Sleepiness may affect surgeons' ability to deal with the unexpected

May 2 2012

Sleep-deprived surgeons can perform a previously learned task or learn a new task as well as surgeons who are rested, according to Penn State College of Medicine researchers. However, in sleep-deprived surgeons, the brain must work harder, which could lead to problems during unexpected events.

The researchers reached these conclusions using simulations to study the effects of sleepiness on surgeons.

"Particularly in surgery, simulation has become the introduction to many procedures for new residents," said Jonathan Tomasko, M.D., a research fellow involved in surgical resident training. "Coupled with an 80-hour work week restriction, simulation is becoming increasingly important to ensure an adequate level of skill prior to operation on a patient."

While published research using simulation to determine the effects of sleep deprivation on surgical skill exists, the results do not agree with each other.

"Interestingly, these reports conflict with the results of sleep disruption on non-medical simulated tasks," Tomasko said. "The ability to fly a plane, operate a locomotive and drive an automobile have all been shown in studies to be significantly affected by sleep disruptions. Two such studies showed impairment in simulated performance equivalent to moderate blood alcohol levels."

Researchers in this study, published in *American Journal of Surgery*, tested two groups of medical students -- one sleep deprived and the other rested -- over two days. All study participants were shown how to use a virtual reality simulator on the first three levels of difficulty. They practiced for no more than 45 minutes a day. Researchers instructed study participants to get a full night's rest and then tested the subjects on the first three levels of the simulator.

The researchers introduced an unexpected task in the test to increase the brain's workload. Students were asked to count the flashes of a yellow disc on the screen while performing the task and then report the number of flashes at the end of the round.

Participants returned for a second day of testing either fully rested -- no less than six hours sleep -- or sleep deprived -- less than two hours of sleep. A majority of participants scheduled their testing on a pre-arranged, 24-hour call shift during their surgery rotation to better approximate the effects of performing surgery at night while sleepy.

Participants retook the test on the second day to assess the effects of sleep deprivation on performing an already learned skill. In addition, the researchers instructed the participants on a different simulator and then tested them to assess the effects of sleepiness on learning a new surgical skill.

Researchers used a metric called the NASA Task Load Index to assess workload on the brain of the subjects. This is a tool used in NASA applications and in simulation to determine how difficult a task is.

"We demonstrated no difference in ability to perform a previously learned simulated surgical task or to learn a new simulated surgical task while moderately sleep deprived," Tomasko said. "However, in order to achieve the same level of performance, sleep-deprived subjects

demonstrated increased cognitive workload compared to their rested counterparts."

When asked to count the yellow flashes, both sleepy and rested participants did so correctly while increasing their score on the surgery skill test the second day.

Other studies have shown that stress on brain workload could have negative effects on patient care, especially during unexpected events during surgery. Future studies should focus on new work-hour restrictions as set forth by the Accreditation Council for Graduate Medical Education, Tomasko said.

Provided by Pennsylvania State University