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Editorial

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Sleep promotion in the hospitalized elderly

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Acute illness warranting hospitalization is associated with sleep derangements that include reduced sleep quality and quantity [1–3]. Such sleep derangements, in turn, may lead to adverse downstream consequences that include sympathetic system activation, elevation of circulating inflammatory cytokines, cognitive dysfunction, delirium, immune dysfunction, and even death [4–6]. Moreover, such sleep derangements have been closely associated with poor health-related quality of life in survivors of hospitalization and critical illness [7]. Interestingly, in critically ill patients undergoing mechanical ventilation, severe sleep derangements can persist despite continuous sedative infusions [8, 9]. While there are data that sedatives may increase total sleep time and reduce nocturnal awakenings and sleep onset latency in ambulatory patients, the failure of such medications to increase sleep quality and quantity in critically ill patients is problematic. There are many possible reasons for such lack of efficacy of sedatives during acute illness. First, most sedatives are "GABAergic," namely they act on gamma amino butyric acid receptors and such agents can cause neurocognitive dysfunction and delirium through various mechanisms including attenuation of dendritic spine formation [10]. Second, despite the administration of sedative agents, various noxious physical symptoms may continue to perturb sleep [11]. Third, in the extreme case of critically ill patients, the very nature of sleep as measured by electroencephalography can be severely deranged ("atypical sleep"), and conventional sedative agents may not be able to promote physiological sleep. In fact, sedatives may worsen electroencephalography patterns with evidence of burst suppression and diffuse slowing [6, 12–15]. Along such lines of reasoning, there are consensus-derived practice guidelines aimed at avoiding or sparingly using sedatives during critical illness and in the elderly residing at home [11, 16]. However, one of the stumbling blocks in researching sleep in the hospital setting is the lack of premorbid information regarding baseline sleep and comorbid conditions ***prior to*** the onset of acute illness that warranted the hospitalization. Conceivably, premorbid states may be an important underlying determinant of sleep during hospitalization and may mislead the interpretation of findings from observational or even intervention-based studies when such vital information is missing.

Smichenko et al. have addressed these thorny questions in their observational study where they examined the sleep trajectory of older patients who were transitioning from home-to-hospital and measured the night-to-night variability [17]. They did so by undertaking the investigation in a large prospective observational multicenter study called, "Hospitalization Process Effects on Mobilization Outcomes and Recovery (HoPE-MOR)." They discovered that medication use only minimally improved sleep quality during hospitalization; however, physical symptom burden was significantly associated with sleep outcomes. Their findings suggest that effective management of physical symptoms in hospitalized elderly is needed. Specifically, they found that higher physical symptom burden was associated with shorter total sleep time, and they found that sleep medication use was not correlated with any of the self-reported sleep parameters—total sleep time, sleep efficiency, number of awakenings, or sleep quality. However, they found that sedative burden (dosage and total cumulative amount of medication administered) was associated with fewer number of self-reported awakenings at night in models adjusted for premorbid and hospitalization-related confounders. Importantly, Smichenko et al. successfully assessed various self-reported sleep parameters and sleep medication use over the home-to-hospital transition and demonstrated the worsening of sleep following hospitalization. Such a finding is suggestive of physical symptoms as a possible underlying mechanism for worsening sleep in the hospital setting but we cannot be certain of causation. Their findings are thought-provoking and suggest that we should effectively treat the underlying medical illness that is causing the physical symptoms and adopting non-pharmacological approaches such as reducing light/noise interruptions, music, aromatherapy, and massage to promote sleep in elderly patients who are hospitalized [1, 18].

There is a dire need to promote sleep in hospitalized patients [19]. Previously, health impairment and neurocognitive sequelae in survivors of hospitalization were attributed to possible long-term effects of hypoxia, inflammation, and drug toxicity [20, 21]. However, such adverse health consequences may also be due to sleep disruptions [22]. Efforts aimed at promoting sleep in the vulnerable elderly hospitalized population are worthy of investigation with a significant return on investment. While the benefits

from sedative agents appear to be minimal from both the study by Smichenko et al. and others, pharmacological approaches can potentially worsen the risk for delirium, falls, and neurocognitive decline in survivors of hospitalization [16, 17, 23, 24]. Such information identifies the knowledge gap and sets the stage for conducting comparative-effectiveness research aimed at assessing the benefits versus risks of pharmacological versus nonpharmacological approaches for promoting sleep during hospitalization.

There is a large scientific body of evidence that favors promoting physical and brain health through physical and neurocognitive rehabilitation in frail elderly patients [18, 25]. For example, cognitive stimulation, family participation, physical therapy, and bright light therapy have been shown to reduce the risk of delirium in hospitalized patients [18]. In the United States alone, annually there are ~13.2 million hospitalizations of elderly adults (aged 65 years and older) [26]. The healthcare burden associated with hospitalization-related sleep derangements and their consequences is enormous. However, the sleep research community has not fully seized this opportunity to promote sleep health in hospitalized patients with the goal of reaping the myriads of downstream benefits to health and quality of life. We commend Smichenko et al. for shining the light on this conundrum and providing targets for various interventions—such as physical symptoms. Moreover, their work paves the way for possible study designs that involve capitalizing on existing cohorts for both case finding and subject characterization. It is about time we put this matter to bed.

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