

Autonomic Variables and their correlation with Electrophysiological Markers in Epilepsy Patients Undergoing Phase II Presurgical EvaluationMauricio Villamar, MD¹ • Amir Al-Bakrei² • Meriem Bensalem-Owen, MD¹ • Sunderam Sridhar, PhD²**7b**¹Neurology, University of Kentucky • ²Engineering, University of Kentucky

Please note that, by the date of the Symposium, we plan to update this abstract with results from the first study subject.

Background: Previous studies have shown that epileptic seizures can follow certain patterns and vary in their frequency with time-of-day depending on the origin and type of seizures. It is unclear if core/skin temperature and other surrogate indices of autonomic function such as heart rate, electrodermal activity, electromyographic activity, or photoplethysmography, follow similar circadian variation and modulate seizure occurrence in this patient population. If consistently present, any changes in the abovementioned variables occurring in a circadian pattern and associated with the onset of clinical seizure activity would be potentially helpful in predicting the occurrence of seizures, and could have important therapeutic implications aimed at decreasing the frequency and/or severity of epileptic seizures.

Purpose: To evaluate circadian variability in heart rate, skin and core body temperature, electrodermal activity, photoplethysmography, surface electromyography, and the wake-sleep cycle in epilepsy patients admitted to the adult epilepsy monitoring unit (EMU) for electrocorticography, as well as to identify any changes in the abovementioned variables associated with the onset and resolution of seizures.

Hypothesis: In epilepsy patients, multiple variables indicative of autonomic activity can show a circadian variability and correlation with the onset and resolution of seizure activity.

Methods: Consecutive patients admitted to the EMU at the University of Kentucky Medical Center will be eligible for enrollment in this study. Upon admission, all subjects aged 18 years and older who are capable of providing informed consent will be offered enrollment and consented for participation. Subjects

will wear an Empatica E4 device on their wrist for the duration of their EMU admission to collect information on heart rate, skin temperature, electrodermal activity, and photoplethysmography. In addition, we will monitor submental EMG using conventional snap electrodes. The EMG signal will provide complementary information about resting muscle tone, which is an index of vigilance state. All the above variables will be recorded synchronously with electrocorticography data. Participants' demographic data will be obtained, including age, gender, duration and frequency of spells/seizures, epilepsy classification and presumed etiology, and number of antiepileptic drugs used. If applicable, information regarding the last menstrual period and usual duration of menstrual cycle will be collected.

For standardization, room temperature will be controlled, kept stable for each given patient and adjusted to his/her comfort level, ideally between 17.0 and 22.0 degrees Celsius. Baseline skin temperature over a period of 24 hours will be established for all patients groups. Core temperature (axillary) will also be obtained every 6 hours and correlated to skin temperature.

For patients who do present either clinical or electrographic seizures during their EMU stay, the abovementioned physiological variables will be analyzed for 30 minutes prior to seizure activity, during the event, and for 30 minutes after seizure end. Data analyses will be performed by a coinvestigator blinded to clinical and EEG findings.