Notice to CNE enrollees:
A closed-book, multiple-choice examination following this article tests your understanding of the following objectives:

1. Identify the advantages of the Richards-Campbell Sleep Questionnaire (RCSQ) compared with polysomnography.
2. Describe the 5 visual analogue scales comprising the RCSQ.
3. Discuss the patient-versus-nurse interrater reliability/agreement of perceived sleep quality rating in medical intensive care unit patients using the RCSQ.

To read this article and take the CNE test online, visit www.ajcconline.org and click “CNE Articles in This Issue.” No CNE fee for AACN members.

Background
The Richards-Campbell Sleep Questionnaire (RCSQ) is a simple, validated survey instrument for measuring sleep quality in intensive care patients. Although both patients and nurses can complete the RCSQ, interrater reliability and agreement have not been fully evaluated.

Objectives
To evaluate patient-nurse interrater reliability and agreement of the RCSQ in a medical intensive care unit.

Methods
The instrument included 5 RCSQ items plus a rating of nighttime noise, each scored by using a 100-mm visual analogue scale. The mean of the 5 RCSQ items comprised a total score. For 24 days, the night-shift nurses in the medical intensive care unit completed the RCSQ regarding their patients’ overnight sleep quality. Upon awakening, all conscious, nondelirious patients completed the RCSQ. Neither nurses nor patients knew the others’ ratings. Patient-nurse agreement was evaluated by using mean differences and Bland-Altman plots. Reliability was evaluated by using intraclass correlation coefficients.

Results
Thirty-three patients had a total of 92 paired patient-nurse assessments. For all RCSQ items, nurses’ scores were higher (indicating “better” sleep) than patients’ scores, with significantly higher ratings for sleep depth (mean [SD], 67 [21] vs 48 [35], \( P = .001 \)), awakenings (68 [21] vs 60 [33], \( P = .03 \)), and total score (68 [19] vs 57 [28], \( P = .01 \)). The Bland-Altman plots also showed that nurses’ ratings were generally higher than patients’ ratings. Intraclass correlation coefficients of patient-nurse pairs ranged from 0.13 to 0.49 across the survey questions.

Conclusions
Patient-nurse interrater reliability on the RCSQ was “slight” to “moderate,” with nurses tending to overestimate patients’ perceived sleep quality. (American Journal of Critical Care. 2012;21:261-269)
Sleep in the intensive care unit (ICU) is characterized by frequent arousals and loss of the restorative sleep stages necessary for healing.\textsuperscript{1} Despite decades of research focusing on disrupted sleep in the ICU, only recently have outcomes related to ICU-associated sleep loss gained attention, mainly because of the potential association of such sleep loss with ICU delirium.\textsuperscript{2,4} Obtaining a reliable and valid measurement of sleep quality is an important barrier to ICU sleep research, because no method of evaluating sleep is currently acceptable and feasible for widespread use in the ICU.\textsuperscript{5,6} Although polysomnography is the reference standard and the most recognized measure of sleep, its requirement for cumbersome machinery, attentive staff, and expert interpretation render it costly and logistically challenging for large-scale ICU studies. Moreover, interpretation of polysomnograms is particularly difficult in critically ill patients because electroencephalographic patterns may be altered by common ICU medications and illnesses such as sepsis, shock, hepatic encephalopathy, and renal failure.\textsuperscript{7,8}

Compared with polysomnography, subjective survey instruments, such as the Richards-Campbell Sleep Questionnaire (RCSQ), have been investigated as potential practical instruments for ICU sleep measurement.\textsuperscript{9-14} Despite the feasibility and low cost of the RCSQ, concerns remain about the appropriateness of patients’ self-reported sleep quality while they are sedated and/or delirious. Hence, researchers have investigated whether nurses’ ratings are similar to patients’ ratings. Two studies\textsuperscript{11,15} of patient-nurse interrater reliability/agreement had favorable results suggesting that RCSQ surveys could be completed by nurses in lieu of patients. However, results of 2 other studies\textsuperscript{5,12} demonstrated poor interrater agreement between patients and nurses. The generalizability and comparability of these existing reliability/agreement studies is limited by the heterogeneity of the populations of patients studied and the use of differing and less-established statistical methods. Hence, our objective was to rigorously evaluate patient-nurse RCSQ interrater reliability/agreement in a population of medical ICU (MICU) patients.

**Methods**

**Setting and Sample**

This interrater reliability/agreement evaluation was conducted in the MICU at Johns Hopkins Hospital from June 28 to July 21, 2010, as part of an ongoing larger sleep quality improvement project. The Johns Hopkins MICU is a closed ICU with 16 private rooms and a nurse to patient ratio of 1 to 2. A curtain and sliding glass door can be used to separate each patient’s room from the ICU hallway. All rooms are uncarpeted, have a television, and have a small window behind the bed. During the larger quality improvement project, MICU-wide interventions were performed to improve patients’ sleep, including environmental improvements (eg, dimming room and hallway lights, closing patients’ doors/curtains, minimizing overhead pages, turning off televisions), offering of nonpharmacological sleep aids (eg, eye masks, earplugs, and soothing music), and promotion of a pharmacological guideline for use of sleep aids. Any patient 18 years old or older who was spending 1 full night (9 PM to 7 AM) in the MICU was eligible for inclusion in this evaluation. Exclusion criteria were as follows: positive delirium screening (using the Confusion Assessment Method for the ICU\textsuperscript{16}) during the preceding night shift, inability to understand English, major com-
munication barriers (eg, inability to write or point to answers), or moribund status.

RCSQ Instrument

The RCSQ was used to measure sleep quality for eligible MICU patients. Previously validated against polysomnography recordings in a MICU population, the RCSQ is a brief 5-item questionnaire used to evaluate perceived sleep depth, sleep latency (time to fall asleep), number of awakenings, efficiency (percentage of time awake), and sleep quality (Table 1). Each RCSQ response was recorded on a 100-mm visual-analogue scale, with higher scores representing better sleep and the mean score of these 5 items, known as the “total score,” representing the overall perception of sleep. As done in prior studies using the RCSQ, our questionnaire also included a sixth item evaluating perceived nighttime noise (range: 0 mm for “very quiet” to 100 mm for “very noisy”). MICU nurses received in-service educational sessions regarding completion of the RCSQ.

Data Collection

The MICU night-shift nurses were instructed to complete an RCSQ for every MICU patient approximately 30 minutes before completion of their 12-hour shift ending at 7 AM. This RCSQ assessment was based solely on each nurse’s perception of their patient’s overnight sleep quality. To maximize survey completion, a nurse leader provided a daily reminder to complete the RCSQ. Nursing assignments for patient care occurred independently of our reliability evaluation. To minimize bias, the night shift nurses were unaware that an assessment of interrater reliability/agreement was occurring.

Between 7 AM and 10 AM, an independent member of the MICU sleep project team (B.K., P.S., or L.K.) identified eligible MICU patients for patient-based completion of the RCSQ. Identified patients were approached and given the option of completing the RCSQ by themselves or with assistance from the project team member (eg, if unable to use a writing instrument). Neither the project team member nor the patient knew the nurse’s RCSQ response. In addition to RCSQ data, a project team member recorded the patient’s age, race, and sex. Patients’ comorbid conditions before hospitalization were evaluated by using the Charlson Comorbidity Index and the Functional Comorbidity Index. Acuity of illness at ICU admission was measured by using the Sequential Organ Failure Assessment (SOFA) score. All project team members received training similar to that received by the MICU nurses regarding completion of the RCSQ.

Table 1

<table>
<thead>
<tr>
<th>Measure</th>
<th>Question*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sleep depth</td>
<td>My sleep last night was: light sleep (0) … deep sleep (100)</td>
</tr>
<tr>
<td>2. Sleep latency</td>
<td>Last night, the first time I got to sleep, I: just never could fall asleep (0) ... fell asleep almost immediately (100)</td>
</tr>
<tr>
<td>3. Awakenings</td>
<td>Last night, I was: awake all night long (0) … awake very little (100)</td>
</tr>
<tr>
<td>4. Returning to sleep</td>
<td>Last night, when I woke up or was awakened, I: couldn’t get back to sleep (0) … got back to sleep immediately (100)</td>
</tr>
<tr>
<td>5. Sleep quality</td>
<td>I would describe my sleep last night as: a bad night’s sleep (0) … a good night’s sleep (100)</td>
</tr>
<tr>
<td>6. Noiseb</td>
<td>I would describe the noise level last night as: very noisy (0) … very quiet (100)</td>
</tr>
</tbody>
</table>

* Each question is scored by using a 100-mm visual analog scale in which a higher score is better.

b Question 6 is not a part of the original 5-item Richards-Campbell Sleep Questionnaire (RCSQ), but was included in this project for consistency with other studies that used the RCSQ.

Statistical Analysis

The 24-day duration of this evaluation of interrater reliability/agreement was selected to ensure enrollment of at least the minimum sample size of 21 unique patient-nurse RCSQ survey pairs. This sample size could be exceeded if enrollment were greater than expected during the designated period. Similar to prior reliability studies, this 21 patient sample size was calculated by using standard methods for reliability studies, with the intention of testing whether a reliability coefficient of 0.90 exceeded a reliability of 0.80, given 2 raters, a 1-tailed α of 0.05, and power of 80%. For patients staying in the MICU for 1 night or longer, we designated the first paired nurse-patient RCSQ assessment as the “initial” survey pair. “Repeated” pairs were designated as the initial pair plus any subsequent RCSQ survey pairs for the same patient.

We defined parameters of interrater agreement as those measuring the “closeness” of patients’ and nurses’ questionnaire scores. Agreement was calculated by using the mean difference between patients’ and nurses’ paired scores and paired Student t tests. For patients with repeated sleep surveys, the P value for this mean difference measure of agreement was calculated on the basis of a robust variance estimate that accounted for the correlation of within-patient repeated measures.

Night nurses completed the RCSQ tool based on their perceptions of the sleep quality for every patient.
Inter-rater agreement was also measured by using a modified Bland-Altman plot, which visually presented differences in paired responses from patients and nurses (y axis) in relation to patients’ responses (x axis)\(^c\) for each of the 6 questionnaire items and the total score.

Inter-rater reliability was defined as the ability to distinguish measurements conducted by the nurse and patient raters, based upon the statistical variability of patients’ and nurses’ sleep ratings.\(^24\)

Because sleep ratings were measured on a continuous scale, we calculated inter-rater reliability by using the intraclass correlation coefficient (ICC), which represents the proportion of total variation that can be explained by differences across patients. Larger ICCs indicate strong clustering of within-patient responses, indicating greater reliability of the nurses’ and patients’ reports. The ICCs were estimated from the results of random effects models, which included a random effect for patients for the initial pairs and random effects for both patients and nurses for the repeated pairs. Confidence intervals for the ICCs were constructed by using the bootstrap method (with 1000 repeated samples from the data). On the basis of previously published classifications, we qualitatively classified reliability as follows: slight, 0.0 to 0.20; fair, 0.21 to 0.40; moderate, 0.41 to 0.60; substantial, 0.61 to 0.80; and almost perfect, 0.81 to 1.00.\(^26\)

For statistical calculations, we used R version 2.10.1.0 (University of Auckland, New Zealand). Statistical significance was defined by a 2-sided \(P\) value less than .05. A description of this project was provided to the institutional review board chair at Johns Hopkins Hospital, who deemed it “quality improvement” within the context of the MICU’s ongoing efforts to improve sleep quality and not requiring approval of the institutional review board in accordance with the Office for Human Research Protections standards.\(^27\) Reporting of this evaluation was done in accordance with the Guidelines for Reporting Reliability and Agreement Studies.\(^28\)

### Results

During a 24-day period, 41 MICU patients met the inclusion criteria for enrollment. Of these 41 patients, 8 were excluded: 1 did not speak English, 1 declined participation, and 6 did not have a nurse-completed RCSQ assessment. We enrolled the remaining 33 patients; the median (interquartile range [IQR]) age for patients was 52 (46-64) years, and 61% were female (Table 2).

The 33 patients had 137 patient-days with completion of 121 patient-based RCSQs and 101 nurse-based RCSQs, with a total of 92 paired patient-nurse assessments. Reasons for the 16 days in which patient-based questionnaires were not completed were as follows: 8 days when the patient was unable to communicate, 2 when the patient was not present in the room, 2 when the patient declined to participate, 1 when the patient had a change in clinical status (moribund), and 3 when the reason was unspecified. The primary reason for the 36 missing questionnaires from nurses was the heavy workload during the shift (eg, new admission or clinical instability of another patient near the end of the shift).

As reported by patients, the mean (SD) overall sleep quality (ie, the RCSQ total score) was 57 (30) on the 33 initial questionnaires and 57 (28) mm for the 92 repeated questionnaires, suggesting a tendency toward favorable (ie, score >50 on a 100-mm visual-analogue scale) sleep quality ratings in the MICU setting (Table 3). Patients’ mean scores for each of the 5 individual RCSQ items ranged from 49 to 62

---

### Table 2

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (IQR), y</td>
<td>52 (46-64)</td>
</tr>
<tr>
<td>Female sex, No. (%)</td>
<td>20 (61)</td>
</tr>
<tr>
<td>Race, No. (%)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>15 (45.5)</td>
</tr>
<tr>
<td>Black</td>
<td>15 (45.5)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (9)</td>
</tr>
<tr>
<td>Charlson Comorbidity Index score,^{a} median (IQR)</td>
<td>2.0 (1.0-4.0)</td>
</tr>
<tr>
<td>Functional Comorbidity Index score,^{b} median (IQR)</td>
<td>2.0 (1.0-3.0)</td>
</tr>
<tr>
<td>SOFA acuity of illness score at MICU admission, median (IQR)</td>
<td>6.0 (4.0-9.0)</td>
</tr>
</tbody>
</table>

**MICU admission diagnosis category, No. (%)**
- Respiratory failure\(^c\) | 13 (39) |
- Gastrointestinal | 7 (21) |
- Sepsis (nonpulmonary origin) | 3 (9) |
- Renal | 3 (9) |
- Cardiovascular | 2 (6) |
- Monitoring/procedure | 3 (9) |
- Other | 2 (6) |

**Received mechanical ventilation during project, No. (%)** | 10 (33) |

Abbreviations: IQR, interquartile range; MICU, medical intensive care unit; SOFA, Sequential Organ Failure Assessment.

\(^{a}\) Charlson Comorbidity Index: a weighted score derived from 19 categories of comorbid conditions, with higher scores reflecting a greater burden of comorbid disease and risk of death.

\(^{b}\) Functional Comorbidity Index: a score derived from 18 categories of comorbid conditions, with higher scores reflecting a greater burden of comorbid disease and risk of impaired physical function.

\(^{c}\) Includes pneumonia, acute respiratory distress syndrome, chronic obstructive pulmonary disease, asthma, and pulmonary embolism.
for the 33 initial measurements and 48 to 61 for the 92 repeated measurements, with the “sleep depth” domain having the lowest mean RCSQ score (ie, worst sleep characteristic) and “returning to sleep” having the highest mean RCSQ score (ie, best sleep characteristic). The mean score of 73 for perceived ICU noise was the highest (ie, high score = less noisy) among all 7 sleep survey scores.

Interrater agreement of the 33 initial patient-nurse survey pairings showed that the nurses’ mean scores were higher than the patients’ mean scores on all 5 RCSQ measures and the total measure, but this difference was statistically significant only for the sleep depth measurement (Table 3). Very similar results were observed for the 92 repeated surveys. Given the larger sample size, the differences in mean scores for sleep depth, awakenings, and total score were statistically significant (after adjustment for the within-subject correlation in responses).

Discussion

We evaluated the patient-versus-nurse interrater reliability/agreement of perceived sleep quality ratings by using the RCSQ for 33 MICU patients who had a total of 92 paired patient-nurse assessments. With the exception of the sleep depth measure, the mean ICU sleep quality scores by patients for all RCSQ measures were balanced toward being favorable, with the highest mean score given for the evaluation of perceived ICU noise (ie, high score = less noisy). In evaluating the interrater reliability/agreement, we found that nurses’ sleep quality ratings had slight to moderate reliability compared with patients’ ratings, with nurses tending to overestimate their patients’ sleep quality.

Our patient-reported RCSQ sleep scores were similar to scores reported in previous ICU studies.

Nurses tend to overestimate their patients’ sleep quality.
For example, the mean (SD) total RCSQ score for the 33 initial patient-completed surveys was 57 (30), consistent with 60 (27) in Richard’s original validation study in 70 male ICU patients who were not receiving mechanical ventilation.10 When compared with a recent trial involving a noise- and light-reduction sleep-promoting intervention in a surgical ICU, each of our patient-reported mean scores (with the exception of sleep depth) fell between the preintervention and postintervention sleep quality scores of that trial. Last, our finding that patient-reported noise ratings tended to be higher (ie, less noisy) than corresponding nurse-reported noise scores was similar to the results of other studies that used the same nighttime noise question.11,14

Our patient-nurse reliability and agreement numbers were similar to those reported in 2 recent reliability/agreement studies.5,12 The first study involved 91 paired assessments in 24 general ICU patients, 79% of whom were receiving mechanical ventilation. That study showed a wide range of differences in patients’ and nurses’ scores, suggesting poor agreement. The second study, conducted in a surgical ICU, demonstrated substantial disagreement (57 of 101 one-time paired measures) between

Table 4
Comparison of studies that used the Richards-Campbell Sleep Questionnaire (RCSQ)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Present project</th>
<th>Richards et al10,a</th>
<th>Frisk and Nordstrom11,b</th>
<th>Nicolás et al12,c</th>
<th>Williamson13,d</th>
<th>Li et al14,e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting</td>
<td>MICU</td>
<td>General ICU</td>
<td>SICU</td>
<td>SICU</td>
<td>CSICU</td>
<td>CSICU</td>
</tr>
<tr>
<td>No. of patients’ surveys analyzed</td>
<td>33</td>
<td>70</td>
<td>31</td>
<td>104</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Patients’ sleep ratings, mean (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Sleep depth</td>
<td>49 (38)</td>
<td>44 (34)</td>
<td>40</td>
<td>51 (26)</td>
<td>51</td>
<td>56</td>
</tr>
<tr>
<td>2. Sleep latency</td>
<td>60 (39)</td>
<td>66 (30)</td>
<td>48</td>
<td>56 (27)</td>
<td>61</td>
<td>71</td>
</tr>
<tr>
<td>3. Awakenings</td>
<td>57 (35)</td>
<td>66 (29)</td>
<td>53</td>
<td>42 (24)</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>4. Returning to sleep</td>
<td>62 (35)</td>
<td>62 (31)</td>
<td>47</td>
<td>56 (26)</td>
<td>56</td>
<td>68</td>
</tr>
<tr>
<td>5. Sleep quality</td>
<td>58 (35)</td>
<td>64 (34)</td>
<td>39</td>
<td>53 (28)</td>
<td>57</td>
<td>69</td>
</tr>
<tr>
<td>Total score (average of items 1-5)</td>
<td>57 (30)</td>
<td>60 (27)</td>
<td>46</td>
<td>51 (22)</td>
<td>57</td>
<td>66</td>
</tr>
<tr>
<td>6. Noise (if applicable)</td>
<td>73 (30)</td>
<td>NA</td>
<td>67</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: CSICU, cardiac surgery intensive care unit; Exp, experimental group; ICU, intensive care unit; MICU, medical intensive care unit; NA, not applicable; SICU, surgical intensive care unit.

a Male ICU patients, 55-79 years old, in stable condition, no mechanical ventilation, in 8-bed US ICU for >48 hours.

b Conscious and alert patients 19-85 years old spending at least 48 hours in 6-bed ICU in Sweden.

c Patients not receiving mechanical ventilation during a 5-month period in a 16-bed ICU in Spain. RCSQ collected during 2 consecutive nights as part of an initiative to minimize nighttime noise and light in the ICU.

d Patients in US CSICU after coronary artery bypass graft surgery, stratified into 2 groups: experimental group (played “white noise” ocean sounds each night to promote sleep) and control group (no ocean sounds). RCSQ performed once on the fourth postoperative night.

e Postoperative patients (2 of 55 were receiving mechanical ventilation) in SICU in Taiwan. Study consisted of 2 phases: 3-month control (ad-lib ICU setting) followed by 3-month experimental period with environmental strategies to promote sleep. RCSQ performed 1 time on 2nd postoperative night.

f Higher sleep survey scores indicate better perceived sleep quality and less perceived noise in the ICU.

Figure Bland-Altman plot of total scores of 92 Richards-Campbell Sleep Questionnaires shows the relationship between patient score (x axis) and the difference between the patient’s score and the nurse’s score (y axis). Each circle represents 1 patient-nurse paired questionnaire. The solid diagonal line is a fitted representation of the simple linear regression of patient-nurse score difference as a function of patients’ scores, with the gray shaded area representing the 95% confidence interval.
patients’ and nurses’ RCSQ scores, with nurses overestimating sleep ratings in 40 (70%) of the 57 discrepant cases. However, our results differed from the results of 2 older and smaller studies, which suggested high reliability/agreement between patients’ and nurses’ RCSQ ratings. These studies include Campbell’s initial research,13 which showed “no significant difference” between 30 paired patient-nurse sleep ratings, and a study10 of postoperative ICU patients that showed a high correlation coefficient ($r = 0.869$, $P < .001$) between 13 paired RCSQ assessments.

Differences in methods may explain some differences in results between our project and prior published reports. For example, this evaluation occurred within a preexisting MICU sleep quality improvement project, which involved a nightly nursing checklist of interventions to promote patients’ sleep. In view of the existing quality improvement project, it is plausible that nurses may have positively biased their perceived sleep ratings, especially when they were actively performing actions (eg, turning off television and lights) to promote patients’ sleep at night. Moreover, the repeated daily completion of the RCSQ by nurses may have created scoring fatigue and reduced nurses’ vigilance in completing the RCSQ, as might be suggested by missing nurse surveys and smaller variability (standard deviation) in nurses’ scores compared with patients’ scores.

In addition, by excluding only those patients who were cognitively or physically unable to complete the sleep questionnaire, we enrolled a heterogeneous sample of ICU patients that had numerous baseline comorbid conditions and a high burden of illness. Because previous studies enrolled patients of lower acuity (eg, no mechanical ventilation, postoperative, long-term ICU, and/or strict exclusion criteria), our patients were systematically sicker and therefore may have experienced worse sleep than was perceived by their nurses. Finally, because we adhered to recently established guidelines for reliability and agreement studies,26 the evaluation and interpretation of our reliability/agreement estimates may have been more conservative than in prior studies, which often used subjective cutoffs or descriptive measures to report patient-nurse interrater reliability/agreement.

This project had potential limitations. First, conducting the project within a preexisting sleep quality improvement initiative may limit the generalizability of these survey ratings to other ICUs and may have affected the overall scores of patients and nurses, as previously discussed. However, our scores were similar to the scores reported in prior studies, which may limit this concern. Second, our project setting and population—a single MICU in a tertiary academic hospital with high severity of illness—may also limit the generalizability of the ratings and reliability/agreement results to different ICU settings and populations of patients. However, as noted in Table 4, our patient sleep questionnaire ratings were comparable to those collected in the presence of both control (ie, ad-lib ICU setting) and experimental (ie, sleep-promoting interventions) settings in various types of ICUs internationally. Third, our results may have been limited by nurse surveys that were missing because of the competing demands of other nursing care requirements. However, this rating of missed assessments was comparable to the only rate (25%) reported in another ICU-based RCSQ reliability study.1 Last, the confidence intervals for our reliability estimates were wider than anticipated because our sample size calculation was based on a minimum reliability of 0.8 and an observed reliability of 0.9, estimates that were far higher than our actual reliability calculations. However, by adhering to the sample size reporting guidelines, our analysis provides meaningful data for calculating sample sizes for future research.

In conclusion, patient-nurse interrater reliability/agreement of the RCSQ-based sleep questionnaire in a MICU setting is slight to moderate, with nurses tending to overestimate sleep quality compared with their patients. Based on these findings, studies that use RCSQ-based measures of ICU patients’ sleep quality must consider potential proxy-related biases that may affect results. Future similar investigations of patient-nurse reliability of the RCSQ in the ICU should evaluate the effect of different ICU settings and patients’ characteristics to evaluate further any potential proxy-related bias.

ACKNOWLEDGMENTS
We thank all the MICU nursing and other staff at Johns Hopkins Hospital who participated in this project, Dr Rahul Ravilla for assistance with data collection, and Mr Peter Shaw for assistance with data entry.

FINANCIAL DISCLOSURES
Dr Kamdar is recipient of a Ruth L. Kirchstein NRSA award from the National Institutes of Health (F32 HL104901). Dr Kho is funded by a Canadian Institutes of Health Research Fellowship Award and Bisby Prize.
REFERENCES


To purchase electronic or print reprints, contact The InnoVision Group, 101 Columbia, Aliso Viejo, CA 92656. Phone, (800) 899-1712 or (949) 362-2050 (ext 532); fax, (949) 362-2049; e-mail, reprints@aacn.org.
1. Which of the following best describes the Richards-Campbell Sleep Questionnaire (RCSQ)?
   a. It is an objective survey instrument.
   b. It is not practical for routine clinical use.
   c. Nurse-patient interrater reliability and agreement are well established.
   d. It is a tool used to assess perceived sleep quality.

2. Intensive care unit-related sleep loss has recently gained attention primarily because of its potential association with which of the following negative patient outcomes?
   a. Delayed wound healing
   b. Intensive care unit (ICU) delirium
   c. Decreased glucose tolerance
   d. Increased activation of the hypothalamic-pituitary-adrenal axis

3. Which of the following is the reference standard and most recognized measure of sleep?
   a. Polysomnography
   b. Bispectral index
   c. Actigraphy
   d. Nurse assessment

4. What was an exclusion criterion for this study?
   a. Polysomnography
   b. Actigraphy
   c. Use of nonpharmacological sleep aids
   d. History of obstructive sleep apnea

5. Which of the following best describes data collection in this study?
   a. Each RCSQ response was recorded using patients' verbal descriptions.
   b. Lower RCSQ response scores represented better sleep.
   c. Nurses and patients completed the RCSQ independently.
   d. The project team member knew the nurse's RCSQ response.

6. Which of the following sleep domains of the RCSQ addresses time to fall asleep?
   a. Sleep latency
   b. Sleep quality
   c. Noise
   d. Awakenings

7. What score was used to measure acuity of illness at ICU admission?
   a. Injury Severity Score
   b. Sequential Organ Failure Assessment
   c. Acute Physiology Score
   d. Acute Physiology and Chronic Health Evaluation

8. Which of the following was defined as the ability to distinguish measurements conducted by the nurse and patient raters, based upon the statistical variability of patients' and nurses' sleep ratings?
   a. Interrater agreement
   b. Interrater reliability
   c. Repeated survey pairs
   d. Initial survey pair

9. Which of the following measures was not a part of the original RCSQ but was included in this project for consistency with other studies?
   a. Returning to sleep
   b. Awakenings
   c. Efficiency
   d. Noise

10. Which of the following best describes the study sample at enrollment?
    a. The median age was 72.
    b. Sixty-one percent were male.
    c. Seventy-five percent were white.
    d. The most common admitting diagnosis was respiratory failure.

11. What was the primary reason for the 36 missing questionnaires from nurses?
    a. Heavy workload during the shift
    b. Reduced nurses' vigilance
    c. Lack of daily reminder by a nurse leader
    d. Scoring fatigue

12. Which of the following is correct about this study's results?
    a. The “sleep depth” domain had the highest patient mean RCSQ score.
    b. Patient-reported noise ratings tended to be lower than corresponding nurse-reported noise scores.
    c. Patient-reported RCSQ scores were dissimilar to previously reported ICU study scores.
    d. Nurses tended to overestimate their patients' sleep quality.

The American Association of Critical-Care Nurses is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center’s Commission on Accreditation. AACN has been approved as a provider of continuing education in nursing by the State Boards of Nursing of Alabama (#ABNP0062), California (#00306), and Louisiana (#ABN12). AACN programming meets the standards for most other states requiring mandatory continuing education credit for relicensure.
Patient-Nurse Interrater Reliability and Agreement of the Richards-Campbell Sleep Questionnaire
Biren B. Kamdar, Pooja A. Shah, Lauren M. King, Michelle E. Kho, Xiaowei Zhou, Elizabeth Colantuoni, Nancy A. Collop and Dale M. Needham

© 2012 American Association of Critical-Care Nurses
Published online http://www.ajcconline.org

Personal use only. For copyright permission information:
http://ajcc.aacnjournals.org/cgi/external_ref?link_type=PERMISSIONDIRECT

Subscription Information
http://ajcc.aacnjournals.org/subscriptions/

Information for authors
http://ajcc.aacnjournals.org/misc/ifora.xhtml

Submit a manuscript
http://www.editorialmanager.com/ajcc

Email alerts
http://ajcc.aacnjournals.org/subscriptions/etoc.xhtml