

Fatigue Is Finally a Surgical Safety Issue

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We may finally be waking up to the sleep problem in surgery.

While surgeons have long been expected to perform at their peak on little sleep, new workplace standards and research trends are signaling a change in a workhorse culture that historically has made it difficult, if not impossible, for surgeons to admit when they're too tired to operate.

"It's like there's some valor in saying, 'I climbed Mt. Everest, and it wasn't hard,'" said Jamie Coleman, MD, FACS, surgeon at UofL Health in Louisville, Kentucky. "If you don't think something's hard, why would you need to recover?"

Recently, the American College of Surgeons issued its first-ever proposed [workplace standards for surgeons](#). They include a section on fatigue mitigation and recommend hospitals put formal policies in place for rescheduling or redistributing elective procedures following intense or extended duty. "Fatigue mitigation should be recognized as a patient safety intervention," the proposal states.

Scientists are working in parallel to advance technologies, like brain-monitoring devices and AI-driven analytics, that [measure cognitive fatigue in objective ways](#), so surgeons can more easily recognize when they need to rest. Recent data shows a shift in how surgical fatigue is studied,

highlighting not just patient outcomes but also consequences to the surgeon's well-being.

“We do need to sometimes work through fatigue because we’re the ones who are there when somebody has a car wreck or needs a [liver transplant](#),” said [Douglas Wood, MD](#), chair of surgery at University of Washington Medicine and coauthor of the proposed standards. “But how surgeons are trained and the expectations health systems have for them have — intentionally or unintentionally — taken advantage of their ability.”

The Science of Sleepy Surgery

Research shows fatigue can [impair clinical decision-making](#), but whether it leads to surgical errors is less clear. Cortisol spikes when a surgeon scrubs in, just as it does for a professional athlete at the start of a game, said Coleman, who’s co-authored several papers on surgeons and sleep. That can help enhance performance during surgery, but danger rises when the hormone wears off.

“When we talk about safety, I’m really referring to surgeon safety,” Coleman said. “Looking at all of our available evidence, our patients do not have worse outcomes by being operated on by surgeons who were up the night before. However, that surgeon is more likely to wreck their car on the way home.” In a study of neurosurgeons, 39% reported [falling asleep at the wheel](#) after a night on call.

Coleman urges surgeons to treat themselves as high-performance professionals who — like elite athletes — require preparation, recovery, and a data-driven understanding of their bodies. That means knowing how much sleep you need to function at your best and how sleep deficits and complicated operations affect performance.

New Research Is Exploring Ways to Help

Three lines of research promise support for cognitively overloaded surgeons.

Brain monitors could detect when fatigue levels get dangerous. Through a sensor worn on the head, functional near-infrared spectroscopy uses near-infrared light to estimate blood-flow changes in the cortex (where thinking and decision-making happen). In experiments, acutely sleep-deprived surgeons showed a steady increase in their brain’s activation response during simulated night shifts as they strived to maintain their level of performance.

“When the chips are down, when you’re tired, your brain steps up to work harder,” said [Daniel Leff](#), MBBS, PhD, chair in surgical performance and precision surgical sciences at Imperial College London, London, England. “We call that a cortical compensation,” he said. “But it begs the question: If it’s a compensation mechanism, what happens when it fails?”

Leff and his colleagues are investigating how to leverage this monitoring in real time to help surgeons recognize when they're approaching cognitive overload. In the meantime, he's keen to collaborate with health systems on using the data to guide work schedules.

"How many surgeries should I do in a day? Is it ok if I go 6 hours straight, or should I do 3 hours and have a coffee break?" he said. "If the impact of the research is we can do better workforce planning, better scheduling — fabulous."

AI can manage workflow and aid decisions. An emerging field called AI logistics is using AI to analyze the whole surgical pathway, flagging risk, simplifying choices, and reducing the burden of subjective judgment for exhausted surgeons.

One application is the [OR Black Box](#), which is available to institutions through Surgical Safety Technologies and is already being used in more than 50 hospitals. Akin to the black box on airplanes (minus the physical box), the system uses panoramic cameras, microphones, sensors, and software to gather data during surgery. AI-driven analytics provide postprocedure feedback to improve performance and safety.

The easiest way it can help: AI-assisted scheduling optimizes the workflow so work can finish sooner before fatigue poses a real risk. "There are billions of permutations of how you can schedule 30 cases in 10 different rooms," said [Teodor Grantcharov](#), MD, PhD, the inventor of the OR Black Box and a professor at Stanford University Medical School in Stanford, California. "The human mind can't do that, but it takes seconds for an AI model."

Real-time decision support is still evolving, but researchers are testing whether the AI can flag risk based on a patient's vital signs. "It frees more cognitive capacity to focus on the complex case rather than monitors," Grantcharov said.

Robotic-assisted surgery may help mitigate the effects of sleep deprivation. One study compared surgeons' experiences performing anastomoses after varying levels of sleep, using the MUSA-2 microsurgical robot or by hand. During the manual procedures, poor sleep quality led to [higher levels of perceived mental, physical, and temporal demand](#) — but that effect disappeared during robotic surgery.

As these technologies intersect and build on each other, Leff sees enormous promise over the coming decades. "It wouldn't shock me if 15 to 20 years from now, these indices and biometrics were being used to help keep patients and staff healthier and safer," Leff said. "I don't think it's science fiction anymore."

Three Strategies to Try Now

While the technology becomes more established, there are new ways of thinking about fatigue that can help you right now — because you may not recognize your own exhaustion.

“What my data, and data from others, shows is that we’re not as tuned into fatigue as we might like to think,” Leff said. “By the time you are tuning in, it’s probably very late in that process, and things have gone bad.”

Think of fatigue as a toilet tank. In a 2025 paper in *Annals of Surgery Open*, Geneva-based researcher Pierrick Laulan, PhD, and colleagues [proposed borrowing](#) an approach developed for [ultramathoners](#). The “flush model,” created by neuromuscular fatigue expert Guillaume Millet, PhD, likens fatigue to water filling a toilet tank — recovery flushes it out.

“That maps directly onto surgery,” Laulan said. Complex cases and interruptions fill up the tank, while mindfulness and short breaks drain it. “The key insight is that fatigue isn’t binary — fresh or exhausted. It’s a dynamic level you can monitor and manage in real time.” The goal isn’t to stay empty — it’s to make sure you don’t overflow.

Because this model doesn’t introduce new interventions — it simply provides a way to visualize fatigue — you can start using it immediately. Step one is self-monitoring during surgery, learning to read your personal “water level” and recognize when focus drifts, irritability rises, or situational awareness drops. Apply practical solutions: Schedule complex cases at your circadian peak, take micro-breaks between cases, and know when to slow down or hand off work.

Step on the (metaphorical) scale. “It’s hard to improve something you don’t measure, and you’re definitely never going to improve anything if you’re not intentional,” Coleman said. She calls this data gathering “stepping on the scale.”

- Track your sleep — when you go to bed and wake up — with a wearable or your phone.
- Inventory your home call: Record how often you’re called and whether you go in. Each interruption disrupts sleep. If patterns start, you can try to adjust your schedule.
- Audit your pre-shift reset: When you’re heading into a night shift, do whatever you can to sleep during the day. Document how many hours you slept vs how many you lost to errands or chores.

Focus on active recovery. Countering chronic sleep deprivation is an ongoing effort. You must work on it even when you’re not trying to sleep. “What are you doing the other 20-plus nights a month, when you’re not on call?” Coleman said. “The data that we have is that we’re not going to bed when we should. We eat too late. We drink too much alcohol, we drink too much [caffeine](#), and we’re not exercising.”

And remember: The culture may be changing, but until official policies exist to acknowledge and adjust for fatigue, your best option is to pay attention to your body’s signals — and speak up before you step into the operating room.

“There are situations where I would go to a patient and say, ‘I’m sorry. I was up all night. I don’t think I should do your operation today. We have a couple of options: We can reschedule you, or one of my colleagues who’s here, who I’ve talked to about what you need, could do the operation

instead of me,” Wood said. “But we do need to have a system that makes that normal.”

Grantcharov is the inventor of the OR Black Box. The other experts cited in this article reported having no relevant disclosures.