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Clinical Research

The Impact of Telemedicine Versus Face-to-Face Follow-Up on Quality of Life, Anxiety and Patient Satisfaction in Patients with Epilepsy: A Randomized Controlled Study

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ABSTRACT

Objective: Epilepsy is a chronic disease that affects patients worldwide and significantly impairs quality of life. In recent years, particularly following the COVID-19 pandemic, telemedicine has emerged as an important alternative for epilepsy management. This study investigates the effects of face-to-face and telemedicine follow-up methods on quality of life, anxiety-depression levels, and patient satisfaction among patients with epilepsy.

Material and Method: A cohort of 60 patients, aged 18 to 65 years, who were under observation at Ankara Bilkent City Hospital, was recruited for this study. Participants were randomly allocated into two groups: face-to-face (n =30) and telemedicine (n =30). The Quality of Life in Epilepsy-31 (QOLIE-31) questionnaire was employed to assess quality of life, while anxiety and depression were analyzed via The Hospital Anxiety and Depression Scale (HADS). Patient satisfaction was measured with the Short Assessment of Patient Satisfaction (SAPS).

Results: The telemedicine group demonstrated significantly higher total QOLIE-31 scores compared to the face-to-face group (55.4 ± 13.2 vs. 46.2 ± 12.9; p =0.0061). Additionally, the telemedicine group showed superior scores in general quality of life (p =0.0019), emotional well-being (p =0.0214), energy/fatigue (p =0.0451), and social functioning (p=0.0483). Anxiety scores were significantly lower in the telemedicine group (6.8 ± 5.6 vs. 9.6 ± 4.9; p =0.0289). Patient satisfaction levels were also significantly greater in the telemedicine group based on SAPS scores (p <0.001).

Conclusion: Telemedicine follow-up improves quality of life and patient satisfaction while reducing anxiety levels in patients with epilepsy. These findings support the integration of telemedicine as an effective monitoring tool and a key component of comprehensive epilepsy care.

Keywords: *Anxiety, Epilepsy, Patient Satisfaction, Quality of Life, Telemedicine.*

ÖZ

Epilepsi Hastalarında Teletıp ile Yüz Yüze Takibin Yaşam Kalitesi, Anksiyete ve Hasta Memnuniyeti Üzerine Etkisi: Randomize Kontrollü Bir Çalışma

Amaç: Epilepsi, dünya genelinde milyonlarca insanı etkileyen ve yaşam kalitesini çok boyutlu şekilde azaltabilen kronik bir nörolojik hastalıktır. Son yıllarda, özellikle COVID-19 pandemisi ile birlikte, teletıp uygulamaları epilepsi yönetiminde önemli bir alternatif haline gelmiştir. Bu çalışmada, epilepsi hastalarının yüz yüze ve teletıp yoluyla izlenmesinin yaşam kalitesi, anksiyete-depresyon düzeyleri ve hasta memnuniyeti üzerindeki etkileri karşılaştırılmıştır.

Gereç ve Yöntem: Çalışmaya Ankara Bilkent Şehir Hastanesi'nde takip edilen, 18-65 yaş aralığında toplam 60 epilepsi hastası dahil edilmiştir. Hastalar randomize olarak yüz yüze (n =30) ve teletıp (n =30) gruplarına ayrılmıştır. Epilepsili Bireyler için Yaşam Kalitesi Ölçeği-31 (QOLIE-31), anksiyete ve depresyon düzeyleri Hastane Anksiyete ve Depresyon Ölçeği (HAD) ve hasta memnuniyeti Kısa Hasta Memnuniyet Ölçeği (KHMÖ) ile değerlendirilmiştir.

Bulgular: Teletıp grubunda QOLIE-31 toplam skoru anlamlı şekilde daha yüksek bulunmuştur (55,4 ± 13,2 vs. 46,2 ± 12,9; p =0.0061). Genel yaşam kalitesi (p =0.0019), duygusal iyilik hali (p =0.0214), enerji/yorgunluk (p =0.0451) ve sosyal işlevsellik (p =0.0483) alt boyutlarında da anlamlı üstünlük saptanmıştır. HAD-Anksiyete skorları teletıp grubunda daha düşük bulunmuştur (6,8 ± 5,6 vs. 9,6 ± 4,9; p =0.0289). Hasta memnuniyeti KHMÖ skorları açısından da teletıp grubunda anlamlı derecede daha yüksek memnuniyet gözlenmiştir (p <0.001).

Sonuç: Teletıp uygulamaları epilepsi hastalarında yaşam kalitesi ve hasta memnuniyetini artırmakta, anksiyete düzeylerini ise azaltmaktadır. Bu bulgular, teletıp hizmetlerinin epilepsi tedavi süreçlerinde etkili bir izlem aracı ve sağlık hizmetlerinin bütünleyici bir parçası olarak değerlendirilmesi gerektiğini desteklemektedir.

Anahtar Sözcükler: *Anksiyete, Epilepsi, Hasta Memnuniyeti, Teletıp, Yaşam Kalitesi.*

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Epilepsy is a long-standing neurological condition impacting nearly 50 million individuals across the globe. Characterized by recurring seizures, the condition often begins in childhood or older adulthood and can impair cognitive, psychosocial, and physical functioning across multiple domains (1, 2). In addition to seizure control, factors such as psychosocial challenges, treatment adherence, and access to healthcare

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services are critical determinants of overall well-being in individuals living with epilepsy. Consequently, the management of epilepsy should not rely solely on pharmacological interventions but must adopt a holistic approach that includes long-term monitoring, counseling, and psychosocial support (3).

With the growing adoption of digital health innovations in recent years, has positioned telemedicine as a key tool in the management of chronic illnesses. For individuals facing geographic or physical barriers to healthcare, telemedicine not only facilitates sustainable follow-up but also offers new opportunities for personalized care and enhanced patient–clinician interaction (4). The COVID-19 pandemic further accelerated the adoption of remote healthcare models, making the benefits and limitations of telemedicine more apparent across various chronic conditions, including epilepsy (5). Multiple studies have reported that telemedicine-based follow-up in epilepsy may positively impact treatment adherence, patient satisfaction, and quality of life (6, 7).

Despite these promising findings, there remains a limited number of studies that directly compare the clinical outcomes, psychological well-being, and patient experience between telemedicine and face-to-face care in epilepsy. Furthermore, it is essential to evaluate not only the technical feasibility of such interventions but also their multidimensional impact on patients' quality of life, depression and anxiety levels, and satisfaction with care (8). Therefore, there is a growing need for contemporary, controlled studies that explore the broader effects of telemedicine in the context of epilepsy.

This study investigates the effects of telemedicine and face-to-face follow-up on quality of life, anxiety-depression levels, and patient satisfaction in individuals with epilepsy, offering a comprehensive assessment of telemedicine's role in epilepsy care.

MATERIAL AND METHOD

Study Design and Sample

This research was structured as a prospective, cross-sectional, randomized controlled trial. A cohort of 60 epilepsy patients, aged 18 to 65 years, who attended the epilepsy unit at the Ankara Bilkent City Hospital Neurology Outpatient Clinic, were included in the study. The study cohort was divided into two groups using a random allocation method: a face-to-face follow-up group (n =30) and a telemedicine follow-up group (n= 30). Eligibility criteria included the ability to complete online questionnaires and participate in telemedicine interviews. Patients in the telemedicine group were evaluated after a minimum of two consultations conducted at intervals of at least three months, over a total follow-up period of no less than six months. Individuals who were unable to complete online forms or attend virtual consultations were excluded. Before joining the study, all participants provided informed consent. The study obtained ethical approval from the Ankara Bilkent City Hospital Clinical Research Ethics Committee on January 26, 2022, under the reference number E1-22-2341.

Data Collection Tools

Demographic characteristics, clinical features related to epilepsy, information on antiepileptic drug use, and seizure frequency within the past year were collected using a standardized form developed by the researchers.

Quality of Life in Epilepsy-31 (QOLIE-31)

Quality of life was assessed using the QOLIE-31 scale, which was adapted and validated for Turkish populations by Mollaoğlu et al. (9). The scale consists of 31 items grouped into seven subscales: Seizure Worry, Medication Effects, Energy/Fatigue, Emotional Well-being, Cognitive Functioning, Social Functioning, and Overall Quality of Life. The Turkish version of the scale has a reported Cronbach's alpha coefficient of 0.90, indicating high internal consistency.

Hospital Anxiety and Depression Scale (HADS)

The HADS was utilized to assess levels of anxiety and depression. Validation of the Turkish version was conducted by Aydemir et al., with Cronbach's alpha coefficients of 0.85 for the anxiety subscale and 0.77 for the depression subscale (10).

Short Assessment of Patient Satisfaction (SAPS)

Patient satisfaction was measured using the SAPS. The Turkish adaptation and validation of the scale were conducted by Kutlu et al., who reported a Cronbach's alpha of 0.87 (11).

Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Normality was tested using the Kolmogorov-Smirnov test. The Mann–Whitney U test was employed to compare the two independent groups. Categorical variables were analyzed using Pearson's chi-square test. Continuous variables are expressed as mean ± standard deviation (SD), whereas categorical variables are represented by frequencies (n) and percentages (%). Relationships among QOLIE-31, HADS, and SAPS scores were analyzed using Spearman's rank correlation. To identify independent predictors of SAPS scores, multiple linear regression analysis was conducted. A p-value of < 0.05 was considered statistically significant.

RESULTS

The study included 60 individuals diagnosed with epilepsy, who were randomly divided into two groups: 30 participants received face-to-face follow-up care, while the remaining 30 were monitored via telemedicine. The groups were comparable in terms of age (face-to-face: 33.5±11.1 years; telemedicine: 34.2±9.6 years; p =0.8417) and gender distribution (50% female in both groups). No statistically significant differences were found between the groups regarding marital status, educational attainment, or employment status, as all p-values exceeded the 0.05 threshold. In the face-to-face group, 60% of the patients were married (n =18) and 40% single (n =12), while in the telemedicine group, 53.3% were married (n =16) and 46.7% were single (n =14) (p =0.7945). Regarding education, 63.3% of face-to-face patients were high school graduates (n =19), 20% university graduates (n =6), and 3.3% had completed only middle school (n =1). The corresponding rates in the telemedicine group were 56.7% (n =17), 20% (n =6), and 6.7% (n =2), respectively (p =0.9065). Employment rates were similar between groups, with 53.3% (n =16) of face-to-face patients and 60.0% (n =18) of telemedicine patients being employed (p =0.7945) (Table 1).

Table 1. *Demographic characteristics of patients with Epilepsy.*

	Face-to-Face (n/%)	Telemedicine (n/%)	p-value
Age (mean ± SD)	33.5 ± 11.1	34.2 ± 9.6	0.8417
Gender			1.0000
Female	15 (50.0%)	15 (50.0%)	
Marital Status			0.7945
Married	18 (60.0%)	16 (53.3%)	
Single	12 (40.0%)	14 (46.7%)	
Education Level			0.9065
Middle School	1 (3.3%)	2 (6.7%)	
High School	19 (63.3%)	17 (56.7%)	
University	6 (20.0%)	6 (20.0%)	
Employment Status			0.7945
Employed	16 (53.3%)	18 (60.0%)	
Unemployed	14 (46.7%)	12 (40.0%)	

There were no statistically significant group differences observed in epilepsy-related clinical variables, including type of epilepsy, seizure classification, disease duration, seizure frequency over the past year, or antiepileptic treatment regimen (p >0.05) (Table 2).

Table 2. *Clinical Characteristics of Patients with Epilepsy.*

	Face-to-Face (n/%)	Telemedicine (n/%)	p-value
Epilepsy Type			0.7954
Focal	18 (60.0%)	17 (56.7%)	
Generalized	12 (40.0%)	13 (43.3%)	
Seizure Type			0.7911
Focal	19 (63.3%)	20 (66.7%)	
Generalized	11 (36.7%)	10 (33.3%)	
Duration of Epilepsy (years)	12.6 ± 7.4	11.9 ± 6.9	0.690
Annual Seizure Frequency	7.3 ± 4.8	6.8 ± 5.2	0.672
AED Regimen			0.9243
Monotherapy	12 (40.0%)	11 (36.7%)	
Polytherapy	17 (56.7%)	18 (60.0%)	
No Medication	1 (3.3%)	1 (3.3%)	

Focal epilepsy was diagnosed in 60% (n =18) of face-to-face patients and 56.7% (n =17) of telemedicine patients, while generalized epilepsy was present in 40% (n =12) and 43.3% (n =13), respectively (p =0.7954). Similarly, focal seizures were observed in 63.3% and generalized seizures in 36.7% of face-to-face patients; for telemedicine patients, the respective rates were 66.7% and 33.3% (p =0.7911).

The average epilepsy duration was 12.6 ± 7.4 years in the face-to-face group and 11.9 ± 6.9 years in the telemedicine group (p =0.690). The average annual number of seizures was also comparable: 7.3 ± 4.8 in the face-to-face group versus 6.8 ± 5.2 in the telemedicine group (p =0.672).

As for AED therapy, 40% (n =12) of face-to-face patients were on monotherapy, 56.7% (n =17) on polytherapy, and 3.3% (n =1) were untreated. In the telemedicine group, 36.7% (n =11) received monotherapy, 60% (n =18) polytherapy, and 3.3% (n =1) were not receiving treatment (p =0.9243).

When the Quality of Life in Epilepsy-31 (QOLIE-31) scores were analyzed, the total score was significantly greater in the telemedicine group compared to the face-to-face group (55.4±13.2 vs. 46.2±12.9; p =0.0061). Subscale analysis revealed that general quality of life (37.3±10.1 vs. 27.9±9.8; p =0.0019), emotional well-being (62.7±17.9 vs. 52.5±16.7; p =0.0214), energy/fatigue (59.0±19.5 vs. 50.0±19.3; p =0.0451), and social functioning (64.6±17.5 vs. 56.2±17.9; p =0.0483) scores were also significantly higher in the telemedicine group. No significant differences were observed between the groups in the subdomains of seizure worry (52.7±22.0 vs. 53.4±23.2; p =0.9646), cognitive functioning (44.6±13.2 vs. 45.0±12.8; p =0.8070), and medication effects (41.2±22.1 vs. 42.5±23.7; p =0.8883) (Table 3).

According to the HADS assessment, individuals in the face-to-face group exhibited significantly higher anxiety scores than those in the telemedicine group, with respective scores of 9.6±4.9 and 6.8±5.6 (p =0.0289). No significant differences were found between the groups for depression scores (6.4±4.0 vs. 6.9±4.2; p =0.6394) or total HADS scores (16.0±8.4 vs. 13.7±8.7; p =0.1709) (Table 3).

Table 3. *QOLIE-31 and HADS Scores of Patients with Epilepsy.*

	Face-to-Face (Mean ± SD)	Telemedicine (Mean ± SD)	p-value
QOLIE-31 Total Score	46.2 ± 12.9	55.4 ± 13.2	0.0061
Overall Quality of Life	27.9 ± 9.8	37.3 ± 10.1	0.0019
Emotional Well-being	52.5 ± 16.7	62.7 ± 17.9	0.0214
Energy/Fatigue	50.0 ± 19.3	59.0 ± 19.5	0.0451
Social Functioning	56.2 ± 17.9	64.6 ± 17.5	0.0483
Seizure Worry	53.4 ± 23.2	52.7 ± 22.0	0.9646
Cognitive Functioning	45.0 ± 12.8	44.6 ± 13.2	0.8070
Medication Effects	42.5 ± 23.7	41.2 ± 22.1	0.8883
HADS-Anxiety	9.6 ± 4.9	6.8 ± 5.6	0.0289
HADS-Depression	6.4 ± 4.0	6.9 ± 4.2	0.6394
HADS-Total	16.0 ± 8.4	13.7 ± 8.7	0.1709

HADS: Hospital Anxiety and Depression Scale; QOLIE-31: Quality of Life in Epilepsy Inventory-31.

Patient satisfaction, measured with the Short Assessment of Patient Satisfaction (SAPS), was significantly higher in the telemedicine group than in the face-to-face group (p <0.001). The mean SAPS score was 8.73 ±1.96 in the telemedicine group and 14.43±2.94 in the face-to-face group, indicating markedly greater satisfaction among patients receiving telemedicine-based follow-up. When categorized, 86.7% (n =26) of the telemedicine group reported being "Very Satisfied" and 13.3% (n =4) "Satisfied." None of the telemedicine patients reported being "Dissatisfied" or "Very Dissatisfied." In contrast, only 10% (n =3) of the face-to-face group were "Very Satisfied," while 83.3% (n =25) were "Satisfied" and 6.7% (n =2) "Dissatisfied." No patients in either group were categorized as "Very Dissatisfied" (Figure 1).

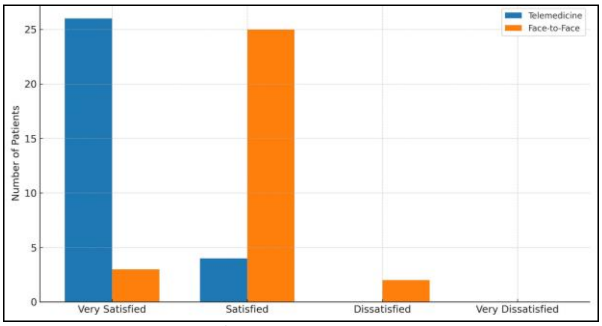

Figure 1. *Patient Satisfaction Categories by Follow-Up Method according to Short Assessment of Patient Satisfaction (SAPS).*

Spearman's correlation analysis indicated that there were no statistically significant associations between SAPS scores and the total and subscale scores of QOLIE-31 or HADS (p >0.05) (Table 4).

Table 4. *Spearman Correlation Between SAPS Scores and Clinical/Psychosocial Variables in the Telemedicine Group.*

	Spearman ρ	p-value
HADS-Anxiety	0.076	0.691
HADS-Depression	0.077	0.685
HADS-Total	0.049	0.7964
QOLIE-31 Total Score	0.159	0.4023
Seizure Worry	-0.261	0.1636
Overall Quality of Life	0.078	0.6801
Emotional Well-being	-0.099	0.6039
Energy/Fatigue	0.181	0.3392
Cognitive Functioning	0.009	0.9638
Medication Effects	0.082	0.6654
Social Functioning	0.207	0.2733

HADS: Hospital Anxiety and Depression Scale; QOLIE-31: Quality of Life in Epilepsy Inventory-31; SAPS: Short Assessment of Patient Satisfaction.

Similarly, in multiple linear regression analysis, none of the independent variables were found to significantly predict SAPS scores (p >0.05) (Table 5).

Table 5. *Linear Regression Results: Effects of Clinical and Psychosocial Variables on SAPS Scores in the Telemedicine Group.*

	β Coefficient	Standard Error	t	p-value	95% CI (Lower)	95% CI (Upper)
Constant	5.7717	2.5254	2.2855	0.0346	0.466	11.0774
HADS-Anxiety	0.1093	0.1393	0.7852	0.4425	-0.1832	0.4019
HADS-Depression	0.1035	0.1894	0.5464	0.5915	-0.2944	0.5014
HADS-Total	-0.0917	0.1416	-0.6478	0.5253	-0.3892	0.2057
QOLIE-31 Total Score	0.0081	0.0181	0.4462	0.6607	-0.0299	0.046
Seizure Worry	-0.015	0.0118	-1.2729	0.2193	-0.0398	0.0098
Overall Quality of Life	0.02	0.0248	0.8074	0.43	-0.0321	0.0722
Emotional Well-being	0.003	0.0154	0.194	0.8483	-0.0293	0.0352
Energy/Fatigue	0.0014	0.0136	0.0997	0.9216	-0.0272	0.0299
Cognitive Functioning	0.0147	0.0207	0.7093	0.4872	-0.0289	0.0583
Medication Effects	0.0056	0.0111	0.5039	0.6204	-0.0177	0.0289
Social Functioning	0.0099	0.0139	0.7136	0.4846	-0.0192	0.039

HADS: Hospital Anxiety and Depression Scale; SAPS: Short Assessment of Patient Satisfaction; QOLIE-31: Quality of Life in Epilepsy Inventory-31.

DISCUSSION

In our study, the total QOLIE-31 scores were observed to be significantly higher in the telemedicine group. Subscale analyses further revealed that patients in the telemedicine group had superior scores, particularly in the domains of general quality of life, emotional well-being, energy/fatigue, and social functioning. These findings are consistent with those reported in the literature. A previous study involving epilepsy patients demonstrated that those followed via telemedicine exhibited significantly better quality of life compared to those receiving face-to-face care (7). This difference was attributed to several factors, including increased temporal and spatial flexibility in accessing healthcare, shorter and more convenient appointment processes, the comfort of being at home, and reduced interference with daily activities during follow-up. Similarly, Koh et al. highlighted that during the COVID-19 pandemic, telemedicine services improved patient comfort, reduced psychological stress, and contributed positively to quality of life in individuals with epilepsy (12). Likewise, Samia et al. reported that telemedicine played an important role in preserving and improving quality of life among epilepsy patients (13). These mechanisms support the findings of our study, suggesting that telemedicine may serve as a viable follow-up strategy to enhance quality of life in chronic conditions such as epilepsy.

With regard to anxiety, HADS-Anxiety scores were significantly lower in the telemedicine group. This may reflect the fact that telemedicine allows patients to access healthcare providers more promptly and with greater ease, thereby reducing uncertainty and mitigating anxiety. Klotz et al. found that telemedicine reduced stress associated with hospital visits and helped lower anxiety levels in pediatric epilepsy patients by improving access to care (14). Additionally, Fonseca et al. demonstrated that telemedicine helped maintain psychological resilience and reduced negative affective states such as anxiety and depression, especially under pandemic conditions (8). These findings align with the lower anxiety levels observed in our telemedicine group.

In terms of patient satisfaction, the telemedicine group reported significantly higher levels of satisfaction. Easier access to healthcare, reduced waiting times, and a more individualized approach are key contributors to this outcome. One study in epilepsy patients noted that telemedicine enabled patients to save time and allowed for less disruption to work and family life, which, in turn, enhanced overall satisfaction (6). Moreover, Teng et al. emphasized that remote monitoring models increased both satisfaction and patient loyalty to healthcare services among individuals with epilepsy (15). These findings suggest that telemedicine not only offers practical convenience but also strengthens the patient–provider relationship, leading to greater satisfaction.

In our study, we did not identify any statistically significant correlations between SAPS scores and the QOLIE-31 subscales or HADS scores. Similarly, multiple linear regression analysis revealed no independent variable that significantly predicted SAPS scores. This outcome indicates that patient satisfaction may not be directly explained by clinical parameters such as quality of life or psychological status alone. Another study in epilepsy patients emphasized that patient satisfaction is influenced not only by clinical outcomes but also by individual expectations, ease of access to healthcare, and the quality of communication with healthcare providers (6). In line with this, Klotz et al. noted that satisfaction is shaped by psychosocial and environmental factors as well as personal health perceptions (14). The absence of statistically significant correlations or predictive variables in our findings may also be attributed to the limited sample size and the heterogeneous characteristics of the patient population. Therefore, future research should aim to explore patient satisfaction as a complex outcome variable using larger samples and multivariate modeling.

Our findings revealed no statistically significant group differences in the QOLIE-31 subscales related to cognitive performance, concerns about seizures, or perceived effects of medication. This may be explained by the relatively short follow-up period, during which the neuropsychiatric aspects of epilepsy may remain stable regardless of follow-up modality. In support of this, Helmstaedter and Witt have emphasized that long-term outcomes such as cognitive functioning require extended observation periods and comprehensive neuropsychological assessment to detect meaningful changes (16). Thus, the absence of significant differences in these areas was not unexpected.

One of the primary limitations of this study is the relatively short follow-up period of six months, which may be insufficient to detect meaningful changes in certain parameters such as cognitive functioning and perceived medication effects. This temporal constraint should be more explicitly acknowledged and addressed in future research through long-term follow-up designs. Additionally, the study was conducted at a single center with a relatively small sample size, which limits the generalizability of the findings. Multi-center studies with larger and more diverse populations are warranted to confirm the reproducibility and external validity of these results. Furthermore, the exclusive reliance on self-report questionnaires introduces the potential for subjective bias. Future studies should consider incorporating objective clinical measures and standardized neuropsychological assessments to enhance methodological rigor and data robustness.

Conclusion

In light of these findings, telemedicine should not be regarded solely as an alternative for epilepsy patients who experience barriers to healthcare access, mobility limitations, or demanding lifestyles. Rather, it should be considered an effective method for enhancing both quality of life and patient satisfaction across the broader epilepsy population during follow-up and treatment processes. Our study demonstrates that telemedicine-based monitoring contributes to patient-centered healthcare delivery by supporting overall well-being. Therefore, telemedicine ought to be viewed not merely as a facilitator of convenience, but as an integral and essential component of comprehensive epilepsy care. However, confirming the broader applicability of these findings will require further research involving larger populations and extended observation periods.

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