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RESEARCH ARTICLE

THE GREEK VERSION OF THE RICHARDS-CAMPBELL SLEEP QUESTIONNAIRE: RELIABILITY AND VALIDITY ASSESSMENT

Christina-Athanasia Sampani[1], Marios Charalampopoulos[2], Panagiota Triantafyllaki[3], Athanasia Liveri[4], Christos Triantafyllou[5], Dimitrios Papageorgiou[6]

1. RN, MSc, PhD (c), General Hospital of Athens "G. Gennimatas", Athens, Greece
2. RN, MSc, CCRN, PHD (c), Medecins Sans Frontieres-Greece
3. RN, MSc, PhD (c), General Hospital of Athens "Evangelismos", Athens, Greece
4. Biostatistics data scientist, Department of Statistics and Insurance Science, University of Piraeus, Piraeus, Greece
5. RN, MSCE, PhD (c), National and Kapodistrian University of Athens, School of Health Science, Department of Nursing, Goudi Athens, Greece
6. Professor, Director of "ICU Follow-Up Care Lab", School of Health and Care Sciences, Department of Nursing, University of West Attica, Greece

Abstract

Background: The lack of sleep is a significant concern for ICU patients, necessitating effective sleep-promoting interventions by nurses. A user friendly and reliable tool is essential for Greek nurses to evaluate the impact of these interventions on patients' sleep. This study aimed to translate the Richards Campbell Sleep Questionnaire (RCSQ) into Greek and ascertain the reliability and validity of this version in measuring sleep quality among ICU patients in a Greek hospital.

Method and Material: The study assessed the night-time sleep of 50 patients in the general ICU of a tertiary hospital in Athens, Greece, from January 2022 to March 2023. The translation of the RCSQ into Greek adhered to all guidelines for translating and adapting psychometric scales. The reliability of the RCSQ scale was tested using Cronbach's alpha (α).

Results: The study included 32 male and 18 female patients. Cronbach's alpha (α) was calculated to be 0.906, indicating excellent reliability for the RCSQ. The overall mean RCSQ score was 52.8 (SD=15.41), ranging from 12 to 78. About 60% of participants reported "good sleep", while 8% experienced "very poor sleep".

Conclusion: The assessment of patient sleep should utilize a valid and reliable instrument. The Greek version of the RCSQ shows great promise for use in Greek hospital settings. It is concise, user-friendly, and comprehensible, and it has demonstrated reliability and validity in capturing various sleep domains, thereby providing a comprehensive assessment of sleep akin to the original version.

Keywords: Sleep, ICU, polysomnography, Richards-Campbell Sleep Questionnaire, RCSQ.

Corresponding Author: Christos Triantafyllou, Papadiamantopoulou 123, Goudi Athens, PC 11527, email: christrian@nurs.uoa.gr, ORCID: https://orcid.org/0000-0002-3198-3965

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INTRODUCTION

The function of sleep, though not fully understood, is universally recognized as vital for maintaining good health, with a lack of sleep often leading to increased illness. Sleep typically follows a cycle of four deepening stages, culminating in rapid-eye-movement (REM) sleep. Stage 1, a transitional phase between wakefulness and sleep, is not considered true sleep. In Stage 2, the sleeper becomes less aware of their surroundings but is still easily aroused. Stages 3 and 4, known as deep sleep, make arousing the sleeper very difficult.[1]

In ICU patients, sleep quality is a major concern, with about 51% reporting altered sleep patterns during and after hospitalization. Insufficient sleep in these patients can lead to confusion, hindered rehabilitation, and prolonged morbidity. Factors like the ICU environment, mechanical ventilation, medication, and disease severity disrupt sleep. Notably, melatonin, the sleep hormone, often has delayed or diminished secretion in critically ill patients, affecting their sleep phase.[2]

Sleep fragmentation causes are varied, but numerous studies have identified several. ICU patients, being severely ill, require round-the-clock monitoring and care, which often disturbs their sleep. Monitoring procedures have been identified as the most significant disruptor. Studies, such as one by Meyer et al.,[3] show that monitoring and therapeutic procedures disturb patients about once per hour throughout the day. Additionally, ICU noise levels often exceed established norms due to medical equipment and staff conversations.[4]

Strong lighting also negatively impacts sleep by affecting the circadian rhythm. Intense light inhibits melatonin production, crucial for regulating sleep-wake cycles. Thus, ICU conditions with constant light and noise, coupled with night-time care routines, likely disrupt patients' sleep-wake cycles.[5]

Assessing sleep in ICU settings remains challenging. Polysomnography (PSG) is the preferred method for its reliability, but its cost and patient compliance requirements limit its practicality. Alternatively, actigraphy offers an objective way to measure sleep. This less invasive method, using a wristwatch-like device, may not precisely detect sleep stages like PSG but can provide valuable sleep information.[3,6]

Subjective methodologies rely on patients' self-reports, often through questionnaires. While quick and easy to administer, the validity and reliability of such instruments can be questionable, and their extensive nature can overwhelm severely ill ICU patients, especially those with medication-induced cognitive impairments.[7]

Given the prevalence of sleep problems in ICU patients, nurses play a crucial role in promoting sleep through various interventions. For effective evaluation of these interventions, a simple assessment tool is necessary.[8] The Richards-Campbell Sleep Questionnaire (RCSQ) offers a solution. Developed and validated by Richards et al., this 5-item visual analog scale, with an optional noise item, assesses sleep depth, latency, awakenings, time awake, and overall quality. Its 6th item, focusing on noise, is scored separately.[9,10] The RCSQ, correlating well with PSG, has been translated into several languages and is widely used internationally.[11,12] The current study aimed to translate the RCSQ into Greek and determine the reliability and validity of its Greek version in assessing sleep among ICU patients in a Greek hospital.

METHODOLOGY

Participants

This study focused on the nocturnal sleep patterns of 50 patients admitted to the general ICU of a tertiary hospital in Athens, Greece, from January 2022 to March 2023. It was utilized a convenience sampling approach. The ICU facility consisted of 17 beds and maintained a nurse-to-patient ratio of 1:2.

Eligible participants were patients aged 16 years and above, both with and without the need for mechanical ventilation, and exhibiting hemodynamic stability. Exclusion criteria included patients under 16 years of age, those with hemodynamic instability, sedation, a history of sleep-disordered breathing (such as sleep apnea syndrome), chronic neuromuscular disease, psychiatric illness, previous sleep pathologies, alcohol addiction, illicit drug abuse, and cognitive dysfunction (including dementia).

Data collection adhered to strict anonymity and confidentiality protocols. The process commenced only after obtaining informed and voluntary consent from each patient. To maintain integrity and confidentiality, the data in the questionnaires were coded and anonymized. Each patient was assigned a unique

code number with no direct reference to their identity.

Description of Richards-Campbell Sleep Questionnaire (RCSQ)

The RCSQ questionnaire was used for the present study with the written permission of its author.[8] All guidelines for translating and adapting psychometric scales were followed for translating the RCSQ into Greek. Initially, the translation was carried out by two experienced and independent translators and the back-and-forth translation procedure was followed.[13]

The RCSQ scale is a short, self-report, 5-item questionnaire used to assess night sleep. Specifically, it assesses:

- sleep depth
- sleep latency (the time it takes to fall asleep)
- number of awakenings
- efficiency (percentage of time awake)
- sleep quality.

Each RCSQ item is scored on a visual analog scale ranging from 0 mm to 100 mm, with higher scores representing better sleep. The average score of the five items is known as the "total score" and represents the overall perception of sleep. As was done in previous studies, our questionnaire also included a sixth item assessing perceived noise at night (range: 0 mm for "very quiet" to 100 mm for "very noisy").

Finally, demographic-clinical characteristics (sex, age, days in the hospital, days on mechanical ventilation, days on spontaneous breathing, whether they underwent a tracheotomy and the type of tracheotomy, and whether they received a mild sedation formulation to promote sleep) were collected from the participants.

Ethical issues

Regarding the ethics of this study, it has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).[14] The study was approved by the hospital's review boards (Ref No 3369/8-2-2021). Data collection and analysis were conducted after obtaining informed, written consent from all patients' relatives during ICU care. The patients' personal data and the hospital's name remained anonymous at all stages of the study.

Statistical analysis

Data analysis was performed with the statistical package SPSS version 22. Mean (mean) and standard deviation (SD) were used to present the quantitative variables while absolute (N) and relative frequencies (%) were used to present the poetic variables. Normality tests were performed using Kolmogorov-Smirnov test. Reliability testing of the RCSQ scale was performed with Cronbach's correlation coefficient α. Index values greater than 0.7 or 0.8 are usually considered satisfactory. To investigate the differences between the RCSQ and the demographic-clinical characteristics of the participants, parametric t-test and Mann-Whitney non-parametric tests were used. Pearson's correlation coefficient (r) parametric and Spearman's correlation coefficient (r) nonparametric were used to investigate the associations between two quantitative variables. Finally, a factor analysis was performed on the RCSQ scale. The level of statistical significance was set at $p<0.05$.

RESULTS

Demographic characteristics

Of the 50 patients who took part in the study, 32 were men, and 18 were women. The mean age of the patients was 56.6 years (SD=17.9). The mean duration of hospitalization was 25 (SD=28.1) days, the mean duration of mechanical ventilation was 20.3 (SD=25.0) days, and the mean duration of spontaneous respiration was 4.9 days (SD=17.1; Table 1).

Cronbach's α coefficient

The Cronbach's correlation coefficient α was calculated at 0.906 revealing excellent reliability of the RCSQ. No question removal significantly increased the coefficient value.

Characteristics of RCSQ

The overall mean score of the RCSQ scale was 52.8 (SD=15.41) with a range of 12 to 78. Patients were divided into four groups according to the RCSQ scale score: patients with very poor sleep, patients with poor sleep, patients with good sleep and patients with very good sleep. 60% of the participants had a "good sleep" while 8% had a "very poor sleep" (Figure 1). **Table 2** shows that patients rated noise levels moderately (mean=57.0 SD=18.43).

Comparisons of RCSQ and noise level

The analysis of gender and taking mild sedation for sleep promotion showed no statistically significant correlations for total score and noise level (p>0.05; Table 3).

Correlations of RCSQ and noise level

The Age and the days of spontaneous breathing did not show a statistically significant correlation with the total RCSQ score (p>0.05). On the contrary, there was a negative statistically significant correlation between the total RCSQ score and patients' hospital days (p=-0.495, p<0.05). Furthermore, there was a negative statistically significant correlation between the total RCSQ score with days on mechanical ventilation of patients (p=-0.474, p<0.05).

Days of mechanical ventilation did not affect the noise levels (p=-0.121, p>0.05). On the other hand, days in the hospital and days on mechanical ventilation of patients negatively affect noise levels (p=-0.465, p<0.05 and p=-0.451, p<0.05, respectively). Age appeared to be weakly and negatively correlated with noise levels (p=-0.289, p<0.05).

Finally, a statistically significant positive correlation was observed between the total RCSQ score and noise level (p=0.931, p<0.05).

Factor analysis

Factor analysis showed that the Simple Moving Average (SMA) equals 0.824 and the statistical function of Bartlett's sphericity test equals χ^2=230.054 and p<0.05 therefore, the scale items are uncorrelated with each other and suitable to be analyzed through factor analysis. The analysis resulted in a statistically significant factor explaining 70% of the total variability. The loading coefficients of all items were greater than the allowable limit.

DISCUSSION

Sleep disruption in the acute hospital setting has been reported widely in the literature. Patients have attributed sleep disruption to environmental factors, symptom management, and nursing interventions.[15]

Around 30% of patients are dissatisfied with their night's rest, which nurses often fail to recognize. As the primary caregivers to patients in the hospital environment, nurses are strategically placed to assess and promote their patients' sleep. However, it is possible that awareness of the health impacts of good sleep is suboptimal by nursing staff in the acute hospital environment, leading in turn to a lack of emphasis on procedure with regard to patient sleep promotion. One of the barriers to sleep promotion is the lack of a standardized tool to assess sleep.[16]

Routine use of an easy-to-use, brief sleep measurement tool has the potential to help nurses identify sleep-related issues and communicate this in a concise manner. Clarification of these issues could provide an impetus for improved nursing assessment, which should, in turn, lead to the implementation of appropriate nursing interventions that promote better sleep for patients.

For clinical purposes, there is a need for a validated, brief sleep assessment tool for hospitalized patients.

Many studies reported the use of the RCSQ, which was originally developed as a five-item scale for patients to report on their previous night's sleep in the critical care environment. According to the developer, Richards et al., 2000, items correlated with polysomnography in the domains of sleep onset, sleep depth and awakenings and total sleep time.[8]

The RCSQ takes approximately two minutes to complete. Item values are summated and divided by five providing a mean score reflecting the patient's perception of their sleep. Thus far, the RCSQ has had limited application beyond the critical care setting where validation studies have been conducted.[7,8,17]

However, a feasibility study of elderly hospitalized patients compared the RCSQ with actigraphy and noted a moderate correlation (r = 0.57, p = <0.001).

The RCSQ has been used largely in critical care settings. Measured against polysomnography, it displayed positive psychometric properties in reliability and correlating with those polysomnographic measures capturing some of the domains of sleep quality in terms of sleep onset, awakenings and depth of sleep. Its ease of scoring, brevity and non-burdensome time commitment from the patient and/or carer make it an attractive option for evaluation of patient sleep assessment in an acute hospital ward.

One of the aims of the present study was to give an account of

ICU patients' perception of their sleep. The fact that a large number of the patients were not able to answer questions about their sleep is, of course, a problem, but one that is unavoidable if you want to study the perceptions of a group of individuals consisting of severely ill intensive care patients. However, it must be considered important to know how these patients experienced their sleep.

This finding is relatively well in line with the study by Nicolas et al.,[1] where one hundred and four surgical patients were recruited for the study. Patients completed the Richards-Campbell Sleep Questionnaire. The total mean score of sleep on the first postoperative night was 51-42 mm, 28% of patients had good sleep, 46% a regular sleep, and 26% a bad sleep. The sleep profile of these patients has been characterized by the patients having a light sleep, with frequent awakenings and generally little difficulty in going back to sleep after the awakenings.[1]

Freedman et al.,[5] in their study, measured the patients' ratings of how they had slept the night before. Some stated that they had not slept at all, while others stated that they had slept very well. The total sleep score ranged between 0 and 97 (mean 45.5). Nine patients (29%) scored a total sleep score of 25 or below (i.e., very poor sleep), and eight (26%) a total sleep score of over 75 (i.e., very good sleep). Cronbach's alpha for the five questions about sleep was 0.92. The results show very wide-ranging variation in the patient's experience of their sleep.[5]

Similar findings had the study conducted by Murata et al..[11] The Richards-Campbell Sleep Questionnaire was initially translated into Japanese using the back-translation method. Validity was evaluated by determining the association between sleep efficiency, measured using simplified polysomnography, and the total score on the Japanese version of the Richards-Campbell Sleep Questionnaire. Reliability was tested using Cronbach's alpha coefficient. Thirty-three patients were included in the analysis. After excluding four patients with subsyndromal delirium, the Pearson correlation coefficient was 0.602 ($p = 0.001$). Cronbach's alpha coefficient was 0.911. The Japanese version of the Richards-Campbell Sleep Questionnaire could be used as an alternative to polysomnography when assessing sleep quality in intensive care unit patients.[11]

In the settings of the study of Krotsetis et al.,[12] the RCSQ was translated following established methodological standards. Data were collected cross-sectionally in a sample of 51 patients at three intensive care units at a university hospital in Germany. The German version of the RCSQ showed an overall internal consistency (Cronbach's alpha) of 0·88. The mean of the RSCQ in the sample was 47·00 (SD ± 27·57). Depth of sleep was rated the lowest, and falling asleep again the highest of the RCSQ sleep items.[12]

Moreover, Locihová et al.,[9] translated the RCSQ according to the translation and cultural adaptation manual. The quality of sleep was assessed using the Czech version of the RCSQ. The sample consisted of 105 patients hospitalized in an interdisciplinary intensive care unit. The internal consistency (Cronbach's α) of the Czech version of the RCSQ is 0.89. There was no statistically significant relationship ($p < 0.05$) between sleep quality and selected variables: age ($F = 0.1$; $p = 0.736$), gender ($F = 0$; $p = 0.929$), and type of admission ($F = 1.8$; $p = 0.183$). This study demonstrates that the Czech version of the RCSQ is rated as a reliable tool and can be used to subjectively assess sleep quality in critically ill patients.[9]

In another study, Chen, Li-xia, et al.,[18] translated the original RCSQ into Chinese and then back-translated it into English to ensure its accuracy of the translation. Internal consistency, discrimination validity, and construct validity of the RCSQ were examined in 150 critically ill patients. The convergent validity of the RCSQ was evaluated in 44 of 150 critically ill patients, and data from the RCSQ were compared with those of the Chinese version of St Mary's Hospital Sleep Questionnaire (SMHSQ). Cronbach's α of the RCSQ was 0.923; thus, it showed high reliability. The psychometric properties of the RCSQ suggest its utility in critically ill patients.[18] The Swedish version of the RCSQ, evaluated by Frisk and Nordström, had a Cronbach's alpha of 0.92 in 31 alert patients in a 6-bed surgical ICU in Sweden.[7] The Spanish version by Nicolás et al., tested on n=104 non-mechanically ventilated patients in a 16-bed surgical ICU in Spain, had an alpha of 0.89.[1]

Our study, investigating a heterogeneous patient sample, importantly contributes to the applicability of the RCSQ in various intensive care settings. Cronbach's correlation coefficient α was calculated to be 0.906, revealing excellent reliability

of the Greek version of the RCSQ. No question removal significantly increased the coefficient value. On the contrary, there was a negative statistically significant correlation of the total RCSQ score with the patients' hospitalization days ($p=-0.495$, $p<0.05$). Furthermore, there was a negative statistically significant correlation between the total RCSQ score with days on mechanical ventilation of patients ($p=-0.474$, $p<0.05$).

This study has several limitations that should be acknowledged. One significant factor is the variability in patients' individual histories, particularly regarding the use of medication or other pre-existing sleep disorders. Although efforts were made to exclude patients with such confounding factors, it's possible that the study's results might either underestimate or overestimate the association between the observed outcomes and sleep quality. Additionally, the relatively small sample size and the specific ICU setting of a single hospital could limit the generalizability of the findings. Thus, while the RCSQ has shown potential in our study, generalizing these outcomes to all critical condition patients, such as those with multiorgan system failure, is constrained. The diverse conditions and complexities of ICU patients present challenges in validating the RCSQ across different patient groups.

In conclusion, the assessment of patient sleep should utilize a valid and reliable instrument. The Greek version of the RCSQ shows great promise for use in Greek hospital settings. It is concise, user-friendly, and comprehensible, demonstrating reliability and validity across various sleep domains, thus offering a comprehensive assessment of sleep akin to the original version.[8] However, further testing is warranted to determine the reliability and validity of its Greek version in assessing sleep among ICU patients confirm its applicability and effectiveness.

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ANNEX

TABLE 1. Characteristics of participants (n=50)

Characteristic	Value
Gender N (%)	
Male/Female	32 (64%)/18 (36%)
Age (years), mean ± SD	56,5±17,9
Days of hospitalization, mean ± SD	25,0±28,1
Days on mechanical ventilation, mean ± SD	20,3±25,0
Days on automatic breathing, mean ± SD	4,9±17,1
Tracheotomy N (%)	
Yes/No	22 (44%)/28 (56%)
Type of tracheotomy	
Surgical/Percutaneous	7 (7%)/15 (30%)
Received mild sedation to promote sleep (DEXDOR)	
Yes/No	25 (50%)/25 (50%)

TABLE 2. RCSQ Questionnaire

Question	Mean	SD	Range
1. Sleep depth	60,40	16,78	0-100
2. Falling asleep	51,20	23,36	0-80
3. Awakenings	48,20	15,74	0-80
4. Returning to sleep	54,60	15,28	10-80
5. Sleep quality	49,40	22,72	0-100
6.Noise level	57,00	18,43	0-80

FIGURE 1. The groups of patients

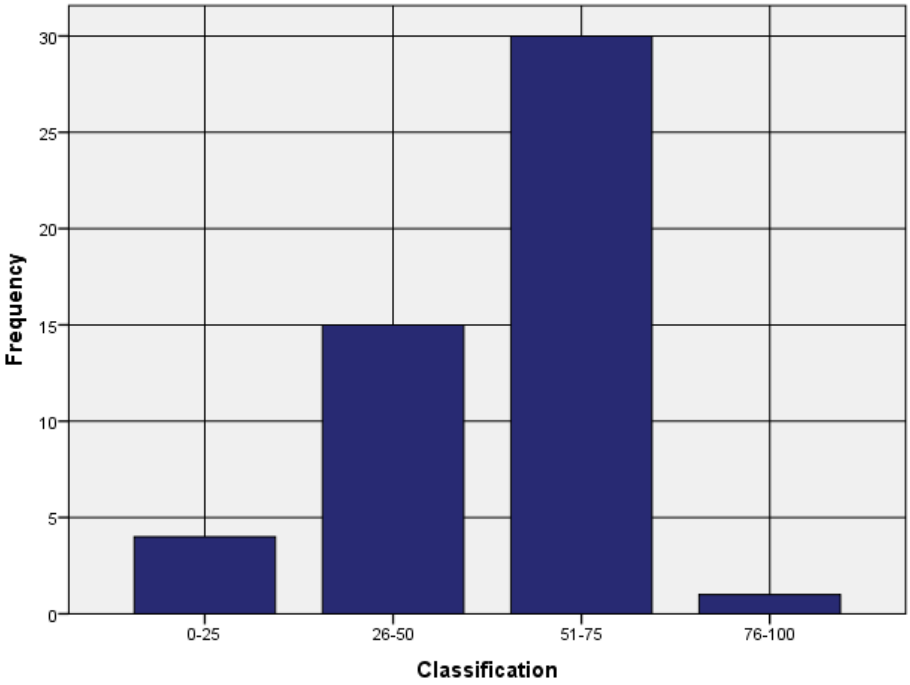

TABLE 3. Comparisons of RCSQ and noise level with gender and received mild sedation to promote sleep

	Gender		
	Male	**Female**	**p**
Total RCSQ	48,88±15,61	49,00±15,79	0,768
Noise level	53,75±17,08	51,67±27,87	0,725
	Received mild sedation to promote sleep		
	Yes	**No**	**p**
Total	47,57±16,50	51,25±13,60	0,503
Noise level	52,86±18,16	53,75±23,87	0,721