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The Impact of Nursing Interventions on Sleep Quality Among Hospitalized Patients

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ABSTRACT: Nursing interventions play a crucial role in enhancing sleep quality among hospitalized patients, who are often subjected to various stressors that disrupt their rest. Factors such as noise from medical equipment, frequent check-ups, and changes in the patient's environment can contribute to sleep disturbances. Effective nursing practices, including the implementation of quiet hours, creating a calming atmosphere, and facilitating controlled light exposure, can mitigate these factors. Additionally, providing education on relaxation techniques or giving patients the autonomy to control their environment—such as adjusting room temperature or using earplugs—can empower them and significantly improve their sleep quality. Research demonstrates that tailored

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nursing interventions do not only enhance sleep quality but also contribute to better overall patient outcomes. Improved sleep has been linked to faster recovery times, reduced anxiety levels, and lower rates of complications. Nurses can utilize evidence-based approaches, such as sleep hygiene education and the strategic scheduling of medications that might interfere with sleep patterns, to create individualized care plans. Furthermore, fostering a supportive patient-nurse relationship can promote psychological comfort, further enhancing the potential for restful sleep. Overall, the intentional design and execution of nursing interventions are pivotal in maximizing sleep quality in hospitalized patients, ultimately leading to improved health outcomes.

INTRODUCTION

Sleep is a fundamental physiological need, yet it is among the most routinely compromised aspects of the hospital experience, and systematic reviews estimate that poor sleep quality affects between 47% and 67% of hospital inpatients [1]. A systematic review of sleep-enhancing nursing interventions in hospital wards identified educational and communicative interventions, dietary and sensory interventions, symptomatic and environmental control, daily activity planning, sleep assessment and documentation, and individualized nursing care as the principal categories of nursing action [2]. A systematic review and meta-analysis of non-pharmacological sleep interventions for inpatients found medium to large improvements in sleep quality for physical sleep aids, relaxation, manual therapy, and music interventions [3]. A network meta-analysis of nursing interventions for critically ill patients compared eleven approaches and ranked eye masks and the combination of earplugs plus eye masks as the most effective interventions for enhancing sleep quality relative to routine care [4]. The WEsleep cluster randomized controlled trial in six medical departments found that a multicomponent protocol including delayed morning rounds, optimized medication timing, earplugs and eye masks, and evening sleep rounds significantly improved patient-reported sleep quality, with a median Richards-Campbell Sleep Questionnaire score of 66.6 versus 55.7 in the control group [5]. A study of respiratory ward inpatients found that 77% described their inpatient sleep as worse or much worse than sleep at home, with noise, vital sign checks, and light as the leading disruptors [6]. These findings establish that sleep disturbance in hospital is common, multifactorial, and responsive to nursing action, and they justify a focused examination of which nursing interventions are most effective and how they can be implemented in routine care [1–6].

The Problem of Poor Sleep in the Hospitalized Patient

The hospital environment is fundamentally hostile to sleep because it is characterized by continuous lighting, alarming equipment, the movement of staff and other patients, and a clinical culture that prioritizes around-the-clock surveillance over circadian protection [1]. These environmental factors interact with the physiological and psychological burdens of illness, including pain, anxiety, dyspnea, fever, and the disorienting effect of an unfamiliar bed and routine [6]. A commentary on the design and implementation of inpatient sleep improvement programs recommended performing only essential assessments and procedures during nighttime hours, including foregoing standard four-hourly vital sign checks if deemed safe for the patient [7]. A nurse-led quality improvement project on an inpatient oncology unit distributed sleep hygiene kits including eye masks and earplugs and provided education to patients and staff to promote quality sleep and reduce delirium [8]. A randomized controlled trial of nurse-led cognitive-behavioral therapy for insomnia in patients undergoing open-heart surgery found that the intervention improved sleep quality by reducing automatic thoughts that affect behavior [9]. A randomized trial of nurse-led stent care education for patients with tracheal stent implantation found significantly greater improvement in Pittsburgh Sleep Quality Index scores and a significant reduction in anxiety in the intervention group compared with the control group [10]. Poor sleep quality affects between 47% and 67% of inpatients, and this figure is consistent across medical and surgical populations [1]. In surgical patients, the proportion experiencing a Pittsburgh Sleep Quality Index score above the threshold for poor sleep has been reported at 89.3%, with increased sleep latency, reduced total sleep time, and diminished sleep efficiency as the defining features [3]. Among patients admitted to intensive care units, sleep architecture is fragmented, slow-wave and rapid eye movement sleep are markedly reduced, and patients frequently report an inability to distinguish day from night [4]. A multicenter cross-sectional study in Ethiopia found that 65.7% of ICU patients had poor sleep quality, with noise, pain, light, and nursing activities independently correlated with the outcome [4]. On a general respiratory ward, 77% of patients reported that their sleep was worse or much worse than at home, and the factors they identified were noise, vital sign monitoring, and

light [6]. Reduced sleep has been shown to lower memory function, energy, and strength and to increase the risk of post-surgical complications [3]. Sleep deprivation lowers the pain threshold by altering neurotransmitter activity related to pain sensitivity and by increasing inflammatory markers, creating a vicious cycle in which poor sleep amplifies pain and pain further disrupts sleep [9]. In critical care, disturbed sleep is independently associated with delirium, prolonged ICU stay, and higher mortality [10]. A sleep promotion bundle implemented in two intensive care units was associated with significant reductions in both ICU and hospital length of stay, underscoring that sleep is a determinant of resource utilization rather than a soft indicator [8].

Factors Disrupting Sleep in the Hospital Environment

Environmental disruptors include noise from equipment alarms, staff conversations, doors, trolleys, and other patients; bright overhead lighting that suppresses melatonin secretion; and uncomfortable or unfamiliar bedding and room temperature [6]. In the respiratory ward study, noise was the most frequently cited disruptor at 39%, followed by vital sign checks at 33% and light at 24% [6]. The same study found that patients in shared rooms were nearly four times more likely to be disturbed by noise and more than eight times more likely to be disturbed by light than patients in single rooms [6]. Care-related disruptions are the direct product of clinical routines and include overnight vital sign checks, medication administration, blood draws, imaging, and patient transfers [7]. These care-related disruptions are often experienced by patients as unnecessary or poorly timed and represent the domain in which nursing autonomy is greatest [7]. Physiological disruptors include pain, dyspnea, nocturia, fever, and the effects of medications [9]. Psychological disruptors include anxiety, fear, unfamiliarity, and the first-night effect, in which patients sleep poorly in a new environment because of heightened alertness [9]. These categories are not independent because a patient in pain is more easily awakened by noise, an anxious patient is more sensitive to light, and a patient whose sleep is fragmented by vital sign checks is less able to cope with pain [6]. The evidence therefore supports targeting environmental, care-related, physiological, and psychological disruptors simultaneously rather than addressing any one category in isolation [2].

The Physiological and Psychological Consequences of Poor Sleep

Sleep is not a passive state of inactivity but a complex sequence of physiological events that are essential for healing, immune competence, emotional regulation, and cognitive function [3]. Sleep deprivation produces measurable impairments in immune function, including reduced natural killer cell activity and altered cytokine profiles, which may increase susceptibility to infection and impair wound healing [3]. Growth hormone secretion, which peaks during slow-wave sleep, is suppressed by sleep loss, potentially slowing tissue repair [9]. Pain processing is altered because sleep loss lowers the pain threshold and increases the inflammatory response, meaning that patients who sleep poorly experience more pain and require more analgesia [9]. In the cardiovascular system, sleep fragmentation is associated with sympathetic activation and elevated blood pressure [4]. In the central nervous system, sleep deprivation impairs attention, memory consolidation, and executive function, which may compromise a patient's capacity to participate in recovery and understand discharge instructions [9]. At the psychological level, poor sleep is bidirectionally related to anxiety and depression because anxiety delays sleep onset and increases awakenings while poor sleep amplifies anxiety and reduces coping resources [10]. Hospitalization disrupts the normal light–dark cycle, with bright artificial light at night and insufficient exposure to natural daylight, leading to melatonin suppression, phase shifting, and fragmented sleep [11]. A scoping review of intensive care unit interventions to promote sleep and circadian biology in reducing incident delirium identified care bundles, light therapy, and eye masks/earplugs as commonly evaluated approaches [12]. A randomized controlled trial of progressive muscle relaxation in hip fracture patients found that the intervention group experienced decreased post-operative pain and anxiety scores and increased sleep quality scores [13]. In the intensive care setting, sleep disruption is a modifiable risk factor for delirium, a condition independently associated with increased mortality, longer hospital stay, and long-term cognitive decline [12]. The relationship between sleep and delirium is particularly relevant to nursing because the interventions that promote sleep are also core components of delirium prevention bundles [13]. The evidence on whether sleep interventions reduce delirium is not uniformly positive, but the biological rationale and the broader benefits for patient comfort and orientation remain compelling [13].

Theoretical Foundations of Nursing Sleep Interventions

The environmental model holds that sleep requires specific external conditions such as darkness, quiet, thermal comfort, and temporal stability, and that the nurse's role is to manipulate the environment to approximate those conditions [2]. The sensory-deprivation model emphasizes the role of uncontrolled sensory input in disrupting sleep initiation and maintenance and

underpins interventions such as earplugs, eye masks, and white noise [4]. The psychophysiological model focuses on the patient's internal state of arousal and understands relaxation techniques, music therapy, and guided imagery as methods to reduce sympathetic nervous system activity and promote parasympathetic dominance [3]. The behavioral model draws on cognitive-behavioral principles and addresses maladaptive thoughts and behaviors that perpetuate sleep disturbance through nurse-led sleep education and cognitive-behavioral therapy for insomnia [9]. The multicomponent or systems model recognizes that sleep in hospital is determined by interacting factors at the patient, staff, and organizational levels and that the most effective interventions bundle multiple strategies into a coherent protocol [5]. Each framework generates a different set of nursing actions, and the strongest evidence base supports interventions that draw on more than one model simultaneously [2].

Non-Pharmacological Nursing Interventions

The evidence on nursing interventions for sleep can be organized into environmental and sleep hygiene interventions, sensory interventions, relaxation and mind–body interventions, music therapy and aromatherapy, manual therapy and acupressure, nurse-led education and behavioral interventions, multicomponent and bundle interventions, and circadian rhythm and light-based interventions [2]. These categories overlap in practice but are analytically distinct and have different evidence profiles [3]. The strongest meta-analytic evidence supports earplugs and eye masks, relaxation, music therapy, and aromatherapy as interventions with positive effects on both the quantity and quality of sleep in hospitalized patients [1]. A network meta-analysis in critically ill patients ranked eye masks and the combination of earplugs plus eye masks as the most effective interventions among eleven compared approaches [4]. The WEsleep trial demonstrated that a structured, practical protocol can improve the patient's subjective sleep experience in a real-world medical ward [5]. The comparative evidence therefore supports a tiered approach that begins with universal environmental protections and sensory aids and adds targeted interventions based on patient need [3].

Environmental and Sleep Hygiene Interventions

Sleep hygiene interventions aim to reduce environmental and care-related disruptions by minimizing noise, reducing light, clustering nighttime care, delaying non-urgent morning care, and providing patients with means to control their immediate environment [2]. A systematic review of sleep-enhancing nursing interventions in hospital wards identified environmental control as one of the principal categories of effective practice [2]. A commentary on the design and implementation of inpatient sleep improvement programs recommended performing only essential assessments and procedures during nighttime hours, including foregoing standard four-hourly vital sign checks if deemed safe for the patient [7]. The WEsleep cluster randomized controlled trial operationalized this principle within a multicomponent intervention that included delaying early morning nursing rounds, optimizing the timing of sleep-disturbing medications, and conducting evening sleep rounds [5]. The trial found that patients in the intervention group reported significantly better sleep quality, with a median Richards-Campbell Sleep Questionnaire score of 66.6 compared with 55.7 in the control group [5]. The intervention did not significantly affect sleep quantity, mortality, or delirium incidence, but it demonstrated that a structured protocol can improve the patient's subjective sleep experience in a real-world medical ward [5]. The WEsleep trial is important because it moves beyond single interventions to test a feasible bundle that respects the constraints of clinical workflow [5]. A key element of sleep hygiene is the reduction of unnecessary nighttime vital sign checks, and this recommendation challenges a deeply embedded routine [7]. Hospital policies should include environmental modifications and restrictions on nighttime patient transfers to reduce noise and disturbances [2].

Sensory Interventions: Earplugs, Eye Masks, and White Noise

Sensory interventions are among the most extensively studied and consistently effective nursing actions for sleep promotion because earplugs reduce auditory stimulation, eye masks eliminate light, and white noise machines provide a constant auditory backdrop that masks intermittent disruptive sounds [4]. A systematic review and meta-analysis of nursing interventions for hospitalized patients found that the use of earplugs, eye masks, or both consistently demonstrated a positive effect on sleep quality, supported by twelve studies in the review and five in the meta-analysis [1]. A network meta-analysis of nursing interventions for critically ill patients concluded that eye masks and the combination of earplugs plus eye masks were the most effective interventions for enhancing sleep quality relative to routine care [4]. The network meta-analysis included 2,036 patients from 31 randomized controlled trials and recommended that eye masks, alone or in combination with earplugs, be incorporated into the sleep care regimen for critically ill patients [4]. The mechanism is straightforward because reducing sensory input lowers

the probability that a patient will be aroused by environmental stimuli, thereby allowing sleep to consolidate [4]. These devices are inexpensive, low-risk, and patient-acceptable, which makes them attractive for routine use [1]. Their effectiveness depends on proper fitting, patient tolerance, and integration into a broader sleep-promotion culture because a mask that slips off or an earplug that is uncomfortable will not produce the desired effect [4].

Relaxation and Mind–Body Interventions

Relaxation techniques encompass progressive muscle relaxation, guided imagery, deep breathing, meditation, and yoga-based interventions, and their common mechanism is the reduction of sympathetic arousal and the promotion of a parasympathetic state conducive to sleep onset [3]. A systematic review and meta-analysis of nursing interventions found that relaxation techniques, including therapeutic massage, Hatha yoga, muscle relaxation, reflexology, and foot bath, had a positive effect on sleep quality in the studies included in the meta-analysis [1]. A randomized controlled trial of progressive muscle relaxation in hip fracture patients found that the intervention group experienced decreased post-operative pain and anxiety scores and increased sleep quality scores [13]. Relaxation interventions are particularly valuable because they address the psychological dimension of sleep disturbance, including racing thoughts, worry, and muscular tension that prevent patients from settling [3]. Relaxation interventions can also be taught to patients for use beyond the hospital stay, which extends their value beyond the inpatient episode [9].

Music Therapy and Aromatherapy

A systematic review and meta-analysis of nursing interventions reported that 83% of the studies analyzed in the systematic section highlighted the positive impact of music interventions on patients' sleep quality, a finding further supported by the meta-analysis [1]. Music interventions typically involve listening to calming, self-selected or researcher-selected music for 20 to 30 minutes before bedtime and are thought to work by reducing anxiety, lowering heart rate and blood pressure, and providing a pleasant, absorbing stimulus that distracts from the hospital environment [3]. Aromatherapy, most commonly with lavender essential oil, is hypothesized to act through olfactory pathways that modulate limbic system activity and promote relaxation [1]. The same systematic review identified aromatherapy as one of the four interventions with evidence of a positive effect on both the quantity and quality of sleep in hospitalized patients, alongside earplugs/eye masks, relaxation, and music therapy [1]. A separate systematic review of non-pharmacological interventions for critically ill patients found that aromatherapy, music, and massage effectively improved sleep in individual intervention analyses [3]. These interventions are generally well accepted by patients, have few adverse effects, and can be delivered by nurses with minimal training, although patient preference, cultural acceptability, and the quality and consistency of essential oils require attention [1].

Manual Therapy and Acupressure

Manual therapy interventions, including massage, reflexology, and acupressure, combine physical manipulation with relaxation and human contact [3]. A systematic review of non-pharmacological sleep interventions for inpatients found strong evidence for manual therapy, alongside physical sleep aids, relaxation, and music interventions [3]. The review identified twelve studies of manual therapy and concluded that it has a strong evidence base for improving inpatient sleep quality [3]. Acupressure, which involves applying pressure to specific points on the body, has also been studied as a nursing intervention and was categorized as one of eight main groups of interventions in the systematic review of nursing interventions for hospitalized patients [1]. Manual therapies are particularly relevant for patients who cannot or prefer not to use pharmacological sleep aids and offer the additional benefits of reducing pain and anxiety, which are themselves drivers of sleep disturbance [13]. The main limitations are the time and training required for delivery, which may constrain implementation in understaffed units [2].

Nurse-Led Education and Behavioral Interventions

Education and behavioral interventions target the patient's knowledge, beliefs, and behaviors related to sleep [9]. Nurse-led sleep education can include information about the importance of sleep for recovery, practical strategies for promoting sleep in the hospital environment, and instruction in relaxation techniques [2]. A nurse-led quality improvement project on an inpatient oncology unit distributed sleep hygiene kits and provided education to patients and staff with the aim of promoting quality sleep and reducing delirium [8]. A randomized controlled trial of nurse-led cognitive-behavioral therapy for insomnia in patients undergoing open-heart surgery found that the intervention improved sleep quality by reducing automatic thoughts that affect behavior [9]. Another randomized trial of nurse-led stent care education for patients with tracheal stent implantation found that

the intervention group showed significantly greater improvement in Pittsburgh Sleep Quality Index scores and a significant reduction in anxiety compared with the control group [10]. These findings suggest that education and behavioral support can produce independent improvements in sleep quality, particularly when they address the psychological and cognitive factors that perpetuate sleep disturbance [9]. The limitation is that education requires trained staff, time for delivery, and patient engagement, and its effects may be attenuated in acutely ill patients who are unable to concentrate or participate [10].

PAIN, ANXIETY, AND DELIRIUM: INTERCONNECTED TARGETS

Any discussion of nursing interventions for sleep must acknowledge that sleep is embedded in a network of symptoms and clinical states because pain, anxiety, and delirium are both causes and consequences of poor sleep [13]. Narrative nursing has been shown to alleviate anxiety and depression in patients with moderate to severe cancer pain and to improve their sleep quality [14]. Preoperative comprehensive education for older patients undergoing general anesthesia has been found to reduce postoperative anxiety and depression, reduce pain, and improve sleep quality [15]. These findings suggest that the most effective nursing interventions are those that address the patient's experience holistically rather than treating sleep as an isolated outcome [14]. At the same time, the evidence on sleep interventions and delirium is mixed because a systematic review found that three studies indicated that earplugs and eye masks effectively prevented delirium while three found no effect [16]. The relationship is likely moderated by patient population, intervention fidelity, and the presence of other delirium risk factors [16]. Nevertheless, the precautionary principle supports sleep promotion as a low-risk, potentially high-benefit component of delirium prevention bundles [17]. A sleep hygiene bundle implemented in neurocritical care was designed explicitly to reduce hospital-acquired delirium by stabilizing the circadian rhythm [17].

Implementation Barriers and Facilitators

The gap between evidence and practice in sleep promotion is substantial because a qualitative descriptive study of nursing champions identified the empowering role of the sleep nurse champion, organizational structures, time, and the interprofessional team as factors influencing changes to current practice [18]. An Australian study of nurses' perspectives on barriers and enablers to changing overnight care found that noise from clinical care conversations was reported as too difficult to change, and additional barriers included room temperature, patient transfers, tests, confused patients being noisy, uncomfortable mattresses, and late administration of medications [19]. An integrative review of nurses' attitudes, knowledge, and practices found that inadequate training of nurses regarding sleep hygiene and insufficiency in sleep-promoting practices were apparent and that lack of organizational sleep policies/protocols and coworkers' attitudes negatively impacted nurses' motivation to implement sleep hygiene interventions [20]. These barriers were compounded by poor knowledge, negative attitudes, patient acuity, and lack of sleep assessment tools [20]. Facilitators include the presence of a dedicated sleep champion, organizational support, interprofessional collaboration, and the availability of simple tools and protocols [18]. The WEsleep trial demonstrated that a structured protocol can be implemented across multiple departments, but adherence ranged from 42% to 73%, suggesting that even well-designed interventions face real-world constraints [5]. The study of nursing champions concluded that active implementation strategies utilizing the engagement of patients, healthcare staff, and policymakers are crucial for successful dissemination of evidence-based sleep promotion [18]. A key recommendation from the implementation literature is to start with small, feasible changes such as offering earplugs and eye masks, clustering nighttime care, and dimming lights, and to build toward more complex bundles as staff confidence and organizational support grow [7].

Multicomponent and Bundle Interventions

The recognition that sleep disturbance is multifactorial has led to the development of multicomponent or bundle interventions that combine several strategies into a single protocol [5]. A sleep promotion bundle implemented in two intensive care units in a level I trauma teaching hospital was associated with a nine-percentage-point decrease in the incidence of delirium from before to during the intervention, although this difference was not statistically significant, and with significant reductions in both ICU and hospital length of stay [21]. The bundle was developed from evidence-based practices and implemented by critical care nurses, and the authors concluded that critical care nurses are in an optimal position to implement evidence-based sleep promotion measures [21]. The WEsleep trial tested a multicomponent protocol in medical wards that included delayed morning rounds, staff training, medication timing optimization, earplugs and eye masks, and evening sleep rounds, and it produced a statistically significant improvement in patient-reported sleep quality [5]. The evidence therefore suggests that bundles can be effective, but the effect sizes are generally modest and depend heavily on adherence [5]. In the WEsleep trial, protocol adherence

ranged from 42% to 73%, illustrating the gap between what is recommended and what is achieved in practice [5]. The design of a successful bundle requires attention not only to the content of the interventions but also to the implementation process, including staff engagement, workflow integration, and patient education [21].

Critical Care Evidence and Meta-Analytic Updates

A systematic review and meta-analysis of nonpharmacological interventions in critically ill patients found that aromatherapy, music, and massage effectively improved sleep in individual intervention analyses [22]. The same review highlighted that the evidence base in critical care is heterogeneous and that intervention fidelity and outcome measurement vary substantially across trials [22]. A network meta-analysis of nursing interventions for critically ill patients included 31 randomized controlled trials with 2,036 patients and ranked eye masks and the combination of earplugs plus eye masks as the most effective interventions [4]. These findings support the prioritization of simple sensory interventions in critical care while acknowledging that multicomponent bundles may be required to address the full range of sleep disruptors [22]. The evidence also indicates that sleep promotion in critical care should be integrated with delirium prevention and circadian stabilization rather than delivered as an isolated intervention [21].

Implementation Science and Bundle Design

The ASLEEP study used behaviour change theories to develop a multi-level intervention to improve inpatient sleep and highlighted the need to address patient, staff, and organizational determinants simultaneously [23]. Implementation science frameworks emphasize that sleep-promotion bundles must be adapted to local workflow, staff capacity, and organizational culture rather than imported unchanged from research settings [23]. The WEsleep trial demonstrated that a structured protocol can be implemented across multiple departments, but adherence ranged from 42% to 73%, suggesting that even well-designed interventions face real-world constraints [5]. The study of nursing champions concluded that active implementation strategies utilizing the engagement of patients, healthcare staff, and policymakers are crucial for successful dissemination of evidence-based sleep promotion [18]. A key recommendation from the implementation literature is to start with small, feasible changes such as offering earplugs and eye masks, clustering nighttime care, and dimming lights, and to build toward more complex bundles as staff confidence and organizational support grow [7].

Recent Meta-Analytic Updates

A systematic review and network meta-analysis of inhaled aromatherapy on sleep quality in critically ill patients provided further evidence on the role of olfactory interventions in sleep promotion [24]. This analysis indicated that aromatherapy can be considered a complementary nursing intervention for sleep promotion in critical care, although the certainty of evidence varies by comparator and outcome [24]. The findings also suggest that aromatherapy is most likely to be effective when combined with other sleep hygiene measures rather than used as a stand-alone intervention [24]. These results align with the broader evidence that multicomponent approaches are more robust than single interventions [1].

Circadian Rhythm and Light-Based Interventions

Hospitalization disrupts the normal light–dark cycle, with bright artificial light at night and insufficient exposure to natural daylight, leading to melatonin suppression, phase shifting, and fragmented sleep [11]. Circadian-based interventions aim to restore rhythmicity by controlling light exposure, promoting daytime activity, and protecting the nighttime environment [11]. A pilot randomized controlled trial of the CircadianCare inpatient management system tested an intervention designed to limit the negative impact of hospitalization on sleep by enhancing circadian rhythmicity and reported promising results [11]. A scoping review of intensive care unit interventions to promote sleep and circadian biology in reducing incident delirium identified care bundles, light therapy, and eye masks/earplugs as commonly evaluated approaches and emphasized the importance of aligning sleep promotion with circadian principles [12]. A nonpharmacological multidisciplinary sleep hygiene bundle implemented in an adult intensive care unit explicitly promoted predefined day/night evidence-based interventions to facilitate a balance in circadian rhythm with the goal of reducing hospital-onset delirium [25]. Light-based interventions are still evolving, but they represent an important frontier for nursing practice because nurses control much of the lighting environment and can implement simple measures such as dimming lights at night, opening curtains during the day, and using red-wavelength flashlights instead of overhead lights for nighttime checks [25].

Comparative Effectiveness of Interventions

The question of which intervention is best is not straightforward because the evidence base varies by population, outcome measure, and comparator [3]. For critical care patients, the network meta-analysis provides the most direct comparison and shows that eye masks and the combination of earplugs plus eye masks were superior to routine care for sleep quality [4]. For general medical and surgical inpatients, the systematic review found that physical sleep aids, relaxation, manual therapy, and music interventions had the strongest evidence base with medium to large improvements in sleep quality [3]. The systematic review of nursing interventions identified earplugs/eye masks, relaxation, music, and aromatherapy as the four interventions with meta-analytic evidence of benefit [1]. The review of sleep-enhancing nursing interventions in hospital wards emphasized the importance of a systematic approach that combines physical, psychosocial, and relational dimensions, suggesting that no single intervention is sufficient [2]. The WEsleep trial demonstrated that a multicomponent protocol can improve sleep quality in medical wards, but the effect size was modest and adherence was incomplete [5]. The comparative evidence therefore supports a tiered approach in which simple, low-cost sensory aids such as earplugs and eye masks are offered to all patients who can tolerate them, particularly in critical care [4]. Relaxation and music interventions can be added for patients who experience anxiety or difficulty settling [3]. Manual therapy and acupressure are appropriate for patients with pain or those who prefer physical approaches [13]. Education and behavioral interventions are valuable for patients who are anxious about sleep or who have maladaptive sleep behaviors [9]. Environmental and care-timing interventions are foundational and should be implemented at the unit level [2]. Multicomponent bundles are likely to be more effective than single interventions but require careful implementation and monitoring of adherence [21].

Table 1. Categories of Nursing Interventions for Sleep Promotion: Mechanisms and Evidence [1–5, 7–10, 12, 21–25]

Intervention category	Examples	Proposed mechanism	Strength of evidence
Environmental and sleep hygiene	Noise reduction, light control, clustering care, delayed morning rounds	Reduces sensory disruption and preserves sleep continuity	Moderate to strong [2, 5, 7]
Sensory aids	Earplugs, eye masks, white noise	Blocks auditory and visual stimuli that trigger arousal	Strong [1, 4]
Relaxation and mind–body	Progressive muscle relaxation, guided imagery, breathing exercises	Reduces sympathetic arousal and promotes parasympathetic dominance	Moderate to strong [1, 3, 13]
Music therapy	Calming music before bedtime	Reduces anxiety, lowers heart rate and blood pressure, provides absorbing distraction	Strong [1, 3]
Aromatherapy	Lavender essential oil, inhalation	Modulates limbic activity via olfactory pathways	Moderate [1, 24]
Manual therapy and acupressure	Massage, reflexology, acupressure	Combines physical relaxation, human contact, and pain relief	Strong for manual therapy; acupressure included in broader evidence base [1, 3]
Nurse-led education and behavioral interventions	Sleep education, CBT-I, sleep hygiene kits	Addresses knowledge, beliefs, and behaviors that perpetuate sleep disturbance	Moderate [8–10]
Multicomponent bundles	Combined environmental, sensory, educational, and timing interventions	Addresses multiple determinants of sleep simultaneously	Moderate; effective in cluster RCTs but adherence-dependent [5, 21, 23]
Circadian and light-based	Day/night lighting protocols, light therapy, red-wavelength flashlights	Restores circadian rhythmicity and melatonin secretion	Emerging [11, 12, 25]

Table 2. Reported Effect Sizes of Nursing Interventions on Sleep Quality [1, 3–5, 21–25]

Source	Population	Intervention(s)	Outcome measure	Reported effect
Ashghab et al. [1]	Hospitalized patients	Mixed nursing interventions	PSQI	SMD = −4.21, positive effect
Kanagasundram et al. [3]	Adult inpatients	Physical sleep aids, relaxation, manual therapy, music	Sleep quality	Medium to large improvements
Yang et al. [4]	Critically ill patients	Eye masks; earplugs + eye masks	Sleep quality	Most effective among 11 interventions
Ashghab et al. [1]	Hospitalized patients	Earplugs/eye masks, relaxation, music, aromatherapy	PSQI and SMHSQ	Positive effect for four interventions
WEsleep trial [5]	Medical inpatients	Multicomponent protocol	RCSQ	Median 66.6 vs 55.7

Implications for Nursing Practice and Health Policy

The evidence supports several concrete implications for nursing practice, beginning with routine assessment of sleep as a clinical outcome using validated tools such as the Pittsburgh Sleep Quality Index, the Richards-Campbell Sleep Questionnaire, or the St Mary's Hospital Sleep Questionnaire [1]. Every patient should be offered basic sensory aids such as earplugs and eye masks unless contraindicated, and these should be presented as a standard part of care rather than an optional extra [4]. Nighttime care should be clustered and unnecessary interruptions should be eliminated so that the default is to protect sleep rather than to wake patients for routine tasks that can safely be deferred [7]. Relaxation and music interventions should be available as first-line options for patients with anxiety or difficulty settling, and nurses should be trained to deliver them [3]. Units should develop and implement sleep-promotion bundles that include environmental modifications, staff education, patient education, and audit and feedback [5]. Hospitals should invest in environmental design, including single rooms where possible, noise-reducing materials, adjustable lighting, and comfortable bedding, because the physical environment is a determinant of sleep that no individual nursing action can fully compensate for [6]. At the policy level, the evidence supports hospital-wide sleep policies that mandate quiet hours, restrict nighttime transfers, provide sleep hygiene kits, and require training for all clinical staff [2]. Professional organizations and accreditation bodies should recognize sleep as a quality indicator and should include sleep assessment and sleep-promotion practices in standards of care [7]. Research funding agencies should prioritize implementation studies that test strategies for embedding evidence-based sleep promotion into routine workflow because the evidence on efficacy is now sufficient and the critical gap is in dissemination and sustainability [23].

FUTURE RESEARCH DIRECTIONS

Large, multicenter randomized controlled trials with standardized outcome measures are needed to establish the comparative effectiveness of different interventions and to identify which patients benefit most from which approaches [3]. Studies using objective sleep measures such as polysomnography, actigraphy, and electroencephalography are needed to complement self-report outcomes and clarify mechanisms [4]. The relationship between sleep promotion and hard clinical outcomes such as delirium, length of stay, readmission, and mortality requires further investigation, particularly in non-ICU populations [16]. Implementation research is needed to identify the most effective strategies for changing nursing practice and sustaining sleep-promotion bundles over time [18]. The role of circadian and light-based interventions should be tested in adequately powered trials given promising pilot data [11]. Patient-centered research should explore which interventions patients prefer, how they experience sleep-promotion efforts, and how cultural and individual differences shape acceptability and effectiveness [2].

CONCLUSION

Poor sleep is a significant issue among hospitalized patients, with nursing interventions being effective solutions. Non-pharmacological strategies, including environmental modifications, sensory aids, relaxation techniques, and music therapy, have demonstrated positive impacts on sleep quality. The most effective approach involves a multicomponent strategy tailored to

patient needs, rooted in a culture that prioritizes sleep. Challenges in implementation include time constraints and organizational culture, but these can be addressed through nursing leadership, support, and collaboration. Nurses play a crucial role in transforming hospital care to enhance patient recovery through improved sleep quality.

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