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Overview Article

Can Improving Postoperative Sleep Speed Up Surgical Recovery?

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Sleep Sci

Abstract

Sleep disturbance is common during recovery after surgical procedures and may have an important effect on mortality, and quality of life. Sleep restriction/deprivation, including decreased quantity and continuity, is common in patients who are patients and persons with acute and chronic illnesses. Age, gender, illness, primary sleep disorders, environment, and medical treatment factors are thought to influence sleep throughout the preoperative period, hospitalization, and recovery. Resulting sleep pattern disturbances include decreases in circadian patterning, continuity, duration, and perceived (subjective) sleep quality. This article synthesizes sleep disturbance in patients who have undergone surgery and highlights sleep strategies to improve faster surgical recovery.

Keywords
- surgery
- sleep
- sleep initiation and maintenance disorders

Introduction

Sleep is an essential body function that often does not get sufficient attention. The body's natural clock has a profound effect on most biological functions. The circadian rhythm is an important factor in optimizing sleep duration.[1,2] Most adults require 7 to 9 hours of sleep per night,[3] and inadequate sleep duration has been associated with a myriad of negative health effects including neurocognitive,[1] metabolic, immunologic,[2] and cardiovascular dysfunctions.[4] Sleep-deprived people can have impaired brain function that could affect judgment and/or decision-making.[5] Sleep deprivation increases proinflammatory cytokines, which impair immune system function, impedes muscle recovery and repair from damage, leads to autonomic nervous system imbalance (simulating overtraining symptoms), results in slower/less accurate cognitive performance, and alters pain perception.[6–8]

Severe preoperative diseases are also associated with worse sleep quality after surgery.[3] Patients with preoperative myocardial infarction, for example, suffer from this issue, and higher preoperative angina score, an independent predictor for it. Another example is the use of regional anesthesia to relieve sleep disturbances after surgery in fast-track abdominal hysterectomy with spinal anesthesia, which causes better sleep in the night after surgery, because regional anesthesia reduces perioperative opioid consumption.[9]

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Sleep disturbances are more severe after major surgery. For example, after laparoscopic cholecystectomy in patients under general anesthesia, sleep disturbances were less severe (manifested as decreased N3 sleep but not REM sleep) during the same night also reported similar results, that is, major surgery (when compared with minor surgery) is associated with lower sleep efficiency after surgery.[4]

Discussion

Sleep Disturbances on Postoperative Outcomes Impact Surgery Recovery

The relationship between sleep and pain is reciprocal; poor sleep also leads to increased pain sensitivity. Studies of patients hospitalized for burn injuries showed that significant temporal relationships exist between sleep, pain, and analgesic medication, that is, a night of poor sleep was followed by a significantly more painful day and higher analgesic intake; furthermore, high levels of pain and analgesic medication during the day were both significant predictors of poor sleep on the following night.

Sleep disturbances also have significant impacts on recovery after surgery.[4,10] In patients who underwent fast-track hysterectomy, poor sleep quality during the first postoperative night was strongly associated with a longer hospital stay. In total knee replacement surgery patients, presence of sleep disruptions after 1-month were associated with functional limitations at 3-months postoperatively, indicating the importance of adequate sleep during recovery. Additionally, sleep disorders were common and associated with poorer emotional state and lower quality of life.[4]

Nonpharmacological and Pharmacological Strategies to Improve Postoperative Sleep

Nonpharmacological strategies include using regional anesthesia whenever possible, decreasing the severity of surgical trauma by performing laparoscopies rather than open-abdominal surgery, providing multimodal analgesia to decrease opioid consumption, and removing ambient stressors during the night. For patients after surgery, management according to sleep care guidelines, such as maintaining a quiet and dim environment and decreasing interruptions from care activities at night, improves sleep quality and efficiency. A metanalysis showed that the use of ear plugs and eye masks is also helpful in promoting sleep among patients in the intensive care unit (ICU).

Pharmacological strategies include prescribing zolpidem, which when administered on the night before and first night after surgery improved the feelings of sleep quality and fatigue, but not sleep architecture. Melatonin is secreted by the pineal gland, and regulates and modifies circadian rhythms and sleep, can be used well. Plasma melatonin levels are decreased after surgery and in hospitalized patients. When given as premedication in adults, it reduces preoperative anxiety when compared with a placebo and is equally effective when compared with midazolam. Furthermore, in patients undergoing prostatectomy, preoperative melatonin enhanced sleep quality, and decreased pain scores and tramadol consumption, but caused sedation during the early postoperative period. On the other hand, for patients after breast cancer surgery, melatonin administration improves sleep quality without producing significant side effects.[9]

Dexmedetomidine is another good strategy,[11,12] acting as a selective α2 adrenoceptor agonist with both sedative and analgesic properties. Unlike other sedative agents, this one exerts its effects through an endogenous sleep-promoting pathway and produces an N2-sleep-like state. In patients under mechanical ventilation, nighttime infusion of a sedative dose of dexmedetomidine preserved the day–night cycle and improved the sleep architecture by increasing its efficiency and N2-sleep. In nonmechanically ventilated elderly patients postsurgery, a low-dose of dexmedetomidine during the night after surgery prolonged total sleep time, increased N2 and decreased N1 sleep, and improved subjective sleep quality.[9]

Does Sleep Promotion Induce Fast Surgical Recovery?

Adequate sleep has clear health benefits. Increasing sleep duration among people who are sleep deprived is shown to improve multiple measurements of function. For example, if the natural circadian rhythm is disrupted, cortisol levels will rise and individuals might go into a catabolic state.[13] Sleep promotion is helpful for the recovery of postoperative patients, improving sleep with ear plugs and eye masks. In animals, it has been showed that propofol protected against anxiety behaviors induced by sleep deprivation, reducing symptoms.[14] Propofol might be superior to sevoflurane for patients with sleep disorders who receive anesthesia, which should be tested in clinical studies.[5]

The role of the hospital's environment and early postoperative discomforts is well established, as well as the influence of frequent patient care activities and noise during sleep-time in patients who had undergone surgery. More recently, positive relationships were found between the self-reported number of sleep-disturbance and related factors, as well as their overall severity. Negative relationships were found between the number of sleep-disturbing factors, their overall severity, self-reported sleep effectiveness, and length of hospitalization.[15] Additionally, it has been reported that hospital-rated stress is positively related to sleep disturbance and inversely related to sleep effectiveness. Illness-related distress does not predict sleep disturbances but was positively related to sleep supplementation (daytime napping). Postoperative discomforts, such as incisional pain, positioning, and nocturia, are also frequently reported causes in the early postoperative period, and although the relevance of these factors to sleep changed throughout recovery, the frequency of self-reported sleep disturbances did not appear to change up to 6 months.[16]

Advances in clinical and basic sleep science emphasize the importance of sleep patterns to wellbeing, functional status, and morbidity. For example, daytime sleepiness is related to general health and functional status, especially energy levels

and fatigue in elderly patients.[17] Daytime sleepiness is more closely associated with measures of sleep continuity,[18] and deprivation has been associated with altered growth hormone secretion,[19] mental status changes,[19] fatigue,[20] and impaired performance on complex tasks—all phenomena that are important to long term health and functioning after surgery. A metanalysis of 19 studies demonstrated that sleep deprivation impairs human functioning.[21] A cohort of patients who had undergone angioplasty showed that better sleep quality was related to physical function, physical role function, and vitality. Self-reported sleep disturbance has been associated with several disability days, and daily activity levels.[22–24]

Environmental interventions during hospitalization should focus on decreasing noise and light stimuli and reducing unnecessary nocturnal patient care interactions. Judicious use of hypnotic drugs could be helpful but is frequently overlooked. The use of interventions to reduce arousals, such as music and massage, may be useful strategies. Providing a structured bedtime routine or a warm shower could also be useful in prolonging sleep continuity. Although evidence suggests that a large proportion of sleep occurs during nonnocturnal times. Therefore, napping cannot be recommended in these cases. Because sleep disturbance may persist after hospital discharge, continued assessments of this complication are warranted during long-term follow-up. Continued sleep disturbance could be a sign of the patients' emotional distress, comorbid health problems, or, most importantly, delayed recovery. Adequate pain management and a return to normal activities of daily living are likely to promote a return to normal sleep patterns. Despite all that, we propose an illustrative model of sleep during recovery (►**Fig. 1**), which illustrates factors that are likely to influence sleep management in patients throughout the experience of illness and recovery. It is used as the framework for the present discussion regarding correlations and consequences of sleep pattern disturbance in patients who have undergone surgery.

Some studies have shown good results of pre- and postoperative psychosocial interventions,[25] with a cognitive focus on weight, dietary behaviors, eating pathology, lifestyle behaviors, and psychological functioning.[6] Another important point is total duration and type of surgery, as well as anesthesia type. Intraoperative pain intensity depends on many variables, including surgical type, stimulation, and incision. It is difficult to properly measure pain under general anesthesia, therefore the anesthetist depends on markers of inadequate analgesia such as increased heart rate, blood pressure, sweating, and lacrimation. However, unfortunately, these parameters can have sudden changes with light plane anesthesia, hypercarbia, and ongoing procedural status of the patient.[7]

From a metabolic and nutritional point of view, the key aspects of perioperative care include the integration of nutrition into the overall management of the patient,[26] avoidance of long periods of preoperative fasting, reestablishment of oral feeding as early as possible after surgery, start of nutritional

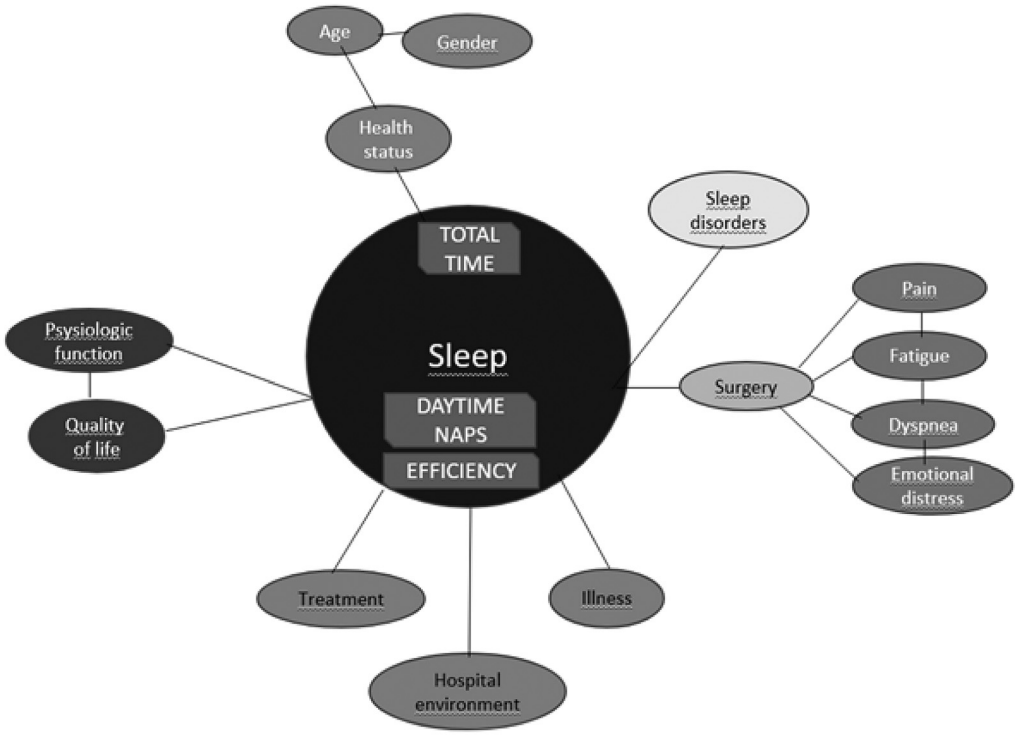

Fig. 1 Relationship between sleep and fast surgical recovery. Total sleep time directly impacts health status, age, and gender, as well as inducing sleep disorders. Surgeries can cause pain, fatigue, dyspnea, and emotional stress, some of which can be avoided with the recovery of adequate total sleep time per individual, including daytime naps and better sleep efficiency. All these actions together contribute to better treatment, reduction of the risk of illness, and hospital environment. Sleep care in hospitals is intimately correlated with patients' physiologic function and quality of life needed to achieve fast surgical recovery.

therapy immediately if there's any risk, as well as metabolic control, such as of blood glucose, reduction of exacerbating factors for stress-related catabolism or impaired gastrointestinal function, minimized time on paralytic agents for ventilator management in the postoperative period, and early mobilization to facilitate protein synthesis and muscle function.[8] For the correct diagnosis, we suggest identifying if the patients are using an ActiGraph (ActiGraph LLC., Pensacola, FL, USA). If not, they are cleared for the surgical procedure. If yes, they need to be evaluated by a specialist doctor. After that, polysomnography, as well as further exams should be requested for treatment, followed by surgery.

Conclusion

Surgeries, especially major ones, cause sleep disturbances. The development of sleep disturbances produces harmful effects on postoperative patients, that is, increased sensitivity to pain, higher rate of cardiovascular events, and poorer recovery times. Measures both with and without drug prescriptions can be used to improve sleep and may be helpful for recovery postoperatively. Otherwise, we highlight that sleep restriction cause worse effects, and we hypothesize that sleeping more or reducing these restrictions can induce fast surgical recovery, especially in patients with sleep disturbances.

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Conflict of Interests
The authors have no conflict of interests to declare.

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