Nudging Providers to Improve Sleep for Hospitalized Patients

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It is 5:45 AM. Thousands of diligent interns are roaming inpatient wards, quietly entering hospital rooms, and gently nudging their patients awake. Little do they know that their rounding is part of a system that unintentionally degrades the quantity and quality of patient sleep and may leave patients worse off than the illness that originally brought them to the hospital.[1] A multitude of adverse outcomes has been associated with sleep deprivation, including aberrant glucose metabolism, impaired wound healing, impaired physical function and coordination, and altered cognition.[2] To put it simply, sleep is vital.[3] Restoring normal sleep patterns in hospitalized patients may decrease hospital length of stay, reduce hospital readmissions, and, as such, should be a new priority for quality improvement.[4]

In this edition of the *Journal of Hospital Medicine*, Arora et al. present a single-center, pre–post analysis of an intervention designed to improve sleep for hospitalized patients.[5] The SIESTA (Sleep for Inpatients: Empowering Staff to Act) intervention was composed of the following three components: provider education on patient sleep, Electronic Health Record (EHR) promotion of sleep-friendly order entry, and empowerment of nurses to actively protect patient sleep. Education and changes to order entry were implemented in two hospital units, but only one received the additional nurse-empowerment intervention. Results were compared for six months pre- and post-intervention. Although the authors found increases in sleep-friendly orders in both units, nighttime room entries and patient-reported sleep disturbance decreased only in the nurse-empowerment unit.

Previous studies assessing both pharmacologic sleep aids as well as bundled nonpharmacologic interventions have demonstrated mixed results and focused primarily on ICU populations.[6,7] What sets this study apart from prior interventions aimed at improving patient sleep is the novelty and implications of their successful intervention. In this study, the authors used the EHR and nursing huddles to "nudge" providers to protect their patients' sleep. The "nudge" concept, first studied in behavioral economics and more recently applied to healthcare, represents ways to present choices that positively influence behavior without restricting options.[8] This study incorporates two distinct nudges, one that utilized the EMR to adjust the default timing of orders for vital sign procurement and delivery of VTE-prophylaxis, and another that made sleep part of the default checklist for nursing huddles. This study suggests that nudges altered both physician and nurse behavior and encouraged improvements in process measures, if not clinical outcomes, around patient sleep.

A key insight and strength of this study was to engage and empower nurses to promote better sleep for patients. In particular, nurses in the sleep-enhanced unit suggested—during the course of the intervention—that sleep protection be added as a default item in daily huddles. As illustrated in the Figure, the timing of this suggestion corresponded with an inflection point in reducing patient room disruptions at night. This simple, low-cost nudge sustained sleep improvement while the effect of the initial higher-cost intervention using pocket cards and posters had begun to fade. This is not a randomized clinical trial, but rather a pragmatic assessment of a rigorous quality improvement initiative. Although more follow-up time, particularly after the nurse-empowerment intervention was adjusted, would be helpful to assess the durability of their intervention, we applaud the authors for demonstrating adaptability and efforts for ongoing engagement, as is needed in real-world quality improvement initiatives.

There are additional factors that disrupt patient sleep that were not targeted in this study but could very well respond to nudges. Recently, Wesselius et al. showed that patient-reported nocturnal awakenings were frequently due to toilet visits and awakening by hospital staff.[9] Perhaps nudges could be implemented to reduce unnecessary overnight intravenous fluids, prevent late dosing of diuretics, and delay the default timing of standard morning phlebotomy orders.

Although this study by Arora et al. makes a very meaningful contribution to the literature on sleep and hospitalization, it also raises unanswered questions.[5] First and foremost, while the pragmatic nature of this study should inspire other hospitals to attempt similar sleep promotion interventions, the use of a pre–post design (rather than a randomized, control design) leaves room for future studies to explore causality more rigorously. Second, although this study has demonstrated significant uptake in standardized order sets to improve sleep (and a corresponding decrease in patient-reported disruptions), future studies should also explore more distal and more chal-

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lenging outcomes of care. These could include length of stay, incidence of delirium (especially in older adults), and frequency of readmission after discharge. Finally, more longitudinal data to explore the sustainability of order set usage and reported or observed interruptions would be useful to guide hospitals that would like to follow the example set by the SIESTA study.

Notwithstanding these limitations, there is an incredible opportunity for nudges and technology to combine to change the paradigms of clinical care. One of the outcomes of this study was to reduce nocturnal room entry for clinical tasks such as obtaining vital signs. It is worth considering whether providers even need to enter patient rooms to obtain vital signs. The technology now exists to measure vitals passively and continuously via low-impact wearable devices. Milani et al. employed the use of such devices, as well as other techniques, including red-enriched light and sensors that warned staff in clinical areas when noises exceeded acceptable thresholds for sleep, and demonstrated decreases in hospital length of stay and readmission rates.[4]

Arora et al. present a compelling study of utilizing nudges to influence physician and nurse behavior.[5] They show that rigorous quality improvement initiatives can be studied and disseminated in a compelling manner. Their study calls appropriate attention to the need for improving patient sleep and provides us with additional tools that can be used in these efforts. Future research is needed to determine whether the changes observed in process measures will translate into meaningful effects on clinical outcomes and to continue to identify ways to curb some of the toxicities of hospital care.

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References

1. Krumholz HM. Post hospital syndrome: A condition of generalized risk. *N Engl J Med.* 2013;368(2):100-102. doi: 10.1056/NEJMp1212324.
2. Pisani MA, Friese RS, Gehlback BK, Schwab RJ, Weinhouse GL, Jones SF. Sleep in the intensive care unit. *Am J Respir Crit Care Med.* 2015;191(7):731-738. doi: 10.1164/rccm.201411-2099CI.
3. Judson T, Johnson K, Bieraugel K, et al. Sleep is vital: improving sleep by reducing unnecessary nocturnal vital signs [abstract]. https://www.shmabstracts.com/abstract/sleep-is-vital-improving-sleep-by-reducing-unnecessary-nocturnal-vital-signs/. Accessed October 24, 2018.
4. Milani RV, Bober RM, Lavie CJ, Wilt JK, Milani AR, White CJ. Reducing hospital toxicity: impact on patient outcomes. *Am J Med.* 2018;131(8):961-966. doi: 10.1016/j.amjmed.2018.04.013.
5. Arora VM, Machado N, Anderson SL, Desai N, et al. Effectiveness of SIESTA on objective and subjective metrics of nighttime hospital sleep disruptors. *J Hosp Med.* 2019:14(1):38-41. doi: 10.12788/jhm.3091
6. Hu RF, Jiang XY, Chen J, et al. Non-pharmacologic treatments for sleep promotion in the intensive care unit. *Cochrane Database Syst Rev.* 2015(10):CD008808. doi: 10.1002/14651858.CD008808.pub2.
7. Lewis SR, Pritchard MW, Schofield-Robinson OJ, Alderson P, Smith AF. Melatonin for the promotion of sleep in adults in the intensive care unit. *Cochrane Database Syst Rev.* 2018;(5):CD012455. doi: 10.1002/14651858.CD012455.pub2.
8. Patel MS, Volpp KG, Asch DA. Nudge units to improve the delivery of health care. *N Engl J Med.* 2018;378:214-216. doi: 10.1056/NEJMp1712984.
9. Wesselius HM, van den Ende ES, Alsma J, et al. Quality and quantity of sleep and factor associated with sleep disturbance in hospitalized patients. *JAMA Intern Med.* 2018;178(9):1201-1208. doi: 10.1001/jamainternmed.2018.2669.