). None of the outcome variables were found to have a statistically significant relationship with length of unit. The strongest relationship with length was job satisfaction ($r = .248$, $p = .212$).

9. *Supplies*

Several units combined medication rooms and supply rooms, thus the rooms were studied together as supply rooms. Number of supply rooms ranged from 1 to 17. The mean number of supply rooms was 4.33 (SD = 4.45). Number of supply rooms was found to have a statistically significant negative relationship with caring for self as measured by the CFS-CS ($r = -.551$, $p = .008$) and job satisfaction ($r = -.437$, $p = .033$). The negative relationship with caring for patients approached statistical significance ($r = -.230$, $p = .292$). This indicates that as the number of supply rooms increases, caring for self, caring for patients, and job satisfaction decreases.

10. *Watson Rooms and Watson Boxes*

Nineteen units had no Watson rooms or boxes, two units had boxes only, three units had Watson rooms only, and three units had both Watson rooms and boxes. Units with no Watson room or box or room were grouped together and coded “0” (n = 19). Units with a Watson room, a Watson box, or both (n = 8) formed a second group. Correlation analysis, using Spearman’s rho, revealed a statistically significant relationship with CFS-CS ($r = -.309$, $p = .132$) and CFS-CPV ($r = -.312$, $p = .121$),

indicating that those units with Watson boxes or rooms had lower scores in caring for self and others than units without these elements.

DISCUSSION

Literature reviews (Connellan et al., 2013; Huisman et al., 2012) and studies in workflow (Attarian et al., 2013) did not examine how bathrooms and supply rooms factor into outcomes for patients or nurses. This study provides insight into the importance of having enough bathrooms, as it appears to impact nurse job satisfaction. Of interest, number of bathrooms had a relationship to patient's report of feeling cared for, as units with bathrooms further away from the point of care had lower scores of patient report of caring as measured by the CFS.

Number and distance of supply rooms staff use was also not found as a point of interest in the literature reviewed for this study. This study found that more supply rooms had a statistically significant negative impact on job satisfaction for nurses. Each of the supply rooms at the study site contained different supplies, with up to 16 unique supply rooms on the same unit. Variance of supplies from supply room to supply room required staff to travel to many different areas of the unit to gather supplies for patient care. Number of supply rooms also had a negative impact on patients' perception of caring, as units with more supply rooms were found to have lower patient scores of caring as measure by the CFS.

The literature review for this study identified outcome research of common architectural elements including lighting, views of nature, and private rooms (Collellan et al., 2013). Included in the outcome research was the relationship between design of work flow in areas of patient care with the productivity of staff and being able to complete the work required within patient care (Attarian et al., 2013). No studies were found that examined flow of work specific to number of supply rooms clinical staff used for delivering patient care. Nor were there any studies found

that examined the relationship between specific architectural design features such as the number of bathrooms available to staff and their ability to care for self or others or their job satisfaction. In this study, supply rooms, bathrooms, and break rooms were as much as 75 yards away from patient care. This finding supports the assertion by Attarian et al. that design can impact efficacy of clinical staff. For example, consider that the nurse respondents in this study must walk almost the distance of a football field to use a bathroom; the time likely adds up to delays that impact the staffs' ability to care for self, patients' perception of caring, and frustration for the staff in completing the work required of them every day. An inability to meet the jobs' requirements likely has a negative impact on satisfaction.

It was interesting to note that Watson rooms and boxes had a statistically significant impact on caring for self and others as perceived by staff, but not in the expected direction. Those units with Watson rooms and boxes had lower scores. It may be that units that have spent resources to secure Watson boxes and rooms have the greatest clarity in processes of caring. High levels of clarity have been shown to increase frustration, as the distance from ideal conditions is more obvious. This was supported by Persky et al. (2012) who found that as staff became clearer about expected and desired behaviors, they were more likely to be dissatisfied with their job if the ideal was not operational.

In the literature review, primary outcomes such as enhanced communication and reduced patient stress were attributed to lighting, views of nature, and single rooms. This study provides support for extending this view to elements in this study that may enhance the perception of caring. It could be proposed that an enhanced relationship between staff and patient, supported by more visible caring using Watson's behaviors of caring, could improve communication and reduce patient stress. More specific research models to study architecture in relation to concepts of caring and associated outcomes may increase the explained variance in outcomes such as enhanced communication and reduced stress.

LIMITATIONS OF STUDY AND SUGGESTIONS FOR FUTURE RESEARCH

The most obvious limitation to this study was the small sample size of 27 units. Replication studies should include larger sample sizes, which may further support or possibly refute findings reported here. Larger sample sizes may help identify whether outliers like the unit identified in this study are really outliers or are actually part of the population distribution that could provide useful insight into the relationships studied.

The impact of technology as part of the caregiving process should also be included in future studies. Aligning architecture, operations, technology, and the perception of caring with informed design can impact the health care delivery process and improve outcomes. Educating the design community with research and data that connect caring science and theory to the built environment will only improve nurses' perceptions of caring for self, caring for others, and job satisfaction. Nurses must continue to advocate for the fundamental structures of caring and implement them into the design of health care environments.

IMPLICATIONS

This study reveals that architectural features that are part of the day's work for direct care providers need to be considered in research of architectural design and outcomes for patients and staff. Current literature has studied lighting and private rooms, but elements like number and distance of staff bathrooms and supply rooms should be added to studies in architecture. Replications of this current study may provide additional support for examining basic staff needs for nutrition, use of bathrooms, and distance required to walk to secure supplies for patient care. More partnerships between architects and clinical staff who work in direct patient care may refine research models, enhancing the sensitivity of architectural research models to detect variables that directly or indirectly impact patient outcomes. Organizations such as the Nursing Institute for Healthcare Design, the American Academy of

Healthcare Interior Designers, and the American College of Healthcare Architects should collectively collaborate to expand and further these research concepts to improve the health care environment for staff and patients.

When disciplines as historically disparate as nursing and architecture enter into partnerships, the differences in their worldviews become more apparent to all. For example, the results of this study indicate that the hallway design most favorable to caring for self is the “I” (straight” shape), which is in contrast to more interesting designs such as the “C” and “O” shapes. This study also found that more mundane elements such as proximity of bathrooms had the strongest relationship with caring for self, rather than functional break rooms or attractive places for staff to re-energize. The partnership reflected in this article is the result of the personal collegial relationships between nurse leader Mary Ann Hozak, architect Debbie Gregory, and nurse statistician John Nelson.

SUMMARY

This study provided insight into architectural dimensions that were not commonly studied as variables in health care. Partnerships between architects and direct care staff could enhance the refinement of research models that are more specified and thus more accurate in identifying how architecture impacts outcomes of patient and staff. Processes of caring should be considered as a strategy to enhance outcomes such as communication, stress reduction, and job satisfaction. However, structure to support the operations and processes of caring must be more clearly understood.

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