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ORIGINAL ARTICLE

The Richards Campbell Sleep Questionnaire for Assessment of Sleep in Critically Ill Patients: Translation, Reliability, and Validation of the Malay Language Version

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ABSTRAK

Kualiti tidur yang kurang baik lazimnya diperhatikan di kalangan pesakit kritikal; namun, penilaian persepsi tidur di dalam pesakit kritikal adalah masih mencabar. 'Richards Campbell Sleep Questionnaire' (RCSQ) adalah alat kaji selidik yang telah disahkan dan mudah untuk digunakan bagi menilai kualiti tidur, serta telah berjaya diterjemahkan kepada pelbagai jenis bahasa. Kajian ini adalah bertujuan untuk menterjemah dan menilai kesahihan serta ketepatan RCSQ versi Bahasa Melayu. Proses penterjemahan ini melibatkan terjemahan hadapan dan songsang. Setelah itu, soal selidik RCSQ tersebut diuji ke atas lima subjek yang tidak mengambil bahagian di dalam ujian ini untuk memastikan bahawa soalan yang diterjemahkan adalah relevan. Ketepatan soal selidik yang diterjemahkan seterusnya diuji dengan menggunakan alfa-Cronbach. Sebanyak 150 pesakit kritikal dewasa telah diuji menggunakan terjemahan RCSQ Bahasa Melayu. Purata jumlah skor bagi versi bahasa Melayu RCSQ adalah 78.59 ± 19.43. Ukuran Kaiser-Meyer-Olkin adalah 0.839, yang menunjukkan bahawa persampelan kajian adalah kukuh. Alfa-Cronbach adalah 0.930, yang memaparkan soalan yang diterjemahkan mempunyai ketepatan yang baik. Kesimpulannya, versi RCSQ Bahasa Melayu adalah sahih dan tepat untuk digunakan bagi menilai kualiti tidur pesakit kritikal.

Kata kunci: Bahasa; kualiti tidur; penyakit kritikal; terjemahan; tinjauan dan soal selidik

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ABSTRACT

Poor sleep quality is commonly observed among critically ill patients; however, the assessment of sleep perception in critically ill patients remains challenging. The Richards Campbell Sleep Questionnaire (RCSQ) is a simple, validated tool for sleep quality assessment that has been successfully translated into various languages. This study aimed to translate and assess the validity and reliability of the Malay language version of the RCSQ. The process of translation involved forward and reverse translation methods. The face validity of the translated RCSQ was tested during the pre-test on five non-participating subjects. The reliability of the translated questionnaire was tested with Cronbach's alpha coefficient. A total of 150 critically ill patients were included in the analysis using the translated RCSQ. The average total score of the Malay language version of the RCSQ was 78.59 $\pm$ 19.43. The Kaiser-Meyer-Olkin measure of sampling adequacy and Cronbach's alpha coefficient showed a score of 0.839 and 0.930 respectively, indicating that the sampling of the study was meritorious and good internal consistency of the Malay RCSQ. In conclusion, the Malay language version of the RCSQ demonstrated excellent reliability and may aid in the assessment of sleep quality in critically ill patients in a local setting.

Keywords: Critical illness; language; sleep quality; surveys and questionnaires; translations

INTRODUCTION

Sleep is defined as a periodic, reversible state of cognitive and sensory disengagement from the external environment (Carskadon & Dement 2011). Sleep can be divided into rapid eye movement (REM) and non-rapid eye movement (NREM) states, in which NREM sleep can be further divided into three stages i.e. N1, N2, and N3. While REM sleep contributes to a restful night's sleep, stage N3 sleep is considered to be the deepest and most restful stage of the sleep cycle, contributing to the anabolic and restorative processes (Delaney et al. 2015). Therefore, deprivation of high-quality sleep could have deleterious consequences. It was found that poor sleep quality in critically ill patients may impair recovery and prolong the length of hospital stay, increasing the risk of myocardial infarction, altering the immunologic responses, and leading to mood disorders such as self-reported depression, frustration, and anxiety (Pisani et al. 2015; Salas & Gamaldo 2008; Zhong et al. 2005). Sleep deprivation has also been implicated as a modifiable risk factor for delirium in critically ill patients (Weinhouse et al. 2009).

A high prevalence of poor sleep quality was observed among critically ill patients (Naik et al. 2018). Studies

characterising the sleep disturbances in the Intensive Care Unit (ICU) have demonstrated fragmented sleep, prolonged sleep latency, decreased sleep efficiency, multiple awakenings, a greater fraction of stage 2 sleep, a decreased or absent stage 3 in both NREM and REM sleep, as well as increased daytime sleeping time up to 50% of total sleep time (Cooper et al. 2000; Elliot et al. 2013 Freedman et al. 2001; Kamdar et al. 2012; Naik et al. 2018). Multiple factors may contribute to sleep disturbances among ICU patients, ranging from the complex environmental setting, patient care activities, staff interactions, mechanical ventilation, noise from background alarms, medication use, and the nature of the illnesses themselves (Kamdar et al. 2012; Simons et al. 2018). However, the assessment of sleep perception in critically ill patients remains a challenge. Polysomnography (PSG) remains the gold standard for the assessment of sleep quantity and quality in ICU patients (Sadeh et al. 1994). It was not widely used as a continuous monitoring device in the ICU because special attention was needed during its application as well as the interpretation of sleep waves (Elliot et al. 2013; Knauert et al. 2014; Pisani et al. 2015). Therefore, it is necessary to have a validated and reliable patient's self-reported sleep assessment tool for researchers to investigate and improve sleep management.

Among the sleep quality assessment tools, the Richards Campbell Sleep Questionnaire (RCSQ) has demonstrated good validity and reliability in comparison to PSG (Darbyshire et al. 2020; Elliot et al. 2013). It is also less cumbersome to perform at the bedside as it does not require electrode application as in PSG, and the interpretation required less expertise. RCSQ consists of a five-item visual analogue scale self-assessment tool measuring the perception of sleep latency, sleep efficiency, depth of sleep, number of arousals, and overall sleep quality of the subjects (Richards et al. 2000). Validation of RCSQ against PSG demonstrated a moderate overall correlation of 0.58, with a mean sleep efficiency index of 70.31% in PSG and 60.19% in RCSQ, and a Cronbach's alpha score of 0.90, showing good reliability between RCSQ and PSG. (Darbyshire et al. 2020; Richards et al. 2000).

A simple, easy, and quick-to-use version of the translated questionnaire is required, which could be a viable option for use in a busy environment in an intensive care setting. The RCSQ has been successfully translated with good reliability into various languages such as Korean, Japanese, German, Chinese, and Portuguese (Biazim et al. 2020; Chen et al. 2019; Kim et al. 2020; Krotsetis et al. 2017; Murata et al. 2019). Sleep deprivation is a common occurrence in critically ill patients, and having the Malay version of the RCSQ will be beneficial in promoting sleep management in a local setting. As there is no Malay version of the sleep questionnaire assessment available, the aim of this study was to translate and assess the reliability and validity of the Malay language version of the RCSQ questionnaire so that it can be used as an assessment tool in order to enable

our researchers to further investigate and improve sleep management in critically ill patients in the future.

MATERIALS AND METHODS

This study was a prospective, cross-sectional, and observational study approved by the Research Committee of the Department of Anaesthesiology and Intensive Care, Hospital Canselor Tuanku Muhriz, Universiti Kebangsaan Malaysia (UKM), and the Medical Research and Ethic Committee, Hospital Canselor Tuanku Muhriz, UKM, with the ethics approval reference number of JEP-2021-325. A convenient sampling method was adapted, and patients either referred for ICU care or who needed postoperative ICU care from September 2021 to May 2022 were recruited. Written informed consent was obtained from the patient or next of kin by a single investigator. The inclusion criteria included critically ill patients above 18 years of age who were admitted to the hospital for more than 24 hours, those who were capable of self-reporting and communicating, as well as patients with Richmond Agitation-Sedation Scale (RASS) scores of -2 to +1 while on sedation. Patients diagnosed with acute neurologic or psychiatric disease, active delirium, and a RASS score of -3 and below or +2 and above were excluded from the study. Patients who were unable to complete the RCSQ questionnaire following consent were considered dropouts.

Translation of the Malay Language Version of RCSQ

The translation procedure of the Malay language version of the RCSQ was carried out according to the principles of good practise for translation and cultural adaptation written by Wild et al. (2005) after obtaining permission from the original author of the RCSQ (Richards et al. 2000). The original RCSQ questionnaire was first translated into Malay by two independent translators fluent in both English and Malay. Both translators were certified translators in English and Malay and held Malaysian Translators Association (MTA) registration number. Reconciliation of the two translations by consensus between the translators and the research group was then performed, and the Malay language version of the RCSQ was reverse translated into English by two independent translators fluent in English and Malay who were unaware of the original questionnaire. A reverse-translation review against the original English version of the RCSQ was then carried out by the primary investigator and another translator who was fluent in English and Malay but was not involved in the initial translation process, followed by the harmonisation process of the different reverse-translated versions against the original. Lastly, cognitive debriefing of the translated version of RCSQ was performed, whereby five consenting patients or people who did not participate in the study were tested in order to test their understanding and comprehension of the Malay language version of RCSQ.

Data Collection Procedure

Patient characteristics, including age, gender, co-morbidities, smoking, alcohol intake, and state of pregnancy, as well as the Acute Physiology, Age, and Chronic Health Evaluation II (APACHE II) score, were charted. The diagnosis, nature of admission, either emergency or elective, and specialty, either medical or surgical-based disciplines, were documented. Clinical data characteristics such as the RASS, type and dose of sedatives, anxiolytics, analgesia, vasopressors, inotropes, and the type of oxygen therapy were documented.

Patients were interviewed using the Malay version of the RCSQ after a night's stay in the critical care areas. The process took place by the bedside between 7 and 11 in the morning. The questions were asked one by one in a clear manner. After each question, patients set a mark on a paper-based visual analogue scale, which was a non-divided line equivalent to 100 mm. A zero-mm mark on the visual analogue scale would indicate the worst score, while a 100 mm mark would indicate the best rating. Patients could either point with the tip of their finger at the chosen spot if they were unable to mark it on the visual analogue scale or, with the help of the investigator, marked it on the scale accordingly. The overall score of the RCSQ included the addition of scores from items one to five and was divided by five. The score that fell within the lowest quartile (0–25 mm) indicated the worst sleep, and those within the highest quartile (76–100 mm) indicated good sleep. Item six was scored individually, which was the measure of the noise score. Patients who were willing for an interview were asked about the reasons for good and poor sleep using a single question. Each response took approximately three to five minutes. The process of translation and questionnaire assessment was summarised in Figure 1.

Statistical Analysis

The sample size was calculated using the methodology of Guadagnoli & Velicer (1988), who recommended a total of 150 patients for factor loading of at least 0.4. Statistical analysis was performed using SPSS version 27 for Windows (IBM). Demographic characteristics as well as clinical data on patients were analysed descriptively.

The validation analysis of the study was carried out in the context of face validity and content validity. Face validity of the translated RCSQ was performed during the cognitive debriefing, where comprehension of the questionnaire was assessed in five patients who did not participate in the actual study. Content validity was analysed using Kaiser-Meyer-Olkin (KMO) to measure the sampling adequacy for factor analysis. The Bartlett's test of sphericity was used to determine whether the observed items were suitable for conducting factor analysis, and a p-value <0.05 was the significant value to proceed with factor analysis. Principle component analysis (PCA) was used to identify the maximum variance of the item. The internal consistency for reliability

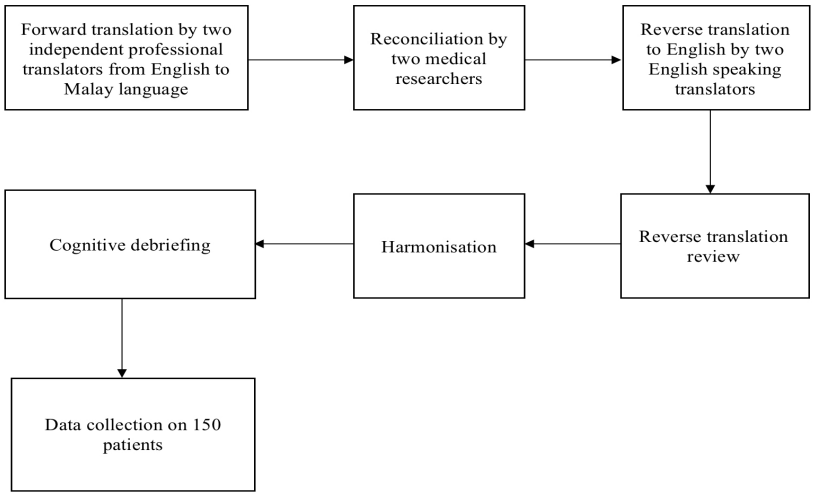

FIGURE 1: Translation process of the Malay language version of RCSQ

of the Malay language version of the RCSQ was analysed with Cronbach's alpha coefficient. The value of $\alpha \geq 0.70$ demonstrated good internal consistency (Portney & Watkins 1993). Items with corrected item-total correlation coefficients of 0.3 and above were viewed as homogenous in perceiving sleep (Ferketich 1991). The mean values and standard deviations of each item in the instrument, as well as the average total score, were calculated and tested with one sample t-test.

RESULTS

The process of translation from the original English version of RCSQ into Malay found minor discrepancies comparing both translations, and these discrepancies were resolved by reconciliation of the two translated versions, as summarised in Table 1. Terms with easier public comprehension were chosen. For example, the RCSQ term "fall asleep" was translated into "tertidur" and terlelap," respectively, and the term "tertidur" more familiar to public understanding, was chosen. Similarly, between the terms "tahap hingar" or "tahap kebisingan" that were translated for the RCSQ term "noise level", and "tahap kebisingan", a more commonly used term, was chosen in the final Malay version. A good comprehension and understanding of the questionnaire were also observed in participants in the face validity test.

A total of 150 patients were enrolled in this study during the study period. There were no dropouts in this study. The sampling adequacy for content validity was adequate, with a KMO score of 0.839. The Bartlett's test was significant with a p-value <0.001, and the calculated Chi-square was 589.05 with 10 degrees of freedom, which supported the factorability of the data. Principal component analysis revealed that the RCSQ had only a single domain

TABLE 1: Translations performed by the first and second translators and the final version of the Malay version of the RCSQ. The word in italics was the chosen word for the questionnaire during the reconciliation process

Item	Original version	Translation by the first translator	Translation by the second translator	Final version
1 (Sleep depth)	My sleep last night was:	*Tidur saya malam semalam* berkeadaan:	Tidur saya malam tadi *adalah:*	Tidur saya malam semalam adalah:
	Deep Sleep	Tidur Lena	*Tidur Nyenyak*	Tidur Nyenyak
	Light Sleep	*Tidur Tidak* Lena	Tidur Ringan	Tidur Tidak *Nyenyak*
2 (Sleep latency)	Last night, the first time I got to sleep, I:	*Malam semalam, kali pertama saya dapat tidur, saya:*	Malam tadi, kali pertama saya dapat tidur, saya:	Malam semalam, kali pertama saya dapat tidur, saya:
	Fell Asleep Almost Immediately	Terlelap *Hampir Serta-merta*	Langsung *Tertidur*	Tertidur Hampir Serta-merta
	Just Never Could Fall Asleep	*Tidak Boleh* Terlelap *Langsung*	Sukar Untuk Tidur	Tidak Boleh *Tertidur* Langsung
3 (Awakening)	Last night I was:	*Malam semalam, saya:*	Malam tadi saya:	Malam semalam, saya:
	Awake Very Little	*Terjaga Seketika*	Berjaga Sebentar	Terjaga Seketika
	Awake All Night Long	*Terjaga Sepanjang Malam*	Berjaga Sepanjang Malam	Terjaga Sepanjang Malam
4 (Returning to sleep)	Last night, when I woke up or was awakened, I:	*Malam semalam, apabila saya bangun atau terjaga, saya:*	Malam tadi, apabila saya bangun atau terbangun, saya:	Malam semalam, apabila saya bangun atau terjaga, saya:
	Got Back To Sleep Immediately	*Dapat Tidur Semula Dengan Segera*	Tidur Semula Serta-merta	Dapat Tidur Semula Dengan Segera
	Couldn't Get Back To Sleep	*Tidak Dapat Tidur Semula*	*Tidak Dapat Tidur Semula*	Tidak Dapat Tidur Semula
5 (Sleep quality)	I would describe my sleep last night as:	*Saya boleh menggambarkan tidur saya malam semalam sebagai:*	Saya boleh gambarkan tidur saya malam tadi sebagai:	Saya boleh menggambarkan tidur saya malam semalam sebagai:
	A Good Night's Sleep	Tidur Yang Nyenyak	*Tidur Malam Yang Baik*	Tidur Malam Yang Baik
	A Bad Night's Sleep	Tidur Yang Tidak Nyenyak	*Tidur Malam Yang* Teruk	Tidur Malam Yang *Buruk*
6 (Noise)	Optional Noise Item	Item Hingar Pilihan:	Item Kebisingan Pilihan:	Item Kebisingan Pilihan:
	I would describe the noise level last night as:	*Saya boleh menggambarkan tahap hingar malam semalam sebagai:*	Saya boleh gambarkan tahap *kebisingan* malam tadi sebagai:	Saya boleh menggambarkan tahap kebisingan malam semalam sebagai:
	Very Quiet	*Sangat Senyap*	*Sangat Senyap*	Sangat Senyap
	Very Noisy	*Sangat Bising*	*Sangat Bising*	Sangat Bising

consisting of the five items, whereby this single domain explained 78.18% of the total variance in the patient's response, and therefore a varimax rotation analysis of the questionnaire was not performed. Item 1 in the Malay RCSQ, which was the sleep depth, was observed to have the highest Eigenvalue, 3.909, which indicated that the variable made the highest contribution to the questionnaire. The Cronbach's alpha coefficient was 0.930, with the corrected item-total correlation ranging between 0.766 and 0.857. The removal of any item in the Malay language RCSQ did not increase internal consistency. The summary of PCA factor loading and Cronbach's alpha for each Malay version of the RCSQ item was summarised in Table 2.

The demographic data of the enrolled patients was shown in Table 3. During the time of enrollment, 83.3% of patients had a RASS score of 0, which was a state of alertness and calm. A total of ten (6.7%) and six (4.0%) patients received intravenous sedatives and opioid infusions, respectively. Among the 150 recruited patients, seventeen were mechanically ventilated (11.3%), while the others were on either non-invasive ventilation or other forms of oxygen therapy. Ten patients (6.7%) required vasopressor or inotropic support during the period of study, as shown in Table 4.

The average total score of the five items of the Malay RCSQ was 78.59 $\pm$ 19.43 (range 3 to 98), as demonstrated in Table 5. Only five patients (3.3%) reported a score less than 26, which indicated poor overnight sleep, while 117 patients (78%) had very good sleep (score >75). Our patients reported an average of 84.87 $\pm$ 14.74 for noise perception in the critical care areas, indicating a low noise level at night. Two of the patients experienced a loud perceived noise with a score of less than 25%. One of the patients explained that the loud noise was mainly due to the alarms of the monitoring devices, while the other was distracted by the conversations among the staff personnel in addition to the sound generated by machine alarms.

DISCUSSION

The original RCSQ demonstrated an internal consistency of 0.90 in comparison with the sleep variables

TABLE 2: Principal component factor analysis and Cronbach's alpha for each item in Malay version of RCSQ

Item	Factor loading	Corrected item-total correlation	Cronbach's alpha if item deleted
1 (sleep depth)	0.848	0.766	0.923
2 (sleep latency)	0.866	0.791	0.918
3 (awakening)	0.900	0.838	0.910
4 (returning to sleep)	0.891	0.826	0.912
5 (overall sleep quality)	0.913	0.857	0.906

TABLE 3: Patient demographic data. Data were expressed in mean ± standard deviation or frequency (percentage) as appropriate

Demographic characteristics	n = 150
Age (year)	57.84 ± 16.28
Gender	
Male	85 (57.0)
Female	65 (43.0)
APACHE II	9.20 ± 4.40
Discipline	
Surgical	71 (47.3)
Medical	68 (45.3)
Other disciplines (such as ORL, O&G)	11 (7.3)
Location	
General ICU	96 (64.0)
Post-operative ICU	54 (36.0)
Admission	
Elective	56 (37.3)
Emergency	94 (62.7)
Comorbidity	
Smoker	33 (22.0)
Asthma	7 (4.7)
Chronic lung disease	8 (5.3)
Hypertension	78 (52.0)
Ischemic heart disease	12 (8.0)
Heart failure	8 (5.3)
Diabetes mellitus	59 (39.3)
Chronic kidney disease	26 (17.3)
Chronic liver disease	2 (1.3)
Neurological diseases	9 (6.0)
Malignancy	13 (8.7)

Abbreviation: APACHE II: Acute Physiology, Age and Chronic Health Evaluation II score; ORL: Otorhinolaryngology; O&G: Obstetric and Gynaecology; ICU: Intensive care unit

TABLE 4: Patient clinical characteristics. Data were expressed as number (percentage)

Clinical characteristics	n = 150
RASS score	
0 (Alert and calm)	125 (83.3)
-1 (Drowsy)	14 (9.3)
+1 (Restless)	11 (7.3)
Intravenous sedative infusion	
Dexmedetomidine	7 (4.7)
Midazolam	3 (2.0)
Analgesia	
Intravenous opioids infusion	6 (4.0)
Oral analgesia	55 (36.7)
Vasopressor and inotropic support	10 (6.7)
Oxygen support	
Invasive mechanical ventilation	
Controlled mode ventilation	6 (4.0)
Spontaneous mode ventilation	11 (7.3)
Non-invasive ventilation	23 (15.3)
High flow nasal cannula	14 (9.3)
Variable oxygen masks	96 (64.0)

Abbreviation: RASS: Richmond Agitation Sedation Scale score

measured by polysomnography (Richards et al. 2000), and our study showed that the Malay RCSQ was a reliable translated tool for sleep assessment in local critically ill patients, having a high internal consistency and homogeneity in assessing the sleep quality. Our result was comparable to other translated versions of RCSQ, including the Korean, Japanese, and Chinese versions, with Cronbach's alpha of 0.960, 0.911, and 0.923, respectively (Kim et al. 2020; Chen et al. 2019; Murata et al. 2019). The removal of a specific item of the RCSQ did not increase its internal consistency, similar to Richards et al.

Table 5: Malay RCSQ and perceived noise score. Results of each item was displayed as mean ± standard deviation and range of score displayed in millimetres

Item	Score	Range of score
1 (sleep depth)	80.91 ± 20.55	0-98
2 (sleep latency)	78.21 ± 20.21	3-100
3 (awakening)	77.27 ± 22.79	3-100
4 (returning to sleep)	79.51 ± 20.91	6-100
5 (overall sleep quality)	77.80 ± 21.43	0-98
Average total score	78.59 ± 19.43	3-98
6 (noise score)	84.87 ± 14.74	5-99

(2000), which indicated that the items were well-constructed and internally consistent, and the removal of a single item did not substantially impact its overall reliability.

With regard to questionnaire validity, we also demonstrated that the Malay version of the RCSQ supported a single factor, similar to the original RCSQ, and these findings ascertained that the questionnaire was a unidimensional scale where the total score represented the construct of sleep. However, the cumulative variance of the original RCSQ was lower than ours, at 72.2% with an Eigenvalue of 3.61 (Richards et al. 2000). In contrast, Chen et al. (2019) observed that the total variance was higher, 76.59%, almost similar to our study, and the author concluded that the difference might be due to cultural differences in response expression and a different study subject. Chen et al. (2019) recruited patients ranging from medical, emergency, and post-operative cases in comparison to Richards et al. (2000), who confined the assessment to medical patients, and the different cohorts as well as characteristics of patients may have influenced the variance score.

We also observed that our enrolled patients were able to comprehend the translated version readily. Our face validity test revealed a complete understanding by the participants, unlike the study by Varella et al. (2018), which demonstrated 10% of the patient's reported ambiguity in question number 6 in Portuguese-Brazil. The differences observed are probably related to the context sensitivity of the language whereby the interpretation of words or phrases may vary based on the context in which they were used, giving different connotations. On the other hand, the smooth process of the original RCSQ translation into Malay was contributed by the minimal discrepancy in the choice of words during forward translation, and as a result, the final translated questionnaire comprised easy and comprehensible words for local use.

In our study, the average total score of the five items of the Malay RCSQ was higher than the average RCSQ score obtained in other similar studies (Biazim et al. 2020; Chen et al. 2019; Kim et al. 2020; Krotsetis et al. 2017; Murata et al. 2019). The difference in the average total score of the Malay RCSQ compared to the other language versions may be attributed to several reasons. One possible explanation was that our study population had fewer severe medical conditions compared to the other studies, as indicated by a lower mean APACHE II score of 9.20 in comparison to 26.04 in a Chinese study or 17.5 in a Korean study (Chen et al. 2019; Kim et al. 2020). As increasing severity of illness is associated with higher sleep fragmentation (Pisani et al. 2015), our study population with a lower APACHE II score and hence less severe medical conditions may have demonstrated better quality of sleep overnight, as reflected by the higher average total RCSQ score. Another postulated explanation for our higher average total RCSQ score may be attributed to the location from which our enrolled patients were assessed. A total of 36% of our patients were

enrolled in the post-operative ICU, which had a lower total bed capacity compared to the general ICU and therefore generally lower admission and bed occupancy rates. The generally quieter environment with lights off at night in the post-operative ICU may reduce noise and light disturbances for the patients, which may improve the quality of sleep. Lights are usually turned off after midnight, and nursing care is carried out in an organised, quiet manner. These efforts, in addition to the spacious area in between beds, may have provided a better environment for patients to obtain better sleep quality.

The noise score in our study also fared better compared to a Korean study, indicating that our set of patients perceived a generally quiet environment in the critical care area during the study period (Kim et al. 2020). High background noises negatively affected the sleep quality and restorative process in ICU patients, with alarm and monitor noises found to be the most disturbing sources (Simons et al. 2018). One of our patients who had reported a low perceived noise score commented that the alarm noises from monitoring devices were the most disturbing, leading to a poor night's sleep. Understanding the negative impact of noise on sleep quality among critically ill patients may pave the way for future efforts and investigations to establish protocols in order to reduce noise levels in the ICU.

There were several limitations to this study. Firstly, there was a low proportion of mechanically ventilated patients who were recruited for the study. This limitation may be due to the nature of illnesses in critically ill patients in our centre that required them either to be on deep sedation or were unable to participate in the questionnaire due to delirium. Secondly, the noise in either the ICU or post-operative ICU was not recorded, and hence the assessment of noise perception by the patients was subjective in this study.

CONCLUSION

In the present study, the Malay language version of the RCSQ was found to be a valid and reliable tool for the assessment of sleep in critically ill patients and therefore, could be used to assess sleep quality in a local ICU setting.

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