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Developing Scales to Evaluate Staff Perception of the Effects of the Physical Environment on Patient Comfort, Patient Safety, Patient Privacy, Family Integration with Patient Care, and Staff Working Condition in Adult Intensive Care Units: A Pilot Study

Mahbub Rashid, PhD, AIA

Associate Professor of Design

University of Kansas

1467 Jayhawk Boulevard, Suite 300

Lawrence, KS 66045

Email: mrashid@ku.edu

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ABSTRACT

Studies suggest that the physical environment can be important for patient comfort, patient safety, patient privacy, family integration with patient care, and staff working condition in adult intensive care units (ICUs). In the absence of any measuring scales, however, evaluations of the physical environment of ICUs in terms of any of these dimensions have remained vague. For rigorous evaluations of ICU designs from the viewpoint of clinical staff, a self-report instrument with several multiple-item scales was created. These scales were tested in a pilot survey that was administered among a small group of nurse managers and ICU directors at several best practice example sites. Reliability analysis of the survey data showed some scales to be internally consistent. For the other scales, factor analysis revealed multiple components, which were then combined to create additional subscales. Using these scales and subscales, the underlying effects of design on staff perception were studied at the best practice example sites that participated in the pilot survey. The results, limitations, and the future directions of the study are discussed.

Key Words: adult intensive care unit (ICU), measurement scales, staff perception, patient comfort, patient safety, patient privacy, family integration with patient care, staff working condition

INTRODUCTION

Both interior design and indoor environment help define the physical environment within a building. The interior design of a building includes global features—such as building configuration, floor layout and functional distribution, and local features—such as room configuration, furniture and fixture

layout, openings, finish materials, color, artwork, natural views and environmental graphics. The indoor environment of a building, on the other hand, includes such features as noise, lighting condition, ambient temperature and air quality. Several empirical studies link both interior design and indoor environmental features of healthcare facilities to patient and staff outcomes including patient comfort, patient safety, patient privacy, family integration with patient care, and staff working condition (for recent reviews of the empirical literature see 1–6).

A recent survey of the best practice example adult ICUs in the USA (7) shows that many of these ICUs are designed based on the evidence presented in the literature for improving patient and staff outcomes. The present study is an attempt to understand how these design choices impact staff perception of *patient comfort*, *patient safety*, *patient privacy*, *family integration with patient care*, and *staff working condition* in these ICUs. As a necessary first step, the study constructs reliable scales to evaluate staff perception in adult ICUs. It is expected that these scales would help conduct more rigorous evaluations of ICU designs from staff perspective. It is also expected that these evaluations, if conducted for a larger sample, may help develop benchmarks and guidelines for ICU design practice.

METHODS

The literature discussing the physical environment of adult ICUs was reviewed (e.g., 8–11). Unit level and patient room level environmental features, suggested having relationships with patient comfort, patient safety, patient privacy, family integration and staff working condition, were identified. These features were used as items in five primary scales, each measuring one of the above five dimensions of ICUs from staff perspective. Each primary scale also had two subscales measuring each dimension at the unit and patient-room level: (1) Out of the 15 items in the patient comfort scale, 6 were unit-level items and 9 were room-level items. (2) Out of the 22 items in the patient safety scale, 10 were unit-level items and 12 were room-level items. (3) Out of the 7 items in the patient privacy scale, 3 were unit-level items and 4 were room-level items. (4) Out of the 14 items in the family integration scale, 10 were unit-level items and 4 were room-level items. (5) Out of the 25 items in the staff working condition scale, 16 were

unit-level items and 9 were room-level items. Additional subscales included a patient comfort scale related to noise, a patient safety scale related to layout, and a patient privacy scale related to information security in adult ICUs. A list of the items included in all the scales and subscales are provided in **Appendix 1**. (For additional information refer to **table 1**.)

In a questionnaire survey, the scales were administered at 7 best practice examples adult ICUs that were built between 1993 and 2003. Each of these ICUs had received an ICU design award from the Society of Critical Care Medicine (SCCM), the American Association of Critical Care Nurses (AACN), and the American Institute of Architects (AIA). The questionnaires were filled-in by one of the nurse managers or the unit director at each site. Response to each item of the questionnaire was reported on a 5-point Likert scale.

The analysis of the survey data was completed in multiple stages. First, non-variant items, i.e., items with the same response from all respondents, were identified. Following this, internal consistency of the items of the primary scales and their subscales were tested. Then, for the scales with unacceptable or poorly acceptable internal consistency, factor analysis was performed to test their multidimensionality. In an attempt to reduce the number of dimensions of a scale with three or more dimensions, items from two or more dimensions were combined and tested for reliability. If these items showed improved internal consistency, they were aggregated to create additional subscales.

After being tested for acceptable internal consistency, the scales and subscales were used for studying the underlying effects of various environmental features on staff perception of patient comfort, patient safety, patient privacy, family integration, and staff working condition in 6 out of the 7 best practice example adult ICUs that participated in the questionnaire survey. Data on the physical environment of these ICUs were collected from the ICU Design Award booklet and videos published by SCCM, AACN, and AIA in 2005. The booklet and videos contained 5-7 minutes of video footage with narrative, a brief written description, and one or more drawings of the layout of each ICU.

Data on the physical environment of ICUs included nominal (e.g., layout types of ICU, types of medical utilities, etc.) and binary (e.g., patient room with or without family space, ICU unit with or without staff lounge, etc.) categorical data; and discrete (e.g., number of patient rooms, number of isolation rooms) and continuous (e.g., unit size, patient room size, gross area per patient bed, etc.) measurement data. For categorical data, one-way ANOVA was applied to determine whether different categories of any variable have significantly different effects on staff perception of patient comfort, patient safety, patient privacy, family integration, and staff working condition. For measurement data, correlational analysis was applied to study the effects of design on staff perception.

RESULTS

Non-variant items

Patient Comfort: All respondents agreed that private patient rooms helped ensure patient comfort in their ICUs.

Patient Safety: All respondents agreed that (1) separate clean and waste disposal sinks, (2) quick and easy access to patients from nurse stations, (3) easy patient observation from staff workstations, (4) easy to clean and maintain finish materials, and (5) water-resistant, smooth and sealed surfaces around all plumbing outlets helped ensure patient safety in their units.

All respondents also agreed that (1) easy to clean and microbial-resistant floor and wall surfaces, (2) conveniently located electrical and data outlets, (3) nurse-server allowing easy access to high-usage care items and linens, (4) sufficient illumination to monitor a change in patient's color, and (5) easy physical and visual access to patients by clinical staff helped ensure patient safety in their patient rooms.

Patient Privacy: All respondents agreed that private patient rooms helped ensure patient privacy in their ICUs. They also agreed that (1) patients' ability to have visual privacy when needed and (2) patients' ability to talk to family members and care providers without being overheard or interrupted helped ensure patient privacy in their patient rooms.

Family Integration: All respondents agreed that (1) easy access to patient status information and clinical staff by family members, and (2) adequate space for family consultation helped ensure family integration with patient care in their units. There was no consensus among the respondents on any item regarding family integration with patient care at the room level.

Staff working condition: All respondents agreed that (1) flexible patient charting locations inside and outside the room, (2) adequate work surface and space at nurse workstations, and (3) proximity of nursing stations to patients helped create better staff working condition in their units.

All respondents also agreed that (1) functionally appropriate patient bed location, (2) conveniently located electrical and data outlets, (3) nurse server allowing easy access to high-usage care items, (4) adequate space and necessary technology for patient manipulation and care, and (5) easy physical and visual access to patients by clinical staff helped create better staff working condition in their patient rooms.

Scales and Subscales

Patient Comfort Scales and Subscales: There was one non-variant item in the 15-item patient comfort scale. The alpha reliability coefficient for the other 14 items of the scale was poorly acceptable (0.542). A factor analysis of the items revealed 5 primary components, which were then combined to create two subscales. These subscales had 0.738 and 0.614 alpha reliability coefficients. The alpha value for the unit-level patient comfort scale was acceptable (0.762), but it was unacceptable for the room-level scale. The patient comfort scale related to noise in ICUs showed good reliability with an alpha value of 0.815. (**Table 1**)

Patient Safety Scales and Subscales: 10 out of the 22 items of the patient safety scale were non-variant, hence were excluded from the analysis. Item PSU 6 (“Patients stay in the same bed throughout their stay and be cared for by nurses who are familiar with their care”) was also excluded from the study because it was related to patient management more than ICU design. The remaining 11 items had an

unacceptable alpha value. A factor analysis of the items revealed 4 primary components. 4 subscales, created combining these components, were then tested for reliability. The reliability coefficient for one of these subscales was very good (0.889); it was acceptable for another two (0.667 & 0.606); and for the remaining one it was unacceptable. The reliability for both the unit-level and room-level patient safety scale was unacceptable. (**Table 1**)

Patient Privacy Scales and Subscales: There were 4 non-variant items in the 7-item patient privacy scale. The other 3 items of the scale showed poor internal consistency with an alpha value of 0.553. However, 2 items of the 3 items of the unit-level patient privacy scale, which also formed the patient privacy scale related to information security, showed excellent reliability with an alpha value of 0.904. The alpha value for the room-level patient privacy scale could not be computed, because 3 out of 4 items of the scale were non-variant. (**Table 1**)

Family Integration Scales and Subscales: 2 out of the 14 items of the family integration scale were non-variant. The other 12 items showed very good reliability with an alpha value of 0.837. The alpha reliability coefficient was acceptable for the unit-level family integration scale (0.704), but was only poorly acceptable for the room-level scale (0.531). (**Table 1**)

Staff Working Condition Scales and Subscales: 8 out of the 25 items of the staff working condition scale were non-variant. The other 17 items of the scale had an acceptable alpha value (0.719). A factor analysis of the items revealed 5 primary components. Two subscales, created combining these components, were then tested for reliability. The alpha reliability coefficient for one of the subscales was good (0.84), while the coefficient for the other subscale was poor but acceptable (0.556). The alpha reliability coefficient for the unit-level staff working condition scale was good (0.817), but it was unacceptable for the room-level scale (0.306). (**Table 1**)

Correlations among scales and subscales: Correlations among the scales and subscales are shown in **table 2**. As expected, there were strong correlations among some of the scales and subscales of each dimension of ICUs studied here. That is because these scales shared many items. However, good

correlations among the scales and subscales of different dimensions were unexpected. For example, one of the patient safety scales had strong and significant correlations with the overall patient privacy scale and the patient privacy scale related to information security. Another patient safety scale had strong and significant correlations with the family integration and staff working condition scales. The two privacy scales also showed significant correlations with the staff working condition scales. However, only one of the patient comfort scales showed some correlation with the room-level family integration scale. These correlations may suggest that staff perception of patient safety, patient privacy, family integration and staff working condition may affect one another in ICUs, and that staff perception of patient comfort may be the most independent of all the dimensions included in this study.

Patient Comfort Scales (PCSs)	Alpha
Overall PCS (PCU 1, 2, 3, 4, 5, & PCR 7, 8, 9, 10, 11, 12, 13, 14, 15)	0.542
PCS I (PCU 1, 2, 3, 4, & PCR 8, 9, 11, 14)	0.738
PCS II (PCU 5, & PCR 7, 10, 13, 15)	0.614
PCS—Unit Level (PCU 1, 2, 3, 4, 5)	0.762
PCS—Room Level (PCR 7, 8, 9, 10, 11, 12, 13, 14, 15)	0.04
PCS related to Noise (PCU 1, 2, 3, 4 & PCR 14)	0.815
Patient Safety Scales (PSSs)	
Overall PSS (PSU 1, 2, 3, 4, & PSR 11, 13, 14, 15, 17, 18, 22)	-0.763
PSS I (PSU 2, & PSR 15, 18)	0.889
PSS II (PSU3, 6, & PSR 14)	0.458
PSS III (PSU 4, & PSR 11, 13)	0.667
PSS IV (PSU 1, & PSR 22)	0.606
PSS—Unit Level (PSU 1, 2, 3, 4)	-0.351
PSS—Room Level (PSR 11, 13, 14, 15, 17, 18, 22)	-2.456
PSS related to Layout (PSU 2, 3)	0.914
Patient Privacy Scales (PPSs)	
Overall PPS (PPU 2, 3, & PPR 7)	0.553
PPS related to Information Security (PPU 2, 3)	0.904
PPS—Room Level (3 of the 4 variables had no variance)	-
Family Integration Scales (FISs)	
Overall FIS (FIU 3, 4, 5, 6, 7, 8, 9, 10, & FIR 11, 12, 13, 14)	0.837
FIS—Unit Level (FIU 3, 4, 5, 6, 7, 8, 9, 10)	0.704

FIS—Room Level (FIR 11, 12, 13, 14)	0.531
Staff Working Condition Scales (SWCSs)	
Overall SWCS (SWU 1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 15, 16, & SWR 18, 19, 21, 22)	0.719
SWCS I (SWU 1, 2, 3, 4, 7, 8, 9, 12, 13, 14, 15, 16, & SWR 18)	0.840
SWCS II (SWU 6, & SWR 19, 21, 22)	0.556
SWCS—Unit Level (SWU 1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 15, 16)	0.817
SWCS—Room Level (SWR 18, 19, 21, 22)	0.306

Table 1: Cronbach's alpha for scales and subscales of staff perception in adult ICUs

	N=7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Patient comfort scale																	
2	Patient comfort scale I	.92 (***)																
3	Patient comfort scale II	0.09	-0.29															
4	Patient comfort unit level scale	.87 (**)	.92 (***)	-0.23														
5	Patent comfort noise scale	.88 (***)	.94 (***)	-0.24	1 (***)													
6	Patient safety scale I	-0.09	0.06	-0.25	-0.07	-0.04												
7	Patient safety scale III	-0.34	-0.58	0.50	-0.34	-0.42	-0.45											
8	Patient safety scale IV	0.13	-0.05	0.50	0.08	0.08	0.22	0.13										
9	Patient safety layout scale	-0.27	-0.02	-0.56	-0.19	-0.14	.80 (**)	-0.63	0.10									
10	Patient privacy scale	-0.22	-0.49	0.62	-0.23	-0.29	-0.22	.87 (***)	0.59	-0.43								
11	Patient privacy information security scale	-0.27	-0.44	0.29	-0.13	-0.22	-0.22	.89 (***)	0.35	-0.38	.91 (***)							
12	Family integration scale	-0.03	-0.20	0.50	-0.19	-0.18	0.53	0.04	.88 (***)	0.35	0.47	0.21						
13	Family integration unit level scale	0.13	0.01	0.34	0.00	0.02	0.56	-0.09	.89 (***)	0.42	0.37	0.15	.97 (***)					
14	Family integration room level scale	-0.29	-0.50	0.67 (*)	-0.48	-0.47	0.41	0.25	0.75 (*)	0.18	0.56	0.27	.91 (***)	.78 (**)				
15	Staff working condition scale	0.27	0.04	0.59	0.32	0.28	-0.02	0.44	.78 (**)	-0.37	0.74 (*)	0.60	0.56	0.55	0.51			
16	Staff working condition scale I	0.20	0.00	0.48	0.32	0.28	-0.09	0.48	.77 (**)	-0.35	.77 (**)	0.68 (*)	0.50	0.49	0.43	.98 (***)		
17	Staff working condition scale II	0.44	0.28	0.56	0.07	0.12	0.13	-0.38	0.17	-0.10	-0.26	-0.59	0.31	0.25	0.35	0.06	-0.12	
18	Staff working condition unit level scale	0.20	-0.01	0.53	0.30	0.26	-0.10	0.51	0.74 (*)	-0.40	.78 (**)	0.68 (*)	0.48	0.46	0.44	.99 (***)	.99 (***)	-0.07

*. Correlation is significant at the 0.1 level (2-tailed).
**. Correlation is significant at the 0.05 level (2-tailed).
***. Correlation is significant at the 0.01 level (2-tailed).

Table 2: Correlations (Pearson's r) among measurement scales and subscales of staff perception in adult ICUs

THE PHYSICAL ENVIRONMENT AND STAFF PERCEPTION

As noted earlier, two different statistical techniques were used to study the effects of the physical environment on staff perception. Correlational analysis was used to study the effects of the design variables with continuous or discrete measurement data, and the ANOVA technique was used to study the effects of the variables with categorical data.

Due to a small sample size and a lack of variance in the data of several variables, the effects of several important design variables on staff perception could not be studied. Among the physical variables included in correlational analysis, several showed significant correlations ($p \leq 0.1$) with staff perception of patient comfort, patient safety, patient privacy, family integration with patient care, and staff working condition (**table 3**). For example, the gross area of the unit showed significant positive correlations with the unit level patient comfort scale and the patient comfort scale related to noise. In other words, staff perception of patient comfort at the unit level and of patient comfort with noise may improve as the gross area of the unit increases. Similarly, one of the patient comfort subscales showed positive correlation with the gross area per patient bed, suggesting that an increase in the amount of space per bed may help improve staff perception of patient comfort in the unit.

Correlational analysis also showed that the amount of gross area per bed and the patient room size had significant negative correlations with one patient safety scale and two privacy scales. These findings may suggest that as the amount of gross area per bed and the patient room size increase staff perception of patient safety and privacy get worse. In contrast, the patient room size had a significant positive effect on one staff working condition scale, suggesting that an increase in the patient room size may help improve staff perception of their working condition.

Among the physical variables included in the ANOVA analysis, several showed significant effects (significance≤ 0.1) on staff perception of patient comfort, patient safety, patient privacy, family integration with patient care, and staff working condition (**table 4**). Staff perception of patient comfort in

ICUs was significantly affected by the functions of an ICU (F = 4.58, Sig. = 0.1); by the layout type of an ICU (F = 7.03, Sig. = 0.07; F = 6.47, Sig. = 0.08; F = 9.75, Sig. = 0.05); by the type of utility device in the patient room (F = 16.8, Sig. = 0.01; F = 7.89, Sig. = 0.05; F = 6, Sig. = 0.07); by the location of sink in relation to patient rooms (F = 5.84, Sig. = 0.07); and by the location of service area (F = 5.35, Sig. = 0.08; F = 4.7, Sig. = 0.1).

Staff perception of patient safety was significantly affected by the location of patient charting (F = 6.84, Sig. = 0.08); by the degree to which family access was controlled in ICUs (F = 15.2, Sig. = 0.06); and by the family area in patient rooms (F = 17.19, Sig. = 0.01).

Staff perception of patient privacy related to information security was affected by the location of patient charting in relation to the patient room (F = 7.02, Sig. = 0.07); and by the family area in patient rooms (F = 13.25, Sig. = 0.02).

Finally, staff perception of their working condition was affected by the layout type of the unit (F = 10.5, Sig. = 0.04); by the degree to which family access was controlled in ICUs (F = 12.8, Sig. = 0.07); and by whether family area was included in the unit or not (F = 5.33, Sig. = 0.08).

N=6	**Gross area of the unit**	**Gross area per bed**	**Patient room size**
Patient comfort scale	0.59	0.41	0.46
Patient comfort scale I	0.66	0.74 (*)	0.59
Patient comfort scale II	-0.29	-0.50	-0.02
Patient comfort unit level scale	.89(**)	0.56	0.18
Patent comfort noise scale	.84(**)	0.69	0.36
Patient safety scale I	-0.14	0.19	0.17
Patient safety scale III	-0.14	-0.9(**)	-0.84(**)
Patient safety scale IV	0.26	-0.04	-0.06
Patient safety layout scale	0.17	0.64	0.36
Patient privacy scale	0.02	-0.76(*)	-0.74(*)
Patient privacy information security scale	0.09	-0.77(*)	-0.94(***)
Family integration scale	0.10	-0.03	0.07
Family integration unit level scale	0.31	0.13	0.10
Family integration room level scale	-0.28	-0.32	-0.02

Staff working condition scale	0.01	-0.52	-0.44
Staff working condition scale I	0.09	-0.50	-0.54
Staff working condition scale II	-0.29	0.21	0.74(*)
Staff working condition unit level scale	0.01	-0.57	-0.55

*. Correlation is significant at the 0.1 level (2-tailed).
**. Correlation is significant at the 0.05 level (2-tailed).
***. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Effects of continuous and discrete physical design variables on staff perception in adult ICUs

Dependent variables	**Factors**	**df**	**F**	**Sig.**
Patient comfort scale	Function type of the unit	1,4	4.58	0.1
Patient comfort scale	Layout type of the unit	2,3	7.03	0.07
Patient comfort unit level scale	Layout type of the unit	2,3	6.47	0.08
Patent comfort scale related to noise	Layout type of the unit	2,3	9.75	0.05
Patient comfort scale	Utility device type in patient room	1,4	16.80	0.01
Patient comfort scale I	Utility device type in patient room	1,4	7.89	0.05
Patent comfort scale related to noise	Utility device type in patient room	1,4	6.00	0.07
Patient comfort scale	Sink location	1,4	5.84	0.07
Patient comfort unit level scale	Service area location in the unit	1,4	5.35	0.08
Patent comfort noise scale	Service area location in the unit	1,4	4.7	0.1
Patient safety scale III	Charting location	2,3	6.84	0.08
Patient safety scale III	Family access in the unit	2,2	15.20	0.06
Patient safety scale III	Family space in patient room	1,4	17.19	0.01
Patient privacy scale related to information security	Charting location	2,3	7.02	0.07
Patient privacy scale related to information security	Family space in patient room	1,4	13.25	0.02
Staff working condition scale II	Layout type	2,3	10.50	0.04
Staff working condition scale II	Family access in the unit	2,2	12.80	0.07
Staff working condition scale II	Family area location in the unit	1,4	5.33	0.08

Table 4: Effects of categorical physical design variables on staff perception in adult ICUs

DISCUSSION

There is a great need for reliable design evaluation scales to help evaluate and improve ICU design. This pilot study contributed to this goal in several ways. First, it was the first study of its kind that attempted to develop a set of scales to evaluate clinical staff perception of the following five important dimensions of ICU—patient comfort, patient safety, patient privacy, family integration with patient care, and staff working condition. It has been argued in the literature that improving any one of these dimensions might have positive effects on ICU outcomes.

Second, the scales and subscales of this pilot study included the most comprehensive set of physical environmental variables. These variables were selected on the basis of a survey of the best practice examples and a review of the literature reporting empirical studies on healthcare settings. It is noteworthy that all the items included in the scales were reported to be relevant to the dimension being measured.

Third, most of the scales, initially proposed in the study, showed acceptable reliability. Multiple subscales with good reliability were also constructed using the items of the scales with unacceptable reliability. As a result, several design items can now be aggregated into a smaller number scales and subscales to help evaluate staff perception in adult ICUs.

Fourth, the study used its scales and subscales to understand the underlying patterns of design effects on staff perception. Because of a very small sample size correlational analysis or ANOVA did not provide significant results for a very large number of design variables. For the other variables, these analyses showed significant trends that would be worth pursuing in future studies.

The study had several limitations. First, the scales developed in this study can be used to evaluate ICU design from staff perspective only. Of course, ICU staff generally knows the most about ICU design needs and issues. However, scales for evaluating ICU designs from patient and family perspectives particularly on issues related to comfort, safety, privacy, and family integration are also needed. A study

of the relationships among patient, family, and staff perspectives may also help us understand more about conflicting impacts of design in ICUs. For example, a family space within the unit may help improve family's role in patient care. However, ICU staff may view the presence of family members in the unit as an obstacle to effective patient care.

Second, the sample size of the study was too small. Only 7 ICUs participated in the questionnaire survey administered for collecting data on the measurement scales and subscales included in the study. The number was probably sufficient for a pilot study designed primarily to investigate whether it was possible to develop reliable scales for ICU design evaluation. Indeed, the study provided sufficient support for the fact that reliable scales and subscales to measure many important design dimensions of ICUs from staff perspective can be developed. The validity of these scales needs to be further tested using a larger sample.

Third, the study sample had included only the best practice example ICUs to maximize the number the relevant design variables in the design evaluation scales. As a result, some variables showed no or little variance in the survey, suggesting that these variables were perceived to be equally important in these ICUs. This also meant that the importance of these variables for ICU design in general remained unknown. In order to understand the importance of these variables, any future studies must also include other ICUs besides the best practice examples.

Finally, any objective evaluation of ICU designs along one or more dimensions using measurement scales may hold little or no value if we are unable to generalize the effects of design on such immediate ICU outcomes as staff perception of patient comfort, patient privacy, patient safety, family integration with patient care, and staff working condition. In this study, many ICU design variables showed no statistically significant effects on staff perception because of a small sample size. Hence, it is very important that this study be repeated for a larger study sample not only to revalidate the scales, but also to understand the underlying effects of design on staff perception.

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Appendix 1: Items used in the scales and subscales for evaluating ICU Designs from staff perspective

Items in the Patient Comfort Scale and Its Subscales
Unit Level Items
PCU 1: The design of the unit helps limit ambient noise.
PCU 2: Nurse-station design helps reduce staff conversation.
PCU 3: Floor finish, wall surface, and ceiling materials help reduce noise.
PCU 4: Unit layout helps reduce traffic in patient care areas.
PCU 5: There are positive distractions for auditory and visual comfort.
PCU 6: Patient comfort is ensured by a large number of individual patient rooms.
Room Level Items
PCR 7: Patient rooms have many positive distractions such as access to nature, outside view, paintings of nature on wall surfaces and ceilings, and soothing music.
PCR 8: Patient beds provide turn assist functions and covert easily into a chair.
PCR 9: Patient room arrangements can be easily changed to meet patients' needs.
PCR 10: There is easy light, air and temperature control at the bedside.
PCR 11: Finishes and furnishings of patient rooms create unity and a calming effect.
PCR 12: Dimmable lights help increase patient comfort.
PCR 13: Patient rooms have adequate space and necessary technology for patient manipulation and care.
PCR 14: There is very little equipment and/or conversational noise in patient rooms.
PCR 15: Natural light in patient rooms provide day/night orientation.

Items in the Patient Safety Scale and Its Subscales
Unit Level Items
PSU 1: The unit is located close to other critical care support areas.
PSU 2: The unit has a critical care skill lab, a staff education room, a teacher-student consultation area, and/or other necessary facilities for staff training.
PSU 3: The flows of clean supplies, dirty supplies, and people are separate in the unit.
PSU 4: The unit has enough handwashing sinks with hands-off controls, antiseptic gels, and/or foam at appropriate locations.
PSU 5: Clean sinks and waste disposal sinks are separated.
PSU 6: Patients stay in the same bed throughout their stay and be cared for by nurses who are familiar with their care.
PSU 7: It is quick and easy to get to patients from nurse stations.
PSU 8: Clinical staff can observe patients while working at their workstations.
PSU 9: Finishes are easy to clean and can withstand repeated cleaning with strong solutions.
PSU 10: Surfaces around any type of plumbing outlet are water-resistant, smooth and sealed.
Room Level Items
PSR 11: Individual air pressure control and HEPA filters for patient rooms allow better infection control.
PSR 12: Floor and wall surfaces of patient rooms are easy to clean and are resistant to microbial growth.
PSR 13: Ergonomically-designed patient room and support facilities help increase patient safety.
PSR 14: Each room has adequate space and necessary technology for patient manipulation and care.
PSR 15: Clinical staff has complete and clear access to patient 360-degree around the bed.
PSR 16: Electrical and data outlets are located conveniently.
PSR 17: Patient beds provide turn assist functions and covert easily into a chair increasing safety during patient manipulation.
PSR 18: Facilities are provided to support order entry and data retrieval right at the bedside.
PSR 19: Nurse-server in each room allows easy access to high-usage care items and linens.
PSR 20: Clinical staff has easy physical and visual access to patients.
PSR 21: There is enough illumination to monitor a change in patient's color.
PSR 22: Patient rooms have private bathrooms eliminating the risks associated with carrying patient waste through other areas.

Items in the Patient Privacy Scale and Its Subscales
Unit Level Items
PPU 1: Patient privacy is ensured by a large number of individual patient rooms in the unit.
PPU 2: Location of charts and assignment sheets ensures patient privacy and confidentiality.
PPU 3: Computers for patient data entry are at secured locations.
Room Level Items
PPR 4: Patients can talk to their care providers without being overheard and interrupted.
PPR 5: Patients can talk to their family without being overheard and interrupted.
PPR 6: Patients can have visual privacy when needed.
PPR 7: Room design considers patient's dignity and accommodates privacy needs for personal hygiene.

Items in the Family Integration with Patient Care Scale and Its Subscales
Unit Level Items
FIU 1: There is adequate space for family consultation.
FIU 2: Design enables families to have easy access to patient status information and clinical staff.
FIU 3: Floor layout, interior design, and environmental graphics assist in wayfinding for visitors and families.
FIU 4: Family areas have telephone, e-mail and internet access.
FIU 5: Family areas have places to eat, relax and sleep.
FIU 6: Family areas have adequate toilets, showers, and lockers.
FIU 7: Family areas have child play area.
FIU 8: Family areas have family education and support room.
FIU 9: Several smaller spaces with a variety of seating arrangements in the family area provide family comfort and privacy.
FIU 10: Positive distractions in the unit help reduce family stress.
Room Level Items
FIR 11: Patient rooms include a private family zone.
FIR 12: Family area has comfortable furniture.
FIR 13: It is easy to observe or hear patients from the family zone.
FIR 14: Family zone has enough space for family-clinician consultation if needed.

Items in the Staff Working Condition Scale and Its Subscales
Unit Level Items
SWU 1: The patterns of movement of patients, caregivers, and visitors are ideal for functional efficiency in the ICU.
SWU 2: The number of beds in the unit is ideal from a functional viewpoint.
SWU 3: The number of beds in each pod is ideal from a functional viewpoint.
SWU 4: Clear and simple spatial layout facilitates staff orientation and improves efficiency.
SWU 5: Patient charting can be performed inside and outside the room allowing for point of care documentation.
SWU 6: Convenient location of patient charts reduces time spent looking for charts.
SWU 7: Each nurse station is supported by a medication room, a nutrition area, an x-ray viewing area, a pneumatic tube system for lab and pharmacy, a supply room and clean and soiled utilities.
SWU 8: There is adequate storage space for emergency supplies and equipment.
SWU 9: All necessary supplies and equipment can be easily accessed from any location of the unit.
SWU 10: Nurse workstations have adequate work surface and space.
SWU 11: Nursing stations offer nursing staff proximity to their patients.
SWU 12: Staff lounge with comfortable furniture, kitchenette, dining area, toilet, natural light, and other amenities help reduce staff stress.
SWU 13: Staff consultation area provides conversational privacy.
SWU 14: There is enough space around the nursing station for teaching groups.
SWU 15: The nursing stations have enough natural light.
SWU 16: The lighting level at workstations is adequate and free of glare.
Room Level Items
SWR 17: The location of beds in patient rooms is ideal from a functional viewpoint.
SWR 18: Ergonomically-designed patient room and support facilities decrease physical strain of clinical staff.
SWR 19: Clinical staff has complete and clear access to patient 360-degree around the bed.
SWR 20: Electrical and data outlets are located conveniently.
SWR 21: Patient beds provide turn assist functions and covert easily into a chair reducing physical strain.
SWR 22: Facilities are provided to support order entry and data retrieval right at the bedside.
SWR 23: Nurse server in each room allows easy access to high-usage care items.
SWR 24: Each room has adequate space and necessary technology for patient manipulation and care.

SWR 25: Clinical staff has easy physical and visual access to patients.