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An update on the prevalence and incidence of epilepsy among older adults

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ABSTRACT

Objective: To estimate the prevalence and incidence of epilepsy among beneficiaries of Arizona Medicare aged 65 and over.

Methods: An analysis of Medicare administrative claims data for 2009–2011 for the State of Arizona was conducted. Epilepsy was defined as a beneficiary who had either ≥ one claim with diagnostic code of 345.xx (epilepsy) or at least two claims with diagnosis code of 780.3x (seizure) ≥30 days apart. Stroke-related and psychiatric comorbidities were determined by diagnostic codes. Average annual prevalence and incidence were calculated and stratified by demographic characteristics and comorbidities. Odds ratios (OR) and 95% confidence intervals (CI) were calculated as measures of effect for prevalence and incidence and the chi-square statistic was calculated to compare the proportions of epilepsy cases with and without comorbidities (alpha = 0.05).

Results: The overall average annual prevalence and incidence over the study period was 15.2/1000 and 6.1/1000, respectively. Relative to the 65–69 age group and White beneficiaries, the highest prevalence was observed for beneficiaries 85 years or older (19.8/1000, OR 1.66, 95% CI 1.53–1.81) and Native Americans (21.2/1000, OR 1.42, 95% CI 1.25–1.62). In contrast, the highest incidence rates were observed for beneficiaries 85 years and older (8.5/1000, OR 1.82, 95% CI 1.60–2.07) and for Black beneficiaries (8.7/1000, OR 1.44, 95% CI 1.12–1.86). The incidence rate for Native Americans was not significantly different from that for White beneficiaries (6.2/1000, OR 1.02, 95% CI 0.81–1.29). More than one quarter of all cases (25.7%) and 31% of incident cases had either stroke-related and/or psychiatric comorbidities (all p-values < 0.001).

Conclusions: Epilepsy is a significant neurological disease among Medicare beneficiaries 65 years and older. Beneficiaries aged 85 and older and Black and Native Americans experienced higher rates of epilepsy than other demographic subgroups compared to White beneficiaries.

1. Introduction

Epilepsy is one of the more common neurologic disorders in the United States (US) and is the third most common for older age groups (Hirtz et al., 2007; Werhahn 2009). The risk for developing epilepsy is high in the very young (< 1 year), decreases by age 20, and drastically increases starting at the age of 60 (Hesdorffer et al., 2011). Across the lifespan, epilepsy is most common among individuals aged 75 and older (Cloyd et al., 2006). As a chronic disease, epilepsy is associated with substantial morbidity and mortality.

A previous study of older Medicare beneficiaries from 2001 to 2005 reported the average annual prevalence to be10.8 per 1000 and incidence rate to be 2.4 per 1000 (Faught et al., 2012). More recent estimates seem to indicate an increase in the prevalence of epilepsy. Among low-income elderly, the 2009 prevalence of epilepsy was estimated to be 19.3 per 1000 (Tang et al., 2015). Using data from the US National Health Interview Survey (NHIS) 2010 for 65 years and over, the prevalence of epilepsy was reported to be 13 per 1000 (CDC 2012). Another study among the commercially insured US population, including those with Medicare supplemental insurance paid by employers, reported lower prevalence estimates but did note a rise in prevalence from 2007 to 2011 from 2.7 per 1000 (95% CI 2.65–4.82) to 4.8 per 1000 (95% CI 4.77–4.82) (Helmers et al., 2015). The purpose of this study is to estimate the prevalence and incidence of epilepsy among

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older Medicare beneficiaries using the State of Arizona Medicare claims data (2009–2011) and to evaluate the impact of comorbidities on these prevalence and incidence estimates.

2. Material and methods

This study was approved by the Institutional Review Board of the University of Arizona.

2.1. Data source

Medicare administrative data for the state of Arizona were obtained from the Centers for Medicare and Medicaid Services. The data contained claims made by Arizona Medicare beneficiaries enrolled in fee-for-service Medicare from 2009 to 2011. Diagnostic information from inpatient and outpatient files, along with demographic information from the master summary files, were extracted since the use of both inpatient and outpatient administrative claims have been shown to enhance the validity of epilepsy case ascertainment (Reid et al., 2012; Thurman et al., 2011).

2.2. Inclusion criteria

Similar to a previous study by Faught et al., the following inclusion criteria were used: 1) enrolled in fee-for-service (FFS), and 2) enrolled in Medicare as a result of being age-qualified ($\geq$65 years of age), and 3) enrolled in Medicare Part A and Part B for 12 consecutive months in the year of enrollment. These criteria excluded Medicare Advantage (MA) beneficiaries and those who qualified for Medicare due to disability or end-stage renal disease. Encounter data for Medicare Advantage (MA) beneficiaries were not captured in the Medicare utilization files and those with disability or end-stage disease may have very different disease burden and other characteristics comparing to Medicare beneficiaries enrolled strictly by age.

2.3. Definition of epilepsy cases

The International League Against Epilepsy's "Practical Clinical Definition of Epilepsy" defined epilepsy as a condition characterized by any of the following conditions: (1) diagnosis of epilepsy; (2) at least two unprovoked seizures occurring > 24 h apart; (3) one unprovoked seizure with at least 60% probability of further seizures over the next ten years (Fisher et al., 2014). In this current study, epilepsy cases were identified as having any of the following International Classification of Disease-Version 9-Clinical Modification (ICD 9-CM) diagnostic codes recorded on encounter claims: At least one ICD 9-CM 345.xx (epilepsy), or at least two ICD 9-CM 780.3x (seizure) claims occurring at least 30 days apart. The 30-day minimum eliminated those with acute symptomatic seizures caused by transient conditions (Faught et al., 2012). Cases with two ICD 9-CM 780.3x claims that crossed over two calendar years were not included because these cases were expected to be captured by an eventual ICD 9-CM 345.xx (epilepsy) code. Referring back to the first two definitions of epilepsy, if two unprovoked seizures occurring > 24 h apart characterize an epilepsy diagnosis, one would expect an ICD 9-CM 345.xx (epilepsy) code to follow two ICD 9-CM 780.3x (seizure) codes. Beneficiaries with the third definition of epilepsy were not included because the determination of the probability of further seizures over the next ten years was not feasible due to the limited data.

2.4. Prevalent case definition

A prevalent case was identified as an eligible beneficiary having a diagnostic code definition for epilepsy during the study time period. Prevalent cases were identified for each of the individual years, 2009–2011.

2.5. Incident case definition

Incident cases were subsets of the prevalent cases with the additional requirement for evidence of the event being a new diagnosis of epilepsy. With the limited timeframe, 2009–2011, incident cases were identified only for 2010 and 2011. For 2010 incident cases, there must have been at least one previous epilepsy-free year. For 2011 incident cases, at least two previous epilepsy-free years were required; individuals with only one diagnosis of ICD 9-CM 345.xx were excluded from the incident count for the following reasons. Hauser et al. concluded from their study of recurrent seizure risk that about one-third of patients with a first unprovoked seizure will have further seizures within five years compared to approximately 75% of those with two or three unprovoked seizures will have further seizures within four years (Hauser et al., 1998). Hauser et al.'s discovery of exponential increase in seizure risk starting from the second seizure indicates that a new case would first present as a seizure episode coded as ICD 9-CM 780.3x and the diagnosis of epilepsy coded as ICD 9-CM 345.xx eventually follows. Furthermore, not all patients with epilepsy seek medical follow-up, a single diagnostic code of epilepsy of ICD 9-CM 345.xx would not be an accurate representation of a new case unless there is a very long preceding period of enrollment with no recorded seizure (ICD 9-CM 780.3x) or epilepsy (ICD 9-CM 345.xx) (Thurman et al., 2011).

2.6. Identification of other risk factors

Presence of stroke-related comorbidities of cerebral thrombosis, transient cerebral ischemia, and cerebrovascular disease were identified by claims for ICD 9-CM codes, 434.xx, 435.xx, and 436.xx respectively. The term, stroke can be used interchangeably with stroke syndrome, cerebral vascular accident, and cerebrovascular accident (Keane, 2003) and can be indicated by numerous ICD 9-CM codes. Our choice of ICD 9-CM codes for defining stroke-related comorbidities was selected to identify specific conditions associated with epilepsy. Psychiatric comorbidities included depression, anxiety, psychosis, and mood disorder and were identified by the ICD-9-CM codes of 311.xx, 300.xx, 295.xx, and 296.xx respectively. Demographic and geographic characteristics of the beneficiaries were obtained from the Medicare beneficiary files age, sex, race, and county of residence.

2.7. Analysis

Prevalence was estimated for each specific year as the number of prevalent cases per 1000 eligible beneficiaries. The denominator for each year was the number of beneficiaries who met inclusion criteria in that year. The average annual prevalence was calculated from the average prevalence of the three specific years. Incidence was estimated as the number of incident cases per number of beneficiaries at risk of being diagnosed with epilepsy for the first time. This population at risk excluded beneficiaries previously identified as cases. Incidence rates for 2010 and 2011 were separately calculated as well as the average annual incidence rate. Both incidence and prevalence estimates were calculated for the total population and various demographic subgroups. Because epilepsy is a rare disease in this population, the odds ratios (ORs) were used to estimate relative risk for both incidence and prevalence comparisons between the demographic characteristics. The frequency estimates (i.e. percentage of cases with comorbidities) were compared using the chi square statistic.

To contrast the association of the presence of comorbidities with incidence and prevalence of epilepsy, we pooled the prevalence population for years 2009–2011 and incidence cohorts of 2010 and 2011. The proportions of epilepsy cases and non-cases with stroke-related and psychiatric comorbidities were compared separately for both population groups using the Chi-square test. Odds ratios (OR) and 95% confidence intervals (CI) were calculated to estimate the effect between the prevalence and incidence of epilepsy among demographic groups and