



The economic cost of nonepileptic attack disorder in Ireland



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ABSTRACT

The present study endeavored to calculate a conservative estimate of both incidence- and prevalence-based costs of nonepileptic attack disorder (NEAD) in Ireland by applying previously identified prevalence figures to Irish population figures. Variables related to the economic cost of NEAD were identified based on a retrospective chart review of patients diagnosed with NEAD at Beaumont Hospital, Dublin. The annual cost per patient of undiagnosed NEAD was calculated as €20,995.30. The combined cost of diagnosis and psychological treatment of NEAD was estimated at €8728. Although it is difficult to determine precise economic costings, early diagnosis and intervention would result in a significant economic saving to the exchequer, a reduction in hospital waiting-list times, and a better prognosis for patients.

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1. Introduction

Nonepileptic attack disorder (NEAD) is a condition characterized by recurrent paroxysmal attacks, which, in contrast to epilepsy, are not caused by abnormal electrical activity in the brain. It is estimated that approximately 10–25% of patients referred to epilepsy specialist centers for intractable epilepsy have, in fact, NEAD [1]. The age of onset of NEAD is usually before 40 years of age, and the mean age of onset is approximately 23 years of age. The gender split in NEAD is quite prominent, with the preponderance of patients being women by a ratio of 3 to 1 [1].

Nonepileptic attacks can resemble any form of epileptic seizure, making differentiation between the diagnoses challenging. The current gold-standard method of diagnosing NEAD is prolonged video-electroencephalography (vEEG) in a specialist epilepsy center [1]. Many patients with NEAD are initially diagnosed with epilepsy and are subsequently re-diagnosed with NEAD when they are referred to neuroscience specialist centers where they undergo vEEG monitoring. Unfortunately, many patients go undiagnosed for a significant period of time [2,3]. The mean time to diagnosis internationally has been demonstrated to vary between 3 and 7 years [4]. It has been postulated that the delay in correct diagnosis may be due to the fact that the majority of patients are initially seen by nonspecialist professionals such as emergency medicine doctors or general practitioners [5]. However, because

of the risk of morbidity associated with epilepsy, it is usually important that presentation of seizures be treated as epilepsy until proven otherwise.

Delayed diagnosis results in patients attending their GP, emergency departments, and neurology clinic appointments and being treated unnecessarily with antiepileptic drugs. Furthermore, prolonged delays between first presentation of the disorder and accurate diagnosis are associated with chronicity and poorer prognosis. Nonepileptic attack disorder is also associated with a severely impaired quality of life comparable to, or worse than, that in patients with intractable epilepsy [6]. Prior to being correctly diagnosed, patients with NEAD are likely to undergo a variety of diagnostic tests including computed tomography (CT), magnetic resonance imaging (MRI), outpatient electroencephalographic (EEG) monitoring, and tilt-table tests. Patients with NEAD are also at risk of unnecessary medical intervention for “nonepileptic psychogenic status” [7]. In addition to this, approximately 30% of patients with NEAD have a concomitant diagnosis of epilepsy, impeding accurate diagnosis. Nonepileptic attack disorder is also highly comorbid with several psychiatric disorders including depression and personality disorder [8].

To date, there is no standardized treatment for NEAD. Although a number of treatment modalities have been proposed, very few randomized control studies have been conducted [9]. The majority of research studies examining treatment options for NEAD center on cognitive behavior therapy (CBT) [5]. Early trials examining the efficacy of CBT have produced positive results [10]. The prognosis for NEAD varies depending on the specific etiology for each patient. Approximately 29–52% of patients with NEAD became seizure-free following treatment [11]. A number of factors can influence the outcome of treatment. Lesser [9] postulates that the most influential of these is whether or not a

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comorbid psychiatric diagnosis is present. Other variables affecting treatment outcome include the length of time the individual has been experiencing NEAD events and the manner in which the diagnosis is presented to and accepted by the patient [8]. Treatment outcome is generally best for those individuals who have been having nonepileptic seizures for only a short time. In support of this, one study reported that of a sample of patients who became seizure-free following diagnosis, 47% had onset within one year of diagnosis and that for patients who reported a >90% reduction in seizure frequency ($n = 9$), 54% had onset within one year of diagnosis [11].

Data on the economic cost of NEAD are very limited. The only study in the peer-reviewed literature to address directly this issue was conducted in 1998 [12]. At that time, the estimated total cost of NEAD-related direct medical expenses in the United States was calculated at \$8156 per annum per person [12]. The present study endeavored to provide a conservative estimate of the direct and indirect economic burden of NEAD in Ireland. The cost of NEAD in an Irish population has not been previously calculated.

2. Methods

2.1. Prevalence of NEAD in Ireland

The prevalence of NEAD in Ireland was calculated using percentage prevalence figures of NEAD as calculated by Benbadis and Hauser [13], applied to known figures on the prevalence of epilepsy in Ireland [14]. The authors had examined the possibility of producing prospective prevalence figures based on epilepsy monitoring unit (EMU) admissions in Ireland. However, this was not possible because of the limited availability of epilepsy monitoring in Ireland and its prioritization for potential presurgical candidates. It has been previously reported that approximately 37,000 people in Ireland have epilepsy [14]. Of this number, approximately 25%, 9250, of patients have intractable epilepsy. Assuming a conservative estimate, that 14% of patients referred to neuroscience specialist centers with intractable epilepsy are rediagnosed with NEAD [13], the median prevalence number of patients with NEAD in Ireland is approximately 1300. This equates to approximately 31 per 100,000. Based on prevalence figures postulated elsewhere [1,6], the actual prevalence in Ireland could in fact range from a low figure of 930 to a higher figure of 2300 people with NEAD at any given time.

2.2. Cost of NEAD in Ireland

As with previous studies examining the economic burden of various neurological and psychiatric disorders, intangible costs such as mental suffering and loss of quality of life are not accounted for. Medical costs were broken down into three categories: annual recurring direct medical costs, single-incident direct medical costs, and costs associated with diagnosis and treatment. Variables contributing to direct medical costs were identified by a retrospective review of medical charts of patients diagnosed with NEAD at Beaumont Hospital, Dublin between 2004 and 2008 and also by a review of the Hospital In-Patient Enquiry (HIPE) System. Beaumont Hospital is Ireland's neuroscience specialist center and houses the National Epilepsy Programme.

Once variables had been identified, costs were calculated with the assistance of the Department of Finance in Beaumont Hospital. Those variables that were identified as directly contributing to the medical costs of NEAD in Ireland on an annual basis were as follows: neurology consultations, ED visits, and antiepileptic medications. Of note, data retrieved from the retrospective patient-chart review indicated that the mean time to diagnosis was 5 years; thus, these costs were recurrent over a five-year period. Single-incident direct medical costs were outpatient EEG scan, CT and MRI scans, and tilt-table test. These were investigations that patients undergo at some point through the course of medical investigation. Finally, the costs associated with diagnosis and

treatment of NEAD were as follows: inpatient vEEG monitoring, neuropsychiatric consultation, neuropsychological consultation, and intervention and neurology consultation. Indirect costs associated with the disorder such as loss of income tax and Pay-Related Social Insurance (PRSI) payable to the exchequer by employed individuals but forgone in cases of unemployment whether directly or indirectly related to disability or illness and the costs of social welfare benefit payable by the exchequer to individuals in receipt of disability-related welfare benefit were also considered.

3. Results

3.1. Incidence of NEAD in Ireland

3.1.1. Using Iceland figures [15]

The Irish National Census of 2011 [16] reported that the population of Ireland was 4,487,000. Sigurdardottir and Olafsson [15] reported that, within their study, the annual incidence of NEAD was 1.4 in 100,000, which they reported was approximately 5% of the incidence of epilepsy. Applying this figure of 1.4 to the population of Ireland, an annual incidence rate of 63 new cases of NEAD occurred per year.

3.1.2. Using Hamilton County, Ohio, figures [17]

Szflarski et al. [17] reported an incidence rate of 3.03 per 100,000 over a four-year period with an annual incidence rate varying between 1.8 and 4.6 per 100,000. Applying this figure of 3.03 per 100,000 to the population of Ireland resulted in an annual incidence of 136 new cases of NEAD occurring per year.

3.2. Economic cost of NEAD in Ireland

A detailed breakdown of the prediagnosis medical costs associated with NEAD (recurring and single incidence) is outlined in Table 1.

Patient records indicated that undiagnosed patients with NEAD attended an average of two outpatient neurology appointments per year prior to being rediagnosed with NEAD. On an outpatient basis at an estimated cost of €117 per visit, assuming a 15-minute consultation, this resulted in an annual cost of €234 per patient. Because of the seemingly intractable nature of their condition, the vast majority of patients were found to be on two antiepileptic drugs. In Ireland, antiepileptic medication is supplied free of charge under the Long-Term Illness Scheme. The average cost of each month's prescription was estimated at €200 per drug, amounting to an annual cost of €4800 per patient. Nonepileptic attack disorder-related ED visits occurred in 50% of patient records, at a cost of €213 per presentation. This equated to a mean cost of €106.50 per patient.

Variables that occurred at least once in the period prior to diagnosis were also considered. Each patient also underwent at least one outpatient EEG, at a cost of €176 per EEG and a CT scan, either as a result of an ED attendance or as a part of routine assessment. The cost of each CT scan was calculated at €200. Eighty percent of patients also underwent an MRI scan at an average cost of €225 per scan. Thus, the per-patient MRI costs amounted to €180. Tilt-table testing to exclude the diagnosis of vasovagal syncope was estimated at a mean of €184 per patient.

The annual direct medical costs per undiagnosed individual with NEAD amounted to €5429.30, as illustrated in Table 2. Calculations were based on the premise that the mean time to diagnosis was five years, and all costs were converted to costs per annum.

The indirect economic costs of undiagnosed NEAD, such as loss of income tax and PRSI income to the exchequer and exchequer payout of social welfare payments to welfare recipients, were also calculated. The basic cost of annual social welfare payments was calculated at €10,626 per annum per person, reflecting the high rate of unemployment in the sample under study. The loss of tax and PRSI income to the exchequer per unemployed individual was calculated conservatively,

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