

Reliability of the Korean version of the Richards-Campbell Sleep Questionnaire

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Background: Sleep disorders are common in critically ill patients. Unfortunately, sleep assessment is challenging in many intensive care units (ICUs). The Richards-Campbell Sleep Questionnaire (RCSQ) is a simple subjective tool that has been validated and used in many countries. This study aimed to evaluate the reliability of the Korean version of the RCSQ (K-RCSQ).

Methods: This prospective, cross-sectional, observational study was conducted in the ICUs of two hospitals. In total, 52 consenting patients answered questionnaires regarding their previous night's sleep (K-RCSQ) and the noise they experienced (range, 0–100).

Results: The K-RCSQ showed excellent internal consistency of 0.960 by Cronbach's alpha. The mean total score of the K-RCSQ was 41.9 ± 28.9 (range, 0–100). The mean perceived ICU noise score was 40.7 ± 28.1 (range, 0–90). There was a significant linear correlation between noise score and average K-RCSQ score ($r = -0.37$, $P < 0.001$).

Conclusions: The K-RCSQ demonstrated excellent reliability (internal consistency). This simple tool may help assess sleep quality in critically ill patients and improve the quality of ICU care.

Key Words: reliability; Richards-Campbell Sleep Questionnaire; sleep disorders

INTRODUCTION

The quality of sleep is poor in many patients admitted to an intensive care unit (ICU) [1-4]. Many factors contribute to this problem. Environmental factors such as light, noise, and inadequate room temperature and psychological factors such as fear, anxiety, and pain play important roles [5-7]. In addition, the severity and acuity of the critical illness itself may also contribute to sleep disturbance [7]. Sleep disturbance is associated with many physiological consequences that may negatively affect the prognoses of critically ill patients [8].

Unfortunately, sleep assessment in the ICU can be challenging. Polysomnography, the gold standard for sleep assessment in stable patients, is impractical in the ICU setting [5,9]. Self-reported subjective assessments offer an alternative approach. Among the subjective tools, the Richards-Campbell Sleep Questionnaire (RCSQ) is the most validated and reliable tool [10]. The RCSQ consists of five questions assessing sleep depth, latency, and fragmentation, as well as time to the resumption of sleep and total sleep quality [11]. The scores are measured with a 100-mm visual analog scale (VAS), and higher scores indicate better sleep [5,12,13]. The RCSQ has been translated from English to other languages, including German,

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Swedish, Spanish, and Chinese [12-15], to be easily incorporated into multiple clinical practices.

Despite growing concerns regarding poor sleep quality in the ICU, there is scarce literature available on sleep quality in the ICUs of Asian countries. Therefore, this study aimed to evaluate the internal consistency of the Korean version of the RCSQ (K-RCSQ) in the medical ICU (MICU) setting.

MATERIALS AND METHODS

Study Design and Patients

This prospective, cross-sectional, observational study was conducted in the MICUs of two hospitals (one secondary and one tertiary care hospital). Patients aged ≥ 19 years who stayed more than 24 hours in the MICU were screened from October 2017 to February 2018. Patients capable of communication and those with a Richmond Agitation and Sedation Score (RASS) of -2 to $+2$ were included. Patients with acute neurologic or psychiatric disease or active delirium were excluded.

This study was approved by the Institutional Review Boards of Seoul National University Hospital (IRB No. H-1708-168-882) and SNU-SMG Boramae Medical Center (IRB No. 20-2017-41). All participants provided written informed consent, and the study was conducted in accordance with the Declaration of Helsinki.

Translation

Permission was received from the author (Richards) to translate and use the RCSQ (Supplementary Figure 1). Two independent experts fluent in English and Korean languages translated the questionnaire into Korean. Then, the questionnaires were translated back into English. One of the authors and an English expert compared the versions for accuracy and comprehension and produced a single K-RCSQ (Supplementary Figure 2).

Data Collection

The K-RCSQ was completed during the daytime between 9 am and 5 pm. Questions rated on a VAS of subjective nighttime noise assessment (0 indicating very quiet, 100 indicating very noisy) were added to the RCSQ [13,16]. We received permission to use the questionnaire of Dr. Richards, who devised the RCSQ, and to publish the results. The K-RCSQ was previously translated and used in an unpublished study conducted by Lee [6]. Translation of the instrument into Korean and back-translation into English were performed by native speakers of English with excellent knowledge of the Korean language.

KEY MESSAGES

- The Richards-Campbell Sleep Questionnaire (RCSQ) is a simple subjective tool that has been validated and used in many countries.
- We tested the Korean version of the RCSQ to demonstrate its usefulness for evaluating sleep quality, and it showed excellent reliability (internal consistency).

Statistical Analysis

Statistical analyses were performed using IBM SPSS ver. 25.0 (IBM Corp., Armonk, NY, USA). P-values less than 0.05 were considered to indicate statistical significance. More than 50 participants were recommended for inclusion to achieve acceptable reliability coefficients [12,17,18]. Internal consistency was calculated using Cronbach's alpha coefficient.

RESULTS

A total of 52 patients was enrolled during the study period (46 patients in a tertiary care and 6 patients in a secondary care hospital). Patient characteristics at the time of enrollment are shown in Table 1. Thirty patients (57.7%) were men, and the mean age of the patients was 62.8 ± 15.9 years. Reasons for ICU admission were respiratory failure (49.2%), cardiologic failure (15.4%), renal failure (13.8%), and sepsis (10.8%). The mean Acute Physiology and Chronic Health Evaluation (APACHE) II score was 17.5 ± 7.3 , and the Sequential Organ Failure Assessment (SOFA) score was 7.3 ± 4.3 . At the time of RCSQ assessment, three patients (5.7%) were under light sedation. One patient had been given propofol (72 mg/kg/day), and two were sedated with dexmedetomidine (16.8 $\mu\text{g/kg/day}$ and 4.8 $\mu\text{g/kg/day}$, respectively). A total of eight patients (15.4%) had been given opiates for pain control. One patient had received a fentanyl patch (75 $\mu\text{g/hr}$), and the other seven had been given remifentanyl (mean, 57.6 $\mu\text{g/kg/day}$). Most patients (80.8%) were alert and calm at enrollment, with an RASS score of 0. The median length of ICU stay was 4 days (range, 1-21 days). At the time of discharge from the ICU, 43 patients (82.7%) were capable of only limited selfcare or were completely disabled (Eastern Cooperative Oncology Group Performance Status 3 or 4).

The mean score of the five items of the K-RCSQ was 41.9 ± 28.9 (range, 0-100) (Table 2). Only eight patients (15%) showed very good sleep (scores > 75), while 16 patients (31%) had a K-RCSQ score less than 26, which indicated very poor sleep [12].

Table 1. Characteristics of the participants on inclusion

Characteristics	Value (n=52)
Male sex	30 (57.7)
Age (yr)	62.8±15.9
Body mass index (kg/m ²)	21.1±4.2
APACHE II score	17.5±7.3
SOFA score	7.3±4.3
Smoking	11 (21.2)
Alcohol intake	17 (32.7)
Comorbidity	
Hypertension	24 (46.2)
Diabetes mellitus	17 (32.7)
Chronic lung disease	13 (25.0)
Chronic liver disease	3 (5.8)
Chronic renal disease	15 (28.8)
Active malignancy	12 (23.1)
Ventilation	
Spontaneous, room air	19 (36.5)
Spontaneous, low-flow oxygen	18 (34.6)
Spontaneous, high-flow oxygen	10 (19.2)
Noninvasive ventilation	2 (3.8)
Invasive mechanical ventilation	3 (5.8)
Sedation/Agitation level (RASS score)	
0 (Alert and calm)	42 (80.8)
-1 (Drowsy)	9 (17.3)
+1 (Restless)	1 (1.9)

Values are presented as number (%) or mean±standard deviation. APACHE: Acute Physiology and Chronic Health Evaluation; SOFA: Sequential Organ Failure Assessment; RASS, Richmond Agitation and Sedation Scale.

The overall internal consistency of the five items of the K-RCSQ was 0.96. Of the K-RCSQ subscales, the “sleep depth” domain had the highest mean K-RCSQ score, and the “returning to sleep” domain had the lowest K-RCSQ score. The mean score of perceived noise assessment was 40.7±28.1 (range, 0–90). There was a significant linear correlation between noise score and average K-RCSQ score ($r=-0.37$, $P<0.001$). The perceived noise score was significantly lower in the good sleep group (K-RCSQ score >50) than in the poor sleep group (K-RCSQ score ≤50) (28.75±26.35 vs. 48.28±26.99, $P=0.014$).

DISCUSSION

Sleep quality in critically ill patients is markedly abnormal. These patients frequently experience prolonged sleep latency,

Table 2. Results of the K-RCSQ and perceived noise score

Questionnaire	Mean±SD	Range
RCSQ 1 (sleep depth)	44.5±28.3	0–100
RCSQ 2 (falling asleep)	41.4±32.3	0–100
RCSQ 3 (awakening)	41.0±30.7	0–100
RCSQ 4 (returning to sleep)	40.1±34.7	0–100
RCSQ 5 (overall sleep quality)	42.4±29.0	0–100
Average K-RCSQ score	41.9±28.9	0–100
Noise score	40.7±28.1	0–90

K-RCSQ: Korean Richards-Campbell Sleep Questionnaire; SD: standard deviation.

sleep fragmentation, and frequent arousal [8]. Despite growing concerns regarding sleep disturbance in the ICU and its physiological consequences, there are only a few studies on sleep quality among critically ill Korean patients [19–22]. Only one study used polysomnography to assess the sleep quality of five patients [21], while other studies used sleep questionnaires. However, sleep questionnaires, such as the Overran-Snyder-Halpern sleep scale, are not adequately validated in critically ill patients after comparison with polysomnography data [10]. To the best of our knowledge, there are no published studies assessing sleep quality of patients in Korean ICUs using the RCSQ, which is currently considered the most validated and reliable tool [10].

In this study, the K-RCSQ showed excellent reliability with an internal consistency of 0.960 by Cronbach’s alpha. The Cronbach’s alpha of the original English version was 0.90 [11]. This result is comparable to that of other versions of the RCSQ. The Cronbach’s alpha of the Swedish [13], German [12], Spanish [14], and Chinese [15] versions was 0.92, 0.88, 0.89, and 0.923, respectively. The K-RCSQ is a reliable tool that can be used for subjective measurements of sleep quality in Korean ICUs.

Subjective sleep quality was low in our study population. The mean K-RCSQ score was 41.9±28.9, which is slightly lower than the RCSQ scores collected from the ICUs of various countries [12,14,23]. One possible explanation is that the study population had more severe medical conditions. Moreover, different ICU settings, such as single- or multi-bed rooms, could have influenced the results. Single-bed rooms were available to only a few patients in our study population. Among the sleep domains, the lowest score was observed in RCSQ 4 (returning to sleep), with a mean of 40.1±34.7. Scores from each sleep domain and the domain with the lowest score vary widely from study to study. Returning to sleep was one of the top-rated issues of the RCSQ in ICUs of several countries [12,14,16]. Stud-

ies from Sweden [13] and China [15] showed that returning to sleep was the third highest rated item. A study from Czech [24] showed that returning to sleep was the lowest rated sleep domain, similar to the results of the present study. There are many possible causes for difficulty in returning to sleep, such as noise and anxiety, and further studies are needed to clarify the cause and effect of these findings.

Critically ill patients are surrounded by many devices that generate loud alarms and noises that may result in disruption of sleep [4]. Results from our study suggest that there is a correlation between perceived noise level and quality of sleep in critically ill patients. An interventional study of ICU patients also showed that improvements in perceived noise score correlated with improvements in RCSQ score [24]. Consciousness of the noise level in the ICU is important because noise reduction may be a feasible nonpharmacological strategy to improve sleep and delirium in the ICU [8].

There are several limitations to this study. First, the validity of the K-RCSQ was not directly assessed. The K-RCSQ was not compared with an objective measurement of sleep. Polysomnography is impractical to use in the ICU, and the RCSQ has been validated against polysomnography, showing moderate correlation [11]. Second, noise in the ICU was not recorded, and the noise level was assessed subjectively. Third, the included patients from the MICU may not appropriately represent the general critically ill population. However, severely ill patients, including those under mechanical ventilation, were able to answer the K-RCSQ. Moreover, the RCSQ is widely used in cardiovascular ICUs [11], heterogeneous ICUs [12] and surgical ICUs [13,14]. In conclusion, the K-RCSQ had excellent reliability (internal consistency). This simple tool may help assess the sleep quality of critically ill patients and improve the quality of ICU care.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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AUTHOR CONTRIBUTIONS

Conceptualization: JKK, JL. Data curation: JHP, JL. Formal analysis: JKK, JL. Methodology: all authors. Investigation: JKK. Writing–original draft: all authors. Writing–review & editing: JKK, JL.

SUPPLEMENTARY MATERIALS

Supplementary materials can be found at <https://doi.org/10.4266/acc.2020.00339>.

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Supplementary Figure 1. Richards-Campbell Sleep Questionnaire (RCSQ)

Directions: Place an "X" anywhere on the answer line that you feel BEST describes your sleep last night.

1. My sleep last night was:

Deep	_____	Light
Sleep		Sleep

2. Last night, the first time I got to sleep, I:

Fell		Just Never
Asleep	_____	Could Fall
Almost immediately		Asleep

3. Last night I was:

Awake	_____	Awake All
Very Little		Night Long

4. Last night, when I woke up or was awakened, I:

Got Back		Couldn't
To Sleep	_____	Get Back
Immediately		To Sleep

5. I could describe my sleep last night as:

A Good	_____	A Bad
Night's		Night's
Sleep		Sleep

Supplementary Figure 2. Korean version of Richards-Campbell Sleep Questionnaire (K-RCSQ)

