GAP·f
Global Accelerator for Paediatric formulations
WHO Hosted Network

World Health Organization

Paediatric drug optimization for epilepsy

Meeting report, 1-2 July 2025

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The need for paediatric drug optimization

The development of medicines for children lags unacceptably behind that for adults by nearly a decade.

Following the resolution at the Sixty-ninth World Health Assembly on promoting innovation and access to quality, safe, efficacious and affordable medicines for children, WHO and partners have increased their efforts to deliver on this global commitment and have scaled up activities to ensure that age-appropriate formulations are available for children *(1)*. The Global Accelerator for Paediatric Formulations Network (GAP-f), a WHO-hosted network, works across the life-cycle of drug development to accelerate the investigation, development and introduction of optimal formulations for children *(2)*. Priority-setting is the first step to enable a targeted approach to research and development. Developing a priority drug portfolio of the most needed formulations for children is essential to streamline researchers' and suppliers' efforts and resources around specific dosage forms and formulations that address the most urgent needs for children. This is especially important since the market for medicines for children is often small and/or fragmented, resulting in limited volumes with potential market failures.

Paediatric drug optimization (PADO) exercises to identify key priority products and their preferred product characteristics for research and development have been successfully undertaken for human immunodeficiency virus (HIV), hepatitis C, tuberculosis and coronavirus disease 2019 (COVID-19) demonstrating their potential for and impact on accelerating access to optimal formulations in the context of fragmented, small markets for medicines for children. To provide further guidance to support similar processes for optimizing drugs for children in other disease areas, GAP-f has published a guidance document to undertake a PADO process and adapt it to the specific needs of each disease area *(3)*.

PADO processes are not guideline processes and as such are not intended to endorse the use of products that have not been fully assessed by a WHO guidelines development group. However, prioritization provides a clear signal that specific formulations and products are of interest in the short-, medium- or long term and that stakeholders should work together towards completing investigation and development of age-appropriate formulations

PADO for epilepsy

Globally, about 52 million people live with epilepsy *(4)*, more than any other chronic neurological disorder *(5)* and affecting up to 1% of children. Data from the Global Burden of Disease 2021 study show that epilepsy ranks sixth in terms of disability-adjusted life years across all neurological conditions for children under 5 years of age, and third for those aged 5–19 years of age *(5)*. Different studies across countries show that the prevalence of paediatric epilepsy in low- and middle-income countries (LMICs) is significantly higher compared to high-income countries; for example, in rural regions of Zambia, the pooled prevalence of paediatric epilepsy is as high as 26 per 1000 population *(6)* compared to approximately 6 per 1000 population in the United States of America *(7)*.

The *WHO Model List of Essential Medicines for children* (EMLc) (10th edition) *(8)*, which is aligned to the *Mental Health Gap Action Programme (mhGAP) guideline for mental, neurological and substance use disorders (9)*, includes several antiseizure medicines in age-appropriate formulations for children (section 5.1). However, challenges relating to the availability of paediatric strengths and formulations of antiseizure medicines persist *(10)*. In some countries, the lack of registration of essential medicines for epilepsy and consequent lack of availability has been identified as the main issue, while in other countries, age-appropriate formulations of antiseizure medicines are available but not affordable *(10)*. Moreover, the lack of prioritization of paediatric formulations in national procurement frequently leads to the need to adapt adult formulations for use in children, creating potential risks and compromising the efficacy of treatments. Moreover, the widespread off-label use of antiseizure medicines in children may complicate efforts to guarantee appropriate therapeutic coverage and to promote their inclusion in publicly funded benefit schemes *(11)*.

Another common practice that creates additional barriers is the tendency of most clinical trials to delay or decline the inclusion of children. Such delays and exclusions not only hinder the practical use of these medications but also limit our understanding of their safety and efficacy in this highly relevant population *(12)*. It is, therefore, extremely important to review medicines that are being investigated in clinical phases to ensure that paediatric investigations of the most needed medicines are promptly initiated.

Objectives

The PADO for epilepsy exercise aimed to support the identification of short- and long-term priorities for epilepsy medicines for the paediatric age group, examine barriers to access, and review emerging products in the research and development pipeline. The outcome of this process will be used to inform and promote the alignment of funders, procurers, market coordination entities, researchers, innovators, generics manufacturers, product development partnerships and regulators around priority products (Box 1) and strategies to improve access to epilepsy medicines in LMICs.

To achieve these objectives, WHO convened a consultation meeting with experts working in the field of epilepsy across all six WHO regions. The meeting provided an opportunity to discuss existing treatment options and related access challenges, while also examining new products under development. Discussions included how best to consolidate the market around a smaller number of formulations, so that collective efforts to increase access are focused and effective. This is particularly important given that the availability of antiseizure medicines in LMICs is often limited, resulting in treatment gaps across the paediatric age spectrum.

In particular, the objectives of the meeting included the following:

- to review available formulations of medicines that are currently recommended by WHO for epilepsy and evaluate their age-appropriateness for children, given available evidence
  - to reach consensus on priority formulations for development to fill identified gaps (PADO priority list, 3–5-year time horizon);
- to review medicines approved for epilepsy but not currently endorsed by WHO, as well as ongoing studies investigating new or repurposed medicines for epilepsy (in adults and children)
  - to reach consensus on medicines approved by stringent regulatory authorities/WHO listed authorities (SRA/WLA), which should be flagged for consideration by WHO;
  - to reach consensus on promising candidates that should be prioritized for paediatric investigation (PADO watch list, 5–10-year time horizon);
- to review ongoing research efforts for the treatment of epilepsy in children
  - to reach consensus on priority research gaps that need to be addressed to ensure that the unique needs of children with epilepsy are effectively addressed;
- to review challenges with access and availability of paediatric medicines for epilepsy, building on the WHO strategy outlined in the report *Improving access to medicines for neurological disorders (10)*
  - to identify and highlight key barriers that need to be addressed towards enabling access to neurological medicines for children.

Box 1. Definition of PADO lists

- **PADO for epilepsy access list** (immediate priorities, 1–2 years) includes products that are already developed and approved for use in epilepsy, and recommended by WHO. The aim of inclusion in this list is to promote greater access, uptake and roll out of these products.
- **PADO for epilepsy priority list** (short-term priorities, 3–5 years) includes products that are missing or under development but not approved as a formulation, with the goal of advocating for accelerated development, approval or consideration for policy development.
- **PADO for epilepsy watch list** (long-term priorities, 5–10 years) includes products under investigation in Phase II or III, with the goal of advocating for accelerated investigation and approval in the paediatric population pending confirmation of efficacy and safety.

Methods

Available resources published by WHO for epilepsy were reviewed, including the *mhGAP guideline for mental, neurological and substance use disorders (9)* and the WHO report on *Improving access to medicines for neurological disorders (10)*.

For the priority-setting exercise of medicines endorsed by WHO, the 9th WHO EMLc (2023) was used as a reference document *(12)*. Expected changes to the 2025 EMLc based on the applications submitted were also considered in the exercise. A review of the age-appropriateness of formulations on the WHO EMLc conducted in 2021–2022 was used to further investigate medicines for which gaps in availability of age-appropriate formulations should be flagged and discussed as part of the PADO for epilepsy meeting *(13)*. The review was conducted by designing and applying a paediatric quality product profile assessment tool that considered various paediatric-centric attributes, including the target population, dose flexibility and acceptability for younger and older children, administration and excipients, storage and shelf-life, and market authorizations *(14,15)*. The specific needs of, and challenges associated with, medicine supply in LMICs were considered. Targets for each of the proposed attributes were then defined based on regulatory guidance documents, taking into consideration the needs of paediatric patients as well as LMICs and a qualitative scoring method was proposed to assess the dosage and formulation of each medicine against the target for the predefined attribute. For medicines recommended by WHO but not yet included in the WHO EMLc (e.g. lacosamide is recommended in WHO's mhGAP), the paediatric quality product profile assessment tool was applied to assess age-appropriateness *(15)*.

Medicines that are either already approved or still under investigation but not yet included in WHO recommendations were identified through a collated database. This database drew on two complementary sources available in the WHO Global Observatory on Health Research and Development: the WHO International Clinical Trials Registry Platform *(16)* and AdisInsight *(17)*, a commercial database that provides structured information on drug development programmes, including product-level details and associated clinical trials. Both datasets were filtered to retain entries relevant to epilepsy. For the WHO International Clinical Trials Registry Platform data, only interventional trials were retained, and disease-relevant keyword filters were applied. The final integrated datasets, cleaned and standardized using in-house scripts, were the basis for downstream analysis of the antiseizure drug development landscape. Typically, medicines included in the PADO Watchlist are considered if they are in Phase II or III clinical trials. However, for the PADO on epilepsy, the results were filtered to include only epilepsy drugs that were currently or had most recently been in Phase III or IV trials. This decision aimed to focus the analysis on medicines at more advanced stages of development, given the already substantial number of candidates in late-stage (Phase III and IV) trials. Medicines that had been registered to begin Phase III or IV clinical trials and had not yet started or were about to start when the data were collected were also considered. The selection criteria included novel agents under investigation for epilepsy and existing drugs being repurposed for epilepsy indications for the first time. Drugs were excluded if they had single studies that had been terminated or had unknown status, single studies conducted over 10–15 years ago without follow-up studies or were not epilepsy related.

Based on these criteria, 33 medicines were identified and categorized into three distinct groups (Annex 1).

- Group 1 consisted of novel medicines under investigation in Phase III or IV trials for epilepsy indications.
- Group 2 comprised repurposed drugs, namely, medicines for other indications being newly investigated for epilepsy in Phase III or IV trials.
- Group 3 included medicines already approved for epilepsy but not currently endorsed by WHO.

An extraction framework capturing a range of relevant criteria was developed and populated for medicines from groups 1 and 2. The framework included information such as developer details, therapeutic target and indication, clinical trial characteristics (phase, category, study design, population, outcomes and inclusion of children), administration and dosing, adherence and palatability, efficacy, safety and tolerability, paediatric formulation and regulatory status (e.g. United States Food and Drug Administration, European Medicines Agency approval). This framework supported background research designed to inform prioritization. Additionally, prior to the meeting, two dedicated priority-setting frameworks were developed to guide the discussion: one for medicines endorsed by WHO and one for medicines currently under clinical investigation (Table 1). Ahead of the meeting, experts from the European Paediatric Formulation Initiative (EuPFI) gathered information on the feasibility of developing solid oral dosage formulations for children (e.g. dispersible tablets) from a chemistry, manufacturing and controls perspective for some of the antiseizure medicines under review. Information on whether age-appropriate formulations exist in some markets was also gathered, and characteristics of these formulations were reviewed. This information was used to inform the discussions during the meeting.

A survey of 10 questions was developed to understand the availability and accessibility of WHO-recommended antiseizure medicines (ASMs) for children, the use of non-WHO-recommended ASMs in clinical practice, existing gaps in treatment options and formulation needs, challenges related to dosing, compounding and formulation variability, as well as opportunities for innovation in paediatric ASM delivery. The survey was disseminated to participants to collect qualitative information and ensure focused discussions. Survey results were presented during the meeting and referred to during the discussions and priority-setting exercise.

Table 1. Attributes included in the priority-setting frameworks of PADO for epilepsy

Attributes for antiseizure medicines endorsed by WHO	Attributes for antiseizure agents under clinical investigation
Flexibility of use across indications	Public health impact and unmet paediatric need
Administration (including the need for titration)	Clinical potential to be transformative compared to existing options
Side-effects/tolerability	Acceptability of current formulation and appropriateness for paediatric use
Drug–drug interactions	
Suitability of existing formulations to dose across the paediatric age spectrum	
Availability of more efficacious and/or safer options for the same indication and use	

Meeting proceedings

The PADO for epilepsy meeting was held virtually on 1 and 2 July 2025 (Annex 2) and brought together over 25 participants, including academics, researchers, clinical experts, regulators, funders and other key stakeholders involved in research and development related to epilepsy (Annex 3). Of the 16 participants who declared potential conflicts, none were considered significant enough to warrant exclusion from the priority-setting process. Funders, regulators and GAP-f partners (Medicines Patent Pool, UNICEF, EuPFI) attended the meeting in an observer capacity and did not participate in the decision-making process.

Consensus on priority ASMs to be further investigated and/or developed for infants and children was reached through group discussions informed by the pre-populated frameworks described above. The final PADO access, priority and watch lists for epilepsy and corresponding research agendas were finalized during a final plenary session.

Summary of discussions

Antiseizure medicines endorsed by WHO

The PADO for epilepsy Group's discussions focused on several aspects, including the suitability of available formulations for children, the population for which the medicine is typically used (burden; how common is the type of seizure in the paediatric population), the current use of the medicine in the paediatric population, and the availability – or expected availability – of products considered superior to others from both the clinical and public health perspectives.

Table 2 presents the ASMs shortlisted for discussion during the PADO for epilepsy meeting,[1] based on a review of their age-appropriateness as listed in the WHO EMLc and further background work.

[1] Not all medicines included on the WHO EMLc were shortlisted for discussion as some were considered to have age-appropriate formulations.

Table 2. Medicines recommended by WHO and/or listed on the WHO EMLc reviewed during the PADO-epilepsy meeting.

Medicine	Formulations listed on the WHO EMLc and discussed during the PADO for epilepsy meeting	
	Core list	**Complementary list**
Levetiracetam	Oral solution: 100 mg/mL Tablet: 250 mg, 500 mg, 750 mg, 1000 mg	Concentrate solution for infusion: 500 mg/5 mL in 5 mL vial Solution for infusion: 5 mg/mL; 10 mg/mL; 15 mg/mL in 100 mL bag
Phenobarbital	Injection: 30 mg/mL or 60 mg/mL; 200 mg/mL Oral liquid: 15 mg/5 mL Tablet: 15 mg, 30 mg, 60 mg, 100 mg	
Phenytoin	Injection: 50 mg /mL Oral liquid: 30 mg/5 mL Solid oral dosage form: 25 mg; 50 mg; 100 mg Tablet (chewable): 50 mg	
Valproic acid	Oral liquid: 200 mg/5 mL Tablet (crushable): 100 mg Tablet (enteric coated): 200 mg; 500 mg	Injection: 100 mg/mL in 3 mL, 4 mL, 10 mL ampoule
Carbamazepine	Oral liquid: 100 mg/5 mL Tablet (chewable): 100 mg; 200 mg Tablet (scored): 100 mg; 200 mg; 400 mg	-
Lacosamide[a]	n/a[a]	n/a[a]
Ethosuximide	-	Capsule: 250 mg Oral liquid: 250 mg/5 mL

[a] Lacosamide is recommended by WHO mhGAP but not listed on the WHO EML or EMLc.

Levetiracetam

Levetiracetam is a first-line option for the treatment of both generalized and focal seizures and it may be the ASM of choice when the type of seizure/epilepsy syndrome is not clear, as it is effective against most types of seizures. Levetiracetam is approved for children as young as 1 month of age for different types of seizures. Despite being such a key antiseizure medicine, the Group agreed that currently available formulations are suboptimal for delivering the WHO-recommended dose in children. For example, the bitter taste of the active pharmaceutical ingredient may lead to palatability and acceptability issues when administering the liquid formulation and it may be necessary to dilute the solution or mix it with food or beverage to help mask the taste. Moreover, the liquid formulation includes several excipients of concern and is supplied in glass bottles, which are bulky and heavy for supply.

Tablets are another available formulation and are suitable for older children who require doses of at least 250 mg (typically those over 6 years of age). However, their generally large size can make them difficult to swallow, posing additional challenges for paediatric use. The Group acknowledged that alternative dosage forms of levetiracetam are available in some high-income countries' markets, namely: coated granules in a sachet, granules for oral solution and tablets for oral suspension, as well as dispersible tablets. Participants working in high-income settings shared their positive experience with the use of some of these improved dosage forms – in particular, the tablet for oral suspension, which is available in the United States of America (250 mg, 500 mg, 750 mg, 1000 mg) and can be dispersed on a spoon in a small volume of liquid or directly in the mouth with a sip of water. It is spearmint flavoured, thus does not have the bitter taste of standard levetiracetam formulations. It was noted that this formulation is cost prohibitive and thus not widely utilized even in high-income settings.

Assuming that the required work is undertaken to ensure that improved formulations are affordable and available in LMICs, the Group agreed to include granules and tablets for oral suspension in the PADO priority list. Given the recommended dose of levetiracetam and the need for increments as small as 25 mg for titration in younger children, the Group agreed that either 25 mg granules for oral suspension or 50 mg scored tablets for oral suspension should be prioritized for development. Given that the technology to produce the granules and scored tablets exists and higher-strength formulations are available in the market, the Group found that developing lower-strength formulations of levetiracetam in these two formats should be feasible without major obstacles.

Phenobarbital and phenytoin

Phenobarbital and phenytoin are options for the treatment of generalized seizures only if lamotrigine, levetiracetam and valproic acid are not available, given their less favourable safety profile *(9)*. Despite this, they are still being used in some LMICs, though availability was noted to be limited in some countries and settings, especially at lower levels of the health-care system. It is important to highlight that these two medications are often available only in higher-strength formulations, which limits the ability for appropriate titration and increases the risk of significant adverse effects. The Group agreed that efforts should be focused on improving access to currently available formulations (including a chewable tablet of phenytoin, which is suitable for children down to 2 years of age) rather than on developing improved child-friendly options, despite noting that currently available formulations are not optimal.

Carbamazepine

Carbamazepine is listed on the WHO EMLc as an oral liquid (100 mg/5 mL), which contains several excipients of concern (benzoates, propylene glycol, sorbitol and colorants) and may be supplied in glass bottles requiring protection from light. Chewable tablets are also included in the WHO EMLc, though these were noted to be less accepted in children under 2 years of age, and survey results indicated that they are less widely available than the oral liquid. As chewable carbamazepine tablets are already available and appropriate for children 2 years of age and above, the Group concluded that developing alternative formulations was not a priority and recommended focusing efforts on enhancing access to current formulations.

Valproic acid

The formulations of valproic acid listed on the WHO EMLc include an oral liquid, which contains excipients of concern (e.g. preservatives, sucrose, sorbitol) and crushable tablets. While the latter can facilitate administration of recommended doses in children, participants noted that access is increasingly restricted in some countries over concerns of its high risk of birth defects and developmental disorders in children exposed while in the womb, and that some manufacturers may discontinue production in the near future. Indeed, WHO has issued a statement warning about the risks associated with use of the medicine in women and girls of childbearing potential. Notwithstanding the risks, valproic acid remains an important treatment option in children and education around its appropriate use as well as national pharmacovigilance systems should be strengthened to guarantee its safe use. Some participants also noted their preference for the use of capsules (opened for administration) over the oral liquid, when they are available, because of the ease of dosing. They also noted it to be better tolerated in children compared to the oral liquid formulation. While the need for a more concentrated oral liquid was noted to reduce administration volumes and the risk of choking in children, the Group agreed not to pursue this proposal for the reasons noted above.

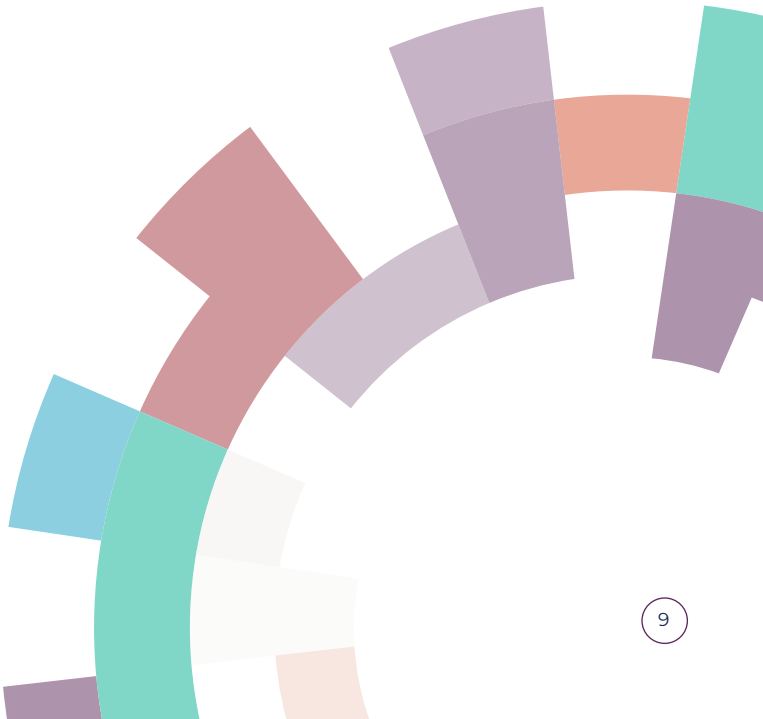
Modified-release granule formulations of valproic acid (50 mg, 100 mg, 250 mg, 500 mg, 750 mg, 1 g sachets) are available in some high-income markets and were considered by the Group to be a promising option going forward. Their modified-release properties were highlighted as important for supporting adherence, given that the dose can be administered less frequently.

Recognizing the need for a child-friendly formulation with suitable strength to support WHO-recommended dosing through titration across the paediatric age and weight spectrum, the Group recommended adding a modified-release granule formulation (50 mg pre-dosed sachets) to the PADO access list. Despite the uncertainty around pricing (noting that the price of the marketed formulations of modified-release granules in high-income settings is prohibitive), the Group emphasized that low-income settings should not be excluded from access to improved options if they offer clinical or administration advantages and that access challenges must be addressed upfront.

Lacosamide

Lacosamide, recommended by WHO through the mhGAP guidelines, but not included on the WHO EMLs, is registered by SRA/WLA as tablets (50 mg, 100 mg, 150 mg, 200 mg) and as an oral liquid (10 mg/mL). The tablets have poor acceptability in younger children, while the oral liquid contains excipients of safety concern and is reported to be viscous, which may compromise dosing accuracy, particularly for small volumes. Participants also noted limited availability of the oral liquid.

The Group recognized that lacosamide has a narrower role in epilepsy management, being used as second-line monotherapy for focal seizures when first-line medicines (lamotrigine, levetiracetam, carbamazepine) are ineffective. For this reason, the development of optimized lacosamide formulations was not prioritized. However, its inclusion on the PADO access list underscores the need to promote the availability of existing formulations and advocate for their inclusion on the WHO EMLs.



Ethosuximide

Ethosuximide is typically used only for absence seizures in children aged 3 years and above and is listed on the WHO EMLc as soft-gel capsules (250 mg) and oral liquid (250 mg/5 mL). Soft-gel capsules are not acceptable for younger children and while they can be used in older children, they are not ideal for low-resource settings, as they need protection from moisture, an environmental condition encountered in many LMICs. While the oral liquid is acceptable for younger children, it contains suboptimal excipients (preservatives, propylene glycol, high sugar content), and it is supplied in bulky glass bottles. Its use in older patients (if the capsules are not available) is problematic because it requires large volumes of liquid to achieve the recommended dose. The syrup was noted to be withdrawn from several markets, probably as a consequence of its bitter persistent metallic taste (despite addition of sweeteners and glycerol) affecting treatment adherence, and its high sugar content. The survey findings and the discussions at the PADO for epilepsy meeting noted a major gap in the availability of ethosuximide (both for adults and children) in many national EMLs and flagged that even when it is available, the high cost of the oral liquid formulation is a major barrier to its use.

Given its limited use in children under 3 years of age and the significant access challenges associated with currently available formulations, the Group decided not to include ethosuximide in the PADO priority list, despite acknowledging that existing formulations are suboptimal. Instead, it was agreed that efforts by WHO and stakeholders should remain on improving the availability and affordability of these formulations, rather than on investing in the development of alternatives specifically for younger children. This decision also reflects the consideration that developing more suitable formulations may require technologies that could hinder cost-effective scale up for global distribution, given the molecule's low melting point and waxy nature.

Antiseizure medicines currently not endorsed by WHO

Novel medicines in development for epilepsy indications

The group discussion focused on a set of five novel medicines (Table 3). The criteria used to guide the discussion included the urgency of the unmet medical need, the expected advantages over existing treatments, and the anticipated transformative potential for children. For each medicine, the meeting participants evaluated the suitability of its current formulation and identified priority cases requiring the development of new, child-appropriate formulations.

Azetukalner (XEN1101) is a small molecule, Kv7.2/7.3-specific potassium-channel opener, currently being investigated in Phase III clinical trials for focal seizures and primary generalized tonic–clonic seizures. It is not being tested at present in children (testing cohort is 12 years and above) and is administered in oral capsules once daily with the evening meal.

Bexicaserin (LP352) is a small molecule, a selective serotonin 5-HT2C receptor agonist in Phase III clinical trials for Dravet syndrome, Lennox–Gastaut syndrome and developmental and epileptic encephalopathy in children aged 2 years and above. It can be administered orally or via gastrostomy tubes/percutaneous endoscopic gastrostomy tubes. Compared to other drugs that target this receptor, which carry cardiovascular risk, bexicaserin is thought to have a reduced risk due to its increased specificity to the receptor. During the discussion, it was also noted that bexicaserin has been tested for early-onset epilepsies, which often prove quite resistant to treatment, with some positive outcomes.

BHV 7000 is a small molecule, also a selective activator of Kv7.2/7.3 potassium channels, which has most recently been investigated in Phase II/III clinical trials for refractory focal epilepsy and idiopathic generalized epilepsy with generalized tonic–clonic seizures. It has been tested only in adults (18–75 years) thus far and is administered via oral extended-release tablets once daily.

It was noted that ezogabine (retigabine), another drug used for the adjunctive therapy of focal seizures, which is also a potassium-channel modulator, has been discontinued due to commercial reasons. The participants highlighted that this has been an issue for patients for whom the approach of this medication has been transformative and therefore the development of medicines such as azetukalner and BVH 7000 could be impactful. The Group highlighted that paediatric investigations for both compounds have not yet been undertaken, despite the candidate being in advanced clinical development and highlighted that both candidates should be promptly investigated in children.

Carisbamate is a small molecule that has been investigated for multiple indications over the past decade and more, and it is therefore not as novel as the other medicines presented in this category. Nonetheless, given the fact that it has not been approved yet for any indication, it is being considered in this category. It had completed Phase III clinical trials for focal epilepsy; however, the United States Food and Drug Administration application was withdrawn due to inconsistent efficacy results. It is currently being investigated in Phase II studies for its use in Lennox–Gastaut syndrome in adults and children and is administered via oral suspension. During the discussion, it was noted that although clinical investigations were being performed in children, this was only for children aged 4 years and above. The need to also investigate the drug in younger children was noted as a priority.

STK-001 (zorevunersen) is an antisense oligonucleotide (ASO) designed to upregulate NaV1.1 protein expression, thereby reducing both the occurrence of seizures and significant non-seizure comorbidities. It is currently in Phase III clinical trials for Dravet syndrome and has been investigated in children aged 2 years of age and above. It is administered intrathecally. If successful, it would be the first disease-modifying drug for Dravet syndrome. Unlike the other medicines discussed, which target downstream processes, the ASO targets the disease source at the RNA level and offers a promising therapeutic option. It also targets a very select patient population. While it has the potential to be transformative, the Group noted that this is still a relatively new area of drug development. Another therapy mentioned during the discussion was Encoded's ETX101 for Dravet syndrome, a gene therapy that also acts on the underlying causative genes rather than directly targeting epilepsy. It is in the early stages of clinical trials and should also be closely followed. It was also highlighted that there are potential challenges in making such therapies available in low-resource settings, including cost, transportation, storage and the expertise required for intrathecal administration. There is growing interest in exploring how these types of treatments can be made more accessible in LMICs, as they represent a key direction in therapeutic innovation and hold considerable promise, making it important to address accessibility from the outset.

Table 3. List of novel medicines in development for epilepsy indications

Medicine	Modality	Indication	Formulation	Studied in children	Phase of development
Azetukalner	Small molecule	Focal seizures and primary generalized tonic–clonic seizures	Oral capsules	No	Phase III, ongoing
Bexicaserin	Small molecule	Dravet syndrome, Lennox–Gastaut and developmental and epileptic encephalopathy	Orally or via gastrostomy tubes / percutaneous endoscopic gastrostomy tubes	Yes	Phase III, ongoing
BHV 7000	Small molecule	Focal epilepsy and idiopathic generalized epilepsy with generalized tonic–clonic seizures	Oral tablets	No	Phase II/III, ongoing
Carisbamate	Small molecule	Lennox–Gastaut syndrome	Oral suspension	Yes	Phase III, ongoing
STK 001 (zorevunersen)	ASO	Dravet syndrome	Intrathecal (IT)	Yes	Phase III, ongoing

The Group agreed to add all the medicines discussed in the PADO watch list, noting that they all add value as they address different needs in the field of epilepsy. Moreover, several cross-cutting conclusions were identified. The Group noted that there is a need to promptly initiate paediatric investigations for compounds where Phase II trials in adults have been completed, including in children under the age of 2 years, recognizing that response to treatment in this age group may differ from that in older children and adults. The Group noted that publicly available information on administration, dosing, formulation and strengths remains limited at this stage. They emphasized that optimal formulation design should be considered upfront in the development process to avoid delays in children's access to age-appropriate formulations once studies are completed. The Group highlighted a preference for crushable or slow-release tablets.

Medicines repurposed from non-epilepsy indications

The discussion around repurposed medicines focused on two key questions, namely, whether any of the identified drugs would address unmet public health needs for epilepsy, and whether their formulations are suitable for paediatric use. However, several important limitations should be acknowledged for this category of medicines. First, due to the vast number of drugs being explored for repurposing across epilepsy and epilepsy-related indications, the review focused on those most aligned with the inclusion criteria, though every potentially relevant compound may not have been captured. Second, when assessing (candidate) repurposed medicines, these often have limited data available since they frequently enter clinical development at advanced phases, bypassing early-stage studies that would often provide some preliminary efficacy and safety signals.

While this category may not represent the most promising or well-characterized group of potential treatments, it remains important to monitor and consider these developments.

Sirolimus is an mTOR inhibitor approved for lymphangioleiomyomatosis and perivascular epithelioid cell tumours and is being investigated for drug-resistant epilepsy associated with tuberous sclerosis complex. It is a small molecule similar to everolimus, a medicine already approved for an epilepsy indication. Though there are some promising results for sirolimus, some evidence suggests that everolimus may demonstrate more favourable pharmacokinetic characteristics, although no direct comparison studies have been conducted for tuberous sclerosis complex-related epilepsy. Sirolimus may be a cheaper option that is more widely available compared to everolimus.

Dalfampridine (4-aminopyridine) is a broad-spectrum inhibitor of voltage-sensitive potassium channels. It is a small molecule that is approved for the treatment of multiple sclerosis and is being investigated for KCNA1 (Kv1.1) and KCNA2 (Kv1.2) epilepsies. During the discussion, it was noted that the indication investigated is for a very rare cohort of patients and it is not a general antiseizure medicine, thus not making it an immediate priority.

Idebenone is a nootropic and antioxidant drug that is thought to act by restoring cellular ATP generation. It is a small molecule approved for Leber hereditary optic neuropathy and is being investigated for post-stroke epilepsy prevention. During the discussion, it was noted that while paediatric stroke itself occurs, only a proportion of these patients develop post-stroke epilepsy, resulting in a relatively small target population. The value proposition may be limited compared to broader therapeutic approaches that address acquired epilepsies across multiple etiologies, which may warrant greater research investment.

Biperiden is a small molecule approved for the treatment of Parkinsonism and extrapyramidal disorders secondary to neuroleptic drug therapy and is being investigated for epilepsy prevention in post-traumatic brain injury. During the discussion, it was noted that while biperiden may be worth monitoring as evidence develops, it is not currently considered a priority, given the limited evidence for its preventive efficacy and its lack of use as a treatment for established epilepsy.

The discussion also highlighted that, given the limited information about study outcomes, it is challenging to determine whether any of the other repurposed medicines under investigation for epilepsy should be included in the priority or watch lists based on currently available data.

Medicines approved for epilepsy but not yet reviewed by WHO for inclusion in guidelines or other normative documents

The PADO for epilepsy Group discussed a total of 22 medicines, shortlisted as described in the Methods section. These medicines are approved by SRA/WLA for an epilepsy indication but have not yet been reviewed by WHO for inclusion in global guidelines (Table 4).

Cenobamate is a novel drug approved in adults for the treatment of focal-onset seizures. During the discussion, there was a consensus that cenobamate should be considered a priority as it has been particularly beneficial for adult drug-resistant epilepsy. This is noteworthy, given that in many LMIC settings, drug-resistant epilepsy remains a significant challenge. During the discussion, experts noted that cenobamate is being used off-label in paediatric populations, including progressively younger patients, with anecdotal evidence of improved seizure control in children with refractory epilepsy who have failed two or more previous medications – consistent with patterns observed in adults. However, paediatric efficacy data remain limited. Consequently, robust evidence is required to confirm its safety and efficacy in children, which is essential to support regulatory approval for on-label paediatric use. Moreover, experts highlighted that one of the main challenges with cenobamate lies in its pharmacological properties and titration schedule. It requires very slow titration, which can be difficult in settings where close monitoring is not possible. Additionally, cenobamate acts as both an enzyme inducer and inhibitor, which can lead to significant drug–drug interactions. Therefore, in patients already receiving other medications, its introduction can be particularly challenging. Doing so requires careful supervision and repeated dose adjustments of other medications, which takes time and expertise. A key advantage that was highlighted was that there are few psychiatric side- effects.

Clobazam is a drug approved for the treatment of Lennox–Gastaut syndrome in children aged 2 years and above. During the discussion, clobazam emerged as a clear consensus priority and was described as invaluable by participants. Beyond its approval for Lennox–Gastaut syndrome in children aged 2 years and above, experts noted strong evidence for its use as add-on therapy with lamotrigine in the management of Lennox–Gastaut syndrome, as well as for myoclonic seizures. It has widespread utility across developmental and epileptic encephalopathies and other epilepsies as an effective adjunctive therapy. Experts also noted that clobazam was particularly valued for being easy to administer and initiate, having a favourable side-effect profile compared to some alternatives. Additionally, it is important due to its ability to bridge through difficult clinical situations such as breakthrough seizures during intercurrent infections. Clobazam is not only suitable for ongoing treatment but can also be used in short adjunctive courses during times of heightened seizure risk, such as infections. As a benzodiazepine, it is a controlled substance, which may pose access challenges in some settings. Improving access to clobazam would make a significant difference for children with Lennox–Gastaut syndrome; however, in some settings, clobazam may be prescribed only in tertiary care facilities, meaning children must return regularly to receive it rather than being down-referred to less specialized settings.

Vigabatrin is a medicine approved for children aged 1 month and older for infantile epileptic spasms, drug-resistant focal seizures, focal seizures, tonic–clonic seizures and Lennox–Gastaut syndrome. During the discussion, it was identified as a priority medicine due to its use in treating infantile epileptic spasms, focal seizures and epilepsies, including those associated with tuberous sclerosis complex in children. For these patients, vigabatrin can make a dramatic difference in outcomes and has been an essential therapeutic alternative for managing some of the most challenging paediatric epilepsy cases.

Topiramate is approved for focal-onset seizures, generalized tonic–clonic seizures, Lennox–Gastaut syndrome in children 2 years and older. During the discussion, experts noted its particular value in treating epileptic spasms and Dravet syndrome, especially when stiripentol is unavailable, with topiramate serving as an important second-line option. While its primary utility is in these epilepsy syndromes affecting younger children, it poses teratogenic risks in adolescent girls of childbearing potential. Experts emphasized that topiramate can impact language development and cognition in children and carries the risks of kidney stones and acidosis without appropriate hydration, which is particularly concerning in LMICs where routine monitoring may be limited. Some participants expressed reservations about adding it to priority lists due to these safety concerns and monitoring requirements in settings with limited health-care resources.

Oxcarbazepine is approved for focal seizures in children aged 2 years and older. During the discussion, it was highlighted as a particularly interesting and safer alternative to carbamazepine, particularly for girls with childbearing potential. The PADO Group noted that, from an equity perspective, oxcarbazepine should be widely available.

Stiripentol is approved for Dravet syndrome in patients aged 6 months and older. Experts noted increasing recognition of the importance of early intervention, highlighting stiripentol as a treatment that can improve long-term outcomes when initiated early.

Table 4. Subset of medicines approved for epilepsy but not currently endorsed by WHO

Medicine	Approved in children	Indication	Marketed formulation
Cenobamate	No, adults only – need for studies in children	Focal seizures	Tablets (12.5 mg, 25 mg, 50 mg, 100 mg, 150 mg and 200 mg)
Clobazam	Yes, 2 years and older	Lennox–Gastaut syndrome	Oral film (5 mg, 10 mg, 20 mg); tablets (10 mg, 20 mg); oral suspension (2.5 mg/mL)
Oxcarbazepine	Yes, 2 years and older	Focal seizures	Extended-release tablets (150 mg, 300 mg, 600 mg), Oral suspension (300 mg/5 mL)
Stiripentol	Yes, 6 months or older	Dravet syndrome	Capsules (250 mg, 500 mg); oral powder for suspension (250 mg, 500 mg)
Topiramate	Yes, 2 years and older	Focal seizures, generalized tonic–clonic seizures, Lennox–Gastaut syndrome	Tablets (25 mg, 50 mg, 100 mg, 200 mg); sprinkle capsules (15 mg, 25 mg); Oral solution (25 mg/mL)
Vigabatrin	Yes, 1 month and older	Infantile epileptic spasms, drug–resistant focal seizures, focal seizures, tonic–clonic seizures, or Lennox–Gastaut syndrome	Oral solution (100 mg/mL); tablets (500 mg), granules (500 mg)

For medicines added to the PADO priority list, the Group also discussed options for optimized paediatric formulations.

For **cenobamate**, the first consideration was that despite its wide off-label use in children, it has been approved only in adults, although there are ongoing clinical studies in children aged 2 years and older (formulation unknown). Currently, only tablets are available, with an oral liquid formulation under development. A consensus was reached that a dispersible tablet would be useful, particularly for children, and therefore should be developed and tested in this population.

Clobazam is available as an oral film, tablets and oral suspension. During the discussion, consensus was reached on the need for a smaller strength tablet to be made available, namely, a 2.5 mg or 5 mg scored tablet or, alternatively, a 2.5 mg unscored tablet. This need arises because titration in younger patients may require 2.5 mg increments, which is not easily achievable with the currently available 10 mg tablets. This is particularly important when careful titration is essential to avoid oversedation, making refined dosing increments highly desirable. It was noted that the available oral suspension has significant limitations, as it tends to adhere to the sides of the bottle, resulting in reduced dosing and missed doses. Participants reported that this is a substantial practical issue, with patients often switching to tablets due to frustration with the suspension.

Vigabatrin is available as an oral solution, tablets and granules in 500 mg sachets. Experts noted that the granules are advantageous, as they can be mixed with water or food and allow for smaller titration increments compared to the 500 mg tablets. However, the 500 mg sachets generate substantial waste, since they are intended for single use even though some patients keep unused portions. To address this, the Group recommended advocating for the availability of smaller 250 mg granule sachets.

PADO-epilepsy access list	PADO-epilepsy priority list
VALPROIC ACID Modified-release granule formulations 50 mg pre-dosed sachet	**LEVETIRACETAM** Oral dosage form (25 mg granules for oral solution or 50 mg scored tablets for oral suspension)
LACOSAMIDE Tablets: 50 mg, 100 mg, 150 mg, 200 mg Oral liquid 10 mg/mL	**CLOBAZAM**[a] Oral, age-appropriate dosage form that allows for lower doses (titration), such as dispersible tablets (preferably 5 mg scored, dispersible tablets)
	VIGABATRIN[a] 250 mg sachet good compromise between dose flexibility and reduction of waste

PADO-epilepsy watch list

CENOBAMATE

Approved for epilepsy in adults but not studied in children; currently used off-label in paediatrics, with a clear need to promote paediatric studies.

Promote the development of oral, age-appropriate dosage form that allows for lower doses (titration), such as dispersible tablets.

AZETUKALNER[b], BHV 7000[b], CARISBAMATE[b], BEXICASERIN[c]

[a] *Clobazam and vigabatrin are approved for an epilepsy indication and have been studied in children; they have not been reviewed by WHO for inclusion in guidance documents.*

[b] *Azetukalner, BHV 7000 and carisbamate are new chemical entities that are being investigated for an epilepsy indication, but ongoing clinical studies do not include children.*

[c] *Bexicaserin is a new chemical entity that is being investigated in children down to 2 years of age.*

Priority research questions

Throughout the expert consultation, several priority research questions were identified that are critical to advancing the evidence base for paediatric epilepsy treatment and ensuring optimal care in LMICs.

A key priority is to investigate the role and safety of cenobamate in children with epilepsy and its relevance for integration into care packages. While this medicine has shown transformative results in adult drug-resistant epilepsy and is being used off-label in paediatric populations, robust paediatric efficacy and safety data remain limited and are essential to support regulatory approval for on-label paediatric use.

Another important research question relates to comparing intravenous phenobarbital and intravenous levetiracetam as second-line interventions, with a focus on guiding treatment in LMICs.

The consultation emphasized the need to promptly initiate paediatric investigations for clinical candidates in young children, including neonates, as treatment response in this age group may differ from older children and adults and early inclusion in clinical research is critical to avoid delays in access to potentially beneficial therapies. In parallel, the Group highlighted that optimal formulation design should be considered from the outset of the development process to prevent delays in children's access to age-appropriate formulations once clinical studies are completed.

Conclusions and next steps

The PADO for epilepsy meeting brought together academic researchers, clinical experts, implementing partners and other key stakeholders involved in research and development to reach consensus on the first-ever PADO lists for epilepsy. The lists contain three key antiseizure agents that have been flagged for development or consideration for policy development (PADO priority list) and five to be monitored in the longer term (PADO watch list), with a clear message on the need to promote prompt initiation of paediatric studies for this indication.

Considering existing paediatric formulations, the Group acknowledged that these formulations are effective in addressing a wide range of seizure types, with important but manageable side-effects. However, a clear message from the Group was that, in most countries – and especially in LMICs – these formulations are rarely or not at all available. Their listing in the PADO-epilepsy access list will support stakeholders to advocate for greater access and highlight the urgent need to prioritize their availability within national health systems.

With regard to newer and better formulations, experts have agreed that if they are available in some markets, their availability should not be precluded in LMICs and mechanisms should be put in place to ensure their availability and affordability, enabling access to these improved formulations in LMICs.

The accessibility challenges for ASMs in LMICs raised by experts have been highlighted in the WHO report on *Improving access to medicines for neurological disorders (10)*. The report underscores the need for concerted health system efforts to ensure that all essential medicines – including novel formulations – are available to those who need them. Key barriers include limited policy prioritization of ASMs (particularly for children), poor registration of paediatric formulations, their omission from national essential medicines lists, treatment guidelines and universal health coverage benefit packages, cost of medicines, as well as shortages of trained health workers to deliver epilepsy care.

In parallel, it is essential to advocate for accelerated research and development efforts that foster innovation in the design of paediatric formulations. Stakeholders are encouraged to explore novel, child-appropriate formulations that enhance safety, tolerability and adherence, thereby improving the quality of life of children living with epilepsy. Such efforts should promote early inclusion of children in clinical research and support coordinated mechanisms to streamline formulation development, regulatory alignment and market introduction.

The overall outcome of the exercise will be widely disseminated through multiple opportunities for engagement with regulators, industry, funders, civil society and the general public. In parallel, prioritized formulations may be proposed for consideration in future expressions of interest for prequalification by WHO, as appropriate, to encourage manufacturers to develop and submit quality-assured products for assessment. Through this process, manufacturers are invited to submit products for evaluation under the WHO Prequalification of Medicines Programme, which verifies their quality, safety and efficacy in accordance with international standards. Separately, identified priority formulations may be proposed for inclusion in the WHO Model Lists of Essential Medicines (EML) and Essential Medicines for Children (EMLc) through an application that can be submitted to the Expert Committee on the Selection and Use of Essential Medicines. Finally, the WHO Brain Health Unit will use existing mechanisms to follow up on some of the technical discussions in the areas given priority, including identified research priorities. Where needed, the GAP-f network and its working groups will be leveraged to advance and accelerate the investigation, development and introduction of priority products.

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Annex 1. Categorization of antiseizure medicines and the development pipeline

Categorization of antiseizure medicines and the development pipeline			
Antiseizure medicines		Antiseizure medicines in development	
Medicines listed on EML/EMLc or in WHO recommendations (WHO-endorsed)	**Medicines approved for epilepsy but not currently on EMLc/WHO endorsed**	**Medicines for other indications being newly investigated (Phase III or IV trials) for an epilepsy indication (repurposed drugs)**	**Novel medicines in development under investigation (Phase III or IV trials) for an epilepsy indication**
Diazepam*	Cannabidiol	Sirolimus	Azetukalner (XEN1101)
Ethosuximide*	Cenobamate	Idebenone	BHV 7000
Lamotrigine*	Clobazam	Biperiden	Carisbamate
Levetiracetam*	Fenfluramine	Dalfampridine/4-aminopyridine	Bexicaserin (LP352)
Midazolam*	Fosphenytoin		Zorevunersen (STK-001)
Valproic acid*	Gabapentin		
Carbamazepine	Ganaxolone		
Lacosamide*	Oxcarbazepine		
Lorazepam	Pregabalin		
Phenobarbital	Retigabine		
Phenytoin	Rufinamide		
Prednisolone	Stiripentol		
	Tiagabine		
	Topiramate		
	Vigabatrin		
	Zonisamide		
	Perampanel		
	Tetracosactide		
	Everolimus		
	Eslicarbazepine acetate		
	Brivaracetam		
	Felbamate		
	Valproate semisodium		
	Corticotropin		

*Phase III/IV clinical trials for other epilepsy indications

Annex 2. Agenda

Tuesday, 1 July 2025 14.00–17.00 CET		
Welcome and introduction	Martina Penazzato and Tarun Dua (WHO)	14.00–14.05
Paediatric Drug Optimization (PADO) for epilepsy: Meeting objectives	Tiziana Masini (WHO)	14.05–14.15
Epilepsy and WHO policies Improving access to medicines for neurological disorders	Tarun Dua and Rodrigo Cataldi (WHO)	14.15–14.30
Stakeholder perspectives to inform the prioritization exercise		
Epidemiology of epilepsy and challenges in prescribing antiseizure medicines to children in LMICs	Archana Patel (Boston Children's Hospital and Harvard Medical School, USA)	14.30–14.40
Preferred characteristics of products to match the clinical need	Helen Cross (UCL-Great Ormond Street Institute of Child Health, UK)	14.40–14.50
Overview of survey results	Katarina Pisani (WHO)	14.50–15.00
Q&A		15.00–15.15
Break		15.15–15.25

Prioritization discussion – existing medicines		
Age-appropriateness of medicines listed on the WHO EMLc	Tiziana Masini (WHO)	15.25–15.35
Group discussion to inform the PADO priority list of formulations, including key access considerations	Moderators: WHO	15.35–16.55
Closing and towards day 2	Tarun Dua (WHO)	16.55–17.00
Wednesday, 2 July 2025 14.00–17.00 CET		
Introduction and objectives of day 2	Tiziana Masini (WHO)	14.00–14.05
Prioritization discussion – pipeline		
Overview of medicines used or in clinical evaluation but not recommended by WHO	Katarina Pisani (WHO)	14.05–14.20
Q&A		14.20–14.40
Group discussion to inform the PADO watch list, including key access considerations	Moderators: WHO	14.40–16.40 (10-minute break during the discussion)
Review of overall PADO outcomes	Tiziana Masini (WHO)	16.40–16.50
Wrap up and next steps	Martina Penazzato (WHO)	16.50–17.00

Annex 3. List of participants

Seblewongel Asmare	Association of Ethiopian Neurologists, Ethiopia
Ralph Bax	European Medicines Agency, Netherlands (Kingdom of the)
Helen Cross	University College London, United Kingdom
Hanna Demissie	Department of Neurology, Addis Ababa University
Kamornwan Katanyuwong	International League Against Epilepsy, Thailand
Nfwama Kawatu	International League Against Epilepsy, Zambia
Edward Kija	Muhimbili University of Health and Allied Sciences, United Republic of Tanzania
Rachel Kinn	University of Iowa Health Care, United States of America
Sébastien Morin	Medicines Patent Pool, Switzerland
Naluca Mwendaweli	International League Against Epilepsy, Zambia
Archana Patel	Harvard Medical School, United States of America
Giulia Segafredo	Medicines Patent Pool, Switzerland
Arjune Sen	University of Oxford, United Kingdom
Maria Sheean	European Medicines Agency, Netherlands (Kingdom of the)
Mary Atieno Ojoo	UNICEF, Switzerland
Smita Salunke	European Paediatric Formulation Initiative; United Kingdom
Gagandeep Singh	Dayanand Medical College, India
Lauren Strasser	Sick Kids Hospital, Canada
Chahnez Charfi Triki	International League Against Epilepsy, Tunisia
Behaylu Yibe	Addis Ababa University, Ethiopia
Jo Wilmshurst	Red Cross War Memorial Children's Hospital, South Africa
WHO	
Rodrigo Cataldi	WHO Department of Mental Health, Brain Health and Substance Use
Ray Corrin	WHO Regulation and Prequalification Department
Tarun Dua	WHO Department of Mental Health, Brain Health and Substance Use
Tiziana Masini	GAP-f, Science for Health, Science Division
Martina Penazzato	GAP-f, Science for Health, Science Division
Katarina Pisani	WHO Department of Mental Health, Brain Health and Substance Use
Gereltuya Dorj	WHO Regional Office for South-East Asia
Sarah Charnaud	WHO Department of Emerging Technologies Research Prioritization and Support, Research for Health, Science Division

Annex 4. Complete list of medicines approved for epilepsy but not currently endorsed by WHO

Medicine	Approved in children	Indication	Marketed formulation
Brivaracetam	Yes, 1 month and older	Focal seizures	Oral tablets (10 mg, 25 mg, 50 mg, 75 mg and 100 mg), oral solution (10 mg/mL) and intravenous (IV) injection (50 mg/mL)
Cannabidiol	Yes, 1 year and older	Tuberous sclerosis, Lennox–Gastaut syndrome, Dravet syndrome	Oral solution
Cenobamate	No, adults only – need for studies in children	Focal seizures	Tablets (12.5 mg, 25 mg, 50 mg, 100 mg, 150 mg and 200 mg).
Clobazam	Yes, 2 years and older	Lennox–Gastaut syndrome	Oral film (5 mg, 10 mg, 20 mg); tablets (10 mg, 20 mg); oral suspension (2.5 mg/mL)
Corticotropin	Yes, infants and children 2 years and under	Infantile epileptic spasms, Lennox–Gastaut syndrome, Landau–Kleffner syndrome	Gel (80 U/mL)
Eslicarbazepine acetate	Yes, 4 years of age and older	Focal seizures	Tablets (200 mg, 400 mg, 600 mg, 800 mg; oral suspension 50 mg/mL and 40 mg/mL)
Everolimus	Yes, 2 years and older	Tuberous sclerosis complex	Tablets for oral suspension (2 mg, 3 mg, 5 mg); tablets (0.25 mg, 0.5 mg, 0.75 mg, 1 mg, 2.5 mg, 5 mg, 7.5 mg and 10 mg)
Felbamate	Yes, 4 years and older	Lennox–Gastaut syndrome	Tablets (400 mg and 600 mg,) oral suspension (600 mg/5 mL)
Fenfluramine	Yes, 2 years and older	Lennox–Gastaut syndrome, Dravet syndrome	Oral solution (2.2 mg/mL)

Medicine	Approved in children	Indication	Marketed formulation
Fosphenytoin	Yes	Generalized tonic–clonic status epilepticus	50 mg PE (phenytoin equivalents)/mL
Gabapentin	Yes, 6 years and older	Focal seizures with and without bilateral synchrony	Capsules (100 mg, 300 mg, 400 mg), film-coated tablets (600 mg, 800 mg) and oral solution (250 mg/5 mL), extended-release tablets (300 mg, 450 mg, 600 mg 750 mg, 900 mg)
Ganaxolone	Yes, 2 years and older	CKDL5 deficiency disorder (CDD/ CDKL5)	Oral suspension (50 mg/mL)
Oxcarbazepine	Yes, 2 years and older	Focal seizures	Extended-release tablets (150 mg, 300 mg, 600 mg), oral suspension (300 mg/5 mL)
Perampanel	Yes, 4 years of age and older	Focal seizures with and without bilateral synchrony	Tablets (2 mg, 4 mg, 6 mg, 8 mg, 10 mg, 12 mg) and oral suspension (0.5 mg/mL)
Pregabalin	No	Focal seizures with or without bilateral synchrony	Capsules (25 mg, 50 mg, 75 mg, 100 mg, 150 mg, 200 mg, 225 mg, 300 mg), oral solution (20 mg/mL), and extended-release tablets (82.5 mg, 165 mg, 330 mg)
Rufinamide	Yes, 1 year and older	Lennox–Gastaut syndrome	Oral suspension (40 mg/mL, tablets (200 mg, 400 mg)
Stiripentol	Yes, 6 months or older	Dravet syndrome	Capsules (250 mg, 500 mg); oral powder for suspension (250 mg, 500 mg)
Tiagabine	No, 12 years and over	Focal impaired consciousness seizures, focal conscious seizure	Tablets (5 mg, 10 mg, 15 mg)
Topiramate	Yes, 2 years and older	Focal seizures, generalized tonic–clonic seizures, Lennox–Gastaut syndrome	Tablets (25 mg, 50 mg, 100 mg, 200 mg); sprinkle capsules (15 mg, 25 mg); oral solution (25 mg/mL)

Medicine	Approved in children	Indication	Marketed formulation
Valproate semisodium	Yes, 2 years and olde	Focal seizures with loss of consciousness and absence seizures	Tablets: (125 mg, 250 mg and 500 mg)
Vigabatrin	Yes, 1 month and older	Infantile epileptic spasms, drug-resistant focal seizures, focal seizures, tonic–clonic seizures, or Lennox–Gastaut syndrome	Oral solution (100 mg/mL); tablets (500 mg), 500 mg granules
Zonisamide	Yes, 6 years and older (EMA)	Focal seizures	Capsules (25 mg, 100 mg); tablets (25 mg, 50 mg, 100 mg); oral solution (100 mg/5 mL)

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