

Association of non-adherence to antiepileptic drugs and seizures, quality of life, and productivity: Survey of patients with epilepsy and physicians [☆]

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ABSTRACT

Non-adherence to epilepsy medications can interfere with treatment and may adversely affect clinical outcomes, although few studies have examined this relationship. This study assessed barriers and drivers to adherence, its impact on quality of life, and the importance of the patient–physician relationship to adherence. Two cross-sectional online surveys were conducted among 408 adult patients with epilepsy and 175 neurologists who treat epilepsy patients. Twenty-nine percent of patients self-reported being non-adherent to antiepileptic medications in the prior month. Non-adherence was found to be associated with reduced seizure control, lowered quality of life, decreased productivity, seizure-related job loss, and seizure-related motor vehicle accidents. Patient-oriented epilepsy treatment programs and clear communication strategies to promote self-management and patients' understanding of epilepsy are essential to maximizing treatment and quality of life outcomes while also minimizing economic costs.

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1. Introduction

Medication non-adherence is considered one of the most serious impediments in current medical practice [1,2] and can have adverse effects on clinical and economic outcomes [3]. It is well established that non-adherence to antiepileptic drugs (AEDs) may lead to a loss of seizure control [4–6]. Negative outcomes that may be associated with a loss of seizure control include: injury, an increase in physician office visits, emergency room care and/or hospitalizations, and a decrease in productivity (e.g., missing school and work). All of these contribute to increased direct and indirect healthcare costs related to epilepsy [3,7–11].

Studies regarding adherence have found four primary factors associated with medication non-adherence: patient-related factors (e.g., socio-economic characteristics, and perceptions and beliefs), illness-related factors (e.g., severity of illness and frequency of symptoms), medication-related factors (e.g., number of daily doses,

efficacy, and side effects), and physician-related factors (e.g., patient–physician relationship) [11–15]. Research regarding patient adherence to AEDs has focused largely on the impact of the patient–physician relationship on adherence and potential education programs intended to improve adherence [11,16–18]. Findings suggest that patients tend to be more adherent when physicians have open dialogue regarding epilepsy and its treatments [16–19] and when patients are comfortable speaking with their physician [11]. It is also important for physicians to not only question patients about seizure frequency and current medication use at office visits, but to probe specifically regarding adherence [16,18].

Due to the paucity of published studies on the impact of non-adherence among patients with epilepsy, this study investigates the factors associated with non-adherence to AEDs, as well as the relationship between non-adherence and patient quality of life, seizure control, and productivity.

2. Methods

2.1. Sample

A cross-sectional online survey was conducted among adult patients with epilepsy and a separate cross-sectional survey of physicians who treat patients with epilepsy in the United States. Patients were recruited through Harris Interactive's

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HarrisPollOnline (HPOL), which is a multimillion member online panel. All individuals contacted for the study use English as their primary language. To qualify for the study, it was required that patients be U.S. residents and citizens, between 18–64 years of age, have a self-reported diagnosis of epilepsy or seizure disorder, and currently take an AED. Between April 19 and May 10, 2007 a total of 2,796 respondents received an email invitation to participate in the research. Patients received points in a Harris Interactive incentive program as encouragement for participating in this study.

For the physician survey, respondents were recruited from the Harris Interactive Physician Panel. Eligible physician respondents were required to be a neurologist or epileptologist, in practice for at least two years beyond residency/fellowship, spend at least 50% of their time in direct patient care, and treat at least one patient with epilepsy or seizure disorder per month. Between April 17 and April 20, 2007 a total of 676 physicians received an email invitation to participate in the research. Physicians received a \$50 cash honorarium for participating in this study.

2.2. Surveys

A working group of epileptologists and pharmacists specializing in epilepsy care was convened to design patient and physician-completed surveys. The patient survey contained questions regarding demographics, seizure history (type and frequency), current AED treatments, seizure related morbidity/impairments (e.g., hospitalization, ER visits, work history), quality of life, self-reported adherence, and the patient-physician relationship. Self-reported adherence was assessed by asking patients whether or not they missed or stopped a dose of their AED at varying recall periods: last week, last month, last 3 months. Based on working group consensus and published literature supporting the one month recall period [20], we established the definition of non-adherence as missing or stopping a dose in the last month. Quality of life was measured using the SF-12 Health Survey (a 12-item short-form survey), a validated sub-set of the SF-36 health assessment tool [21]. The SF-12 was chosen to be able to compare patients with epilepsy in our study to the SF-12 normative data of the general population as well as to minimize questionnaire burden for the respondents since the SF-12 is able to address quality of life in fewer questions as compared to other epilepsy scales (e.g., QOLIE-31 or QOLIE-89). The Medical Outcomes Study, MOS-Cog, was used to assess cognitive functioning and was selected because it has been widely validated and used in epilepsy [22–24]. The Health and Work Questionnaire (HWQ), a validated instrument, was used to assess productivity and work functioning [25].

For physicians, the survey captured demographics (practice and physician-specific), current prescribing behaviors, perceived non-adherence of patients, perceived reasons for non-adherence, and opinions of the patient-physician relationship. The physician survey was designed based on items in the patient survey so that comparisons could be made between the physician and patient data.

2.3. Statistical analyses

Patient data were weighted using propensity score weighting to reflect the adult epilepsy population in the United States. This is a method used to correct for attitudinal differences typically found in online respondents [26]. Variables used to weight the data included age, gender, race/ethnicity, education, region, and household income. The propensity score weighting specifically allowed for adjustment of attitudinal and behavioral differences between those who are online versus not online, those who join online panels versus those who do not, and those who responded to this survey versus those who did not.

Descriptive statistics were performed using t-tests and significance was defined as an alpha < 0.05. Bivariate and multivariate analyses using logistic regression were conducted to further understand the relationship between medication non-adherence and seizure-related events. Non-adherence to AEDs within the past month was used as the independent variable. For the multivariate analyses, the following covariates were included: depression, employment/disability status, seizure frequency in the past year, and number of epilepsy-related drugs. Statistical significance was measured using the Likelihood Ratio Test and was defined as $p < 0.05$.

3. Results

3.1. Patient and physician characteristics

A total of 408 patients completed the online survey, yielding a response rate of 28% and a qualification rate of 52%. The average survey duration for patients was 23 minutes (SD: 13.9). Respondents were distributed around the United States and numerous zip codes were represented. Most respondents ($n = 382$) had unique zip codes while 13 zip codes were shared by two respondents each. The majority of respondents were white (81%), male (51%) and had a mean age of 43 years (SD: 11.7). Additional patient demographic information is presented in Table 1. On average, pa-

Table 1
Patient characteristics

	All patients ($n = 408$)	Adherent patients ($n = 298$)	Non-adherent patients ($n = 110$)
Gender			
Male	51%	48%	59%
Female	49%	52%	41%
Age			
18–19	1%	1%	^a
20–29	15%	13%	16%
30–39	22%	17%	32%
40–49	32%	36%	21%
50–59	23%	22%	24%
60+	9%	10%	6%
Mean (SD)	43.3 (11.7)	44.2 (11.7)	41.3 (11.8)
Marital status			
Single, never married	29%	29%	31%
Married	52%	54%	49%
Divorced	9%	8%	12%
Separated	2%	1%	3%
Widowed	1%	2%	1%
Living with partner	6%	6%	5%
Highest level of education			
Less than high school	1%	1%	—
High school	38%	38%	38%
College	50%	50%	50%
Graduate school	11%	11%	12%
Race			
White	81%	80%	84%
Black/African-American	5%	7%	—
Hispanic	5%	6%	3%
Other	7%	6%	8%
Declined to answer	2%	1%	4%
Income			
<\$15,000	17%	17%	19%
\$15,000–34,999	25%	22%	29%
\$35,000–49,999	14%	14%	14%
\$50,000–74,999	12%	11%	15%
\$75,000–99,999	11%	12%	7%
\$100,000+	10%	11%	7%
Declined to answer	12%	13%	10%

Note. Percentages may not add up to 100% because of rounding.

^a Less than 1%.

tients began experiencing seizures at 20 years of age (SD: 14.2) and were diagnosed with epilepsy or seizure disorder by a physician at 21 years of age (SD: 13.7). Over half (57%) of patients self-reported that they had generalized epilepsy, 12% reported partial epilepsy, a quarter reported both generalized and partial epilepsy, and 7% were not sure of their epilepsy type. Sixty-one percent of patients reported that they were on monotherapy while 38% reported that they were on a combination of epilepsy-related medications (mean number of epilepsy-related medications: 1.6, SD: 1.2).

Thirty percent of patients experienced a seizure in the preceding three months of taking the survey and 11% had experienced a seizure during the prior 3 to 12 months. Fifty-five percent had not experienced a seizure for 12 months or more, while 4% were unsure when their last seizure occurred. The majority of patients (76%) described the current level of control they experience with their epilepsy or seizure disorder as “completely controlled” or “well-controlled” compared to 8% who reported that they were “poorly controlled” or “not at all controlled.” Prevalent co-morbid conditions included: depression (37%), high cholesterol (27%), migraines (24%), hypertension (24%), physical disability (20%), and asthma (15%).

A total of 175 physicians completed the online survey, yielding a response rate of 40% and a qualification rate of 65%. The average survey duration for physicians was nine minutes (SD: 5.4). Physi-

cians were distributed across the United States, with each representing a unique zip code. For the physician survey, data were available from 175 physicians, 99% neurologists and 1% epileptologists. Eight-five percent of physicians were male. On average, physicians have been in practice for 15 years (SD: 7.9), spend 93% (SD: 10.9) of their time in direct patient care, and treat an average of 46 adults (SD: 50.2) with epilepsy per month. Physician practice demographics are displayed in Table 2.

3.2. Rates of non-adherence to AEDs

Non-adherence was defined as a patient who self-reported missing a dose or stopping an AED within the last month. Using this classification, 29% of patients were categorized as non-adherent and 71% as adherent. There were no demographic differences (i.e., gender, age, education, race, or income) between adherent and non-adherent patients. On average, adherent patients reported taking 1.6 AEDs (SD: 1.4) and 2.7 other non-AEDs (SD: 3.2) while non-adherent patients reported being on 1.6 AEDs (SD: 0.9) and 2.5 other medications (SD: 3.0). Adherent patients (64%) were significantly more likely than non-adherent patients (37%) to report they had not experienced a seizure in the past year ($p < 0.05$).

Generally, patients rated their own adherence higher than physicians. When probed specifically about taking their medication at the same frequency as prescribed, significantly more patients (84%) reported taking their AED as prescribed within the last month compared to physicians who reported 76% on behalf of their patients ($p < 0.05$). However, patients and physicians reported similar rates of taking AEDs less often than as prescribed in the last month (14% vs. 20%, respectively).

3.3. Factors associated with non-adherence

Both patients and physicians on behalf of their patients identified patient forgetfulness or not having medication on hand as the primary reason for non-adherence to AEDs (72% vs. 70%, respectively). When considering other treatment-related factors contributing to missing AEDs, patients significantly differed from

physicians in that patients ranked the following factors as less important than physicians: cost (13% vs. 43%, $p < 0.05$), side effects (9% vs. 60%, $p < 0.05$), and dosing frequency (3% vs. 33%, $p < 0.05$). These data are depicted in Fig. 1. Overall, adherent patients were significantly more likely than non-adherent patients (93% vs. 83%, $p < 0.05$) to report that they are “very” or “extremely confident” in knowing how to take their medication as prescribed. Adherent patients were significantly more likely than non-adherent patients to indicate that they fit their medications into a daily routine in order to take AEDs as prescribed (53% vs. 37%, $p < 0.05$).

3.4. Association of non-adherence and seizure control

Non-adherent patients were significantly ($p < 0.05$) more likely than adherent patients to report that they had experienced a loss of seizure control, had symptoms that were “poorly” or “not at all controlled,” had one or more seizures in the past year, and had experienced a convulsive seizure. Importantly, non-adherent patients were also significantly ($p < 0.05$) more likely than adherent patients to report that they missed a dose of their epilepsy medication before experiencing a seizure. These data can be found in Fig. 2.

The majority of patients who experienced a loss of seizure control had their epilepsy treatment changed as a result of the seizure (72%). Treatment changes included: changing the dose of their current medication (70%), switching to a new medication (61%), adding another medication (56%), and switching to a new formulation (16%). On average, neurologists reported that they switched a patient who experienced a loss of seizure control to a different dose of their current medication 41% of the time, added a new medication to the patients' regimen 21% of the time, or switched to a new medication 20% of the time.

3.5. Association of non-adherence on quality of life and productivity

Fig. 3 presents the association between non-adherence and quality of life. Non-adherent patients scored significantly lower than those who are adherent on the mental health summary (SF-12 MNBS) and on overall cognition (MOS-Cog). Both groups scored similarly on the physical health summary (SF-12 PNBS). Non-adherent patients were significantly more likely than adherent patients to have experienced greater consequences as a result of a seizure, such as losing or being fired from a job or missing work or school due to depression.

For the Health Work Questionnaire (HWQ), adherent respondents were significantly more likely to score higher than non-adherent patients on their own productivity, concentration and focus, and the HWQ total. These data are depicted in Table 3. Non-adherent patients were significantly more likely than adherent patients to say that they had to miss or stop going to school or work due to a seizure because of thinking/memory issues (38% vs. 21%, $p < 0.05$) or because they faced the embarrassment of having a seizure in front of classmates/coworkers (31% vs. 16%, $p < 0.05$).

3.6. Multivariate analysis of medication non-adherence and seizure-related events

Table 4 presents the bivariate and multivariate associations observed between non-adherence and seizure-related events. The bivariate results demonstrated that non-adherent patients were more likely than adherent patients to miss or stop going to work due to seizure-related loss of or firing from a job (OR: 3.14, $p < 0.0001$, CI: 1.84–5.35), miss or stop going to work due to seizure-related loss of driving ability (OR: 1.76, $p = 0.02$, CI: 1.10–2.82), experience a motor vehicle accident due to a seizure (OR: 2.18, $p = 0.006$, CI: 1.25–3.81), be hospitalized due to a seizure

Table 2
Characteristics of neurologists

Variable	All physicians (n = 175)
Specialty	
Neurology	99%
Epileptology	1%
Years in practice	
2–5	13%
6–10	25%
11–15	17%
16–20	18%
21–25	20%
26+	7%
Mean (SD)	14.6 (7.9)
Time spent in direct patient care	
41–50%	2%
51–60%	3%
61–70%	3%
71–80%	6%
81–90%	19%
91–100%	66%
Mean (SD)	92.5% (10.9)
No. of patients with epilepsy/month	
Pediatric (0–11)	7.2 (20.3) ^a
Adolescent (12–17)	9.9 (16.2)
Adult (18–64)	45.8 (50.2)
Geriatric (65+)	30.8 (44.0)

^a Mean (SD).

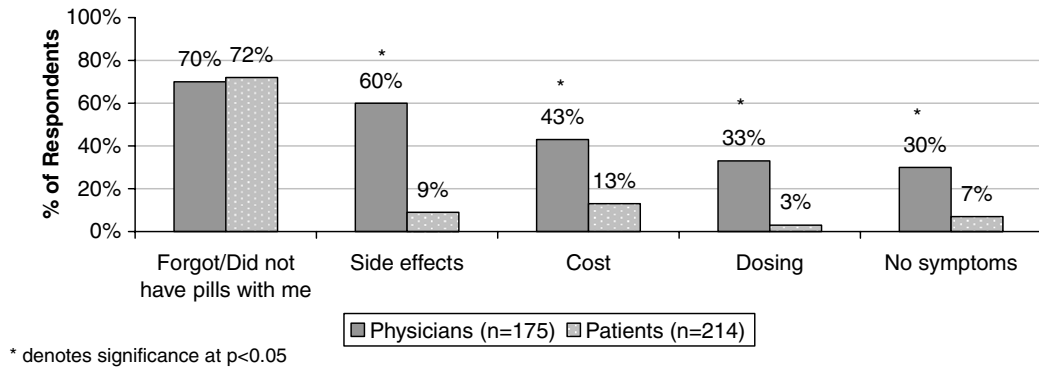


Fig. 1. Factors associated with non-adherence.

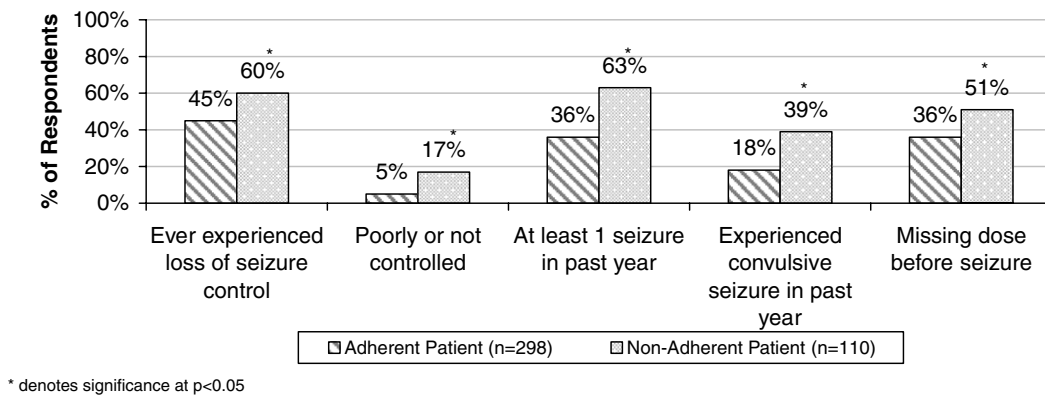


Fig. 2. Association between non-adherence and seizure activity.

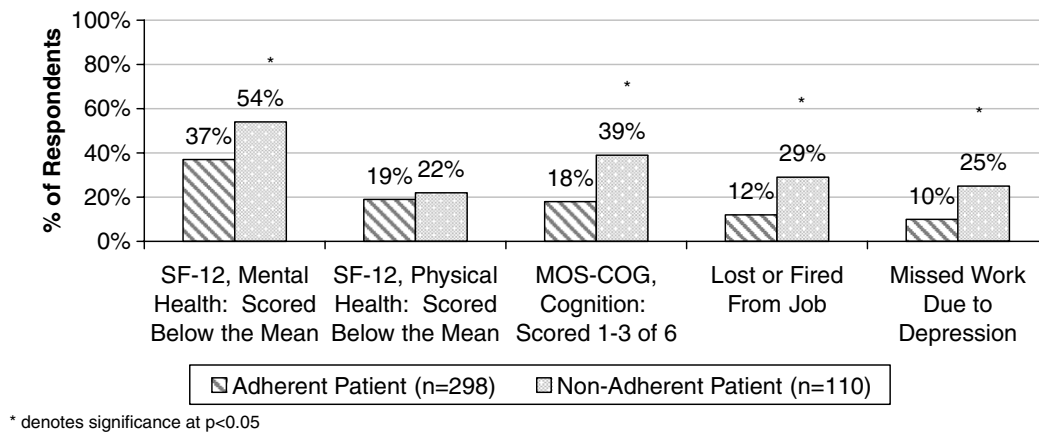


Fig. 3. Association between non-adherence and quality of life.

(OR: 1.60, $p = 0.03$, CI: 1.04–2.47), and to experience loss of seizure control (OR: 1.82, $p = 0.007$, CI: 1.18–2.81). After adjusting for potential confounders, the multivariate analyses demonstrate a statistically significant increased likelihood to stop going to work due to seizure-related loss of or firing from a job (OR: 3.09, $p = 0.0001$, CI: 1.73–5.53) or to experience a motor vehicle accident due to a seizure (OR: 1.92, $p = 0.03$, CI: 1.07–3.43).

3.7. Patient–physician relationship

More physicians reported that they believe that patients trust physicians to make the decision that is best for the patient than pa-

tients reported (34% vs. 29% top-box “strongly agree” on a 5-point scale). Physicians were significantly less likely than patients to report that patients feel comfortable discussing missed medications with physicians (7% top-box vs. 22% top-box, $p < 0.05$). About one-third of physicians believe that they spend a lot of time talking to their patients regarding their epilepsy; however, few patients agree with this statement (31% top-box vs. 14% top-box).

We also examined the patient–physician relationship from the perspectives of adherent and non-adherent patients. Adherent patients (27%) were significantly more likely than non-adherent patients (12%) to “strongly agree” that they are comfortable discussing missed medications with their doctor ($p < 0.05$). In addi-

Table 3
Health Work Questionnaire scores^a

	Mean (SD) HWQ score	
	Adherent (n = 113–130)	Non-adherent (n = 55–59)
Productivity		
Own	7.7 ^b (1.6)	7.1 (1.7)
Others	8.1 (1.8)	7.6 (1.6)
Total	7.9 (1.6)	7.4 (1.4)
Concentration and Focus total	7.9 ^b (2.1)	6.0 (2.0)
Impatience and Irritability total	7.4 (2.1)	7.1 (2.1)
HWQ total	7.8 ^b (1.5)	7.0 (1.4)

^a All respondents in analysis for HWQ were employed.

^b Significant at $P < 0.05$.

tion, adherent patients (34%) were significantly more likely than non-adherent patients (17%) to “strongly agree” that they trust their doctor to make decisions that are best for them ($p < 0.05$). These, along with physician data comparisons, are in Fig. 4.

4. Discussion

This study found a non-adherence rate of 29% and associated AED non-adherence with reduced seizure control, lowered quality of life, and decreased job-related productivity. Notably, non-adherence was also strongly related to seizure-related job loss and motor vehicle accidents. The results of this study underscore the importance of patient-related factors (such as forgetfulness) and treatment-related factors (including side effects, dosing, and costs)

which contribute to non-adherence. Furthermore, while we cannot state direction, non-adherence was associated with reduced mental and emotional well-being, including impaired cognition. These types of seizure-related events and complications contribute to the estimated thirteen billion dollar annual costs of care for patients with epilepsy [10,17].

The association of medication non-adherence and seizure control has been documented in previous literature [4]. In a study by Jones et al., the authors hypothesized that general practitioners may refer patients with poor control to specialists due to an apparent failure of AED treatment when non-adherence could be the major contributor to the appearance of treatment failure [4]. Similarly, non-adherent patients in our study were more likely than adherent patients to experience a loss in seizure control and those that experienced a loss of seizure control were likely to have their treatment changed in some way. The failure to consider adherence as a reason for apparent medication failure may result in an unnecessary increase in AED dosage or an addition of another AED in an attempt to control seizures [27,28]. This may unnecessarily expose the patient to more medication related side effects and iatrogenic complications. In order to assist physicians in identifying non-adherent patients, a standardized epilepsy management protocol should be developed that assists physicians in correctly identifying the causes of treatment failure.

In our study, non-adherent patients were less likely than adherent patients to understand the importance of taking AEDs exactly as prescribed. Improving patient understanding of their condition and treatment offers a means of empowerment, which may facilitate treatment adherence, better management, and improved quality of communication with healthcare providers [17]. Such

Table 4
Association Between Medication Adherence and Seizure-Related Events

	Bivariate [^]		Multivariate	
	Odds Ratio	Confidence Intervals	Odds Ratio	Confidence Intervals
Ever Missed or Stopped Going to Work Due to Seizure-Related Loss of or Firing from a Job	3.14 [*]	(1.84–5.35)	3.09 [*]	(1.73–5.53)
Experienced Motor Vehicle Accident Due to Seizure	2.18 [*]	(1.25–3.81)	1.92 [*]	(1.07–3.43)
Ever Been Hospitalized as a Result of a Seizure	1.60 [*]	(1.04–2.47)	1.54	(0.98–2.41)
Ever Missed or Stopped Going to Work Due to Seizure-Related Loss of Driving Ability	1.76 [*]	(1.10–2.82)	1.46	(0.89–2.40)
Ever Experienced Loss of Seizure Control	1.82 [*]	(1.18–2.81)	1.32	(0.82–2.14)
Ever Been to Emergency Room as a Result of a Seizure	1.50	(0.93–2.42)	-	-
Ever Missed/Stopped Going to Work Due to Increased Number of Doctor Visits	0.92	(0.48–1.76)	-	-
Experienced Injury, Fall, or Accident Due to Seizure	0.76	(0.49–1.19)	-	-

Note: Unweighted $N = 408$.

^{*} Denotes significance using the Likelihood Ratio Test.

[^] Bivariate was not controlled for: ever having depression, being disabled, the number of seizures in the past year, or the number of epilepsy-related drugs currently taking.

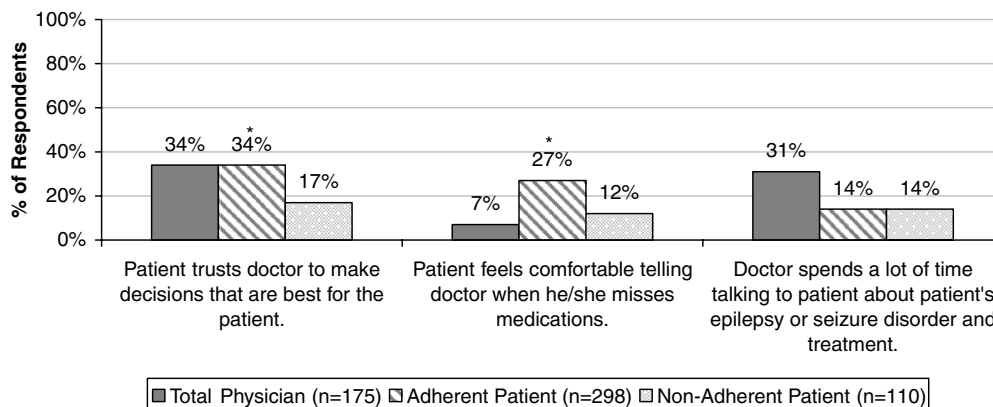


Fig. 4. Patient-physician relationship: percentage who agree with statements.

strategies appear to enforce the importance of taking AEDs as prescribed and offer an opportunity for the patient to interact with healthcare providers more often [17]. Patients in our study reported the perception that their physicians do not spend a lot of time discussing epilepsy and treatments with them. Dilorio et al. found that patients, nurses, and physicians agreed that information on medications and seizures were the two most important learning needs for patients [19]. Dowse and Futter found that patients who visited a specialist clinic and received individual attention were more informed about their disease which had a significant impact on their adherence [28]. These findings further exemplify the need for a more patient-oriented approach to care.

Patients have a desire for information regarding their disease and would like to be part of the medical decision-making process [19]. Similar to the study Buck et al. conducted [11], which suggested that those patients who are more comfortable talking with their physician tend to be more adherent, we found that patients who report a trusting relationship with their physician and who feel comfortable discussing missed medications are more likely to be adherent. As a result, physician education should focus on best practices regarding how to enhance communication with patients about epilepsy, treatment regimens and the importance of adherence, keeping in mind that some patients are reluctant to openly speak with physicians about these issues.

Communication between patients and physicians should occur on an ongoing basis to keep patients informed of their disease and physicians informed of any patient behavioral or lifestyle changes. In addition, since verbal communication alone is not always sufficient [29] patients should also be given written information about epilepsy and their treatment at the time of diagnosis and anytime their treatment is modified. Forgetfulness may be the primary reason for non-adherence [27,28] and significantly more adherent patients than non-adherent patients in our study report they fit their medication into their daily routine. Therefore, physicians should stress the use of a reminder method and also provide patients with a plan of action in the written information for when pills are forgotten.

Interestingly, 27% of our adult epilepsy sample reported being disabled. However, other published estimates also support the association between epilepsy and disability. McDermott et al. conducted retrospective electronic record audits and found that seizure prevalence rates were higher among those with a disability compared to patients without a disability [30]. Additional research is needed to understand the role of epilepsy on employment status.

4.1. Limitations

There are limitations inherent in collecting self-reported data. Adherence was measured using patient report, and patients may have overestimated their adherence [31]. There is also no gold standard to define or assess non-adherence in survey-based studies and definitions used in the literature have varied [32–34]. As a result, our definition of non-adherence was based on working group consensus and published literature to indicate that patients could effectively recall disease-related events in the month prior [20]. There are other methods that may be more objective that can be used to assess adherence including: evaluation of serum medication levels, electronic monitoring caps, or matching to claims databases [35–37]. Claims database studies and electronic monitoring caps are intended to quantify prescription fills and patterns. However, these measures cannot assess the impact of specific factors such as barriers to adherence, quality of life, and impact of productivity at work. Future research is warranted to augment patient-reported data on non-adherence with one of the abovementioned measures.

The diagnosis of epilepsy, type of seizures (e.g., partial, generalized), seizure frequency, and medication-taking behavior in this study are also based solely on patient report. These data were not verified by medical records or physician report and may be subject to incorrect reporting. Patients enrolled from the Harris Interactive website underwent no clinical screening process to confirm their self-reported diagnosis. However, it is unlikely that subjects other than the intended respondents completed the survey because limited monetary gain (points redeemable for a gift) was associated with participation in the survey. In addition, participation required a commitment of just over 20 minutes to complete the survey, which does not lend to participation by a casual respondent.

Some selection bias may have resulted due to using an online panel for data collection. The selection bias associated with the sample in an Internet-based survey is that all respondents have made choices that potentially differentiate them from the population of interest (e.g., they have chosen to become part of the Internet population and have chosen to become part of a survey panel). As a result of these choices, the respondents may differ in fundamental ways from the population of interest on attitudinal and behavioral dimensions as well as demographic dimensions. For example, those that are online typically have higher education and are non-Hispanic, white, or Asian [38]. We found similar demographic characteristics in our online sample. In addition, Kaye found that 15% of adults with a work disability use the Internet [39]; however we found a relatively high prevalence of reported disability within our epilepsy sample. In order to minimize these potential biases, we used propensity score weighting for the patient sample [26].

Similarly for the neurologist sample, there may be inherent bias present due to the online nature of the sample surveyed. However, when observing the practice characteristics of the neurologists, there was an even distribution of number of years in practice, large amount of time devoted to patient care, and relatively good volume of epilepsy patients seen per month. All of these attributes suggest that the neurologists were well-informed regarding epilepsy patient-specific issues and could knowledgeably respond on behalf of their patients regarding possible adherence problems.

5. Conclusions

These findings underscore the factors associated with and the impact of non-adherence in adult patients with epilepsy. Targeted epilepsy management programs and communication strategies are necessary to improve adherence and to avoid the clinical consequences of poor adherence. Further longitudinal research combining patient report and objective measures of tracking adherence are needed to fully understand the drivers and impact of non-adherence to AEDs in the epilepsy community.

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