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Driving prevalence and factors associated with driving among patients with epilepsy

Ramon Edmundo D. Bautista *, Peter Wludyka

Comprehensive Epilepsy Program, Department of Neurology, University of Florida Health Sciences Center/Jacksonville, 580 West Eighth Street, Tower One, Ninth Floor, Jacksonville, FL 32209, USA

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Abstract

Purpose. The goal of the work described here was to determine the prevalence of driving and associated variables among patients followed at a level 4 epilepsy center.

Method. A survey was mailed out to patients seen at the University of Florida/Jacksonville Comprehensive Epilepsy Program.

Results. The study population comprised 308 respondents. Nearly 20% of patients with poorly controlled seizures continued to drive. Although several demographic and clinical variables were associated with driving, on univariate analysis, using multiple logistic regression, being employed, not receiving disability benefits, having less frequent seizures, and taking fewer antiepileptic drugs were the variables independently associated with driving. A subset analysis of patients with poorly controlled seizures indicated that being employed was still an independent factor associated with driving, along with higher annual household income and absence of convulsions and waking seizures.

Conclusion. A significant number of patients with poorly controlled seizures drive. Being employed is a major reason these patients continue to drive.

Keywords: Driving; Employment; Epilepsy; Seizure disorder

1. Introduction

Epilepsy is a common neurologic disorder that affects up to 1% of the population [1]. Despite advances in therapy, a significant number of persons with epilepsy continue to experience inadequately controlled seizures [2]. Individuals with poorly controlled seizures who drive are at higher risk for motor vehicular accidents (MVAs). Krauss et al. [3] reported that there is a significantly increased risk of MVAs in persons with epilepsy who have been seizure-free less than one year. Individuals with epilepsy who drive also are at increased risk of sustaining serious injuries as well as nondriver fatalities [4].

Various state and international laws exist that restrict the ability of individuals with epilepsy to drive [5–7]. Under these laws, the permission to drive is premised on a defined period of seizure freedom and receipt of medical care. In Florida [8], individuals with epilepsy have to be seizure-free for 2 years before being allowed to drive, although this restriction may be decreased to 6 months for patients who receive regular medical care.

The inability to drive has repeatedly been shown to be a major concern of individuals who have epilepsy [9–12]. This restriction hampers their ability to work and negatively influences their quality of life. Studies have demonstrated that up to 30% of individuals with poorly controlled seizures continue to drive [13], and there is tendency for patients with epilepsy to underreport their seizure frequency to their physicians [14,15].

In this study, we determined the prevalence of driving among individuals with epilepsy who are seen at the

* Corresponding author.
E-mail address: ramon.bautista@jax.ufl.edu (R. E. D. Bautista).

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University of Florida Health Sciences Center/Jacksonville Comprehensive Epilepsy Program (UFHSCJ-CEP). We also determined those factors associated with driving. Using multiple logistic regression, we identified those variables that are independently associated with driving.

2. Methods

The Institutional Review Board of the UFHSCJ and Shands Hospital/Jacksonville approved this study.

The UFHSCJ-CEP is a level 4 epilepsy center located in downtown Jacksonville, FL, USA, and is a major epilepsy referral center for the northeast Florida and southern Georgia region. Forty-two percent of patients seen at the UFHSCJ-CEP are male. Fifty-eight percent are Caucasian, and 31% are African–American. Approximately 40% of patients are part of the city's indigent care program or recipients of Medicaid/Medicaid HMO programs. Around 5% of patients followed at the UFHSCJ-CEP have undergone epilepsy surgery and/or vagus nerve stimulator implantation.

In September 2005, we mailed out a survey to all patients who were seen at the UFHSCJ-CEP. Using this survey, we obtained the following information on our patient population:

- *Demographic information*: age, gender, marital status, race, highest educational attainment, annual household income, whether the patient is driving, access to transportation, whether the patient receives disability benefits, whether the patient is presently studying and/or receiving vocational training, current employment status, and whether the patient is retired.
- *Disease related information*: age at seizure onset, seizure duration (current age *minus* age at seizure onset), seizure frequency, whether the patient is experiencing convulsions, whether the patient experiences seizures while awake, number of antiepileptic drugs (AEDs) currently taken, and adverse effects from seizure medications.

The Appendix A contains the survey.

A reminder postcard was sent to all patients who did not return the survey 2 and 4 weeks after the initial mailing. A second copy of the survey was also mailed out at 4 weeks along with a self-addressed stamped envelope.

To include subjects who could not participate because of cognitive slowing or other impairments, we asked caregivers of patients who could not complete the questionnaire to do so on the patients' behalf. This was done to increase study representation, and enables us to obtain a more accurate description of the demographic and clinical characteristics of our population. Including the complete spectrum of patients with epilepsy in our study (including those suffering from severe impairments) prevents us from obtaining data that are skewed toward individuals who may be higher functioning.

This study examined the association between the patient's current driving situation (target variable) and the other demographic and disease-specific variables (predictor variables) in the survey. Because this study examined factors associated with driving, we limited our analysis only to patients who were 16 years and older.

2.1. Statistical analysis

Statistical analyses were performed with SPSS 9.0. We first determined whether our study sample was representative of our patient population by comparing the two groups using χ^2 analysis along gender and racial (African–Americans and Caucasians, as these make up more than 90% of our patient population) lines. We also determined whether the zip codes of our survey respondents and nonrespondents were similar.

Because surveys were completed by either the patients or their caregivers, we determined whether the trends in responses were similar by testing for homogeneity of odds ratios before consolidating the data from both respondent groups. Using Breslow–Day statistics, we determined whether the associations between driving status and the different predictor variables were similar regardless of who completed the questionnaire. A P value less than 0.05 indicated a nonhomogeneous association between the two respondent groups, and these predictor variables were excluded from further analysis.

Univariate statistical analysis of the remaining variables was performed at the 5% level of significance. Testing for the equality of means for interval variables was done using ANOVA (with transformation of certain data to satisfy the assumptions of ANOVA). Ordinal variables were tested using the Mann–Whitney test, and categorical data were analyzed with χ^2 statistics. Adjusted standardized residuals (ASR) were used as the post hoc comparison method. We also performed multiple logistic regression (using backward elimination with a POUT of 0.1) of significant variables identified by univariate analysis to determine those that retained their significance in the simultaneous context of other variables.

3. Results

One thousand three hundred ninety patients were seen at the UFHSCJ-CEP at the time of the study. We sent the survey to 932 patients whose addresses were available. Five hundred eighty-four patients did not return the surveys, and 18 did not wish to participate. Eleven patients had died. Three hundred nineteen (34%) completed the survey, but only 312 of the 319 responses were from patients 16 years of age and older. Of these, only 307 (33%) indicated their work status, and these comprised the study sample. Two hundred one (65.3%) patients completed the questionnaires themselves, and caregivers completed the remaining ones. Among patients who completed the survey themselves, 37.3% drove a motor vehicle, in contrast to only 8.2% of patients whose survey was completed by their caregiver.

Demographics and disease characteristics are summarized in Table 1. The mean age was 43, and 42% were males. With respect to race, 59% of our subjects were Caucasian and 33% were African–American. Gender ($P = 0.89$) and racial ($P = 0.81$ when comparing Caucasians and African–Americans) distributions of our study sample and the population with epilepsy were similar. Also, the zip codes of survey respondents and nonrespondents were similar ($P = 0.157$). Nearly 70% of our subjects had less than a college education. Half our subjects had an annual family income less than $10,000. Less than 30% of our subjects drove a motor vehicle, although the majority had access to transportation. Only 31% of our subjects were employed (20% were employed full-time), and half received disability benefits.

The mean age at seizure onset was 21 years, and our subjects had experienced seizures for an average of 23 years. More than two-thirds of our subjects had their last seizure within the past year, and the majority (90%) were taking AEDs. Most of our subjects experienced adverse reactions to their AEDs, but only a few (17%) described the reactions as being a major problem.