Home sensors can detect opioid withdrawal signs at night

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(left) The CASAS Smart Home in a Box (SHiB) contains (middle) passive infrared (PIR) motion detectors coupled with ambient light sensors and (right) magnetic door use detectors coupled with ambient temperature sensors. When there is a change in state, sensors indicate the new state in a text message sent to a central Raspberry Pi. This machine tags the message with the corresponding date, time, and sensor identifier. Credit: *Pain Management Nursing* (2022). DOI: 10.1016/j.pmn.2022.08.011

Some smart home technology could help curb opioid overdose. A Washington State University pilot study showed that a set of noninvasive home sensors could provide accurate information about overnight restlessness and sleep problems for people recovering from opioid use disorder.

Disrupted sleep is a major complaint of people trying to quit highly

addictive opioids. Although methadone is effective at reducing cravings and withdrawal, it is often prescribed once daily and adjusting for the proper dosage can take time. In the meantime, treatments can wear off during the night, returning withdrawal symptoms and pain—which increases the risk of resuming drug use and accidental overdose.

In the study, detailed in the journal *Pain Management Nursing*, WSU researchers found the home sensors matched other monitoring methods for sleep disturbance about 89% of the time.

"One day when people go home from addiction treatment, we could send them to a smart home sensor environment, so we can know remotely if they're struggling to sleep and getting up and down a lot," said lead author Marian Wilson, a WSU nursing professor. "We know that poor sleep is a trigger for substance use and could lead to unintended overdose."

Wilson and her colleagues designed the study to see if they could create a system that could detect problems such as sleep apnea and other breathing issues as well as physical movement indicating an inability to sleep well. This information could then potentially help alert healthcare workers of the problems and prompt medication changes or supportive interventions. The findings also simply validated patients' concerns.

"Our study confirms what people with opioid use disorder have been saying—their sleep can be restless and disturbed. We need to appreciate that people may be suffering," said Wilson. "There's a misconception that substance use is all about that euphoric 'high.' By the time people get into a methadone treatment program, they're usually just trying to feel normal."

For the study, which was conducted at WSU's Sleep and Performance Center, researchers collected about 16 hours of data over two nights for

four people in methadone treatment programs. The sensors were placed on a wall, overhead and on the door to monitor movements.

They compared the data collected by the unattached, camera-less sensors to information collected by observers via video and polysomnography, the most common sleep study method. Polysomnography involves attaching monitoring wires and equipment to the patient to collect measurements like oxygen saturation and leg movement.

The researchers found that the home sensors captured a lot of the same information as the systems with wires and cameras.

"This tells us that maybe in the future, we don't need to have the person come into the sleep lab to be observed," said Wilson. "The home sensors would be a very unobtrusive way to monitor somebody with no cameras, no videos, just the sensors that tell us about their movements."

The next step for this research would be to test the sensor concept in the home environment instead of a lab, which would involve placing sensors in the homes of patients who are being discharged from an in-patient treatment program or starting an outpatient medication treatment program.

More information: Marian Wilson et al, Piloting Smart Home Sensors to Detect Overnight Respiratory and Withdrawal Symptoms in Adults Prescribed Opioids, *Pain Management Nursing* (2022). DOI: 10.1016/j.pmn.2022.08.011

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