A regular feature of the *American Journal of Critical Care*, Clinical Evidence Review unveils available scientific evidence to answer questions faced in contemporary clinical practice. It is intended to support, refute, or shed light on health care practices where little evidence exists. To send an eLetter or to contribute to an online discussion about this article, visit www.ajcconline.org and click "Respond to This Article" on either the full-text or PDF view of the article. We welcome letters regarding this feature and encourage the submission of questions for future review.

Using Music to Promote Sleep for Hospitalized Adults

By Rebecca Shaw, RN-BC, BSN, BSW, MA

Adequate sleep is a critical component of illness recovery. Inadequate sleep contributes to a myriad of physiological problems, including impaired immune response, decline in wound healing, greater insulin resistance, increased perceptions of pain, and an increase in mortality. Sleep problems exacerbate the healing process during hospitalization and can endure beyond hospitalization.[1-3] Researchers in one study[4] documented that sleep difficulties may endure beyond hospitalization: 50% of respondents reported moderate to severe sleep problems 1 week after discharge. Other studies have offered evidence that sleep problems experienced during hospitalization increase the risk for development of chronic insomnia.[3]

Acutely ill patients experience difficulty falling asleep, sleep fragmentation, decreased rapid-eye-movement (REM) sleep, and sleep perceived as poor quality.[2,5] In hospitals, many factors can interfere with patients' sleep. Environmental noise (eg, noisy equipment, alarms, staff interaction) is a pervasive problem. The Environmental Protection Agency recommends that noise levels not exceed 45 decibels during the day and 35 decibels at night. Numerous studies in acute and intensive care settings have documented noise levels regularly exceeding the recommendations.[6,7] Other sleep disruption factors include lighting that interferes with sleep-wake cycles, pain, anxiety, and symptoms related to patients' underlying illness.[4] Many of these sleep-disrupting factors are amplified in intensive care units.

Pharmacological interventions, such as sedatives, are often the first response to promoting sleep in hospitalized patients. However, use of sedatives has been linked to such adverse effects as memory loss, disorientation, increased fall risk, and daytime fatigue.[3] In recent years, growing emphasis has been placed on exploring the effectiveness of nonpharmacological interventions to promote sleep, such as minimizing nighttime disruptions, decreasing noise and light, increasing meaningful daytime activity, and using relaxation techniques (eg, aromatherapy, massage, guided imagery, ear plugs, and eye masks).[3] Music is another previously studied technique for promoting sleep. Music is hypothesized to have psychological and physiological effects on the body, including potentially sleep-promoting influences.[8] The PICO (patient/problem, intervention, comparison, outcomes) question that this review addresses is, What effect do interventions using music, compared with other methods, or usual care, have on promoting sleep in hospitalized adults?

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Methods

The literature search strategy included searching Cochrane Library, Joanna Briggs Institute's Evidence-Based Practice (EBP) Database, PubMed, EMBASE, and CINAHL Plus. Key words included *music*, *sleep*, *hospital**, *lab**, and *patient** (asterisks indicate that truncated versions of those words were used in the literature search). No limitations were placed on publication date so as to identify the largest number of relevant studies possible. Reference lists of identified articles were also searched by hand.

Results

Twenty-eight articles were retrieved by using the search strategy. The following inclusion criteria were then applied: studies involved only adult participants, measured specific sleep outcomes, and were performed in an inpatient setting or sleep laboratory. Studies performed in community settings, such as participants' homes, were excluded because of concerns over inadequate control of the test environment and data validity and reliability. After these criteria were applied, 11 articles were reviewed. Table 1 presents the major findings of these articles.

The majority of studies showed at least 1 positive and statistically significant effect on the sleep-related outcomes that were measured. The studies were conducted in a range of settings, including sleep laboratories, acute care units, and intensive care units. Most studies fell within the B and C levels of evidence according to the American Association of Critical-Care Nurses' evidence-leveling system (Table 2). Two meta-analyses[11,18] are included in this review, and both reported positive significant effects on patients' subjective perceptions of sleep quality.

Table 1
Matrix of studies

Reference	Design, intervention, and sample description	Intervention effects on sleep outcomes		Level of evidence
		Sleep perceptions	Sleep quality	
Chang et al[9]	Randomized controlled trial Music only Volunteers with chronic insomnia in hospital-based sleep laboratory (N=50)	+ Feeling rested after sleep 0 Total sleep time 0 Sleep onset latency 0 Number of awakenings	+ Shortened stage 2 sleep + Longer REM sleep 0 Total sleep time 0 Sleep onset latency 0 Sleep efficiency 0 Stages 1, 3, and 4 sleep duration 0 Intrasleep awakenings 0 Arousal index	C
Chen et al[10]	Randomized controlled trial Music only Healthy volunteers in sleep laboratory (N=24)		+ Reduced stage 2 sleep in baseline short and long sleep latency groups + Participants with baseline longer sleep latencies spent a larger percentage of sleep time in sleep stages 3 and 4 0 Duration of stage 1, stage 3, or REM sleep	C
de Niet et al[11]	Meta-analysis Music only Volunteers with primary sleep complaints with and without comorbid conditions (N=5 randomized controlled trials)	+	+	A
de Niet et al[12]	Pre-post, quasi-experimental (nonrandomized) Music-assisted relaxation vs cognitive behavioral therapy vs sleep hygiene education Inpatient psychiatric unit patients (N=171)	Condition: + Music-assisted relaxation 0 Cognitive behavioral therapy 0 Sleep hygiene		B
Kamdar et al[13]	Observational, pre-post quasi-experimental (nonrandomized) Multiphase intervention: stage 1—daytime/nighttime environment modifications; stage 2—earplugs, eye masks, soothing music; stage 3—pharmacological sleep aids Intensive care unit (N=300)	0		C
Lazic and Ogilvie[14]	Pre-post test (nonrandomized) Music vs audio tones Healthy volunteers in sleep laboratory (N=10)	+ Sleep onset latency	0 Sleep onset latency 0 Sleep efficiency 0 Wake after sleep onset 0 Percent time spent awake, in stages 1, 2, 3, 4, and REM	C
Levin[15]	Quasi-experimental, pretest/posttest Brain music vs placebo brain music Adults with insomnia, setting unknown (N=58)	+ Sleep onset latency + Duration of sleep + Intrasleep awakenings + Sleep quality	+ Sleep duration + Sleep onset + Intrasleep awakenings + Sleep cycles completed + Reduced movements per hour of sleep + Time spent in delta sleep + Time spent in REM sleep	B
Ryu et al[16]	Randomized controlled trial Music vs ear plugs Percutaneous transluminal coronary angiography patients in cardiac care unit (N=58)	+ Total sleep time	+	B

Table 1
Continued

Reference	Design, intervention, and sample description	Intervention effects on sleep outcomes: Sleep perceptions	Intervention effects on sleep outcomes: Sleep quality	Level of evidence
Su et al[17]	Randomized controlled trial Music only Patients in medical intensive care unit (N = 28)	+ Sleep quality + Shorter time spent in stage 2 + Longer time spent in stage 3	0 Total sleep time 0 Sleep onset latency 0 Sleep efficiency 0 Time in stage 1	C
Wang et al[18]	Meta-analysis Music only Volunteers with acute and chronic sleep disorders (N = 10 randomized controlled trials, 557 participants)	+ Sleep quality + Similar effects for patients with acute and chronic sleep disorders		A
Zimmerman et al[19]	Repeated measures experiment (randomized) Music, music video Postoperative CABG patients in acute care unit (N = 96)	0 Total sleep time comparing music with resting period group + Total sleep time (comparing music video with resting period group)		C

Abbreviations: CABG, coronary artery bypass graft; REM, rapid eye movement.
Key: + = beneficial impact from music ($P < .05$); 0 = no, or negative impact from music ($P > .05$).

Sleep outcomes were measured by using a variety of methods. Sleep perceptions were measured through subjective self-reported validated tools, primarily the Richards-Campbell Sleep Questionnaire (RCSQ) and the Pittsburgh Sleep Quality Index (PSQI).[21,22] The RCSQ subjectively measures 5 domains of sleep quality: sleep depth, falling asleep, awakening, returning to sleep, and quality of sleep. The PSQI includes 19 subjective questions about perceptions of sleep quality in the past month. Aspects of sleep quality were measured through tools that provided quantitative physiological data, primarily polysomnography. Polysomnography uses a combination of electroencephalography, electromyography, and electrooculography to provide objective data on measures including total sleep time, sleep onset latency, nighttime awakenings, and percentage of time spent in sleep stages 1 through 4 and REM sleep.

Subjective perceptions of sleep were more commonly used in these studies, but results for both subjective and objective measures tended to trend in the same direction. In only 2 studies where both subjective and objective measures were used, findings of positive significant effects on all subjective sleep perceptions were not supported by statistically significant results for objective measures.[14,17]

Recommendations for Practice

Despite mixed results and methodological concerns (eg, high reliance on self-reported data, large variation in observation period and experimental setting), the evidence supports the potential value of music in promoting sleep. To implement music as a sleep-promotion tool in hospitals, several questions must be considered; first of all, what music should be played.

Most of the studies reviewed used music with soothing or sedating qualities. Commonly agreed upon characteristics of this type of music are a tempo of 60 to 80 beats per minute, no dramatic changes in volume and rhythm, and played at a volume of 30 to 40 decibels.[10,17] Preferences for the music played may be a more important factor than specific characteristics of the music.[11] Chang and colleagues[9] reported that when study participants

Table 2
American Association of Critical-Care Nurses evidence-leveling system[a]

Level	Description
A	Meta-analysis of multiple controlled studies or metasynthesis of qualitative studies with results that consistently support a specific action, intervention, or treatment
B	Well-designed controlled studies, both randomized and nonrandomized, with results that consistently support a specific action, intervention, or treatment
C	Qualitative studies, descriptive or correlational studies, integrative reviews, systematic reviews, or randomized controlled trials with inconsistent results
D	Peer-reviewed professional organizational standards, with clinical studies to support recommendations
E	Theory-based evidence from expert opinion or multiple case reports
M	Manufacturer's recommendation only

[a]From Armola et al,[20] with permission.

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listening to music selected by researchers were compared with study participants who listened to their own preferred music, no difference in sleep quality was apparent between these groups. Therefore, any type of music, as long as it is preferred by the listener, may promote sleep.

A second question to consider is how to deliver the music to patients. The infrastructure to broadcast music in patients' rooms already exists in many hospitals through closed circuit television systems with channels devoted to playing different music genres. In these cases, providing music to assist patients to sleep would not involve additional cost. Considerations would need to be made for patients in semiprivate rooms to provide headphones. Also, it would be necessary to be able to turn off, or cover, the television screen so the light would not interfere with sleep. If this amenity is not available, Chlan and Tracy[8] offer guidance for developing a library of music to be played on portable music players.

The studies reviewed here provided the music through headphones or speakers and primarily through portable music players. When music is provided via these methods, infection control issues must be addressed. For example, disposable headphones might need to be purchased, and methods for disinfecting portable music players must be established.

A sleep assessment should be used in conjunction with any sleep-promoting intervention. Conducting a sleep assessment at admission allows providers to identify underlying sleep disorders and gather information about a patient's preferences for his or her sleeping environment, bedtime routines (eg, typical sleep-wake times), and use of pharmacological sleep aids.[23]

Providing music to hospitalized patients is potentially inexpensive and feasible to implement across a variety of hospital settings. Additionally, no evidence of negative side effects for this practice have been reported. Although the researchers in the studies reviewed here all acknowledge some limitations to generalizability and strength of evidence, adequate evidence exists to continue pursuing music as a possible effective intervention for promoting sleep.

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FINANCIAL DISCLOSURES

None reported.

eLetters

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