

# Impact of sleep on women's cardiovascular health

Jason Carter, associate vice president for research development and professor of kinesiology and integrative physiology, is speaking at the 2018 National Institute of Health Heart, Lung and Blood Institute Research Conference on Sleep and the Health of Women in Bethesda, Maryland. He is participating in a presentation and panel discussion Wednesday, Oct. 17 at 8:35 a.m. about the effects of sleep on cardiovascular health in women.

“Population-based data suggests certain cardiovascular diseases like hypertension are more strongly associated with short sleep in women than they are in men,” Carter says. The focus of his presentation, which is geared at a broad audience, is on the role of the sympathetic nervous system – the so-called fight-or-flight system – and how this response is more pronounced in women who are getting less sleep than in men who lack sleep.

“When women are deprived of sleep, their nervous systems appear to respond more aggressively than men,” Carter says. “There’s an acceleration of the nervous system. We see higher blood pressures and greater potential risk for heart attack. The surge of sympathetic activity also increases the risk of stroke. Too much of an excitation of the body sets a person up for negative cardiovascular events acutely and chronically.”

The conference is free and open to the public, who are encouraged to attend.

Carter has been integral in the recent opening of the Michigan Technological Sleep Research Laboratory combines sleep analysis technologies to provide a window into the effects of sleep on cardiovascular health.

The two-bed sleep study facility is located in Michigan Tech University's Student Development Complex and has a core staff of two faculty researchers, a sleep physician, a registered nurse who is also a certified sleep technician, a lead doctoral student researcher, as well as other graduate students and undergraduate students.

Studies at the facility hinge on research into the effects of sleep on cardiovascular health, contributing to the broader field of sleep research—a field that is growing rapidly.

“What implication does sleep have? We sleep one-third of our lives. It's a huge chunk of our days,” says Jason Carter, associate vice president for research development and professor of kinesiology and integrative physiology. “An elephant only sleeps three hours a day, while a lion sleeps up to 20 hours a day. We see a huge species variation in sleep, but we still don't fully understand what sleep does.”

Both of the sleep rooms in the new facility not only have the capabilities of the overnight polysomnography (PSG) and electroencephalography (EEG), but also take simultaneous measurements of beat-by-beat blood pressure through finger plethysmography, which constantly records blood pressure throughout the night; pulse oximetry, which measures oxygen content in the blood throughout the night; and transcutaneous carbon dioxide levels from the skin.

The facility meets all of the physical requirements to seek a sleep study center accreditation from the American Academy of Sleep Medicine. Additionally, researchers are working with sleep study software company Natus to add blood pressure readings to its suite of monitored biometric signals. Perhaps most cutting edge, is the team's interdisciplinary approach to sleep research that includes biomedical engineering signal processing techniques applied to physiology. In the future, the Michigan Tech Sleep Research Laboratory plans to prove the importance of Big Data in the field of sleep research.

“We’re using these technologies in novel combinations to better understand the impact of things like alcohol, sleep deprivation and insomnia on blood pressure,” Carter says. “There’s a very complex relationship between sleep and blood pressure control. The epidemiological evidence is clear these are strongly coupled, and they seem to be more strongly coupled in women than men.”

Current research at the center focuses on several separate studies:

- National Institutes of Alcohol Abuse and Alcoholism (NIAAA)-funded study to understand alcohol’s effects on sleep, blood pressure and brain activity
- National Heart, Lung and Blood Institute (NHLBI)-funded study to compare cardiovascular responses to sleep deprivation in postmenopausal women and men of similar ages
- Effects on insomnia on cardiovascular health

“What’s unique for us is the ability to combine various technologies that have been developed in human physiological signal processing,” Carter says. “The real-world applicability and emphasis is to ultimately inform and educate the public on how we might avoid or slow down the risk for cardiovascular disease as it pertains to sleep insufficiencies.”