

For epilepsy sufferers, cutting-edge technology offers early alerts of seizures

May 18 2023, by Anthony King



Credit: AI-generated image ([disclaimer](#))

People with epilepsy could soon get a one-minute warning of an impending seizure with the help of a new medical device.

An epileptic [seizure](#) can put a person at risk of injury in everyday situations that most other people take for granted. Often this leads

sufferers to avoid common activities such as cycling, swimming or walking up steep inclines.

But wearers of the new device can be reassured that they will get an alert before the onset of a seizure and take necessary precautions. Dr. David Blázquez, an engineer, was inspired to invent the earpiece for very personal reasons.

"We started this project because of my daughter Marina, who has [epilepsy](#)," Blázquez said.

He had been a robotics researcher but saw the need for people like his daughter to wear a device that could warn them about an approaching convulsion.

"She experienced a lot of seizures in different situations and some of them were very dangerous for her," said Blázquez, chief executive officer of MJN Neuro, a Spanish company that developed the earpiece.

The business received EU funding through the [SERAS v4.0](#) project in 2019–2022 to advance the device, which is now available in some European countries.

While today epilepsy sufferers can wear bracelets or monitors indicating the condition to other people, no warning of a seizure is given ahead of time.

Earpiece app

The earpiece signals an app on the patient's mobile phone that a seizure is likely. A family member or caregiver can also be alerted.

The device constantly monitors [brain activity](#) using an

electroencephalogram, logging key medical information and building up an algorithm that over time gets better at spotting the signs of an impending seizure.

The general goal is to offer an advance alert of at least one minute, according to Blánquez, who said some wearers may get longer than that.

"We are personalizing the algorithm for each patient because, for each person with epilepsy, their brain is different," he said.

An epileptic seizure occurs when the brain misfires. Only about one in 20 people recognizes the signs of a seizure before it happens.

Epilepsy is a neurological condition that worldwide afflicts about 50 million people, or 1% of the global population. About six million people in Europe have the condition, which can be caused by genetics, head trauma, viral infections or damage before birth. About half of all cases are unexplainable.

Sudden death

In rare instances, epilepsy can cause death, even in apparently healthy children and young adults.

Dr. Esther Rodriguez-Villegas, an [electrical engineer](#) at Imperial College London, is working on finding a solution in an EU-funded project called [NOSUDEP](#). The project began in 2017 and runs through 2024.

Sudden death strikes roughly one in every 1,000 people with epilepsy, most often people aged 21 to 40, according to Rodriguez-Villegas.

In recent years, a study shone some light on the mystery, indicating that it can happen when a person momentarily stops breathing during

slumber—a condition known as apnea.

The link was discovered when epilepsy patients were being monitored in hospital before surgery. Some stopped breathing.

When a nurse realized within three minutes what was happening, the patients were revived and survived. If the time lapse was between five and 10 minutes, only some were saved. After 10 minutes, it was too late for all patients, according Rodriguez-Villegas, who cited a [2013 study in the journal *The Lancet Neurology*](#).

Sleeping and breathing

While many people stop breathing during sleep, they begin to do so again on their own. In some people with epilepsy, the brain seemingly fails to hit the restart button.

"I was introduced to families of people who had died from sudden unexpected death in epilepsy," said Rodriguez-Villegas. "And I decided that I wanted to do something to help."

Her plan was to design a nonintrusive device that patients would wear at night and that would alert them or a family member when a problem arose.

But because this is frontier research rather than product development, she has had to take into account new clinical evidence that adds to the complexity.

"I thought we could do this by tracking apnea, but now I know it is more complicated than that," said Rodriguez-Villegas.

False alarms

Part of the challenge is that a device can't be flashing needless warnings at 3 am to parents that their child is at risk of dying. It needs to be ultra-reliable.

"What we have seen is that epilepsy patients do have sleep apnea, but the vast majority of apnea are actually very short," said Rodriguez-Villegas.

These short periods would need to be ignored by the device so that [false alarms](#) don't inflict needless anxiety and deter people from using it.

Now Rodriguez-Villegas aims to produce an alarm system designed to be as failsafe as possible. It would be based on data from an apparatus that could track breathing, heart rhythms, oxygen saturation levels, vocal sounds and even sleep position.

A best-case scenario is that some sort of device, worn around or on the neck, could be available in five years, according to Rodriguez-Villegas. But she signaled it could well take longer.

Back in Spain, Blázquez's seizure-warning earpiece is available for about €1,700. It's also obtainable in the U.K. and will soon be in Germany as well.

"We need a solution for people with epilepsy to allow them engage in more everyday activities," Blázquez said.

More information:

- [SERAS v4.0](#)
- [NOSUDEP](#)

Provided by Horizon: The EU Research & Innovation Magazine

Citation: For epilepsy sufferers, cutting-edge technology offers early alerts of seizures (2023, May 18) retrieved 24 April 2024 from <https://medicalxpress.com/news/2023-05-epilepsy-cutting-edge-technology-early-seizures.html>

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