Subjective sleep quality among hospitalised adult patients: An observational, cross-sectional study

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Abstract

Background: Inpatient sleep quality is influenced by multiple factors including medical conditions, use of medication and the ward environment. Without adequate rest, detrimental effects on patients’ physical and psychological performances may persist, inhibiting recovery and increasing length of stay.

Objective: This study examined the sleep quality of adult inpatients and its associations with sociodemographic, clinical and environmental factors.

Methods: An observational study was conducted in the medical wards of an acute care hospital in Singapore from July to December 2018. Patients completed the Pittsburgh Sleep Quality Index (PSQI) to establish baseline sleeping habits and the Richards-Campbell Sleep Questionnaire (RCSQ) to assess perception of sleep quality during hospitalisation. Noise levels were measured using the SL-4023SD sound level meter. Environmental factors affecting sleep were also recorded.

Results: 52 patients were recruited reported a mean RCSQ score of 5.83 (SD = 2.31) and mean Global PSQI score was 6.06 (SD = 3.33), indicative of poor baseline sleep. The highest mean noise level presented with an average reading of 80 dB, surpassing the WHO recommended noise levels by two times. Subjective sleep quality was not affected by demographic, clinical factors and bed locations. Patients exposed to night lamps reported a reduction in sleep quality (p = .04).

Conclusions: Recognising the importance of overall sleep quality and the identification of external factors influencing patients’ sleep quality during hospitalisation is a vital step towards developing successful interventions to promote good sleep hygiene in the general wards of the Asian context.

Keywords
cross-sectional study, hospital, medical, noise level, nursing, observations, sleep quality

Introduction

Poor sleep quality is a prevailing issue experienced by hospitalised individuals worldwide. More than 47% of inpatients suffer from impaired sleep quality, for which the aetiology is multifactorial. A study revealed that inpatients experience up to 60 sleep interruptions each night, accounting for 18% of nocturnal awakenings. Furthermore, the combination of fragmented sleep, stress and anxiety underlying ones’ medical condition serve as key stressors for inpatients. Without adequate rest, detrimental effects on inpatients’ physical and psychological performances may persist, inhibiting their recovery. Patients’ optimal rest is often inhibited during the hospitalisation due to sleep interruptions often caused by a combination of intrinsic (patients’ clinical diagnosis) and extrinsic (environmental noise and light) factors.

Several socio-demographic elements such as age, gender and race play a vital role in influencing an individuals’ sleep quality. Almost 30% of older adults’ experience impaired

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sleep quality due to the physiological modifications that realign their circadian rhythms. Although racial differences may be associated with sleep disturbances, reasons behind these findings still remain unclear. Hence, it is pertinent to delve deeper into the issue of impaired sleep quality among individuals of varying socio-demographical characteristics, seeing that one’s social background may directly or indirectly influence their sleeping behaviour.

Intrinsic factors related to inpatients’ illnesses may be the foremost cause of poor sleep quality. Those presenting with either chronic or acute illnesses may experience sleep fragmentations, owing to their suppressed adaptive immune responses and increased pro-inflammatory cytokine activities. Coughing and respiratory congestions are one of the many few signs of discomfort that may further exacerbate the quality of sleep received by vulnerable patients. Extrinsic disturbances in the form of repetitive staff interventions, excessive noise levels and bright lighting occur frequently, giving rise to sleep disruptions among hospitalized individuals. While the effect of extrinsic factors on sleep quality still remains ambiguous, many studies have associated fragmented sleep to adverse immunological responses. Most patients perceived irksome sounds emitted by medical equipment such as vital signs devices and infusion pumps used during patient care were found to be very disruptive to patients’ ability to sleep. Hence, in order to overcome such a pertinent issue, the World Health Organization proposed guidelines to maintain the average noise exposure to under 40 decibels (dB) to establish desirable noise limits at night.

Existing hospital inpatient sleep studies tend to focus on the acute changes in sleep quality among critically ill patients in intensive care units instead of inpatients admitted in the medical general wards. Furthermore, sleep quality experienced by hospital inpatients are usually measured collectively, whereby the sleep scores obtained by patients residing in different hospital settings such as the emergency rooms and general wards are often generalised together.

It is essential to assess the association between socio-demographical, clinical and environmental factors on sleep quality to fully elucidate the impact these variables have on the sleep of patients in the general wards.

**Aim**

This study aimed to evaluate the overall subjective sleep quality of adult patients specifically in medical general wards, examine inpatients’ subjective sleep quality and its’ associations with socio-demographical (gender, age and race), and clinical factors (acute and chronic conditions), and examine the association between environmental factors (light and noise) and inpatients’ subjective sleep quality.

**Methods**

**Study design**

An observational cross-sectional survey study design was used to determine the association of patients’ sleep quality and their socio-demographical, clinical, as well as the environmental factors.

**Setting and sample**

This study was carried out in a tertiary hospital in Singapore. Data was collected from two medical general wards comprising of a total of 65 beds. A sample size of 87 was determined based on the significance test of a sample at alpha =0.05 when the population is medium at 0.80 power. To allow for 20% withdrawal, the sample size of 102 was required to evaluate the association between sleep and the factors influencing it. However, due to several unexpected discharges and unwilling participants, as well as a burden to night shift nurses, a total of 52 participants was recruited for this study.

All patients who have fulfilled the inclusion criteria and were recruited between July 2018 and December 2018. The inclusion criteria were over 21 years old able to read or comprehend English, Mandarin or Malay, and admitted for not more than 48 h upon recruitment. The exclusion criteria were patients with hearing impairment, diagnosed with psychiatric disorders, critically ill patients, and suffers from pre-existing insomnia which were prescribed with sedative medications.

**Measures**

The Richards-Campbell Sleep Questionnaire (RCSQ) was used to measure sleep quality of participants during hospitalization. It is a brief 5-item questionnaire, used to evaluate sleep depth, sleep latency, number of awakenings, sleep efficiency and sleep quality via a 10 centre-metre visual analogue scale. The total mean RCSQ scores of the five components with scores interpreted as ‘poor’ sleep (0–3.3), ‘average’ sleep (3.4–6.6), and ‘optimal’ sleep (above 6.6). The RCSQ is a fairly suitable tool that can be used to measure the quality of sleep of individuals, owing to its high reliability and validity scores with a reported high Cronbach alpha of 0.90 and correlation coefficient of 0.70.

The English version of the Pittsburgh Sleep Quality Index (PSQI) was used to measure pre-hospitalisation sleep pattern. PSQI is validated tool used to measure sleep quality and discriminate “good” and “poor” sleepers. It assesses the individual’s sleep quality based on his past 4 weeks and allow us to gather baseline data of the individual sleep habits. It consists of 19 self-rated items, grouped into 7 components. It is rated on a Likert Scale of 0–3, with global PSQI score ranging from 0 to 21 points. The higher the score, the worst the quality of sleep. The Chinese and Malay versions of the PSQI were also used in this study which were both valid and reliable.

Noise levels were measured using a single digital instrument SL-4023SD sound level meter (range, 30–130 dB; weight, fast response; IEC 61,672 class 2) at three different bed locations (next to window, next to nurses’ station and in between two beds). This device was intentionally placed in close proximity to participants’ bedside table from 9p.m. to 7a.m. to retrieve consistent and accurate sound readings. The presence of light from different sources (corridor, night lamp,
near constant light sources) was also recorded on the data collection form by the night duty nurse.

**Data collection**

Participants’ socio-demographical profile and clinical factors were retrieved from the hospital electronic medical record. Clinical data was classified into two groups namely, acute and chronic conditions using The International Classification of Diseases, 11th Revision (ICD-11). The ICD-11 has been reported to be a preeminent tool for classifying diagnoses within the health care systems around the world.

On the night of recruitment, a sound meter was placed at participants’ bedside table to measure extrinsic noise levels from 9 p.m. to 7 a.m. Night nurses caring for the patient were also given the data collection form to record other extrinsic factors such as the use of night lights, patients’ bed location and nursing activities that were performed overnight. The next morning at around 7 a.m., the researcher ceased the recording of the sound meter. Following which, the RCSQ was administered to participants, concluding the study.

**Ethical approval**

This study was approved by the Institutional Review Board. Informed consent was obtained from all the eligible participants who were over 21 years old able to read or comprehend English, Mandarin or Malay, and admitted for not more than 48 h upon recruitment.

**Data analysis**

Data obtained for this study were entered into the SPSS (Version 24) data analysis software. All tests were conducted at a significance level of $p < .05$. Descriptive statistics were computed to examine participants’ demographics, clinical and environmental characteristics. Continuous variables such as, noise levels (dB) and the scores of the RCSQ were presented according to their means and standard deviations (SD). Independent sample T-test and One-way ANOVA were used to test for the significant differences in RCSQ scores in each of the independent variables with two and three groups, respectively. Independent sample t-test and one-way ANOVA were used to examine participants’ subjective sleep quality and its’ associations with their intrinsic factors. Normality tests were also conducted on all continuous variables by implementing the Shapiro-Wilk (SW) test to identify the most appropriate test to analyze data.

**Results**

**Sociodemographic and clinical profile of participants**

The results are presented in Table 1. There were 32 females (61.5%) and 20 males (38.5%), with mean age of 59.2 years (SD = 16.3). Around half of the participants were aged 65 years and below (59.6%). Majority of the patients were Chinese (n = 32, 61.50%). Majority of the participants were admitted for acute medical conditions (n = 33, 63.5%). While some participants had beds situated either next to the nurses’ station or in between two beds, most of the beds of recruited participants were situated next to windows (n = 26, 50%).

**Socio-demographical and clinical factors influencing sleep quality**

**Pittsburgh sleep quality index and Richards-Campbell sleep questionnaire**

Pittsburgh Sleep Quality Index was used to measure the sleep quality of the individual pre-admission and obtained an average global PSQI score of 6.06 out of a maximum score of 21, whereby a score greater than 5 is indicative of poor sleep. From the results, 55.7% (n = 30) participants scored more than 5, suggestive of poor pre-admission sleep (Table 2). From the RCSQ scores, the mean total score (n = 52) obtained was 5.83 (2.31). On a scale from 0 to 10, a score lesser than 5 suggests for poor sleep quality. A breakdown of the pre-hospitalisation sleep quality found that only 42.3% (n = 22) of the participants had normal sleep pre-hospitalisation. The higher proportion of participants with poor sleep pre-hospitalisation may account for the total mean score.

A correlation was observed between PSQI and RCSQ, where the tools share an inverse relationship. The higher the Global PSQI score, the lower the mean total RCSQ score. This implies that individuals with poorer pre-admission sleep quality are likely to present with lower subjective sleep quality whilst hospitalised ($r = -0.37$, $p = .007$).

The quality of sleep pre-hospitalisation (PSQI), while hospitalised (RCSQ) were compared against sociodemographic, care activities and the physical environment. The subdomains of the tools were also assessed for any significant differences.

Participants’ RCSQ results were generally consistent among the five different components (Table 2). Among the five domains, the highest ranked component was ‘Awakenings’ (M = 6.29, SD = 2.65), while the lowest ranked was ‘Sleep Depth’ (M = 5.47, SD = 2.68). The overall mean

| Table 1. Socio-demographic, clinical and environmental characteristics of participants (n = 52). |
| --- |
| Gender | Frequency (%) |
| Female | 32 (61) |
| Male | 20 (39) |
| Age (year) | |
| <65 | 31 (59.6) |
| ≥65 | 21 (40.4) |
| Race | |
| Chinese | 32 (61.5) |
| Non-Chinese | 20 (38.5) |
| Clinical diagnosis | |
| Acute | 33 (63.5) |
| Chronic | 19 (36.5) |
| Bed location | |
| Next to the window | 26 (50.0) |
| Next to nurses’ station | 14 (26.9) |
| In between two beds | 12 (23.1) |

*a*Non-Chinese comprised of Malays (n = 12), Indians (n = 5) and Nepalese (n = 3).

*b*Classified according based on the ICD-11.
RCSQ score of the five components was 5.83 (SD = 2.31), implying that inpatients experienced ‘average’ sleep quality during hospitalisation. Table 3 illustrated participants’ mean RCSQ scores across the various socio-demographical and clinical factors. Results showed no significant differences in participants’ subjective sleep quality across gender (p = .06), age (p = .89), race (p = .63) and clinical diagnosis (p = .57), implying that the type of sleep quality obtained by participants during hospitalization were not significantly associated with socio-demographical and clinical characteristics.

**Environmental factors influencing sleep quality**

The comparison of participants’ mean RCSQ scores exposed to different light sources was illustrated in Table 4. The results showed a significant difference in subjective sleep quality among participants who utilized night lamps (p = 0.04). The decrease in the mean RCSQ score for those with night lamps turned on implied that participants slept better in the absence of light. However, results showed no significant differences on total RCSQ scores among those who slept near a constant light source and with corridor lights (p = 0.79, p = 0.17), implying that constant light sources and corridor lights did not affect inpatients’ sleep quality. Table 5 showed the noise levels overnight placed next to participants’ bedside. The mean and standard deviation of the lowest, highest and average noise levels at the three different bed locations exceeded the annual average night exposure guideline of 40 dB proposed by the World Health Organization. Furthermore, the highest mean noise level presented with an average reading of 80 dB, surpassing recommended noise levels by two times. Subjective sleep quality at different bed locations (next to the window, next to the nurses’ station, in between two beds) with the RCSQ found no significant difference in subjective sleep quality among participants sleeping at various bed locations (p = .30).

**Discussion**

While various authors have claimed that sleep disturbances occur within three to 7 days of hospitalization, participants in our study were in general wards within 48 h, before experiencing alterations in sleep quality. Sleep disturbances have been reported to occur among those afflicted with chronic illnesses, to which it was speculated that the frequent nocturnal awakenings may be strongly associated to nocturia. However, most participants in this study suffered from acute short-term treatable conditions and may be less prone to experiencing persistent awakenings attributed to certain conditions. Although excessive noise levels, have been cited as the most common extrinsic factor to affect inpatients’ sleep quality in our study, there were no significant differences in the incidence of poor sleep among patients’ residing in rooms with other patients. Hence, to ensure that this study yielded insightful data, noise levels were measured within the same hospital room at specific bed locations next to a window, next to the nurses’ station and in between two beds. The prevalence of poor sleep may be more pronounced in the elderly who are more vulnerable to age-associated sleep changes. More than half of the participants in this study were less than 65 years old (59.6%), implying fewer physiological modifications and in turn, reduced risks of acquiring a less fragmented sleep-wake cycle.

Results in this study revealed that participants obtained an ‘average’ overall sleep quality during hospitalization, inconsistent with the literature where inpatients experienced inadequate sleep attributed to extrinsic environmental disturbances. The differences in ward settings and relatively small sample size of participants in our study may have influenced the varying sleep quality outcomes. It remained crucial to apprehend the reasons behind why medical inpatients in this study were not obtaining optimal sleep quality. Since our participants were approached within 48 h of their admission, sudden changes to inpatients’ normal environment and recently developed worries in relation to their illness may have influenced patients to experience average sleep quality. Hence, to ensure a swift recovery process among inpatients, preventable stressors such as poor and average sleep quality should be treated. Hospitals may look into implementing necessary environmental and patient care improvements to ensure patients experience a smooth sleep transition into the hospital.

Our study was unable to establish any significant differences in subjective sleep quality within participants’ genders and age groups during hospitalization implying that socio-demographical factors did not influence participants’ sleep quality. Results from our study are inconsistent with other literature which reported that women are 1.41 times more predisposed to experiencing sleep disturbances as opposed to men, owing to gender-related differences such as menopause. The non-significant difference in patients’ subjective sleep quality in our study across different gender and age groups may be attributed to the high stress levels in

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**Table 2. PSQI and RCSQ scores (n = 52).**

| Parameters                | Mean (SD)  |
|---------------------------|------------|
| **PSQI**                  |            |
| Subjective sleep quality  | 1.21 (0.96) |
| Sleep latency             | 1.63 (1.12) |
| Sleep duration            | 1.19 (1.12) |
| Sleep efficiency          | 0.92 (1.12) |
| Sleep disturbance         | 1.27 (0.56) |
| Use of sleep medication   | 0.33 (0.88) |
| Daytime dysfunction       | 0.69 (0.85) |
| Global PSQI               | 6.06 (3.33) |
| **RCSQ**                  |            |
| Sleep depth               | 5.47 (2.68) |
| Sleep latency             | 5.59 (3.03) |
| Awakenings                | 6.29 (2.65) |
| Returning to sleep        | 5.88 (3.00) |
| Sleep quality             | 5.90 (2.70) |
| Noise                     | 5.68 (3.12) |
| Total RCSQ score          | 29.13 (11.55) |
| Mean RCSQ score           | 5.83 (2.31) |

Pearson correlation: −0.371, P < .001

*Significant value p < .05.*
Table 3. Associations between inpatients’ subjective sleep quality and socio-demographic and clinical factors.

| Socio-demographic and clinical factors | Total RCSQ | t/F | Df | p-value |
|---------------------------------------|------------|----|----|---------|
| Gender*                               |            |    |    |         |
| Female (n = 32)                        | 5.36 (2.27) | -1.91 | 50 | 0.06    |
| Male (n = 20)                          | 6.58 (2.23) |    |    |         |
| Age (year)*                            |            |    |    |         |
| <65 (n = 31)                           | 5.67 (2.35) | -0.13 | 55 | 0.89    |
| ≥65 (n = 21)                           | 5.5 (2.67)  |    |    |         |
| Race*                                 |            |    |    |         |
| Chinese (n = 32)                       | 5.70 (2.42) | -0.49 | 50 | 0.63    |
| Non-Chinese (n = 20)                   | 6.03 (2.17) |    |    |         |
| Clinical diagnosis*                    |            |    |    |         |
| Acute (n = 33)                         | 5.69 (2.40) | -0.57 | 50 | 0.57    |
| Chronic (n = 19)                       | 6.07 (2.19) |    |    |         |

*Independent sample T-test.
**One-way ANOVA.

Table 4. Subjective sleep quality with different light exposure.

| Light exposures                          | Total RCSQ | t  | Df | p-value |
|------------------------------------------|------------|----|----|---------|
| Night light turn on*                     |            |    |    |         |
| Yes (n = 5)                              | 5.62 (2.28) | 2.07 | 50 | 0.04*   |
| No (47)                                  | 7.80 (1.63) |    |    |         |
| Sleeping near constant light source*     |            |    |    |         |
| Yes (n = 11)                             | 5.78 (2.38) | 0.27 | 50 | 0.79    |
| No (n = 41)                              | 5.99 (2.13) |    |    |         |
| Corridor light switched on*              |            |    |    |         |
| Yes (n = 19)                             | 5.49 (2.21) | 1.38 | 50 | 0.17    |
| No (n = 33)                              | 6.40 (2.42) |    |    |         |

*Independent sample T-test.
**Significant value p < .05.

Singapore. A recent survey conducted revealed that most individuals working in Singapore spend longer hours at work as compared to their Hong Kong counterparts, causing stress levels among 52% of male and female workers in Singapore. Moreover, the minimum age to retire has been recently increased to 62 years old, implying that more older adults are still active in the workforce. Although an increase in labor force participation rate may be beneficial to the economy, it may have taken a toll on the sleep quality of both male and female participants of all ages, thereby, yielding insignificant results. It is widely known that work stressors and poor sleep quality are dependent of each other.9

There was no significant difference found in the overall sleep quality among Chinese and non-Chinese participants. Most existing literature often assessed sleep quality and its association with the different races in Western countries as opposed to those in the Southeast Asian region, for which significant differences in sleep quality were frequently observed among African-Americans, Hispanics and White participants. With the small sample size and participants recruited throughout the data collection period were seen to be primarily of Chinese ethnicity, this may have influenced the insignificant outcomes.

Results from our study did not incur any statistical difference in subjective sleep quality between those admitted with chronic illness and acute illnesses, incongruent with existing literature especially diabetes, hyperlipidemia and hypertension have been reported to have experienced more sleep disruptions as compared to healthy.24 These cardiometabolic risk factors are closely linked to nocturia.28 Since most participants in our study suffered from acute illnesses, acuity of the illness may decrease swiftly, thereby, diminishing sleep disrupting factors. Furthermore, nocturnal arousals attributed to trips made to the washroom are eliminated, given that most participants in this study required the use of indwelling catheters to facilitate urinary drainage. A significant difference in subjective sleep quality was found among patients sleeping with night lamps congruent to existing literature. Most articles revealed that 40% of participants attributed sleep disruptions to bright lightings in hospitals especially from xenon lamps, located close to patients’ bedside. Evidently, exposure to bright light at night have been proven to interrupt of patients’ circadian clock by suppressing melatonin, thereby reducing their quality of sleep.30 The significant results could be attributed to the bright lighting at night and relatively low light levels in the day within study wards, which may be insufficient to maintain a normal circadian rhythm. Furthermore, night nurses in our study alluded to the utilisation of night lamps to the continuous monitoring of chest drainage levels of patients with respiratory problems throughout the night, thereby disrupting sleep-wake cycle of individuals. These results necessitate nurses to be more conscientious when dealing with light sources at night. However, there were no significant difference in subjective sleep quality among participants exposed to other light sources such as corridor lights or constant light sources. This may be due to the relatively low light illuminance to our patients given that the ward corridors were located quite a distance away from patients’ bedside.

Excessive noise levels in hospital settings have been labelled as one of the major contributors to poor sleep quality among inpatients. In our study, the average, highest and lowest noise level across different bed locations exceeded the recommended noise level by 10 dB, 40 dB and 5 dB, respectively.13 Similarly, it
was reported that sound intensities within hospitals surpassed the acclaimed noise levels proposed by the WHO by 20 dB. Despite congruent findings with most literature, our study did not yield any significant difference between patients’ sleep quality at different bed locations. This could be due to the extensive noise pollution in urban Singapore, a small yet densely populated with over 7000 residents within each square-meter of open space. Hence, it is no surprise for ambient noise levels in Singapore to soar to high levels of 55 dB, 15 dB higher than European countries. Unfortunately, noise levels in Singapore cannot be avoided completely due to the constant upgrading of infrastructure. Hence, many participants may be unaffected by the excessive noise levels in the hospital as they have been enduring the ear-splitting noise caused by jackhammers even before hospitalisation.

Limitations

Firstly, the sample size was not met due to the limited resources available. Throughout the entire duration of the data collection process, only one sound meter was made accessible to the research team thus, we were only able to recruit only one patient after every 2 days. This study adopted a cross-sectional design, which made it tough to deduce the relationship between the risk factor and the outcome variable. Hence, our study only allowed the researchers to infer the associations between extrinsic and intrinsic variables on poor sleep quality instead of its’ actual causation. In addition, the exclusion criteria of the patients in this study was not exhaustive, there are other pre-existing medical conditions that may influence patients’ pre-hospitalisation sleep quality, therefore the results should be interpreted with caution. Furthermore, the broad categorisation of patients into acute and chronic medical conditions in this study limited the ability to determine its’ effect on the sleep quality during hospitalization, requiring further investigation to control the heterogeneity of patients’ medical conditions. Lastly, participants in our study were recruited from two medical general wards within one public hospital, limiting the generalisability of findings to other medical inpatients in Singapore. Further studies including a longitudinal study would be necessary to investigate the relationship sleep quality and related factors in hospitalised adults in the general ward setting.

Conclusions

Recognising the importance of overall sleep quality and the detrimental effects of inadequate rest during hospitalisation is a vital step towards developing successful interventions to promote good sleep hygiene in the general wards of the Asian context. Improvements are necessary to help overcome the clinical and environmental factors that are associated with patients’ poor sleep quality during hospitalisation.

Table 5. Noise levels at different bed locations (n=52).

| Noise level (decibel, dB) | Next to the window (n = 26) | Next to nurses’ station (n = 14) | In between two beds (n = 12) |
|--------------------------|-----------------------------|---------------------------------|-----------------------------|
| Lowest noise level       | 45.7 (1.93)                 | 42.7 (11.0)                     | 45.8 (17.3)                 |
| Average noise level      | 50.0 (1.46)                 | 50.1 (1.70)                     | 53.1 (11.9)                 |
| Highest noise level      | 81.0 (3.63)                 | 81.1 (9.53)                     | 81.2 (6.78)                 |

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Author contributions

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE [http://www.icmje.org/recommendations/]):

- substantial contributions to conception and design, acquisition of data or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

Study design: SNBA, LYH, VL
Data collection: SNBA, LYH
Data analysis: SNBA, LYH, VL, LSH
Manuscript writing: SNBA, LYH, VL, LSH
All authors reviewed and edited the manuscript and approved the final version of the manuscript.

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Ethical approval

This study was approved by the Institutional Review Board (ref no: 2018/2408/A) and complied with the ethical guidelines of the Declaration of Helsinki.

Informed consent

Informed consent was obtained from all the eligible participants who were over 21 years old able to read or comprehend English, Mandarin or Malay, and admitted for not more than 48 upon recruitment.

Availability of data

The datasets generated and/or analysed during the current study are available from corresponding author.

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