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Sleep Deprivation in the Intensive Care Patients

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ABSTRACT

Patients in the intensive care unit (ICU) are known to have highly fragmented sleep, with a disturbed circadian pattern, shortened overnight sleep hours, drastically enhanced stages 1 and 2 sleep and limited or non-existent deep sleep. In order to maintain patients' biological circadian rhythms, sleep should be prioritised during the day and night. Thus, to minimize the impact of sleep interruptions and exhaustion in ICU patients, a comprehensive strategy that includes assessment of sleep problems and lethargy, environmental controls, appropriate pharmaceutical management, and educational and psychological interventions is required. This review article focuses on the impact, causes, risk factors and management of sleep deprivation along with interventions to promote the sleep quality.

Keywords: Sleep impairment, intensive care unit, polysomnography, nocturnal awakening.

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INTRODUCTION

Sleep deprivation is a harmful illness that affects many intensive care unit (ICU) patients. It has been linked to mental suffering, compromised immune system, cognitive issues, muscle troubles, respiratory abnormalities and long-term mechanical ventilation. Critically sick patients have a higher rate of impaired sleep efficiency, sleep fragmentation, a lack of restorative sleep and frequent nocturnal awakenings. Noise, light, patient-ventilator desynchrony, medications and frequent care are all linked to sleep deprivation in the ICU. However, 30% of awakenings in the ICU are mainly due to environmental noise.[1,2]

It is becoming a more common concern in the ICU population, and can lead to sleep problems even after the critical disease is resolved. During their hospital stay, over 80% of ICU patients experience sleep loss. Medication, prior sleep disorders, critical illness, delirium and cerebral perfusion are just a few of the factors that can impair sleep quality in the complicated ICU patient.[3]

There is mounting evidence that sleep disruptions are linked to negative outcomes. The impact of sleep deprivation on critically sick patients, as well as the link between sleep loss and delirium, is gaining attention .This review article focuses on sleep in intensive care unit patients (ICU). We go over the causes and factors of sleep disruption in the ICU, techniques for measuring sleep in critically sick patients, sleep-promoting interventions in the ICU.[4]

Impact of Sleep Deprivation in ICU

Sleep deprivation has been associated to both short and long-term consequences in ICU patients. Immune system compromise, cognitive issues, psychosis, emotional discomfort, muscle disorders and respiratory abnormalities are all possible outcomes of sleep deprivation. Delirium is a common problem in ICU patients. Sleep deprivation, old age, electrolyte imbalance, blood transfusions, obstructive sleep apnea, prior cognitive impairment, the use of benzodiazepines and other factors have all been associated to delirium in the ICU. Delirium may cause increased morbidity and mortality as well as a reduction in functional capacity in the elderly. When critically sick patients experience delirium, they are more likely to stay in the hospital longer, resulting in higher healthcare expenses and long-term cognitive impairment. Melatonin levels and the circadian rhythm are disrupted by sleep deprivation.[2]

These disturbances have also been linked to the development of delirium. Increasing melatonin availability, may lessen the risk of delirium[2]

FACTORS AFFECTING SLEEP IMPAIRMENT IN ICU PATIENTS

The nature and severity of the underlying illness, the pathophysiology of the acute illness, pain (from operations or the underlying condition), and stress/anxiety are all major factors for sleep

deprivation in ICU patients. However, the specific link between sleep and the severity of disease in the ICU is unknown.[4] Risk factors can be divided into; Modifiable factors such as pain, noise, visitors, medications and non-modifiable factors such as emergent procedure, acute illness, presence of ventilators.[2] Although patient-related factors are likely to have a substantial influence in sleep disruption, the ICU environment cannot be overlooked. Some of the factors include:

- Noise which has been implicated as a cause of sleep disturbance.
- Abnormal light and nocturnal light exposure are another reason.
- Nursing procedures, vital signs, imaging, and treatments, as well as other patient care, all contribute to sleep disruption in the ICU.
- The burden of the disease may play a role in sleep interruption.
- Alarms, staff-charts, television can contribute to sleep deprivation
- Several drugs such as vasopressors, antibiotics, sedatives, and analgesics might affect sleep quality and architecture. Although benzodiazepines have been demonstrated to increase total sleep time, they cause sleep architecture to become aberrant.
- When taken in high amounts, analgesics have also been linked to aberrant sleep architecture.
- Beta blockers can have a deleterious impact on sleep, causing insomnia and nightmares due to the suppression of REM sleep. Sleep deprivation has been demonstrated to decrease memory, attention, and other aspects of neurologic function in healthy volunteers.[4]
- Sleep may also be disrupted by mechanical ventilation and drugs.[5]
- The link between sleep deprivation and delirium in the intensive care unit is still unknown. Due to the impact of sleep deprivation on cognitive function, a link between delirium and sleep deprivation in critically ill individuals may exist.[2,4]

SLEEP MEASUREMENT TOOLS FOR CRITICALLY ILL PATIENTS

A variety of techniques can be used to assess sleep in critically ill patients.

Polysomnography:

It is the gold standard tool for accessing sleep impairment in ICU. It includes electroencephalography (EEG), electrooculography (EOG), subcutaneous electromyography (EMG), electrocardiography (ECG), monitoring of thorax movements and pulse oximetry.[1] As a result, it is feasible to characterize specific sleep stages and determine their duration. The presence of a number of sensors monitoring basic vital functions, which are attached to the patient's body, further complicates the course of the polysomnographic test in the ICU.[1,4]

Despite the fact that polysomnography (PSG) is the gold standard for sleep assessment in the outpatient context, its use in the ICU is fraught with difficulties. To begin, EEG requires competent staff to operate the equipment and interpret the data. Because sleep may not be isolated to night times, additional costs may be spent due to the necessity for extended PSG recordings. Also, rating sleep in ICU patients presents a number of complications.[4]

Actigraphy:

Actigraphy uses an integrated accelerometer to track body movement and a proprietary algorithm to track sleep duration. The actigraph is a wrist or ankle-worn automated watch that can be used to track rest–wake patterns and overall rest duration. It is most commonly used in clinical practice to examine circadian rhythms in non–critically ill patients; however, a few studies have utilized it to measure sedation/agitation in ICU patients.[1,4] It also corresponds with nurse-directed monitoring of agitation, sleep, and drowsiness in awake and relaxed patients, according to some studies.

SLEEP PROMOTING INTERVENTIONS

The requirement to provide timely and properly aggressive 24-hour care to critically ill patients while identifying solutions that allow for the maintenance of sleep and the promotion of day–night rhythms is a problem for ICU sleep research.[1]

- Earplugs have been shown to improve sleep quality, with fewer arousals and longer REM periods in some studies. However, another study found that while reducing noise improved sleep quality, it had no effect on sleep architecture.
- Use of eye mask can be useful to improve sleep impairment associated with light.
- Several studies show a range of relaxation techniques to help ICU patients sleep better. When critically ill male patients were given a 6-minute back massage, their sleep quality increased.
- Complex sleep-promoting therapies will be required, with an emphasis on reducing nighttime sleep disruption and maintaining a normal circadian rhythm. Daytime sleep may have to be limited as part of such a strategy.
- Implementing ICU sleep protocols will necessitate a culture shift, which has to be adapted by each institution's and critical care setting's work routines. This will necessitate ICU physician, nurse and other ancillary staff education, as well as performance and procedure compliance monitoring. [4]
- Reduce the number of visitors at a time.
- Avoid taking numerous prescriptions at the same time and limit the use of sleep-disrupting drugs.[6]

Nursing activities to promote sleep

- Allow uninterrupted quiet moments during the day, preferably between 2:00 and 4:00 p.m., when the circadian rhythm is at its lowest and the body is naturally at rest.
- Specialists such as radiographers and physical therapists, should be notified that quiet time is set aside for rest.
- To improve night-time sleep, the patient should be engaged in the afternoon or evening if possible.
- Allow the patient to sleep for an entire sleep cycle (90–120 minutes) without interruptions.
- Asynchrony with the ventilator should be minimized.
- Reduce the number of alarms on medical devices like monitors and ventilators.
- Make sure there is sufficient light throughout the day, and don't let the patient rest in poor light for extended periods of time.
- During quiet hours without other distractions, listen to classical music or other relaxing music.
- Electrocardiographic electrodes should be changed on a daily basis.
- Assess the patient's pain by pain scales or pain scoring instruments such as NRS or CPOT to ensure that the patient is pain-free.[9]
- Display signs reminding employees and visitors to keep conversations to a minimum at or nearby the bedside. [6]

MANAGEMENT OF SLEEP DEPRIVATION IN THE ICU

If preventative efforts have failed, the next best choice is to identify and handle the problem as soon as possible. Due to the multifaceted nature of sleep impairment, a tailored treatment plan based on clinical opinion and general practice principles should be established.[2] To decrease the effects of sleep disruptions in ICU patients, education of the professionals and change in behavioural patterns are required.[7]

Nonpharmacological perspective:

There are several non-medication options for dealing with sleep deprivation.[2] Cognitive behavioural therapies, supplementary therapies, and environmental measures are three major categories in this approach.[7] Sleep hygiene routines can evidently improve the quality of sleep pattern in patients along with increasing the patient's activity and energy expenditure during the day, optimizing mobility through early progressive mobility programmes, purposely adjusting the quantity of ambient light during the day versus the night, clustering nocturnal care activities and reducing noise are all examples of specific sleep hygiene therapies.[2]

Nutrition

Nutritional timing is an important factor which should not be overlooked. In ICU patients, guidelines advocate starting enteral feeding as soon as tolerated throughout 24–48 hours. As a result, daytime nourishment with pauses, as opposed to continuous 24-hour administration, is thought to reduce circadian rhythm abnormalities.[8]

Limiting Interventions

Critically ill patients frequently require care interventions to maintain an optimal level of care, which interrupts sleep patterns in both ventilated and non ventilated patients. To prevent overnight awakenings while improving therapeutic outcomes in critical care patients, individualized nursing strategies should be devised. [2]

Medication Adjustment

Patients admitted to the ICU usually have numerous disease conditions that demand the use of multiple medications. These patients are generally prescribed with morphine, benzodiazepine, barbiturates, sedative-hypnotics and analgesics which have been shown to diminish deep sleep while boosting lighter stages of sleep and cause negative impact on sleep quality. Withdrawal symptoms that affect sleep caused by continuous usage of additive substances such as alcohol at home, may be concealed due to the presence of the critical illness and usage of sedatives.[2]

Avoiding light exposure

In the ICU, prolonged light exposure and the loss of the natural day-night cycle may cause the circadian clock to malfunction.[5] Patients' observed sleep has been proven to be improved by reducing lights at night while purposely exposing them to light during the day.[2] Insufficient daytime light availability was linked to a worsening of sleep patterns.[4] In many studies, value of being exposed to the sun's rays is highlighted. These therapies appear to be cost-effective and provide patients with a positive experience.[2]

Noise reduction

The WHO noise guidelines contain noise measurement and standards, as well as cost-effective and efficient noise reduction programmes. Noise levels were determined to be 50 dB at night and 53 dB throughout the day after quiet time hours were implemented. Thus, to avoid sleep deprivation, attempts should be made to limit the noise caused by machines and equipment in the ICU.[2]

Massages, relaxation techniques, foot spas, valerian acupressure and aromatherapy are examples of alternative therapies that may help with sleep. The conflicting results of the investigations, on the other hand, suggest that there is very little proof.[8]

Pharmacological Perspective

Individuals and families in the ICU frequently request pharmacological treatments to aid them sleep. Thus, physicians may feel compelled to prescribe a therapeutic solution, but they should be conscious of the consequences. Many sleep promoting agents have negative side effects and might exacerbate delirium in critical care patients. [2]

- Propofol or midazolam infusions improved subjective sleep impressions especially at night.
- Melatonin aids sleep without causing daytime psychomotor abnormalities.[5] It is generally given 1 hour before bedtime orally and has been proven to benefit the immunity, oxidant activity and neuroprotective effects by helping to optimize circadian rhythm. [2]
- When Ramelteon® (8 mg/d) was given, the research team lead by Nishikimi witnessed a decrease in delirium incidence (24.4 percent from 46.5 percent) and delirium duration (24.4 percent from 46.5 percent).[8]
- Benzodiazepines, non-benzodiazepines (e.g., zolpidem, zopiclone, zaleplon) and antihistamines have also been examined for sleep control.
- Dexmedetomidine has been demonstrated in two distinct trials to increase stage 2 sleep and decrease stage 1 sleep, which is generally beneficial but it is costly and when taken in large amounts, can cause fall in blood pressure and bradycardia.[2]

CONSEQUENCES OF SLEEP DEFICIENCY

Inadequate sleep has been linked to a variety of pathophysiological processes, including circadian dysrhythmias and sensorium disturbances, which can result in a delayed recovery, a longer stay in critical care, and, as a result, a higher death rate. Poor sleep appears to affect not only neurocognition and respiratory muscle strength, but also immunological function, elevating infection susceptibility.

Sleep deprivation can also cause homeostatic dysregulations, which should not be disregarded. For instance, a study showed an elevated levels of thyroid, cortisol and norepinephrine levels. This results in a drop in growth hormone and melatonin levels, as well as a glucose metabolism condition called insulin resistance.

Furthermore, but this has yet to be proven, a lack of nocturnal blood pressure drop worsens cardiovascular function and as a result, has damaging consequences on pre-existing heart failure.[8]

SLEEP DISTURBANCE AFTER ICU

Sleep quality is affected during critical illness but might continue to be disturbed after discharge.[12] Insomnia, nightmares, and poor sleep quality are confirmed by more than 50 percent of ICU survivors. These symptoms can last up to a year after being discharged from the hospital and have

a negative impact on one's quality of life. [11] Three months following hospital discharge, the seriousness of a critical illness is a predictor of shorter sleep duration and sleep disruption.[12]

CONCLUSION

Sleep deprivation is widespread in ICU patients, and it has a deleterious impact on a number of outcomes.[11] Patients in the ICU often report poor sleep, which is frequently related with worry, anxiety, and nightmares, all of which affect subsequent quality of life. Noise, especially staff interactions and patient-care routines, are definitely contributory factors, accounting for 40% of sleep interruption.[6] Many patients might continue to have poor sleep after being discharged from the ICU, which could have an impact on their functional restoration. Sleep quality is frequently disregarded in the hectic milieu of critical care.[10]

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