

# Shift work increases the severity of strokes later in life

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As most Americans wind down for bed, 15 million people are just clocking into work. These hospital workers, emergency responders, factory operators and others are among the 20 percent of the world's

population who do shift work. Their different sleep-wake cycle elevates their risk for numerous health disorders, including diabetes, heart attacks, cancer and strokes.

Now, new research published in *Neurobiology of Sleep and Circadian Rhythms* shows the adverse effects of shift work can be long-lasting, even after returning to a normal [schedule](#).

"Shift work, especially rotating shift work, confuses our body clocks and that has important ramifications in terms of our health and well-being and connection to [human disease](#)," said David Earnest, professor in the Department of Neuroscience and Experimental Therapeutics at the Texas A&M University College of Medicine. "When our internal body clocks are synchronized properly, they coordinate all our biological processes to occur at the right time of day or night. When our body clocks are misaligned, whether through shift work or other disruptions, that provides for changes in physiology, biochemical processes and various behaviors."

A previous study done by Earnest and colleagues and published in *Endocrinology* found animal models on rotating shift work schedules had more severe stroke outcomes, in terms of both brain damage and functional deficits, than those on regular 24-hour cycles of day and night. Males were distinguished by worse outcomes in which mortality rates were much higher.

This new study took a different approach. Rather than examining immediate effects of shift work on strokes, the researchers returned all subjects to regular 24-hour cycles and waited until their midlife equivalent—when humans are most likely to experience a stroke—to evaluate stroke severity and outcomes.

"What was already born out in [epidemiological studies](#) is that most

people only experience shift work for five to eight years and then presumably go back to normal work schedules," Earnest said. "We wanted to determine, is that enough to erase any problems that these circadian rhythm disruptions have, or do these effects carry over even after returning to normal work schedules?"

They found that the health impacts of shift work do, indeed, persist over time. The sleep-wake cycles of subjects on shift work schedules never truly returned to normal, even after subsequent exposure to a regular schedule. Compared to controls maintained on a regular day-night cycle throughout the study, they displayed persistent alterations of their sleep-wake rhythms, with periods of abnormal activity when sleep would have normally occurred. When they suffered strokes, their outcomes were again much worse than the control group, except females had more severe functional deficits and higher mortality than the males.

"The data from this study take on added health-related significance, especially in females, because stroke is a risk factor for dementia and disproportionately affects older women," said Farida Sohrabji, professor in the Department of Neuroscience and Experimental Therapeutics and director of the Women's Health in Neuroscience Program.

The researchers also observed increased levels of inflammatory mediators from the gut in subjects exposed to a shift work schedule. "We now think that part of the underlying mechanism for what we're seeing in terms of circadian rhythm disruption causing more severe strokes may involve altered interactions between the brain and gut," Earnest said.

The results of this study could eventually lead to the development of interventions that block adverse effects of disrupted [circadian rhythms](#). In the meantime, shift workers can improve care of their internal body clocks by trying to maintain a regular schedule as much as possible and

avoiding a diet high in fat, which can cause inflammation and also alter the timing of circadian rhythms.

This research has clear implications for shift workers, but it could extend to many other people who keep schedules that differ greatly from day to day.

"Because of the computer age, many more of us are no longer working from nine to five. We take our work home and sometimes work late at night," Earnest said. "Even those of us who do work regular schedules have a tendency to stay up late on the weekends, producing what is known as '[social jet lag](#),' which similarly unwinds our [body clocks](#) so they no longer keep accurate time. All this can lead to the same effects on human health as [shift work](#)."

To avoid some of these health hazards, Earnest says the best approach is to maintain a regular schedule of awake time, sleep time and mealtimes that doesn't vary drastically from day to day. In addition, avoid the usual cardiovascular risk behaviors like eating a high-fat diet, not getting enough physical activity, drinking too much alcohol and smoking.

**More information:** David J. Earnest et al, Sex differences in the diathetic effects of shift work schedules on circulating cytokine levels and pathological outcomes of ischemic stroke during middle age, *Neurobiology of Sleep and Circadian Rhythms* (2022). [DOI: 10.1016/j.nbscr.2022.100079](https://doi.org/10.1016/j.nbscr.2022.100079)

David J. Earnest et al, Sex Differences in the Impact of Shift Work Schedules on Pathological Outcomes in an Animal Model of Ischemic Stroke, *Endocrinology* (2016). [DOI: 10.1210/en.2016-1130](https://doi.org/10.1210/en.2016-1130)

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