

Guest Editorial

Sleep and sleep disorders following traumatic brain injury: An introduction

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“Even a soul submerged in sleep is hard at work and helps make something of the world.”

– *Heraclitus*

1. Sleep

The word itself conjures many images, behaviors, and emotional responses. Relaxation, fear, desire to dream, avoidance, and recovery from injury or illness are all issues that have strong connections to the experience of sleep. The ancient Greeks recognized the importance of sleep in how it was treated in their mythology. Hypnos, the Greek god of sleep, was able to overcome Zeus, king of the gods, not only once, but twice. To the Greeks, sleep and death were considered closely related. Hypnos was the brother of Thanatos, the god of death. Still today, there is much intertwining of thoughts regarding sleep and death. This is reflected in the language used to discuss both of these phenomena. Many feel that sleep is wasted time; the average human spends approximately a third of their life asleep. However, when an individual does not get adequate sleep, it is apparent how important sleep is for normal functioning.

Sleep is also integral to healing. The ancient Egyptians recognized the need for sleep, and had special temples designed for sleep for the purpose of healing. They also had an understanding of many sleep disorders recognized today, as outlined in papyri dealing with medical issues. Dream analysis was practiced by the Egyptians a millennia before the advent of psychoanalysis. In many ways, modern medicine is coming full circle to the understanding of the relationship between sleep and health held by the ancients.

Following traumatic brain injury, some of the most common problems experienced are disorders of sleep. Particularly with more severe injuries, sleep disorders are so common that they are often not given the appropriate level of consideration by medical professionals. Poor sleep can impact almost every aspect of healing and cognitive function; therefore, addressing this should be a cornerstone of treatment following brain injury. Our system of care typically does not do the best job of recognizing sleep as a problem after serious illness and injury. Hospitals, especially intensive care settings, are frequently poor at allowing patients adequate, restful sleep, due to the presence of equipment, the need for frequent monitoring, the facility design, and the disruption of nursing interventions. This issue is becoming more recognized and several manuscripts have been published on this issue. Much like early mobilization, addressing sleep issues early after injury to the brain

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may have dramatic effects on outcomes and preventing secondary complications of non-restorative sleep cycles.

The number of issues affecting sleep following brain injury are numerous. It is quite common for brain injury to disrupt the pattern of release of neurotransmitters responsible for normal sleep-wake cycle, resulting in insomnia and rapid sleep-wake cycles. Injury to deeper structures in the brain and brainstem that are part of the reticular activating system may result in disorders of consciousness or sleep disorders. Concomitant injuries, such as fractures, may also result in pain or positioning problems that may complicate a patient's ability to get adequate sleep. Additionally, many of the medications that are administered early after brain injury may alter sleep function. All of these issues make appropriate treatment of sleep issues extremely challenging.

As guest editor, I am very pleased to introduce this special thematic issue of *NeuroRehabilitation* on sleep disorders following traumatic brain injury. The first three articles address the effects of TBI on patterns of sleep function and the approach to the evaluation and diagnosis of sleep disorders. Wolfe, Sahni, & Attarian begin the special issue with a discussion of normal sleep patterns and types of sleep disorders seen following TBI in their article, "Sleep Disorders after Traumatic Brain Injury." Sampathkumar et al. then present the approach to diagnosis of sleep disorders in the article, "The Assessment of Sleep following Traumatic Brain Injury." Makley

et al. then discuss challenges faced with the use of wearable technology to assess sleep in individuals with TBI in their article, "Objective measures of sleep and wakefulness in patients with moderate to severe brain injury on an inpatient rehabilitation unit. Pearls and pitfalls of actigraph monitoring." Bell et al. then present "Sleep after TBI: How the TBI Model Systems have Advanced the Field."

The next few articles address how sleep disorders affect various aspects of physiological, emotional, and cognitive functioning. Larson presents the first article in this section, "Sleep Disturbance and Cognition in People with TBI." Next, Maneyapanda et al. present "Association of Sleep with Neurobehavioral Impairments during Inpatient Rehabilitation after Traumatic Brain Injury," followed by Howell & Griesbach who present, "The Interplay between Neuroendocrine and Sleep Alterations following Traumatic Brain Injury."

The last two articles address the treatment of Sleep disturbances following TBI. First, Driver & Stork present, "Pharmacological Management of Sleep after Traumatic Brain Injury." Lastly, Thomas & Greenwald conclude the issue with "Nonpharmacological Management of Sleep Disturbances after Traumatic Brain Injury."

The editors and I hope that readers gain a greater understanding of the interplay of sleep and TBI, and that this knowledge will improve both diagnosis as well as treatment of this class of post-TBI impairment.