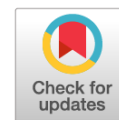


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Trends in Antiepileptic Drug Use in Pharmacoresistant Epilepsy

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ABSTRACT

BACKGROUND: Antiepileptic drugs are the cornerstone of treatment in patients with epilepsy.

AIM: to examine the spectrum of antiepileptic drugs across different generations and trends in their use over the 20th and 21st centuries.

MATERIALS AND METHODS: A retrospective observational cohort study was conducted in 2022–2024. Study population: patients with a verified diagnosis of epilepsy. Study focus: antiepileptic drug therapy. Patients with a verified diagnosis of epilepsy were divided into 2 groups: group 1 included patients from the 20th century with epilepsy duration of more than 20 years as of 2020; group 2 included patients from the 21st century with epilepsy duration of less than 20 years. The history of antiepileptic drugs use was evaluated by generation: first-generation (traditional/older), second-generation (newer), and third-generation (most recent). The frequency of first-generation antiepileptic drugs use was calculated both as a percentage and as the mean number of antiepileptic drugs per patient for the 20th and 21st centuries.

RESULTS: The study included 60 patients: group 1 comprised 28 patients and group 2, 32 patients. The mean age and disease duration in the overall cohort were 31.5 ± 9.3 years and 19.5 ± 9.1 years, respectively; the male-to-female ratio was 1:1. The mean number of antiepileptic drugs used per patient over time was 5.1 ± 2.3 (range, 2–10). First-generation antiepileptic drugs were used in 61% of patients in group 1 and 42% in group 2; second-generation in 32% and 46%, respectively; and third-generation in 7% and 12%, respectively. The mean number of first-generation antiepileptic drugs per patient across the cohort was 2.2 ± 1.5 , with group-specific means of 3.1 in group 1 and 1.3 in group 2. Barbiturates accounted for 24% of prescriptions in group 1 and 5% in group 2; benzodiazepines, for 5% and 0%, respectively; valproates, for 26% in both groups; and carbamazepine, for 13% and 8%, respectively.

CONCLUSION: An increased use of newer-generation antiepileptic drugs (anticonvulsants) was observed in the 21st century, with a marked decline in older-generation drugs, primarily due to decreased use of barbiturates and benzodiazepines. Valproic acid and carbamazepine have maintained their roles in epilepsy management.

Keywords: antiepileptic drugs; barbiturates; benzodiazepines; valproic acid; carbamazepine; third-generation drugs; second-generation drugs; first-generation drugs; epilepsy.

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Динамика применения антиэпилептических препаратов при фармакорезистентной эпилепсии

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АННОТАЦИЯ

Актуальность. Антиэпилептические препараты являются краеугольным камнем лечения пациентов с эпилепсией.

Цель — изучение спектра антиэпилептических препаратов различных поколений и динамику изменения в XX и XXI вв.

Материалы и методы. Ретроспективное наблюдательное когортное исследование выполнено в 2022–2024 гг. Объект исследования: пациенты с эпилепсией. Предмет исследования: антиэпилептические препараты. Включены пациенты с верифицированным диагнозом «эпилепсия» в 2 группах: 1-я — XX в., длительность эпилепсии более 20 лет на 2020 г.; 2-я — XXI в., длительность менее 20 лет. Оценен анамнез антиэпилептических препаратов по трем поколениям: 1-е — старые и традиционные препараты; 2-е — новые; 3-е — новейшие препараты. Рассчитана частота применения антиэпилептических препаратов старого поколения в процентах и в среднем на одного пациента в XX и XXI вв.

Результаты. В исследование включено 60 человек: 1-я группа — 28 пациентов; 2-я — 32. Средний возраст и длительность заболевания в когорте — $31,53 \pm 9,3$ и $19,45 \pm 9,1$ лет соответственно; соотношение м:ж — 1:1. Среднее количество антиэпилептических препаратов в анамнезе составило $5,1 \pm 2,3$ (минимум 2, максимум 10). Антиэпилептические препараты 1-го поколения в анамнезе в 1-й группе составили 61%, во 2-й — 42; 2-го — 32 и 46; 3-го поколения — 7 и 12% соответственно. Применение антиэпилептических препаратов 1-го поколения в когорте в среднем составило $2,17 \pm 1,49$ на 1 человека; в 1-й группе — 3,1, во 2-й — 1,3. Барбитураты составили 24 и 5%, бензодиазепины — 5 и 0, вальпроаты — по 26, карбамазепины — 13 и 8% соответственно.

Заключение. Наблюдаются рост применения антиэпилептических (противосудорожных) препаратов новых поколений в XXI в. и существенное снижение доли препаратов старых генераций преимущественно за счет снижения барбитуратов и бензодиазепинов. Вальпроаты и карбамазепины сохраняют свои позиции в терапии эпилепсии в XXI в.

Ключевые слова: антиэпилептические препараты; барбитураты; бензодиазепины; вальпроаты; карбамазепин; новейшие препараты; препараты нового поколения; препараты старого поколения; эпилепсия.

Как цитировать

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BACKGROUND

Epilepsy remains a pressing issue owing to its widespread prevalence and significant impact on patients, their families, and society [1]. In 2022, the World Health Organization adopted a 10-year Intersectoral Global Action Plan on Epilepsy and Other Neurological Disorders, which includes the Epilepsy 90–80–70 cascade target. This target aims to address gaps in mental and physical health promotion, prevention, early detection, care, treatment, and rehabilitation and meet the social, economic, educational, and inclusive needs of people with epilepsy and their families [2]. Moreover, the study aim to ensure that 80% of people diagnosed with epilepsy have access to appropriate, affordable, and safe antiepileptic drugs (AEDs) by 2031.

As of 2020, 27 AEDs have been approved worldwide, which are the cornerstone of treatment for patients with epilepsy [3]. Approximately 70% of patients with epilepsy achieve seizure control with AEDs. However, approximately 30% of patients receive multiple therapy without achieving seizure control and become pharmacoresistant [4]. Epilepsy affects men and women differently. Epidemiological studies showed that epilepsy is more common in men [5]. Regarding clinical signs and symptoms and complications, including those associated with the female endocrine profile and reproductive system, endocrine disorders primarily affect women [6].

AEDs are divided into groups or generations, depending on the time of their development. First-generation (old and conventional) AEDs include bromides, barbiturates (phenobarbital, primidone, and benzodiazepines such as clonazepam, diazepam, and nitrazepam), hydantoins (phenytoin), and succinimides (ethosuximide) and conventional AEDs such as carbamazepine and valproic acid derivatives. Second-generation (new) AEDs include lamotrigine, topiramate, felbamate, vigabatrin, gabapentin, tiagabine, oxcarbazepine, and levetiracetam. Third-generation (novel) AEDs comprise lacosamide, brivaracetam, eslicarbazepine, perampanel, rufinamide, and cenobamate [7]. Twenty-three AEDs with different mechanisms of action and effectiveness and safety profiles have been approved in Russia. Recently, the International League Against Epilepsy has recommended referring to AEDs as anticonvulsants because these drugs do not affect underlying epileptogenic processes and are designed to control seizure symptoms.

Since the 1990s, significant progress has been made in epilepsy pharmacology, expanding the range of available AEDs. New and novel drug groups have emerged and are currently being used to treat patients with epilepsy [8]. The expansion of the AED range during the late 20th and early 21st centuries influenced the widespread clinical use of older-generation drugs. The choice of AED depends on the side effects, which are less common with

newer-generations drugs. The global burden of epilepsy, dementia, and their combination is expected to increase. Most AEDs, especially first-generation AEDs, negatively affect cognitive function. The increased use of second-generation AEDs may reduce adverse cognitive effects [10]. Drowsiness is a commonly reported adverse effect of AEDs and is more frequently associated with first-generation AEDs [11]. Moreover, first-generation AEDs are a common cause of drug-induced liver injury [12]. AEDs affect serum sex hormone levels, leading to secondary endocrine disorders [13]. Reproductive endocrine disorders are significant in epilepsy because they can cause reproductive dysfunction and worsen seizures [14]. The use of valproic acid and AEDs that induce liver enzymes is associated with reproductive disorders. Newer AEDs do not negatively affect reproductive function; however, more research is required.

Trends in the use of different generations of AEDs have not been closely monitored.

Thus, this study *aimed* to evaluate the different generations of AEDs and trends in their use throughout the 20th and 21st centuries.

METHODS

Study Design

This retrospective, observational, cohort study was performed by the Polenov Neurosurgical Institute under state assignment of the Ministry of Health of the Russian Federation no. 122011900530–8, *Risk Stratification, Selection of the Optimal Surgical Treatment Strategy, and Prediction of Outcomes in Patients With Drug-Resistant Structural Epilepsy*, in 2022–2024. Patients diagnosed with epilepsy were included, and the use of AEDs was evaluated.

Population

The study included patients with epilepsy that was diagnosed based on the International League Against Epilepsy recommendations and Clinical Guidelines for Epilepsy and Status Epilepticus in Adults and Children published in Russia in 2022. Antiepileptic history was determined in 60 neurosurgical patients with focal drug-resistant epilepsy at the Department of Neurosurgery No. 2 and the Outpatient Department of the Polenov Neurosurgical Institute. The patients were divided in two groups: group 1: Patients with disease onset in the 20th century and a disease duration of more than 20 years as of 2020; group 2: Patients with disease onset in the 21st century and a disease duration of less than 20 years as of 2020.

Inclusion Criteria:

- Male and female patients aged >18 years,
- Diagnosis of drug-resistant epilepsy,
- Signed informed consent form,

Non-inclusion Criteria:

- Patients aged <18 years,
- Exclusion Criteria:**
- Refusal of any communicative act, termination of communication, and
 - Generalized epilepsy.

Methods

Demographic and clinical characteristics were investigated. Antiepileptic history was assessed for first-generation (old and conventional), second-generation (new), and third-generation AEDs (novel) (according to the National Institute for Health and Care Excellence classification) (Fig. 1).

The mean exposure of older-generation AEDs per patient was calculated. The groups were compared based on the range and frequency of use of older-generation AEDs. Additionally, trends in the use of first-generation AEDs (barbiturates, benzodiazepines, valproates, and carbamazepine) were determined.

Ethics Approval

All participants provided written informed consent prior to the study. The study was approved by the Local Ethics Committee of the Almazov National Medical Research Centre (protocol no. 2304–22, dated April 18, 2022).

Statistical Analysis

Descriptive statistics were used (SPSS29.0.10), and $p=0.05$ indicated significance.

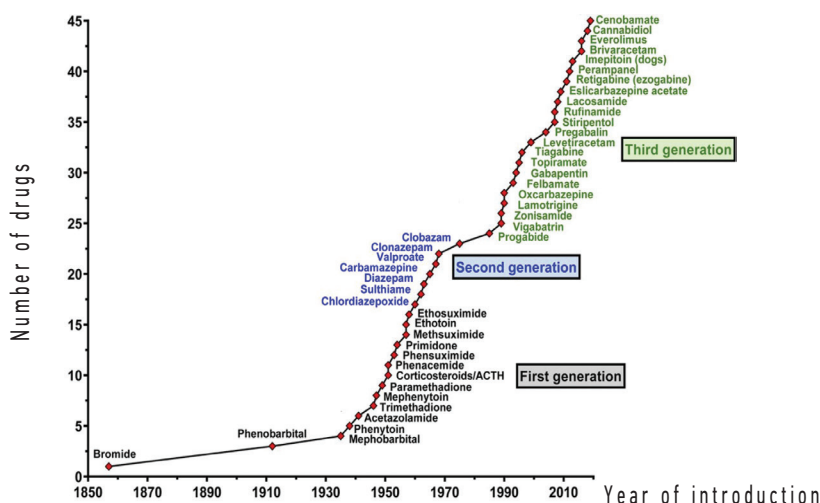
RESULTS

The study included 60 patients who were divided into two groups: group 1, 28 patients with disease onset in the 20th century and a disease duration of more than 20 years; and group 2, 32 patients with disease onset in the 21st century and a disease duration of less than 20 years.

Demographic Characteristics

The mean age of the patients was 31.53 ± 9.30 years (range: 18–56). The median age was 31.5 years. The male-to-female ratio in the cohort was 30:30=1:1 (Table 1).

In group 1 (28 patients), the mean age was 31.1 ± 9.9 years, and the male-to-female ratio was 14:14=1:1. In group 2 (32 patients), the mean age was 31.90 ± 8.99 years, and the male-to-female ratio was 16:16=1:1. The majority of the cohort were working-age patients, particularly women of late reproductive age (30–40 years old).

**First-generation (old) agents**

Mephobarbital
Phenytoin*
Acetazolamide*
Trimethadione
Mephentoin
Paramethadione
Corticosteroids/
adrenocorticotrop
hormone*

Second-generation (new) agents

Chlordiazepoxide
Sultiam
Diazepam
Carbamazepine
Valproic acid
Clonazepam
Clobazam

Third-generation (novel) agents

Progabide*
Vigabatrin
Rufinamide
Lacosamide
Zonisamide
Eslicarbazepine acetate
Lamotrigine
Retigabine (ezogabine)
Oxcarbazepine
Perampanel
Felbamate*
Imepitoin* (dogs)
Gabapentin
Brivaracetam
Topiramate
Everolimus
Tiagabine*
Levetiracetam
Pregabalin
Stiripentol*
Cannabidiol*
Cenobamate*
Fenfluramine*

Fig. 1. Three generations of antiepileptic drugs for the treatment of epilepsy. Löscher W, Potschka H, Sisodiya SM, Vezzani A. Drug resistance in epilepsy: clinical impact, potential mechanisms, and new innovative treatment options. *Pharmacol Rev.* 2020;72:606–638. * Not registered in Russia

Рис. 1. Три поколения АЭП для лечения эпилепсии. Источник: Löscher W, Potschka H, Sisodiya SM, Vezzani A. Drug resistance in epilepsy: clinical impact, potential mechanisms, and new innovative treatment options. *Pharmacol Rev.* 2020;72:606–638. *Не зарегистрировано в РФ

Clinical Characteristics

The mean disease duration was 19.45 ± 9.10 years in the cohort (range: 3–36 years), 27.32 ± 4.58 years in group 1 (range: 22–36 years), and 12.6 ± 5.7 years in group 2 (range: 3–20 years). Disease duration negatively correlated with positive responses to the addition of a new AED and surgical treatment of epilepsy. At the time of hospital admission, the groups did not show any differences in the distribution of epilepsy forms, seizure frequency, and seizure types. Patients with temporal lobe epilepsy predominated in both groups. These patients experienced polymorphic seizures at least once a month.

Antiepileptic Therapy

The mean number of AEDs used per patient was 5.1 ± 2.3 (range: 2–10). Moreover, the mean use of older-generation AEDs was 2.17 ± 1.49 in the cohort, 3.1 per person in group 1, and 1.3 per person in group 2. In the 21st century, older-generation AEDs were used 2.5 times less frequently per person per group. Analysis of trends in the use of individual AEDs revealed the following: barbiturates, 24% in group 1 and 5% in group 2; benzodiazepines, 5% in group 1 and 0% in group 2; valproates, 26% in group 1 and 2% in group 2; and carbamazepines, 13% in group 1 and 8% in group 2 (Fig. 2).

Analysis of the use of the most common older-generation AEDs demonstrated a 5-fold decrease in barbiturate and benzodiazepine use and a 1.5-fold decrease in carbamazepine use. The percentage of valproate use did not change.

A history of older-generation AED use was reported by 61% of patients in group 1 and 42% in group 2 and of new AED use by 32% of patients in group 1 and 46% in group 2. Moreover, a history of novel-AED use was reported by 7% of patients in group 1 and 12% in group 2 (Fig. 3).

General trends in AED use included a decrease in the use of old, conventional AEDs and an increase in the use of new and novel AEDs. The use of novel AEDs slightly exceeds the increase in the use of newer-generation AEDs.

DISCUSSION

Significant changes were noted in the range of AEDs used in clinical practice over the past two decades. The use of old AEDs has decreased by 1.5 times, whereas the use of new and novel AEDs has increased by 1.5 times and 1.7 times, respectively. However, old AEDs are still being used. Although barbiturate and benzodiazepine use

Table 1. Demographic characteristics in the groups and the cohort

Таблица 1. Демографические характеристики в группах и когорте

Parameter	Group 1 (n=32), years	Group 2 (n=28), years	Cohort (n=60), years
Age distribution			
Mean age	31.1 ± 9.9	31.9 ± 8.99	31.53 ± 9.3
• Min	22	19	19
• Max	54	56	56
Sex distribution by groups			
Male	14	16	30
Female	14	16	30

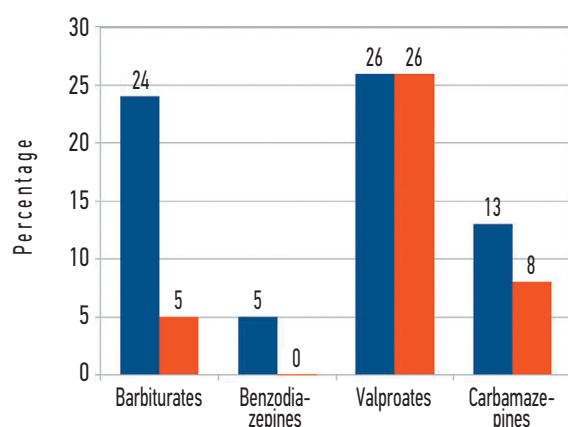


Fig. 2. Trends in first-generation antiepileptic drug use across the groups.

Рис. 2. Динамика применения АЭП 1-го поколения в группах.

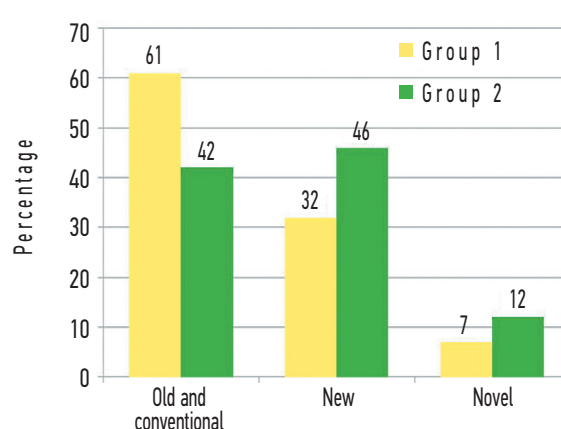


Fig. 3. Trends in antiepileptic drug use by generation across the groups.

Рис. 3. Динамика применения АЭП различных поколений в группах.

has significantly decreased, valproate and carbamazepine use remains high, and the risk of AED-related complications remains high.

The demographic characteristics of neurosurgical patients with drug-resistant epilepsy include a young age (mean: 32 years), which is the period of social activity and reproductive potential. However, clinical presentation is characterized by a long duration of the epilepsy before surgical treatment and a severe disease course. To date, society has not overcome the perception of surgical treatment for epilepsy as a last resort; thus, the cohort of patients with focal drug-resistant epilepsy is relatively homogeneous worldwide [1].

In the 21st century, the range of AEDs has significantly expanded. Sex characteristics in the use of individual groups of AEDs and their impact on reproductive potential are actively being studied [16]. In such situations, valproates are associated with a higher risk of reproductive endocrine disorders and teratogenesis [13]. Regulatory authorities do not recommend the use of valproates in women of reproductive age because of an increased risk of teratogenesis during pregnancy [15]. However, the percentage of valproate use among neurosurgical patients did not change owing to the severity of their epilepsy, which is characterized by a combination of focal seizures with impaired awareness and bilaterally synchronous (secondarily generalized) seizures. Old AEDs are associated with a high percentage of adverse gastrointestinal effects [12]. However, new AEDs are linked to lower incidence of drowsiness as an adverse effect, and some agents, such as perampanel, improve sleep characteristics [17]. The lower incidence of cognitive disorders associated with new AEDs is a crucial feature of pharmacological treatment in recent years [8].

Therefore, the increased use of the latest generation of AEDs reduces the risk of side effects and improves the quality of life of patients with epilepsy.

CONCLUSION

The use of new antiepileptic (anticonvulsant) agents has significantly increased in the 21st century, whereas the use of older agents has significantly decreased,

primarily due to decreased use of barbiturates and benzodiazepines. In the 21st century, valproates and carbamazepines remain the primary treatments for drug-resistant epilepsy.

Clinicians should consider changes in the range of AEDs used with a significant percentage of conventional, older agents.

ADDITIONAL INFO

Authors' contribution. All authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study. Personal contribution of each author: N.O. Dengina, literature review, collection and analysis of obtained data, conclusions, preparation of the manuscript; G.V. Odintsova, development of the concept and plan of the study, conclusions; N.E. Ivanova, collection and analysis of obtained data, preparation of the manuscript.

Conflict of interest. The authors declare that there is no conflict of interest.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией. Личный вклад каждого автора: Н.О. Деньгина — обзор литературы, сбор и анализ полученных данных, выводы, подготовка текста рукописи; Г.В. Одинцова — разработка концепции и плана исследования, выводы; Н.Е. Иванова — сбор и анализ полученных данных, подготовка текста рукописи.

Конфликт интересов. Авторы заявляют об отсутствии конфликта интересов.

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REFERENCES | СПИСОК ЛИТЕРАТУРЫ

1. Karlov VA. *Epilepsy in children and adult women and men. A guide for doctors*. 2nd ed. Moscow: BINOM; 2019. 896 p. (In Russ.)
2. EPILEPSY90-80-70 1: A SMART Target SMART: Specific Measurable Achievable Relevant Time bound 2. (n. d.). Retrieved March 29, 2023, from <https://www.bmj.com/content/371/bmj.m3658>
3. Johannessen Landmark C, Johannessen SI, Patsalos PN. Therapeutic drug monitoring of antiepileptic drugs: current status and future prospects. *Expert Opin Drug Metab Toxicol*. 2020;16(3):227–238. doi: 10.1080/17425255.2020.1724956
4. Denton A, Thorpe L, Carter A, et al. Definitions and Risk Factors for Drug-Resistant Epilepsy in an Adult Cohort. *Front Neurol*. 2021;12:777888. doi: 10.3389/fneur.2021.777888
5. Fiest KM, Sauro KM, Wiebe S, et al. Prevalence and incidence of epilepsy: A systematic review and meta-analysis of international studies. *Neurology*. 2017;88(3):296–303. doi: 10.1212/WNL.0000000000003509

6. Odintsova GV, Aleksandrov MV, Nesterova SV. The characteristics of social adaptation in reproductive-aged women with epilepsy and migraine. *Nevrologiya, neiropsikhiatriya, psikhosomatika = Neurology, Neuropsychiatry, Psychosomatics*. 2018;10(1S):46–50. (In Russ.) doi: 10.14412/2074-2711-2018-1S-46-50
7. Luszczki JJ. Third-generation antiepileptic drugs: mechanisms of action, pharmacokinetics and interactions. *Pharmacol Rep*. 2009;61(2):197–216. doi: 10.1016/s1734-1140(09)70024-6
8. Mikulić I, Likić R, Janković SM. Cost-Effectiveness of Zonisamide Versus Levetiracetam in Newly Diagnosed Focal Onset Epilepsy in Serbia. *Value Health Reg Issues*. 2022;27:49–57. doi: 10.1016/j.vhri.2021.05.007
9. Nevitt SJ, Sudell M, Cividini S, et al. Antiepileptic drug monotherapy for epilepsy: a network meta-analysis of individual participant data. *Cochrane Database Syst Rev*. 2022;4(4):CD011412. doi: 10.1002/14651858.CD011412.pub4
10. Beghi E, Beghi M. Epilepsy, antiepileptic drugs and dementia. *Curr Opin Neurol*. 2020;33(2):191–197. doi: 10.1097/WCO.0000000000000802
11. Sánchez-Villalobos JM, Aledo-Serrano Á, Villegas-Martínez I, et al. Epilepsy treatment in neuro-oncology: A rationale for drug choice in common clinical scenarios. *Front Pharmacol*. 2022;13:991244. doi: 10.3389/fphar.2022.991244
12. Kamitaki BK, Minacapelli CD, Zhang P, et al. Drug-induced liver injury associated with antiseizure medications from the FDA Adverse Event Reporting System (FAERS). *Epilepsy Behav*. 2021;117:107832. doi: 10.1016/j.yebeh.2021.107832
13. Markoula S, Siarava E, Keramida A, et al. Reproductive health in patients with epilepsy. *Epilepsy Behav*. 2020;113:107563. doi: 10.1016/j.yebeh.2020.107563
14. Taylor PA, Reynolds RC, Calhoun V, et al. Highlight results, don't hide them: Enhance interpretation, reduce biases and improve reproducibility. *Neuroimage*. 2023;274:120138. doi: 10.1016/j.neuroimage.2023.120138
15. Tomson T, Söderberg Löfdal K. Sista pusselbiten på plats i översynen av epilepsivården — Nu finns nya rekommendationer för läkemedelsbehandling [New recommendations for antiepileptic drug therapy: the last piece in the review of epilepsy care]. *Lakartidningen*. 2020;117: FWWZ. PMID: 31935046
16. Ivanova NE, Odintsova GV, Oleinik AA, et al. Pregnancy and epilepsy: focus on seizure frequency changes and obstetric complications. Progress in studies and lag in practice. *Nevrologiya, neiropsikhiatriya, psikhosomatika = Neurology, Neuropsychiatry, Psychosomatics*. 2020;12(6):77–82. (In Russ.) doi: 10.14412/2074-2711-2020-6-77-82
17. Carvalho BMS, Chaves J, da Silva AM. Effects of antiepileptic drugs on sleep architecture parameters in adults. *Sleep Sci*. 2022;15(2):224–244. doi: 10.5935/1984-0063.20220045

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