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Quality Indicator for Epilepsy Treatment 15 (QUIET-15): Intervening after recurrent seizures in the elderly

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Abstract

In this study, we examined the provision of care to older adults with epilepsy and compliance with the "Quality Indicator for Epilepsy Treatment 15" (QUIET-15) measure. We analyzed 2008–2010, 5% random sample of Medicare beneficiaries augmented with data from all beneficiaries who identified as a minority with claims related to seizures (780.3x) or epilepsy (345.xx). Of 36,912 identified epilepsy cases, 12.6% had ≥1 emergency room (ER) visit for seizure(s). For those who presented to ER, among those taking anti-epileptic drugs (AEDs), AED was changed in 15.4%, dose adjusted in 19.7%, and stopped in 14.9%; among those not taking AED, therapy was initiated in 68.5%. In adjusted logistic regressions, African-Americans were more likely to have recurrent seizures than Whites (OR 1.41, 95%CI 1.27–1.56), while Asians were less likely to have recurrent seizures (OR 0.71, 95%CI 0.57–0.89). There were no significant racial/ethnic differences in the likelihood of a post-seizure intervention. The chance of seizure recurrence leading to ER visit decreased with age and increased with the number of comorbidities. Patients with seizure recurrence were more likely to be taking an enzyme-inducing AED (OR 1.69, 95%CI 1.57–1.82) and receiving Part D Low Income Subsidy (OR 1.36, 95%CI 1.22–1.51). The probability of AED change after a seizure was higher for patients with ≥4 comorbidities (OR 1.69, 95%CI 1.25–2.27), patients who saw a neurologist (OR 1.49, 95%CI 1.30–1.70), and patients who were taking an enzyme-inducing AED (OR 1.47, 95%CI 1.27–1.71). Overall, a minority of Medicare beneficiaries experienced seizure recurrence that resulted in an ER visit. However, only half of them received treatment concordant with QUIET-15. Though racial differences were observed in occurrence of seizures, none were noted in the provision of care.

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Key terms

Race; ethnicity; quality of care; guidelines; treatment delays; seizure; epilepsy

1. Introduction

The provision of medical care in people with epilepsy is increasingly tied to various measures and indicators designed with a goal to eventually improve the quality of that care. To address the need for improved care provision, 24 evidence-based Quality Indicators for Epilepsy Treatment (QUIET) were developed using RAND appropriateness methods via extensive literature, expert panel, and patient focus group reviews (1). Of those quality indicators, the QUIET-15 indicator specified that if the patient continues to have seizures after initial treatment, then interventions should be instituted including increase/adjustment in anti-epileptic drug (AED) dose or changing to a different AED monotherapy, compliance assessment and appropriate lifestyle modifications, monitoring of AED levels, or a referral to an epilepsy center (1). The importance of this continued care indicator is underscored by the results of recent analyses revealing significantly less adherence to QUIET-15 in a primary care setting as compared to neurology-only care or shared (PCP & neurology) care (2), better outcome with epilepsy subspecialty care (3), and continued suboptimal access to care for patients with epilepsy within the first year after occurrence of recent seizures as assessed by the National Health Interview Survey (NHIS) (4). In addition, a recent examination of two insurance databases (commercial and federal) found longer times between hospitalization for recurrent seizures in beneficiaries who received change in AEDs (preferably to a second-generation AED) and received neurology treatment (5).

The goals of this work were twofold: to evaluate the provision of care to older adults with epilepsy using compliance with QUIET-15 after seizure recurrence, i.e. in the chronic or more advanced stages of care, and to assess for the presence of racial disparities in the provision of care. Thus, we examined the occurrence of seizures after an initial diagnosis, and the interventions implemented following that event. The focus on older Medicare beneficiaries was dictated by the fact that they are the most vulnerable societal group with the age-related increasing incidence and prevalence of epilepsy and numerous psychological and physical barriers to receiving quality care (6). The additional focus on the presence of racial disparities in the selected outcomes was dictated by the disparities that have been observed in patients with epilepsy in other studies (7–10). Our hypothesis was that there still are significant discrepancies in QUIET-15 and the provision of care in the Medicare population, and that compared to White beneficiaries, typically disadvantaged minorities (e.g., African Americans, Native Americans, and Hispanics) are less likely to receive care concordant with QUIET-15.

2. Methods

2.1. Participants

This study is a retrospective analysis of Medicare claims data from 2008–2010 obtained from the Center for Medicare and Medicaid Services (CMS). The base population is the 5%

random sample of Medicare beneficiaries. To facilitate comparisons between minority racial/ethnic groups, the 5% random sample was augmented with data from all beneficiaries with any claims related to seizures (780.3x) or epilepsy (345.xx) within that time period who identified as African-American, Hispanic, Asian, or American Indian/Alaskan Natives (AI/AN). Inclusion criteria were age 66 or older in 2008 and with Medicare coverage for Part A (hospital insurance), Part B (coverage for outpatient and physician visits), and Part D (prescription drug coverage) and not covered by a managed care plan, who have received at least one year of follow-up after a claim-based epilepsy diagnosis or until the time of death.

We identified prevalent cases of epilepsy in 2009 using the following claim-based epilepsy diagnosis criteria: i) at least one claim (inpatient, outpatient, or physician visit) with International Classification of Disease – version 9 (ICD-9) codes 345.xx (epilepsy), or at least two claims with 780.3x (seizures) that were ≥30 days apart (this approach allows addressing the frequently noted uncertainty in the diagnosis of epilepsy in the elderly who present with vague or unusual symptoms) (11), and ii) at least one AED prescription of 60 days or more. This approach addresses 2006 changes in coding that resulted in a change in diagnostic code assignment to patients treated for seizures/epilepsy (12).

The index event was defined as the date of the first claim used in the diagnosis of epilepsy. Similar claims-based epilepsy definitions were found to have a positive predictive value of 94% for detecting cases of epilepsy among older veterans (13), and 70%–88% in a managed care population (14).

Prevalent cases had the broadest definition as cases fulfilling all of the inclusion criteria. We further classified cases as probable incident cases using the data from the year before the index event as those beneficiaries with continuous Medicare coverage who had no managed care plan participation, claims with ICD-9 codes for epilepsy or seizures, or filled AED prescriptions during that year. Recognizing that some AEDs are prescribed for reasons other than seizure control (e.g. gabapentin for neurogenic pain) we defined possible incident cases similarly to probable incident cases, but with one or more filled prescriptions for AEDs in the year prior to the index event, excluding AEDs that are almost exclusively prescribed to control seizures: carbamazepine, ethosuximide, felbamate, levetiracetam, methsuximide, phenytoin, oxcarbazepine, and tiagabine.

This study was approved by IRB at the University of Alabama at Birmingham.

2.2. Medication Data

All prescription medication data were collected from the Part D event file, grouped by generic medication names, and broadly classified as AEDs or non-AEDs. As we do not utilize the data regarding non-AEDs in this work, we only provide the definition of AEDs as medications that are typically used for the treatment of epilepsy and that were used in this setting in conjunction with seizure/epilepsy ICD-9 codes (780.39 or 345.xx). All other medications were classified as non-AEDs. The timing of prescription fills was recorded in relation to the time of the index event. The data were used to calculate the number of distinct AEDs prescribed for each beneficiary and the order and timing in which new medications were added in the follow-up period. The timing of prescription fills and the days' supply of

each fill was used to define periods when patients had one of more AEDs on hand and periods when there were gaps in AED coverage during which they would be expected not to have any AEDs on hand.

2.3. QUIET-15 Outcomes

Older adults considered for inclusion in the study analyses were those whose seizure recurrence was identified by a claim, after the index event, originating from an emergency room (ER) visit with a primary diagnosis code for seizure (780.39). This definition was not expected to capture all recurrent seizures, and thus, to have low-sensitivity, but high specificity. In addition, we opted to not consider outpatient claims with seizure codes (345.xx) to eliminate routine follow-up visits which would be difficult to discern as recurrent seizures.

Once beneficiaries were identified for data inclusion, we examined the following QUIET-15 outcome related measures: 1) change in the dose of an already-prescribed AED, 2) a prescription change to another AED, 3) one or more AEDs stopped or held for more than 7 days, or 4) a previously held AED restarted. These outcome measures were assessed within two-months after the recurrent seizure(s).

2.4. Covariates

Covariates considered in analyses included: 1) individual factors such as gender and ethnicity (White, African-American, Hispanic, Asian, American Indian/Alaska Native), (2) medical factors such as age at epilepsy diagnosis (i.e., index event), number of comorbid medical conditions (identified in the year before the claim-based diagnosis of epilepsy using algorithms based on the Charlson Comorbidity score (15)), and neurology care defined as having at least one claim for a visit with a neurologist or neurosurgeon close to index event which was defined as occurring from 45 days before to 60 days after index event, and being on an enzyme-inducing AED (binary variable), 3) socio-economic factors: being eligible for Part D Low Income Subsidy (binary variable), ZIP code level indicators of poverty (ZIP code level information on poverty obtained from the 2010 Census; we created indicators for high poverty corresponding to ZIP code levels with >20% of households living below 100% of the Federal Poverty Line), and 4) geography: US region of residence (Northeast, West, Midwest, and South). Odds ratios (OR) and 95% confidence intervals (CI) were calculated from the regression models.

2.5. Analysis

We estimated the overall and race-specific frequency of recurrent seizures by diagnostic category (prevalent case, possible new case, and probable new case), and by the number of AEDs prescribed prior to the recurrent seizure (one or more than one) or whether the recurrent seizure occurred during a gap in AED coverage. We similarly obtained the overall and race-specific frequency of the therapeutic responses with additional stratification by AED use at the time of recurrence.

Testing for differences by race/ethnicity in unadjusted proportions was done with two-sided chi-square tests with a p-value <0.05 indicating significance. Logistic regression was used

across groups to examine the association of race/ethnicity, adjusting for covariates, with the binary outcomes of 1) any recurrent seizure vs. none, and 2) any therapeutic response vs. none.

3. Results

During the study period, we identified 36,912 older adults with epilepsy (prevalent cases), 8,787 possible cases and 3,706 probable cases (Table 1). Of the prevalent sample, 61.6% were women, 41.5% were 67–74 years old, 46% had ≥4 comorbid conditions, and >80% were eligible for Low Income Subsidy (LIS). Approximately 50% were from the southern US. Similar variable proportions were found for the possible and probable cases. A higher proportion of possible (54.9%) and probable (72.8%) new cases had at least one claim for a visit with a neurologist or neurosurgeon in the 45 days prior to the 60 days period after the 2009 epilepsy index event than the prevalent cases (36.3%).

Table 2 reports the estimated probabilities of seizure recurrence after the index event as defined in this study. Of the prevalent cases, 12.6% had at least one recurrent seizure. Possible new cases had a similar recurrence probability (12.5%), but probable new cases had somewhat higher probability at 17.9%. The incidence of recurrent seizures was not significantly different across race/ethnic groups and it ranged from 7.7% in Asians to 14.5% in African-Americans among prevalent cases, from 7.4% in AI/AN to 14.7% in African-Americans among possible new cases, and from 11% in Asians to 20.3% in African-Americans among probable new cases.

In terms of the QUIET-15 Outcome measures, most of the recurrent seizures occurred after a prescription for an AED had been filled (Table 2),. This was similar across the prevalent cases (11.2%), and possible and probable new cases (8.9% and 10.5%, respectively). The proportion of cases with recurrent seizures were similar across race/ethnic groups, and in general highest for AA beneficiaries (Table 2).

Among prevalent cases with recurrent seizure(s) and on one AED, the AED was changed for 15.4%, the dose of the AED changed for 19.7%, the AED was stopped for 14.9%, and no AED changes were observed for 50% of the beneficiaries (Table 3). Among prevalent cases with recurrent seizure and >1 AED, we observed AED changes in 26.9% and no AED changes in 48.9%. Results were similar for possible and probable new cases (Table 3). We observed no AED changes in 50.3% of possible new cases with one AED and 53.2% of probable new cases with one AED (Table 3). Among those with >1 AED, we found no AED changes for possible new cases and 42.9% for probable with cases with a recurrence. Among probable new cases with recurrent seizures and >1 AED, 37.1% had AED changes (Table 3). Among cases not on AED at the time of the seizure, the AEDs were started in about 63.9–68.5% of cases.

No racial/ethnic differences were observed in the interventions after recurrent seizures. Changes in AED (including AED restart) were observed in 23.3% (Asian) to 30.4% (AI/AN). AED dose changes occurred in 19% of Asians and as low as 17.2% of Whites 15.7% Hispanics and 15.6% of AAs. Small sample size prevented AI/AN inclusion in this analysis.

AEDs were stopped/held in about 10% of each racial/ethnicity group. Finally, AEDs were not changed or restarted in over 40% of each group (AI/AN 42%; 45.9% Whites; 46.1% AA; 47.9% Asian; and 48.2% Hispanics).

In adjusted logistic regressions (Table 4), African-Americans were significantly more likely to have recurrent seizures than Whites (while Asians were less likely). Among those with a recurrent seizure, no significant racial/ethnic differences were found in the likelihood of an intervention (AED change/dose change/AED restart) after the seizure. Analyses revealed that the odds ratios of seizure recurrence were age-dependent with lower likelihood of seizure recurrence in patients ages 75–84 or ≥85 compared to those 66–74 years old. Further, seizure recurrence was higher in patients with 1–3 comorbidities and ≥4 comorbidities vs. no comorbidities, and those who were evaluated by neurologist close to the index event when compared to patients who did not have such evaluation. Patients with seizure recurrence were also more likely to be taking an enzyme-inducing AED than another AED and receiving Part D LIS. The probability of AED change or adjustment after a recurrent seizure was lower in patients in the 75–84 and ≥85 age group when compared to the 66–74 age group and it was higher in patients who had ≥4 comorbidities vs. no comorbidities, who saw a neurologist close to the index event, and who were taking an enzyme-inducing AED

4. Discussion

This is a first evaluation of the QUIET-15 outcome measure that focuses exclusively on a large U.S. Medicare beneficiary-based sampling of older adults with epilepsy. Several findings in this large and ethnically-diverse cohort need consideration. First, we found that approximately 10% of patients who were initiated on appropriate AED had a seizure that resulted in ER visit, and that almost half of them were not prescribed an AED. The proportion of patients with seizure recurrence observed in this study may be considered low by some in view of the fact that more than 40% of patients would be expected to have seizure recurrence during the study period (16). However, we only included seizures associated with ER visits and only occurring during a single year, likely substantially underestimating the rates of seizure recurrence in the elderly. Second, after presenting with recurrent seizure, about half of our cases continued the same treatment, i.e., the dose and/or treatment was not changed. This is possibly in disagreement with the guidance provided by QUIET-15 (1) but in agreement with the recently provided data that showed low concordance with QUIET-15 by primary care physicians and an overall high percentage of epilepsy patients receiving care from non-neurologists rather than from neurologists (2, 4). Finally, on a more optimistic note, the racial/ethnic disparities in the provision of care after recurrent seizure and ER visit were minimal.

Overall, 18% of probable new epilepsy patients received care from emergency rooms after the initial diagnosis and treatment were instituted. There are three common reasons for seizure recurrence – non-compliance with treatment, incorrect diagnosis leading to incorrect choices of AEDs, and lifestyle factors (3, 17). Almost half of the patients with recurrent seizures were not receiving AEDs at the time of presentation to the emergency room. While not analyzed here, our recent study in the same cohort of patients showed substantial delays

in AED treatment after a first seizure with approximately 50% of patients waiting 30 days or more for therapy initiation as assessed by the date of first AED prescription filled (18). Thus, delays in treatment may be the reasons for seizure recurrence in at least some of the patients. This is a major concern as these delays may directly contribute to seizure recurrence and may have direct impact on long-term outcomes (19). It is clear that chance of seizure recurrence is directly related to the preceding number of seizures and that non-compliance is associated with development of intractability and higher cost of care (20, 21). The reason for the care delays are unclear in our study because the required data are not available in the Medicare database, and could be only accessible by directly interviewing the beneficiaries. However, we can speculate that these delays are multifactorial and include access to care, e.g., to neurologists and/or epilepsy specialists, financial barriers, lack of support, non-compliance and possibly other unidentified factors. In support of this notion, Martin et al. found that the likelihood of timely AED prescriptions was higher for those receiving neurology care and lower for beneficiaries with poverty indicators (18). In addition to these factors, recent analyses showed that high vs. low quality of care, as reflected by adherence to the quality of care measures put forth by the American Academy of Neurology (22, 23), results in better seizure control in patients with epilepsy (24).

Further, specialist care may improve outcomes as at least one study documented improved outcomes of patients who switched care from general neurologist to epilepsy specialist (3). In line with this literature, our results show that such specialty care is sought by patients who may have worse disease and recurrent seizures. However, the likelihood of treatment changes and guideline-concordant care is more likely when such care is received (2, 4). These factors will need to be further investigated in the future via either medical record review (25, 26) or via direct contact with patients and providers to develop appropriate interventions that aim at preventing seizure recurrence.

The incidence of recurrent seizures treated in the ER setting in beneficiaries of African American descent is higher than in other groups and lower in Asians. This finding is mirrored in all diagnostic categories. At the same time, the type of the intervention instituted is different between racial groups with AEDs changes observed in AI/AN beneficiaries less frequently, but dose adjustments were noted more frequently. The reasons for these differences cannot be identified in this study. We can hypothesize that these differences have multitude of reasons including inequalities in access to care, health status, and less positive perceptions of physicians by minorities when compared to Whites that may results if less trust and lower the adherence to care plans (27).

The difference between the possible and probable new cases is that a proportion of beneficiaries in the “possible” group (N=5,081) did not receive the diagnostic code of epilepsy or seizure disorder prior to the year in question, but they received AED(s) (reason for AED use could not be specifically investigated). Thus, the frequency of recurrent seizures being higher in probable new cases may indicate that these patients were either less comfortable with the initial diagnosis or with the decisions regarding the management of seizures (e.g., starting treatment). The differences in AED use in the prior year may indicate that the patients who did not carry the diagnostic epilepsy code in their records had, in fact, epilepsy that was not officially recognized or diagnosed later. This is consistent with the fact

that the diagnosis of epilepsy in the elderly is sometimes delayed because of the atypical clinical characteristics of the seizures or because of the lack of acceptance of the diagnosis (11). Interventions focusing on improving patient – physician interactions and early medication adherence may be necessary provided this is the reason for the identified differences (21, 27).

It also appears to be relatively clear why there are differences between the groups when beneficiaries are prescribed one AED. Prevalent cases have lowest recurrence of seizures during the period in question likely because their treatment is established and titrated to an appropriate dose that is known to control seizures in them, while the other groups, especially patients with probable diagnosis may still be in the process of AED initiation. This is supported by the highest incidence of AED changes in this group (Table 2).

Limitations of the study need to be underlined. First, we consider recurrent seizures that are managed by an ER visit. The higher incidence of such seizures in some demographic groups may be due to a higher use of ERs overall. Patients other than African Americans may not go to ER with same type of seizure which may reflect the previously discussed racial differences in the delivery of care and other factors that may influence the outcomes. Prospective, direct contact studies are needed to address these and other questions posed by this work. A growing number of studies have begun to examine quality indicator outcome standards via electronic medical records review within medical hospital and outpatient care centers and have found value with documented levels of care as benchmarks towards improving standard-of-care outcomes (25, 26). Second, we have not assessed all components of concordance with the QUIET-15 indicator. Interventions other than changes in AED prescriptions, e.g., assessing compliance or increased monitoring, may also be implemented. Third, despite the large number of older adults with epilepsy, this cohort may not represent all older adults with epilepsy: by design, we limited to those who have Part D coverage and fee for service plans, who are about 30% of the Medicare older population.

In summary, ~10% patients initiated on AED had a seizure that resulted in an ER visit; about half of them were not taking AED at that time. In about half of the patients who present with a recurrent seizure the treatment was not adjusted or changed. Finally, while there were racial differences in the recurrence of seizures, we did not identify any differences in the AED care following the seizures.

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References

1. Pugh MJ, Berlowitz DR, Montouris G, Bokhour B, Cramer JA, Bohm V, et al. What constitutes high quality of care for adults with epilepsy? Neurology. 2007; 69(21):2020–7. [PubMed: 17928576]
2. Pugh MJ, Berlowitz DR, Rao JK, Shapiro G, Avetisyan R, Hanchate A, et al. The quality of care for adults with epilepsy: an initial glimpse using the QUIET measure. BMC Health Serv Res. 2011; 11:1. [PubMed: 21199575]

3. Szaflarski JP, Rackley AY, Lindsell CJ, Szaflarski M, Yates SL. Seizure control in patients with epilepsy: the physician vs. medication factors. BMC Health Serv Res. 2008; 8:264. [PubMed: 19094222]
4. Cui W, Kobau R, Zack MM. Control USCfD, Prevention EP. Among adults with epilepsy reporting recent seizures, one of four on antiseizure medication and three of four not on medication had not seen a neurologist/epilepsy specialist within the last year, the 2010 and 2013 US National Health Interview Surveys. Epilepsy Behav. 2016; 61:78–9. [PubMed: 27318431]
5. Faught E, Helmers SL, Begley CE, Thurman DJ, Dilley C, Clark C, et al. Newer antiepileptic drug use and other factors decreasing hospital encounters. Epilepsy Behav. 2015; 45:169–75. [PubMed: 25819943]
6. Fitzpatrick AL, Powe NR, Cooper LS, Ives DG, Robbins JA. Barriers to health care access among the elderly and who perceives them. Am J Public Health. 2004; 94(10):1788–94. [PubMed: 15451751]
7. Burneo JG, Black L, Martin R, Devinsky O, Pacia S, Faught E, et al. Race/ethnicity, sex, and socioeconomic status as predictors of outcome after surgery for temporal lobe epilepsy. Arch Neurol. 2006; 63(8):1106–10. [PubMed: 16908736]
8. Burneo JG, Knowlton RC, Martin R, Faught RE, Kuzniecky RI. Race/ethnicity: a predictor of temporal lobe epilepsy surgery outcome? Epilepsy Behav. 2005; 7(3):486–90. [PubMed: 16103016]
9. Szaflarski M. Social determinants of health in epilepsy. Epilepsy Behav. 2014; 41:283–9. [PubMed: 24998313]
10. Szaflarski M, Szaflarski JP, Privitera MD, Ficker DM, Horner RD. Racial/ethnic disparities in the treatment of epilepsy: what do we know? What do we need to know? Epilepsy Behav. 2006; 9(2): 243–64. [PubMed: 16839821]
11. Ramsay RE, Rowan AJ, Pryor FM. Special considerations in treating the elderly patient with epilepsy. Neurology. 2004; 62(5 Suppl 2):S24–9. [PubMed: 15007161]
12. Cardenas VM, Roman GC, Perez A, Hauser WA. Why U.S. epilepsy hospital stays rose in 2006. Epilepsia. 2014; 55(9):1347–54. [PubMed: 25040913]
13. Pugh MJ, Van Cott AC, Cramer JA, Knoefel JE, Amuan ME, Tabares J, et al. Trends in antiepileptic drug prescribing for older patients with new-onset epilepsy: 2000–2004. Neurology. 2008; 70(22 Pt 2):2171–8. [PubMed: 18505996]
14. Holden EW, Grossman E, Nguyen HT, Gunter MJ, Grebosky B, Von Worley A, et al. Developing a computer algorithm to identify epilepsy cases in managed care organizations. Dis Manag. 2005; 8(1):1–14. [PubMed: 15722699]
15. Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. Journal of clinical epidemiology. 1992; 45(6):613–9. [PubMed: 1607900]
16. Kwan P, Brodie MJ. Early identification of refractory epilepsy. N Engl J Med. 2000; 342(5):314–9. [PubMed: 10660394]
17. Schuele SU, Luders HO. Intractable epilepsy: management and therapeutic alternatives. Lancet Neurol. 2008; 7(6):514–24. [PubMed: 18485315]
18. Martin R, Faught E, Szaflarski J, Richman J, Funkhauser E, Pilper K, et al. What does the U.S. Medicare administrative claims database tell us about the initial antiepileptic drug treatment for older adults with new-onset epilepsy? Epilepsia. in print.
19. Faught E, Duh MS, Weiner JR, Guerin A, Cunnington MC. Nonadherence to antiepileptic drugs and increased mortality: findings from the RANSOM Study. Neurology. 2008; 71(20):1572–8. [PubMed: 18565827]
20. Faught RE, Weiner JR, Guerin A, Cunnington MC, Duh MS. Impact of nonadherence to antiepileptic drugs on health care utilization and costs: findings from the RANSOM study. Epilepsia. 2009; 50(3):501–9. [PubMed: 19183224]
21. Modi AC, Wu YP, Rausch JR, Peugh JL, Glauser TA. Antiepileptic drug nonadherence predicts pediatric epilepsy seizure outcomes. Neurology. 2014; 83(22):2085–90. [PubMed: 25355825]
22. Fountain NB, Van Ness PC, Bennett A, Absher J, Patel AD, Sheth KN, et al. Quality improvement in neurology: Epilepsy Update Quality Measurement Set. Neurology. 2015; 84(14):1483–7. [PubMed: 25846995]

23. Fountain NB, Van Ness PC, Swain-Eng R, Tonn S, Bever CT Jr, et al. American Academy of Neurology Epilepsy Measure Development P. Quality improvement in neurology: AAN epilepsy quality measures: Report of the Quality Measurement and Reporting Subcommittee of the American Academy of Neurology. Neurology. 2011; 76(1):94–9. [PubMed: 21205698]

24. Moura LM, Mendez DY, Jesus JD, Andrade RA, Weissman JS, Vickrey BG, et al. Association of adherence to epilepsy quality standards with seizure control. Epilepsy Res. 2015; 117:35–41. [PubMed: 26370916]

25. Fitzsimons M, Dunleavy B, O'Byrne P, Dunne M, Grimson J, Kalra D, et al. Assessing the quality of epilepsy care with an electronic patient record. Seizure. 2013; 22(8):604–10. [PubMed: 23537634]

26. Pourdeyhimi R, Wolf BJ, Simpson AN, Martz GU. Adherence to outpatient epilepsy quality indicators at a tertiary epilepsy center. Epilepsy Behav. 2014; 39:26–32. [PubMed: 25171260]

27. Doescher MP, Saver BG, Franks P, Fiscella K. Racial and ethnic disparities in perceptions of physician style and trust. Arch Fam Med. 2000; 9(10):1156–63. [PubMed: 11115223]

Highlights

- Quality Indicator for Epilepsy Treatment 15 (QUIET-15) was investigated
- No racial/ethnic differences were found in post-seizure interventions
- Seizure recurrence was associated with taking an enzyme-inducing AED
- Only half received treatment adjustment concordant with QUIET-15
- Racial differences in provision of care were not observed.

Table 1

Characteristics of Medicare beneficiaries with epilepsy and in a random sample.

	Prevalent epilepsy cases	New epilepsy cases		Medicare beneficiaries' random sample
	N = 36,912	Possible N = 8,787	Probable N = 3,706	N = 633,710
White	19.2	21.3	18.0	87.0
African American	62.5	58.4	61.2	7.8
Hispanic	11.3	12.0	12.3	2.4
Asian	5.0	6.1	6.6	2.4
American Indian/Alaskan Natives (AI/AN)	2.0	2.2	2.0	0.4
Female	61.6	66.3	64.9	69.1
Age in 2009				
67–74	41.5	39.4	34.9	38.4
75–84	36.1	36.4	37.3	36.1
85+	22.4	24.1	27.8	26.0
Comorbid conditions				
0	8.3	5.1	3.7	41.6
1–3	45.7	42.6	41.0	39.3
4+	46.0	52.3	55.3	19.1
Neurologist close to index event in 2009	36.3	54.9	72.8	5.3
LIS[a] eligible	82.0	79.9	77.2	33.5
High poverty ZIP code area of residence	43.2	41.5	42.7	20.9
Region of residence[b]				
South	50.2	48.9	49.2	38.8
West	13.3	15.3	15.1	16.0
Mid West	17.7	17.1	17.0	25.9
North East	18.7	18.8	18.8	19.4

[a]LIS = Part D Low Income Subsidy;

[b]South = DE, DC, FL, GA, MD, NC, SC, VA, WV, AL, KY, MS, TN, AR, LA, OK, TX; West = AZ, CO, ID, NM, MT, UT, NV, WY, AK, CA, HI, OR, WA; Midwest = IN, IL, MI, OH, WI, IA, NE, KS, ND, MN, SD, MO; Northeast = CT, ME, MA, NH, RI, VT, NJ, NY, PA; Random Sample data provided for comparison only.

Table 2

Incidence of seizures requiring an emergency room visit by race among prevalent and incident cases of epilepsy in older Medicare beneficiaries.

	Overall	White	AA	Hispanic	Asian	AI/AN
Prevalent cases	N = 36,912	N = 7,071	N = 23,069	N = 4,166	N = 1,851	N = 755
≥ 1 seizure in the ER	12.6	9.2	14.5	11.1	7.7	9.4
≥ 1 seizure in the ER and occurs after AED started	11.2	8.1	12.9	9.5	6.5	9.1
Possible new cases	N = 8,787	N = 1,872	N = 5,130	N = 1,053	N = 538	N = 194
≥ 1 seizure in the ER	12.5	9.5	14.7	9.7	8.4	7.7
≥ 1 seizure in the ER and occurs after AED started	8.9	6.9	10.5	6.2	5.6	7.2
Probable new cases	N = 3,706	N = 665	N = 2,267	N = 456	N = 245	N = 73
≥ 1 seizure in the ER	17.9	14.9	20.3	15.6	11.0	*
≥ 1 seizure in the ER and occurs after AED started	10.5	8.9	11.9	8.6	6.1	*

AA: African-American; AI/AN: American Indian/Alaskan Natives; AED: Anti-epileptic drug; No significant differences across race/ethnicity;

*Omitted due to small numbers

Table 3

Interventions after seizures

	Prevalent cases N = 36,912	Possible new cases N = 8,787	Probable new cases N = 3,706
Interventions among those on one AED at time of seizure in the 2 months after seizure	N = 2,469	N = 515	N = 282
AED changed (type/number)	15.4	18.3 *	14.2
Dose changed	19.7	18.5	19.5
AED stopped > 7 days	14.9	13.0	13.1
No changes in AED	50.0	50.3	53.2
Interventions among those on >1 AED at time of seizure in the 2 months after seizure	N = 881	N = 99	N = 35
AED changed (type/number)	26.9	29.3	37.1
Dose changed (of ≥ 1 AED)	20.0	*	*
AEDs stopped for > 7 days	4.2	*	*
No changes in AED	48.9	49.5	42.9
Interventions among those not on AED at time of seizure in the 2 months after seizure	N = 782	N = 164	N = 72
AED restarted	68.5	66.5	63.9

AED: Anti-epileptic drug;

* significant p-value (< .05) possible vs prevalent cases;

† significant p-value (< .05) probable vs prevalent cases;

* Omitted due to small numbers

Table 4

Likelihood of having a seizure resulting in emergency room visit and of treatment changes after the seizure: Logistic regression analyses (Odds Ratios and 95% Confidence Intervals)

	Likelihood of having a seizure in the ER after AED starts				Likelihood of AED change/dose change/AED restart after seizure			
	N	%	OR (95% CI)	P-value	N	%	OR (95% CI)	P-value
Race/Ethnicity								
White	575	8.1	1.00	<0.0001	311	54.1	1.00	0.858
AA	2971	12.9	1.41 (1.27, 1.56)		1602	53.9	0.89 (0.73, 1.09)	
Hispanic	396	9.5	1.00 (0.86, 1.15)		205	51.8	0.80 (0.60, 1.06)	
Asian	121	6.5	0.71 (0.57, 0.89)		63	52.1	0.81 (0.53, 1.25)	
AI/AN	69	9.1	1.10 (0.84, 1.45)		40	58.0	1.17 (0.69, 2.00)	
Male	1607	11.3	1.00	0.478	871	54.2	1.00	0.644
Female	2525	11.1	1.01 (0.94, 1.08)		1350	53.5	1.02 (0.89, 1.16)	
Age in 2009								
67–74	1829	11.9	1.00	0.0005	1027	56.1	1.00	0.015
75–84	1446	10.9	0.91 (0.84, 0.98)		760	52.6	0.83 (0.72, 0.96)	
85+	857	10.4	0.89 (0.82, 0.98)		434	50.6	0.82 (0.69, 0.98)	
Comorbid conditions								
0	221	7.2		<0.0001	104	47.1		0.036
1–3	1683	10.0	1.41 (1.21, 1.64)		887	52.7	1.34 (0.99, 1.82)	
4+	2228	13.1	1.82 (1.57, 2.12)		1230	55.2	1.69 (1.25, 2.27)	
Neurologist close to diagnosis								
No	2402	10.2	1.00	<0.0001	1228	51.1	1.00	<0.0001
Yes	1730	12.9	1.48 (1.38, 1.59)		993	57.4	1.49 (1.30, 1.70)	
EI-AED								
No	1098	8.5	1.00	<0.0001	542	49.4	1.00	0.0007
Yes	3034	12.7	1.69 (1.57, 1.82)		1697	55.3	1.47 (1.27, 1.71)	
LIS eligible								
No	550	8.3	1.00	<0.0001	303	55.1	1.00	0.498
Yes	3582	11.8	1.36 (1.22, 1.51)		1918	53.5	1.16 (0.95, 1.42)	

	Likelihood of having a seizure in the ER after AED starts				Likelihood of AED change/dose change/AED restart after seizure			
	N	**%**	**OR (95% CI)**	**P-value**	**N**	**%**	**OR (95% CI)**	**P-value**
High poverty ZIP code area of residence								
No	2231	10.5	1.00	<0.0001	1173	52.3	1.00	0.101
Yes	1901	12.1	1.01 (0.94, 1.09)		1048	55.1	1.08 (0.95, 1.23)	
Region of residence								
Northeast	737	10.6	1.00	<0.0001	383	52.0	1.00	0.456
South	2195	11.8	1.08 (0.98, 1.18)		1174	53.5	1.13 (0.95, 1.35)	
West	445	9.1	0.97 (0.85, 1.11)		241	54.2	1.28 (0.99, 1.65)	
Mid West	755	11.6	1.10 (0.98, 1.22)		423	56.0	1.14 (0.93, 1.41)	

ER: Emergency room; AED: Anti-epileptic drug; AA: African-American; AI/AN: American Indian/Alaskan Natives; EI-AED: Enzyme inducing anti-epileptic drug; LIS = Part D Low Income Subsidy