

TeleEPI

Integrated care pathway for people with epilepsy based on an unobtrusive AI-powered telemedical system

KEYWORDS

Telemedicine, Epilepsy, Artificial Intelligence, Mobile EEG, Neurology, Biosignal Processing,

DURATION

36 months

ABSTRACT

The diagnosis and treatment process of people with epilepsy starts with suspected epileptic seizures. Patients are referred to neurological departments which perform several diagnostic procedures to rule epilepsy in or out, mainly using electroencephalography (EEG). Repetitive short EEG measurements and/or inpatient long-term EEG monitoring of several days are undertaken. Trained personnel perform the visual evaluation and interpretation of EEG data. This process is time-consuming and requires a high degree of specialization. Anti-seizure medication (ASM) represents the main form of treatment. More than 20 ASMs are used to treat seizures, frequently prescribed in combination (polytherapy). Finding the proper medication which makes the patient seizure free is often a trial-and-error process which requires several iterations and monitoring of treatment impact and side effects. Several outpatient appointments for routine EEG monitoring are often needed, especially for more complex patients. An essential input for adjusting and evaluating the treatment effects is self-documented epilepsy diaries, where patients report their seizures and other potential epileptic events. However, they are based on pure subjective patient experiences and are therefore error-prone and sometimes even misleading for medical experts (over- or underreporting of epileptic seizures). The main current gaps and challenges for optimised care in epilepsy are as follows: - Complex interaction between stakeholders and information-flows coming from the inpatient but also the outpatient setting - Error-prone and subjective patient-reported information (seizure over- and underreporting) - Lack of monitoring solutions applicable in the patients home - Not quantifiable influences in standardized inpatient monitoring settings differing from the usual familiar patient environment which often result in a lack of seizure episodes during inpatient monitoring - High degree of specialization needed to personalize diagnostics and treatments - Limitations of resources (time and technology) and lack of available experts The main focus of this project is to implement and test an innovative digital solution to optimize care for epilepsy. Our telemedical approach replaces inpatient investigations by continuous, unobtrusive and real-life monitoring at home to optimize treatment decisions for epilepsy based on objective continuously recorded EEG and reporting in a telemedical platform. In this project, we will integrate and improve several existing components of the consortium partners into a comprehensive solution that our clinical partners will implement. The ultimate goal is to find a solution which provides the best possible care, reduces the complexity of care, uses resources more efficiently and achieves optimal outcomes in the sense of high-value care for each patient. The main components of our system are: Telemedical Platform: We will use AITs telemedical platform which enables simple and intuitive data transfer from medical devices and a broad range of data-capturing methods. The system allows easy communication between medical experts and patients. The platform will be expanded to include a digital seizure and nutrition diary (<https://kit.ait.ac.at/home-2/>). Mobile EEG monitoring: We will evaluate two approaches for mobile EEG monitoring and connect the devices with the

telemedical platform. The first conservative system will use glued standard electrodes and mobile recording hardware (several candidates in the market). The second system will be the wearable seizure monitoring solution EpiCare@Home of project partner Byteflies. AI-based EEG analysis software: We will integrate AITs AI-based EEG analysis software called encevis. encevis is CE-certified and FDA-approved and covers a wide range of EEG analysis as spike detection, seizure detection, electrical source localization and trend analysis tools.

PARTNERS

PI	Organisation	Country
Gritsch	Austrian Institute of Technology GmbH	Austria
Baumgartner	Karl Landsteiner Institute for clinical epilepsy research and cognitive neurology	Austria
Kastner	Telbiomed Medizintechnik und IT Service GmbH	Austria
Ryvlin	Department of Clinical Neurosciences, Centre Hospitalier Universitaire Vaudois	Switzerland
van Blooijis	Stichting Epilepsie Instellingen Nederland	the Netherlands
Vandendriessche	Byteflies NV	Belgium