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The direct costs of epilepsy in Russia. A prospective cost-of-illness study from a single center in Moscow

Alla Guekht [a,b,c], Maria Mizinova [a], Igor Kaimovsky [a,b,c], Oksana Danilenko [b], Elisa Bianchi [d], Ettore Beghi [d,*]

[a] Department of Neurology, Neurosurgery and Genetics, Russian National Research Medical University, Moscow, Leninsky Prospect 8, Block 8, Russian Federation
[b] Moscow Research and Clinical Center for Neuropsychiatry, Moscow, Donskaya, 43, Russian Federation
[c] Moscow City Hospital No. 12, Moscow, Bakinskaya, 26, Russian Federation
[d] IRCCS-Institute for Pharmacological Research "Mario Negri", Milan, Italy

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ABSTRACT

Objective: The objective of this study was to investigate prospectively the direct costs of epilepsy in Russia, taking a patient perspective and a bottom-up approach.
Methods: The study was conducted in adolescents and adults with epilepsy seen in the ambulatory services of a city hospital in Moscow. Patients were assigned to different prognostic categories: newly diagnosed epilepsy; epilepsy in remission for 2+ years; epilepsy in remission for <2 years or with occasional seizures; active, non-drug-resistant epilepsy; drug-resistant epilepsy; and drug-resistant epilepsy in surgical candidates. Patients were followed prospectively for 12 months. Demographic and clinical features at admission were collected and correlated with costs. Cost estimates were based on the Russian National Health Service perspective and its implementation in Moscow. Cost items included drugs and laboratory/instrumental tests. The costs per patient were calculated for the entire sample and for each prognostic category separately. Univariate and multivariate analyses were performed.
Results: Included were 738 patients (393 men, 345 women aged 14–85 years). The median annual cost/patient was €955 (IQR 521–2134; range 51–10,904). The median cost of drugs was €643 (IQR 288–1866; range 0–9960), and the median cost of laboratory/instrumental testing was €202 (IQR 160–270; range 20–1217). Mean costs varied across prognostic categories ranging from €782 in newly diagnosed patients to €3777 in patients with drug-resistant epilepsy. Mean (SD) hospital costs ranged from €646.7 (109.0) in patients with occasional seizures to €950.0 (28.3) in surgical candidates. Independent predictors of total costs were younger age at diagnosis, disability status, generalized seizures, multiple seizure types, seizure severity, and etiology.
Significance: The cost of epilepsy in Moscow varies significantly depending on disease characteristics and response to drug treatment.

1. Introduction

Epilepsy is a chronic clinical condition that, in virtue of its high frequency and prolonged course, poses a considerable economic burden on society. The costs of epilepsy have been estimated in different countries with differing results. In a comprehensive review of the cost of brain disorders in Europe [1], the total annual cost per patient with epilepsy ranged from 695€ to 11,654€, and the corresponding direct costs ranged from 695€ to 4493€. This variability can be explained by the heterogeneity of the source populations, the study design, and the difficult separation of the intrinsic costs of epilepsy from the costs of the underlying causes and comorbidities [2]. Epilepsy is a treatable disorder with differing severity and variable response to the available treatments [3]. Studies on the costs of epilepsy in patients with differing response to antiepileptic drugs have consistently shown that the annual expenditures per patient decrease when comparing the first to the subsequent years of follow-up [4–6] and increase exponentially when comparing patients with prolonged seizure remission to patients with occasional seizures, patients with frequent nondrug-resistant seizures, and patients with drug-resistant epilepsy [7–11]. As expected, the cost of drugs, among the highest source of expenditures, tends to increase when moving from the first generation to the second and third-generation compounds. In this complex scenario, a prospective cost-of-illness study was undertaken in Moscow (Russian Federation) taking a patient perspective and a bottom-up approach.

The research aim was to assess the direct costs of epilepsy in patients included in different prognostic groups and to compare these costs to those calculated in patients from other countries.

* Corresponding author at: Laboratory of Neurological Disorders, IRCCS-Mario Negri Institute for Pharmacological Research, Via Giuseppe La Masa 19, 20156 Milan, Italy.
E-mail address: ettore.beghi@marionegri.it (E. Beghi).

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2. Material and methods

The study was an observational prospective investigation conducted in the outpatient services of the Moscow City Hospital No. 12 in the period 2011–2013. At the time of the study, the hospital hosted an outpatient epilepsy service whose activities included the management of newly diagnosed and chronic epilepsy in patients living in the hospital's catchment area. There were three outpatient centers for epilepsy in Moscow, each covering 3–4 districts. Where possible, diagnostic testing and treatment changes were offered on an outpatient basis, limiting hospital admissions to patients requiring acute and/or intensive management. Consecutive individuals aged 15 years or older and seen for an outpatient consultation for epilepsy during the period from September 9, 2011 until June 1, 2013 were the target population. To be included in the study, a patient should have a confirmed diagnosis of epilepsy, i.e., two or more unprovoked seizures 24 h or more apart [12] and be willing to provide an informed consent. At entry, all eligible patients were assigned to one of the following prognostic categories: 1. Newly diagnosed epilepsy, i.e., an epilepsy firstly diagnosed in the participating institution; 2. Epilepsy in remission, i.e., with complete seizure control for 2+ years; 3. Epilepsy in remission for less than 2 years or with occasional seizures (not requiring treatment changes); 4. Active, nondrug-resistant epilepsy, i.e., with seizures that in the opinion of the treating physician are still amenable of treatment changes; 5. Drug-resistant epilepsy, i.e., with seizures that in the opinion of the treating physician cannot be improved by further treatment changes; and 6. Drug-resistant epilepsy in a surgical candidate. These categories have been previously used in Italian studies on the direct costs of epilepsy [10,11].

Each patient was interviewed at entry, and details were collected on patients' demographics (age and sex, education, occupation with monthly salary, marital and disability status) and the main clinical features of the disease (seizure types and annual frequency, disease duration, etiology, epilepsy syndrome, interictal EEG and imaging findings, past and current treatments). Comorbidities were recorded if deemed clinically relevant. Each patient was followed prospectively for 12 months.

Cost estimates were based on the Russian National Health Service perspective and its implementation in the City of Moscow, which is based on mandatory health care insurance with reimbursement to the health care providers for services and treatments for the management of all diseases. The average monthly salary in Moscow was around 49,000 Rubles. The salary in Moscow was significantly higher than, in general, in Russia (estimated at about 29,000 Rubles) and was significantly higher than the income of people with epilepsy (16,000 to 32,000 Rubles, disability pensions included). All pensions, including disability, are provided according to the Federal Law. In 2013, the exchange rate was 42.3 Rubles/1 Euro and 31.54 Rubles/1 US$. Indirect costs were not taken into account.

Descriptive statistics are reported as range, mean, standard deviation, and median with interquartile range (IQR) for quantitative variables or frequencies and percentages for qualitative variables. Univariate and multivariate generalized linear models (adjusting for all significant univariate predictors) were used to estimate the predictors of total epilepsy costs. Cost items included drugs, laboratory/instrumental tests, outpatient consultations, and hospitalizations. The costs per patient were calculated for the entire sample and for each prognostic category separately and were expressed as means with standard errors (SE) and medians (with IQR). Costs were also stratified according to each demographic and clinical variable. Statistical significance was set at the 5% level ($p = 0.05$). All analyses were performed with SAS (version 9.2; SAS Institute, Inc., Cary, NC, USA). The study has received IRB approval from the hosting institution.

3. Results

The sample included 738 patients (393 men and 345 women) aged 14 to 85 years. The demographic characteristics of the sample are illustrated in Table 1. The mean age at diagnosis was 24.4 years. Seventy percent of cases were less than 30 years old. Almost 90% of cases had at least 12 years of education. Half of them were currently employed, one fifth were students, and one-sixth were unemployed. More than half were single. More than half of cases were moderately disabled, and 6% were severely disabled. Epilepsy was the reason for obtaining disability status in three-fourths of disabled individuals. Almost two-thirds of cases received a monthly salary ranging from 380 to 750 Euros.

Disease duration was from two months to 65 months. A family history of epilepsy was recorded in about 6% of cases (Table 2). History of febrile seizures was experienced by less than 10% of patients. Almost 90% of patients had focal seizures with/without secondary generalization. Two or more seizure types were present in more than half of cases. Status epilepticus was reported in rare instances. The interictal EEG showed epileptiform abnormalities in more than half of cases. More than two-thirds of cases undergoing an MRI presented a structural lesion. Symptomatic epilepsy was the commonest syndrome, followed by cryptogenic and idiopathic epilepsy. About two-thirds of patients

Table 1
Demographic characteristics of the sample.

Variable	N	%
Age at diagnosis (years)		
<10	113	15.5
10–19	242	33.1
20–29	158	21.6
30–39	84	11.5
40–49	61	8.3
50–59	41	5.6
60–69	19	2.6
70–79	11	1.5
80+	2	0.3
NS	7	
Sex		
Male	393	53.2
Female	345	46.7
Education (years)		
None	5	0.7
Elementary (3–4)	12	1.6
Secondary (10–11)	66	8.9
Professional (12–13)	469	63.5
University (15–17)	186	25.2
Occupation		
Unemployed	130	17.6
Student	148	20.1
Employed	392	53.2
Working pensioner	5	0.7
Pensioner	62	8.4
NS	1	
Marital status		
Married	312	42.3
Single	414	56.2
Widowed	11	1.5
NS	1	
Disability cause		
Epilepsy	341	46.3
Other	102	13.8
None	294	39.9
NS	1	
Disability group		
Mild	11	1.5
Moderate	389	52.8
Severe	43	5.8
None	294	39.9
Unknown	1	
Disability pension		
Yes	50	6.8
No	688	93.2
Monthly salary (euros)		
<380	96	21.5
380–750	274	61.3
760–1090	75	16.8
1100–1400	2	0.4
1500+	–	–