Epilepsy Monitoring Unit

An Epilepsy Monitoring Unit (EMU) is a specialized medical facility that is designed to monitor and evaluate patients who have seizures or suspected epilepsy. EMUs are typically located in hospitals or specialized epilepsy centers and are staffed by a team of healthcare professionals who are trained in epilepsy care.

The purpose of an EMU is to provide comprehensive monitoring of a patient's seizures in a controlled environment. This allows healthcare professionals to accurately diagnose and classify the patient's epilepsy, determine the frequency and severity of seizures, and develop an appropriate treatment plan.

During a stay in an EMU, patients are typically connected to an electroencephalogram (EEG) machine that records brain activity and allows healthcare professionals to monitor for any abnormal electrical activity in the brain that may be associated with seizures. Patients may also be asked to keep a diary of their seizures and report any symptoms they experience during their stay in the unit.

EMU stays can vary in length depending on the needs of the patient. Some patients may only require a few days of monitoring, while others may need to stay in the unit for several weeks. Once a patient's seizures have been adequately monitored and evaluated, healthcare professionals can make recommendations for treatment and provide ongoing management of the patient's epilepsy.

The Epilepsy Monitoring Unit (UME) is for prolonged video-EEG recordings and is equipped with the latest stereo-electroencephalography (SEEG) acquisition systems with a recording capacity of up to 256 channels. The structure consists of a monitoring room where nurses and technicians meet for 24 hours a day with exclusive dedication to the EMU. There is also a specific guard for epilepsy so in case of emergencies, a specialized professional is always available.

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80 patients underwent intracranial EEG recording for epilepsy surgery planning. Ghosn et al. developed a first-order pharmacokinetic model of the ASMs administered in the EMU to generate a continuous metric of the overall ASM load. We then related modeled ASM load to seizure likelihood and severity. We determined the association between the rate of ASM load reduction, the length of hospital stay, and the probability of having a severe seizure. Finally, we used modeled ASM load to predict oncoming seizures.

Seizures occurred in the bottom 50th -percentile of sampled ASM loads across the cohort ($p < 0.0001$, Wilcoxon sign-rank test), and seizures requiring rescue therapy occurred at lower ASM loads than seizures that did not require rescue therapy (logistic regression mixed effects model, odds ratio = 0.27, $p = 0.01$). Greater ASM decreases early in the EMU was not associated with an increased likelihood of having a severe seizure, nor with a shorter length of stay.

A pharmacokinetic model can accurately estimate ASM levels for patients in the EMU. Lower modeled ASM levels are associated with increased seizure likelihood and seizure severity. We show that ASM load, rather than ASM taper speed, is associated with severe seizures. ASM modeling has the potential to help optimize taper strategy to minimize severe seizures while maximizing diagnostic yield [1)].

The EMU of the Hospital del Mar meets the highest standard of international security by having continuous observation and specialists on duty throughout the stay, even on weekends. Stays can vary in duration from 2 or 3 days in cases of children up to 2 or 3 weeks in case of patients implanted with electrodes.

The registration rooms are equipped with infrared cameras for patient observation and seizure evaluation as well as screens for EEG recording. Patient beds are designed to avoid injuries, and cardiorespiratory monitoring systems are available that allow rapid control of possible alterations that may appear during seizures.

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Ghosn NJ, Xie K, Pattnaik AR, Gugger JJ, Ellis CA, Sweeney E, Fox E, Bernabei JM, Johnson J, Boccanfuso J, Litt B, Conrad EC. A pharmacokinetic model of anti-seizure medication load to guide care in the Epilepsy Monitoring Unit. Epilepsia. 2023 Feb 23. doi: 10.1111/epi.17558. Epub ahead of print. PMID: 36815252.