**Evaluation of IV Levetiracetam Dosing for Acute Seizures in the Emergency Department**

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**Background:** Levetiracetam is often the preferred agent for benzodiazepine refractory seizures and status epilepticus given low risk of drug interactions, minimal adverse events, and ease of administration.3 The recommended dose of IV levetiracetam per guidelines is either 60 mg/kg with a maximum dose of 4500 mg, or a flat rate dosing of 1000-3000 mg IV.2 Given the various dosing strategies, an assessment of IV levetiracetam dosing in the Emergency Department (ED) and associated seizure cessation was warranted to identify optimal dosing.

**Objective:** To assess dosing strategies of initial levetiracetam load in achieving successful seizure cessation.

**Methods:** This retrospective cohort study was conducted at a community health system and included three emergency departments (ED). A report was utilized to identify patients who received IV levetiracetam in the ED between June 2019 and August 2021. Patients were excluded if they were less than 18 years of age, received levetiracetam for an indication other than seizures, pregnant, had brain lesions or tumors, acute hemorrhagic or ischemic stroke, or were incarcerated. The primary endpoint was the percentage of patients who failed to achieve successful seizure cessation with a loading dose, defined as the total amount received in the 4 hours following an initial seizure, of IV levetiracetam. Treatment failure was defined as requiring either supplemental benzodiazepine doses or addition of a new anti-epileptic drug (AED) within 12 hours following IV levetiracetam administration. Secondary endpoints included percentage of patients receiving weight based IV levetiracetam versus fixed dosing, ED discharge disposition, rates of IV levetiracetam treatment failure in status epilepticus patients, and rates of reported adverse events.

**Results:** A difference in overall treatment failure was found between levetiracetam doses < 20 mg/kg and doses ≥ 20 mg/kg (22% vs. 40%, p=0.01). The overall percentage of patients receiving weight based IV levetiracetam versus fixed dosing for benzodiazepine refractory seizures was 2% (3/148) and 98% (145/148) respectively. 134/300 (45%) of patients were discharged home from the ED, 123 (49%) received levetiracetam doses < 20 mg/kg and 11 (22%) received doses ≥ 20 mg/kg. No difference in the incidence of treatment failure was found in patients with status epilepticus (SE) between those treated with levetiracetam doses < 20 mg/kg and those treated with doses ≥ 20 mg/kg (79% vs. 55%, p=0.4). Adverse events were reported in 8/300 patients (2.7%).

**Conclusion:** Levetiracetam doses ≥ 20 mg/kg did not result in greater seizure cessation. Observed difference in treatment failure for patients with acute seizures likely related to more critical patients receiving higher doses of levetiracetam. Most patients were treated with fixed doses rather than weight-based dosing, with the majority receiving 1 gram doses regardless of weight variability. Levetiracetam doses ≥ 20 mg/kg were not associated with an increased risk of adverse effects compared to doses < 20 mg/kg. Future studies solely evaluating SE patients and including more patients receiving LEV doses ≥ 20 mg/kg are warranted to better evaluate differences in seizure cessation between various dosages.