Cost of epilepsy in the Russian Federation

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SUMMARY

Background. Epilepsy underdiagnosis in Russia, population aging, innovative drugs and expensive treatment regimens, the introduction of additional and alternative methods such as neurosurgery, annually increase the cost for treatment of epilepsy patients. In this regard, an issue of maximizing benefits for the largest number of the population becomes relevant. Pharmacoeconomical research within the assessment of healthcare technologies helps to choose the most economically and medically effective treatment strategy among numerous alternatives.

Objective: analysis of epilepsy-associated costs in the Russian Federation, aimed at supporting decision-making processes in the field of health policy and financing.

Material and methods. The empirical study was based on collecting the data on a continuous sampling of 384 epilepsy outpatient records from subjects aged 19 to 79 years for the period 2019–2022. The issues related to all costs of epilepsy were discussed. While planning, conducting and analyzing these studies, the principles of strengthening the reporting of observational studies in epidemiology (STROBE) were taken into account.

Results. The total annual per-patient expenditure on epilepsy treatment comprised a fifth of gross domestic product per capita. Indirect costs exceed direct cost savings. It was found out that the economic damage caused to society, family, and individual related to epilepsy is three times higher than the direct costs.

Conclusion. The results obtained are consistent with other publications in which unemployment among epilepsy patients is one of the major cost-determining factors and illustrates a critical need to maintain employment for such patients or to find suitable alternative work through professional retraining.

KEYWORDS

Epilepsy, direct costs, indirect costs, cost-of-illness analysis, health technology assessment.

Стоимость заболевания эпилепсией в Российской Федерации

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РЕЗЮМЕ

Актуальность. Гиподиагностика эпилепсии в России, старение населения, инновационные препараты и дорогостоящие схемы лечения, внедрение дополнительных и альтернативных методов, таких как нейрохирургия, ежегодно увеличивают медицинские расходы на лечение пациентов с эпилепсией. Становится актуальным вопрос максимизации пользы для наибольшего числа граждан. Фармакоэкономические исследования как часть оценки технологий здравоохранения помогают из многочисленных альтернатив выбрать тактику лечения, наиболее эффективную с экономической и медицинской точек зрения.

Цель: анализ расходов, связанных с эпилепсией, в Российской Федерации, направленный на поддержку процессов принятия решений в области политики здравоохранения и финансирования.

Материал и методы. Эмпирической базой исследования послужили данные копировки методом сплошной выборки 384 амбулаторных карт пациентов с эпилепсией возрастной категории от 19 до 79 лет за период 2019–2022 гг. Рассмотрена проблематика учета всех затрат на заболевание. При планировании, проведении и анализе данных исследований учитывали принципы повышения качества отчетов о наблюдательных исследованиях в эпидемиологии (англ. strenghtening the reporting of observational studies in epidemiology, STROBE).

Результаты. Общие ежегодные траты на лечение эпилепсии в расчете на 1 пациента составили пятую часть от размера валового внутреннего продукта на душу населения. Непрямые затраты превосходят сумму прямых расходов. Установлено, что экономический ущерб, наносимый обществу, семье, индивидууму в связи с заболеванием, троекратно превышает прямые затраты.

Заключение. Полученные результаты показывают, что безработица среди больных эпилепсией относится к основным факторам, определяющим затраты, и подтверждают критическую необходимость сохранения занятости таких пациентов или поиска подходящей альтернативной работы путем профессиональной переподготовки.

КЛЮЧЕВЫЕ СЛОВА

Эпилепсия, прямые затраты, косвенные затраты, анализ стоимости болезни, оценка технологий здравоохранения.

INTRODUCTION / ВВЕДЕНИЕ

In the Russian Federation (RF), healthcare is defined as a strategic national priority. The state pays special attention to protecting public health emphasized in the Presidential Decree dated July 2, 2021 No. 400 "On the National Security Strategy of the Russian Federation. The development of the state's social policy is inextricably linked with the level of social protection of citizens particularly with sufficient provision of the population and medical organizations with medicinal products within the framework of the obligations of state guarantee programs.

Chronic diseases, including epilepsy, are of particular importance because they are associated with long-term costs and therefore pose a significant burden on health care system. Epilepsy is the most common serious brain disorder in all countries [1]. Moreover, the disease causes stigma and negatively affects education, social interaction, professional fulfillment and overall patients' quality of life [2, 3]. According to the 2020 Federal State Statistics Service, 366 thousand people suffer from epilepsy, of which 37% are children under 18 years of age. Epidemiological studies analysis shows the likelihood of significant epilepsy underdiagnosis in Russia. Drug-resistant epilepsy is diagnosed in up to a third of patients, whereas 30% patients achieve seizure control by taking a single anti-seizure drug (ASD) [2].

For various reasons, the social guarantee standard presented as a free prescription drug provision is only partially in demand by epilepsy patients. Half of the antiepileptic therapy is purchased at citizens' own expense [2]. The growing epilepsy prevalence due to improved diagnostic methods and population aging causes significant damage and leads to economic costs for both individuals and overall society [2, 3–15].

Unemployment and workplace absence for health issues are the main reasons for the decreased labor productivity of subjects with epilepsy, with low levels of employment and income reducing social status [16]. Loss of employment status and increased need for medical services lead to high eco-

nomic losses. Epilepsy is associated with high costs to the health care system due to treatment, productivity loss, and frequent health care use. Analyzing epilepsy treatment and care cost in some countries confirms significant long-term socioeconomic impacts comprising up to 1% of total national health care expenditure [3, 17]. Analyzing epilepsy study expenditure in different countries demonstrated that costs of epilepsy are substantial and largely concentrated in countries with well-developed health care systems [4].

The 73rd World Health Assembly resolution calls for the development of a global actions on epilepsy requiring awareness of the cost of illness at global and regional levels. Cost of illness (COI) studies provide crucial data for assessing the cost-effectiveness and efficiency of prevention and treatment strategies [5] and demonstrate the economic value of reducing disease burden [18]. Such knowledge can assist policymakers in setting priorities in health workforce planning and financial allocation [19, 20].

The need to analyze trends and costs associated with specific illnesses, or COI, is dictated by the economic orientation of the health care system. Pharmacoeconomics as a discipline comparatively studies a value between benefits and pharmaceuticals expended implying a full accounting of relevant costs over a certain period of time. The assessment includes direct costs related to diagnostics and treatment of a patient, and indirect costs due to incapacity and working time. Moreover, there are "elusive" losses associated with quality of life, social stigmatization, patient discrimination, etc. Cost analysis is an essential stage of pharmacoeconomic research and underlies application of special analysis methods. Pharmacoeconomics analysis is based on clinical pharmacology and pharmacotherapy studies fulfilling requirements of evidence-based medicine [21].

Top-down or bottom-up COI analysis methods as well as their combination exist for accurate data approximation [22]. Here, a bottom-up approach was used, wherein costs and cost components were calculated based on data obtained directly from well-characterized patients. Yet time-consuming and, therefore, limiting study cohort size, the bottom-up approach allows to analyze disease-specific costs.

Objective: analysis of epilepsy-associated costs in the RF, aimed at supporting decision-making processes in the field of health policy and financing.

MATERIAL AND METHODS / МАТЕРИАЛ И МЕТОДЫ

Study design / Дизайн исследования

A multicenter retrospective open clinical and economics study was conducted. Using the continuous sampling method, the study included the data from 384 outpatient cards of adult epilepsy patients aged 19 to 79 years (43% males, average age 38.19±1.07 years; 57% females, average age 44.8±0.98 years) from the cities of Barnaul (120 patients), St. Petersburg (217), and Kaliningrad (47) in 2019–2022.

Patients / Пациенты

The study patients were stratified as follows: 60 inpatients subjects (31 males and 29 females, average age 39.65±1.52 years, disease length 15.75±1.48 years), 238 subjects (102 males, 136 females, average age 41.83±0.90 years, disease length 20.43±0.64 years) under outpatient observation at psychoneurologic dispensary, 86 patients (32 males, 54 females, average age 43.16±1.75 years, disease length 18.98±1.66 years) observed by neurologists at epileptology office.

Inclusion and exclusion criteria / Критерии включения и исключения

The inclusion criteria:
– age ≥18 years and older;
– verified epilepsy diagnosis;
– patient written informed consent.
Exclusion criteria:
– non-verified epilepsy diagnosis;
– lack of patient written informed consent.

Assessment of patient condition / Оценка состояния больных

Study patient condition was assessed by ward epileptologists by using the Clinical Global Impression (CGI) scale based on the Russian Clinical Global Impression – Severity (CGI-S) subscale: 7-point scale, where 1 point – healthy (no illness) and 7 points – severe illness level) [23].

Methods of analysis / Методы анализа

There were used content analysis, structural-logical, graph-analytical, and factorial methods. The guidelines for strengthening the reporting of observational studies in epidemiology (STROBE) were used to improve the quality of the observational study report and facilitate study critical assessment and interpretation.

Cost calculation / Расчет затрат

The calculation of COI (total disease burden) was carried out using the formula:

$$COI = DC + IC,$$

where DC – direct cost; IC – indirect (non-medical and indirect, alternative) cost [23].

Direct cost includes healthcare expenditure directly related to treatment process and provision of medical care at all stages – diagnostics, direct treatment and rehabilitation. Indirect cost is not directly related to treatment process but create relevant conditions also including alternative cost, or opportunity cost.

While analyzing care direct costs for study epilepsy patients, the following parameters were taken into account:
– costs of outpatient and inpatient treatment, including cost of drug therapy in average daily dosage;
– the number of visits to a neurologist, cardiologist, ophthalmologist and psychiatrist;
– cost of laboratory and instrumental examination methods;
– planned perennial hospitalizations;
– cost of electroencephalographic monitoring to assess treatment dynamics.

The national epilepsy treatment standards were primarily used for direct costs[1]. Due to impossibility of conducting clinical analysis for each disease case, calculation of drug therapy cost was carried out by taking into account ASDs solely but not that of concomitant comorbid disease therapy as well as side effects therapy.

Direct costs were estimated based on outpatient card copies. For greater significance for all costs accounting, a structured questionnaire was additionally used to estimate epilepsy treatment cost. The study participants provided self-reports on the number of visits to specialists, the number of hospitalization days, laboratory and instrumental examinations not included in the medical documentation studied.

To calculate direct costs, there were used average price lists for counseling services at the following medical institutions: Consultative and Diagnostic Center of Altai Krai, Federal Center for Neurosurgery (Novosibirsk), Regional Clinical Hospital (Barnaul), Regional Clinical Hospital of Kaliningrad Region, Sergei Berezin Medical Institute (St. Petersburg), Bekhterev National Medical Research Center of Psychiatry and Neurology (St. Petersburg), INVITRO independent laboratory. The cost of drug therapy was calculated based on data from the State Register of Medicines[2] and the Unified Information System in Procurement[3].

Indirect costs (expenses caused by production loss due to unemployment, working time reduction due to illness, or early retirement related to epilepsy) were estimated using the human capital approach (HCA). Disease-related productivity loss was equated to the monetary equivalent of years off work before retirement age. The amount of human capital loss was calculated based on average gross income. To calculate indirect costs, all patients under retirement age in the Russian Federation in 2022 were taken into account. Accordingly, patients of the age threshold up to 56.5 years for women and 61.5 years for men who reported receiving a pension during the observation period were classified as early retirees. Working patients and trainee patients were not taken into account while calculating productivity losses. According to the Russian Federal State Statistics Service[4], the average gross income per capita in 2022 was 1,058,867 rubles. Social payments of disability pensions were also taken into account while analyzing indirect costs.

Statistical analysis / Статистический анализ

The study data and results were processed using MS Office Excel, Word (Microsoft, USA), StatTech (OOO Stattech, Russia) software suites. Quantitative indicators were assessed for compliance with normal distribution by using Shapiro–Wilk test (<50 subjects) or Kolmogorov–Smirnov test (>50 subjects). In the absence of normal distribution, quantitative data were presented as a median (Me) as well as lower and upper quartiles (Q1–Q3). Comparison of three or more groups by a quantitative indicator with not normal distribution was performed by using Kruskal–Wallis test. Differences were considered statistically significant at $p < 0.05$.

RESULTS / РЕЗУЛЬТАТЫ

Patient characteristics / Характеристики пациентов

The patient socio-demographic and clinical characteristics are presented in **Table 1** and **Table 2**, respectively.

Of the 384 patients, 6 (1.56%) took no ASDs. The remaining patients received the recommended therapy: monotherapy – in 178 (46.36%) patients, and polytherapy – in 200 (52.08%) patients. Thus, regarding ASD administration monotherapy dominated.

Cost calculation / Расчет затрат

Average epilepsy-related direct medical costs amounted to 46,868±7.17 rubles per year per patient, or 23.2% total costs, largely due to ASD costs (26,339 rubles). Cost for counseling services (11,515 rubles) and medical examinations (10,743 rubles) amounted to 5.5% and 5.1%, respectively. The minimum costs were shown for hospitalization (300 rubles), which confirms the importance of epilepsy outpatient treatment. Direct non-medical cost amounted to 6.5% total expenditure and

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[1] Order of the Ministry of Health of the RF dated 24.12.2012 No. 1541n "On approval of the standard for specialized care for epilepsy"; Order of the Ministry of Health of the RF dated 24.12.2012 No. 1519n "On approval of the standard for specialized care for organic including symptomatic, mental disorders, dementia related to epilepsy"; Order of the Ministry of Health of the RF dated 29.12.2012 No. 1695n "On approval of the standard for specialized care for children with epilepsy"; Order of the Ministry of Health of the RF dated 24.12.2012 No. 1439n "On approval of the standard for primary care for generalized epilepsy"; Order of the Ministry of Health of the RF dated 24.12.2012 No. 1514n "On approval of the standard for organic including symptomatic, mental disorders, psychosis related to epilepsy in outpatient neuropsychiatric dispensary (outpatient department, office)"; Order of the Ministry of Health of the RF dated 24.12.2012 No. 1515n "On approval of the standard for primary care for organic including symptomatic, mental disorders, related to epilepsy in outpatient neuropsychiatric dispensary (outpatient department, office)"; Order of the Ministry of Health of the RF dated 20.12.2012 No. 1107n "On approval of the standard for primary care for partial epilepsy in remission"; Order of the Ministry of Health of the RF dated 24.12.2012 No. 1404n "On approval of the standard for primary care for partial epilepsy (diagnostics and treatment strategy)"; Order of the Ministry of Health of the RF dated 24.12.2012 No. 1440n "On approval of the standard for primary care for generalized epilepsy in remission"; Order of the Ministry of Health of the RF dated 24.12.2012 No. 1517n "On approval of the standard for primary care for organic including symptomatic, mental disorders, depression and anxiety disorders related to epilepsy"; Order of the Ministry of Health of the RF dated 28.02.2005 No. 174 "On approval of the standard for care for epilepsy".

[2] https://grls.rosminzdrav.ru/default.aspx.

[3] https://zakupki.gov.ru/epz/main/public/home.html.

[4] https://rosstat.gov.ru/statistics/accounts.

were borrowed from official statistics reports (public transportation). The cost pattern is presented in **Table 3**.

The cost of disability pension payment for 170 patients receiving benefits amounted to 36,369.6 rubles per year, which was equal to 16,101.1 rubles per year per 1 patient while analyzing entire subject cohort (n=384). Total indirect costs per 1 patient amounted to 46,868±7.17 rubles, or 70.3% total costs. The study showed that disease-related productivity loss reaching 132,358 rubles largely accounted for costs (62.7%). Cost of disability pension payments amounted to an average of 16,101 rubles per year, or 7.6% total costs.

The total average cost of epilepsy per patient per year was 208,992±493.87 rubles per year (USD 3,047.87).

Factors affecting cost of epilepsy treatment / Факторы, влияющие на стоимость лечения эпилепсии

The COI analysis revealed statistically significant factors affecting cost of epilepsy treatment (**Table 4**): place of observation (p<0.001), presence or absence of disability (p<0.001), level of education (p=0.002), work or study status (p<0.001), disease etiology (p<0.001), assessment of patient's health status (p<0.001), antiepileptic therapy, number of drugs in therapy (p<0.001) and seizures frequency (p<0.001).

DISCUSSION / ОБСУЖДЕНИЕ

The total cost of epilepsy calculated for the Russian Federation (USD 3,047 per patient per year) significantly exceeds the average annual cost per epilepsy patient in low-income countries (from USD 204) and is significantly lower than those in high-income countries in North America and Western Europe (up to USD 11,432) [6]. It is about 2-fold lower than that in Germany (USD 5,848) [4] and much higher than in Ethiopia (USD 166) [3], India (USD 344) [7], and China (USD 949) [8]. Direct medical costs in the Russian Federation (USD683) are about 4-fold lower than in Mexico (USD 2,646) [9].

Despite methodological differences, a positive relationship between COI and gross domestic product (GDP) per capita in the compared countries was confirmed [19]. The results are consistent with the World Bank data showing that Russia is classified as an upper-middle income country [24].

We found that indirect costs accounted for 70.3% total costs, which is comparable those for Ethiopia [3] and India (72.9%) [7], but is inferior to amount of costs of up to 83% in Poland [10].

Our findings confirmed the results of studies in Oman [11] and China [8], which concluded that no gender-specific relationship between cost of epilepsy patients exists assumingly due to economic similarities between both patient sexes. However, in Ethiopia [3], female vs. male patients were 3.66-fold more likely to encounter high cost of epilepsy treatment.

It was shown that patient's age increasing by 1 year, should be expected to be paralleled with COI decline by 6.2%, whereas length of disease follow-up increased by 1 year is coupled to COI decrease by 3.4%. Patient age is identified as a factor unrelated to high treatment cost. The latter contradicts the studies conducted in China [8], Bhutan [12], and Oman [11] due to the model differences. In our study, disease

Table 1. Patient socio-demographic characteristics (n=384)

Таблица 1. Социально-демографическая характеристика пациентов (n=384)

Parameter / Параметр	Number of patients, n (%) / Число пациентов, n (%)
Gender / Пол	
male / мужской	164 (42,7)
female / женский	220 (57,3)
Geographic region / Регион	
Saint Petersburg / Санкт-Петербург	217 (56,6)
Kaliningrad / Калининград	47 (12,2)
Barnaul / Барнаул	120 (31,3)
Age group / Возрастная группа	
18–29 years / 18–29 лет	67 (17,4)
30–45 years / 30–45 лет	168 (43,8)
46–60 years / 46–60 лет	97 (25,3)
61–69 years / 61–69 лет	40 (10,4)
≥70 years / ≥70 лет	12 (3,1)
Education / Образование	
none / нет образования	11 (2,9)
elementary / начальное	13 (3,4)
secondary / среднее	214 (55,7)
higher / высшее	146 (38,0)
Employment / Рабочий статус	
trainee / учащийся	22 (5,7)
employed / работающий	132 (34,4)
unemployed / неработающий	230 (59,9)
Marital status / Семейное положение	
single // холост / не замужем	239 (62,2)
married // женат/замужем	145 (37,8)
Disability / Инвалидность	
none / нет	214 (55,7)
group 1 / 1-я группа	9 (2,3)
group 2 / 2-я группа	107 (27,9)
group 3 / 3-я группа	54 (14,1)

severity assessed by the CGI-S scale significantly affected COI level (p=0.001).

Our study shows that no education-patients and their representatives incur the highest costs. The study data from Ethiopia [3] also demonstrates a relation between COI and education level. We also found that patients with higher vs. secondary education incurred 18.6% lower costs. It is assumed that subjects with higher education are the most ef-

Table 2. Patient clinical characteristics (n=384)

Таблица 2. Клиническая характеристика пациентов (n=384)

Parameter / Параметр	Number of patients, n (%) / Число пациентов, n (%)
Point-of-care / Место наблюдения	
psychoneurologic dispensary / психоневрологический диспансер	237 (61,7)
hospital / стационар	60 (15,6)
neurologist-epileptologist's office / кабинет невролога-эпилептолога	87 (22,7)
Length of disease follow-up / Длительность анамнеза	
1–5 years / 1–5 лет	84 (21,9)
6–10 years / 6–10 лет	29 (7,6)
≥11 years / ≥11 лет	271 (70,6)
Etiology of epilepsy / Этиология эпилепсии	
structural / структурная	190 (49,5)
genetic / генетическая	37 (9,6)
infectious / инфекционная	13 (3,4)
metabolic / метаболическая	0 (0,0)
immune-related / иммунная	3 (0,8)
combined / сочетанная	28 (7,3)
unknown / неизвестная	113 (29,4)
Seizure type / Тип приступов	
focal onset without loss of consciousness / фокальное начало без потери сознания	36 (9,4)
focal onset with loss of consciousness / фокальное начало с потерей сознания	7 (1,8)
focal onset without loss of consciousness + BTCS / фокальное начало без потери сознания + БТКП	159 (41,4)
focal onset with loss of consciousness + BTCS / фокальное начало с потерей сознания + БТКП	46 (12,0)
generalized onset / генерализованное начало	51 (13,3)
focal and generalized onset / фокальное и генерализованное начало	39 (10,2)
undifferentiated / недифференцируемые	2 (0,5)
focal onset with loss of consciousness + BTCS + generalized onset / фокальное начало с потерей сознания + БТКП + генерализованное начало	4 (1,0)
BTCS / БТКП	35 (9,1)
focal onset with loss of consciousness + without loss of consciousness + BTCS / фокальное начало с потерей сознания + без потери сознания + БТКП	5 (1,3)
Therapy / Терапия	
none / без терапии	6 (1,56)
monotherapy / монотерапия	178 (46,36)
polytherapy / политерапия	200 (52,08)
SGI-S assessment / Оценка по SGI-S	
borderline ill / пограничное расстройство	18 (4,7)
mildly ill / легкое расстройство	139 (36,2)
moderately ill / умеренно выраженное расстройство	188 (49,0)
markedly ill / выраженное расстройство	30 (7,8)
severely ill / тяжелое расстройство	9 (2,3)

Note. BTCS – bilateral tonic-clonic seizure; SGI-S – Clinical Global Impression – Severity scale.

Примечание. БТКП – билатеральный тонико-клонический приступ; SGI-S (англ. Clinical Global Impression – Severity, CGI-S) – субшкала оценки тяжести болезни шкалы общего клинического впечатления.

Table 3. The cost structure for epilepsy treatment

Таблица 3. Структура затрат на лечение эпилепсии

Cost type / Тип затрат	Annual per-patient expenditure, rub. / Затраты в год на 1 пациента, руб.	Annual per-patient expenditure, USD* / Затраты в год на 1 пациента, долл. США*	SD, rub. / СО, руб.	Proportion of total cost, % / Доля от суммы всех затрат, %
Direct medical costs / Прямые медицинские затраты	46 868±7,17	683	194,69	23,2
counseling services / консультации	11 515±1,01	233	19,79	5,5
therapy / терапия	26 339±0,19	384	58,05	12,5
instrumental examination / обследования инструментальные	9014±2,21	131	43,25	4,3
laboratory examination / обследования лабораторные	1729±0,20	25	3,99	0,8
admission to hospital / госпитализация	300±3,56	4	69,61	0,1
Direct nonmedical costs / Прямые немедицинские затраты	13 665	199	–	6,5
Indirect costs / Непрямые затраты	148 459±484,86	2165	9501,89	70,3
production loss / производственные потери	132 358±484,25	1930	9453,90	62,7
disability payments / социальные выплаты пенсий по инвалидности	16 101±2,45	235	47,99	7,6
Total / Итого	**208 992±493,87**	**3047,87**	**9696,58**	**100**

Note. *SD – standard deviation.* * *1 USD = 68.57 rub.*

Примечание. *СО – стандартное отклонение.* * *1 USD = 68,57 руб.*

Table 4 (beginning). Factors affecting epilepsy treatment cost

Таблица 4 (начало). Факторы, влияющие на стоимость лечения эпилепсии

Factor / Фактор	Category / Категория	Average sum, rub. / Среднее значение, руб.	Range, rub. / Диапазон значений, руб.	n	p
Point-of-care / Место наблюдения	Hospital* / Наблюдение в стационаре*	393 141,5	268 961,0 – 476 870,5	60	<0,001
	Neuropsychiatric dispensary by psychiatrist-epileptologist / Наблюдение в ПНД психиатром-эпилептологом	184 191,0	128 922,0 – 313 372,0	238	<0,001
	Neurologist office by neurologist-epileptologist / Наблюдение в неврологическом кабинете неврологом-эпилептологом	138 582,0	98 694,0 – 254 472,2	86	0,006
Patient gender / Пол пациента	Male / Мужской	173 829,0	115 553,0 – 364 674,0	164	0,967
	Female / Женский	199 837,5	134 846,5 – 313 697,0	220	
Length of disease follow-up / Длительность анамнеза	≤5 years / ≤5 лет	177 464,5	125 908,2 – 392 796,0	84	0,431
	6–10 years / 6–10 лет	268 961,0	89 535,0 – 462 442,0	29	
	≥11 years / ≥11 лет	192 376,0	132 310,0 – 314 294,0	271	
Patient age group / Возрастная группа пациентов	18–29 years / 18–29 лет	244 195,0	137 371,0 – 430 562,0	67	0,077
	30–45 years / 30–45 лет	173 359,0	107 985,0 – 313 488,0	168	
	46–60 years / 46–60 лет	199 466,0	156 368,0 – 280 304,0	97	
	61–69 years / 61–69 лет	255 607,0	144 124,0 – 327 280,0	40	
	≥70 years / ≥70 лет	202 669,5	165 774,5 – 231 919,5	12	
Disability group / Наличие или отсутствие группы инвалидности	No disability / Отсутствие инвалидности	151 880,5	89 476,8 – 276 245,5	216	<0,001
	Disability group assigned / Наличие группы инвалидности	256 629,5	173 829,0 – 364 099,0	170	
Education / Уровень образования	None / Нет образования	341 073,0	276 656,5 – 360 364,0	12	0,002
	Elementary / Начальное	161 885,0	51 199,8 – 315 307,8	12	0,025
	Secondary / Среднее	197 040,0	145 743,5 – 327 280,0	214	0,025
	Higher / Высшее	166 073,0	99 322,5 – 267 871,0	146	0,025

Table 4 (end). Factors affecting epilepsy treatment cost

Таблица 4 (окончание). Факторы, влияющие на стоимость лечения эпилепсии

Factor / Фактор	Category / Категория	Average sum, rub. / Среднее значение, руб.	Range, rub. / Диапазон значений, руб.	n	p
Employment / Рабочий статус	Unemployed / Неработающий	221 159,0	153 159,0 – 360 364,0	230	<0,001
	Employed / Работающий	159 332,5,0	96 346,0 – 239 320,8	132	<0,001
	Trainee / Учащийся	328 284,0	99 243,2 – 485 714,0	22	0,015
Marital status / Семейное положение	Single // Холост / не замужем	202 341,0	128 776,0 – 341 073,0	239	0,077
	Married // Женат/замужем	171 685,0	128 443,0 – 295 796,0	145	
Etiology of epilepsy / Этиология заболевания	Structural / Структурная	221 159,0	131 432,5 – 364 674,0	190	<0,001
	Genetic / Генетическая	197 987,5	93 114,5 – 300 221,5	36	
	Infectious / Инфекционная	88 005,0	88 005,0 – 90 657,5	3	
	Immune-related / Иммунная	504 869,0	346 696,5 – 592 138,5	3	0,008
	Combined / Сочетанная	218 351,0	165 827,2 – 324 036,0	28	
	Unknown / Неизвестная	168 881,0	115 553,0 – 244 104,2	124	
Patients health status / Оценка состояния здоровья пациента	Borderline ill / Пограничное расстройство	175 960,5	120 566,0 – 381 986,5	18	<0,001
	Mildly ill / Легкое расстройство	237 719,0	134 218,0 – 324 036,0	139	
	Moderately ill / Умеренно выраженное расстройство	171 689,0	99 322,5 – 269 608,0	188	0,001
	Markedly ill / Выраженное расстройство	288 242,5	248 505,0 – 379 760,0	30	
	Severely ill / Очень тяжелое расстройство	163 329,0	79 463,0 – 244 195,0	9	
Antiseizure therapy / Противоприступная терапия	None / Без терапии	33 805	15 400,0 – 50 210	6	<0,001
	Monotherapy / Монотерапия	144 124,0	85 716,0 – 260 187,8	178	0,002
	Polytherapy / Политерапия	253 378,0	171 680,5 – 406 523,0	200	<0,001
Seizure frequency / Частота приступов	Focal onset without loss of consciousness / Фокальное начало без потери сознания	252 541,0	89 535,0 – 710 132,0	200	<0,001
	Focal onset with loss of consciousness / Фокальное начало с потерей сознания	206 718,0	115 553,0 – 710 132,0	62	0,256
	Transformed to BTCS / Трансформация в БТКП	218 378,0	84 953,0 – 577 053,0	249	<0,001
	Generalized onset / Генерализованное начало	198 726,0	78 463,0 – 487 410,5	95	<0,001
	Undifferentiated / Недифференцируемые	149 418,0	71 036,0 – 341 073,0	2	<0,001

Note. *NPD – neuropsychiatric dispensary; BTCS – bilateral tonic-clonic seizure.* * *Inpatient Department of Bekhterev National Medical Research Center of Psychiatry and Neurology.*

Примечание. *ПНД – психоневрологический диспансер; БТКП – билатеральный тонико-клонический приступ.* * *Стационар ФГБУ «Национальный медицинский исследовательский центр психиатрии и неврологии им. В.М. Бехтерева» Минздрава России.*

ficient participants in health care system, and therefore incur lower costs.

The data we obtained are consistent with other publications identifying unemployment among epilepsy patients as a major cost driver [13–15] and demonstrate the critical need to maintain employment of epilepsy patients or find suitable alternative employment through vocational retraining [25, 26].

Seizure frequency was also identified as a prominent contributor that agrees with the study results from China [8] and Bhutan [12] that may be accounted for by additional costs to cover frequent seizures.

To obtain an estimate of direct cost of epilepsy, a method has been developed to convert raw cost data into a percentage of GDP per capita in any country or regional domestic product in a particular region allowing easily calculate economic burden of a particular disease [19].

Limitations of study / Ограничения исследования

In the current study, direct non-medical costs such as public transportation, accommodation and food, and communication were not assessed (due to complicated accurate

estimates). Participants may also have underreported own expenses. The study relied in part on self-reporting of expenses, and data underestimation might have resulted from difficulties in memorizing expenses.

The lack of expenditure accounting on rehabilitation, physiotherapy procedures and purchase of special equipment due to the absence of expense nomenclature in accordance with the current national standards for provision of medical care to epilepsy patients could have led to lowered COI assessment.

Indirect costs were calculated without taking into account the number of days off work due to seizures for employed patients. Also, productivity losses incurred by family members or close relatives caring for a patient were not taken into account. Therefore, loss of income for caregivers was not determined.

Injuries and related consequences as the most common manifestations of epilepsy were also not taken into account in the study.

Comparing costs between countries in monetary terms is complicated by differences in clinical practice patterns and health system structures. Exchange rate differences between national currencies to the US dollar also complicate the data interpretation.

CONCLUSION / ЗАКЛЮЧЕНИЕ

The total annual cost of epilepsy treatment per patient comprised one fifth of the GDP per capita. Given the prospects for organizing and paying for epilepsy patients work, the amount of disease-associated cost may be a substantial burden for patients and their families. It was found out that compared to direct costs the economic damage caused to society, family, and individual due to epilepsy is three times greater.

Despite a relatively low cost of hospitalization, a place of patient observation significantly impacted on the outcome. Thus, a stay in hospital increased costs more than twice compared to outpatient observation. Direct medical costs of disabled patients were 1.5 times higher than those of patients without disabilities. The higher costs for no education-patients are explained by disease severity. Direct medical costs for employed vs. unemployed patients were 20% higher. In every third case (29.4%),

Epilepsy etiology was not established in every third case (29.4%) that could also lead to profound drawback in healthcare organization.

The features uncovered illustrate the difference in individual cost determinants, emphasizing a complexity of economic health care analysis.

Оригинальные статьи / Original articles

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