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Lack Of Sleep Study

Attention, vigilance, driving skills suffer as much from long work hours & overnight shifts as from blood alcohol level of 0.04%

ANN ARBOR, MI - The long hours and overnight shifts that are a rite of passage for young doctors may leave them so sleep-deprived that they function as poorly as if they'd had a few cocktails, a new study finds.

In findings published in this week's issue of the Journal of the American Medical Association, 34 young pediatric residents showed similar impairments in vigilance, attention, and driving skills on standardized tests after they had been on duty overnight in the hospital and worked a month of 90-hour weeks, compared with when they had consumed three to four alcoholic drinks after a month of 44-hour weeks with no overnight duties.

The study involved medical residents from Brown University Medical School and was led by a sleep researcher from the University of Michigan Health System. Most subjects were tested before new national requirements limited resident work hours to an average 80-hour work week and maximum 24-hour work day. The team monitored participants' sleep habits during the study using sleep diaries and an automatic wrist-watch activity monitor, which verified that the residents on heavy work shifts got significantly less sleep per night on average than those with lighter schedules.

They also asked the residents to rate their performance and effort on the tests. Ratings of impaired performance were higher following the month of heavy work shifts compared to the light work shifts and residents rated their effort as higher after heavy work shifts compared to the light work shifts with alcohol.

"This adds to the growing evidence that sleep deprivation among medical residents significantly impairs their ability to perform, although it is important to note that we did not assess performance on specific medical tasks," says J. Todd Arnedt, Ph.D. a sleep psychologist who is a Clinical Assistant Professor of Psychiatry and Neurology at the U-M Medical School.

"The regulations in place that limit the number of hours residents can work each week on average are a good initial step, but the solution to the problem is not likely as simple as well-intentioned policies aimed at reducing work hours, which can themselves have negative ramifications. Our study, like others before it, does raise concerns about the performance of sleep deprived physicians-in-training and suggests that strategies aimed at reducing fatigue-related impairments are likely necessary."

Arnedt and his colleagues are the first to study medical residents using the sleep deprivation and alcohol comparison model, which has been used in other populations including truck drivers. Both sleep deprivation and alcohol consumption impair a person's reaction time, attention, judgment, control and driving ability.

The residents were tested four times, in two separate sessions. Two of the tests were done after they had worked a month of light duty without overnight shifts; the tests were done before and after they consumed three to four alcoholic drinks. In the second session, they were tested on the day after an overnight shift that came at the end of a month of 90-hour work weeks that included overnight work every fourth or fifth night. During this session, they were tested before and after drinking a non-alcoholic placebo beverage. The main comparison of interest were the tests conducted after they had drunk either the alcohol or the placebo.

In a Harvard University study published earlier this year, the authors found that first-year residents (called interns) were more likely to have an automobile crash or near-miss while driving after an extended work shift. Arnedt and his colleagues found that skills on a driving simulator deteriorated in residents who were tested after an overnight shift in the hospital and at the end of a month of heavy night work. The findings from these two studies suggest that the personal safety of residents who drive home after working all night may be at risk.

The new U-M/Brown study compared residents who were working days in office-based clinics for about 44 hours a week with those who were working up to 90-hour weeks of day shifts in the hospital's wards or intensive care units, and also had to be in the hospital and awake overnight once every four or five nights to care for patients. (In hospital jargon, a resident who has just completed a period of such intense duty is said to be "post-call.")

Depending on the type of medical or surgical care they decide to specialize in, young doctors can spend anywhere from three to twelve years in residency and fellowship training. The first year, called the internship, is considered the most intense and also features more rotation between different sub-specialties and hospital wards.

Arnedt hopes that this growing body of research on the effects of sleep deprivation among residents helps to highlight the consequences of inadequate sleep in medical training. In 2003, the Accreditation Council for Graduate Medical Education imposed an 80-hour weekly work-hour limit, a 24-hour limit on continuous duty time, in-house call duty no more than once every three nights, and one day in seven free from all patient care and educational obligations, all averaged over four weeks.

"We need to continue to find simple, practical, and effective strategies that hospitals and senior doctors can take to reduce sleep deprivation among residents," says Arnedt, who hopes to study such strategies in future. "We also need to continue to study this issue in other types of residents." Arnedt is a member of the the U-M Sleep Disorders Center, and the U-M Depression Center Sleep & Chronophysiology Laboratory.

For now, though, the new JAMA paper quantifies the issue further, with clear results that contrast with some previous studies whose methodologies did not allow for clear interpretation.

For example: The reaction time of residents who had just finished a month of heavy work schedules was 7 percent slower and they committed 40 percent more errors than when they were on a month of light schedules, On a driving simulator, they had more difficulty maintaining a consistent lane position and a constant speed during the heavy work compared to the lighter work schedule.

Speed variability on the driving test was also 29 percent higher following the heavy-schedule compared to the light schedule after drinking alcohol, but there

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were no other performance differences between these two conditions.

In other words, after a month of 90-hour weeks with overnight shifts every fourth or fifth night, residents performed about the same as when they had a BAC of 0.04 percent after a month of 44-hour weeks of daytime shifts.

The sleep monitoring performed for the study used a wrist device called an actigraph, which records the wearer's level of movement and allows researchers to download data into a computer to assess how many hours a person was inactive, which is used as a proxy measure of sleep.

In the 24 hours leading up to the test days, residents on a light schedule slept an average of 6 hours and 37 minutes, compared with about 3 hours for the residents on a heavy schedule. Residents' post-call ratings of sleepiness during the heavy call month were also higher than their ratings during the light call month, even after they had consumed alcohol on the light call rotation. Residents were not allowed to nap on the test day or to use caffeine after noon time. Both the light-duty and post-call tests were conducted at 3 p.m.

The researchers asked the residents to rate their performance on the driving, attention and vigilance tests, from poor to very good.

They then correlated those self-ratings with the residents' actual performance. In general, the residents who had just completed heavy work schedules could judge their own performance, but only modestly.

In addition to Arnedt, who moved from Brown to U-M in 2004, the study's authors include his two sleep-research colleagues from Brown: Judith Owens, M.D., MPH and Mary Carskadon, Ph.D. Research assistants Megan Crouch and Jessica Stahl are co-authors. The study was funded by a grant from the American Academy of Sleep Medicine.

The original news release can be found [here](#) at the University of Michigan Health System Website.

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