

Characterising Community-Based Prolonged Seizures and Automated Screening Using a Large Language Model

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Methodological Issue Being Addressed Routine clinical text review is too labour-intensive and inconsistent to support large-scale identification of prolonged seizures in community monitoring data. To overcome this limitation, we developed an automated screening method using instruction-tuned LLAMA-3.1 with a structured prompt to classify epileptic seizures and extract duration from free-text reports. This approach provides a scalable and reproducible analytical tool that enables the systematic quantification of prolonged seizure burden, addressing a key methodological gap in real-world clinical data analysis.

Introduction Prolonged seizures carry a significant risk of progressing to status epilepticus, a life-threatening emergency associated with long-term neurological morbidity and potential contribution to SUDEP. Early intervention—before the onset of the tonic-clonic phase—offers an opportunity to terminate seizures using rescue antiseizure medications (ASMs), yet community-based evidence on the epidemiology and characteristics of prolonged seizures remains limited. This study uses a large collection of at-home video-EEG-ECG recordings to characterise prolonged seizures in real-world settings, identify clinical and sleep-related risk factors, and develop an automated method for seizure screening.

Methods We analysed 1,830 monitoring reports containing 4,096 recorded events, including epileptic and non-epileptic events. To automate event identification, we fine-tuned LLAMA-3.1 using instruction tuning and a structured prompt designed to classify events as epileptic seizures and extract duration.

Results Of all reports, 127 (7%) contained epileptic seizures, corresponding to 429 seizure events (10.5%). Duration was extractable for 271 seizure events (63%). Among these, 55 events (20%) lasted ≥ 3 minutes, 43 (16%) ≥ 5 minutes, and 30 (5%) ≥ 30 minutes.

Conclusion This work provides one of the largest community-based characterisations of prolonged seizures and demonstrates the utility of LLM-driven text screening. The findings support improved understanding of prolonged seizure patterns and inform future strategies for optimising rescue ASM interventions.

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Keywords

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