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Algorithm may predict the onset of seizure clusters

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Information gleaned from the recordings of brain activity by the stimulator enable physicians to forecast the risk of seizure clusters. Credit: University of Alabama at Birmingham

Researchers at the University of Alabama at Birmingham have developed a method to predict when patients with seizure disorders such as epilepsy might be at risk for a cluster of seizures. Seizure clusters are seizures that occur in rapid succession over several hours or days and are

linked to an increase in hospitalization and sudden death.

"Reliable seizure cluster prediction would immensely benefit individuals with epilepsy," said Adeel Ilyas, M.D., a resident in the Department of Neurosurgery in the UAB Marnix E. Heersink School of Medicine and first author of the study, published in the journal *Epilepsia*.

The research team used data from brain signals recorded via electrocorticography in 10 patients who had previously received the RNS System implant from NeuroPace. RNS stands for responsive neurostimulation. The device, which is used to help control seizure activity in patients with difficult-to-control epilepsy, is an electrical stimulator implanted in the skull with electrodes strategically placed within the brain. It records a patient's specific brain activity and can recognize patterns that are associated with seizures. The system then delivers stimulation to modulate those seizures.

"By analyzing past recordings from the 10 patients, we were able to create an algorithm that could accurately forecast when a seizure cluster was likely to be imminent," Ilyas said.

The NeuroPace stimulator is implanted in the skull. Electrodes are placed in the brain to measure brain activity. Credit: University of Alabama at Birmingham

Knowing that a patient is at increased risk for a seizure cluster allows medical professionals to intervene to reduce the risk, such as increased monitoring, adjustments to medication or tweaks to the patient's stimulator. Ilyas likens the algorithm to weather forecasting.

"We are able to use past information, referenced against actual outcomes, to predict future events, in much the same fashion as the science of weather forecasting," he said. "We have been able to show the forecast can identify a window roughly two and a half days prior to the onset of clusters, giving patients and their medical care team time to establish an intervention plan."

The forecasts were effective in all 10 study subjects, but Ilyas says these

early results need to be validated with much larger studies. If they are verified, he anticipates that a mobile app could be created to deliver a warning of increased cluster risk. Patients with NeuroPace or any other intracranial EEG system might be able to self-monitor their risk.

More information: Adeel Ilyas et al, Forecasting seizure clusters from chronic ambulatory electrocorticography, *Epilepsia* (2022). DOI: 10.1111/epi.17347

Provided by University of Alabama at Birmingham