



Evaluation of costs of epilepsy using an electronic practice management software in Germany



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ABSTRACT

Purpose: This study used an electronic practice management software in daily routine to gather long-term disease and cost-of-illness (COI) data in patients with epilepsy in Germany.

Methods: Data on socio-economic status, course of epilepsy as well as direct and indirect costs were recorded using practice software-based questionnaires.

Results: In 2011 we enrolled 359 patients (170 male (47.4%); mean age 50.5 ± 20.7 years) in six neurological practices. The majority of patients had been in long-term seizure remission for more than one year ($n = 200$, 55.7%) and in more than two-thirds the anti-epileptic drug (AED) monotherapy ($n = 248$, 69.1%) was used. Levetiracetam (31%), lamotrigine (26%) and valproate (24%) were the drugs prescribed most frequently.

Total annual direct costs amounted to €1698 per patient with anticonvulsants (59.9% of total direct costs) and hospitalization (30.0%) as the main cost factors. Of the patients enrolled 252 (70.2%) were of working age and indirect annual costs due to absenteeism amounted to €745 per patient.

Potential cost-driving factors were seizure frequency and a recent diagnosis of epilepsy associated with higher costs. Anticonvulsant treatment in patients aged 65 years and older was associated with lower drug costs due to prescription of older AEDs.

Conclusion: We were able to demonstrate that electronic practice management software can easily be used to perform long-term health economic evaluations with a bottom-up approach. The combination of both physician- and patient-based electronic databases will facilitate performing less expensive studies, but at the same time simplify large, prospective and multicentre clinical trials.

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1. Introduction

Epilepsy is a common and chronic neurological disorder that imposes a substantial burden on individuals and society as a whole. The initial diagnosis of epilepsy is associated with costs of diagnostic procedures and inpatient admission. In the further clinical course the majority of patients require an anticonvulsant treatment for an extended period of time and up to 30% of patients

are refractory to medical treatment [1]. Economic evaluations are particularly important in patients with newly diagnosed and active epilepsy as they account for a high proportion of total costs [2–5]. Given the growing resource utilization and limited amount of healthcare resources, it has become essential to gather reliable cost estimates as a scientific basis for resource allocation and health policy decision making. In fact, this has become even more important as the introduction of new antiepileptic drugs, the use of generic medication, the marketing of brain stimulation devices and the resurgence of new surgical treatment options can result in a considerable increase in costs or a shift in the distribution of cost components [6–10]. Furthermore, epilepsy is still strongly associated with social stigma, reduced employment opportunities and impaired quality of life for patients and their carers, resulting in increased indirect as well as intangible costs [11–15].

For economic evaluations either a top-down or a bottom-up approach is utilized to gather cost-of-illness (COI) data [16]. The bottom-up approach is individual-related and preferred when precise cost estimates are required for different subpopulations. It allows epilepsy-specific costs and detailed data on socio-economic and disease course to be gathered, however such studies are time-consuming and costly as each patient has to be interviewed in detail [17]. On the other hand, top-down studies are useful for high-prevalence illnesses that are well represented in national surveys or insurance databases. However they are incompatible with the stratification of cost by patient or disease characteristics [17].

To date, previous German COI studies have used a bottom-up approach, with detailed questionnaires, usually spanning over a three-month period, providing information on trends and cost-driving factors over time [3,18–20]. Due to time-consuming and labour-intensive implementation of such studies they cannot be easily repeated or performed over long periods. Thus, the objective of this bottom-up evaluation was to use an electronic practice management software in daily routine to omit the labour-intensive paper-pencil questionnaires, but to gather, simultaneously, reliable, long-term disease and COI data in patients with epilepsy.

2. Patients and methods

2.1. Study setting and design

The evaluation was performed at six neurological practices providing outpatient care throughout Germany in the cities of Alzenau (18,491 inhabitants), Bielefeld (327,199), Dresden (517,765), Grünstadt (13,069), Neukirchen-Vluyn (27,689) and Stuttgart (591,015), population data as of year 2011 (www.destatis.de).

The study population consisted of consecutive outpatients, 18 years of age or older, with an established diagnosis of epilepsy, who gave informed consent to electronic clinical data processing and evaluation. The diagnosis was based on the definitions proposed by the International League Against Epilepsy and the International Bureau for Epilepsy [21]. The electronic data collection was established in 2009 and patients were evaluated if a full data set was available for the evaluation period between 1st January 2011 and 31st December 2011. Patients were excluded when the diagnosis of epilepsy could not be determined without doubt.

2.2. Patients and cost assessment

Data on the epilepsy syndrome, concomitant diseases, MRI and EEG findings, socioeconomic status, current antiepileptic drugs (AED) and current seizure frequency were provided by the treating neurologist and entered into an electronic practice management software. For that purpose the practice management software was

equipped with the modular designed electronic expert system EPI-Scout[®] (epilepsy scout). The EPI-Scout[®] software (Desitin Arzneimittel GmbH, Hamburg; Medomus Technologien & Services GmbH, Cologne, Germany; www.medomus.de/technologien/software/episcout.php) supports the neurologist to orient themselves to the evidence-based guidelines for the diagnosis and the treatment of patients with epilepsy and offers the possibility to document case-related clinical action, either for exchange with cooperation partners or towards payers. The software was developed in collaboration with the Department of Epileptology, University of Bonn and a working group of BVDN and BDN (Federal Associations of German Neurologists) [22].

At each visit the patients were asked by the treating neurologist about epilepsy-related direct and indirect costs. To facilitate the survey only established main direct cost components, including inpatient hospital and rehabilitation care, neurological outpatient service and drug costs due to epilepsy, were recorded and evaluated according to German recommendations for performing health economic evaluations [23–25]. The aim of this evaluation was to calculate the genuine costs due to epilepsy and not costs that may be triggered by other diseases not related to epilepsy. Therefore, patients were asked in detail whether or not the medication, service or resource were used specifically for epilepsy. The costs of formal and informal care are based on the three nursing care levels (Pflegestufen) approved to the patient by the statutory long-term care insurance (Pflegeversicherung, PV). Former studies [18,19] indicated that nursing costs were mainly not related to the epilepsy but to a handicap caused by the underlying disease, such as stroke, dementia or cancer. Therefore, we did not consider these nursing costs as due to epilepsy in this evaluation.

The evaluation of costs was performed by means of a bottom-up approach from the perspective of the statutory health insurance (Gesetzliche Krankenversicherung, GKV). Averaged drug costs were obtained from prescription reports [26]. Costs for inpatient care (hospitalization and rehabilitation) were calculated based on daily charges and the German Diagnosis Related Groups (2011, G-DRG; www.g-drg.de). The charges for outpatient care were obtained from the official German doctors' fee scale (Einheitlicher Bewertungsmaßstab, EBM) [27]. Other direct costs as laboratory investigations of imaging were not evaluated in this study. Indirect costs for lost productivity due to days off were evaluated using the human capital approach for patients younger than 65 years. According to the Federal Statistical Office (www.vgrdl.de) the mean gross income was €36,213 in 2011. All costs were calculated for the evaluation period of one year and are provided in 2011 Euro (€). For further details of the cost calculations, see previous studies [3,28].

2.3. Data entry and statistical analysis

Data entry was performed by each neurologist using the electronic practice management and EPI-Scout[®] software. For further evaluation and processing the data was exported and anonymized by an independent company to comply with data protection regulations [22].

Statistical analyses were performed using IBM SPSS Statistics 21 (SPSS Inc., Chicago, IL, USA). Cost data are presented as mean \pm standard deviation (SD), minimum, maximum and median or percentages where appropriate. In addition, 95% confidence intervals (C.I.) are provided using the bootstrap method according to the bias-corrected accelerated (bca) approach, taking into account the fact that most cost variables are right-skewed [29]. Comparisons between groups were performed using the Mann-Whitney test or Kruskal-Wallis test. When appropriate, post hoc comparisons (Holm-Bonferroni) were reported and *p*-values were corrected.

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