

Sleep Disturbance and Disorders within Adult Inpatient Rehabilitation Settings:

A Systematic Review to Identify Both the Prevalence of Disorders and the Efficacy of Existing Interventions.

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COMMENTARY

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It is well established that sleep is an important factor impacting recovery post-injury. Consequently, Laver and colleagues conducted a systematic review synthesising the extent of research investigating the prevalence of sleep disturbances and disorders amongst ageing adult rehabilitation unit inpatients. Their review also aimed to identify interventions which have been used to improve sleep quantity and/or quality amongst the cohort.

Of the 19 studies which met inclusion criteria, 12 included ageing adults who have experienced a stroke and the remaining studies included people with diverse conditions. Prevalence studies synthesised, concluded that obstructive sleep apnea is a common sleep condition amongst those with stroke, while some form of sleep disturbance is consistent across ageing rehabilitation unit inpatients with diverse conditions. The three intervention studies synthesised investigated the efficacy of Continuous Positive Airway Pressure (CPAP) therapy on the sleep and functional rehabilitation outcomes of inpatients.

Their review is important as it has confirmed that many ageing adults receiving rehabilitation have a sleep condition which may impact functional rehabilitation outcomes. As a result, Laver and colleagues advocate that implementing interventions and/or programs to promote better sleep amongst rehabilitation unit inpatients, including interventions which consider the hospital environment, are worthwhile.

Environmental determinants of sleep in rehabilitation settings: The need for an evidence-base

Environmental factors overnight in hospital (for example, noise, light and temperature) have an impact on sleep outcomes [1-21]. Studies have confirmed that increased sound [10-13, 15-19, 21] and light [12, 16] throughout the evening are both associated with adverse sleep quantity and/or quality. As the referenced studies generally investigate the impact of determinants overnight on the sleep of people within intensive care units or acute settings, they do not add to our understanding surrounding the impact of hospital environmental determinants on the sleep and functional rehabilitation outcomes of rehabilitation unit inpatients. This is an area of worthy of further investigation, confirmed by findings from Laver and colleagues and Amato [22] which both highlight that a lack of research in this area exists.

Acquired brain injury, sleep, and rehabilitation environments

It is important that research investigate the impact of environmental determinants overnight on the sleep outcomes of people who have experienced an acquired brain injury (ABI) and are receiving rehabilitation. It is well established that adverse sleep outcomes are a consequence of experiencing an ABI [23-29].

“The adverse sleep consequences of ABI is problematic as poorer sleep is associated with unfavourable functional rehabilitation outcomes.”

[30, 31]

In the face of medical complications and physical and cognitive impairments that are associated with newly diagnosed ABIs, sleep disorders can often go unnoticed [32]. Early identification and treatment of sleep difficulties is imperative [33] as for people with ABI, increased sleep over and above what is typically required by people without injury is necessary to promote recovery [34, 35]. This is especially so during the acute stage of injury where improved sleep is instrumental in addressing recovery [35, 36].

The increased noise in hospital overnight may have an impact on patient recovery and wellbeing.



The impact of rehabilitation unit environmental factors overnight on the sleep of people with an ABI is largely unknown [22]. At the Gold Coast University Hospital Neurorehabilitation Unit, we have conducted a pilot study to investigate baseline levels of environmental factors overnight and the impact that these have on the sleep and fatigue of inpatients with an acquired brain injury (ABI) receiving rehabilitation.

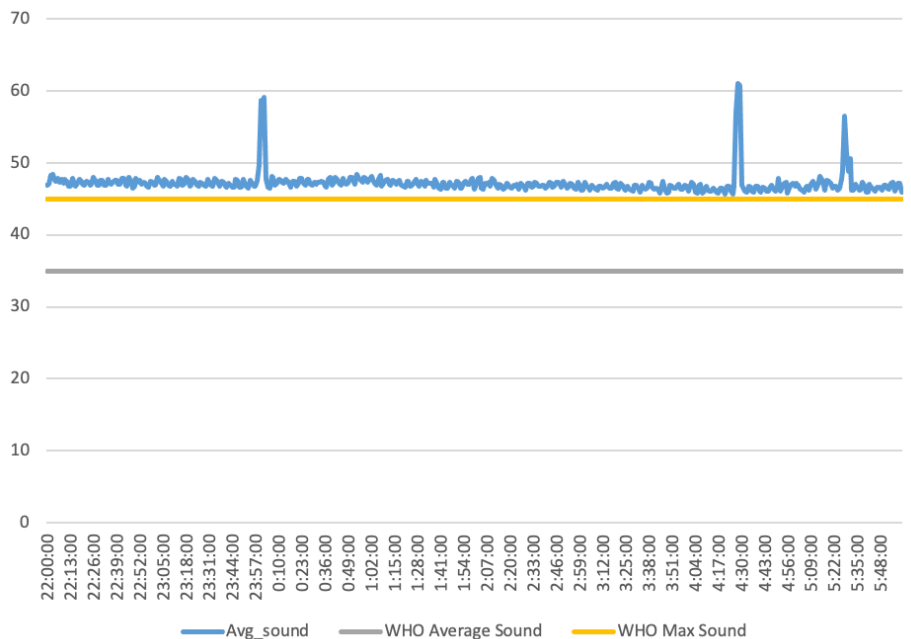
Preliminary findings were presented at The Hopkins Centre, 2019 **Bold Ideas Better Solutions Symposium** [37], and these preliminary findings concluded that overnight sound levels (measured in decibels [dBs]), within a patient's room over a period of seven nights, were consistently above World Health Organization (WHO) hospital environment guidelines [38]. Please see the line graph [right] where a single night's sound has been illustrated. These findings are similar to Oliveira, Gomes [16] which confirmed that overnight sound levels in a paediatric unit were consistently above WHO recommendations. In combination, the findings suggest that high levels of overnight noise are likely prevalent throughout diverse hospital units. The increased noise in hospital overnight may have an impact on patient recovery and wellbeing.

Concluding remarks

Environmental factors overnight may adversely impact the sleep and functional rehabilitation outcomes of rehabilitation unit inpatients. Due to a lack of research, definitive conclusions are not possible. Laver and colleagues suggest that interventions and/or programs that promote sleep are necessary, and these need to consider environmental factors. Prior to the development of such interventions, rigorous research needs to establish baseline measures of environmental

determinants, and investigate the impact of these determinants on sleep and functional rehabilitation outcomes. Such research can inform interventions and programs that should be implemented. It is expected that the pilot study undertaken by THC researchers and colleagues from the Gold Coast University Hospital Unit can assist in identifying important factors to consider for future interventions.

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REFERENCES

1. Bernhofer, E.I., et al., Hospital lighting and its association with sleep, mood and pain in medical inpatients. *Journal of Advanced Nursing*, 2014. 70(5): p. 1164-1173.
2. Boyko, Y., et al., Sleep in intensive care unit: The role of environment. *Journal Of Critical Care*, 2017. 37: p. 99-105.
3. Buxton, O.M., et al., Sleep Disruption due to Hospital Noises: A Prospective Evaluation. *Annals of Internal Medicine*, 2012. 157(3): p. 170-179.
4. Dennis, C.M., et al., Benefits of quiet time for neuro-intensive care patients. *Journal of Neuroscience Nursing*, 2010. 42(4): p. 217-224.
5. Elbaz, M., et al., Sound level intensity severely disrupts sleep in ventilated ICU patients throughout a 24-h period: a preliminary 24-h study of sleep stages and associated sound levels. *Annals Of Intensive Care*, 2017. 7(1): p. 25-25.
6. Engwall, M., et al., Lighting, sleep and circadian rhythm: An intervention study in the intensive care unit. *Intensive & Critical Care Nursing*, 2015. 31(6): p. 325-335.
7. Engwall, M., et al., The effect of cycled lighting in the intensive care unit on sleep, activity and physiological parameters: A pilot study. *Intensive & Critical Care Nursing*, 2017. 41: p. 26-32.
8. Fanfulla, F., et al., Sleep disturbances in patients admitted to a step-down unit after ICU discharge: the role of mechanical ventilation. *Sleep*, 2011. 34(3): p. 355-362.
9. Fukuda, N., et al., Effects of bright light at lunchtime on sleep in patients in a geriatric hospital II. *Psychiatry And Clinical Neurosciences*, 2001. 55(3): p. 291-293.
10. Gabor, J.Y., et al., Contribution of the intensive care unit environment to sleep disruption in mechanically ventilated patients and healthy subjects. *American Journal Of Respiratory And Critical Care Medicine*, 2003. 167(5): p. 708-715.
11. Li, S., et al., Efficacy of controlling night-time noise and activities to improve patients' sleep quality in a surgical intensive care unit. *Journal of Clinical Nursing*, 2011. 20(3/4): p. 396-407.
12. Linder, L.A. and B.J. Christian, Nighttime Sleep Disruptions, the Hospital Care Environment, and Symptoms in Elementary School-Age Children With Cancer. *Oncology Nursing Forum*, 2012. 39(6): p. 553-561.
13. Litton, E., et al., Using Clinically Accessible Tools to Measure Sound Levels and Sleep Disruption in the ICU: A Prospective Multicenter Observational Study. *Critical Care Medicine*, 2017. 45(6): p. 966-971.
14. Meehan, P., et al., Can We Do Something About the Noise in Our Unit?...2018 National Teaching Institute Research Abstracts Presented at the AACN National Teaching Institute in Boston, Massachusetts, May 21-24, 2018. *American Journal of Critical Care*, 2018. 27(3): p. e14-e14.
15. Monsén, M.G. and U.M. Edéll-Gustafsson, Noise and sleep disturbance factors before and after implementation of a behavioural modification programme. *Intensive & Critical Care Nursing*, 2005. 21(4): p. 208-219.
16. Oliveira, L., et al., Environment in pediatric wards: light, sound, and temperature. *Sleep Medicine*, 2015. 16(9): p. 1041-1048.
17. Park, M.J., et al., Noise in hospital rooms and sleep disturbance in hospitalized medical patients. *Environmental Health And Toxicology*, 2014. 29: p. e2014006-e2014006.
18. Persson Waye, K., et al., Improvement of intensive care unit sound environment and analyses of consequences on sleep: an experimental study. *Sleep Medicine*, 2013. 14(12): p. 1334-1340.
19. RH, A.L.-S. and P. Cullen, Sleep and adverse environmental factors in sedated mechanically ventilated pediatric intensive care patients. *Pediatric Critical Care Medicine*, 2005. 6(5): p. 562-567.
20. Snyder-Halpern, R., The effect of critical care unit noise on patient sleep cycles. *CCQ. Critical Care Quarterly*, 1985. 7(4): p. 41-51.
21. Stanchina, M.L., et al., The influence of white noise on sleep in subjects exposed to ICU noise. *Sleep Medicine*, 2005. 6(5): p. 423-428.
22. Amato, S., Effects Of Environmental Factors On Sleep Patterns In Traumatic Brain Injured Adults In The Rehabilitation Setting, in *College of Nursing*. 2018, Kent State University: USA.
23. Williams, E.T., et al., Injury, Sleep, and Functional Outcome in Hospital Patients With Traumatic Brain Injury. *The Journal Of Neuroscience Nursing: Journal Of The American Association Of Neuroscience Nurses*, 2019. 51(3): p. 134-141.
24. Raikes, A.C., B.C. Satterfield, and W.D.S. Killgore, Evidence of actigraphic and subjective sleep disruption following mild traumatic brain injury. *Sleep Medicine*, 2019. 54: p. 62-69.
25. Kaufmann, C.N., et al., Psychometric Characteristics of the Insomnia Severity Index in Veterans With History of Traumatic Brain Injury. *Behavioral Sleep Medicine*, 2019. 17(1): p. 12-18.
26. Botchway, E.N., et al., Outcomes of Subjective Sleep-Wake Disturbances Twenty Years after Traumatic Brain Injury in Childhood. *Journal Of Neurotrauma*, 2019. 36(5): p. 669-678.
27. Wolfe, L.F., A.S. Sahni, and H. Attarian, Sleep disorders in traumatic brain injury. *Neurorehabilitation*, 2018. 43(3): p. 257-266.
28. Williams, C.N., M.M. Lim, and S.A. Shea, Sleep disturbance after pediatric traumatic brain injury: critical knowledge gaps remain for the critically injured. *Nature And Science Of Sleep*, 2018. 10: p. 225-228.
29. Wickwire, E.M., et al., Sleep, Sleep Disorders, and Circadian Health following Mild Traumatic Brain Injury in Adults: Review and Research Agenda. *Journal Of Neurotrauma*, 2018. 35(22): p. 2615-2631.
30. Lowe, A., A. Neligan, and R. Greenwood, Sleep disturbance and recovery during rehabilitation after traumatic brain injury: a systematic review. *Disability And Rehabilitation*, 2019: p. 1-14.
31. Botchway, E.N., et al., A Systematic Review of Sleep-Wake Disturbances in Childhood Traumatic Brain Injury: Relationship with Fatigue, Depression, and Quality of Life. *The Journal Of Head Trauma Rehabilitation*, 2018.
32. Ouellet, M.-C., S. Beaulieu-Bonneau, and C.M. Morin, Insomnia in patients with traumatic brain injury: Frequency, characteristics, and risk factors. *Journal of Head Trauma Rehabilitation*, 2006. 21(3): p. 199-212.
33. Grima, N., et al., Sleep Disturbances in Traumatic Brain Injury: A Meta-Analysis. *Journal Of Clinical Sleep Medicine: JCSM: Official Publication Of The American Academy Of Sleep Medicine*, 2016. 12(3): p. 419-428.
34. Sommerauer, M., et al., Excessive sleep need following traumatic brain injury: a case-control study of 36 patients. *Journal Of Sleep Research*, 2013. 22(6): p. 634-639.
35. Wiseman-Hakes, C., et al., Sleep in the Acute Phase of Severe Traumatic Brain Injury: A Snapshot of Polysomnography. *Neurorehabilitation And Neural Repair*, 2016. 30(8): p. 713-721.
36. Holcomb, E.M., et al., The Relationship Between Sleep-Wake Cycle Disturbance and Trajectory of Cognitive Recovery During Acute Traumatic Brain Injury. *The Journal Of Head Trauma Rehabilitation*, 2016. 31(2): p. 108-116.
37. Lakhani, A., et al., Establishing baseline measures of sleep and environmental factors impacting sleep for inpatients with an acquired brain injury in Bold Ideas Better Solutions 2019. 2019: Brisbane, Australia.
38. Berglund, B., et al., Guidelines for Community Noise. 1999.