Sleep Disturbances and Critical Illness

Roberta Kaplow, PhD, APRN-CCNS, AOCNS, CCRN

KEYWORDS

• Sleep disturbances • Critical care • Intensive care unit • Sleep

KEY POINTS

- Sleep is an essential part of life. It is required for its healing, defensive, and energy preserving functions.
- Disruption in sleep is often associated with critical illness. Alterations in sleep patterns, including sleep deprivation, are widespread problems experienced by intensive care unit (ICU) patients.
- The etiology of sleep deprivation in the ICU is multifactorial.

INTRODUCTION

Sleep is an essential part of life.[1,2] It is required for its healing, defensive, and energy preserving functions.[1] Despite its importance, sleep disturbances have been reported as a clinical entity for almost 4 decades. Several negative sequelae are associated with alterations in sleep patterns. Sleep disturbances are reported to continue following discharge from the intensive care unit (ICU) and the hospital, compromising patients' quality of life.[3] Several factors, including the ICU environment, have been implicated in the development of sleep disturbances. Multidisciplinary strategies to help mitigate sleep disturbances and optimize patient outcomes are described in this article.

WHY SLEEP IS NEEDED

Sleep disturbance is defined as "the perceived or actual alterations in nighttime sleep (both quantity and quality) with subsequent daytime impairment."[1(pp205)] Disruption in sleep is often associated with the onset of critical illness.[1,4] Alterations in sleep patterns, including sleep deprivation, are widespread problems experienced by patients admitted to the ICU.[3,5–15] Inferior quality of sleep compared with the sleep they receive at home is also reported.[5]

As far back as the early 2000s, patients have been reporting that inadequate sleep was among the most stressful aspects of their ICU admission.[13,16,17] Sleep is an essential element for recovery from critical illness and survival. It is also important

Funding: No funding support.
Disclosure: The author has nothing to disclose.
Emory University Hospital, 2184 Briarwood Bluff NE, Atlanta, GA 30319, USA
E-mail address: roberta.kaplow@emoryhealthcare.org

Crit Care Nurs Clin N Am 28 (2016) 169–182
http://dx.doi.org/10.1016/j.cnc.2016.02.005 **ccnursing.theclinics.com**
0899-5885/16/$ – see front matter

for emotional well-being and adequate cognitive, immunologic, and muscle function and healing,[1,7,10] and it affords the energy that patients need to partake in their treatment.[11] Adequate restorative sleep is also associated with decreased morbidity and with restoring health.[11,12]

NORMAL SLEEP ARCHITECTURE

Normal sleep is divided into 2 discrete phases: non–rapid eye movement (NREM) and rapid eye movement (REM) sleep. The phases are defined based on their distinctive electroencephalograph (EEG) characteristics.[9] NREM sleep is composed of 4 discrete stages from light to deep sleep. N1 and N2 (formerly stages 1 and 2, respectively) are considered light sleep. These stages precede deep slow wave sleep (SWS). N2 is thought to be most important for physiologic repair and the most restorative stage of sleep. N3 and N4 (formerly stages 3 and 4, respectively) are considered deeper sleep. REM sleep accounts for approximately 20% of total sleep time.

During REM sleep, there is an increase in cerebral and physiologic activity.[9] REM sleep increases in amount of time and intensity throughout the night. REM sleep is primarily a parasympathetic state with bursts of sympathetic activity. During the bursts, there is a risk for increases in heart rate and blood pressure and there is the greatest amount of risk for cardiac and respiratory instability. Patients are also at risk for cerebral ischemia and arrhythmias.[11]

During deep sleep, tissue repair is most effective. Energy sources are restored in deep sleep. There is also decreased ocular movement and decreased muscle activity during this time.[15]

Four to 6 repeated 90-minute cycles or periods of NREM and REM sleep comprise normal sleep architecture.[1,9,13,18] The percentages of total sleep time and the characteristics of the phases of sleep are shown in **Table 1**.

The sleep-wake cycle is controlled by 2 disparate processes. The drive for sleep (becoming sleepy, the onset of sleep, and sleep promotion) is controlled by process S, which is regulated by adenosine. Promotion of sleep is also regulated by secretion of melatonin from the pineal gland.[9] Sleeplessness is regulated by process C from the suprachiasmatic nucleus. Pathways from the suprachiasmatic nucleus inhibit release of melatonin in response to introduction of bright light. Other neurotransmitters that foster sleeplessness include dopamine, norepinephrine, histamine, serotonin, acetylcholine, and orexin.[9]

Table 1
Stages of sleep and associated characteristics

Stage of Sleep	TST (%)	Characteristics
N1	~2–5	Light sleep, start of sleep from being awake, drowsiness
N2	~45–55	Slow wave or deep sleep; can be easily awakened by noise
N3	~15–20	Restorative sleep, slow wave, deepest and most restful sleep
N4	~20–25	SWS, deep sleep, increased cerebral and physiologic activity, decreased muscle activity
R (REM)	~20	Restful sleep; primarily a parasympathetic state with bursts of sympathetic nervous system activity that can increase heart rate and blood pressure

Abbreviation: TST, total sleep time.
Data from Refs.[9,10,13,19]