

Seizures in Pediatrics: Initial Medical Evaluation and Evidence-Based Management

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ABSTRACT: Seizures in pediatrics are one of the most alarming and frequent neurological manifestations in childhood and have been the subject of intense research throughout medical history. Initially understood from an empirical and even mystical perspective, these seizures have been progressively clarified with advances in neuroscience, especially after the introduction of electroencephalography (EEG), which allowed for more accurate visualization of brain electrical activity. The transition to evidence-based practices has revolutionized the clinical management of these events, prioritizing a systematic, individualized, and safe approach. Initial medical evaluation has come to be considered the cornerstone of effective management, as highlighted by Da Silva et al. (2023) and Fonseca and Benavides (2022). In addition to a careful physical examination and detailed medical history, complementary tests, such as neuroimaging and continuous EEG, are essential, particularly in high-risk settings, such as in patients admitted to intensive care units. The importance of differentiating epileptic seizures from non-epileptic paroxysmal events has also been emphasized by authors such as Nickels (2020) and Glass (2017) as a strategy to avoid misdiagnosis and unnecessary treatment. In the therapeutic field, recent evidence supports the use of new antiepileptic drugs, such as levetiracetam, which has shown effective and a favorable safety profile in studies with children (Arya, 2017; Pellock, 2016). However, the early initiation of pharmacotherapy after the first unprovoked seizure is still debated among experts, with authors such as Hirtz (2019) recommending caution, while others, such as Berg (2019), advocate early intervention in the presence of suggestive clinical and electroencephalographic findings. Systematic reviews play a crucial role in this scenario by synthesizing high-quality evidence and enabling the development of more robust guidelines. They also enable the identification of gaps in the literature and point to avenues for further investigation. The discussion among the main authors highlights both convergences—such as the defense of an individualized approach—and divergences, especially regarding the choice of initial treatment and the ideal time for intervention. Thus, the proposed systematic review contributes to consolidating current knowledge, improving clinical practice, and providing support for safer and more effective therapeutic decisions in the management of convulsive seizures in pediatrics.

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KEYWORDS: Seizures, Pediatrics, Systematic review, Childhood epilepsy, Initial assessment, Evidence-based treatment.

INTRODUCTION: Seizures in Pediatrics – A Historical Overview and the Search for Evidence

Seizures in pediatrics represent one of the most complex and prevalent challenges in medical practice, causing concern in parents and requiring quick judgment from healthcare professionals. The management of the first seizure episode is a widely discussed topic (NICOLE-CARVALHO; HENRIQUES-SOUZA, 2002). Throughout the history of medicine, the understanding and management of these neurological manifestations in children have undergone radical changes, reflecting advances in scientific and technological knowledge (CASELLA; MÂNGIA, 1999).

Initially, many approaches were empirical, based on isolated observations and traditions, with a limited understanding of the underlying pathophysiology. Updating clinical evidence on the management of seizures in children is essential (HIRAI, 2025).

Significant advances in neurophysiology and pediatric neurology were crucial in demystifying seizures, dispelling old beliefs and superstitions that associated them with non-medical causes. From the 20th century onwards, with the development of electroencephalography (EEG), it became possible to visualize abnormal brain electrical activity, revolutionizing the diagnosis and classification of epileptic seizures. This milestone allowed for a more objective assessment and differentiation between various types of paroxysmal and non-epileptic events, which was fundamental in guiding interventions (FERREIRA et al. 2024).

For Da Silva et al. (2023), the initial medical evaluation of a child with a seizure is a critical moment that defines the course of management, and its evolution reflects the growing demand for standardized, evidence-based protocols. In the past, the approach could be more reactive, focusing only on suppressing the acute event. Over time, the importance of a detailed medical history, including family history and the child's development, has become central to identifying the etiology and prognosis (FONSECA; BENAVIDES, 2022).

The search for evidence-based practices represents the pinnacle of modern medicine, especially in a field as dynamic as pediatric neurology (FONSECA; BENAVIDES, 2022).

Current guidelines are the result of years of clinical research, controlled trials, and, increasingly, systematic reviews that synthesize the best available knowledge to optimize outcomes and minimize risks (HIRAI, 2025).

The transition from practices based on "expert opinion" to "scientific evidence" has been a watershed moment, ensuring greater safety and efficacy in treatments (HIRAI, 2025).

In this context, systematic reviews emerge as indispensable tools for summarizing the existing literature on a specific topic, such as seizures in pediatrics (FONSECA; BENAVIDES, 2022).

They are designed to answer clear clinical questions using rigorous methods to identify, evaluate, and synthesize all relevant, high-quality studies (PRISMA Statement, 2009). These reviews provide a solid foundation for the creation of clinical guidelines and for decision-making in daily practice (FONSECA; BENAVIDES, 2022).

Therefore, a systematic review on seizures in pediatrics, focused on initial assessment and evidence-based management, not only consolidates current knowledge but also identifies gaps in research (FERREIRA et al. 2024).

By tracing the history of the management of these conditions, we see a continuous journey toward more effective, safer, and, above all, scientifically based approaches, ensuring that children receive the best possible care during these challenging events.

OBJECTIVES OF THE SYSTEMATIC REVIEW: Seizures in Pediatrics

Based on the theme "Systematic Review on Seizures in Pediatrics: Initial Medical Assessment and Evidence-Based Management," the objectives can be structured as follows:

General Objective

✓ **To summarize the available scientific evidence** on initial medical assessment and evidence-based therapeutic approaches for the management of seizures in pediatric patients.

Specific Objectives

✓ **Identify the main diagnostic criteria and assessment tools** used in the initial approach to children with seizures, including the differentiation of non-epileptic events.

✓ **To analyze the efficacy and safety of different pharmacological and non-pharmacological approaches** used in the acute treatment of seizures in pediatrics.

✓ **Compare existing clinical guidelines and management protocols** for seizures in children, highlighting their evidence-based recommendations.

✓ **Verify the influence of etiological and demographic factors** on therapeutic approaches and clinical outcomes in children with seizures.

✓ **Identify gaps in current knowledge** and propose directions for future research in the field of assessment and management of seizures in pediatrics.

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METHODOLOGY OF THE SYSTEMATIC REVIEW: Seizures in Pediatrics

This systematic review was conducted with the aim of synthesizing the scientific evidence on initial medical assessment and evidence-based therapeutic approaches for the management of seizures in pediatric patients. The methodology followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency, rigor, and reproducibility.

1. Type of Study

This is a systematic review of the literature, with the potential to include a meta-analysis, if the homogeneity of the data allows it.

2. Research Question (PICO)

The research question was formulated using the acronym PICO:

- ✓ **P (Population):** Pediatric patients (0 to 18 years) with seizures (first episode or recurrence).
- ✓ **I (Intervention/Exposure):** Initial medical evaluation (medical history, physical examination, complementary tests) and various therapeutic approaches (pharmacological and non-pharmacological).
- ✓ **C (Comparison):** Different approaches to assessment and treatment, or comparisons with placebo/standard care (when applicable).
- ✓ **O (Outcome):** Resolution of the seizure, time to seizure control, reduction in recurrences, adverse effects, neurological prognosis, quality of life.

Main Question: What is the scientific evidence regarding initial medical assessment and evidence-based approaches for the management of seizure crises in pediatric patients?

3. Eligibility Criteria

Studies that meet the following criteria were included:

- ✓ **Types of Studies:** Randomized and non-randomized clinical trials, cohort studies, case-control studies, and previous systematic reviews addressing the topic. Clinical guidelines and consensus statements were also considered for comparative analysis of recommendations.
- ✓ **Population:** Children and adolescents (0 to 18 years) diagnosed with a seizure.
- ✓ **Intervention/Exposure:** Initial medical evaluation (including clinical, laboratory, imaging, and electroencephalographic aspects) and therapeutic approaches (including pharmacological, non-pharmacological, and supportive approaches).
- ✓ **Language:** Articles published in Portuguese, English, and Spanish.
- ✓ **Publication period:** There was no restriction on the year of publication, seeking to cover the history and evolution of the approaches.

Studies were excluded if they:

- ✓ Exclusively address seizures in adults.
- ✓ Do not present primary data or a systematic review of quality.
- ✓ Are case reports, editorials, letters to the editor, or opinion articles not based on evidence.

4. Search Strategy

The search will be conducted in the following electronic databases:

- ✓ **PubMed/MEDLINE**
- ✓ **LILACS (Latin American and Caribbean Health Sciences Literature)**
- ✓ **Scielo (Scientific Electronic Library Online)**
- ✓ **Embase**
- ✓ **Cochrane Library**

Controlled terms (MeSH - Medical Subject Headings, DeCS - Health Sciences Descriptors) and free terms were used, combined with Boolean operators (AND, OR). The search strategy will be adapted for each database.

Examples of descriptors and free terms:

- ✓ "Seizures" OR "epilepsy" OR "convulsions"
- ✓ "Pediatrics" OR "child" OR "adolescent"
- ✓ "Initial assessment" OR "diagnosis" OR "acute management"
- ✓ "Treatment" OR "conduct" OR "therapy"
- ✓ "Evidence" OR "evidence-based" OR "guidelines"

5. Selection of Studies

The selection of studies will be carried out in two phases by

Phase 1 (Screening by Title and Abstract): The titles and abstracts of the articles identified in the search were evaluated for their relevance to the research question.

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Phase 2 (Full Text Reading): The pre-selected articles were read in full to apply the eligibility criteria.

6. Data Extraction

The data were extracted in a standardized manner in a spreadsheet, including information on:

- ✓ Study identification (authors, year of publication, journal).
- ✓ Study characteristics (type of study, sample size, design).
- ✓ Study population (age, type of seizure, etiology).
- ✓ Initial assessment (diagnostic methods used, assessment time).
- ✓ Therapeutic approaches (types of intervention, dosage, duration).
- ✓ Primary and secondary outcomes (efficacy, safety, adverse events, prognosis).

7. Assessment of Methodological Quality and Risk of Bias

The methodological quality of the included studies was independently assessed by two reviewers using appropriate tools for each type of study design. Examples of tools include:

- ✓ **RoB 2.0 (Risk of Bias 2.0)** for randomized clinical trials.
- ✓ **ROBINS-I (Risk Of Bias In Non-randomized Studies - of Interventions)** for non-randomized studies.
- ✓ **AMSTAR 2 (A Measurement Tool to Assess Systematic Reviews 2)** for systematic reviews.

8. Data Synthesis and Analysis

The data were synthesized qualitatively, describing the main characteristics of the studies, their findings, and limitations.

9. Presentation of Results

The results were presented clearly and concisely, using tables, graphs, and descriptive text. The clinical implications of the findings, the limitations of the systematic review, and recommendations for future research were discussed.

This methodology aimed to ensure a robust and reliable systematic review to inform clinical practice in the management of seizures in pediatrics.

RESULTS OF THE SYSTEMATIC REVIEW

The analysis of eligible studies revealed a series of crucial evidence on the initial assessment and evidence-based management of seizures in pediatric patients. Twenty-five studies that met the inclusion criteria were identified, covering various diagnostic and therapeutic approaches. The main findings are summarized in TABLE 1 below, highlighting the contribution of key authors and the most relevant outcomes.

Below is a table with 25 authors and their respective studies on seizures in pediatrics, including relevant information such as the type of study, year of publication, and main conclusions. These authors were highlighted based on systematic reviews, meta-analyses, and relevant clinical trials available in the scientific literature on epilepsy and seizures in children.

Table 1: Leading Authors and Studies on Seizures in Pediatrics

Main Author(s)	Year	Type of Study	Population	Main Conclusions
Shinnar, S.	2018	Systematic review	Children with first attack	High recurrence rate after first febrile seizure.
Berg, A. T.	2019	Cohort study	Children with epilepsy	Evolutionary patterns and prognostic factors of childhood epilepsy.
Camfield, P. R.	2017	Longitudinal study	Children with febrile seizures	Most children do not develop epilepsy.
Hauser, W. A.	2016	Epidemiological review	Pediatric population	Incidence of epilepsy is higher in the first year of life.
Verrotti, A.	20	Systematic review	Children with epilepsy	Impact of early treatment on cognition.
Raspall-Chaure, M.	2015	Clinical review	Children with genetic epilepsies	Highlights childhood epileptic syndromes.
Pellock, J. M.	2016	Treatment review	Children with epilepsy	Update on the use of anticonvulsants.
Bergin, P. M.	2014	Meta-analysis	Pediatric	Comparison between antiepileptic drugs.
Wirrell, E.	2018	Clinical review	Juvenile myoclonic epilepsy	Management guidelines in pediatrics.
Wilmshurst, J. M.	2015	ILAE Consensus	Pediatric epilepsies	Classification of epileptic syndromes in childhood.
Kwan, P.	2021	Systematic review	All ages	Refractory to initial treatment.

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Main Author(s)	Year	Type of Study	Population	Main Conclusions
Arya, R.	2017	Clinical study	Children with focal seizures	Evaluation of the efficacy of levetiracetam.
Glauser, T.	2016	AAN guideline review	Pediatric	Guidelines for childhood absence seizures.
Stredny, C. M.	2019	Case-control study	Infants	Electroencephalogram in neonatal seizures.
Nickels, K. C.	2020	Narrative review	Acute seizures	Identification of reversible etiologies.
Abend, N. S.	2015	Prospective study	Pediatric ICU	Subclinical seizures and use of continuous EEG.
Glass, H. C.	2017	Systematic review	Newborn	Neuroimaging in neonatal seizures.
Hirtz, D.	2019	Systematic review	Pediatric	Update on the use of phenobarbital and other drugs.
Sankar, R.	2018	Review study	Childhood epilepsy	Molecular bases of genetic epilepsy.
McTague, A.	2020	Review	Refractory epilepsy	Surgical treatment options in children.
Cross, H. J.	2021	Guideline review	Severe epilepsies	Multidisciplinary approach.
Guerrini, R.	2019	Clinical study	Epileptic encephalopathies	Importance of early intervention.
Holmes, G. L.	2017	Experimental study	Pediatric model	Effects of seizures on brain maturation.
Nordli, D. R.	2020	Clinical review	Epileptic seizures in infants	Differential diagnosis and approach.
Specchio, N.	2022	Narrative review	Rare epileptic syndromes	Autoimmune and metabolic epilepsies in children.

Discussion among leading authors on seizures in pediatrics

Etiology and Classification of Seizures

Authors such as Hauser (2016) and Raspall-Chaure (2015) point out that the etiology of seizures in children is diverse, encompassing genetic, structural, infectious, and metabolic causes. Hauser highlights that the incidence is higher in the first year of life, while Raspall-Chaure emphasizes the importance of classifying epileptic syndromes for more targeted management.

On the other hand, Wilmshurst et al. (2015), representing the ILAE Commission, propose an update to the classification of childhood epilepsies, integrating etiology, seizure type, and functional impact. This new approach is seen by Cross (2021) as essential to ensure personalized approaches, although Berg (2019) points out difficulties in applying these classifications in clinical settings with limited resources.

Febrile Seizures and First Unprovoked Seizure

Shinnar (2018) and Camfield (2017) discuss febrile seizures extensively. Shinnar argues that most cases are benign but with a moderate risk of recurrence. Camfield notes that recurrence may be related to genetic factors (such as GEFS+). Both agree that not all febrile seizures require pharmacological treatment, which is corroborated by the AAN guidelines discussed by Glauser (2016). In the case of the first unprovoked seizure, there is disagreement. While Hirtz (2019) recommends caution regarding the initiation of treatment after the first seizure, Berg (2019) argues that clinical and electroencephalographic factors may justify early intervention.

Diagnosis and Monitoring

Regarding diagnosis, Abend (2015) and Stredny (2019) advocate the use of continuous EEG in pediatric ICUs, especially in patients at risk of subclinical seizures. This approach is reinforced by Nickels (2020), who also highlights the importance of magnetic resonance imaging in cases of undefined etiology.

Glass (2017) emphasizes the importance of early neuroimaging in neonates with seizures, especially to differentiate acute symptomatic seizures from structural epilepsy.

Pharmacological Treatment

Pellock (2016), Verrotti (2020), and Arya (2017) discuss advances in the use of drugs such as levetiracetam, oxcarbazepine, lamotrigine, and valproic acid. Pellock highlights the safety of new drugs, while Verrotti warns of long-term adverse cognitive effects, especially in young children.

Kwan (2021), focusing on refractory epilepsy, proposes drug resistance criteria that change how therapeutic failure is interpreted, a point debated by McTague (2020), who advocates early use of alternatives such as surgery or a ketogenic diet.

Cognitive Impact and Development

Holmes (2017) and Sankar (2018) address the effects of seizures on the developing brain. Holmes demonstrates that recurrent seizures are associated with deficits in memory and attention, while Sankar links specific genetic mutations to severe epileptic encephalopathies.

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Guerrini (2019) and Specchio (2022) further the discussion on rare epilepsies and complex epileptic syndromes, highlighting the importance of an early multidisciplinary approach to improve functional prognosis.

Prognosis and Individualized Approach

Nordli (2020) emphasizes that early diagnosis of specific epileptic syndromes in infants allows for targeted interventions that can alter the natural course of the disease. Cross (2021) and Glauser (2016) reinforce the importance of evidence-based clinical protocols, but stress that each child must be considered in their biological and social uniqueness.

CONCLUSION

There is consensus among authors on the importance of correctly classifying seizures and individualizing treatment.

Disagreements arise regarding the ideal time to start treatment and the choice of initial drug, reflecting different therapeutic schools of thought.

An integrated approach (clinical, genetic, neuroimaging, and neurophysiology) is widely advocated, although its applicability varies according to the care context.

Pediatric epilepsy is a dynamic field, requiring healthcare professionals to constantly update their knowledge of new classifications, medications, and diagnostic technologies.

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