Original Article

The Impact of Listening to Quran Recitation during Pain-Inducing Procedure among Patients Receiving Mechanical Ventilation Support: An Interventional Study

Mohammad Rababa, Shatha Al-Sabbah, Audai Hayajneh

Department of Adult Health Nursing, Faculty of Nursing, Jordan University of Science and Technology, Irbid, Jordan

Abstract

Background: Pain experienced by intubated patients is caused by several extrinsic sources, including nursing care procedures such as endotracheal suctioning. Several nonpharmacological therapies, including listening to Quran recitation, have never been tested for their pain relief effects among intubated patients, despite these therapies being cost-effective, easy to implement, and free of adverse effects. This study aimed to examine the pain-relieving effect of listening to Quran recitation during pain-inducing procedures in patients receiving mechanical ventilation support. **Materials and Methods:** This pilot study used an experimental design with 32 intubated patients at King Abdullah University Hospital in Irbid, Jordan. The Behavioral Pain Scale and Ramsay Sedation Scale were used to assess pain levels and sedation, and physiologic parameters were monitored before and during endotracheal suctioning. **Results:** The findings showed significant differences in Behavioral Pain Scale (BPS) scores and heart rate measures between the intervention and control groups after controlling for the level of sedation. The patients in the intervention group scored lower pain and HR measures than those in the control group ($F_{5,26} = 11.47$, $p < 0.001$). **Conclusions:** The findings showed significant improvement in the levels of pain and heart rate measures among intubated patients who are exposed to Quran recitation. Complementary medicine is essential to the healthcare plans of critically ill patients and their families. Holy Quran recitation has been reported to be a useful nonpharmacological intervention for critically ill Muslim patients.

Keywords: *Complementary therapies, critical care, intubation, pain, vital signs*

Introduction

Pain is one of the most irritating symptoms among intubated patients.[1] The incidence of pain in medical and surgical Intensive Care Unit (ICU) patients is reported to exceed 50%.[2] Furthermore, it has been reported that over 80% of patients discharged from ICUs have memories of pain associated with endotracheal tube insertion and suctioning.[3] Chronic pain among ICU survivors is associated with increased morbidity after discharge.[4] Pain among critically ill patients (e.g. intubated patients) is caused by multiple intrinsic and extrinsic sources.[5] An example of these sources is pain-inducing procedures, which include position changing, vascular access, hygiene care, and endotracheal suctioning.[6] According to an ICU procedural pain intensity survey, endotracheal suctioning was rated to have the highest pain intensity scores compared to other painful nursing care procedures.[7] During tracheal suctioning, intubated patients experience moderate to severe levels of pain.[6] In the study of Yamashita *et al*.,[8] a significant number of the participating mechanically ventilated patients had a score of over 5 on the Behavioral Pain Scale (BPS) after a short period of intubation. Meanwhile, Halm[9] showed that the severity of pain experienced by ICU patients during care procedures was two-fold the pain experienced during rest.

Undertreated or untreated pain in intubated patients can lead to extreme agitation and anxiety,[10] which may be inappropriately managed by sedatives.[11] Many healthcare providers misperceive sedatives to have the same effect as analgesia.[12] However, heavy sedation, especially continuous sedative infusion, negatively impacts health

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Address for correspondence:
Dr. Mohammad Rababa, Adult Health Nursing, Faculty of Nursing, Jordan University of Science and Technology, Irbid 22110 Jordan.
E-mail: mjrababa@just.edu.jo

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outcomes among critically ill patients (e.g. intubated patients).[13] The use of sedatives is often associated with decreased consciousness and adverse central nervous system and immune system outcomes. Furthermore, the use of sedatives is associated with delays in mechanical ventilation extubation, as well as prolonged ICU length of stay.[14] Taking into account the misconceptions prevalent among healthcare providers related to the use of analgesics to treat intubated patients and the serious adverse consequences of the use of sedatives, incorporating nonpharmacological therapy into the treatment plans of intubated patients could lead to better outcomes.[15] Several nonpharmacological therapies are easy to use, free of adverse effects, and cost-effective. The guidelines for the prevention and management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption (PADIS) among ICU patients recommend the use of nonpharmacological interventions which target pain among critically ill adults. One of these recommended nonpharmacological therapies is music therapy.[2] Many studies have shown music to have therapeutic effects in addition to being easy to access and use.[16-18] For example, music therapy improves hemodynamic stability by reducing respiratory rate, Blood Pressure (BP), and Heart Rate (HR) among mechanically ventilated patients.[19] Moreover, music therapy has been shown to be an effective complementary treatment for pain management, as it can help reduce the transmission of pain signals to the central nervous system.[20] Listening to familiar and favorable music can promote relaxation, decrease feelings of discomfort and uncertainty, and act as a method of distraction during painful nursing care procedures (e.g., suctioning and bed bathing).[19,21] In the current study, listening to the recitation of the Quran will be used as an alternative to music therapy, as listening to the Quran recitation may be more religiously and culturally acceptable for the participants and their families. Previous studies have explored the effectiveness of listening to Quran recitation in relieving pain among ICU patients[22] and pregnant women during labor.[23,24] Therefore, this study aimed to examine the pain-relieving effect of listening to Quran recitation during pain-inducing procedures in patients receiving mechanical ventilation support.

Materials and Methods

This experimental pilot study was conducted on a convenience sample of 32 intubated patients admitted to medical or surgical ICUs at a university hospital in Irbid, Jordan, with 16 patients in each group (i.e., intervention and control), from January to April 2020. Strict eligibility criteria were applied to reduce the variability between the participants as much as possible. The inclusion criteria for participation in this study were (1) being aged 18 years and over; (2) being practicing Muslim; (3) having a score of 9 and above on the Glasgow Coma Scale; (4) having been connected to a mechanical ventilator for over 48 hours as recommended in previous similar studies[25,26]; (5) not having quadriplegia; (6) not receiving neuromuscular blocking agents; (7) not regular narcotics users; (8) not diagnosed with polyneuropathy; (9) not on deep sedation, as identified by the Ramsay Sedation Scale (RSS); and (10) not having hearing impairments or facial trauma or abnormality The patient will be excluded from the study in case of (1) incomplete data, (2) being ineligible after randomization, (3) failure to continue, or (4) death. The sample size was calculated using a sample size formula based on the following parameters: the power of 80%, an anticipated effect size of 0.4 based on similar previous studies,[25,26] $\alpha = 0.05$ as a criterion of statistical significance, z1 = 1.96, z2 = 0.84, and r = (1). According to the sample size calculation, the minimum required sample size is 32 patients, 16 in each group. Owing to the difficulty of participant recruitment secondary to the restrictions associated with the coronavirus disease of 2019 (COVID-19) pandemic, such as social distancing and strict infection control measures, as well as the governmental defense rules, the researchers turned the study into a pilot study. According to Kang[27] recommendations, the total sample size required for experimental pilot studies is 24 patients: 12 in each group.

The BPS was used by the nurses to assess patients' levels of pain prior to, during, and after endotracheal suctioning.[7,28] The BPS is a valid and reliable observational scale for assessing pain in critically ill mechanically ventilated patients. The total scale score is calculated by summating the scores of the three behavioral items, which are facial expressions, movements of the upper limbs, and compliance with ventilation. Each item is answered on a 4-point Likert scale ranging from 1 = "no response" to 4 = "full response." The total score of the scale ranges from 3 = "no pain" to 12 = "maximal pain."[29] Many studies have shown the BPS to be effective in monitoring pain among intubated.[5,7,28] Many studies have reported HR, systolic and diastolic BP, and oxygen (O2) saturation as being the most important physiological indicators of pain in critically ill patients.[1,30] Thus, while the nurses assessed the patients' sedation and pain levels, HR, O2 saturation, and BP were monitored and recorded. The RSS[31] was used to assess the patients' levels of sedation. The RSS is one of the most commonly used measures of sedation level in ICUs and is reliable, valid, simple, and easy to use in critical care settings.[32,33] The RSS scores categorize patients into six different levels of sedation according to how arousable the patient is, as per the following criteria: 1 = "Patient is anxious and agitated or restless, or both"; 2 = "Patient is cooperative, oriented, and tranquil"; 3 = "Patient responds to commands only"; 4 = "Patient exhibits brisk response to light glabellar tap or loud auditory stimulus"; 5 = "Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus;" and 6= "Patient exhibits no response."[30] The concepts of analgesia and sedation are inevitably intertwined in intensive care settings. Previous

studies, which assessed pain levels using the BPS, treated the level of sedation measured by the RSS as a covariate, controlling for its confounding effect.[1,34] Therefore, the level of sedation was treated as a covariate in this study. The patients' demographic data (i.e., age, gender, and marital status) and clinical data (i.e., medical diagnosis, medical history, and duration of mechanical ventilation) were extracted from their medical records. The patient's family members were asked about the patient's Quran recitation preferences, including preferred reciter and verses that the patient used to listen to. After obtaining institutional review board approval and completing the consent procedures, the researcher met with the administrator of the medical and surgical ICUs at the selected hospital to discuss the workflow of the study procedure. The date and time of the site visit for data collection were also agreed upon based on the nurses' availability and work schedules. The researcher obtained a list of potential participants from the administrator after explaining the eligibility criteria. To facilitate the study procedure, the researcher gave a brief description of the study to the nurses and asked them to get in touch with the families of the potential participants to complete the informed consent procedure.

The eligible participants were randomly assigned to the intervention and control groups with an allocation ratio of 1:1. Each patient in the intervention group was exposed to a 45-minute session of Quran recitation through a disposal headphone connected to a cassette player. The patients were exposed to the Quran recitation 20 minutes before, during, and 20 minutes after the endotracheal suctioning. Before, during, and after the Quran recitation, BPS and RSS scores and physiological parameters were assessed and recorded by the nurse. The rationale for evaluating patients' pain levels even after completing the suctioning for 20 minutes is because the stress hormones, such as epinephrine and norepinephrine, which are released into the bloodstream after the endotracheal suctioning in this case, usually return to their normal levels after 20 minutes. In addition, the timings of pain and physiologic parameter measures were selected based on evidence from previous research.[26,34] Consistent with the policy of the selected hospital, endotracheal suctioning was performed by a respiratory therapist. The aim of using headphones was to ensure that each patient could hear the recitation clearly and minimize the effect of environmental noise. To enhance the effectiveness of the Quran recitation intervention, the patients' recitation preferences were collected from their family members. According to many recent studies, incorporating patients' preferences by selecting familiar and pleasant sounds is crucial for the success of any relaxant sound intervention.[35,36] After considering the patient's preferences, the researcher consulted a sound engineer for recommendations on the volume of the recitations to elicit a calming effect. According to the literature, soft sounds at a volume of 60–80 decibels and pleasant rhythms have been found to elicit a relaxation response and a sense of comfort.[35,36] The nurse put the headphones inside the ears of the patients in the control group with turning the cassette player off. The BPS scores and physiologic parameters were measured for the control group three times as done for the intervention group. No intervention was conducted on the patients in the control group. The researchers controlled for the potential confounding variables that may impede the validity and reliability of the collected data. For example, the researcher standardized the time for data collection to be in the early morning to rule out the confounding effects of the audio–visual noise, which has to be as little as possible at that time. In addition, the research applied strict inclusion and exclusion criteria and controlled the variation in participants' level of sedation by using their scores on RSS as a covariate in the statistical tests used in this study.

Data analysis was conducted using the Statistical Package for the Social Sciences, version 25.0 (SPSS Inc., Chicago, IL, USA). The level of significance for all statistical analyses in the current study was set at $\alpha \leq 0.05$. Descriptive statistics, including means, standard deviations, and frequencies, were used to describe the patients' sociodemographic and clinical characteristics, BPS and RSS scores, and physiological parameters (i.e., HR, BP, and O2 saturation). Chi-squares and Independent Samples Mann–Whitney U tests or t-tests were used for the purpose of comparing the differences between the intervention and control groups with regard to the categorical and continuous variables, respectively. Repeated-measures Multivariate Analysis of Covariance (MANCOVA) was used to examine the differences in BPS scores and HR measures during respiratory suctioning between patients in the treatment and control groups after controlling for RSS scores. Consequent individual ANCOVAs and the Bonferroni *post hoc* test were used to assess the differences in the dependent variables between and within the study groups. The assumptions of repeated-measures MANCOVA, including normal distribution (via Shapiro–Wilk test), homogeneity of variances (via Leven's test), multivariate and univariate normality, sphericity of within-group variances (via Mauchly's test), and homogeneity of variances-covariance (via Box's M test) were evaluated and achieved.

Ethical considerations

Ethical approval was obtained from the Institutional Review Board (IRB) committee at Jordan University of Science and Technology and the administrative offices of the selected hospital (IRB # 778-2020) on December 2, 2020. For the mechanically ventilated (intubated) patients who are noncommunicating and unable to make their own decisions, the researcher obtained written informed consent from their families. The researcher emphasized voluntary participation in the study and the confidentiality and privacy of collected data. The researchers also emphasized the participants' right to withdraw from the study at any time their families want with no penalty. The personal information of participants was deidentified

and not disclosed to anyone without permission. Each participant was given an identification (ID) code and saved on a password-protected personal computer (PC) and only accessible by the researcher, while paperwork information was saved in a locked locker located in the researcher's office.

Results

Sociodemographic and clinical characteristics

The sociodemographic and clinical characteristics of the patients are presented in Table 1. The patients' ages ranged from 18 to 90 years, with an average age of 60.84 (17.46) years. The average duration of mechanical ventilation was 79.50 (38.76) hours. The last dosage of analgesics was taken 9.38 (3.77) hours on average before the time of data collection. The majority of the participants were male (59.40%), 56.30% were nonsmokers, 90.60% had previous experience of intubation, and 45.10% were diagnosed with malignancy during their current hospitalization. The majority of the patients had a medical history of cardiovascular diseases. The RSS scores ranged from 1 to 4, with a mean (SD) of 2.34 (0.90). Details about the mean BPS total scores and subscale scores before and during suctioning are presented in Table 1.

Effectiveness of listening to Quran recitation

Patients' level of pain, HR, SBP, DBP, and O2 saturation was measured by the nurses for the control and intervention groups at three-time points: 20 min before, during, and 20 min after the endotracheal suctioning while listening to Quran recitation. Repeated-measure MANCOVA analyses confirmed that there were significant multivariate effects for the study group ($F_{5,26} = 11.47$, $p < 0.001$, $\eta^2 = 0.69$), time ($F_{10,21} = 10.50$, $p < 0.001$, $\eta^2 = 0.83$), and the interaction between time and study group ($F_{10,21} = 3.82$, $p = 0.005$, $\eta^2 = 0.65$) after controlling for patients' sedation level. Univariate between-group analyses showed that the control group had significantly greater BPS scores ($F_{(1,30)} = 59.24$, $p < 0.001$, $\eta^2 = 0.66$) than the intervention group. Univariate within-group analyses showed that BPS scores ($F_{2,60} = 48.32$, $p < 0.001$, $\eta^2 = 0.62$), HR ($F_{2,60} = 14.50$, $p < 0.001$, $\eta^2 = 0.34$), and O2 saturation ($F_{2,60} = 5.25$, $p = 0.008$, $\eta^2 = 0.15$) were significantly improved across the intervention time (regardless of the study group). There was a significant interaction between the study group and time for BPS scores ($F_{2,60} = 3.46$, $p = 0.038$, $\eta^2 = 0.10$) and HR ($F_{2,60} = 13.37$, $p < 0.001$, $\eta^2 = 0.31$).

To find the source of that interaction, multiple independent and paired t-tests with adjusting significance cutoff points to account for multiple comparisons. Further analyses of the interaction for pain levels showed that the patients in the control group had significantly greater BPS scores than the intervention group before ($t_{30} = 3.66$, $p = 0.001$), during ($t_{30} = 5.71$, $p < 0.001$), and after ($t_{30} = 8.81$, $p < 0.001$) endotracheal suctioning. For HR, while the patients in the control group had significantly greater HR than the intervention group during endotracheal suctioning ($t_{30} = 3.71$, $p = 0.001$), there were no significant differences between the study groups before ($t_{30} = 0.64$, $p = 0.53$) and after ($t_{30} = 0.35$, $p = 0.73$) endotracheal suctioning. BPS scores increased significantly between before and during suctioning for the intervention group ($t_{15} = -5.76$, $p < 0.001$) but not nearly as much as for the control group ($t_{15} = -6.23$, $p < 0.001$). BPS scores improved significantly between during and after suctioning for the intervention group ($t_{15} = 6.67$, $p < 0.001$) but not nearly as much as for the control group ($t_{15} = 5.64$, $p < 0.001$). Please see Table 2.

Table 1: Clinical and Sociodemographic Characteristics of the Patients (*n*=32)

Variables	Total Sample (*n*=32) Mean (SD)	Control Group (*n*=16) Mean (SD)	Intervention Group (*n*=16) Mean (SD)	Test, *p*
Age, years	60.84 (17.46)	61.31 (17.9)	60.38 (17.62)	*t*-test=0.15, *p*=0.882
*MV duration	79.50 (38.76)	73.50 (32.2)	85.50 (44.66)	*t*-test=-0.87, *p*=0.390
Time since last analgesics dose	9.38 (3.77)	9.43 (4.00)	9.31 (3.66)	*t*-test=0.09, *p*=0.927
**RSS	2.34 (0.90)	2.13 (1.03)	2.7 (0.73)	Mann-Whitney *U*, *p*=0.142
Variables	**Total Sample (*n*=32) *n* (%)**	**Control Group (*n*=16) *n* (%)**	**Intervention Group (*n*=16) *n* (%)**	**Test, *p***
Gender				
Male	19 (59.4)	11 (68.8)	8 (50.0)	Chi-square=1.17, *p*=0.280
Female	13 (40.6)	5 (31.2)	8 (50.0)	
Smoking				Chi-square=2.03, *p*=0.154
Yes	14 (43.8)	5 (31.2)	9 (56.3)	
No	18 (56.3)	11 (68.8)	7 (43.7)	
Previous intubation				Chi-square=0.37, *p*=0.544
Yes	3 (9.4)	1 (6.25)	2 (12.5)	
No	29 (90.6)	15 (93.75)	14 (87.5)	

*MV: Mechanical Ventilation; **RSS: Ramsay Sedation Scale

Discussion

Although listening to Quran recitation is well-known for improving patient outcomes, this experimental study is the first to test the effectiveness of listening to Quran recitation in relieving pain during pain-inducing procedures in adult intubated patients. The current study showed that during endotracheal suctioning, patients who listened to Quran recitation as a nonpharmacological intervention to relieve pain had lower pain levels and HR measures than patients who did not listen to Quran recitation. Although the current study is the first to examine the effectiveness of listening to Quran recitation in relieving pain among intubated patients, several previous studies have found this intervention effective among different patient populations. For example, Keivan *et al*.[35] revealed that listening to Quran recitation led to a significant decrease in pain levels and an improvement in pain control during dressing changes in critically ill burn patients. Furthermore, recent studies showed listening to Quran recitation to have a pain-relief effect among hypertension patients, college students with musculoskeletal disorders, and cancer patients, respectively.[37-40] Furthermore, previous studies have explored the effectiveness of listening to Quran recitation in relieving pain among ICU patients[22] and pregnant women during labor.[23,24] Moreover, a recent systematic review showed that listening to Quran recitation could reduce levels of pain during labor.[41] Physiologically, listening to Quran recitation can (1) stimulate the brain to produce endogenous natural opioid analgesics which block pain nociceptors; (2) reduce the level of stress hormones; (3) activate releasing of natural endorphins; (4) enhance a state or feelings of comfort and relaxation, and distract attention from tension, stress, and fear; and (5) improve the body's homeostasis, reducing BP, pulse, and RR and HR.

Several previous studies have also shown listening to Quran recitation to be effective in relieving other distressing symptoms, such as anxiety. For example, various studies have reported that listening to Quran recitation leads to significant improvements in the level of anxiety among ICU patients.[39-41] Mohammadpoor *et al*.[39] compared between listening to music and listening to Quran recitation in terms of their effect on acute coronary syndrome patients' levels of anxiety. The study found listening to Quran recitation significantly more effective than listening to instrumental music in decreasing patients' anxiety. In addition, according to the systematic review of Mat-Nor *et al*.,[22] listening to Quran recitation led to significant improvements in critically ill comatose patients' levels of consciousness.

In the present study, listening to Quran recitation was found to significantly decrease patients' HR measures. This aligns with previous studies, which found listening to Quran recitation to decrease mean BP, HR, and respiratory rate measures among critically ill patients.[40,42] Elcokany

Table 2: Main effects of intervention and time and interaction effect on outcomes variable (*n*=32)

Variable	Time	Group		*F*Group	*F*time	*F*Group* Time
		Control Mean (SD)	Experimental Mean (SD)			
Combined Effect[a]				11.47†††	10.50†††	3.82††
Pain				59.24†††	48.32†††	3.46††
	Pre	5.06 (2.18)	3.06 (0.12)			
	During	8.81 (2.23)	5.13 (1.31)			
	Post	5.81 (1.22)	3.06 (0.25)			
*HR				3.36	14.50†††	13.37†††
	Pre	82.75 (13.49)	79 (13.11)			
	During	100.37 (15.56)	81 (13.18)			
	Post	83.94 (13.65)	82.31 (12.48)			
**SBP				0.00	2.68	1.76
	Pre	120.25 (27.39)	123.56 (19.52)			
	During	127.81 (24.24)	124.00 (18.90)			
	Post	121.75 (22.58)	122.62 (17.83)			
***DBP				0.42	3.21	0.59
	Pre	65.13 (12.50)	64.19 (8.72)			
	During	69.31 (10.97)	65.50 (11.43)			
	Post	64.63 (8.72)	63.31 (6.30)			
****O_2 Sat				0.03	5.26**	0.43
	Pre	97.00 (3.14)	97.63 (2.06)			
	During	95.94 (3.60)	95.75 (3.00)			
	Post	96.81 (2.95)	96.80 (2.26)			

[a]Repeated-measures Multivariate Analysis of Covariance (MANCOVA); *HR: Heart Rate; **SBP: Systolic Blood Pressure; ***DBP: Diastolic Blood Pressure; ****O_2 Sat: Oxygen Saturation; ††p<0.01; †††p<0.001

and Abd El Wareth[40] examined the effect of listening to Quran recitation on clinical outcomes among mechanically ventilated patients undergoing weaning, which is considered a stressful situation that affects patients' hemodynamic stability. The results showed significant decreases in patients' HR, BP, and respiratory rate measures and increased oxygen saturation measures. Similarly, Mat-Nor *et al*.[22] reported that listening to Quran recitation significantly improved ICU patients' hemodynamic stability.

Nursing education in Jordan, especially at the undergraduate level, lags behind nursing education in Western countries and other Middle Eastern countries such as Qatar. Despite the high prevalence of pain and unmet comfort needs among critical care unit patients,[1] nursing schools in Jordan do not offer courses focusing on the topic of alternative and complementary medicine. These topics are not incorporated into nursing school curricula as an important element of pain management practice despite the high prevalence of analgesic misuse and its serious negative consequences in Jordan. Nursing administrators and educators should not underestimate the importance of alternative and complementary medicine in relieving pain in suffering patients. The findings of this study may encourage the incorporation of alternative medicine courses in nursing school curricula as core courses.

Further, our findings may guide the development of evidence-based standard pain management protocols tailored to meet the comfort needs of intubated patients, emphasizing the importance of alternative and complementary medicine for pain management. Nonpharmacological pain management interventions should be incorporated into critically ill patients' care plans, and critical care nurses should be theoretically and practically trained on how to implement these interventions.

This study measured the effectiveness of listening to Quran recitation in relieving pain associated with daily pain-inducing nursing procedures experienced by intubated patients. However, the current study has limitations that should be accounted for in interpreting the study results. This study was a pilot study, which may limit the generalizability of the findings due to the small sample size and the possibility of type II errors.[43] Furthermore, the fact that this study was conducted in one geographical area (Irbid, Jordan) may also limit the generalizability of the findings. Future studies which examine the effectiveness of listening to Quran recitation as a nonpharmacological intervention for relieving pain associated with daily pain-inducing nursing procedures among larger samples of intubated patients in multiple geographical areas are recommended.

Conclusion

Although pain is one of the most stressful symptoms experienced by intubated patients, it has not been extensively researched. There is a need for further experimental and longitudinal research on pain assessment and management barriers and facilitators, as well as nonpharmacological treatment modalities, among critically ill patients. The findings showed significant improvement in the levels of pain and heart rate measures among intubated patients who are exposed to Quran recitation. Complementary medicine is essential to the healthcare plans of critically ill patients and their families. Holy Quran recitation has been reported to be a useful nonpharmacological intervention for critically ill Muslim patients. However, there is a need for Islamic healthcare institutions and providers to pay further attention to including spiritual care in the healthcare management plans of their patients.

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Conflicts of interest

Nothing to declare.

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