Published in final edited form as:

Sleep Med Clin. 2018 March ; 13(1): 127–135. doi:10.1016/j.jsmc.2017.09.012.

Sleep in Hospitalized Older Adults

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SYNOPSIS

Hospitalization is a period of acute sleep deprivation for older adults due to environmental, medical and patient factors. Although hospitalized patients are in need of adequate rest and recovery during acute illness, older patients face unique risks due to acute sleep loss during hospitalization. Sleep loss in the hospital is associated with worse health outcomes, including cardio-metabolic derangements and increased risk of delirium. Because older patients are at risk of polypharmacy and medication side effects, a variety of nonpharmacological interventions are recommended first to improve sleep loss for hospitalized older adults.

Keywords

Sleep; hospitalized adults; geriatrics; older adults; patients; hospitals

INTRODUCTION

Nearly 70 million Americans suffer from a chronic disorder of sleep, which adversely affects their health.¹ The National Academy of Medicine estimates that hundreds of billions of dollars per year are spent caring for patients with sleep disorders. For example, 1 in 5 of all injuries due to serious car crashes are due to drowsy driving.² Despite this, most people with underlying sleep disorders remain undiagnosed. Awareness of diagnoses and treatment of sleep disorders among health care professionals and the public remain very low.

Sadly, the patients most at risk for poor, non-restorative sleep are often acutely ill and hospitalized, when they arguably need sleep to recover from their acute illness. Acute sleep loss in the hospital has been associated with poor patient outcomes, including cardio-metabolic effects such as high blood pressure and hyperglycemia, as well as delirium.³ For

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DISCLOSURE STATEMENT

The authors have no relevant disclosures related to this article.

instance, Krumholz coined the term “post-hospital syndrome” to highlight the increased risk of readmission for the nearly 3 million hospitalized seniors for diseases unrelated to the index admission.⁴ While studies of long-term consequences of acute sleep loss of hospitalization are lacking, in-hospital sleep loss has been implicated as a potential mediator of post-hospital syndrome.

Prior research has demonstrated that sleep loss is associated with worse cardiometabolic outcomes in the hospital⁵, that hospitalization is a period of acute sleep loss which does not recover in the week after discharge⁶, and that 40% of medical patients without a known sleep disorder are actually at high risk for sleep-disordered breathing.⁷ Therefore, the hospital setting is a missed opportunity to optimize the sleep environment for better sleep in hospital and post-discharge, but also to improve diagnosis and treatment of previously unrecognized sleep disorders and potentially reduce unnecessary hospital readmissions.⁸

SLEEP LOSS IN OLDER ADULTS

Changes in sleep among healthy older adults are highly relevant when considering disturbed sleep among older adults in the hospital setting. Sleep in older adults is characterized by decreased deep sleep (N3), increased amounts of lighter sleep, more frequent awakenings, less REM sleep and less total sleep time.⁹ In addition, complaints of insomnia are more frequent in older adults. Older patients are also more easily aroused from sleep by environmental stimuli such as noise or light exposure (which is common in the hospital setting). As a result, sleep becomes increasingly fragmented and sleep efficiency decreases. The circadian sleep/wake cycle also frequently advances with age, resulting in a tendency to fall asleep and awaken earlier, and circadian rhythms are more sensitive to disruption in older adults. These changes occur in nearly all older adults independent of any medical or psychiatric pathology.¹⁰ Anxiety, depression, loss of social support, pain, and acute illness can all further contribute to sleep disturbances in older patients.

Given the increasing recognition that sleep disturbance in older patients can be considered as part of a geriatric syndrome¹¹, it is important to optimize sleep in older patients, especially during times of care transitions, such as admission and discharge from the hospital. Unfortunately, obtaining a good night’s sleep in the hospital is often difficult.

HEALTH EFFECTS OF SLEEP LOSS FOR HOSPITALIZED OLDER ADULTS

Although there is a paucity of literature regarding the effects of sleep loss in hospitalized patients, a model of two possible pathways by which sleep loss may impair recovery and function in hospitalized older patients can be proposed (see Figure). First, laboratory and epidemiologic studies provide evidence to suggest that sleep deprivation itself can lead to a variety of intrinsic negative health consequences (e.g., development of delirium, metabolic derangements in blood sugar or blood pressure).^{12,13,14,15} Interestingly, these health consequences that are linked to sleep deprivation (e.g., delirium, hypertension, and hyperglycemia) are also known complications of hospitalization in older patients.^{16,17} In addition, these conditions often are associated with administration of additional medications or higher dosages of existing medications for older people (e.g., antipsychotics for delirium,

insulin for hyperglycemia, or antihypertensives for elevated blood pressure). Furthermore, a significant portion of these medications may be continued after discharge and subsequently result in patient harm.¹⁸ Another possible pathway by which sleep loss can impair recovery in hospitalized older patients is due to fatigue and excessive daytime sleepiness, which may hinder patients' participation in recovery activities (e.g., physical therapy), or could diminish patients' desire and ability to be an active participant in their care (i.e. ask informed questions, understand medication changes, follow-up tests).^{19,20} Understanding this pathway is especially important since diminished daytime physical activity is a known contributor to functional decline, a well-known negative consequence of hospitalization in older adults. In addition, hospitalized older patients who are less empowered and informed regarding their hospital care are more likely to experience readmission.²¹

In addition to these factors, sleep loss has been associated with a variety of important outcomes of relevance for hospitalized older adults as they recover from acute illness. In addition to delirium discussed above, sleep loss has been implicated in other geriatric syndromes, such as falls, that are also prevalent in hospitalized older patients. For example, in one study women with shorter sleep duration or lower sleep efficiency were more likely to suffer from falls in the subsequent year compared to women with normal sleep duration (>7 hours) and sleep efficiency (>70%).²² In addition, sleep loss has also been associated with impaired immune function in animals and healthy humans, which may have implications for hospitalized older adults.²³ For example, scientists have shown that more sleep post-infection yields better survival in fruit flies.²⁴

BARRIERS TO PROPER SLEEP FOR HOSPITALIZED OLDER ADULTS

Obtaining a good night's sleep in the hospital is far from easy. Among the factors that are likely to disrupt sleep are environmental factors (e.g. noise, light disruptions), medical care related factors (e.g., early morning vital signs, phlebotomy), and patient factors (e.g., pain). Patients in a variety of acute care settings report difficulty falling and staying asleep, not feeling rested, increased daytime napping, and a reduction of sleep quality.²⁵

Medical Care Interruptions

Frequent awakenings by care providers represent a significant barrier to sleep in the hospital. Patients who are awakened often may be unable to complete an entire sleep cycle, leading to further deprivation of N3 and REM sleep. Routine nighttime awakenings by care providers are often used to complete tasks needed for clinicians during the day, such as vital signs or blood draws. Interruptions in observational studies of wards and ICUs are so prevalent that patients rarely received 2–3 hours of uninterrupted sleep.^{26,27}

Patient Factors

Issues such as poor health, anxiety, and depression that are often associated with acute and chronic illnesses contribute to sleep disturbances among older inpatients.²⁸ Studies show that poor self-rated health and presence of chronic conditions (e.g., cardiovascular disease, chronic obstructive pulmonary disease, gastroesophageal reflux and arthritis) are associated

with complaints of poor sleep.²⁹ Pain is also frequently reported by inpatients as a major cause of poor sleep and nighttime awakenings.³⁰

Environmental Disruptions

Hospital noise is more than just an annoyance.³¹ The auditory environment should exemplify high and compassionate standards of patient care. Failure to provide patients with quiet rooms affects clinical outcomes through several mechanisms, including increased physiological arousal and stress responses³², medical errors, sleep disruption and interference with speech privacy.³³ Although the United States Environmental Protection Agency recommends a maximum noise level of 45 decibels (dB) throughout the day and 35 dB at night, most hospitals today have noise levels from 50 to 70 dB during the day and an average of 67 dB at night.³⁴ Medicare has recently made patient-reported noise a publicly reported quality measure as part of its Hospital Compare program.³⁵ Unfortunately, this data demonstrates that only 58% of hospitalized Americans report their room as quiet at night, which is the worst performing patient experience measure in the entire Hospital Consumer Assessment of Healthcare Providers and Systems Survey. Further, a study in the intensive care unit (ICU) setting found that 51% of noise was modifiable, with patients reporting staff conversation and television noise as the most irritating disturbances, and interfered with sleep in electroencephalogram recordings.³⁶ In addition, patients in the loudest rooms get significantly less sleep.³⁷ In addition, the absence or reduced amplitude of diurnal light-dark cycles in hospital environments can result in disruption of the circadian regulation of sleep.³⁸ This is especially problematic in ICU settings, where circadian rhythms in patients are particularly abnormal.³⁹

PREVALENCE OF SLEEP DISORDERS AMONG HOSPITALIZED OLDER ADULTS

Hospitalization also represents a 'missed opportunity' to screen patients for sleep disorders. The high prevalence of untreated sleep disorders may often complicate or worsen patients' existing conditions. For example, as many as 80% of patients are apparently at risk for obstructive sleep apnea (OSA) according to a recent small single-institution study which screened patients using the STOP-BANG questionnaire.⁴⁰ Despite this high prevalence, very few had been evaluated with a sleep study, diagnosed with OSA, or were receiving treatment with continuous positive airway pressure (CPAP) therapy, which is known to improve quality of life and reduce complications.^{41,42} The prevalence of insomnia is also high, as a recent study suggested nearly 2 out of every 5 patients screened positive for insomnia.^{43,44} In another study of hospitalized patients, although half of inpatients reported chronic sleep complaints with nearly a third screening positive for insomnia, there was *no mention* of a sleep complaint in the admission record.⁴⁵ To make matters worse, even if sleep disorders are recognized in hospitalized patients, therapy is often suboptimal. For example, in a nationally representative sample of nearly 300,000 discharges of OSA patients from nonfederal acute care hospitals in the United States, only 5.8% of patients were identified as receiving CPAP therapy.⁴⁶ Given that sleep disorders may exacerbate cardiopulmonary health conditions that actually result in hospitalization, such as congestive heart failure or chronic obstructive pulmonary disease, it is critical to recognize that sleep disorders

complicate patient's underlying medical conditions.⁴⁷ For example, patients with OSA who undergo surgery are at greater risk of having postoperative hypoxemia, ICU transfers and longer hospital stays.^{48,49,50} Certain inpatient medical diagnoses, such as acute stroke or heart failure, are associated with a higher prevalence of sleep-disordered breathing.^{51,52,53,54,55,56} Moreover, treatment of OSA with CPAP in patients with post-acute stroke or systolic heart failure improves outcomes.^{57,58,59} The presence of a highly treatable and very prevalent disorder such as SDB in such patients warrants a process for better and earlier recognition and treatment.⁶⁰

Perhaps most concerning is that acute sleep loss in the hospital may be associated with the development of chronic insomnia after discharge, especially among those with pre-existing poor sleep hygiene.⁶¹ This is especially problematic given the association between chronic insomnia and poor long-term health outcomes highlighting the need for early recognition of insomnia.⁶² Lastly, poor self-reported sleep quality predicts one-year mortality among older adults who received inpatient rehabilitation.⁶³ A similar study demonstrated that sleep disturbance as determined by hourly observations of patients in a geriatric hospital were associated with higher mortality at 2 years.⁶⁴

INTERVENTIONS TO IMPROVE SLEEP IN HOSPITALIZED ADULTS

In general, interventions to improve sleep in hospitalized older adults can be classified as pharmacologic or non-pharmacologic interventions. While some patients do request pharmacologic sleep aids, it is generally recommended that nonpharmacologic interventions be the first line of therapy.⁶⁵ In the event a pharmacologic sleep aid is needed, the choice of drug should be customized based on the patient profile to minimize any side effects, especially given the degree of polypharmacy common in hospitalized older adults.

Pharmacologic Interventions

Melatonin—If a pharmacologic sleep aid is deemed necessary, melatonin is well tolerated and considered by some as the first choice to consider in older adults due to its minimal side effect profile, low likelihood of drug-drug interactions, and possibility to improve circadian rhythms.^{66,67} Small randomized studies done with ICU patients, hospitalized patients, and in simulated sleep environments showed improvements in sleep duration (as measured by polysomnography) and sleep quality (as measured by actigraphy) when initiating 1 to 5 mg of melatonin at night.^{68,69,70} Although dosing has not yet been standardized, the typical dose is 1 to 3 mg dispensed between 9pm and 10pm, depending on the sleeping habits of the patient, and should be given 30 minutes prior to the desired bedtime.

Sleep aids—Sleep aid medications are commonly prescribed in the hospital setting, although they are generally not recommended due to concerns about side effects. A retrospective single-center study from 2014 found that, over a 2-month period, 26.2% of patients received a sleep aid, with trazodone being the most commonly prescribed (30.4% of the time).⁷¹ A meta-analysis by Glass et al in 2005 evaluated the risks and benefits of sedative hypnotics in people over age 60, and found a statistically significant improvement in sleep quality and sleep duration with sedative use compared to placebo, although the magnitude of the effect was small, and the risks (including falls and cognitive impairment)

Sleep Med Clin. Author manuscript; available in PMC 2019 March 01.

demonstrated a 28% improvement in self-reported sleep quality in the group which received a soothing music video compared to the control group.⁸⁵

Sleep hygiene program—A RCT by Lareau et al evaluated a nighttime intervention of decreasing light and noise, clustering nursing care, and minimizing unnecessary patient contact, compared to usual care. The intervention was associated with an improvement of sleep quality by 7% and a decrease in the use of sleep aid medications.⁸⁶ Edinger et al evaluated an inpatient sleep hygiene program to usual care for hospitalized psychiatric patients. The intervention included standardization of sleep and wake times, including removal of daytime napping. The intervention was associated with an increase of 18 minutes (5%) of total sleep time, although neither sleep quality nor significance testing was reported.⁸⁷

Bright light therapy—Three small studies evaluated bright light therapy (3,000–5,000 lux) use during daytime hours. Mishima et al exposed patients with dementia in a psychiatric hospital to bright light therapy between 9 and 11 am for 4 weeks, and found an improvement in average total sleep time among intervention patients.⁸⁸ Wakamura et al exposed 7 hospitalized patients to 5 hours of bright light therapy during daytime hours, and noted a 7% increase in total sleep time in the intervention arm.⁸⁹ Twenty-seven Alzheimers patients were exposed to bright light therapy by Yamadera et al, and were noted to have an increase in total night time sleeping.⁹⁰ While these studies all reported an increase in total sleep time after exposure to bright light therapy, the effects are modest and the strength of the evidence is low based on potential bias, along with measurement and reporting inconsistencies.⁹¹

Noise reduction—Several studies assessing modalities for noise reduction in the ICU have been performed. These approaches include use of ear plugs in conjunction with eye masks⁹², use of "white noise" otherwise known as sound masking^{93,94}, and installation of sound proof materials.⁹⁵ The overall quality of evidence with these approaches is also low, and the outcomes used have primarily been subjective sleep measures.⁹⁶

Reducing nighttime interruptions—Two reported studies evaluated the reduction of nighttime nursing interruptions, by altering workflow and reducing patient interactions during typical sleeping hours. These studies suggest that in reducing nighttime interruptions, a reduction in sedatives requested by patients decreases, although sleep duration and quality did not improve.^{97,98} Further studies are needed in this area to best determine how to reduce nighttime patient interactions, so as to improve sleep quality and duration.

Sleep education and empowerment—In a recent randomized trial, non-ICU patients who received sleep-enhancing tools (eye mask, ear plugs, and a white noise machine) plus education reported less fatigue and sleep impairment than those who just received the sleep-enhancing tools alone.⁹⁹

Multifaceted protocols

An example of a multifaceted protocol is the "Somerville" approach, where several components were implemented such as an 8-hour quit time, fewer disruptions for routine

vitals and medications, and noise control. The investigators noted that fewer patients reported sleep disruption from hospital staff and also fewer patients received as-needed sedatives.¹⁰⁰

Assessment and treatment of underlying sleep disorders

Several studies suggest that early recognition and treatment of underlying sleep disorders in hospitalized patients is associated with improved outcomes after discharge. For example, in a very small study, Konikkara showed that compared to patients not compliant with CPAP, chronic obstructive pulmonary disease patients who were compliant with CPAP had fewer emergency room and readmission visits 6 months after discharge.¹⁰¹ In a larger study of hospitalized congestive heart failure patients, patients compliant with CPAP for a minimum of 4 hours 70% of the time in the first month post-discharge had fewer readmissions compared to those not compliant with CPAP therapy after discharge.¹⁰² Likewise, a study of early diagnosis of sleep disordered breathing in hospitalized cardiac patients using in-hospital portal sleep studies demonstrated that patients who were adherent to CPAP had fewer 30-day readmissions.¹⁰³

SUMMARY

Sleep disturbance is common in hospitalized older adults due to a variety of factors, including environmental, medical and patient issues. Sleep loss in the hospital is associated with worse health outcomes, including cardio-metabolic derangements and increased risk of delirium. In addition, the hospital setting may represent an important opportunity to identify previously unrecognized sleep disorders, such as OSA, that can impact important patient outcomes. Finally, a growing body of evidence suggests that non-pharmacological interventions should be the first choice to improve sleep in hospitalized older adults.

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KEY POINTS

- Despite the need for rest and recovery during acute illness, hospitalization is a period of acute sleep deprivation for older adults due to environmental, medical and patient factors.
- Sleep loss in the hospital for older adults is associated with worse health outcomes, including cardio-metabolic derangements and increased risk of delirium.
- Both pharmacological and non-pharmacological interventions have shown promise in improving sleep loss for hospitalized older adults.

Figure 1.