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Hybrid epilepsy care: wearable, home EEG in the diagnosis and follow-up of absence seizures.

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Introduction

COVID-19 has caused a global shift towards remote care. Within epilepsy, a major hindrance for adoption of tele-consultations is the importance of EEG in the diagnosis and follow-up of people with epilepsy. Some solutions for ambulatory or remote EEG exist, yet they still interrupt the daily routine (school, home) and still need an EEG technician to attach and detach the electrodes. Epihunter, a CE-cleared device for the automatic detection of absence seizures, has been recently introduced. It uses wearable 2-lead frontal EEG and artificial intelligence (AI) to detect seizures. The wearable EEG is streamed over bluetooth to a smartphone, which runs the algorithm. When a seizure is detected, it is logged in a diary and a (non-clinical) EEG trace is recorded. Optionally, a video can be automatically captured starting 30 seconds prior to seizure onset and the user can add annotations.

Methods

We evaluated a new procedure for hybrid epilepsy care in a private practice and university hospital. It combines physical consultations with the ease of self-monitoring with epihunter in daily life (home, school). When an in-person or remote consultation couldn't provide sufficient evidence on the presence or absence of absence seizures, the neurologist initiated the home-care procedure. Epihunter was asked to send the patient a welcome box, including the device and instructions. The patient was instructed to use epihunter for at least 20h during their daily routine (at home, school). Note that the recording was not consecutive, but spread out over multiple weeks. This allowed for recording at the moments where seizures were most expected. Optionally, the patient was asked to perform a parent supervised hyperventilation test while wearable EEG and video were recorded. All results were

collected in a secure cloud platform. The neurologist could review the results in the neurologist portal. The portal shows an overview of seizure detections, and for each seizure a synchronised view of the wearable EEG, recorded video and potential user annotations. The results were discussed with the patient during follow-up (phone) consultation(s) and the use of epihunter was continued when needed.

Results

The procedure has run on 9 patients. Physicians report that they have more confidence in their diagnosis and treatment plan, as they have additional objective data. The consultation with the patient is more concrete combining patient input and the real-life data recorded by epihunter. Parents are more confident about the diagnosis and report less reporting pressure, especially as they could use epihunter to record additional information on the moments they notice a potential seizure. In multiple cases the remote monitoring added intermediate data avoiding frequent trips to the practice.

Conclusions

We have shown the potential for the use of wearable EEG and home-monitoring as a digital diagnostic (DDx) in the diagnostic and follow-up of people with (suspected) absence seizures. Epihunter can both be used to confirm seizure freedom or report on seizure occurrence and frequency. In the future, we will further investigate the impact on the care pathway, neurologist, patient and their family.