

# New Horizons in the Pharmacological Management of Pediatric Epilepsy

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## Abstract

Epilepsy is one of the most common neurological disorders in childhood, affecting nearly 0.5-1% of children worldwide. The management of pediatric epilepsy has seen substantial progress in recent years, thanks to advances in genetics, neuroimaging, and pharmacology. This article explores some of the latest developments in the pharmacological management of pediatric epilepsy.

**Keywords:** Neurological disorder • Antiepileptic drugs • Pediatric epilepsy

## Introduction

The past few decades have seen an increase in the number and diversity of AEDs available for treating pediatric epilepsy. Traditional first-line drugs, such as phenobarbital and valproic acid, have been supplemented with newer drugs like levetiracetam, oxcarbazepine, and lamotrigine. These newer drugs often have better tolerability, fewer side effects, and less interaction with other medications, making them particularly suitable for use in children [1].

### Precision medicine in pediatric epilepsy

One of the most promising areas of advancement is the move towards precision medicine tailoring treatment to the individual patient based on their genetic makeup. Certain genetic mutations are associated with specific types of epilepsy, which can guide the choice of AED.

For instance, children with Dravet syndrome, a severe form of epilepsy often resistant to traditional AEDs, have been found to respond well to a drug called stiripentol. More recently, fenfluramine, a drug previously used as an appetite suppressant, has been repurposed and approved for use in Dravet syndrome due to its significant seizure reduction properties [2].

## Description

### Cannabidiol (CBD) and pediatric epilepsy

Cannabidiol (CBD), a compound derived from the cannabis plant, has gained attention for its potential antiepileptic effects. In 2018, the US FDA approved Epidiolex, a purified CBD product, for the treatment of two severe pediatric epilepsy syndromes: Dravet syndrome and Lennox-Gastaut syndrome. Clinical trials have shown a significant reduction in seizure frequency with CBD treatment. However, more research is needed to determine the long-term safety and efficacy of CBD in children [3].

### Emerging treatments on the horizon

Several promising treatments are currently under investigation:

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**Gene therapy:** Gene therapy aims to treat epilepsy at its root by correcting the underlying genetic abnormalities. While still in the experimental stages, this approach holds considerable promise, especially for genetic epilepsies that do not respond well to traditional AEDs.

**Neurosteroids:** Neurosteroids, naturally occurring steroid molecules in the brain, have shown potential antiepileptic properties. A synthetic neurosteroid called ganaxolone is currently in clinical trials for various types of epilepsy.

**mTOR inhibitors:** For specific epilepsy syndromes like Tuberous Sclerosis Complex (TSC), drugs that inhibit the mTOR pathway, such as everolimus, have shown promise in reducing seizure frequency [4].

### Non-pharmacological treatments

While this article focuses on pharmacological treatments, it's worth noting the increasing recognition of non-pharmacological therapies in managing pediatric epilepsy. This includes the ketogenic and other diets, neurofeedback, and mind-body therapies such as yoga and mindfulness. These can serve as valuable adjuncts to pharmacological treatments, helping to manage not only seizures but also the broader psychosocial aspects of living with epilepsy.

### Patient and family-centered care

In pediatric epilepsy management, the child and family are integral members of the care team. Their lived experience and perspectives should guide treatment decisions. Shared decision-making, where clinicians and families collaborate to make decisions that align with the child's health status and family's values, is a crucial component of epilepsy management.

Empowering families with knowledge about their child's condition and treatment options is key to this process. In addition, ongoing emotional and psychosocial support for the child and family can significantly improve treatment adherence and quality of life.

### The future of pediatric epilepsy management

The future of pediatric epilepsy management is undoubtedly exciting. As we move towards a more personalized approach, children with epilepsy can look forward to treatments that are not only more effective but also safer and better tailored to their needs. But alongside these advances, we must remember the importance of holistic care. This includes not only seizure control but also addressing the cognitive, behavioral, and emotional aspects of epilepsy. After all, the ultimate goal of epilepsy management is to enable children with epilepsy to live fulfilling, rewarding lives, without being defined by their condition [5].

**Challenges and considerations:** While these advances are encouraging, several challenges remain. Many of these newer treatments are only effective for specific epilepsy syndromes, and the majority of children with epilepsy do not have a clear genetic diagnosis. There is also the issue of access and cost. Many newer AEDs and treatments like gene therapy are significantly more

expensive than traditional AEDs, potentially limiting their use to high-income countries or well-insured patients.

The landscape of pediatric epilepsy treatment is evolving rapidly, with a move towards more personalized and targeted therapies. Advances in genetics and neurobiology are paving the way for innovative treatments, from precision medicine to gene therapy. While challenges remain, the future holds promise for improved seizure control and quality of life for children living with epilepsy. As researchers continue to explore these new horizons, collaboration between neurologists, geneticists, pharmacologists, and other stakeholders will be essential to translate these advances into effective patient care.

### Pharmacogenomics and personalized medicine

One rapidly advancing field in epilepsy treatment is pharmacogenomics, which studies how an individual's genetic makeup affects their response to drugs. For example, certain genetic variants can influence the metabolism of a drug, altering its efficacy or increasing the risk of side effects.

With next-generation sequencing becoming more accessible and affordable, personalized medicine based on a child's unique genetic profile could soon become routine. This not only promises to increase treatment efficacy but also reduce adverse drug reactions, which are of particular concern in children [6].

## Conclusion

The pharmacological management of pediatric epilepsy is evolving rapidly, offering new hope for children and families. As we continue to push the boundaries of what's possible, collaboration, innovation, and a steadfast commitment to patient-centered care will light the way.

## Acknowledgment

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## Conflict of Interest

None.

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