

High-Stress Shifts Among Orthopaedic Trainees Alter Cognitive Abilities and Surgical Performance: A Troubling and Undisguised Pilot Study

Michal Jandzinski, MD; Kempland C. Walley, MD; Ross Michaels, MD; Jack T. Eichman, BS; James R. Holmes, MD; Mark Hake, MD; Jaimo Ahn, MD

Purpose: The effect of sleep deprivation and environmental stresses on orthopaedic trainees' health, manifesting as physical and mental impairment in addition to worsening psychomotor performances, has been previously reported. Lack of sleep and rest can compromise decision making and clinical judgment. The cumulative effects of the relative stress and sleep deprivation due to increasing call workload, however, have not been studied. The purpose of this study is to quantify the amount of clinical workload that precipitates a decline in psychomotor and cognitive performance among orthopaedic trainees.

Methods: The study cohort comprised orthopaedic surgery residents from University of Michigan Health, all in good standing, ranging from postgraduate year (PGY)2 to PGY5 levels. 20 residents involved with direct clinical care with respect to taking primary fracture/trauma call at a Level I academic tertiary care center were included in this study. Participants were evaluated before and after call shifts. Participants' technical and spatial processing abilities were evaluated via targeted drilling exercises on Sawbones. Cognitive performance and neuropsychology assessments were captured using a validated, cognitive testing platform.

Results: Following exposure to call shifts, those who experienced a high-stress call shift displayed statistically significant declines in their mental flexibilities ($P = 0.0079$) and information processing ($P = 0.0003$) capabilities as assessed by the cognitive battery. High-stress call shift exposure was associated with significantly worse performance on psychomotor testing, as those subjects demonstrated higher aiming errors ($P = 0.028$) and missed distances ($P = 0.046$) on drilling exercises. Linear regression uncovered a statistically significant protective effect of increased baseline attention on psychomotor performance following call shift exposure.

Conclusion: Following high-stress call shifts among orthopaedic trainees, one can expect declines in neurocognition and technical performance. This study demonstrates a negative relationship between clinical workload and a decline in psychomotor performance and cognitive function that may be protected by higher baseline characteristics, suggesting the need for mitigating strategies. This study should motivate further discussion for residency program directors and traumatologists on best practices in an effort to improve training and overall delivery of patient care.