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Title

Outpatient visit behavior in patients with epilepsy: Generalized Epilepsy is more frequently non-attendance than Focal Epilepsy

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Abbreriviations:
ASM, anti-seizure medications; CAE, Childhood Absence Epilepsy; CI, confidence interval; FE, Focal Epilepsy; FLE; frontal lobe epilepsy; GE, Generalized Epilepsy; GTCA, epilepsy with Generalized Tonic-Clonic Seizures Alone; IGE, Idiopathic Generalized Epilepsy; ILAE, International League Against Epilepsy; JAE, Juvenile Absence Epilepsy; JME, Juvenile Myoclonic Epilepsy; OR, odds ratio; PWE, patients with epilepsy; TLE, temporal lobe epilepsy.

Highlights

- Patients with Idiopathic Generalized Epilepsy (IGE) were more frequent in non-attendance to appointments than Focal Epilepsy (FE).
- In patients with IGE, females were less frequently in non-attendance than males.
- No difference in odds of non-attendance between Juvenile Myoclonic Epilepsy (JME) and IGE other than JME was identified.

Abstract

Background:

Patients with epilepsy (PWE), especially those with Generalized Epilepsy (GE), are at a high risk of disadvantage caused by non-adherence. It has been suggested that medical visit behavior may be a surrogate indicator of medication adherence. We hypothesized that patients with IGE would adhere poorly to visits.

Methods:

This was a retrospective study of PWE who visited the Department of Psychiatry and Neurology at Hokkaido University Hospital between January 2017 and December 2019. Demographic and clinical information on PWE were extracted from medical records and visit data from the medical information system. Non-attendance of outpatient appointments was defined as "not showing up for the day of an appointment without prior notice." Mixed-effects logistic regression analysis was conducted with non-attendance as the objective variable.

Results:

Of the 9151 total appointments, 413 were non-attendances, with an overall non-attendance rate of 4.5%. IGE was a more frequent non-attendance than Focal Epilepsy (FE) (odds ratio (OR) 1.94; 95% confidence interval (CI) 1.17–3.21; p = 0.010). History of public assistance receipt was associated with higher non-attendance (OR 2.04; 95% CI 1.22–3.43; p = 0.007), while higher education (OR 0.64; 95% CI 0.43–0.93; p = 0.021) and farther distance to a hospital (OR 0.33; 95% CI 0.13–0.88; p = 0.022), and higher frequency of visits (OR 0.18; 95% CI 0.04–0.86; p = 0.031) were associated with fewer non-attendances. In a subgroup analysis of patients with GE, women were associated with fewer non-attendance (OR 0.31; 95% CI 0.14–0.72; p =

0.006).

Conclusions:

GE was more frequent in the non-attendance group than in the FE group. Among patients with GE, females were found to have non-attendance less frequently; however, there was no clear difference in the odds of non-attendance between Juvenile Myoclonic Epilepsy (JME) and IGE other than JME.

Keywords

Idiopathic Generalized Epilepsy; Outpatient visit behavior; Non-attendance; Poor adherence; Personality traits

1. Introduction

Poor treatment adherence in patients with epilepsy (PWE) negatively affects their prognosis. The occurrence of generalized tonic-clonic seizures and status epilepticus caused by medication nonadherence increases emergency visits and hospital admissions [1,2]. Declining medication adherence increases the risk of Sudden Unexpected Death in Epilepsy [3]. Poor medication adherence also affects social outcomes such as unemployment and car accidents [4].

Treatment adherence has also been noted to vary according to the epilepsy diagnosis. Patients with Generalized Epilepsy (GE), especially Idiopathic Generalized Epilepsy (IGE), are more likely to have poor medication adherence than those with Focal Epilepsy (FE) [2,5]. Patients with Juvenile Myoclonic Epilepsy (JME), a type of IGE, are more likely to discontinue visiting the hospital regularly [6,7] and to cause withdrawal seizures as a result of medication discontinuation [8]. Therefore, patients with IGE may be at a high risk of suffering from disadvantages caused by poor adherence.

Studies on the visit behavior of PWE have been conducted to assess adherence to treatment [9-15], investigate the reasons and factors behind non-attendance [16-18], survey the prognosis for non-attendance [19], and to optimize outpatient appointment systems [20,21]. Although visit adherence is a potential indirect surrogate measure of medication adherence [10,12,13,22], these studies have several limitations, including insufficient consideration of the effect of companions [10,13,16-21], ambiguous diagnostic classification of epilepsy [16,17, 19-21], and insufficient assessment of clinical factors associated with non-attendance [11-13,15,16].

This study aimed to investigate whether non-attendance of outpatient visits is

more predominant in patients with IGE than in patients with other types of epilepsy, and which factors may influence non-attendance. We conducted this study with a focus on the accurate diagnosis of epilepsy and the exclusion of PWE who needed to be accompanied. We hypothesized that among PWE, IGE is associated with a higher frequency of non-attendance at outpatient visits than other epilepsy diagnoses. We also performed a sub-analysis of patients with IGE to elucidate whether JME is associated with a higher risk of poor visit adherence than IGE other than JME.

2. Methods

2.1. Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Review Committee for Life and Medical Research of Hokkaido University Hospital (C-A2022-0148).

2.2. Study population

This was a retrospective cohort study of PWE attending the outpatient epilepsy department of the Department of Psychiatry and Neurology at Hokkaido University Hospital. Data of PWE who visited our department between January 2017 and December 2019 were extracted from medical information systems. The selected subjects were classified according to the International League Against Epilepsy (ILAE) 2017 epilepsy types [23]. The type of epilepsy in each patient was diagnosed by multiple experienced epileptologists. To include PWE who could visit an outpatient epilepsy clinic with adults independently, those with GE other than IGE and Combined Generalized and Focal Epilepsy, which may require support for outpatient visits because of physical or mental disabilities, were excluded. Patients with Unknown Epilepsy were also excluded because it may be indistinguishable from IGE. Consequently, the IGE and FE were included in the analysis.

Subsequently, those under 18 years of age, those who needed to be accompanied by hospital visits, those with concurrent family visits, those living outside Hokkaido, and those with other ineligibility requirements related to hospital visits (fewer than three return visits during the study period, examination only, no prescription, and hospitalization) were excluded.

2.3. Assessment of outpatient visit behavior

Non-attendance for an outpatient appointment was defined as "not showing up for an appointment without prior notice." Non-attendance was used as the main measure.

In our department, referrals from other physicians on the first visit are mandatory. The appointment times for the first visits are fixed. The outpatient staff, who are informed by the referring physicians, determine the appointment date and inform patients, making it difficult for patient preferences to be reflected. However, for return visits, patient preferences are more likely to be reflected as the doctors and patients discuss and decide the date and time of the next appointment during the consultation. Because the method of visit differed between the first and return visits, we excluded the first visit and evaluated only the return visit.

2.4. Data collection

Patient characteristics (age, sex, address, education history, work status, marital status, and public assistance) and clinical data (family history of epilepsy, frequency of seizures, epilepsy type, epilepsy syndrome, age of onset, duration of illness, frequency of hospital visits, number of anti-seizure medications (ASM) and comorbid psychiatric disorders) were extracted from the medical records. Patients who had already visited the hospital were referred to our medical records at the beginning of the study. Patients who visited the hospital during the study period were referred to our records at the time of their first visit. The distance between the participant's home and our facility was calculated using the distance measurement function between points in Google Maps

(https://support.google.com/maps/answer/1628031?hl=en&co=GENIE.Platform%3DDesktop).

Patients with outpatient appointments were displayed on the medical information system as “no-show.” Their status changes to “waiting” when the patient passes their IC card through the return visit reception machine upon visiting the hospital on the day of their return visit. After completing the consultation, the doctor closes the medical record, and the status changes to “finished.” If patients do not visit the hospital, the status remains as “no-show.” These visit categories, appointment times, and visit times for each appointment date were extracted from the medical information system.

2.5. Statistical analyses

2.5.1. Summary of statistical analyses

Mixed-effects logistic regression was performed with non-attendance binary data as the objective variable and the predictors as explanatory variables, as described in previous studies [20,24]. The predictors included patient background factors, epilepsy clinical factors, and visit behavioral factors, as described below. Continuous variables were stratified based on these predictors and categorical variables were used. Predictors were included as fixed effects. A random-effects term for the intercept grouped by patient identifier was also included.

All statistical analyses were performed using the dplyr package in R (version 4.0.2, R Foundation for Statistical Computing, Vienna, Austria). All probability values were two-tailed, and the significance level was set at $p < 0.05$.

2.5.2. Patient background factors

Patient background factors were selected based on their effects on non-attendance reported in previous studies [25]. Sex was categorized as male or female, marital status as married or unmarried (never married or divorced), and public assistance as having received public assistance or never. Age was classified into three groups based on the Japanese long-term care insurance system: under 39 years, 40–64 years, and 65 years or older. The distance was classified as less than 5 km, between 5 and 50 km, and more than 50 km, considering the daily living and commuting distances in the Sapporo metropolitan area. Work status was categorized as either employed or unemployed. Educational history was classified into two categories: high school graduates or lower and junior college/university graduates or higher.

2.5.3. Epilepsy clinical factors

Clinical factors of epilepsy were categorized as follows: number of ASM (one, two, three, or more), duration of illness (<1 year, 1-5 years, >5 years), seizure freedom (free, not free), psychiatric disorder (with vs no comorbidity). Seizure freedom was defined as "no seizures have appeared for at least 3 years since the last seizure. Epilepsy types were categorized as IGE or FE to compare IGE with other types of epilepsy.

2.5.4. Visit behavioral factors

While previous studies have reported that lead time (the time interval between the date when the appointment is registered and the actual appointment date) is a predictor of non-attendance, in this study, we used visit interval as a surrogate indicator and classified it as twice or more a month, once a month, or once in several months in terms of the stability of treatment. In addition, patients with JME tend to have a

nocturnal circadian rhythm and difficulty with activities before 10 a.m. [26-29]. Hence, the appointment times were divided into four categories: early morning (8–10 a.m.), late morning (10–12 a.m.), afternoon (12–3 p.m.), and early evening (3–5 p.m.).

2.5.5. Subgroup analyses

IGE includes four established epilepsy syndromes: Childhood Absence Epilepsy (CAE), Juvenile Absence Epilepsy (JAE), epilepsy with Generalized Tonic-Clonic Seizures Alone (GTCA), and JME [30]. JME is the most common IGE and is a more homogeneous population, as described by the characteristic seizures and EEG findings [31,32]. Therefore, a subgroup analysis of patients with IGE was performed to compare JME with other types of IGE and mixed-effects logistic regression was used. It was assumed that patients with IGE generally have a good prognosis for seizures [32,33] and that very few patients come from distant or frequent visits. Therefore, in the IGE-only subgroup analysis, the distance was classified as less than 5 km and more than 5 km and the visit interval was 1-2 times a month and once every several months, respectively.

3. Results

3.1. Subject background

A total of 923 patients (15085 appointments) who met the inclusion criteria were identified from outpatient appointment data during the study period. Six hundred and thirty-three participants were identified from these patients, after excluding those who met the exclusion criteria, 97 participants with insufficient demographic and appointment information, and 536 participants (9151 appointments) (Figure 1).

Of the 536 patients, 89 had IGE, of which five (0.9%) had CAE, 12 (2.2%) had JAE, 30 (5.6%) had JME, 37 (6.9%) had GTCA, and five (0.9%) had unspecified IGE. Of the 447 patients with FE, 134 (25.0%) had temporal lobe epilepsy (TLE), 120 (22.4%) had frontal lobe epilepsy (FLE), and 193 (36.0%) had other types of epilepsy (parietal lobe, occipital lobe, and undetermined focal epilepsy).

The demographic data of the participants are presented in Table 1.

3.2. Non-attendance rate

Out of a total of 9151 appointments, 413 were not attended, for an overall non-attendance rate of 4.5%. Out of the 1252 appointments for patients with IGE, 103 were not attended, with a non-attendance rate of 8.2%, and out of a total of 7899 appointments for patients with FE, 310 were not attended, with a non-attendance rate of 3.9%.

3.3. Main analysis

Results of mixed-effects logistic regression with non-attendance as the objective variable showed that among clinical factors associated with epilepsy, the

diagnosis of IGE was associated with higher non-attendance compared to FE (odds ratio (OR) 1.94; 95% confidence interval (CI) 1.17–3.21; p = 0.010) (Table 2). Other clinical factors (duration of illness, number of ASMs, freedom from seizures, and psychiatric disorders) were not associated with non-attendance.

Among the characteristics data, the history of public assistance receipt was associated with higher non-attendance (OR 2.04; 95% CI 1.22–3.43; p = 0.007). High educational history (high school or higher, including college and junior college degrees) (OR 0.64; 95% CI 0.43–0.93; p = 0.021) and farther distance to a hospital (OR 0.33; 95% CI 0.13–0.88; p = 0.022) were associated with fewer non-attendances. No significant differences were found in terms of sex, age, work status, or marital status.

Among the visit behavior data, a higher frequency of visits (twice a month or more) (OR 0.18; 95% CI 0.04–0.86; p = 0.031) was associated with fewer non-attendance. The appointment time was not clearly associated with non-attendance.

3.4. Sub-analysis

In a subgroup analysis of patients with IGE only, mixed-effects logistic regression showed that females were associated with fewer non-attendance (OR 0.31; 95% CI 0.14–0.72; p = 0.006) (Table 3). No clear association was observed between the diagnosis (JME or IGE other than JME) and non-attendance.

4. Discussion

Mixed-effects logistic regression with non-attendance as the objective variable in PWE showed that the odds of non-attendance were higher for IGE than for FE. No other clinical variables were significantly associated with non-attendance. Among the patient background factors, public health insurance, educational history, distance to the hospital, and sex were associated with non-attendance. Among visiting behavior factors, the frequency of hospital visits was associated with non-attendance. Mixed-effects logistic regression restricted to patients with IGE showed that females had lower odds of non-attendance than males did. There was no clear difference in the odds of non-attendance between JME and IGE other than JME.

4.1. Reasons for high rate of non-attendance among patients with IGE

This study found a high rate of non-attendance among patients with IGE, which may be attributed to the difference in seizure burden between patients with IGE and those with FE. The duration of the seizure differs based on the type of seizure, with focal seizures being longer than generalized seizures [34]. Compared with the patients with FE, it is possible that the patients with IGE might not feel the need to visit hospitals for seizure relief as absence and myoclonic seizures are of extremely short duration, although generalized tonic-clonic seizures are different. In addition, a large study investigating seizure burden reported persistent seizures (≥ 1 per year) in up to 56% of patients with FE and over 40% of patients with IGE [35,36]. While these previous studies suggested that inter-diagnostic differences in seizure frequency may have an effect on inter-diagnostic differences in non-attendance, this study found that seizure freedom (including seizure frequency) did not affect non-attendance. Hence,

inter-diagnostic differences in non-attendance were found to be not related to seizure frequency.

Furthermore, it is likely that personality or cognitive traits of the IGE might have had an effect on the high rate of non-attendance in patients with IGE. Personality traits of the JME, such as indifference towards illness, lack of discipline, and hedonism, have long been described [37], and these may have influenced the visit behavior of patients with IGE. In addition to personality traits, several cognitive characteristics of the IGE have been reported to be associated with frontal lobe function, including executive dysfunction [38-52], impulsivity [41,45,50,53-58], risk-taking behavior [59-62], and social cognition [42,63,64]. Patients with IGE and JME have impairments in a wide range of executive functions, including mental flexibility, conceptualization, and response inhibition [38,40,46] and are less likely to make complex plans, break predetermined rules, or have difficulty inhibiting ongoing activities [52]. Among these cognitive traits, difficulties with complex planning may have made it difficult to manage appointments properly. The difficulty in controlling ongoing activities may also have made it difficult to keep appointments on time.

Although this study showed that IGEs had a high rate of non-attendance, we cannot eliminate the possibility that the low rate of FE non-attendance indicated that IGEs had a relatively high rate of non-attendance. TLE, the main syndrome of FE, has personality characteristics such as viscosity and hypermorality [37], which may decrease the non-attendance of FE. In contrast, patients with FE also have pervasive cognitive dysfunction [65-68], which may affect the increase in non-attendance. In any case, because TLE accounted for 25.0% of FE cases in this study, we believe it is difficult to explain the overall non-attendance of FE with the characteristics of TLE.

4.2. Reasons for low non-attendance in women patients with IGE

Previous systematic reviews found that sex was not a statistically significant predictor of no-shows in most studies; however, some studies reported that males were more likely to miss appointments than females [25]. In this study, there was no sex difference in non-attendance in PWE; however, females were less likely to be non-attendants in patients with IGE.

In IGE, sex differences have been identified in seizures and electrophysiology [69-71]. An association between catamenial seizures and refractoriness in female patients with IGE has been noted [71]. In addition, PWE has unique counseling issues for females, such as pregnancy, parturition, and breastfeeding [72]. Although valproate is the first-line drug for seizures in patients with IGE, females tend to avoid prescribing valproate, a teratogenic drug that results in less seizure freedom [69,70,73-75]. Although this study did not examine individual prescription medications because female patients with IGE face medication challenges at various stages of their lives, contrary to patients with IGE who are seizure-free and can discontinue their visits [6,7], these patients may have a higher demand for consultation and reduced non-attendance. In addition, impulsivity has been reported to be higher in males among patients with IGE [56], which may influence sex differences in non-attendance in patients with IGE.

4.3. Additional Results

Although the overall non-attendance rate in this study (4.5%) was detectably lower than that in previous reports on non-attendance among PWE (9–46.4%) [17-19], it is noteworthy that the previous studies counted those who were absent, whereas this

study considered appointments that resulted in non-attendance. Hence, they are not directly comparable. The non-attendance rates (5–12.5%) of previous studies that counted the number of missed appointments [20,24] were comparatively similar or lower than that reported in this study. There were several reasons for this observation. Although previous studies have reported higher non-attendance rates for first-time visits than for return visits [25], it is possible that the non-attendance rate was lower in this study because first-time patients were excluded due to the different visit procedures from return patients, such as the time and paperwork involved in arriving at the hospital. In addition, while previous studies have reported that facilities with more experienced physicians have lower non-attendance rates [25], this study included PWE attending an outpatient department at a university hospital, and it is possible that the high level of expertise at our facility influenced the lower non-attendance rates.

In Japan, a universal health insurance system is provided. Since 2003, the co-payment to citizens has been 30% [76]; however, public assistance recipients in poverty can receive medical care without co-payment [77]. While this study showed an association between a history of receiving public assistance and non-attendance, previous studies have indicated an association between Medicaid recipients and non-attendance [25], agreeing that poor individuals have a higher rate of non-attendance. Previous studies have attributed this to not owning a contact phone number due to poverty [78]. Additionally, inappropriate frequent outpatient attendance among public assistance recipients has been observed in Japan [79], suggesting that while some poor people are more likely to have access to medical care, they are also more prone to disregard appointments and have disorderly visit behavior. This study showed an association between low educational history and high non-attendance, similar to

previous studies [25]. This could be explained by the association of the low educational history with low health literacy in PWE [80], and low health literacy is associated with higher rates of non-attendance [81]. This study showed an association between hospital visit intervals and non-attendance, consistent with previous findings that longer lead times are associated with higher rates of non-attendance [25]. In this study, visiting the hospital from far distances was associated with a decrease in non-attendance, a trend that differed from that of a previous study that showed an increase in non-attendance rates at further distances [25]. This study was conducted on patients who visited our hospital in Sapporo from all over Hokkaido, and their visit behavior may have been more planned, as they needed to secure transportation for travel over a wide area beyond the commuting metropolitan area.

4.4. Strengths and limitations of this study

This study is the first to report differences in medical visit behaviors based on the diagnosis of epilepsy according to the 2017 ILAE classification of epilepsies. As we excluded patients/appointments with companions, we were able to successfully assess the patients' visit behavior. A comprehensive review of the relevant factors expected from previous studies allowed us to identify those that affect non-attendance.

This study has several limitations. First, because the endpoint was outpatient visit behavior, it was difficult to establish a study design and subject population that would compare patients with IGE to healthy controls. As a result of limiting the subject population to PWE who could visit the hospital independently, only patients with IGE and FE were included in the analysis. Doctor-patient relationships and physician communication skills may influence adherence [82,83]; however, this was a

retrospective study and could not be evaluated. The seizure frequency was recorded based on patient self-reports, which may differ from the actual seizure frequency. Although physical comorbidities may have had an effect on non-attendance [24], only psychiatric comorbidities were evaluated in this study. The reason for this is that the epilepsy physician in our department was a specialized psychiatrist and psychiatric comorbidities were always evaluated. However, new physical illnesses that emerged during long-term visits could have been undeclared by the patient or not interviewed and documented by the physician. This study included Japanese patients living in Hokkaido, Japan. Differences in population in terms of geography, race, and culture may not always be generalizable.

5. Conclusions

Patients with IGE were more frequently non-attending than those with FE. Among patients with IGE, females were found to have non-attendance less frequently; however, there was no clear difference in the odds of non-attendance between JME and IGE other than JME.

Although this study did not assess executive dysfunction, impulsivity, or personality traits, these may be associated with non-attendance. Future studies that assess correlations between these rating scales and non-attendance are expected to be conducted.

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Declaration of interest

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	Value	*n*
Characteristics		
Sex, n (%)		536
Male	226 (42.2)	
Female	310 (57.8)	
Age, year, n (%)		536
~39	202 (37.7)	
40~64	263 (49.1)	
65~	71 (13.2)	
Distance, km, n (%)		536
~5	206 (38.4)	
5~49.9	289 (53.9)	
50~	41 (7.6)	
Education history, n (%)		536
~High school graduate	277 (51.7)	
Vocational school, (Jr.) Collage graduate~	259 (48.3)	
Marital status, n (%)		536
Unmarried, Divorced	303 (56.5)	
Married	233 (43.5)	
Work status, n (%)		536
Unemployed	237 (44.2)	
Employed(In school)	299 (55.8)	
History of receiving public assistance, n (%)		536
Never received	449 (83.8)	
Have received	87 (16.2)	
Psychiatric disorder, n (%)		536
No psychiatric comorbidity	403 (75.2)	
With psychiatric comorbidity	133 (24.8)	
Diagnosis, n (%)		536
Generalized epilepsy (GE)	89 (16.6)	
Idiopathic Generalized Epilepsy (IGE)	89 (16.6)	
Childhood Absebce Epilepsy(CAE)	5 (0.9)	
Juvenile Absebce Epilepsy(JAE)	12 (2.2)	
Juvenile Myoclonic Epilepsy(JME)	30 (5.6)	
Epilepsy with Generalized Tonic-Clonic Seizures Alone(GTCA)	37 (6.9)	
Unspecifed IGE	5 (0.9)	
Focal Epilepsy (FE)	447 (83.4)	
Temporal Lobe Epilepsy (TLE)	134 (25.0)	
Frontal Lobe Epilepsy (FLE)	120 (22.4)	
Other Focal Epilepsy	193 (36.0)	
Duration of illness, years, n (%)		536
~1	8 (1.5)	
1~4.9	40 (7.5)	
5~	488 (91.0)	
Number of ASM, n (%)		536
1	306 (57.1)	
2	130 (24.3)	
3~	100 (18.7)	
Freedom from seizures, n (%)		536
Free	252 (47.0)	
Not free	284 (53.0)	
Visit interval, n (%)		536
Once a several months	405 (75.6)	
Once a month	117 (21.8)	
Twice a month	14 (2.6)	

Table 1. Participant characteristics

	Odds ratio	95%CI		*P*
Sex (Female vs male)	0.76	0.52	1.13	0.173
Age (y)				
40~64 vs ~39	0.80	0.52	1.22	0.292
65~ vs ~39	0.59	0.30	1.18	0.139
Education history (Collage etc. vs ~High school)	0.64	0.43	0.93	0.021*
Work status (Employed (In school) vs Unemployed)	1.17	0.75	1.82	0.495
Marital status (Married vs Unmarried, Divorced)	1.04	0.69	1.56	0.854
Distance (km)				
5~49.9 vs ~4.9	0.95	0.65	1.39	0.784
50~ vs ~4.9	0.33	0.13	0.88	0.022*
Public assistance (Have received vs Never received)	2.04	1.22	3.43	0.007**
Diagnosis (IGE vs FE)	1.94	1.17	3.21	0.010*
Duration of illness (y)				
1~5 vs ~1	1.18	0.21	6.53	0.850
5~ vs ~1	1.13	0.22	5.72	0.882
Number of ASM (n)				
2 vs 1	0.88	0.54	1.44	0.618
3~ vs 1	0.97	0.56	1.68	0.909
Freedom from seizures (Not free vs Free)	0.79	0.52	1.21	0.271
Psychiatric disorder (With vs No comorbidity)	0.72	0.45	1.14	0.161
Visit interval				
Once a month vs Once a several months	1.16	0.70	1.92	0.575
Twice a month vs Once a several months	0.18	0.04	0.86	0.031*
Appointment time				
Early morning vs Early evening	0.73	0.43	1.24	0.242
Late morning vs Early evening	1.01	0.60	1.70	0.975
Afternoon vs Early evening	0.79	0.48	1.30	0.348

CI: confidence interval; IGE: Idiopathic Generalized Epilepsy; FE: Focal Epilepsy.
Collage etc.: Vocational school, (Jr.) Collage, Graduate school are included.

Table 2. Mixed-effect logistic regressions analysis, variables associated with non-attendance

	Odds ratio	95%CI		*P*
Sex (Female vs Men)	0.31	0.14	0.72	0.006**
Age (y)				
40~64 vs ~39	1.10	0.42	2.85	0.852
65~ vs ~39	0.31	0.04	2.19	0.241
Education history (Collage etc. vs ~High school)	0.70	0.31	1.55	0.376
Work status (Employed (In school) vs Unemployed)	0.88	0.37	2.12	0.773
Marital status (Married vs Unmarried, Divorced)	1.95	0.80	4.77	0.142
Distance (km)(5~ vs ~4.9)	0.67	0.27	1.62	0.373
Public assistance (Have received vs Never received)	2.77	0.76	10.09	0.123
Diagnosis (JME vs IGE other than JME)	1.04	0.43	2.49	0.939
Duration of illness (y)(5~ vs ~4.9)	0.80	0.19	3.49	0.770
Number of ASM				
2 vs 1	0.29	0.07	1.20	0.088
3~ vs 1	3.74	0.63	22.19	0.147
Freedom from seizures (Not free vs Free)	0.97	0.41	2.30	0.944
Psychiatric disorder (With vs No comorbidity)	0.79	0.22	2.86	0.713
Visit interval (1-2 times a month vs Once a several montl	0.81	0.16	4.07	0.793
Appointment time				
Early morning vs Early evening	1.11	0.40	3.11	0.840
Late morning vs Early evening	2.06	0.72	5.90	0.181
Afternoon vs Early evening	0.93	0.34	2.57	0.889

CI: confidence interval; IGE: Idiopathic Generalized Epilepsy; JME: Juvenile Myoclonic Epilepsy.
Collage etc.: Vocational school, (Jr.) Collage, Graduate school are included.

Table 3. Mixed-effect logistic regressions analysis for patients with IGE, variables associated with non-attendance

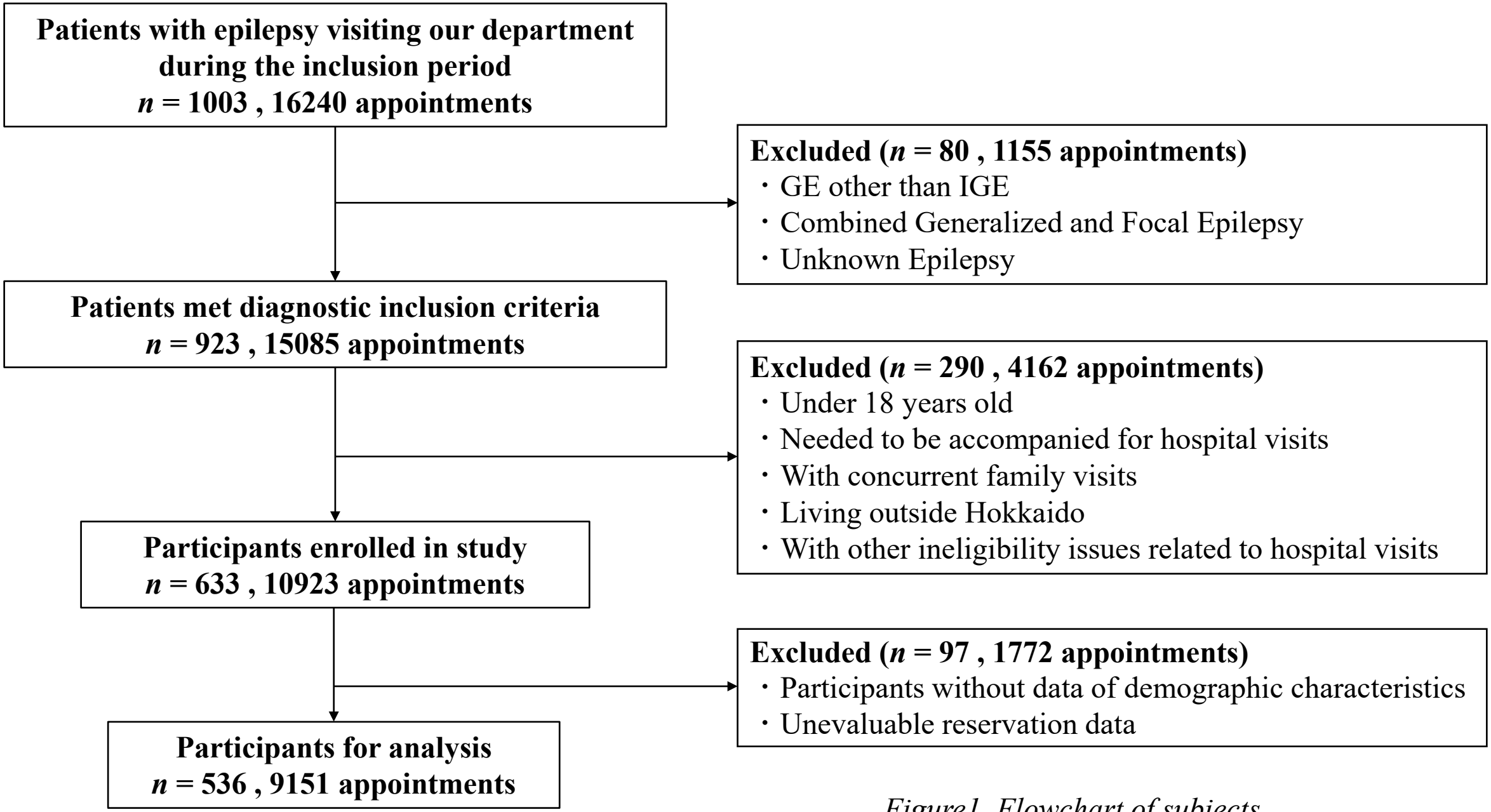

Figure1. Flowchart of subjects