

Journal Pre-proofs

Exploring the influence of telehealth on patient engagement with a multidisciplinary Non-Epileptic Seizure (NES) Clinic during the COVID-19 Pandemic

Meagan Watson, Holly Borland, Sarah Baker, Stefan Sillau, Carl Armon, Laura Strom

PII: S1525-5050(22)00156-1
DOI: <https://doi.org/10.1016/j.yebeh.2022.108707>
Reference: YEBEH 108707

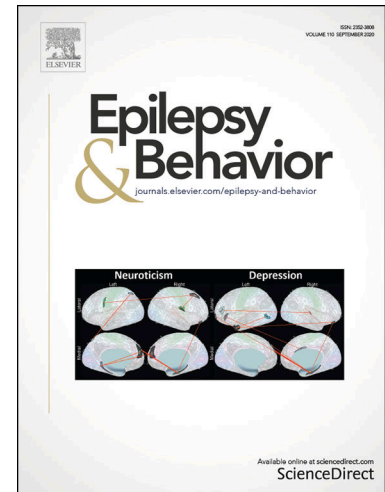
To appear in: *Epilepsy & Behavior*

Received Date: 7 February 2022
Revised Date: 4 April 2022
Accepted Date: 12 April 2022

Please cite this article as: Watson, M., Borland, H., Baker, S., Sillau, S., Armon, C., Strom, L., Exploring the influence of telehealth on patient engagement with a multidisciplinary Non-Epileptic Seizure (NES) Clinic during the COVID-19 Pandemic, *Epilepsy & Behavior* (2022), doi: <https://doi.org/10.1016/j.yebeh.2022.108707>

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2022 Published by Elsevier Inc.



TITLE: Exploring the influence of telehealth on patient engagement with a multidisciplinary Non-Epileptic Seizure (NES) Clinic during the COVID-19 Pandemic.

Authors: Meagan Watson^a, Holly Borland^a, Sarah Baker^a, Stefan Sillau^a, Carl Armon^b, Laura Strom^a

Affiliations: ^aDepartment of Neurology, University of Colorado, Aurora, Colorado, USA; ^bDepartment of Epidemiology, Children's Hospital Colorado, Aurora, Colorado, USA

Corresponding Author: Meagan Watson, MPH

Non-Epileptic Seizure (NES) Clinic

Department of Neurology

University of Colorado Anschutz Medical Campus

12401 E. 17th Ave, L-950, Aurora, CO 80045

Meagan.watson@cuanschutz.edu

DECLARATIONS OF INTEREST: None

TITLE: Exploring the influence of telehealth on patient engagement with a multidisciplinary Non-Epileptic Seizure (NES) Clinic during the COVID-19 Pandemic.

Authors: Meagan Watson^a, Holly Borland^a, Sarah Baker^a, Stefan Sillau^a, Carl Armon^b, Laura Strom^a

Affiliations: ^aDepartment of Neurology, University of Colorado, Aurora, Colorado, USA; ^bDepartment of Epidemiology, Children's Hospital Colorado, Aurora, Colorado, USA

Corresponding Author: Meagan Watson, MPH

Non-Epileptic Seizure (NES) Clinic

Department of Neurology

University of Colorado Anschutz Medical Campus

12401 E. 17th Ave, L-950, Aurora, CO 80045

Meagan.watson@cuanschutz.edu

HIGHLIGHTS: Telehealth improves patient engagement in treatment for non-epileptic seizures.

ABSTRACT – The ILAE task force has identified a gap in treatment access for patient with non-epileptic seizures (NES).[1] Access to multidisciplinary treatment clinics for adults with NES is limited with only 18 institutions delivering care across the United States. [2] Patient engagement has been low in the University of Colorado, NES Clinic treatment program despite our clinic's status as the only clinic of its kind in the mountain west. We analyzed patient factors of those who engaged in treatment before and after COVID-19 regulations were imposed and found a 23.6% increase in treatment engagement using

telehealth. Those who engaged using telehealth were more likely to be of white race, of non-Hispanic ethnicity, publicly insured, employed, have a Charlson Comorbidity Index (CCI) of zero, a daily seizure rate of 0-1, did not have suicidal ideation or attempts, and live greater than 25 miles from the NES clinic. Delivering NES treatment via telehealth reduced the logistical and psychological barriers to initiating recovery and with a severe lack of accessible treatments for patients with NES, barrier reduction is necessary. This study describes patient factors that result in higher engagement with NES treatment using telehealth and emphasizes the importance of telehealth utilization to improve access to available treatment.

Key words: psychogenic non-epileptic seizure, PNES, functional neurological disorder, conversion disorder, telehealth, engagement.

Abbreviations: PNES = psychogenic non-epileptic seizures, NES = non-epileptic seizures, BH = behavioral health, CCI = Charlson Comorbidity Index

1. INTRODUCTION:

Non-epileptic seizures (NES) are diagnosed in epilepsy monitoring units and neurology clinics worldwide and identified by the International League Against Epilepsy (ILAE) as one of ten key areas of neuropsychiatric disorders associated with epilepsy. [3] Functional disorders are diagnosed in 16% of patients referred to neurology clinics. [4] Approximately 20% of patients presenting to epilepsy clinics have NES. [5] Non-epileptic seizures can resemble the full spectrum of epileptic seizures but are not associated with electrographic abnormalities specific to epilepsy on an electroencephalogram (EEG).

Initiation, described here as engagement, of NES treatment services is the focus of this paper. This work builds on a relatively small literature of previous studies looking mainly at overall adherence to recommended care in this population. Research investigating NES patient adherence to recommended psychotherapeutic treatment indicates poor retention in long-term treatment. [6-9] A few studies have highlighted the difficulty of engaging NES patients in behavioral healthcare (BH), with approximately 20-35% of those referred not following treatment recommendations (e.g., follow up visits). [10, 11] A recent study looked at adherence to all recommended care and demonstrated improved adherence with the use of telehealth. [12] In our observational, retrospective study, patients were offered in person visits before COVID-19 restrictions or telehealth visits after COVID-19 restrictions to describe the impact of telehealth on patient engagement with first appointments. It is known that the patient's experience of BH treatment once initiated is enhanced by factors such as the quality of the therapeutic alliance, shared decision making, and person-centered care. [13] Participating in BH has been shown to lead to improvement in NES symptoms. [14] However, there is no opportunity to employ these tools for the many patients who simply do not engage in recommended treatment. Identifying and addressing the factors which limit initial engagement will be expected to improve patient adherence in future recommended treatment.

Prior to the COVID-19 pandemic, patients with a high burden of serious mental illness (SMI) were among the most difficult to engage with traditional in-person BH treatment. [13, 15] Likewise, patients with NES have a high burden of illness and psychiatric comorbidity [16, 17] and are at risk for those same difficulties. [18] In a recent large, randomized control treatment trial, roughly 43% of patients eligible for evaluation did not engage in care for a variety of reasons. [19] Poor rates of engagement are further exacerbated by patients' inability to drive due to seizure precautions [20-23] and a lack of NES disorder specific resources. [24]

When the COVID-19 pandemic began, an immediate transition to telehealth was required for continuation of care in the University of Colorado, NES Clinic. This forced transition was due to low rates

of vaccination, making face to face encounters dangerous and the lack of space to accommodate physical distancing in group treatment. This transition provided a unique opportunity for NES patients to engage with care, free of logistical barriers like distance to clinic and inability to drive. Yet, while such a prompt response increased overall access to care, it underscored the socioeconomic disparity in the NES population with many patients still facing obstacles to care such as being unable to afford reliable internet connections and cellular data plans to conduct their visits using telehealth. Furthermore, the immediate transition challenged patients to quickly learn how to utilize technology and interface with their healthcare providers in a new way.

Despite these challenges, studies have indicated that there are no major differences between receiving in-person and telehealth treatment for BH disorders. [25, 26] Furthermore, in the veteran NES population, Dr. Curt LaFrance et al. (2020) proved similar treatment outcomes utilizing telehealth versus in-person including significant decrease in seizure frequency and improvement in comorbid symptoms. [25] Our study represents the first results of a series of investigations by the University of Colorado NES Clinic to determine factors influencing a civilian NES population's initial engagement with a multidisciplinary clinic, adherence to recommended treatment, and treatment outcomes. The present study describes the results of the first investigation focusing on patient factors including but not limited to race, ethnicity, insurance status, and distance to the physical NES Clinic and their effect on initiation of treatment (engagement) between encounters conducted in-person compared to those conducted via telehealth.

2. MATERIALS AND METHODS:

Permission was obtained for this retrospective, observational study by the Colorado Multiple Institutional Review Board (COMIRB). Secondary use approval allowed for a waiver for informed consent on the basis that all clinical information collected was obtained as routine medical care during treatment in the NES Clinic. Chart review was completed by Professional Research Assistants, with clinical oversight from the NES providers, who were trained in the Epic system electronic medical record (EMR) and FileMaker Pro database (FMP).

2.1. Cohort Assignment:

Our study population consisted of all patients referred to the University of Colorado, NES Clinic between March 2019 and September 2020. All patients had a confirmed vEEG NES diagnosis, met NES Clinic eligibility criteria, and given the opportunity to engage (contacted or scheduled for first appointment) (Figure 1). Eligibility criteria was independent of in-person or telehealth cohort assignment. Patients referred to the NES Clinic who were non-English speaking, with active eating disorders, actively abusing substances (excluding marijuana), are routinely provided alternative resources as part of the NES Clinic's standard of care protocols. Patient data were extracted from the FMP database and confirmed with Epic. The telehealth and transition cohorts were defined circumstantially. Our in-person cohort included all patients referred with the opportunity to engage between March 1, 2019 – March 13, 2020.

2.1.1. Engaged Cohorts:

Engagement in the NES Clinic is defined as the completion of both neurological and behavioral health intake appointments. Patients referred for treatment with an opportunity to engage between March 1, 2019 and March 16, 2020 comprised our in-person cohort as there was no opportunity at that time for patients to engage using telehealth before COVID-19 restrictions. The transition cohort included patients who were receiving care in our clinic as of March 13, 2020 and had to convert from in-person to telehealth appointments to continue treatment after COVID-19 restrictions were implemented. Patients referred for treatment after March 16, 2020 comprised our telehealth cohort as the clinic was unable to

provide a space large enough to accommodate our treatment model. Patients in the telehealth cohort had no opportunity to engage in-person due COVID-19 restrictions (Figure 1).

2.1.2. Not-engaged Cohorts:

Patients who were referred to the NES Clinic and had the opportunity to engage but did not complete both neurological and behavioral health intake appointments were identified as “not-engaged” and assigned to their respective in-person or telehealth cohort timeframe as “not-engaged” in-person or “not-engaged” telehealth.

2.2. Visit Inclusion Criteria:

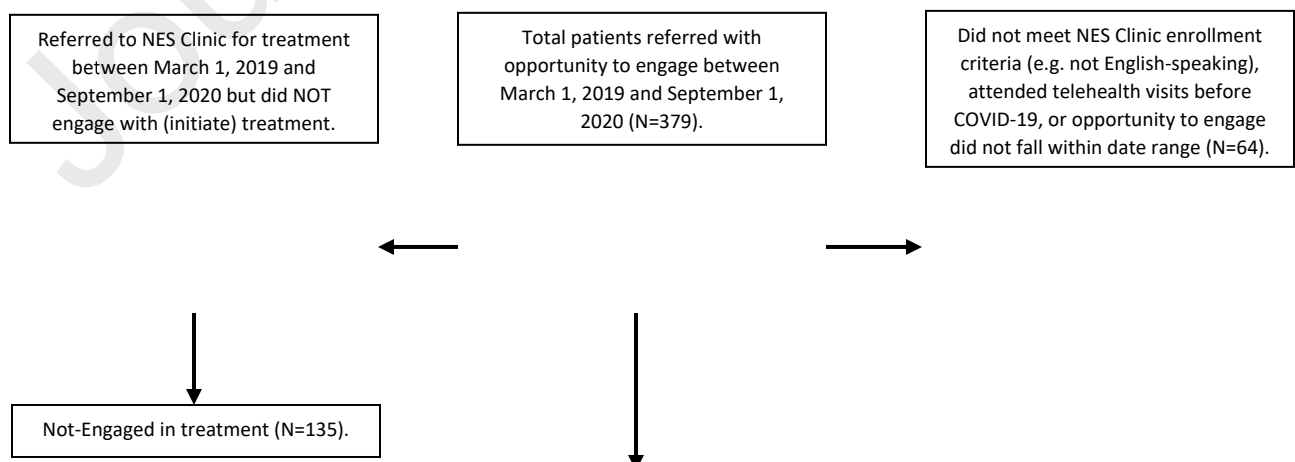
All patients’ scheduling followed the same protocol including three contact attempts after referral. For those we successfully scheduled, all patients received an automated reminder from their electronic medical record (EMR), patient portal 24 hours before the visit start time. If patients no-showed or canceled their appointment, patients were given three opportunities to complete the visit before being discharged from clinic due to non-adherence. Visits rescheduled to a telephone visit or canceled due to telehealth technical difficulties were included.

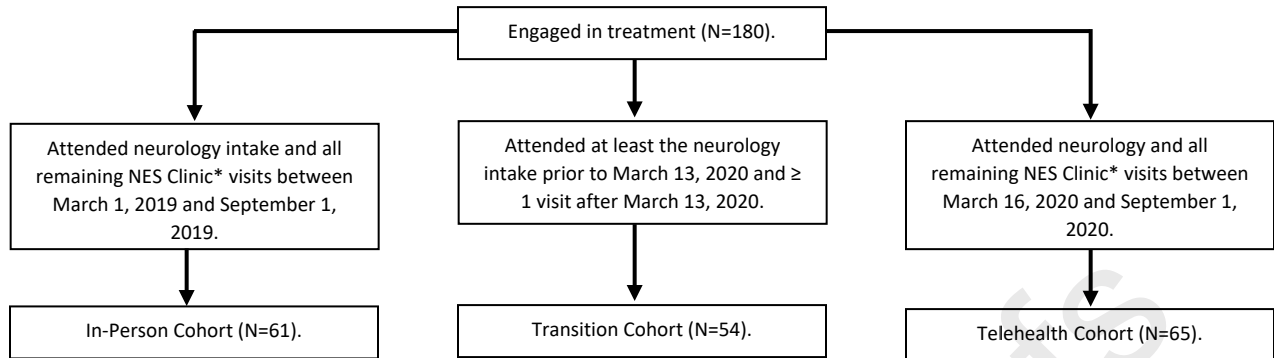
2.3. Demographic characteristics:

Relevant patient factors were extracted from either the referral or NES clinic intake notes (Table 1). Medical histories were reviewed and categorized by the NES Clinic neurologist to determine Charlson Comorbidity Index (CCI). The Charlson Comorbidity Index predicts 10-year survival in patients with multiple medical comorbidities and is the most extensively studied and widely used comorbidity index in the medical literature. [27] The NES Clinic routinely calculates CCI to measure and controls for each patient’s illness severity on outcomes. Distance to clinic was calculated using the zip code of the Anschutz Medical Campus Neurology Outpatient clinic and the patient’s home, and further categorized into greater or less than 25 miles from the clinic. Insurance categories were condensed into public, private, government, or other. Public insurance included only Medicaid and Medicare while the government category included Tricare and Veteran’s Administration insurances. Employment status was consolidated into employed versus unemployed. Disability status was categorized based on current use or intention to apply for Social Security Disability Insurance or Supplemental Security Income. Education level was grouped by highest level achieved.

2.4. Data Collection methods

Figure 1: Cohort selection steps





Legend: Opportunity to engage = attempted to contact for neurology intake, Engaged in treatment = attended neurology and behavioral health (BH) intakes. *NES Clinic = Non-Epileptic Seizure Clinic.

2.5. Statistical Methods:

Summary statistics were compared between engaged (completed both neurological and BH intake visits) patients, and not engaged patients, and among cohorts, in-person, telehealth, and transition, for both engaged and not engaged patients. The proportion of engaged patients was compared between in person and telehealth cohorts with two-way tables and continuity-adjusted chi squared tests. Similar methods investigated whether patient factors of race (white vs non-white), distance of patient to clinic (≤ 25 miles vs > 25 miles), patient health insurance (public vs non-public a proxy for socioeconomic status), and patient education (high school or less, partial college or 2-year degree, or 4-year college degree or more), current employment (yes vs no), number of psychiatric diagnoses (0-1 vs ≥ 2), CCI (0 vs 1-3), daily baseline seizure rate (0-1, 2-3, 4-5, or ≥ 5), the presence of suicidal thoughts (yes vs no) or suicidal attempts (yes vs no or unknown) modified the telehealth effect. All tests were two-sided and were performed with univariate alpha of 0.05 unless otherwise stated. The study is preliminary and multiple testing adjustments were not applied. Univariate 95% confidence intervals were presented for effects. Statistical analyses were performed using SAS 9.4 (Cary, NC).

3. RESULTS:

3.1. Cohort characteristics:

There were 315 participants: 249 (79.0%) female, 270 (85.7%) non-Hispanic white, 206 (65.4%) publicly insured, 173 (54.9%) unemployed, 180 (57.1%) not driving at study entry, 177 (56.2%) live greater than 25 miles from the clinic, 142 (45.1%) with suicidal thoughts, and 86 (27.3%) with suicidal attempts. Of the 315 participants, 180 (57.3%) were engaged, and 135 (42.7%) were not-engaged. Excluding the 54-participant transition cohort, there were 261 patients, 126 (48.3%) engaged and 135 (51.7%) not-engaged. Among the 180 engaged patients, 61 (33.7%) were in-person, 65 (35.9%) were telehealth, and 54 (30.4%) were transition. If the transition cohort is excluded, then 48.4% were in-person, and 51.6% were telehealth. Among the 135 not-engaged patients, 96 (71.1%) were in-person, and 39 (28.9%) were telehealth.

3.2. Engagement during in-person and telehealth:

Overall engagement in the telehealth group was 62.5% (65/104) (95% CI: [53.0%, 72.0%]), compared to 38.9% (61/157) (95% CI: [31.1%, 46.6%]) in the in-person group, risk ratio (RR) estimate = 1.61 (95% CI: 1.26-2.06). Similarly, engagement in the telehealth cohort compared to the in-person cohort, was higher for those of white race (RR 1.75, CI: 1.33-2.31), those of non-Hispanic ethnicity (RR

1.58, CI: 1.22-2.05), the publicly insured (RR 1.88, CI: 1.40-2.54), the employed (RR 2.08, CI: 1.22-3.54), those living > 25 miles from the clinic (RR 1.87, CI 1.33-2.63), those with a CCI score of zero (RR 1.56 CI: 1.19-2.22), those with a daily baseline seizure rate of 0-1 (RR 3.39, CI:1.82-6.20), those without documented suicidal thoughts or attempts (RR 2.11, CI: 1.33-3.33; and RR 1.76 CI: 1.28-2.43, respectively) (Table 2).

4. DISCUSSION & CONCLUSION:

The purpose of this retrospective, observational study was to investigate the potential influence of patient factors on engagement comparing telehealth vs. in-person appointments, and whether telehealth facilitates patient engagement. To the best of our knowledge, this is the first study to report on the initiation in treatment of a civilian NES population treated in a multidisciplinary NES clinic. These results reflect patients' realistic access to and engagement with NES treatment, representing a pragmatic approach bounded only by healthcare system policies and regulations.

Our results suggest patients are more likely to engage with NES treatment when the initial neurological and BH intake appointments are conducted using telehealth. Among the telehealth cohort, we engaged more patients who self-identify as white race and those who identify as non-Hispanic. We attribute higher engagement of these groups to the overall Colorado population. As of 2021, the U.S (United States) Census Bureau estimates the Colorado population as 86% White and 21.8% Hispanic and Latino. We suspect the low engagement in treatment of non-White individuals reflects the multi-faceted stigmatization experienced by this population, producing lower BH treatment engagement rates. [28-30] The extent to which non-White individuals engage in BH treatment is a result of the phenomenon known as the intersectional impact of stigma. [26] Several studies have shown the negative impact of the intersection of different stigmas on utilization of mental health services including race, HIV-status, and gender. [31-33] Furthermore, the consequences of mental illness stigma are found to be more severe when patient demographic characteristics, like race, coincide with other social adversities like poverty or sexual minority status (e.g. identified gender). [26] Considering that NES has not been classified as a racial or ethnic specific disorder, we should consider the effect of stigma on engagement with treatment. We suspect that the overall population prevalence of NES is underestimated and further under reported when stratified by race or other minority statuses. Future development of NES Clinic's and treatment should be informed by Critical Race Theory to ensure patients from all backgrounds and orientations have equal access to treatment. [34]

In alignment with our initial hypotheses, we successfully engaged more publicly insured patients. Considering that only four patients in the publicly insured category were on Medicare and above age 65, we can consider this a proxy measure of lower socioeconomic status. We also engaged higher rates of employed patients. These results paired together paint an interesting picture as we would have expected them to vary inversely. However, the transition to telehealth has allowed for medical and BH treatment to enter the home. We suspect that the increase in engagement of employed patients reflects the systemic changes and new regulations surrounding the national response to COVID-19, supporting the expansion of tele-medicine and increased accessibility to healthcare when working from home. That same expansion of access to care was extended to those who are publicly insured. Even though the NES Clinic treatment program is time limited, it is a substantial time commitment, requiring the patient to be available during a weekday at the same time each week for up to 18 weeks [11]. Free of strict employer and school attendance policies, working from home increases the flexibility of work and life schedules (e.g., childcare) and combined with telehealth, eliminates many of the daily logistical barriers to seeking treatment. This not only increases physical access to treatment, but indirectly encourages patients to prioritize their well-being through reduction of psychological barriers, like stigma in NES and asking for time off for BH treatment. [12]

Additionally, using telehealth we were able to engage more patients living > 25 miles from the physical location of the NES Clinic. Utilizing telehealth relieves not just the NES patients' real barrier of driving restrictions, but also the high burden of weekly travel for treatment. [12] Furthermore, there is a significant geographical barrier for patients with NES, with a striking proportion of patients unable to find specialized BH providers local to them forcing them to travel long distances and across states. [12]

To control for the effect of poor medical health on engagement, [35] we measured the CCI. [27] We found that patients with a score of zero, meaning they are not significantly burdened with other medical health needs, were more likely to engage using telehealth. We also found an effect on engagement of those with less than one seizure per day. Because the CCI does not consider psychiatric diagnoses, we also analyzed the effect of mean number of psychiatric diagnoses on engagement. While this showed no difference between patients who engaged with in-person vs. telehealth, an effect emerged with patients who had suicidal thoughts or attempts. Patients who did not have documented history of suicidal ideation or attempts were more likely to engage with telehealth vs. in-person treatment services. This finding highlights the pragmatic nature of this research as the University of Colorado NES Clinic only excludes patients from treatment (in-person and telehealth) if they are actively abusing substances (except marijuana) or have an active eating disorder. The NES Clinic does not discourage those with active or chronic suicidal ideation from completing initial intakes.

There are several important limitations to this study. As an observational, retrospective study, causal relationships between patient factors and engagement with initial neurological and BH intakes with the University of Colorado, NES Clinic cannot be inferred. Regardless, this study highlights that conducting telehealth visits with NES patients is associated with higher engagement with initial treatment services. This finding alone is imperative for hospitals and clinics with a desire to develop treatment services for patients with NES, and for the patients themselves, as we cannot deploy best practices to retain patients in treatment unless we can first bring them in the door. If patients are unable to engage, they are unable to adhere to recommended treatment. If they are unable to adhere, their prognosis is worse, exacerbating the vicious cycle of inappropriate healthcare utilization by both the patient and the healthcare system. [36] This study indicates that telehealth has the potential to reduce logistical barriers for individuals with NES in the United States and decrease the effort needed from patients to engage with NES treatment services. Although we collected information about technical limitations in our patient population, we did not do this in a way that allowed us to control for race with this factor. The present study does not provide a comprehensive patient profile that would be "most likely" to engage as another important limitation. To better understand this, we recommend that future studies pursue research that can systematically evaluate a patient's "readiness" to undergo NES treatment and investigate patient factors that can influence readiness such as illness perception, history of trauma, attachment styles, and social support. Furthermore, the authors recognize the scope of these findings being limited to NES patients in the United States and being referred to a quaternary epilepsy care center as some of the barriers discussed (e.g., paid time off, transportation) may not be applicable in other countries. Finally, we did not measure the influence of the COVID public health crisis on patients' decisions to adopt telehealth in a way that may have affected our results.

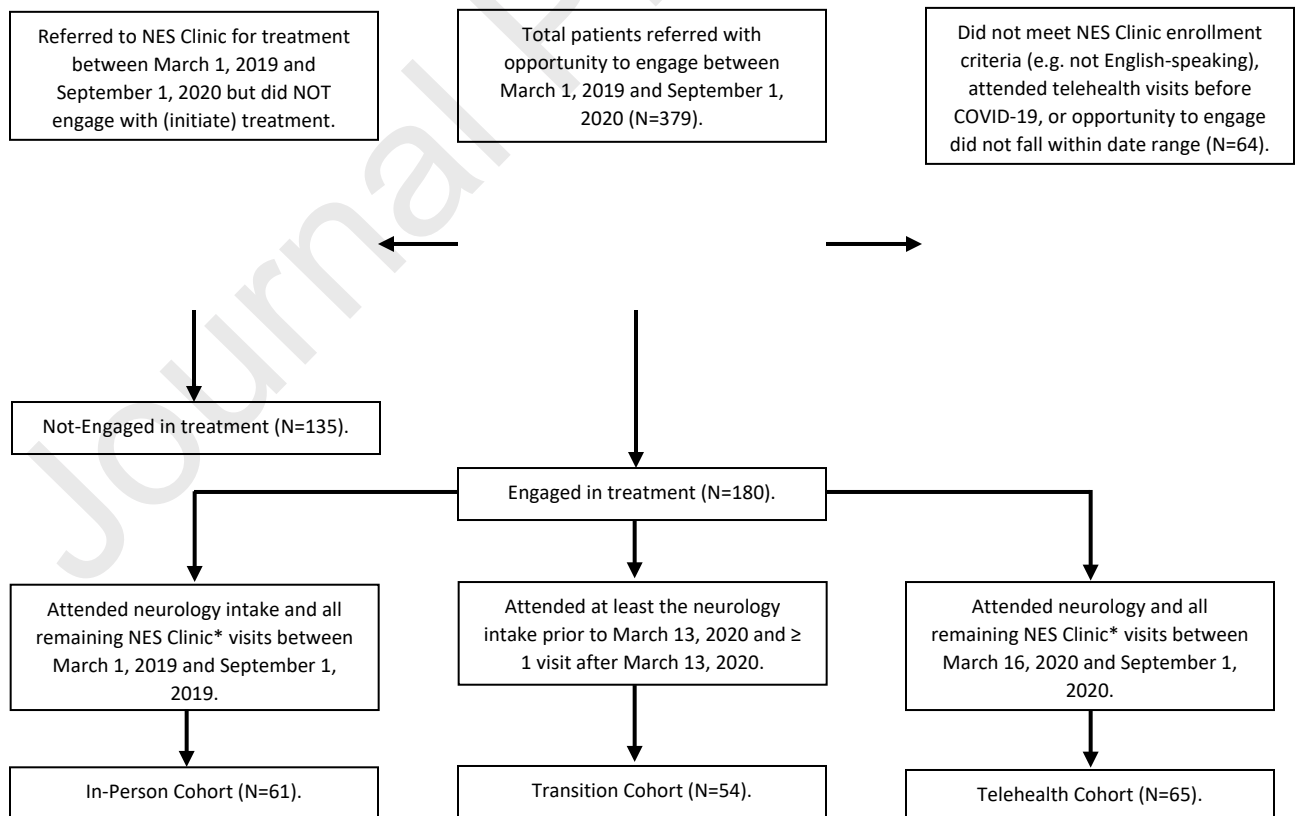
The paucity of accessible BH treatments is the norm for NES patients in the United States, leaving us with two primary options as dedicated clinicians and practitioners serving the NES population. We either improve access to available treatment by increasing the number of sites that offer it, or better understand how to effectively and efficiently use the treatment programs that are available. This retrospective, observational chart review study confirms that civilian NES patients are more likely to engage with treatment using telehealth. The patient factors, race, public insurance, distance to clinic are all correlated with engagement in treatment via telehealth and will be useful for screening after the public health crisis ends. These results were obtained at a quaternary epilepsy center, but will provide a starting point to those offering treatment programs, with the option to deliver either telehealth and in

person treatment modality. The goal is to improve engagement in NES treatment with telehealth options and to provide choices to patients which may optimize their care. Through this identification of those more likely to engage, the University of Colorado, NES Clinic and NES treatment programs alike, can make a more conscious effort to extend care and cater to the needs of this vulnerable and underserved population.

5. **FUNDING:** Dr. Strom has clinical responsibilities that include the diagnosis and treatment of patients with non-epileptic seizures. Otherwise, none of the authors declare any conflicts of interest. We confirm we have read the journal's position on issues involved with ethical publication and confirm this report is consistent with those guidelines. This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
6. **ACKNOWLEDGMENTS:** We acknowledge the critical contributions of all providers who treat patients in the University of Colorado, NES Clinic not authored here including Dr. Randi Libbon and Ms. Abbie Pennetti, LCSW, as well as all the students who have assisted the NES Clinic's data collection and maintenance over the last several years. Without them this work would be impossible.
7. **DECLARATIONS OF INTEREST:** None

TABLES & FIGURES:

Figure 1: Cohort selection steps



Legend: Opportunity to engage = attempted to contact for neurology intake, Engaged in treatment = attended neurology and behavioral health (BH) intakes. *NES Clinic = Non-Epileptic Seizure Clinic.

Table 1: Participant characteristics analysis, March 2019-September 2020, n = 315.

Participant Characteristics: n (%), or median (95% CI)	Overall (n = 315)	In-Person (n=157)		Telehealth (n=104)		Transition (n=54)
		Engaged (n=61)	Not Engaged (n=96)	Engaged (n=65)	Not Engaged (n=39)	Engaged (n=54)
Age, years	35 (25-46)	30 (24-41)	36 (26-47)	37 (28-44)	41 (25-49)	36 (25-46)
Gender						
Female	249 (79.0)	52 (85.2)	72 (75.0)	51 (78.5)	32 (82.1)	42 (77.8)
Male	61 (19.4)	9 (14.8)	23 (24.0)	13 (20.0)	5 (12.8)	11 (20.4)
Non-Binary	5 (1.6)	0 (0.0)	1 (1.0)	1 (1.5)	2 (5.1)	1 (1.8)
Race						
White	270 (85.7)	48 (78.7)	84 (87.5)	56 (86.2)	32 (82.1)	50 (92.6)
Non-White	45 (14.3)	13 (21.3)	12 (12.5)	9 (13.8)	7 (17.9)	4 (7.4)
Ethnicity						
Hispanic/Latinx	43 (13.7)	6 (9.8)	12 (12.5)	10 (15.4)	6 (15.4)	9 (16.7)
Not Hispanic/Latinx	272 (86.3)	55 (90.2)	84 (87.5)	55 (84.6)	33 (84.6)	45 (83.3)
Insurance						
Public	206 (65.4)	39 (63.9)	68 (70.8)	46 (70.8)	21 (53.8)	32 (59.3)
Private	109 (34.6)	22 (36.1)	28 (29.2)	19 (19.2)	18 (45.2)	22 (40.7)
Education						
High School or Less	73 (23.2)	26 (42.6)	5 (5.2)	20 (30.8)	8 (20.5)	14 (25.9)
Partial college or 2-year degree	99 (31.4)	25 (41.0)	13 (13.5)	27 (41.5)	9 (23.1)	25 (46.3)
College degree(s)	44 (14.0)	9 (14.8)	8 (8.3)	12 (18.5)	5 (12.8)	10 (18.5)
Unknown	99 (31.4)	1 (1.6)	70 (72.9)	6 (9.2)	17 (43.6)	5 (9.3)
Employment						
Yes	78 (24.8)	11 (18.0)	21 (22.1)	20 (30.8)	8 (20.5)	18 (33.3)
No	173 (54.9)	50 (82.0)	29 (30.5)	45 (69.2)	13 (33.3)	36 (66.7)
Unknown	64 (20.3)		46 (48.4)		18 (46.2)	
Driving at intake						
Yes	53 (16.8)	11 (18.0)	9 (9.4)	13 (20.0)	2 (5.1)	18 (33.3)
No	180 (57.1)	49 (80.3)	33 (34.4)	42 (64.6)	22 (56.4)	34 (63.0)
Unknown	82 (26.0)	1 (1.6)	54 (56.2)	10 (15.4)	15 (38.5)	2 (3.7)
Distance to Clinic						
≤ 25 miles	138 (43.8)	33 (54.1)	46 (47.9)	20 (30.8)	17 (43.6)	22 (40.7)
> 25 miles	177 (56.2)	28 (45.9)	50 (52.1)	45 (69.2)	22 (56.4)	32 (59.3)
Psychiatric diagnoses, mean number	1.3	1.36	0.79	1.74	1.28	1.46
Psychiatric diagnoses						
0-1	186 (59.0)	37 (60.7)	71 (74.0)	28 (43.1)	25 (64.1)	25 (46.3)
≥ 2	129 (41.0)	24 (39.3)	25 (26.0)	37 (56.9)	14 (35.9)	29 (53.7)
CCI						
0	256 (81.3)	51 (83.6)	74 (77.1)	54 (83.1)	31 (79.5)	46 (85.2)
1-3	59 (18.7)	10 (16.4)	22 (22.9)	11 (16.9)	8 (20.5)	8 (14.8)
Daily baseline seizure rate						
0-1	129 (41.0)	12 (19.7)	65 (67.7)	19 (29.2)	17 (43.6)	16 (29.6)

> 1 to 3	83 (26.3)	24 (39.3)	15 (15.6)	18 (27.7)	12 (30.8)	14 (25.9)
>3 to 5	47 (14.9)	11 (18.0)	6 (6.3)	14 (21.5)	7 (17.9)	9 (16.7)
>5	56 (17.8)	14 (23.0)	10 (10.4)	14 (21.5)	3 (7.7)	15 (27.8)
Suicidal Thoughts						
Yes	142 (45.1)	38 (62.3)	20 (20.8)	41 (63.1)	14 (35.9)	29 (53.7)
No/Unknown	173 (54.9)	23 (37.7)	76 (79.2)	24 (36.9)	25 (64.1)	25 (46.3)
Suicidal Attempts						
Yes	86 (27.3)	20 (32.8)	14 (14.6)	25 (38.5)	11 (28.2)	16 (29.6)
No/Unknown	229 (72.7)	41 (67.2)	82 (85.4)	40 (61.5)	28 (71.8)	38 (70.4)

Abbreviations: CCI, Charlson comorbidity Index; CI, confidence interval.

Table 2: Proportion of engaged participants to total participants analysis, by timeframe, March 2019-September 2020, n = 261.

Participant Characteristics:	In-Person (n=157, engaged=61)	Telehealth (n=104, engaged=65)	Telehealth vs. In- Person Ratio (95% CI)	P-value*
	Estimate, (95% CI)	Estimate, (95% CI)		
Total	38.9 (31.1-46.6)	62.5 (53.0-72.0)	1.61 (1.26-2.06)	< 0.001
Gender				
Female	41.9 (33.1-50.7)	61.4 (50.8-72.1)	1.47 (1.12-1.92)	0.009
Male	28.1 (11.7-44.6)	72.2 (49.3-95.1)	2.44 (1.30-4.61)	0.010
Race				
White	36.4 (28.0-44.7)	63.6 (53.4-73.9)	1.75 (1.33-2.31)	< 0.001
Non-White	52.0 (31.0-73.0)	56.3 (28.9-83.6)	1.08 (0.61-1.92)	1.00
Ethnicity				
Hispanic/Latinx	33.3 (9.2-57.5)	62.5 (35.9-89.1)	1.88 (0.88-3.99)	0.17
Not Hispanic/Latinx	39.6 (31.3-47.8)	62.5 (52.2-72.8)	1.58 (1.22-2.05)	0.001
Insurance				
Public	36.4 (27.2-45.7)	68.7 (57.6-79.8)	1.88 (1.40-2.54)	< 0.001
Private	44.0 (29.7-58.3)	51.4 (34.5-68.2)	1.17 (0.75-1.82)	0.64
Education				
High School or Less	83.9 (70.2-97.6)	71.4 (53.6-89.3)	0.85 (0.64-1.13)	0.40
Partial college or 2-year degree	65.8 (50.0-81.6)	75.0 (60.1-89.9)	1.14 (0.85-1.53)	0.54
College degree(s)	52.9 (26.4-79.3)	70.6 (46.4-94.7)	1.33 (0.77-2.30)	0.48
Employment				
Yes	34.4 (17.0-51.8)	71.4 (53.6-89.3)	2.08 (1.22-3.54)	0.009
No	63.3 (52.4-74.2)	77.6 (66.5-88.6)	1.23 (0.99-1.52)	0.11
Distance to Clinic				
≤ 25 miles	41.8 (30.7-52.9)	54.1 (37.2-70.9)	1.29 (0.87-1.92)	0.30
> 25 miles	35.9 (25.0-46.8)	67.2 (55.6-78.7)	1.87 (1.33-2.63)	< 0.001
Psychiatric diagnoses				
0-1	0.34 (0.25-0.43)	0.53 (0.39-0.67)	1.54 (1.07-2.22)	0.037
≥ 2	0.49 (0.34-0.63)	0.73 (0.60-0.85)	1.48 (1.06-2.06)	0.027
CCI				
0	0.41 (0.32-0.50)	0.64 (0.53-0.74)	1.56 (1.19-2.03)	0.002
1-3	0.31 (0.14-0.48)	0.58 (0.33-0.82)	1.85 (0.98-3.52)	0.12
Daily baseline seizure rate				
0-1	0.16 (0.07-0.24)	0.53 (0.36-0.70)	3.39 (1.82-6.20)	< 0.001
> 1 to 3	0.62 (0.46-0.78)	0.60 (0.41-0.79)	0.98 (0.66-1.43)	1.00
>3 to 5	0.65 (0.39-0.90)	0.67 (0.45-0.89)	1.03 (0.65-1.64)	1.00
>5	0.58 (0.37-0.80)	0.82 (0.62-1.03)	1.41 (0.94-2.11)	0.20

Suicidal Thoughts				
Yes	0.66 (0.53-0.78)	0.75 (0.63-0.86)	1.14 (0.89-1.45)	0.40
No/Unknown	0.23 (0.15-0.32)	0.49 (0.34-0.63)	2.11 (1.33-3.33)	0.003
Suicidal Attempts				
Yes	0.59 (0.41-0.76)	0.69 (0.54-0.85)	1.18 (0.83-1.68)	0.50
No/Unknown	0.33 (0.25-0.42)	0.59 (0.47-0.71)	1.76 (1.28-2.43)	0.001

Abbreviations: CCI, Charlson Comorbidity Index; CI, confidence interval.

*Continuity-adjusted chi-square test.

REFERENCES:

1. Kanemoto, K., et al., *PNES around the world: Where we are now and how we can close the diagnosis and treatment gaps-an ILAE PNES Task Force report*. *Epilepsia Open*, 2017. **2**(3): p. 307-316.
2. Beimer NJ, L.W.J., *Evaluation and Treatment of Psychogenic Nonepileptic Seizures*. *neurolog clinics*, 2022(In Press).
3. Kerr, M.P., et al., *International consensus clinical practice statements for the treatment of neuropsychiatric conditions associated with epilepsy*. *Epilepsia*, 2011. **52**(11): p. 2133-2138.
4. Stone, J., et al., *Who is referred to neurology clinics?--the diagnoses made in 3781 new patients*. *Clin Neurol Neurosurg*, 2010. **112**(9): p. 747-51.
5. McDade, G. and S.W. Brown, *Non-epileptic seizures: management and predictive factors of outcome*. *Seizure - European Journal of Epilepsy*, 1992. **1**(1): p. 7-10.
6. Tolchin, B., et al., *Adherence with psychotherapy and treatment outcomes with psychogenic nonepileptic seizures*. *Neurology*, 2019.
7. Tolchin, B., et al., *Motivational Interviewing Techniques to Improve Psychotherapy Adherence and Outcomes for Patients With Psychogenic Nonepileptic Seizures*. *J Neuropsychiatry Clin Neurosci*, 2019: p. appineuropsych19020045.
8. Tolchin, B., B.A. Dworetzky, and G. Baslet, *Long-term adherence with psychiatric treatment among patients with psychogenic nonepileptic seizures*. *Epilepsia*, 2018. **59**(1): p. e18-e22.
9. Perez, D.L., et al., *Preliminary Predictors of Initial Attendance, Symptom Burden, and Motor Subtype in a US Functional Neurological Disorders Clinic Population*. *Cogn Behav Neurol*, 2016. **29**(4): p. 197-205.
10. Fetting, M., et al., *Adherence to mental health care and caregiver-patient relationship after diagnosis of psychogenic non-epileptic seizures: Longitudinal follow-up study*. *Seizure - European Journal of Epilepsy*, 2020. **80**: p. 227-233.
11. Libbon, R., et al., *The feasibility of a multidisciplinary group therapy clinic for the treatment of nonepileptic seizures*. *Epilepsy Behav*, 2019. **98**(Pt A): p. 117-123.
12. Tilahun, B.B.S., et al., *Telepsychology May Improve Treatment Adherence in Patients with Psychogenic Nonepileptic Seizures*. *Telemed J E Health*, 2021.
13. Dixon, L.B., Y. Holoshitz, and I. Nossel, *Treatment engagement of individuals experiencing mental illness: review and update*. *World Psychiatry*, 2016. **15**(1): p. 13-20.
14. Carlson, P. and K. Nicholson Perry, *Psychological interventions for psychogenic non-epileptic seizures: A meta-analysis*. *Seizure*, 2017. **45**: p. 142-150.
15. Miu, A.S., et al., *Teletherapy with serious mental illness populations during COVID-19: telehealth conversion and engagement*. *Counselling Psychology Quarterly*, 2020: p. 1-18.
16. Diprose, W., F. Sundram, and D.B. Menkes, *Psychiatric comorbidity in psychogenic nonepileptic seizures compared with epilepsy*. *Epilepsy Behav*, 2016. **56**: p. 123-30.

17. Wang, A.D., et al., *Distinct psychopathology profiles in patients with epileptic seizures compared to non-epileptic psychogenic seizures*. *Epilepsy Res*, 2019. **158**: p. 106234.
18. Smith, B.J., MD, FAAN, *Closing the Major Gap in PNES Research Finding a Home for a Borderland Disorder*. *Epilepsy Currents*, 2014. **14**(2): p. 63-67.
19. Goldstein, L.H., et al., *Cognitive behavioural therapy for adults with dissociative seizures (CODES): a pragmatic, multicentre, randomised controlled trial*. *Lancet Psychiatry*, 2020. **7**(6): p. 491-505.
20. Asadi-Pooya, A.A., et al., *Driving a motor vehicle and psychogenic nonepileptic seizures: ILAE Report by the Task Force on Psychogenic Nonepileptic Seizures*. *Epilepsia Open*, 2020. **5**(3): p. 371-385.
21. Xu, Y., et al., *Return to driving after a diagnosis of epilepsy: A prospective registry study*. *Epilepsia*, 2018. **59**(3): p. 661-667.
22. Kang, J.Y. and S. Mintzer, *Driving and Epilepsy: a Review of Important Issues*. *Curr Neurol Neurosci Rep*, 2016. **16**(9): p. 80.
23. Dawit, S., et al., *Characterizing the driving dilemma among patients with psychogenic nonepileptic seizures: A single-center prospective cohort study*. *Epilepsy & Behavior*, 2022. **127**.
24. Hingray, C., et al., *Access to diagnostic and therapeutic facilities for psychogenic nonepileptic seizures: An international survey by the ILAE PNES Task Force*. *Epilepsia*, 2018. **59**(1): p. 203-214.
25. LaFrance, W.C., Jr., et al., *Treatment of psychogenic nonepileptic seizures (PNES) using video telehealth*. *Epilepsia*, 2020. **61**(11): p. 2572-2582.
26. Hubley, S., et al., *Review of key telepsychiatry outcomes*. *World J Psychiatry*, 2016. **6**(2): p. 269-82.
27. Bannay, A., et al., *The Best Use of the Charlson Comorbidity Index With Electronic Health Care Database to Predict Mortality*. *Med Care*, 2016. **54**(2): p. 188-94.
28. Eylem, O., et al., *Stigma for common mental disorders in racial minorities and majorities a systematic review and meta-analysis*. *BMC Public Health*, 2020. **20**(1): p. 879.
29. Wong, E.C., et al., *Racial and Ethnic Differences in Mental Illness Stigma and Discrimination Among Californians Experiencing Mental Health Challenges*. *Rand health quarterly*, 2017. **6**(2): p. 6-6.
30. Benuto, L.T., et al., *Mental Health Literacy, Stigma, and Behavioral Health Service Use: the Case of Latinx and Non-Latinx Whites*. *J Racial Ethn Health Disparities*, 2019. **6**(6): p. 1122-1130.
31. Radcliffe, J., et al., *Stigma and Sexual Health Risk in HIV-Positive African American Young Men Who Have Sex with Men*. *AIDS Patient Care and STDs*, 2010. **24**(8): p. 493-499.
32. Clement, S., et al., *Mental Health-Related Discrimination as a Predictor of Low Engagement With Mental Health Services*. *Psychiatric Services*, 2015. **66**(2): p. 171-176.
33. Nadeem, E., et al., *Does Stigma Keep Poor Young Immigrant and U.S.-Born Black and Latina Women From Seeking Mental Health Care?* *Psychiatric Services*, 2007. **58**(12): p. 1547-1554.
34. Lett, E., et al., *Conceptualizing, Contextualizing, and Operationalizing Race in Quantitative Health Sciences Research*. *Ann Fam Med*, 2022. **20**(2): p. 157-163.
35. Zhang, L., et al., *Mortality in patients with psychogenic non-epileptic seizures a population-based cohort study*. *J Neurol Neurosurg Psychiatry*, 2022.
36. Barsky, A.J., E.J. Orav, and D.W. Bates, *Somatization increases medical utilization and costs independent of psychiatric and medical comorbidity*. *Arch Gen Psychiatry*, 2005. **62**(8): p. 903-10.

TITLE: Exploring the influence of telehealth on patient engagement with a multidisciplinary Non-Epileptic Seizure (NES) Clinic during the COVID-19 Pandemic.

Authors: Meagan Watson^a, Holly Borland^a, Sarah Baker^a, Stefan Sillau^a, Carl Armon^b, Laura Strom^a

Affiliations: ^aDepartment of Neurology, University of Colorado, Aurora, Colorado, USA; ^bDepartment of Epidemiology, Children's Hospital Colorado, Aurora, Colorado, USA

Corresponding Author: Meagan Watson, MPH

Non-Epileptic Seizure (NES) Clinic

Department of Neurology

University of Colorado Anschutz Medical Campus

12401 E. 17th Ave, L-950, Aurora, CO 80045

Meagan.watson@cuanschutz.edu

HIGHLIGHTS: Telehealth improves patient engagement in treatment for non-epileptic seizures.

TITLE: Exploring the influence of telehealth on patient engagement with a multidisciplinary Non-Epileptic Seizure (NES) Clinic during the COVID-19 Pandemic.

Corresponding Author: Meagan Watson, MPH

Non-Epileptic Seizure (NES) Clinic

Department of Neurology

University of Colorado Anschutz Medical Campus

12401 E. 17th Ave, L-950, Aurora, CO 80045

Meagan.watson@cuanschutz.edu

DECLARATIONS OF INTEREST: None