Relationship between office-based provider visits and emergency department encounters among publicly-insured adults with epilepsy

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ABSTRACT

Introduction: The proportion of adults with epilepsy using the emergency department (ED) is high. Among this patient population, increased frequency of office-based provider visits may be associated with lesser frequency of ED encounters, and key patient features may be linked to more ED encounters.
Methods: We analyzed the Medical Expenditure Panel Survey Household Component (MEPS-HC) dataset for years 2003–2014, which represents a weighted sample of 842,249 publicly-insured US adults aged ≥ 18 years. The Hurdle Poisson model that accommodates excess zeros was used to estimate the association between office-based and ED visits.
Results: Annual mean ED and office-based visits for publicly-insured adults with epilepsy were 0.70 and 10.8 respectively. Probability of at least one ED visit was 0.4% higher for every unit of office-based visit. Individuals in the high income category were less likely to visit the ED at least once while women with epilepsy had a higher likelihood of visiting the ED at least once. Among those who visited the ED at least once, there was a 0.3% higher likelihood of visiting the ED for every unit of office-based visit. Among individuals who visited the ED at least once, being aged 45–64 years, residing in the West, and the year 2011/14 were associated with higher ED visits.
Conclusion: In this representative sample of publicly-insured adults with epilepsy, higher frequency of office visits was not associated with lower ED utilization, which may be due to underlying greater disease severity or propensity for more treatment complications.

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1. Introduction

Epilepsy is one of the most common neurologic conditions; affecting about 3.4 million individuals in the U.S. [1]. Seizure and epilepsy are among the most frequent neurological reasons/conditions for visiting the emergency department. Using the National Hospital Ambulatory Medical Care Survey (NHAMCS) data from 1993 to 2003, it was estimated that every year, 1 million individuals visited the emergency room for either seizure or epilepsy [2]. Publicly-insured patients, including those with epilepsy disproportionately utilize the emergency department compared to privately-insured individuals [3] and therefore represent a potential target for interventions aiming to decrease the societal and financial burden incurred by the inappropriate use of emergency department services. We recently showed that epilepsy cost in the emergency department (ED) was nearly 2.5 times higher in patients with epilepsy than in their counterparts, contributing to nearly 10% of the mean annual direct epilepsy cost [4]. Several factors have been linked to excess ED utilization among people with epilepsy

including uncontrolled seizures, race, socioeconomic status, quality of life, and insurance status [5,6]. There is also a potential association between ED utilization and office-based providers. By providing an interface for patients' education, screening for medical, psychiatric, and social comorbidities, more office-based provider visits may lead to less ED visits. Evidence-based information on the relationship between ED visits and office-based provider are needed to help refine healthcare-related financial priorities and policies as well as to mitigate cost associated with frequent ED visits by people with epilepsy. We are not aware of any study that has comprehensively and specifically evaluated the association between office-based visits and ED utilization among patients with epilepsy. As such, using data from the largest nationally representative survey of the medical costs in the United States, we conducted an analysis of the association between office-based visits and ED visits among publicly-insured adults with epilepsy.

2. Methods

2.1. Study setting and sample population

Data from the Medical Expenditure Panel Survey Household Components (MEPS-HC) were used. The Agency for Healthcare

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Research and Quality (AHRQ) administers the MEPS, which is a U.S. civilian noninstitutionalized nationally representative survey that over sample blacks and Hispanics. The MEPS-HC collects detailed information about demographic, health conditions, health status, healthcare utilization, charges, and source of payments [7,8].

We combined data from the MEPS-HC of the full year consolidated data file and the medical condition file, from 2003 through 2014. The full year consolidated data file contains details of demographic and health characteristics, and the medical condition files include each medical diagnosis. Medical conditions and procedures reported by MEPS related to each disease condition were recorded through an interview as verbatim text and then converted by professional coders to International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) codes, and the error rate of the coding did not exceed 2.5% on verification [8]. Combining 12-year pooled data ensured sufficient sample size of individuals with epilepsy and publicly-insured. The primary independent variable was epilepsy. Epilepsy was identified as the principal diagnosis using the Clinical Classification Codes (CCC) of 83 recorded in the medical condition files [8]. The CCC aggregates the ICD-9-CM codes into clinically meaningful categories in an effort to maintain confidentiality. Public insurance categories included individuals who were covered by Medicare, Medicaid, or other public hospital/physician programs [7]. Our analyses were weighted and adjusted for the complex survey design in order to allow generalizations to adults with epilepsy and publicly-insured US population [7].

2.2. Measures

2.2.1. Outcome and exposure

The dependent variable was annual emergency department visits, which represents a count of all ED visits reported for the survey 2003/14. We generated the following two dependent variables from ED visits: a binary variable (zero vs any positive visits) and a continuous variable. The primary independent variable was annual office-based provider visit for the survey 2003/14, which was treated as a continuous variable.

2.2.2. Covariates

To estimate the adjusted annual ED visit, we included age (18–44, 45–64, ≥65 years), sex (male vs. female), race/ethnicity (non-Hispanic White, Non-Hispanic Black, Hispanic, Other), education (<High School, High School, College or more), census region (Northeast, Midwest, South, West), income, marital status, Charlson Comorbidities index (CCI), and year category. Marital status was coded into the following three groups: married, non-married (Widowed/Divorced/separated), and never married. Income level was defined as a percentage of the poverty level and grouped into the following four categories: poor (<125%), low income (125% to less than 200%), middle income (200% to less than 400%), and high income (≥400%). Charlson Comorbidities Index (CCI) was adopted from D'Hoore and colleagues [9] based on 17 conditions. The CCI was grouped into the following three categories: 0, 1, and ≥2.

2.2.3. Analyses

Table 1 depicts descriptive statistics using proportions and means to summarize the population characteristics. The ED visit counts ranged from 0 to 19, where 63% of the sample had zero visit. A Hurdle Poisson model that accommodates excess zeros was used to estimate the effect of office based visit on ED utilization [10,11]. The Hurdle count model is relevant in healthcare utilization research; it is based on patient–doctor (two-part) decision-making process. First, the patient decides whether to seek medical care or not. Then, conditional on making the decision to use care, the doctor mainly makes the decision about how much care to provide [12]. Given that 63% of adults with epilepsy had no ED visit in our sample, factors associated with excess zero visit may also be associated with inequitable systems of epilepsy care [11,13]. In the first step of the model, we fitted a logit model for the probability that

Table 1
Sample demographics among adults with epilepsy and publicly-insured, MEPS 2003–2014.
(n = 1275, N = 842,249).

Variables	Percentage (%)
Age category	
Age 18–44	36.2
Age 45–64	38.7
Age 65–85	25.1
Gender	
Male	44.2
Female	55.8
Race/ethnicity	
Non-Hispanic White	61.6
Non-Hispanic Black	18.6
Hispanic	13.1
Others	6.7
Marital status	
Married	27.9
Non-married[a]	31.6
Never married	40.5
Education category	
<High School	13.6
High School	56.8
College or more	29.6
Census region	
Northeast	15.8
Midwest	22.7
South	38.8
West	22.7
Income as % of poverty category	
Poor income (<125%)	49.7
Low income (125% to less than 200%)	20.3
Middle income (200% to less than 400%)	21.0
High income (≤400%)	9.0
Charlson comorbidity index	
0	53.3
1	13.2
≥2	33.5
Usual source of care	
Yes	91.4
Year category	
Year 2003/06	32.4
Year 2007/10	30.4
Year 2011/14	37.2
Utilization	
ED visit mean (SD)	0.70 (1.40)
Office based visit (SD)	10.8 (18.4)

N - weighted sample size; n - unweighted sample size; %, weighted percentage.
[a] Non-married stands for widowed/divorced and separated.

the number of ED visit is greater than zero. In the second step, we fitted a truncated Poisson model to estimate the level of positive ED visits [11]. Using the Variance inflation factor (VIF) test, and taking into account the complex survey design, it was determined that no multicollinearity problems existed between predictors of the Hurdle Poisson model.

All analyses were performed at the person-level using STATA 14 [14]. Only estimates that are statistically significant at the $p < 0.05$ level are discussed in the paper.

3. Results

3.1. Population characteristics

Table 1 summarizes the population characteristics of publicly-insured US adults with epilepsy. Out of 98,260 US adults with epilepsy and publicly-insured, 1275 (1.3%) had epilepsy. This adult population with epilepsy and publicly-insured represented a weighted US population of 842,249 including 36.2% aged 18–44 years, 38.7% aged 45–64 years, and 25.1% aged 65 years or more. The annual mean ED visit and office-based visit for publicly-insured adults with epilepsy was 0.70 and 10.8, respectively.