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Validity and reliability of sleep promotion questionnaire and predictors of quality of care

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Abstract

Background: Sleep disturbance is common among hospitalized patients. However, sleep promotion is not a high priority for most healthcare providers, which potentially impacts quality of care. Due to a paucity of validated tools to assess sleep promotion, little is known about the relationship between sleep promotion and quality of care. This study was conducted to assess the validity and reliability of a newly-developed instrument, the Sleep Promotion Questionnaire, and to examine sleep promotion as a predictor of quality of care. The Sleep Promotion Questionnaire includes dimensions of attitude, control, unit norms, intention, and behavior that are associated with sleep promotion.

Methods: A total of 302 nurses participated in an online survey. The survey included the initial 36-item Sleep Promotion Questionnaire, a quality of care question, Caring Behavior Inventory, and Professional Quality of Life scale. An exploratory factor analysis was performed to determine the factor structure of the Sleep Promotion Questionnaire. The internal consistency reliability as well as the convergent and divergent validities was assessed. Pearson's correlations and hierarchical multiple regression procedures were performed to explore the predictors of perceived quality of care.

Results: Exploratory factor analysis of the Sleep Promotion Questionnaire yielded 28 items in five subscales, comprising Attitude, Control, Unit Norms, Sleep-aid Intention, and Behavior. Convergent and divergent validities were supported ($r = 0.37$; $r = -0.38$, respectively). The Cronbach's alphas of internal consistency reliabilities of the Sleep Promotion Questionnaire subscales ranged from 0.70 to 0.89. Regression models showed that sleep-promoting Unit Norms was the only significant predictor of perceived quality of care among both ICU and non-ICU nurses ($\beta = 0.40$; $\beta = 0.28$, respectively).

Conclusion: The Sleep Promotion Questionnaire appears to be a reliable and valid instrument with satisfactory psychometric properties for assessing sleep promotion, and it seems that having unit norms conducive to sleep promotion may positively impact the quality of care. However, further studies are needed to confirm these results.

Keywords

Sleep, sleep promotion, quality of care, norms, attitude, behavior, instrument

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Sleep disturbance among hospitalized patients is a common threat to their recovery. Sleep is essential for healing, but patients often experience sleep disturbance due to frequent awakening and negative environmental factors.[1–3] Clinical practice guidelines recommend redesigning workflow and improving patient environment to promote sleep.[4] However, sleep promotion is not a high priority for most nurses and other healthcare providers, which could negatively impact the quality of care.[5,6]

Background

Sleep is vital for maintenance of health and survival. It consists of rapid eye movement (REM) sleep and three non-REM sleep stages, N1, N2, and N3. Each stage is characterized by a unique combination of eye movements, brain electrical activities, and muscle movements.[7] According to the American Academy of Sleep Medicine (AASM), normal sleep includes (a) absence of sleep disturbance or daytime

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effects of unsatisfactory sleep, (b) stability of sleep timing, (c) absence of illness affecting sleep, (d) absence of sleep disturbance arising from substance exposure, and (e) no primary sleep disorder.[8,9]

In contrast, sleep disturbance refers to abnormalities in sleep timing, quality, or quantity, as well as "sleep insufficient for normal daily function."[10,11] A number of factors contribute to sleep disturbance among hospitalized patients, but the environmental factor is the most common modifiable cause of sleep disturbance, including noise, light, and frequent sleep-interrupting care activities at night.[2,3,12–14] Sleep disturbance puts patients at risk for physical sequelae including altered cardiac and respiratory function, altered neuroendocrine response, poor wound healing, longer hospitalizations, and higher mortality rates.[15–19] Sleep disturbance is also a potentially contributing factor for delirium that occurs in about one-third of hospitalized patients and up to 80% of patients on mechanical ventilation.[4,20] In the United States, the estimated annual healthcare costs associated with delirium range from US$38 billion to US$152 billion.[21]

Among the ICU survivors, sleep deprivation is reported to be one of the most stressful aspects of the ICU experience, and more than half of the survivors continue to experience poor sleep quality for months following hospital discharge.[22,23] Studies have also shown long-term effects such as depression, posttraumatic stress disorder, cognitive impairment, or lower quality of life among ICU survivors.[24–27] These cognitive, psychological, and physical problems experienced by ICU survivors are called post-intensive care syndrome (PICS).[28]

Despite these adverse effects of sleep disturbance among hospitalized patients, cultivating a unit culture that is conducive to sleep promotion is challenging. In a study of 1223 ICU healthcare providers, most of them believe that patients are not sleeping well, and that poor sleep results in adverse outcomes for the patients, such as delirium, prolonged length of stay, and delayed weaning from mechanical ventilation.[6] However, only one-third of these providers report having a sleep-promotion protocol in their units. Studies also suggest that nurses have positive attitudes toward patient sleep, but they often lack understanding of sleep physiology and its impact on patients' health.[29,30] In addition, most unit cultures and norms demand higher priorities for competing diagnostic, monitoring, and therapeutic activities, which raises a major barrier to sleep promotion.[31]

A multicomponent, bundled approach has been proposed as a sleep-promotion strategy. Sleep promotion has been defined as "deliberate encouragement of sleep," which can be achieved through nonpharmacologic means, such as optimizing environmental conditions and unit procedures to minimize sleep disturbance and enhance normal sleep-wake cycles.[4,32] Specific examples include reducing environmental noise and light levels, clustering care-related activities, use of eye masks and earplugs, as well as encouraging physical activities during the daytime.[33,34] Bundled approaches such as this may allow better team communications, provide standardized care processes, and enhance sleep-promoting unit culture.

Sleep promotion in hospitals is an important determinant of quality of care. Recently, much attention has been paid to implementing nonpharmacologic sleep promotion practices to lower the incidence of hospital delirium and reduce the use of sedatives and anxiolytics.[4,35] However, sleep promotion needs to be measurable for monitoring improvements. Despite the critical role of nurses in promoting sleep, there is a paucity of valid and reliable instruments for measuring nurses' sleep-promotion practices. Furthermore, the lack of such instruments has been a major barrier in assessing the relationship between sleep promotion and quality of care. Thus, there is a need to develop a valid and reliable instrument for assessing nurses' sleep-promotion practices.

In the development of psychometric instruments that assess health-related behaviors, the theory of planned behavior (TPB) has been widely used for conceptual underpinnings.[36] The theory includes five constructs: attitudes, perceived subjective or social norms, perceived behavioral control, behavioral intention, and behavior.[37] The theory suggests that behavior and behavioral intention are explained by the individual's own beliefs and attitudes, social pressure or norms to follow a specific behavior, as well as the perceived ability to carry out such a behavior. In this study, we used this conceptual underpinning as a framework for developing a sleep-promotion questionnaire.

Aims

The aims of this study were (a) to assess the validity and internal consistency reliability of a newly-developed instrument, Sleep Promotion Questionnaire (SPQ) and (b) to examine the extent of influence of sleep-promotion attitude, control, unit norms, intention, and behavior as predictors of perceived quality of care among nurses.

Item generation and content validity testing

In this study, sleep promotion was conceptualized as multifaceted, nonpharmacologic interventions to deliberately encourage patient sleep and minimize sleep disturbance.[4,32] Five TPB-based constructs were operationalized to generate potential items for each dimension of the SPQ.[37] First, the nurse's behavioral intention and behavior were identified as specific nursing actions and plans to promote sleep. Second, social norms were renamed as unit norms, which was defined as the nurse's perceived social pressure or expectations in the unit to engage in sleep-promoting activities. Third, attitude is the nurse's beliefs toward sleep promotion and expected outcomes. Finally, behavioral control is the nurse's perception of power to promote patient sleep.

After reviewing the literature regarding sleep promotion as well as the operational definitions, two PhD-prepared nurse researchers, who are experts in tool development,

drafted a total of 36 potential SPQ items with a 5-point Likert-type response format ranging from 1 (strongly disagree/never) to 5 (strongly agree/always). For the initial content validity testing, these items were submitted to a panel of 11 master's-prepared nurses, with expertise in caring for patients with sleep disturbance, to ensure each item reflected the construct. They rated clarity, relevance, and representativeness of each item on a four-point scale. The content validity index (CVI) was calculated to assess the extent of agreement among the panel members, with 80% agreement or better being regarded as acceptable.[38] Based on the CVI scores and panel's comments, some of the items were reworded. To further examine the validity and internal consistency reliability of the SPQ, the following study was conducted.

Study methods

Design and participants

A cross-sectional study using an online survey system, *Snap* WebHost, was conducted at two acute-care hospitals, one located in southern California and the other in central Texas from July to August of 2016. The sample inclusion criteria were clinical nurses from inpatient medical-surgical units, telemetry units, critical care units, and antepartum/postpartum units. Nurses working in emergency departments, psychiatric units, pediatric units, and operating rooms were excluded because patient sleep patterns in these units have different characteristics.

Instruments

In addition to the SPQ, Caring Behaviors Inventory (CBI)[39] and Professional Quality of Life scale Version 5 (ProQOL-V)[40] were included to assess the construct validity of the SPQ. One global item from the Essentials of Magnetism (EOM) instrument was included to rate the nurses' perception of the quality of care in their own units on a scale of 0–10, with 10 indicating the highest quality of care.[41] Demographic data were also collected as a part of the survey.

The 24-item CBI was used to assess convergent validity of the SPQ.[39] It was thought that nurses who actively promoted sleep for their patients were more likely to exhibit caring behaviors. CBI rates a nurse's caring behaviors on a 6-point Likert-type response format ranging from 1 (never) to 6 (always), with higher scores indicating greater caring behaviors. The caring behaviors include a nurse's presence and availability to serve patients' needs, professional competence, attending to the dignity of patients, and providing assistance to patients. The internal consistency reliability of the CBI was reported as Cronbach's alpha of 0.96. Convergent validity of the CBI was supported by a significant positive correlation with patient satisfaction ($r = 0.62$). In this study, it was hypothesized that there would be a positive correlation between CBI and SPQ scores for convergent validity testing.

The 10-item Burnout subscale of ProQOL-V was used to assess divergent validity of the SPQ.[40] It was thought that nurses experiencing burnout are less likely to promote sleep for their patients. This subscale measures negative feelings such as hopelessness or emotional exhaustion among professionals working in helping professions on a 5-point Likert-type response format ranging from 1 (never) to 5 (very often), with higher scores indicating greater burnout. The internal consistency reliability of the Burnout subscale was reported as Cronbach's alpha of 0.75 and the construct validity has been previously established. In this study, it was hypothesized that the SPQ score would have a negative correlation with the Burnout subscale score for divergent validity testing.

Data collection procedures

This study was reviewed and approved by the institutional review boards at two participating hospitals and the University. A recruitment email with a URL link to the online survey was sent to nurses at the participating hospitals. When the link was clicked, they were directed to an introductory page containing an informed consent form with an option to decline or accept. When accepted, they were then led to the actual survey which took approximately 15 min to complete. At completion of the survey, each participant was automatically redirected to a separate, delinked website where the work email address could be submitted for a US$20 electronic gift card. The study was open for 1 month and two reminder emails were sent during this period.

Data analyses

Descriptive statistics including means, standard deviations, frequencies, and percentages were used to summarize sample characteristics. An exploratory factor analysis with varimax rotation was performed to determine factor structure and remove unsuitable items of the SPQ. Confirmatory factor analysis was not planned in this early stage of SPQ development. The criteria for factor solution included factor loading greater than 0.40 and eigenvalue greater than 1.0.[42] The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were computed to assess sampling adequacy and suitability of the data for factor analysis.[43] A sample size of 300 was chosen based on the assumption of 5-factor solution with 2–6 items in each factor and modest communalities.[44]

For internal consistency reliability, item-total correlation coefficients between 0.30 and 0.75 were required to ensure the homogeneity of the items within a factor and to avoid redundancy.[42] Cronbach's alpha above 0.70 was considered acceptable. Construct validity, including divergent and convergent validities, were assessed through bivariate Pearson's correlations among CBI, ProQOL-V Burnout subscale, and SPQ mean scores. Since ICUs have high

Table 1. Sample characteristics ($N = 302$).

Variables	Total ($N = 302$)	ICUs ($n = 92$)	Non-ICUs ($n = 210$)
Age, years, mean (range)	36 (20–65)	38 (20–63)	36 (22–65)
Ethnicity			
Caucasian	181 (59.9)	71 (77.2)	110 (52.4)
African American	12 (4.0)	2 (2.2)	10 (4.8)
Asian/Pacific Islanders	63 (20.9)	9 (9.8)	54 (25.7)
Hispanic	31 (10.3)	7 (7.6)	24 (11.4)
Others	15 (5.0)	3 (3.3)	12 (5.7)
Educational level			
Diploma/associate degree	55 (18.2)	16 (17.4)	39 (18.6)
Bachelor's degree	213 (70.5)	64 (69.6)	149 (71.0)
Graduate degree	34 (11.2)	12 (13.0)	22 (10.5)
Shifts			
Day	177 (58.6)	56 (60.9)	121 (57.6)
Evening/night	125 (41.4)	36 (39.1)	89 (42.4)
Years of RN experience, mean (range)	10 (0–41)	12.5 (0–38)	8.5 (0–41)

ICU: intensive care unit.
Values are expressed as *n* (%) unless otherwise indicated.
Percentages may not add up to 100% because of missing data or rounding.

environmental stimuli around the clock that frequently cause sleep disruptions, the samples from ICUs and non-ICUs were analyzed separately. Independent *t*-tests were conducted to compare the mean scores of each SPQ subscale and perceived quality of care between the two groups. For bivariate analyses, Pearson's correlation procedures were performed between the perceived quality of care and SPQ subscales as well as the demographic variables among ICU and non-ICU nurses. To determine sleep promotion as predictors of the perceived quality of care in multivariate analyses, the demographic variables that correlated with the perceived quality of care were entered in the first step of the hierarchical multiple regression models. The SPQ subscales were then entered in the second step to determine predictors of perceived quality of care above and beyond the demographic variables among ICU and non-ICU nurses. SPSS version 24.0 (IBM SPSS Statistics, Armonk, NY) was used for all data analyses and the significance level was set at $p < 0.05$.

Results

Sample characteristics

Of the 311 participants who completed the study questionnaire, 302 eligible participants (92 from ICUs and 210 from non-ICUs) were included in data analyses (Table 1). Nine participants were excluded from analyses because of ineligible unit locations. A majority were Caucasians (59.9%) and had bachelor's degrees (70.5%). They also worked day shifts (58.6%) and in non-ICU settings (69.5%). The average age and years of RN experience of the participants were 36 years and 10 years, respectively.

Factorial validity and internal consistency reliability

An exploratory factor analysis with varimax rotation showed a satisfactory sampling adequacy, with KMO value of 0.75 and significant Bartlett's test of sphericity ($\chi^2 = 3156.45$, $df = 630$; $p < 0.001$) supporting the appropriateness of factor analysis. Based on the theoretical framework, 5-factor solution was forced, resulting in a total of 29 items. The remaining seven items failed to load into any of the five factors. These items included offering sleep medications, having control over giving sleep medications, sleep medications not helping, sleep quality not being important in nursing assessment, disrupting sleep for routine nursing care, limiting routine nursing care when patient is asleep, and uninterrupted sleep being beneficial. The 5-factor solution accounted for 41.6% of the total variance, including 13.8% (Factor 1), 10.7% (Factor 2), 6.79% (Factor 3), 5.32% (Factor 4), and 4.94% (Factor 5). Table 2 shows the factor loadings of the items.

Factor 1, Behavior subscale with seven items, covers nurses' sleep-promotion behaviors. Internal consistency reliability was Cronbach's alpha of 0.78. The item-total correlation coefficients ranged from 0.36 to 0.58, indicating reasonable homogeneity of the items without redundancies. Factor 2, Unit Norms subscale with seven items, encompasses nurses' perception of unit culture regarding sleep promotion. The internal consistency reliability showed a Cronbach's alpha of 0.76 with satisfactory item-total correlation coefficients. Factor 3, Control subscale consisting of six items, rates nurses' perception of control over sleep-promoting behaviors. Cronbach's alpha was 0.72 with satisfactory item-total correlation coefficients.

Table 2. Factor loadings of Sleep-Promotion Questionnaire (SPQ) items.

Items	1	2	3	4	5
Factor 1: Behavior (α = 0.78)					
I group routine care for uninterrupted sleep	0.66				
I provide quiet time to promote sleep	0.65				
I include sleep promotion in planning	0.64				
I ask sleep routine at home	0.60				
I provide environment to promote sleep	0.59				
I document sleep quality	0.58				
I limit routine care when patient sleeping	0.57				
Factor 2: Unit Norms (Cronbach's α = 0.76)					
Nurses in unit group routine nursing care		0.70			
Nurses in unit try to limit noise		0.66			
Medical staff respect uninterrupted sleep		0.65			
Nurses in unit not respect sleep*		0.57			
Manager pays attention to noise level		0.57			
Manager not see importance of patient's sleep*		0.56			
Non-nursing staff respect uninterrupted sleep		0.50			
Factor 3: Control (α = 0.72)					
No control over grouping routine nursing care*			0.67		
No control over delaying routine nursing care*			0.64		
No control over providing quiet time*			0.60		
I disrupt sleep to provide care*			0.59		
Control over satisfying sleep needs			0.54		
Control over non-pharmacologic interventions			0.53		
Factor 4: Attitudes (α = 0.70)					
Sleep problems are common				0.73	
Artificial lighting disrupts sleep				0.69	
Pain causes sleep disturbance				0.66	
Patients need quiet time				0.57	
Noise level affects sleep quality				0.44	
Sleep promotion high priority				0.42	
Factor 5: Sleep-Aid Intention (α = 0.89)					
Providing ear plugs					0.83
Providing eye masks					0.82

α = Cronbach's alpha.
* Negative-worded item.

Factor 4, Attitude subscale with six items, covers the nurses' attitude toward patients' sleep. Cronbach's alpha was 0.70 with satisfactory item-total correlations. Factor 5, Sleep-aid Intention subscale, initially comprised of three items. However, item-total correlation coefficient for the item regarding visiting hours was unacceptably low at 0.11 and was removed. The resulting 2-item subscale covers providing sleep aids with Cronbach's alpha of 0.89. Therefore, the final SPQ comprises of 28-items in five subscales, that is, Attitude, Control, Unit Norms, Sleep-aid Intention, and Behavior.

Construct validity

In testing the convergent and divergent validity of the SPQ, the results of Pearson's correlation supported the hypotheses. There was a statistically significant positive correlation between SPQ and CBI scores ($r = 0.37$; $p < 0.001$), supporting convergent validity. In contrast, there was a significant negative correlation between ProQOL-V Burnout subscale and SPQ scores ($r = -0.38$; $p < 0.001$), which supports the divergent validity.

Sleep promotion and perceived quality of care

Among the five SPQ subscales, there were significant differences between ICU and non-ICU nurses in the Attitude and Unit Norms subscale scores. Independent *t*-tests showed that the mean Attitude subscale score of ICU nurses was significantly higher than that of the non-ICU nurses (M = 4.35 vs 4.11; $t(201) = 4.50$, $p < 0.001$). In contrast, the mean Unit Norms score was significantly lower for the ICU nurses

Table 3. Bivariate correlations with perceived quality of care ($N = 302$).

	ICU nurses ($n = 92$)	Non-ICU nurses ($n = 210$)
Age	−0.07	0.11
Years of RN experience	−0.09	0.04
Educational level		
Diploma/associate degree	−0.02	0.11
Bachelor's degree	0.08	−0.09
Graduate degree	−0.08	0.01
Day shifts	−0.05	0.14*
Sleep promotion		
Unit Norms	0.35***	0.31***
Attitude	−0.05	−0.04
Control	−0.02	0.16*
Sleep-aid Intention	0.03	0.04
Behavior	0.01	0.15*

ICUs: intensive care units.
*$p < 0.05$.
***$p < 0.001$ by Pearson's correlations.

compared to the non-ICU nurses (M = 3.30 vs 3.56; $t(155) = -3.05$, $p = 0.003$). For the perceived quality of care, ICU nurses scored significantly higher than non-ICU nurses (M = 8.78 vs 8.47; $t(219) = 2.51$, $p = 0.013$).

Bivariate correlations showed that Unit Norms had statistically significant correlations with perceived quality of care among both ICU ($r = 0.35$; $p < 0.001$) and non-ICU nurses ($r = 0.31$; $p < 0.001$; Table 3). In addition, Control ($r = 0.16$; $p = 0.024$), Behavior ($r = 0.15$; $p = 0.030$) subscales, and working in day shifts ($r = 0.14$; $p = 0.037$) correlated significantly with quality of care among non-ICU nurses.

Hierarchical multiple regression analyses were performed to determine the predictors of perceived quality of care above and beyond the demographic variables among ICU and non-ICU nurses (Table 4). The model assumptions of normality, linearity, and homoscedasticity were met.[42] For the ICU nurses, entry of working in day shifts in the first step of a hierarchical multiple regression model accounted for 0.3% of the variance in perceived quality of care ($p = 0.618$). The entry of the five SPQ subscales in the second step of the model accounted for 13.9% of the variance in perceived quality of care above and beyond the demographic variables ($p = 0.024$). Unit Norms was the only statistically significant predictor of perceived quality of care ($\beta = 0.40$; $p < 0.001$).

For the non-ICU nurses, entry of working in day shifts in the first step of the model explained 2.1% of the variance of perceived quality of care ($p = 0.037$). The entry of the five SPQ subscales in the second step of the model explained 10.9% of the variance in perceived quality of care, indicating that the sleep promotion explained a modest fraction of variance in perceived quality of care above and beyond the demographic variables ($p < 0.001$). Unit Norms ($\beta = 0.28$; $p < 0.001$) and working in day shifts ($\beta = 0.16$; $p = 0.022$) were statistically significant predictors of perceived quality of care.

Discussion

As far as we are aware, SPQ is the first valid and reliable instrument for assessing sleep promotion among clinical nurses. The availability of an instrument that measures multiple factors involved in sleep promotion may help in monitoring future efforts to improve nurses' sleep-promotion attitude, control, unit norms, intentions, and behavior. It was surprising that out of the five SPQ dimensions, only sleep-promoting unit norms was a significant predictor of perceived quality of care. This implies that the unit culture and normative expectations from other healthcare providers in the unit have a significant influence on perceived quality of care. It is plausible that the quality of care is largely determined by the concerted efforts of multidisciplinary teamwork within the unit rather than an individual nurse's behavior or attitude.[44,45]

It is interesting that the Unit Norms scores were significantly lower among ICU nurses compared to the non-ICU nurses, which suggests that ICU nurses perceive their unit norms to be less supportive of sleep promotion.[6] However, sleep promotion protocol at the unit level is below optimum levels, in multinational studies outside the United States, only 10% of the ICUs have adopted sleep promotion protocol.[46] This is likely due to the higher priority patient care and monitoring required in the ICUs that contribute to frequent sleep disruptions.[5,31] To overcome such barriers to sleep promotion in the ICUs, implementation of structured sleep protocol could help change the unit workflow and environmental factors so that sleep promotion can become a part of the unit norms whenever possible.[3]

Since personnel from multiple disciplines have impacts on patient sleep, a multidisciplinary approach involving nursing, the medical staff, as well as the laboratory and radiology departments is probably necessary to establish and sustain sleep-promoting unit norms.[47,48] Multidisciplinary sleep bundles that foster sleep-promoting unit norms have resulted in better patient outcomes, such as reduction in postoperative delirium and length of ICU stays.[49,50] The use of sleep aids, such as ear plugs or eye masks, as a part of a sleep bundle, reduced the incidence of delirium and improved sleep quality.[51,52] These nonpharmacologic strategies can optimize modifiable environmental factors such as light and noise levels and enhance normal sleep-wake cycles.[4,32] The institution of multidisciplinary sleep bundles is expected to enhance sleep-promoting unit norms, which could be assessed by the SPQ. In addition to the impact on unit norms, implementation of sleep bundles may improve other dimensions related to sleep promotion, such as sleep-promotion attitudes, control, and behavior.

Limitations

There are several limitations to this study. First, the result showing sleep-promoting norms as a significant predictor of perceived quality of care should not be taken as a cause-and-effect relationship in this cross-sectional study.

Table 4. Hierarchical multiple regression predicting perceived quality of care ($N = 302$).

Predictors	ICU nurses ($n = 92$)		Non-ICU nurses ($n = 210$)	
	β	p	β	p
Step 1				
Day shifts	0.05	0.618	0.14	0.037
	$R^2 = 0.003$;	$p = 0.618$	$R^2 = 0.021$;	$p = 0.037$
Step 2				
Day shifts	0.05	0.635	0.16	0.022
Sleep promotion				
Unit Norms	0.40	<0.001	0.28	<0.001
Attitude	0.06	0.597	−0.03	0.705
Control	−0.10	0.405	0.04	0.546
Sleep-aid Intention	0.05	0.663	0.01	0.989
Behavior	−0.07	0.543	0.09	0.194
	R^2change = 0.139;	$p = 0.024$	R^2change = 0.109	$p < 0.001$
	F change $_{(5, 85)} = 2.748$		F change $_{(5, 203)} = 5.090$	

ICUs: intensive care units.

Second, participants in this self-reported survey may have overestimated their perception of sleep promotion and quality of care to be more socially desirable. Third, although the SPQ appears to be a valid and reliable instrument for assessing nurse's perception of various sleep-promotion dimensions in this exploratory study, additional studies are needed with confirmatory factor analysis to further validate the instrument. Fourth, although this study was done at two separate hospitals located in two regions of the United States, the findings may not be generalizable to nurses at other locations. Finally, the perceived quality of care was elicited from the participating nurses rather than the patients. Therefore, patient-reported outcomes related to sleep promotion interventions need to be studied further.

Conclusion

The SPQ appears to be a valid and reliable instrument with satisfactory psychometric properties for assessing sleep promotion. This instrument may help develop strategies for improving sleep among hospitalized patients, including multidisciplinary sleep-bundle protocol. We have also found that unit norms for sleep promotion may be a significant predictor of quality of care. However, further studies are needed to confirm the results.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

This study was approved by (1) University of California, San Diego Human Research Protections Program (Project #160190XX); (2) Texas State University, Institutional Review Board (Project # EXP2015T210035L); and (3) Austin Multi-Institutional Review Board (SKMBT_36115091018280)

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Informed consent

Written informed consent was obtained from all subjects before the study. Yes

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