Medscape

March 6, 2019

Unique Device Holds Promise for Agitation in Dementia

By Pauline Anderson

ATLANTA — A device that emits low-frequency radio waves and collects detailed data on movements can help inform treatment decisions for dementia patients with agitation, new research suggests.

Known as Emerald, the novel sensing device uses radio wave sensing and signal processing "to map human behavior in a contact-free, completely remote and relatively private way. We are really excited about the potential of this technology and how it might guide real time medication changes," study investigator, **Ipsit V. Vahia, MD**, from **McLean Hospital**, Belmont, Massachusetts, and Harvard Medical School, Boston, told *Medscape Medical News*.

The findings were presented here at the American Association for Geriatric Psychiatry (AAGP) 2019.

Discreet Device

Vahia's team is collaborating with Massachusetts Institute of Technology (MIT) researchers who developed the device.

The wall-mounted device is plugged into a power source "so no one needs to remember to charge it," said Vahia.

Patients aren't constantly reminded that their movements are being tracked. They don't need to wear anything or carry a mobile device and the technology doesn't involve intrusive cameras taking pictures of them, said Vahia.

The device emits wireless radio signals similar to WiFi signals but 100 times less powerful. It can relay information on a person's exact location in a room at any given time, and extracted information may shed light on respiration and other vital signs.

"It can detect gait, so based on gait and gait speed, we can map out pacing, agitation, and restlessness," said Vahia.

The device can also measure length of sleep and other parameters. "We can detect periodic limb movements in sleep, which has important implications," said Vahia.

The data the device collects is compressed and displayed in patterns that illustrate changes over time. To Vahia, the ability to collect data longitudinally is the most exciting element of the technology.

"We can see changes in behavior over time, which we believe may allow us to study the impact of treatments and interventions."

Advancing Quickly

The researchers presented data collected for individual dementia patients in assisted-living facilities that illustrate potential applications of the device.

One example was an 85-year-old white woman diagnosed with a major neurocognitive disorder, major depression and anxiety, with a history of restlessness and agitation.

Sensor data collected over time showed "fairly classic pacing behavior in the context of Alzheimer's disease," said Vahia.

His team used the wave patterns to suggest medication changes—decisions that were "100% verified" by conferring with onsite attending staff, he said.

The investigators were keen to learn more about the cause of the spikes in this patient's behavior. After combing through staff logs, they found that the patient paced more on the days following visits from her husband or son. This knowledge also informed important treatment alterations.

Current investigation of the device is restricted to patients with dementia, which Vahia called "the most expensive clinical problem facing us across all of medicine."

It's a condition where early intervention may reduce hospitalization, and impact negative outcomes such as falls, he said.

"This work is early stage but rapidly moving," said Vahia. "The goal of our team is to expedite the implementation of this technology in real-world care, to the greatest extent possible, but in a manner that is evidence-based."

The availability of "easy, efficient technology and rapid analytics" represents a "tipping point" in this research area, said Vahia.

"It has turned this work from being cumbersome and not translatable into something that you can immediately translate into care."

"Groundbreaking" Research

Commenting on the study for *Medscape Medical News*, Prasad Padala, MD, professor of Psychiatry and Geriatrics, University of Arkansas for Medical Sciences in Little Rock, called it "groundbreaking."

Sensor-based measurements can be superior to clinician-driven data collection, said Pradala, who was not involved with the current research.

He used the example of in-office assessment of gait speed, which is a marker for longevity.

"The moment I tell patients that I'm measuring their gait speed, they want to put their best foot forward, and that defeats the purpose."

Vahia's team is collecting data "without the explicit awareness of the patient" so in a more objective manner than is possible with a clinician, said Padala. "The data will be more reflective of what's in reality."

He doesn't believe this noncontact data collection process will eliminate the role of the physician. "Once we get the data, what we do with it is where the doctor comes into the picture."

The research was supported in part by the National Institute of Mental Health, Once Upon a Time Foundation, Massachusetts Institute of Technology, Stein Institute for Research on Aging, UCSD RPC iPad Project, and the John A. Hartford Foundation. Vahia and Padala have disclosed no relevant financial relationships.

American Association for Geriatric Psychiatry (AAGP) 2019: Abstract LB6. Presented March 3, 2019.