Between Rest and Repercussions: Unveiling the Hidden Toll of Sleep Deprivation on Patient Safety in Perfusion Training

It's 3 AM after two scheduled cell saver cases, and a 13 hour MVR turned ECMO, and my Viking horn ringtone pierces through the silence: a call from the hospital. A gunshot wound victim is en route, and the OR urgently requires cell saver. I rush in, driving with blaring music and chewing stale gum to stave off drowsiness. In the OR, while surgeons scramble to control life-threatening hemorrhage, I process liter after liter of PRBCs on the cell saver. Then, in a heartbeat, I notice that I have processed one 225 ml bowl with plasmalyte—a mistake that, in that critical moment, I thought could have deprived a desperate patient of needed blood. Later to learn that it was okay. In that moment, I cannot help but wonder: Could this error have been caused by my lack of sleep? Patient safety in perfusion is not just a matter of technical skill—it is profoundly influenced by human factors, particularly fatigue and sleep deprivation. Although my time as a perfusion assistant ended without further incident, this experience underscores a distressing truth: sleep is often relegated to the bottom of the priority list.

During perfusion training, students are expected to be exemplary, not only academically but also clinically. We are the first to arrive and the last to leave, volunteering for extra cases and call shifts, all while juggling rigorous capstone projects, evaluations, and extracurricular responsibilities. The cumulative pressure can easily lead to chronic sleep deprivation. I have observed fellow students, and even experienced myself, the dangerous consequences of this overcommitment. Rushed checklists, miscalculated drug dosages, delayed arterial blood gas analyses, and lapses in hemodynamic monitoring are not abstract risks; on bypass, a single misstep can lead to embolism or even death.

A study by Hodge et al. provides sobering evidence of how acute sleep deprivation affects cardiovascular perfusion students. In this investigation, students were subjected to 24 hours of continuous wakefulness while performing simulated cardiopulmonary bypass (CPB) tasks. Using both the Epworth Sleepiness Scale and the Stanford Sleepiness Scale, the study documented a progressive increase in sleepiness over time, with reaction times for critical tasks significantly prolonged, especially those requiring higher cognitive processing. Students described feelings of being "on autopilot" and recounted episodes of micro-sleep, highlighting the real danger posed by fatigue in high-stakes clinical scenarios. These findings are particularly alarming when one considers that many perfusionists work long shifts, face unpredictable emergencies, and must often manage high-risk cases such as cell saver trauma scenarios and ECMO procedures.

The challenges do not cease once we transition from student life to professional practice. Practicing perfusionists are frequently subjected to short staffing, excessive on-call duties, and the relentless pressure to perform flawlessly, regardless of the time of day. In these environments, fatigue not only undermines individual performance but also disrupts interprofessional communication and teamwork—critical components of patient safety. Studies in other healthcare

fields, such as those conducted by Papp et al., reveal that resident physicians experience significant decrements in cognitive abilities and job performance after sleep loss. When perfusionists operate under similar conditions, the risks are magnified by the life-or-death nature of their work.

Addressing these issues requires a multifaceted approach. First, robust scheduling policies and fatigue management programs must be implemented. Institutions should develop and enforce evidence-based guidelines that limit consecutive work hours and mandate sufficient rest periods. This strategy, similar to protocols in high-risk industries like aviation, could significantly reduce fatigue-related errors. Second, mentorship and peer-support initiatives should be established to cultivate a culture of self-care among perfusion students and practitioners. Senior perfusionists and faculty can share effective strategies for managing fatigue, while peer-support groups can offer both practical tips and emotional support during demanding times.

Moreover, technological solutions hold promise for alleviating workload pressures. Automated monitoring systems capable of tracking fatigue levels and alerting staff when performance may be compromised could be integrated into clinical practice. Advances in simulation training can also better prepare students for the rigors of extended shifts by replicating realistic high-stress scenarios, thereby fostering the development of safe work habits early in their careers.

Ultimately, the underlying culture in healthcare must shift. The expectation that perfection can be maintained on just a few hours of sleep is not only unrealistic but also dangerous. Educational institutions and healthcare facilities have a responsibility to prioritize the well-being of their staff, recognizing that adequate rest is as vital to patient safety as any technical skill. By reevaluating workload expectations and implementing systemic changes, we can create an environment where both patient outcomes and clinician well-being are optimized.

In conclusion, sleep deprivation and fatigue pose significant risks to patient safety in perfusion, both during training and in clinical practice. The evidence from simulation studies and neuroimaging research clearly shows that lack of sleep impairs cognitive function, delays reaction times, and increases the likelihood of errors during critical procedures. As we continue to push the boundaries of clinical performance, it is imperative that we also advocate for systemic reforms in scheduling, mentorship, and technological integration. Only by addressing the pervasive culture of overwork can we truly safeguard patient safety and ensure that every perfusionist operates at their best, even on those long, inevitable nights.

1. Hodge AB, Snyder AC, Fernandez AL, Boan AD, Malek AM, Sistino JJ. The effect of acute sleep deprivation and fatigue in cardiovascular perfusion students: a mixed methods study. *J Extra Corpor Technol*. 2012;44(3):116-125.
2. Papp KK, Stoller EP, Sage P, et al. The effects of sleep loss and fatigue on resident-physicians: a multi-institutional, mixed-method study. *Acad Med*. 2004;79(5):394-406. doi:10.1097/00001888-200405000-00007
3. Zhou, Fuqing MD, PhDa,b,*; Huang, Muhua MDa,b; Gu, Lili MDc; Hong, Shunda MDa,b; Jiang, Jian MDa,b,*; Zeng, Xianjun MDa,b; Gong, Honghan MD, PhDa,b. Regional cerebral hypoperfusion after acute sleep deprivation: A STROBE-compliant study of arterial spin labeling fMRI. Medicine 98(2):p e14008, January 2019. | DOI: 10.1097/MD.0000000000014008