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Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_1357_21

The effects of a team-based planned care program on the quality of sleep in cardiac surgery patients hospitalized in the intensive care unit: A two-group controlled clinical trial

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Received: 14-09-2021
Accepted: 26-10-2021
Published: 29-07-2022

Abstract:

BACKGROUND: Sleep disturbances as a major health problem are common in patients hospitalized in critical care units. This study examined the effects of a team-based care plan on the quality of sleep in patients hospitalized in a cardiac surgery intensive care unit (CSICU) of a multidisciplinary hospital.

MATERIALS AND METHODS: In this clinical trial, 100 patients with cardiac surgery were selected through convenience sampling and then nonrandomly allocated to the intervention and or the control group. A plan of care with the recommendation of all intensive care unit care teams was designed and then applied. In this study, the Richards-Campbell Sleep Questionnaire was used to evaluate sleep quality. Patients in the intervention group received the care plan for two consecutive nights. The study's national approval code is IRCT2017091915512N2. Collected data were analyzed using SPSS software (v. 21), and by paired, independent *t*, Chi-square, and Fisher's exact tests.

RESULTS: Quality of sleep in patients admitted to the CSICU is significantly improved by noise reduction both in the first and second nights. Moreover, the team-based care plan requires good coordination between all team members taking care of cardiac surgery patients admitted to the CSICU ($P < 0.001$).

CONCLUSIONS: The team-based care plan significantly improves the quality of sleep. It may be due to the close coordination between all team members to avoid sleep disturbances.

Keywords:

Cardiac, intensive care unit, sleep, surgery, teamwork, telemedicine, vascular

Introduction

Sleep disturbance after cardiac surgery is a main problem of care in patients hospitalized in the cardiac surgery intensive care unit (CSICU).^[1] Postoperation low-quality sleep may rise up to 60% in the patients.^[2] More than 61% of patients hospitalized in intensive care units (ICUs) reported their sleep time was not enough.^[3,4] Sleep problems increase hospital stay for

twice as long as patients getting adequate sleep.^[5] This serious problem is caused by different factors such as pain, discomfort, medication, stress, equipment alarms, therapeutic measures, noises, light, and temperature and can lead to in-hospital complications. Nursing staff in coordination with other health-care professionals such as anesthesiologists, physiotherapists, physicians, and dieticians can improve sleep quality in these patients by preventing disturbances during nighttime with a

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How to cite this article: Rahimi A, Faizi F, Nir MS, Amirifar A, Mahmoudikohani F. The effects of a team-based planned care program on the quality of sleep in cardiac surgery patients hospitalized in the intensive care unit: A two-group controlled clinical trial. *J Edu Health Promot* 2022;11:231.

holistic approach.^[6,7] Factors such as pain, discomfort, medication, anxiety, stress, senility, equipment alarms, nursing interventions and therapeutic measures, environmental noises, light, and temperature.^[8-11] Environmental factors (including sounds of staff and patients talking, equipment alarms, and sounds of telephone ringing) were the most significant factors behind sleep problems in critical care units.^[12] The high prevalence dilemma^[2,13] is manageable through medication therapy.^[10] However, medication is expensive and can lead to various adverse effects such as delirium. Pharmacological interventions have many side effects such as drug resistance, cognitive impairment, drowsiness, dizziness, poor quality of sleep, and increase risk of falls.^[14] Another way to deal with sleep disorders in a CSICU is to diminish factors contributing to these disorders.^[2] Yet, most previous studies have focused only on some environmental factors behind sleep disorders such as environmental light and noise.^[15-18]

Teamwork is one of the strategies for managing environmental factors. It has been actively advocated in the international medical field. Teamwork consists of practitioners and professionals with different kinds of expertise and skills to assess, plan, and manage patients' health conditions cooperatively to meet the needs of individuals with complex care needs. It minimizes clinical errors and thus, improves patient satisfaction and safety.^[19] Teamwork can perform better in human resource management than traditional models of care, in addition, teamwork can get reduction the length of the hospitalization time, reduction the rehospitalization, improvement of the communication and cooperation between physicians and caregiver groups, and reduction of health-care costs.^[19]

Chamanzari *et al.* found that using a quiet time protocol was effective in improving the quality of sleep in surgical care units.^[2] Bahramnezhad *et al.* also reported that modifying nursing care measures and environmental factors can significantly improve the quality of sleep in coronary care units.^[10]

Therefore, due to the stressful environment of the ICU and the critical condition of patients, and since the impact of teamwork on the sleep quality of patients in this unit in Iran has not been studied, Therefore, the purpose of the study was to test the efficacy of the team-based care plan to quality of sleep in patients hospitalized in CSICU.

Materials and Methods

Study design and setting

This two-group controlled clinical trial was conducted in a tertiary and multidisciplinary hospital. The population of the study comprised all patients who

were hospitalized in the CSICU of our hospital. The protocol for this study was approved by the Ethics and Research Committee of Baqiyatallah Medical University (No.IR.BMSU.REC.1395.92). This trial is registered at the Iranian Registry of Clinical Trials, number IRCT2017091915512N2.

Study participants and sampling

Patients who were 15 years of age or above, hospitalization in the CSICU for two or more days, being alert, away from using: psychiatric medication, hypnotics, or opioids at least 5 h before nighttime sleep, as well as no more than Class III of heart failure, no previous sleep disorders, and no audiovisual loss, were included. Exclusion criteria encompassed: unwilling to participate in the study, undergoing cardiopulmonary resuscitation, taking sedatives, hypnotics, anesthetics, or amphetamines during the study.

Utilizing Altman's nomogram and results of a similar study in the field^[20] and applying a Type I error of 0.05 and a power of 0.80; a sample of 45 patients in each group (90 in total) was calculated then considering attrition rate, ten more patients were added. After convenient selection, they were nonrandomly allocated to a control and/or intervention group. Initially, 48 patients were recruited as controls, and their quality of sleep and sleep-related needs were assessed. After that, a team-based planned care program was developed based on the predetermined needs. The program was implemented for 52 patients in the intervention group [Figure 1].

The intervention of this study was a team-based planned care program. To develop this program, we initially assessed sleep-related needs of patients in the control group, as well as the general structure and specifications of the study setting. Members of the team consisted of CSICU staff (including CSICU physicians, nurses, auxiliary nurses, and ancillary workers), attending physicians and supervisors. Planned cares that includes: environmental care (noise reduction and modification, light modification, temperature modification of ICU, and modification of care and treatment interventions) and nonpharmacological care (use of eye mask and earplugs) as a team for patients in the intervention group were performed (the resident physician of the ICU's duties: such as cooperation in the implementation of nonpharmacological care regarding patients' sleep against drug intervention. Nurse's duties: such as performing nursing cares except of the rest and sleep time of the patient and cooperation in preparing the unit environment during the patient's rest and sleep. The patient's relevant physician's duties: such as visiting patients during the day or the time of their awakening. Supervisor's duties: such as visiting the unit

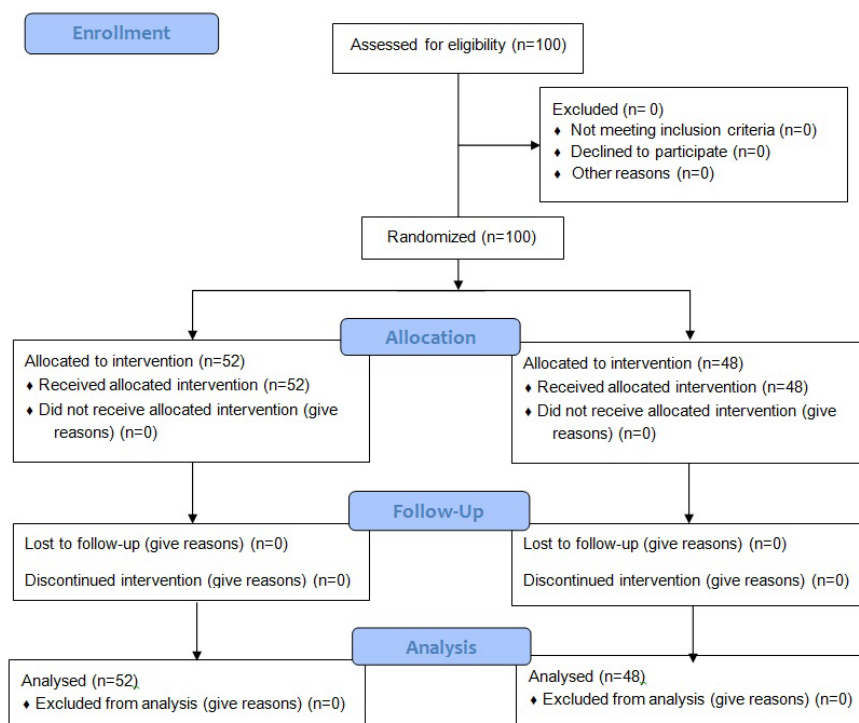


Figure 1: CONSORT flow diagram of participant allocation, follow-up, and analysis

and rounding it in hours except patients’ rest and sleep. Researcher’s duties: such as holding briefings before and during the study to inform and encourage team members) [Table 1]. At first, we held three 1-h training sessions to provide team members with information on factors affecting sleep quality, negative effects of inadequate sleep, strategies for reducing environmental stimulation, and the role of each member in the program [Figure 2].

Moreover, the role of each member was declared through a poster on the CSICU announcement board.

At the beginning of the study, the quality of the previous night’s sleep of patients in the control group was assessed twice at 8 AM on the second and third mornings of their hospitalization in the CSICU. One week later, the team-based planned care program was implemented for patients in the intervention group on the first and second nights of hospitalization in the unit from 10 PM to 6 AM. The quality of their night sleep was assessed twice on the second and third mornings of CSICU hospitalization.

Data collection tool and technique

Study tools included a demographic questionnaire and the self-administered questionnaire developed by Richards-Campbell Sleep Questionnaire (RCSQ) was used for assessing the quality of sleep in the critical care unit.^[21] More studies in clinical settings have

Table 1: Interventions and details of measures undertaken

Topic	Details
Noise reduction 10 pm-6 am	Equipments’ alarm levels set low Reduced volume of telephone ring tone Putting the staff’s cell phones on silent mode Speaking softly Limiting entrance to CSICU Avoid moving and dragging chairs at nights Replacing noisy mattress air pumps with new ones
Nursing care modifications	Setting visits before 10 pm Doing graphies, blood sampling, urinary/NGT catheterization, dressings, CVP measurement, drug administration, physical therapy, tube feeding, suctioning etc., before 10 pm only necessary visits were done between 10.00 pm and 6.00 am
Temperature modification	Setting unit temperature according to standards Using blanket based on the physiological status of patients and their personal preferences
Light modification	Reducing environmental lighting Turning off lights in the patient’s unit
Others	Putting on eye mask Applying earplugs

CSICU=Cardiac surgery intensive care unit, CVP=Central venous pressure, NGT=Nasogastric tube

applied it to verify sleep quality in Iran.^[22,23] It encompasses five items on perceived sleep depth, sleep onset latency (or time to fall asleep), number of awakenings, sleep efficiency, and sleep quality, as well as one item on perceived nighttime noise. One can

respond to the first five items using a 100-ml visual analog scale. The mean of scores of all five items ranges from 0 to 100 as higher scores indicate higher sleep quality. Another item shows noise intensity ranging from 0 (very noisy) to 100 (very quiet). Acceptable reliability of the RCSQ was reported through an internal consistency assessment and reported a Cronbach's alpha value of 0.90.^[21] In this study, we initially translated the RCSQ into Persian and then, revised the translation based on comments from ten nursing faculty members. Moreover, we found that the inter-rater correlation coefficient and Cronbach's alpha value of the questionnaire were 0.714 ($P < 0.0001$) and 0.906, respectively.

After data collection, they analyzed utilizing SPSS software v. 21 (IBM Inc., Chicago, IL, USA), and by conducting paired-sample and independent-sample *t*-test, Chi-square test, and Fisher's exact test.

Ethical consideration

The study was carried out under tight supervision and reviewing bodies in the institution and all clinical and ethical standards set forth in the Helsinki Declaration of 1975. The ethical approval for this study was given by the Ethics Committee of Baqiyatallah University of Medical Sciences in Tehran, Iran (No.IR.BMSU.REC.1395.92). The patients were assured that participation in the study would be voluntary and withdrawal from it would not affect their treatment. Furthermore, informed consent was obtained from all participants.

Results

The demographic characteristics of the participants of the study are shown in Table 2. Independent-sample *t*-test, Chi-square test, and Fisher's exact test illustrated no significant difference between the groups regarding these demographic characteristics ($P > 0.05$).

The mean sleep quality scores of patients in the control group on the first and second nights of CSICU

hospitalization were 222.29 ± 98.74 and 181.54 ± 63.65 , respectively. In the intervention group, these values were 374.42 ± 73.65 and 315.96 ± 76.52 , respectively. The independent-sample *t*-test revealed that sleep quality in the intervention group was significantly better than in the control group ($P < 0.001$) [Table 3] on both the first and second nights. Furthermore, the paired-sample *t*-test indicated that in both study groups, sleep quality on the first night was significantly better than on the second night ($P = 0.001$) [Table 3].

The results of the independent-sample *t*-test also illustrated that the level of perceived nighttime noise was significantly lower in the intervention group than in the control group ($P < 0.05$) [Table 4].

Discussion

Study findings showed that the team-based planned care program mainly including nonpharmacological

Table 2: Demographic characteristics of the patients

Group variable	Intervention	Control	P
Gender			
Male	39 (75)	33 (68.75)	0.487
Female	13 (25)	15 (31.25)	
History of health problems			
Diabetes mellitus	3 (5.769)	8 (16.6)	0.157
Liver problems	2 (3.846)	0	
Kidney problems	1 (1.923)	0	
Hypertension	11 (21.153)	6 (12.5)	
Multiple problems	20 (38.46)	15 (31.25)	
None	15 (28.846)	19 (39.583)	
History of hospitalization in ICU			
Yes	1 (1.923)	6 (12.5)	0.053
No	51 (98.076)	42 (87.5)	
Type of surgery			
Coronary artery bypass graft	41 (78.846)	41 (85.416)	0.393
Valve replacement or repair	11 (21.153)	7 (14.583)	
Age, mean±SD	60.60±9.302	60.65±10.035	0.980

SD=Standard deviation, ICU=Intensive care unit

Table 3: Comparing the groups according to mean scores of sleep quality

Time group	Mean±SD		Paired <i>t</i> -test
	First night	Second night	
Intervention	374.4231±73.65	315.9615±76.52	$T=4.369$ $df=51$ $P<0.001$
Control	222.2917±98.74	181.5417±63.65	$T=3.375$ $df=47$ $P=0.001$
Independent-sample <i>t</i> -test	$T=-8.777$ $df=98$ $P=0.000$	$T=-9.506$ $df=98$ $P=0.000$	

SD=Standard deviation

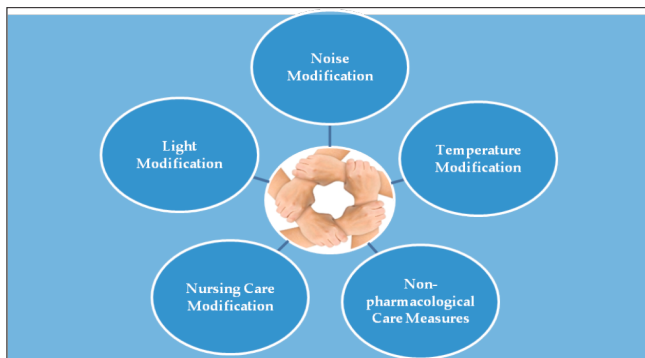


Figure 2: The main areas of the care plan designed in coordination with all cardiac surgery intensive care unit staff

modifications significantly improved the quality of sleep in patients at a CSICU.

In line with our findings, Kamdar *et al.* created a multifaceted team-based care program that was effective in improving sleep quality among patients in CSICUs^[20] with the exception that they included both pharmacological and nonpharmacological modalities in their program. The results of this study are in line with our study, with the difference that in the present study, only the effect of environmental and nonpharmacological care on the quality of sleep of patients was investigated, and no pharmacological interventions were used. However, in the above study, in addition to environmental and nonpharmacological interventions, pharmacological intervention was performed to improve patients' sleep quality. This study has also been done in the United States and it can be said with certainty that such studies are not unaffected by indigenous and regional conditions and culture.

In a study by Li *et al.* that investigated the efficacy of controlling nighttime noise and activity in intensive surgical care unit, the patients of the intervention group reported better sleep quality and sleep efficiency than did the control group.^[15] In this study, the effect of the external environmental stimuli was investigated, while in our study, the control of environmental factors through teamwork was investigated, and the results of this study in noise control and sleep time are consistent with the results of our study; however, the results of the present study are in line with the results of the above study, but the care interventions to improve sleep quality in this study were partial and without the participation of teamwork. In the present study, care interventions to improve sleep quality were multidimensional (environmental care and nonpharmacological care) and performed as a teamwork in the ICU.

Chamanzari *et al.* found that using a quiet time protocol was effective in improving the quality of sleep in surgical ICUs.^[2] The examined tools for sleep quality in this study are different from our study, and by using more appropriate tools, can be achieved more accurate results about the sleep quality of these patients.

Table 4: Comparing the groups according to perceived night-time noise

Time group	Mean±SD	
	First night	Second night
Intervention	91.92±7.93	88.85±8.55
Control	57.50±13.60	48.54±11.48
Independent-sample t-test	T=-15.602 df=98 P=0.001	T=-20.005 df=98 P=0.001

SD=Standard deviation

The average sleep efficacy of the intervention group was significantly better than that of the control group. The finding supports the efficacy of the study intervention for improving the sleep environment and enhancing ICU patients' sleep quality. These results are similar to those of the Bahramnezhad *et al.* and Zolfaghari *et al.* studies. They also reported that modifying nursing care measures and environmental factors can significantly improve the quality of sleep in coronary care units.^[10,17] Other studies also reported the effectiveness of nonpharmacological modalities such as earplugs and eye masks in improving the quality of sleep.^[18,24-30]

In done studied, the care interventions to improve sleep quality were partial and without the participation of teamwork, but in the present study, care interventions to improve sleep quality were multidimensional (environmental care and nonpharmacological care) and performed as a teamwork in the ICU. Furthermore, in the present study, unlike other studies, was used a specific tool for measuring the quality of sleep in patients in the ICU (Richard-Campbell Sleep Quality Questionnaire).

Limitations

One of the limitations of this study was that we were unable to completely control environmental noise and light. Moreover, the need of critically-ill patients for cardiopulmonary resuscitation sometimes made the implementation of our program difficult. In such situations, we were compelled to exclude intended patient(s) and recruit new ones for the study. Besides, we conducted the study in a single CSICU and thus, our findings may have limited generalizability.

Conclusions

Study findings showed that the team-based planned care program (including both environmental modification and nonpharmacological care measures) significantly improves the quality of sleep and thereby, health status of patients hospitalized in CSICUs. Given the effectiveness of multicomponent environmental modification care programs, using these simple and safe programs is recommended for improving the quality of sleep in critical care units.

Acknowledgment

We would like to appreciate Clinical Research Unit of Baqiyatallah Hospital and all CSICU staff attended in the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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