Rady Children's Health Orange County
Best Evidence and Recommendations (BEaR)

Recognition and Management of Pediatric Seizures

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Abstract
Background: Children undergoing long-term video electroencephalogram (VEEG) monitoring are vulnerable to delayed seizure recognition and intervention when bedside nurses lack training and confidence in early identification. Delays in recognition may increase the risk of prolonged seizures, status epilepticus, and adverse outcomes.

Purpose: The purpose of this initiative was to identify and implement best practices to enhance nurse involvement in the early recognition, documentation, and management of seizures in a pediatric unit performing long-term VEEG monitoring.

Recommendations: Evidence supports a bundled approach including standardized nurse education on seizure recognition (clinical and subclinical), foundational EEG concepts, and escalation protocols; development of bedside cognitive aids; competency validation; and structured interdisciplinary collaboration.

Outcomes: Planned outcome measures include nurse knowledge and self-efficacy, time from seizure onset to nurse recognition and provider notification, protocol adherence, documentation accuracy, and adverse events related to delayed intervention.

Implications for practice: Standardized education, validated competencies, accessible bedside resources, and interdisciplinary alignment are essential to ensure consistent, evidence-based practice. This initiative highlights the critical role of nurses in continuous seizure surveillance and highlights opportunities to improve clinical responsiveness, interdisciplinary communication, and patient safety in pediatric VEEG settings.

Keywords: management, nursing education, pediatric seizures, recognition,

PICO(T) Question
In a pediatric unit that performs long-term VEEG monitoring, what are the best practices, compared to current practice, to enhance nurse involvement in early recognition and management of patients with seizure activity during hospitalization?

Background and Significance
Seizure activity is one of the most common neurologic reasons for pediatric hospitalization. Children are admitted for new-onset seizures, breakthrough seizures in the setting of known epilepsy, status epilepticus, medication titration, diagnostic clarification, or characterization of atypical events. Accurate seizure classification is essential because treatment decisions, medication management, surgical candidacy, and long-term prognosis depend on distinguishing epileptic from non-epileptic events and

identifying seizure type. Misclassification or delayed recognition may lead to inappropriate medication escalation, prolonged hospitalization, increased risk of neurologic injury, or missed diagnostic opportunities.

Long-term video electroencephalogram (VEEG) monitoring is considered the gold standard for seizure diagnosis because it synchronizes continuous EEG waveform recording with real-time video capture of patient behavior. This dual-modality monitoring allows correlation between electrographic activity and clinical manifestations, enabling neurologists to differentiate epileptic seizures from movement disorders, psychogenic nonepileptic events, or other paroxysmal behaviors. VEEG monitoring requires specialized equipment, continuous EEG acquisition, video recording, technologist oversight, neurologist interpretation, and vigilant bedside nursing surveillance. While EEG technologists and neurologists interpret waveform data, bedside nurses are responsible for ongoing patient assessment, recognition of subtle clinical changes, event button activation, documentation of semiology, patient safety during events, and timely escalation to providers. Because seizures may present as subtle staring spells, autonomic changes, or minimal motor activity, accurate bedside observation is critical to diagnostic accuracy.

Despite this responsibility, literature consistently identifies knowledge gaps among bedside nurses in seizure classification, documentation accuracy, and escalation pathways (Maguire et al., 2018). Seizures are typically classified by onset (focal, generalized, unknown), level of awareness, motor versus non-motor features, and evolution of symptoms. However, studies demonstrate variability in nurses' ability to distinguish seizure types, accurately describe semiology, and differentiate epileptic from nonepileptic events. Documentation challenges include incomplete characterization of onset time, duration, motor features, responsiveness, oxygen desaturation, and postictal state. Inconsistent documentation limits neurologists' ability to correlate clinical observations with EEG tracings, potentially affecting diagnostic precision.

Timely escalation is equally critical. Prolonged seizures, particularly those lasting more than five minutes, increase the risk of status epilepticus, which is associated with higher morbidity and longer hospital stays. Literature examining inpatient seizure responses identifies delays in provider notification and variability in the activation of rapid response protocols. While ideal escalation for prolonged seizure activity should occur within minutes—particularly when approaching the five-minute threshold—studies report variability in recognition and notification timing, particularly when nurses lack specialized neuro training (Abend et al., 2017). These delays represent preventable patient safety risks.

Improving nursing seizure competencies is directly linked to patient safety outcomes, including reduced risk of prolonged seizures, faster initiation of rescue medications, improved diagnostic yield of VEEG studies, decreased length of stay, and enhanced interdisciplinary communication. Structured education programs focused on seizure recognition have demonstrated improved time to provider notification, increased accuracy of event classification, and greater family confidence in care delivery (AANN, 2022; Abend et al., 2017).

The American Association of Neuroscience Nurses (AANN) Seizure and Epilepsy Certificate provides the only nationally recognized standardized educational framework specifically designed for nurses caring for patients with seizures and epilepsy. This certificate program includes foundational content on seizure pathophysiology, classification, EEG basics, safety interventions, rescue medication

administration, and interdisciplinary coordination. Adoption of such a framework provides a structured, evidence-based approach to competency validation and reduces variability in practice.

In alignment with challenges presented in the literature, Rady Children's Hospital Orange County, Mission Viejo, does not currently have a standardized requirement for seizure recognition education or neuro-specific competency validation for bedside nurses. Internal review identified variability in training exposure and limited formalized neuro-specific competencies compared with pediatric neuroscience centers of excellence. Given the "hospital within a hospital" structure at Mission, nurses must maintain competence across a wide range of patient populations and acuity levels. This flexibility is a strength; however, it may contribute to variability in highly specialized skills such as seizure recognition when standardized education is not required.

Because Rady Children's Health strives to excel in pediatric neuroscience care, alignment of neuro-specific competencies across the Mission and Orange campuses is a system-wide priority to ensure consistent care. This initiative supports Magnet nursing standards by promoting professional development, evidence-based practice, and standardized competency validation. Addressing variability in seizure recognition through a structured EBP initiative represents a critical opportunity to strengthen patient safety, enhance diagnostic accuracy, and elevate the quality and reliability of care for children undergoing long-term VEEG monitoring.

Framework

This EBP project utilizes the "Translating Evidence into Practice: CHOC's Approach to EBP" model, adapted in November 2023 from the Revised 2018 version of Evidence Based Practice Institute Model © 2007 Caroline E. Brown and Laurie Ecoff (Ecoff, Stichler & Davidson, 2020).

Search for the Evidence

Databases searched for this literature review included PubMed (MEDLINE) and CINAHL via EBSCO. Additionally, search engines, including Cochrane Library were utilized. Keywords and search concepts/strings with Boolean logic include: pediatric OR child OR adolescent OR neonate; VEEG OR "video EEG" OR "video electroencephalography" OR "epilepsy monitoring"; nurse OR nursing staff OR RN; seizure recognition OR response OR detection OR "clinical observation" OR "nursing assessment"; best practice OR guideline OR protocol OR intervention; inpatient OR hospitalization OR "acute care setting."

This search yielded 20 included articles that were critically appraised. These consisted of three quality improvement or implementation studies, five guidelines or consensus statements, four pediatric ICU or neonatal observational/accuracy studies, two national practice and safety surveys, and six narrative or scoping reviews. Collectively, the evidence supports nurse-led seizure first aid protocols, structured seizure education programs, training nurses in screening qEEG trends, and adopting minimum standards for inpatient long-term video-EEG monitoring.

To review a breadth of the evidence, grey literature was examined. Websites reviewed included AANN, the American Epilepsy Society (AES), the Children's Hospital Association (CHA), and the Epilepsy Foundation. To further understand current practices in pediatric nurse involvement in seizure recognition, 8 children's hospitals across the nation were contacted via email and/or phone call. Of those, three hospitals responded.

Critical Appraisal and Synthesis of the Evidence

The evidence consistently supports a multi-component approach to enhancing nurse involvement in the early recognition and management of seizure activity in pediatric units that perform long-term video electroencephalographic (VEEG) monitoring. Foundational to this work is the standardization of seizure definitions, terminology, and escalation pathways. The International League Against Epilepsy (ILAE) updated classification system provides a shared language for seizure semiology and documentation (International League Against Epilepsy [ILAE], 2022), while consensus statements from the American Clinical Neurophysiology Society (Herman et al., 2015) and guidelines from the American Epilepsy Society (Glauser et al., 2016) emphasize the importance of timely identification and treatment of seizures, particularly in critically ill children. Observational evidence further demonstrates that delays in treatment of refractory convulsive status epilepticus are associated with worse short-term outcomes, reinforcing the clinical imperative for rapid recognition and escalation (Gaínza-Lein et al., 2018). Together, these guidelines and outcome studies underscore the need for clearly defined nurse-driven protocols in VEEG settings.

Education and competency development emerge as central best practices for strengthening nursing performance. The American Association of Neuroscience Nurses (AANN, 2021) outlines core competencies for seizure and epilepsy nursing, and participation in the AANN Seizure and Epilepsy Certificate Program has been associated with significant improvements in nurse knowledge and confidence (Bhatnagar et al., 2025). Additional educational strategies, including structured e-learning modules (Le Marne et al., 2016) and unit-based training focused on seizure observation and documentation (Spray, 2015), further support the value of standardized educational preparation. Although most studies are quasi-experimental or descriptive in design, findings consistently demonstrate improvements in knowledge, confidence, and recognition skills following targeted educational interventions.

The literature also supports integrating nurses into EEG-enabled recognition workflows. Studies demonstrate that, with training, nurses and non-neurophysiologist clinicians can accurately detect electrographic and subclinical seizures using quantitative EEG (qEEG) trend panels and seizure detection algorithms (Kaleem et al., 2021; Kang et al., 2019; Swarnalingam et al., 2022). Rapid-response EEG systems have been shown to reduce the time to seizure diagnosis in pediatric acute care settings (Rajan et al., 2025), highlighting the potential impact of structured nurse engagement in EEG monitoring. While automated seizure detection and artificial intelligence–based video analysis show promise, current evidence positions these tools as adjunctive supports rather than replacements for clinical judgment (Ahmedt-Aristizabal et al., 2024; Kamitaki et al., 2019). Clear governance and role delineation remain essential when incorporating emerging technologies into nursing workflows.

Standardized protocols and unit-based safety programs further enhance reliability in seizure management. Implementation of structured inpatient seizure management protocols has been associated with improved adherence to acute care processes and more consistent response patterns (Pavitt et al., 2021). Comprehensive unit-based safety programs within epilepsy monitoring units emphasize systems-level interventions, including role clarity, workflow standardization, and continuous performance feedback (Wang et al., 2025).

Finally, simulation-based education strengthens preparedness for high-risk seizure events. In-situ simulation and team-based training have been shown to improve rapid response performance and care models in pediatric settings (Rule et al., 2017; Rayburn et al., 2023). Curriculum learning combined with simulation enhances pediatric status epilepticus management skills (Wei et al., 2022), and virtual reality–based seizure simulators improve nursing student performance and confidence (Wu et al., 2022). Although primarily educational in design, these studies support simulation as a valuable strategy to reinforce standardized protocols and interdisciplinary coordination.

In synthesis, the evidence favors a bundled best-practice approach for pediatric VEEG units: (a) standardized seizure definitions and nurse-driven escalation protocols aligned with national guidelines; (b) competency-based education with ongoing validation; (c) structured integration of nurses into qEEG and rapid EEG workflows; (d) implementation of unit-based safety and quality infrastructure; and (e) routine simulation to reinforce skills and teamwork.

While randomized pediatric trials remain limited, the evidence provides consistent support for enhancing nurse involvement in early seizure recognition and management to improve timeliness, reliability, and patient safety outcomes.

Practice Recommendations

The evidence supports implementation of a bundled best-practice model consisting of:

1. Standardized terminology and nurse-driven escalation protocols.
2. Competency-based education with ongoing validation.
3. Structured nurse integration into EEG and rapid response workflows.
4. Unit-based safety and quality monitoring systems.
5. Routine simulation to reinforce recognition, escalation, and teamwork.

Although randomized pediatric trials are limited, converging guideline recommendations, educational research, technology integration studies, and quality improvement literature provide consistent support for this multi-component approach. Collectively, these strategies are expected to improve the timeliness of recognition, reduce variation in response, strengthen interdisciplinary collaboration, and enhance patient safety outcomes in pediatric VEEG settings.

This evidence provides a strong and practical foundation for a quality improvement initiative. The next step is to engage key stakeholders, including nursing leadership, neurology, neurophysiology, and Quality teams, to determine feasibility, resource requirements, and alignment with institutional priorities. A formal discussion should assess whether this initiative addresses a meaningful performance gap within our hospital and whether it warrants advancement as a structured QI project with defined metrics, timeline, and leadership sponsorship.

Outcome Measures

As we consider advancing this work as a formal quality improvement initiative, a key discussion point with stakeholders is how we would meaningfully measure success and whether the proposed outcomes reflect true performance gaps in our current state.

One potential approach would be a 12-month pre–post evaluation, beginning with a three-month baseline review to understand our current performance in VEEG seizure recognition and response. Primary outcomes could focus on two high-impact metrics: (1) nurse seizure recognition accuracy and (2) timeliness of escalation. Recognition accuracy could be assessed through structured chart audits comparing nurse-documented seizure events with neurophysiology-confirmed VEEG findings to determine agreement rates and sensitivity. Timeliness could be measured as the interval between EEG-confirmed seizure onset (or event marker activation) and the documented provider notification. As a group, we would need to determine what constitutes a meaningful improvement (e.g., a 30% reduction in median notification time or a target compliance rate for escalation benchmarks) and whether we currently have reliable timestamp data to support this analysis. Monthly audits during the first six months could support rapid-cycle feedback, transitioning to quarterly review for sustainability.

Process measures could help us evaluate whether the infrastructure supporting recognition is improving. These might include nurse knowledge and self-efficacy (measured through pre- and post-education assessments with a six-month retention follow-up), education completion and competency validation rates (tracked through CHOC U, with a proposed compliance target of >90%), and adherence to the core elements of the seizure response protocol. Protocol adherence could be assessed through structured audits that evaluate event marker activation, safety positioning, standardized semiology documentation, and appropriate rescue medication administration when indicated. We may also consider tracking balancing measures, such as adverse events related to delayed intervention, and incorporating targeted family experience questions regarding timeliness and clarity of communication during seizure events, aggregated quarterly.

Using improvement science, results could be displayed using run charts or control charts to assess trends and process stability over time. Early monthly monitoring would enable timely adjustments, while quarterly reviews would help determine whether the practice change is sustained. These proposed outcome measures are intended as a starting framework for discussion. Key questions for stakeholder consideration include: Do these metrics reflect a meaningful gap in our current performance? Do we have the data infrastructure to measure them reliably? What level of improvement would justify the investment of time and resources? Clarifying these points will help determine whether this initiative should move forward as a formal, sponsored QI project with defined goals, accountability, and a timeline.

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