



EFFECTIVENESS OF NON-PHARMACOLOGICAL INTERVENTIONS ON SLEEP QUALITY IN CRITICALLY ILL PATIENTS: A SYSTEMATIC REVIEW

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ABSTRACT

Sleep disturbances are a common problem in Intensive Care Unit (ICU) patients, which can increase the risk of delirium, anxiety, and other physiological disorders. Therefore, non-pharmacological approaches are important, as these methods are considered safer and have fewer side effects compared to drug-based therapies. This study aimed to evaluate the effectiveness of non-pharmacological interventions, such as earplugs, eye masks, classical music, counseling, and nursing bundles, on sleep quality in ICU patients. This systematic review analyzed 16 articles published between 2021 and 2025, retrieved from PubMed, Proquest, Sage Journals, Science Direct, and Google Scholar databases. Studies meeting the inclusion criteria included randomized controlled trials (RCTs), quasi-experimental designs, or nursing interventions that used instruments to measure sleep quality such as the RCSQ, VSH, and PSQI. 984 articles were obtained and 16 articles were used. Data analysis was conducted narratively using a thematic synthesis approach. All analyzed studies demonstrated a significant improvement in ICU patients' sleep quality after the interventions. The combination of earplugs and eye masks resulted in an average increase in sleep scores of approximately 25–40 points ($p < 0.001$). Furthermore, the implementation of a nursing bundle successfully reduced the incidence of delirium by 15–28%, while the use of classical music and counseling was shown to reduce anxiety levels and improve patient vital signs. The environmental factors most likely to contribute to sleep disturbances were noise (71%), lighting (60%), and nursing procedures performed at night (49%). Non-pharmacological interventions have been shown to be effective in improving sleep quality and reducing the incidence of delirium and anxiety in ICU patients. Therefore, the routine implementation of the combination of earplugs and eye masks, along with an environmentally-based nursing bundle, is highly recommended as part of standard nursing practice in the Intensive Care Unit (ICU).

Keywords: earplugs; eye masks; ICU; non-pharmacological interventions; sleep quality

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INTRODUCTION

A critically ill patient is a patient with rapid physiological deterioration that can lead to disability or death (Minister of Health of the Republic of Indonesia, 2010). Critically ill patients are those with high morbidity and mortality and receive care in the Intensive Care Unit (ICU) (M. Christopher, 2016). The ICU is a section of a hospital with specialized staff and specialized equipment. Patients treated in this unit typically require immediate medical care, continuous monitoring, and coordinated management of their organ systems to prevent physiological decompensation and allow for continuous monitoring and appropriate therapy titration (Minister of Health of the Republic of Indonesia, 2010).

The inpatient environment, particularly in the ICU, is an uncomfortable situation that can cause changes in a person's personality and activities. The varied and complex medical equipment in the ICU impacts the patient's psychological and social well-being (Topcu & Tosun, 2022a). This can be caused by fear during treatment, uncertainty about the course of the disease, adaptation to a new

environment, treatment procedures, and psychological instability, all of which can impact sleep quality during ICU care (Cho et al., 2017).

The impact of psychological and social stress experienced by critically ill patients leads to sleep quality disturbances. Sleep is the ability to stay asleep and obtain an adequate amount of sleep, or medically defined as 6-8 hours of Non-Rapid Eye Movement (NREM) and Rapid Eye Movement (REM) sleep, per day (Nelson et al., 2022). Sleep quality is crucial for patients, especially critically ill patients. This is because good sleep quality is associated with accelerated recovery (Harvey et al., 2008).

A literature review conducted by the author found that 54.8% of critically ill patients reported being unable to fall asleep, 71.6% reported waking during the night, and 28.3% were unable to return to sleep after waking. Sleep quality during the first night in the ICU was described as poor by 79.7% of patients, who reported very high noise levels (Locihová et al., 2018; Pagnucci et al., 2019; Topcu & Tosun, 2022a). ICU patients are awake for approximately 30–40% of their sleep time, and 60% of critically ill ICU patients report sleep deprivation, which negatively impacts their physical and psychological well-being (Locihová et al., 2018).

Sleep disturbances are a serious problem experienced by most ICU patients. Research shows that more than 60% to 70% of ICU patients experience poor sleep quality, characterized by shallow, intermittent sleep, and loss of normal circadian rhythms, resulting in delayed wound healing, impaired immune function, and delayed recovery from illness. Furthermore, sleep disturbances also cause hormonal disturbances, including increased thyroid hormone, norepinephrine, and cortisol, as well as decreased growth hormone and insulin, which can lead to decreased organ function (Czempik et al., 2020). This condition not only impacts physiological, cognitive, and immunological functions but also increases the risk of delirium, prolongs hospitalization, and reduces quality of life after ICU discharge (Zhang et al., 2024).

Several factors that contribute to sleep disturbances in ICU patients include sound or noise levels (alarm sounds, respirator or bed monitors, ventilators, telephones, and conversations), light intensity, patient care activities, and diagnostic procedures. Furthermore, patients with a history of sleep disorders, pain complaints, anxiety, delirium, and medication use in the ICU are also at risk of experiencing sleep disturbances. The most influential factor affecting sleep quality in ICU patients is noise, although the noise level is modifiable (Czempik et al., 2020).

Environmental factors are a major factor associated with sleep disturbances experienced by ICU patients. The World Health Organization (WHO) recommends noise levels not exceeding 35 dBA at night and 40 dBA during the day (Pulak & Jensen, 2016). Noise levels exceeding these thresholds can disrupt the sympathetic nervous system, which in turn increases heart rate and affects the function of the patient's respiratory muscles (Knauert et al., 2019).

Noise levels exceeding the standard noise level of 35 dBA in the ICU are not recommended. However, several studies on environmental noise measurements in hospitals conducted worldwide have revealed noise levels exceeding recommended limits (Busch-Vishniac et al., 2005; Fortes-Garrido et al., 2014; Zannin & Ferraz, 2016). Several studies report that ICU noise levels average 53-59 dBA, with noise levels reaching 67-86 dBA, which can contribute to patients' lack of REM sleep (Guisasola-Rabes et al., 2022).

In an effort to improve the sleep quality of ICU patients, various intervention studies have been conducted. Evidence-based interventions, including noise reduction, tailoring nursing interventions at night, and lighting adjustments, have been shown to be effective in improving the sleep quality of ICU patients admitted for more than one night. Another study examined the use of eye masks and

earplugs, finding that eye masks were the most effective in improving sleep quality. (Sayed et al., 2022; Topcu & Tosun, 2022b)

Therefore, current evidence confirms that non-pharmacological intervention-based strategies, whether in the form of sleep promotion protocols or bundled interventions to improve sleep quality, or simple aids such as eye masks and earplugs, are effective approaches to improving sleep quality and reducing the risk of delirium in critically ill patients. This study aimed to evaluate the effectiveness of non-pharmacological interventions, such as earplugs, eye masks, classical music, counseling, and nursing bundles, on sleep quality in ICU patients.

METHOD

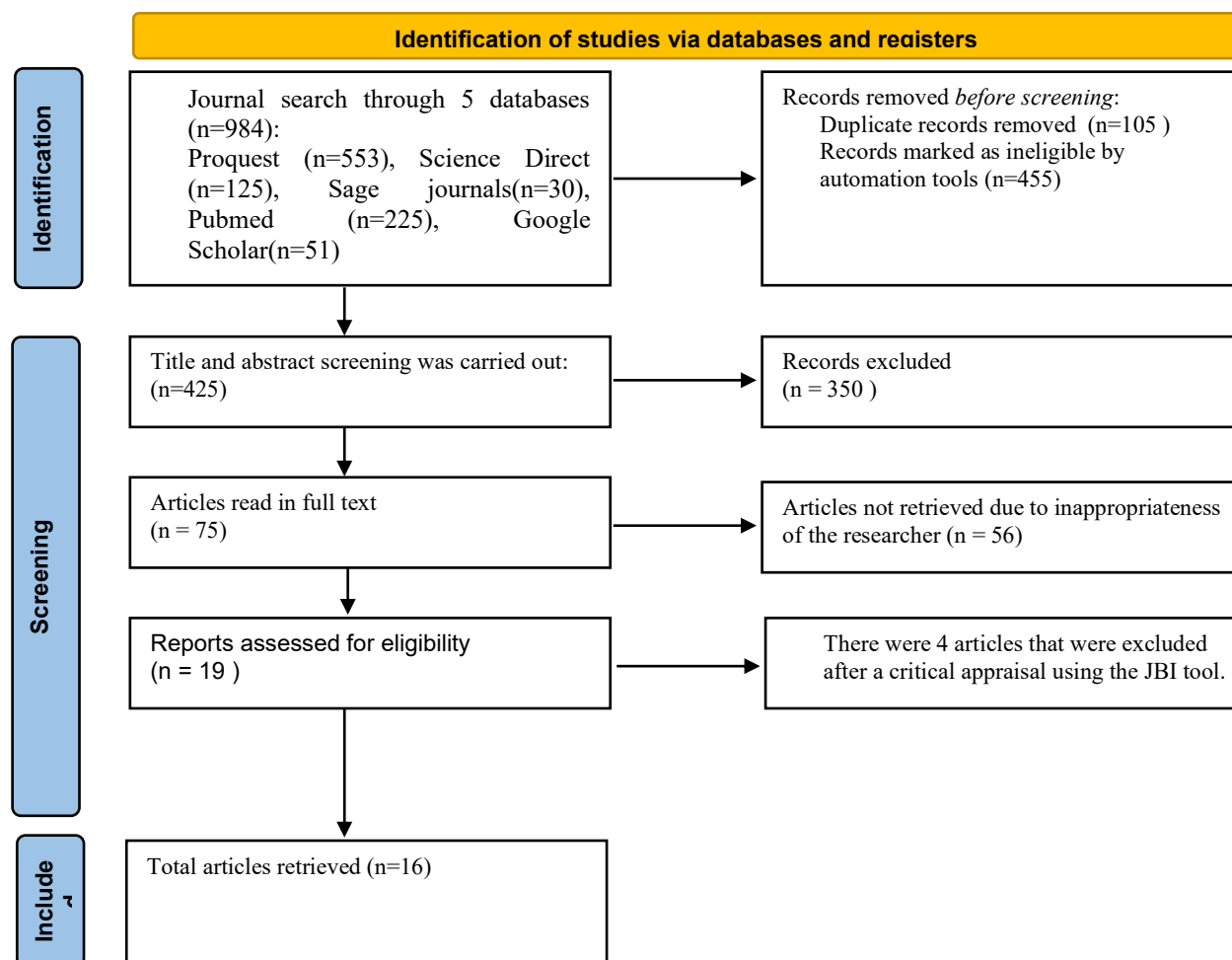


Figure 1. PRISMA 2020 flow diagram for new systematic reviews

A journal search to ensure the authenticity of this research was conducted using the Research Engines Science Direct, Sage Journals, PubMed, Proquest, and Google Scholar. Keywords used included "Noise," "Sleep promotion protocol," "non-pharmacologic intervention," "Sleep quality," "Quality of sleep," and "Critically ill patient," with the "Boolean" (AND, OR, or NOT) also applied among the keywords entered. The article screening process took into account several limitations, including publication year (2020-2025), full text, and English language. The results yielded 984 articles from Proquest (553), Science Direct (125), Sage Journals (n=30), PubMed (225), and Google Scholar (51). These articles were then narrowed down and identified using the PICOS framework (population, intervention, comparison, outcomes, and study design), resulting in 425 articles meeting the screening criteria. During the screening phase, based on the articles' relevance to the planned research, 75 articles were removed, leaving 19 articles discussing non-pharmacological interventions for sleep quality in critically ill patients. Eligibility was assessed

based on the articles' summary and comprehensive coverage using critical appraisal with the JBI tool, resulting in 16 articles meeting the inclusion criteria. To further explore the search results, please see the PRISMA 2020 flow diagram.

RESULT

Table 1.
Results of the Synthesis of the Systematic Review of the Effectiveness of Non-pharmacological Interventions on the Sleep Quality of Critically Ill Patients in the ICU.

| Title | Method | Results |
|---|---|--|
| The Effect of Earplugs and Eye Masks on Sleep Quality in Patients in the Intensive Care Unit (Aziz & Warsono, 2022) | D: This study used a case study with a nursing care approach. I: The Richards Campbell Sleep Questionnaire (RCSQ) was used as a measurement tool to measure patient sleep quality. V: I: Use of earplugs and eye masks. D: Sleep quality in ICU patients. S: 2 patients. A: Descriptive analysis was conducted by comparing pre-test and post-test sleep quality scores. | The use of earplugs and eye masks has been shown to improve sleep quality in ICU patients. Patient 1's sleep quality score before the intervention was 33, which increased to 77 after the intervention. Patient 2's score increased from 35 to 75 (still in the poor sleep quality category), but showed improvement. |
| The Effect of Hypnosis with Mozart's Classical Music on Sleep Quality for Patients in the ICU (Imardiani et al., 2021) | D: The study used a quasi-experimental design with a one-group pretest-posttest design without a control group. I: The Pittsburgh Sleep Quality Index (PSQI) was used to measure patient sleep quality. V: Hypnosis with Mozart's classical music was used. D: Sleep quality for ICU patients. S: 16 patients. A: Normality test using Shapiro-Wilk test, as the data were not normally distributed. The Wilcoxon test was used to analyze the difference between pretest and posttest. | Sleep quality before intervention: median (range 45-65). Sleep quality after intervention: median 70 (range 55-70). The Wilcoxon test showed a p-value of 0.001 (p<0.05), indicating a significant difference in sleep quality before and after the intervention. Conclusion: Hypnosis therapy with Mozart's classical music effectively improves sleep quality for ICU patients. |
| Back Massage Therapy to Improve Sleep Quality and Reduce Anxiety in ICU Patients (Waladani & Suwaryo, 2023) | D: This study used a quasi-experimental pre-post-test design involving an intervention and control group. I: The Verran and Synder-Halpern Sleep Scale (VSH) was used to measure sleep quality, and the Hospital Anxiety and Depression Scale (HADS) was used to measure anxiety and depression. Nurse observations recorded patient duration (sleep time from 10:00 PM to 6:00 AM) V: I: Back massage intervention D: Sleep quality, anxiety, and depression in ICU patients S: 40 patients A: Analysis using frequency distribution, descriptive statistics, chi-square test, independent t-test, and Generalized Estimation Equation (GEE) to examine the effect of the intervention over time. | - The average sleep time of patients observed by nurses was approximately 3.9 hours (indicating poor sleep quality in ICU patients). - Back massage had a positive impact: significantly improving patient sleep quality, significantly reducing anxiety on the third day of the intervention. It had no significant effect on depression. It provided a relaxing effect, reducing muscle tension, improving breathing, and increasing comfort. - Conclusion: Back massage therapy effectively improves sleep quality and reduces anxiety, but does not significantly impact depression in ICU patients. |
| Based Evidence – An Intervention Study to improve Sleep Quality in Awake Adult ICU Patient (Zhang et al., 2024) | D: This study used a prospective, cluster-controlled, single-blind trial. V: I: Evidence-based interventions to improve sleep quality (nighttime lighting modifications, noise reduction, and earplug and eye mask options). D: Sleep quality of ICU patients (RCSQ scores, total sleep time, deep sleep time, number of awakenings). S: 246 patients (125 patients in the intervention group and 121 in the control group). A: Statistical analysis comparing RCSQ scores and actigraphy data between the control and intervention groups. Testing the effect of the intervention, taking | - Sleep quality of adult ICU patients receiving the intervention significantly improved when admitted for more than one night. - The average score in the intervention group was 70-80, while in the control group it was 60-80. - On the following night or after two nights, patients in the intervention group showed better sleep quality (high classification 80-90). - Conclusion: Evidence-based |

| Title | Method | Results |
|---|---|---|
| | into account cluster variation. | interventions (a quieter and darker sleep environment) effectively improve sleep quality in ICU patients. |
| Examining the Effect of Earplugs, Eye Mask, and Earplugs + Eye Mask on Sleep Quality in Intensive Care Patients : RCT (Kazak Saltı et al., 2025) | <p>D: This study used a single-center, randomized controlled trial (RCT) design.</p> <p>I: Instruments used:</p> <ul style="list-style-type: none"> - Patient description form (age, gender, marital status, occupation, education, chronic diseases, sleep disturbance factors) - Richards Campbell Sleep Questionnaire (RCSQ) → 6-item scale to assess patient sleep quality <p>V: I: Use of earplugs (EP), eye mask (EM), and a combination of earplugs and eye mask</p> <p>D: Sleep quality of ICU patients (RCSQ score)</p> <p>S: 120 patients (30 patients each in the EP, EM, combination, and control groups)</p> <p>A: Normality test using the Kolmogorov-Smirnov test, intragroup analysis using the paired-sample t-test (dependent t-test). Intergroup analysis using one-way ANOVA.</p> | <ul style="list-style-type: none"> - Main factors causing sleep disturbance in the ICU: noise (71.6%), light (60.8%), nursing intervention (49.1%) - RCSQ score: pretest (no significant difference between groups $p > 0.05$) and posttest (there was a difference between groups $p > 0.05$) (significant difference between groups ($F = 27.426, p < 0.001$)) - Significant increase in RCSQ scores within groups: EP ($t = 7.99; p < 0.001; n_2 = 0.683$), EM ($t = 17.268; p < 0.001; n_2 = 0.911$), EP + EM ($t = 9.381; p < 0.001; n_2 = 0.752$), control → not significant ($t = 1.084; p > 0.05$) - Intervention effectiveness: Eye masks (EM) were the most effective in improving sleep quality compared to EP or EP + EM. EP had a positive effect but was the lowest compared to the other groups. EP + EM also improved sleep quality, but less than EM alone (possibly due to the discomfort of the combination). - Conclusion: The use of eye masks is the most effective non-pharmacological intervention for improving sleep quality in ICU patients, while earplugs had the least effect. |
| Effect of Implementing Nursing Interventions Bundle on Sleep Quality and Associated Delirium Among Patients at Intensive Care Unit (Sayed et al., 2022; Topcu & Tosun, 2022b) | <p>D: This study used a quasi-experimental design with a control group and an intervention group.</p> <p>I: Using the Richards Campbell Sleep Questionnaire (RCSQ) to measure patient sleep quality and the Intensive Care Delirium Screening Checklist (ICDSC) to detect delirium in ICU patients.</p> <p>V: I: Implementation of the nursing intervention bundle (environmental management, noise reduction, lighting, and sleep support interventions).</p> <p>D: Patient sleep quality (RCSQ score) and delirium incidence (ICDSC).</p> <p>S: 60 patients (30 patients in the control group and 30 patients in the intervention group). Using purposive sampling</p> <p>A: Statistical analysis was conducted using a difference test between the control and intervention groups, with a significance level of $p < 0.05$.</p> | <ul style="list-style-type: none"> - Sleep quality: The intervention group receiving the nursing bundle experienced a significant improvement in sleep quality compared to the control group. - Delirium: The incidence of delirium in the control group was 30%, while in the intervention group it was 13.3% → a significant difference ($p = 0.024$). - Conclusion: The implementation of the nursing intervention bundle has been proven effective in improving sleep quality and reducing the incidence of delirium in ICU patients |
| Efforts to Improve Sleep Quality in a Medical Intensive Care Unit: Effect of a protocol of Non-Pharmacological Interventions | <p>D: This study used a pretest-posttest design with a control group.</p> <p>I: Instruments used:</p> <ul style="list-style-type: none"> - Acute Physiology and Chronic Health Evaluation II (APACHE II) - Glasgow Coma Scale (GCS) - Richmond Agitation Sedation Scale (RASS) - Richards Campbell Sleep Questionnaire (RCSQ) - Confusion Assessment Method for ICU (CAM-ICU) - Noise measurement device (CA *# \$ Sound | <ul style="list-style-type: none"> - Noise levels decreased significantly from 70.9 ± 3.8 dB(A) to 62.7 ± 3.5 dB(A) after the protocol ($p < 0.01$) - Sleep quality scores (RCSQ) increased significantly from 48.3 ± 1.4 dB(A) to 62.1 ± 1.8 dB(A) after the protocol ($p < 0.01$) - Delirium frequency decreased from 60% (control) to 45% (intervention), but the difference was not significant |

| Title | Method | Results |
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| (Topcu & Tosun, 2022b) | Measurement and Recording Device) V: I: Non-pharmacological intervention protocol (light measurement, sound measurement, and disturbance measurement) D: Sleep quality, environmental noise level, and delirium incidence S: 70 patients (38 in the intervention group and 40 in the control group) A: This study used descriptive analysis, chi-square test, independent sample t-test, Mann-Whitney U test, and correlation analysis. Significance at $p < 0.05$ | ($p > 0.05$) - There was a significant negative correlation between ICU noise levels and patient sleep quality scores ($r = -0.607$; $p < 0.001$) - In conclusion, the multi-component non-pharmacological intervention protocol can improve patient sleep quality and reduce noise levels in the ICU. Although the reduction in delirium was not significant, the results still show a positive trend. |
| The Effect of a Quality Improvement Intervention on Sleep and in Critically Ill Patients in a Surgical ICU (Tonna et al., 2021) | D: This study used a pre-post quality improvement study design (without a control group). I: Instruments used: - Richards Campbell Sleep Questionnaire (RCSQ) to assess sleep quality - Confusion Assessment Method for ICU (CAM-ICU) to assess delirium - Richmond Agitation Sedation Scale (RASS) - Environmental noise and light measurement tool V: I: Quality improvement intervention (non-pharmacological bundle: noise reduction, lighting control, use of eye masks and earplugs, staff education) D: Patient sleep quality, delirium incidence, and noise and lighting levels in the ICU S: 203 patients (103 pre-intervention, 100 post-intervention) A: Descriptive statistics, chi-square, t-test, Mann-Whitney U test, and multivariate analysis to control for confounding factors. | - Sleep quality scores (RCSQ) significantly improved from 34.4 ± 0.00 (pre-intervention) to 51.1 ± 5.5 (post-intervention), $p < 0.001$ - Delirium incidence decreased from 23% (pre) to 10% (post), $p < 0.01$ - Nighttime noise levels decreased significantly, and nighttime lighting was also more controlled after the intervention - Non-pharmacological bundle interventions were proven safe and effective in improving sleep quality and reducing delirium in surgical ICU patients |
| The Effects of Earplugs and Eye Mask on Sleep Quality of Patients Admitted to Coronary Care Units (RCT) (Khoddam et al., 2022) | D: This study used a randomized controlled trial with four parallel groups (control, eye mask, earplugs, and a combination of earplugs and eye mask). I: The Verran and Snyder-Halpern (VSN) sleep scale was used to measure subjective sleep quality. And urinary melatonin and cortisol levels were examined using the ELISA method. V: I: Use of eye masks, earplugs, a combination of both, and no intervention (control) D: Sleep quality, melatonin levels, and cortisone levels S: 68 patients A: Using the Shapiro-Wilcoxon normality test, one-way analysis of covariance (ANCOVA) for intergroup comparisons, and the Bonferroni test for pairwise comparisons. | - All three interventions improved sleep quality compared to the control. - Eye masks significantly improved sleep effectiveness, reduced the need for additional sleep, and increased melatonin levels. - Earplugs were most effective in reducing sleep disturbances and lowering cortisol levels. - The combination of both reduced cortisol, but was less effective than either alone. - Overall, eye masks were the most comfortable and easy to use, according to patients' assessments. |
| Effect of Earplug/Eye Mask on Sleep and Delirium in Intensive Care Patients (Akpinar et al., 2022) | D: This study used a randomized controlled trial with two groups (experimental and control). I: Information form (demographic data), GCS, Richards Campbell Sleep Questionnaire (RCSQ) for sleep quality, and Intensive Care Delirium Screening Checklist (ICDSC) for delirium. V: I: Use of eye masks and earplugs. D: Sleep quality, delirium level, perceived noise. S: 84 patients. A: Using the Shapiro-Wilk normality test, normal data using the t-test, non-normal data using the Mann-Whitney U test, and within-group comparisons using the Friedman test. | - The experimental group had higher RCSQ scores than the control group, indicating better sleep quality. - Perceived noise levels were lower in the experimental group. - Delirium scores (ICDSC) were lower in the experimental group, especially on day 3 (0.19 ± 0.39 vs. 0.57 ± 0.66 ; $p = 0.004$). - Conclusion: Use of eye masks and overnight earplugs in the ICU improve sleep quality and reduce the degree of delirium. |
| Effect of Rosa Damascene Aromatherapy | D: This study used a randomized, double-blind, controlled trial. I: Demographic questionnaire, St. Mary's Hospital | - Before the intervention, there were no significant differences between the control and experimental groups. |

| Title | Method | Results |
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| on Anxiety and Sleep Quality in Cardiac Patients (RCT) (Jodaki et al., 2021) | Sleep Questionnaire (SMHSQ) for sleep quality, and Speilberger State Trait Anxiety Inventory (STA) to assess anxiety. V: I: Aromatherapy with Rosa damascene (inhalation). D: Sleep quality and anxiety levels. S: 60 patients. A: Normality test using the Kolmogorov-Smirnov test. Data were analyzed using the t-test and chi-square test. | - After 3 nights of intervention (10:00 PM to 6:00 AM), the experimental group showed a significant decrease in anxiety scores ($p = 0.001$) and a significant increase in sleep quality ($p = 0.001$). - Rosa damascene aromatherapy effectively reduces anxiety and improves sleep quality in cardiac patients in the intensive care unit (CCU), and can be used as a complementary therapy. |
| The Effect of Counseling and Sleep Mask Application in Coronary Intensive Care Patients on Sleep Quality and Anxiety: A Randomized Controlled Trial (Kavaklı et al., 2023) | D: Using a Randomized Controlled Trial I: Using a personal information form, the Richards Campbell Sleep Questionnaire (RCSQ) for sleep quality, and the Spielberger State Trait Anxiety Inventory (STAI) for anxiety levels V: Counseling and use of an eye mask while sleeping D: Sleep quality and anxiety levels S: 70 patients A: Normality was tested using the Shapiro-Wilk test, and data were analyzed using the t-test, chi-square test, Mann-Whitney U test, and Wilcoxon signed-rank test | - Before the intervention, there were no significant differences between the control and intervention groups. - After the intervention: - The intervention group had significantly higher sleep quality scores ($p < 0.05$). - Anxiety levels in the intervention group decreased significantly compared to the control group ($p < 0.05$). - Conclusion: The combination of counseling and eye mask use effectively improves sleep quality and reduces anxiety in CICU patients |
| The effects of eye masks and earplugs on sleep quality, anxiety, fear and vital signs in ICU patients (Bahcecioglu Turan et al., 2024) | D: Randomized Controlled Trial I: Pittsburgh Sleep Quality Index (PSQI) → assesses sleep quality, Spielberger State-Trait Anxiety Inventory (STAI) → assesses anxiety, Fear Scale, Demographic Form, Vital Sign Observation Sheet V: I: Use of eye mask and earplugs D: Sleep quality, anxiety and fear levels, vital signs S: 60 patients A: Normality test: Kolmogorov–Smirnov, and Analysis: Independent t-test, Paired t-test, Chi-square test | - The intervention group experienced: - Significant improvement in sleep quality ($p < 0.001$). - Significant decrease in anxiety levels ($p < 0.001$). - Significant decrease in fear levels ($p < 0.001$). - Better stability of vital signs (blood pressure, pulse rate, respiratory rate, body temperature) compared to the control group. - Conclusion: the use of eye masks and earplugs effectively improves sleep quality, reduces anxiety and fear, and helps stabilize vital signs in ICU patients. |
| The Effect of Music and Eye Masks on Sleep Quality and Delirium in Abdominal Surgery Intensive Care Patients (Topal & Sürme, 2025) | D : Penelitian ini menggunakan desain Randomised Controlled Trial (RCT) I : Formulir pasien, Skala Agitasi Sedasi Richmond (RASS), kuesioner Richard D: D : This research uses a Randomized Controlled Trial (RCT) design I: Patient form, Richmond Sedation Agitation Scale (RASS), questionnaire Richard D: This study used a randomized controlled trial (RCT) design. I: Patient forms, Richmond Sedation Agitation Scale (RASS), Richard Campbell Sleep Quality Questionnaire (RCSQ), Delirium Screening Scale (Nu-DESC). V: Independent variables were the use of eye masks and soothing music. Dependent variables included sleep quality and delirium incidence. S: 45 patients, divided into 21 intervention groups and 24 control groups. | A simple intervention (eye masks and 1 hour of soothing music per night) can improve measurable sleep quality and is associated with a reduction in signs of delirium in post-abdominal surgery patients in the ICU. A simple intervention (eye masks and 1 hour of soothing music per night) can improve measurable sleep quality and is associated with a reduction in signs of delirium in post-abdominal surgery patients in the ICU. |

| Title | Method | Results |
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| Effectiveness of Using Eye Masks and Earplugs on Sleep Quality of Patients in Intensive Care Unit (Nazarina & Husna, n.d.) | <p>A: Statistical analysis using chi-square or t-tests to compare sleep quality scores and delirium incidence between groups, as well as regression analysis to assess the contribution of the intervention.</p> <p>D: This study used a quasi-experimental design, with a pre-test and post-test with a non-equivalent control group.</p> <p>I: The instrument used was the Richard Campbell Sleep Questionnaire (RCSQ) to assess sleep quality. The Insomnia Severity Index (ISI) was used for initial screening of insomnia.</p> <p>V: The independent variable was the use of eye masks and earplugs. The dependent variable was the patient's sleep quality.</p> <p>S: The sample size was 68 patients (34 in the intervention group and 34 in the control group).</p> <p>A: The study analysis used an independent t-test to compare differences between group</p> | <p>A simple intervention (eye masks + earplugs) can improve patients' sleep quality without any reported side effects during the intervention period. The difference between the groups after the intervention was statistically significant ($p = 0.000$)</p> |
| The Effect of Light on Sleep Quality and Physiological Parameters in Patients in the Intensive Care Unit (Pamuk & Turan, 2022) | <p>D: Experimental and Randomized Controlled Trial (RCT)</p> <p>I: Numeric Rating Scale (NRS) to assess pain level, Glasgow Coma Scale (GCS) to assess patient consciousness, Richmond Agitation Sedation Scale (RASS) to assess sedation and agitation levels, Actiwatch Device (Philips Respironics) as an objective tool to measure deep sleep duration, light sleep duration, total sleep duration, circadian activity, and lighting. Physiological parameter recording forms (blood pressure, pulse, respiratory rate, body temperature) were used.</p> <p>V: Independent variable: lighting system (natural cyclic vs. standard ICU lighting). Dependent Variables: Sleep Quality and Physiological Parameters</p> <p>S: 148 patients (74 in the experimental group and 74 in the control group)</p> <p>A: Statistical analysis using the independent t-test or Wilcoxon test for paired data, and the Mann-Whitney U test for non-parametric data.</p> | <ul style="list-style-type: none"> - Sleep Quality: The average deep sleep, light sleep, and total sleep in the cyclic lighting group were significantly higher than in the control group ($p < 0.05$). - Physiological Parameters: There were no significant differences between the groups in blood pressure, heart rate, or body temperature ($p > 0.05$). |

Effectiveness of Non-pharmacological Interventions

Non-pharmacological interventions have been shown to be effective in improving the sleep quality of critically ill patients in the ICU who are fully conscious or comatose, particularly when combined interventions are implemented as a bundle rather than as a partial intervention. Implementing a sleep promotion protocol that includes reducing noise levels, adjusting room lighting, minimizing nursing interventions at night, educating nurses, and providing eye masks and earplugs has increased sleep quality scores on the RCSQ from 51.4 to 68.4 (Topcu & Tosun, 2022b). In an evidence-based intervention study, total sleep duration increased, deep sleep increased, and the number of awakenings decreased from 6.09 to 3.98. Moderate to significant effects were seen in patients admitted to the ICU for more than one night. Additional therapies such as back massage, aromatherapy, and Mozart's classical music also significantly improved sleep quality, based on scores obtained from the PSQI and VSH questionnaires (Imardiani et al., 2021; Topcu & Tosun, 2022b; Waladani & Suwaryo, 2023; Zhang et al., 2024).

Impact on Delirium

Non-pharmacological bundle interventions reduced the incidence of delirium by 15% compared to standard protocols (from 60% to 45%). Another study using sleep bundles showed a reduction in delirium prevalence, duration, and severity in ICU patients. Sleep bundle efforts, which involve environmental and nursing intervention management, are effective when consistently implemented

for at least 3 days (Alegria et al., 2023; Topcu & Tosun, 2022b).

Psychological and Physiological Impacts

Sleep disturbances in the ICU have psychological (anxiety/depression) and physiological (blood pressure, circadian rhythm, hormonal) impacts. However, hypnosis music and back massage can significantly reduce anxiety on the third day of intervention. This is evidenced by the decrease in HADS anxiety scores, although the effect on depression is inconsistent (Imardiani et al., 2021; Waladani & Suwaryo, 2023; Zhang et al., 2024).

Holistic Approach

An evidence-based nursing approach to sleep bundle interventions in the ICU should involve environmental modifications, including reducing noise and light intensity, minimizing interruptions to nursing care, providing relaxation interventions such as music therapy, aromatherapy, and massage therapy, and providing personalized psychological education to patients. Where optimal effectiveness can be achieved if the approach is holistic, focusing on the clinical, psychological, and spiritual aspects of the patient's needs (Topcu & Tosun, 2022b; Waladani & Suwaryo, 2023; Zhang et al., 2024).

DISCUSSION

Environmental Influence on Sleep Quality

ICU equipment noise, interactions between nurses and other staff, and exposure to nighttime light are major factors in disrupting sleep in ICU patients. In this context, the sleep bundle protocol intervention is expected to reduce noise by up to 8 dB and improve subjective sleep scores. Measurable environmental changes will be key to the success of the sleep bundle protocol intervention, which aims to improve sleep quality in critically ill patients in the ICU (Topcu & Tosun, 2022b).

Physiological Mechanisms

A person will experience autonomic dysfunction, triggered by sleep deprivation. This impacts the sympathetic nervous system, hormonal disturbances (melatonin and cortisol), a weakened immune system, and metabolic dysfunction. Environmental modification interventions that involve reducing light intensity and reducing sensory disturbances can restore circadian rhythms and body homeostasis in patients (Alegria et al., 2023; Imardiani et al., 2021).

Nursing Impact

A bundle protocol requires sound training and commitment from ICU nursing staff, ensuring that interventions focus not only on the patient's physical aspects but also on their psychological and spiritual well-being. Nursing interventions at night should be minimized. Non-urgent interventions can be moved to the hours before the patient needs to fall asleep, i.e., before 11:00 PM, as this prioritizes the patient's need for rest (Topcu & Tosun, 2022b; Zhang et al., 2024).

Comparison of Effectiveness

The review above shows that studies implementing multiple interventions (bundles) are more effective than single interventions. Interventions that combine classical music therapy, massage therapy, aromatherapy, eye masks, and earplugs have been shown to have a greater effect on improving sleep quality, anxiety, and delirium in critically ill patients than those interventions administered separately. The sleep bundle protocol is also more cost-effective and easier to implement in critically ill patients in the ICU in various settings (Imardiani et al., 2021; Topcu & Tosun, 2022b; Waladani & Suwaryo, 2023; Zhang et al., 2024).

Additional Psychological Interventions

In the literature review, researchers also discussed the effectiveness of additional non-

pharmacological interventions. These additional interventions include counseling therapy and psychological education with a person-centered approach, which can increase patient motivation, reduce anxiety, and improve sleep quality, especially when combined with musical relaxation interventions, aromatherapy, and massage therapy (Imardiani et al., 2021; Kavaklı et al., 2023; Waladani & Suwaryo, 2023).

CONCLUSION

Based on the results of the systematic review synthesis on the effectiveness of non-pharmacological interventions on sleep quality in critically ill patients in the ICU, the following conclusions can be drawn a combination of evidence-based interventions, including noise reduction, nighttime lighting, minimizing nursing interventions, eye masks, earplugs, music therapy, aromatherapy, back massage, and counseling, has been shown to effectively improve sleep quality in critically ill patients and reduce the incidence of delirium and anxiety disorders in critically ill patients in the ICU. The most significant effects were seen in ICU patients with more than one night's stay. Implementation of these evidence-based interventions is easy, safe, cost-effective, and can be used as a standard practice for modern intensive care nursing.

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