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RESEARCH ARTICLE

Key predictors of the need for a family-focused pediatric epilepsy adherence intervention

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Abstract

Objective: Nonadherence to antiseizure drugs is a significant problem in pediatric epilepsy and is linked to increased morbidity and mortality, clinically unnecessary medication changes, and increased health care costs. Family interventions can improve adherence. However, it is challenging to determine which families will struggle with nonadherence and require intervention. This study aims to identify specific parent, family, child, and medical factors that predict which families most need family-based adherence interventions.

Methods: Families enrolled in a randomized clinical trial of a family-based adherence intervention completed measures assessing parent, family, child, and medical factors. Families also used an electronic adherence monitor. Adherence of ≥95% was considered high adherence (not requiring intervention), and <95% was considered suboptimal adherence (requiring intervention). We conducted a stepwise logistic regression analysis to assess demographic, medical, child, family, and parent predictors of membership to the suboptimal adherence group.

Results: Of the 200 families of children with new onset epilepsy who enrolled, 177 families completed the study. Of these families, 121 (68%) were in the high adherence group and 56 (32%) were in the suboptimal adherence group. Families with lower socioeconomic status (SES), children of color, lower general family functioning, and more parent distress were more likely to be in the suboptimal adherence group.

Significance: We identified that parent and family factors, as well as sociodemographic characteristics, predicted membership in the suboptimal adherence group. It is critical to find creative and practical solutions for assessing and intervening upon key adherence predictors. These may include streamlined screening for parental distress and family functioning, as well as recognition that families of lower SES and communities of color may be at heightened risk for suboptimal adherence.

KEYWORDS
adherence, epilepsy, family functioning, race, socioeconomic status

1 | INTRODUCTION

Pediatric epilepsy affects roughly 472 000 children in the United States,[1] and the first line of treatment is the use of antiseizure medication (ASM), which leads to seizure freedom in ~65% of children with epilepsy[2]; however, approximately 60% of children and families struggle to maintain adherence to their ASM.[3] Nonadherence (i.e., behaviors that do not align with recommendations made by a medical professional or health care provider)[4,5] is linked to increased morbidity (e.g., continued seizures)[6], clinically unnecessary medication changes,[5] and increased health care costs.[7] For example, children who were nonadherent in the first 6 months of ASM treatment were 3.24 times more likely to have ongoing seizures 4 years following diagnosis.[6] Thus, identifying and mitigating adherence barriers early in the disease process is imperative to optimizing quality of life.

As outlined by the Pediatric Self-Management Model, individual, family, community, and health care system factors contribute to pediatric self-management.[4,5] For younger children with epilepsy, members of the family system, such as caregivers, play a particularly large role, taking on primary responsibility for completing treatment-related tasks, including scheduling appointments, obtaining medicines, developing dosing routines, and managing competing demands to achieve optimal adherence.[8] Thus, parent and family factors can play a large role in a child's adherence, including socioeconomic status (SES), family communication, and family problem-solving.[4,5,9,10] Additionally, parents who lack knowledge about epilepsy and those experiencing psychosocial distress may struggle to optimally follow medication regimens.[4,5,9,10]

Child-specific factors such as behavioral problems, medical factors such as medication side effects, and other community and health care system factors can also help or hinder adherence among young children with epilepsy.[4,5] For young children, these child-, medical-, and health care system-specific factors often indirectly contribute to adherence behaviors by leading to additional family stress and burden, which may interfere with administering ASM. Thus, these data clearly indicate a need for family-focused adherence interventions, given the many barriers that families can face in maintaining adherence to their child's ASM.

Despite the need for family-focused interventions to improve adherence in pediatric epilepsy, few studies exist.[11-15] Several pilot trials and a recent large randomized controlled clinical trial, known as Supporting Treatment Adherence Regimens (STAR[16]), which focuses on improving parent epilepsy knowledge and family-based problem-solving skills around adherence barriers, have demonstrated preliminary efficacy in improving ASM adherence. However, we still lack the ability to identify which families would most benefit from a family-focused adherence intervention.

Key Points

- To optimize and maximize the delivery of family-based adherence interventions, it is important to identify who is in need of intervention
- Family, parent, and sociodemographic factors appear to predict whether a family has suboptimal adherence after new onset epilepsy
- Creative approaches to screening for and addressing adherence barriers are essential to maximize the health of children with epilepsy

Evidence-based treatments can take years to integrate into clinical practice, with a 17-year research to practice gap.[17] One first important step in the translation of research to practice is to identify families that require an intervention based on clinical information to inform practitioners. Thus, the key aim of the current paper is to identify specific parent, family, child, and medical factors to identify families that most need family-based adherence interventions. Specifically, this study utilizes baseline data from a randomized controlled trial (NCT01851057) for a family-focused adherence intervention (STAR) among 200 families of young children (2–12 years old) newly diagnosed with epilepsy.[16,18] STAR trial uses an enrichment design, which screens and identifies nonadherent participants (e.g., run-in period to identify nonadherence) and only randomizes individuals who would most benefit from the intervention.[19] Thus, participants who had an adherence rate of ≥95% during the baseline period were considered to represent families that did not require intervention and thus ended study participation. In contrast, families that exhibited <95% were randomized to either the control (i.e., education) or treatment group (i.e., education and problem-solving). We hypothesized that demographic (SES, child race, parent marital status), medical (presence of a seizure since last clinic visit, medication side effects), child (internalizing symptoms, externalizing symptoms, adaptive functioning, history of psychosocial functioning), family (family functioning variables), and parent (epilepsy knowledge, parent psychosocial distress) factors would predict membership in either a suboptimal adherence group needing intervention or a high adherence group not needing intervention. Importantly, we believe that these data can help to shed light on families that may be most at risk for suboptimal adherence, and therefore in need of family-focused interventions as a part of routine clinical care.

2 | MATERIALS AND METHODS

2.1 | Study participants

Participants included young children with epilepsy and their caregivers recruited from the Comprehensive Epilepsy Center at Cincinnati Children's Hospital Medical Center from April 2013 to December 2018. Inclusion and exclusion criteria included (1) child between 2 and 12 years of age; (2) child diagnosed with epilepsy in the past 7 months; (3) ASM monotherapy; (4) child and parent able to read and speak English; (5) no nonepilepsy medical disorders requiring daily medications for the child, with the exception of allergies and asthma; (6) no significant child developmental delay (i.e., autism); and (7) family living within 75 miles of the hospital.

2.2 | Design and procedures

A sequential randomization, enrichment design clinical trial (NCT01851057) was used to evaluate a family-tailored adherence intervention (i.e., STAR) for children with epilepsy and their caregivers compared to an education only intervention.[16,18] Two hundred participants were enrolled and screened for intervention based on baseline adherence rates (nonadherence < 95%). Participants demonstrating nonadherence were randomized to either the attention control group (education only) or treatment group (education and problem-solving). Both treatment groups received eight sessions. Participants with near-perfect adherence (≥95%) were monitored over the course of 7 total months for nonadherence. If nonadherence was identified during this time frame, randomization occurred. Participants with near-perfect adherence during the entire 7-month screening period ended study participation. Randomized participants received eight intervention sessions over a 4-month period and were followed for three additional follow-up visits (3, 6, and 12 months following intervention).

Eligible participants were screened in outpatient epilepsy clinics for recruitment by study coordinators and, if eligible, approached to learn about the study. Once all questions were answered and consent/assent forms were signed, study participation commenced. At the initial baseline visit, parents completed questionnaires and were given an adherence electronic monitor to track their daily medication taking. Subsequent assessments included downloading of adherence monitors and questionnaire completion. Medical chart reviews also occurred at each visit. For purposes of the current study, only baseline questionnaires were used. Baseline for each participant was considered the time point at which patients first demonstrated a month of adherence of <95%, which could have been at 1, 3, or 6 months following initial enrollment in the study. See Figure 1 for a simplified version of the study timeline. Participants were compensated for their time and effort. This study was approved

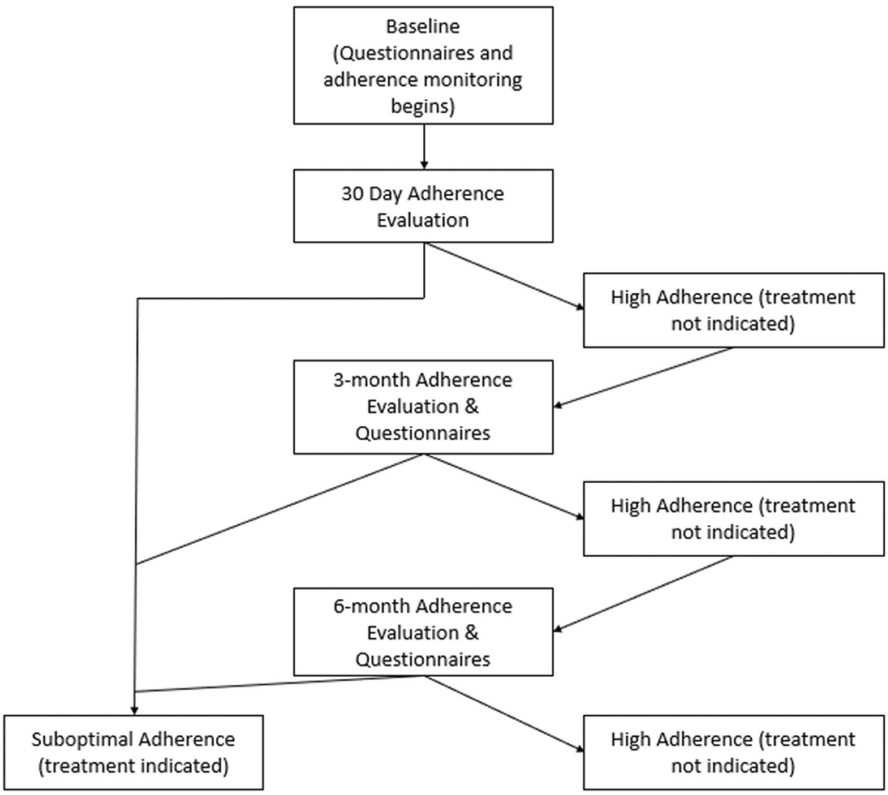

FIGURE 1 Study timeline

by the hospital institutional review board. A detailed overview of the study methods can be found in Ref. [18].

2.3 | Measures

2.3.1 | Background information form

The Background Information Form is a demographic questionnaire completed by caregivers that provides general information about the child's age, race/ethnicity, sex, and parent marital status. Race and ethnicity data were determined from self-report. A family Duncan score was used as a proxy for SES, with scores ranging 15–97 and higher scores representing higher SES.[20]

2.3.2 | Medical chart review form

Medical information was extracted from the electronic medical record to document seizure type/etiology, seizure frequency, and treatment regimen.

2.3.3 | Electronic monitoring

The Medication Event Monitoring Systems TrackCap (MEMS 6 TrackCap) made by AARDEX Corporation is an electronic monitoring system measuring the dosing histories of patients prescribed oral medications (i.e., standard plastic vial or microelectronic circuit in bottle that registers dates and times bottle is accessed). The SimpleMed + Pillbox is an electronic pillbox provided to families to organize and administer their seizure medication. Of note, the SimpleMed pillbox was not available for the study until July 2015.

Daily data from these two devices were used to calculate monthly adherence rates by dividing the number of doses taken by the number of doses prescribed and multiplying by 100% (e.g., 45 doses taken/60 doses prescribed * 100% = 75%). Monthly adherence rates were used for analyses.

2.3.4 | Pediatric Epilepsy Side Effects Questionnaire

The Pediatric Epilepsy Side Effects Questionnaire is a caregiver-completed questionnaire that assesses seizure medication side effects in youth aged 2–18 years with epilepsy.21 Items cover a broad range of neurological, behavioral, gastrointestinal, skin, and motor side effects and are summed to obtain a total side effects severity score. Item responses range from 1 (not present) to 6 (high severity), and total scores can range from 0 to 100. The measure has demonstrated excellent reliability and internal consistency.

2.3.5 | Behavior Assessment Schedule for Children: Parent Rating Scale

The Behavior Assessment Schedule for Children: Parent Rating Scale provides a parental assessment of behavioral and emotional difficulties in children and adolescents.[22] It yields several composite and subscale scores, including Externalizing Problems (Hyperactivity, Aggression, Conduct Problems subscales), Internalizing Problems (Anxiety, Depression, Somatization subscales), and Adaptive Skills (Adaptability, Social Skills, Leadership, Activities of Daily Living, Functional Communication subscales). Individual raw scores are converted to standardized *T*-scores, with elevations detected for ≥70 for all except Adaptive Skills, for which low scores reflect elevations (i.e., ≤30).

2.3.6 | Brief Symptom Inventory

The Brief Symptom Inventory is a self-report measure assessing parental symptoms of emotional and behavioral disorders across 10 dimensions, including Somatization, Obsession–Compulsion, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic, Anxiety, Paranoid Ideation, and Psychoticism.[23] A global index score was calculated to assess general distress: the Global Severity Index (GSI; distress level). The GSI raw scores were converted to *T*-scores. Higher scores are indicative of more symptoms. Internal consistency coefficients ranged from .71 to .85.[24]

2.3.7 | Epilepsy Knowledge Questionnaire–Revised

The original Epilepsy Knowledge Questionnaire is a 55-item questionnaire with statements regarding epilepsy knowledge and 21 statements on social knowledge of epilepsy.[25] Items were modified or deleted for the current study to be consistent with language and medical practice in the United States with 47 items. The final score represents the percentage of questions the parents answered correctly. Psychometric properties of the revised total knowledge score are adequate.

2.3.8 | McMaster Family Assessment Device

The Family Assessment Device (FAD) is a parent-report questionnaire designed to assess family functioning based on the McMaster model of family functioning.[26] The FAD contains six specific behavioral dimensions of family functioning (Problem-Solving, Communication, Roles, Affective Responsiveness, Affective Involvement, Behavior Control) and one separate scale of overall functioning, which was used for this study (alpha coefficients = .72–.92).[27] Higher scores indicate worse functioning, with a range of possible scores from 1 to 4.

2.4 | Statistical analysis

All analyses were conducted using IBM SPSS Statistics version 26. Descriptive data were evaluated including means, SDs, and percentages. Bivariate correlations were run to evaluate the relationships between variables of interest. The sample was dichotomized into two groups: (1) families that had adherence >95% (i.e., high adherence group) and (2) families that had adherence ≤95% (i.e., suboptimal adherence group). Individuals in the high adherence group were assigned a value of 0, and individuals in the suboptimal adherence group were assigned a value of 1 for adherence group membership. Adherence group classifications align with the criteria for qualifying for adherence-focused family treatment in the larger clinical trial (NCT01851057[18]).

A stepwise logistic regression was conducted to assess predictors of being in the suboptimal adherence group relative to the high adherence group among the full sample of study completers ($N = 177$). Pairwise deletion was used to handle missing data. Demographic factors, including SES, parent marital status, and child race, were included in Step 1. Medical factors, including the presence of a seizure since the last clinic visit and reported side effects of ASM medication, were included in Step 2. Child factors, including internalizing symptoms, externalizing symptoms, adaptive functioning, and history of psychosocial concerns, were added in Step 3. Family factors, including the seven domains of the FAD, were added in Step 4. Finally, parent factors, including epilepsy knowledge and parent psychological distress, were included for Step 5. When using logistic regressions, an R^2 cannot be calculated; thus, a pseudo R^2 is most commonly used to assess model fit. We used the Nagelkerke R^2, which has an upper limit of 1, and higher numbers indicate better fit. The Nagelkerke R^2 is reflective of improvement above and beyond a null model (model with no predictors).

3 | RESULTS

Two hundred parents of children with new onset epilepsy enrolled in the study, but 23 withdrew from the study or were lost to follow-up, resulting in a total of 177 families that completed the study. Of these families, 121 (68%) were in the high adherence group and 56 (32%) were in the suboptimal adherence group. Of the 56 families in the suboptimal adherence group, 52% were randomized after the initial 1-month of monitoring. The remaining families were randomized at later time points due to high initial adherence (4-month randomization = 35%, 7-month randomization = 13%). Based on self-report, parents were predominantly White, non-Hispanic (86.5%); female (94.5%); and married (70%; see Table 1).

A small subset of parents reported clinically significant global psychological distress (14%). A slightly larger group reported psychosocial concerns about their child, with 20% reporting clinically concerning internalizing problems, 13.5% reporting clinically concerning externalizing problems, and 18.4% reporting clinically concerning adaptive functioning difficulties. A subset of families reported low family functioning across all domains: Problem-Solving (6.1%), Communication (14.4%), Affective Responsiveness (6.1%), Roles (13.9%), Affective Involvement (26.1%), Behavioral Control (14.4%), and General (6.7%).

3.1 | Logistic regression

In Step 1 (demographics, Nagelkerke $R^2 = .20$), individuals with higher SES (odds ratio [OR] = .98, $p < .001$) were less likely to be in the suboptimal adherence group. Specifically, for each 1 unit increase in SES (range = 15–97), individuals were 3.3% less likely to be in the suboptimal adherence group. Families with children of color (i.e., Black, Asian, or multiracial; OR = 3.26, $p = .009$) were 226% times more likely to be in the suboptimal adherence group. There were no significant predictors of adherence group in Step 2 (medical factors, Nagelkerke R^2 change = 0) or Step 3 (child psychosocial factors, Nagelkerke R^2 change = .02). In Step 4 (family factors, Nagelkerke R^2 change = .07), those with better general family functioning (OR = .08, $p = .032$) were less likely to be in the suboptimal adherence group. Specifically, for each 1 unit increase in family functioning (range = 1–4), individuals were 92% less likely to be in the suboptimal adherence group. In Step 5 (parent factors, Nagelkerke R^2 change = .05), parents with higher psychosocial distress (OR = 1.05, $p = .027$) were 5% more likely to be in the suboptimal adherence group. Specifically, for each 1 unit increase in parent

TABLE 1 Descriptive characteristics at baseline

Characteristic	Suboptimal adherence, *n* (%)	High adherence, *n* (%)	Total, *n* (%)
Sample size	56	121	200
Parent ethnicity			
White	46 (82.1%)	109 (90.1%)	173 (86.5%)
Black	8 (14.3%)	6 (5%)	18 (9%)
Asian	0 (0%)	3 (2.5%)	3 (1.5%)
Multiracial	2 (3.6%)	2 (1.7%)	4 (2%)
Other/unknown	0 (0%)	1 (.8%)	2 (1%)
Parent sex			
Female	56 (100%)	114 (94.2%)	189 (94.5%)
Marital status			
Married	28 (50%)	99% (81.8%)	140 (70%)
Single, divorced, or other	28 (50%)	22 (18.2%)	60 (30%)
Child age, mean (SD)	7.7 (3.1)	7.6 (2.9)	7.5 (2.9)
Child sex			
Female	29 (51.8%)	65 (53.7%)	105 (52.5%)
Seizure type			
Partial	11 (20%)	45 (37%)	60 (30%)
General	31 (55%)	47 (39%)	87 (43.5%)
Unclassified	14 (25%)	29 (24%)	53 (26.5%)
Initially prescribed antiseizure drug			
Carbamazapine	6 (11%)	18 (15%)	27 (13.5%)
Ethosuximide	18 (32%)	32 (26%)	54 (27%)
Levetiracetam	12 (21%)	39 (32%)	60 (30%)
Oxcarbazepine	3 (5%)	11 (9%)	15 (7.5%)
Lamotrigine	0 (0%)	3 (2%)	3 (1.5%)
Topiramate	1 (2%)	1 (1%)	2 (1%)
Valproic acid	16 (29%)	17 (14%)	39 (19.5%)
Parent BSI global severity index *T*-score, mean (SD)	52.3 (11.4)	47.7 (10.9)	48.9 (11.2)
BASC-PRS, mean (SD)			
Internalizing *T*-score	52 (11.3)	49.4 (10.7)	50.1 (11.4)
Externalizing *T*-score	51.2 (10)	48.8 (10)	49.2 (9.9)
Adaptive functioning *T*-score	46.7 (11)	51.8 (10)	50.5 (10.7)
Family functioning, mean (SD)			
General	1.6 (.4)	1.5 (.4)	1.5 (.4)
Problem-solving	1.8 (.4)	1.7 (.4)	1.7 (.4)
Communication	1.9 (.4)	1.7 (.4)	1.8 (.4)
Roles	2.1 (.4)	1.9 (.4)	1.9 (.4)
Affective responsiveness	1.7 (.5)	1.6 (.4)	1.6 (.4)
Affective involvement	1.9 (.4)	1.8 (.5)	1.8 (.5)
Behavioral control	1.5 (.4)	1.4 (.3)	1.4 (.4)

Note: Two hundred families completed the baseline assessment, but 23 families withdrew or were lost to follow-up, so these families are not represented in the 56 and 121 who respectively were categorized into the suboptimal and high adherence groups, but are captured in the descriptive statistics for the total *n*.

Abbreviations: BASC-PRS, Behavior Assessment Schedule for Children: Parent Rating Scale; BSI, Brief Symptom Inventory.

distress, individuals were 5% more likely to be in the suboptimal adherence group. Thus, an individual with higher parent distress (1 SD above the mean) was 112% more likely to be in the suboptimal adherence group than an individual with low parent distress (1 SD below the mean). In the final model with all five steps, lower SES, children of color, lower general family functioning, and more parent distress all remained unique and significant predictors of being in the suboptimal adherence group (final Nagelkerke $R^2 = .34$). See Table 2 for a list of the final ORs.

3.2 | Exploratory analyses

We conducted exploratory analyses to better understand the odds of being in the suboptimal adherence group by race. The dichotomization of race into White and non-White is not ideal; however, this decision was made due to small sample sizes of children of color. Therefore, we decided to run two exploratory logistic regressions evaluating the odds of being in the suboptimal adherence group for Black children relative to White children and multiracial children relative to White children, as these two groups were large enough for comparisons. We controlled for income and SES in these analyses. These analyses indicated that families with children who are Black (OR = 2.90, $p = .002$) were nearly three times more likely to be in the suboptimal adherence group and that families with children who are multiracial (OR = 1.22, $p = .56$) were no more likely to be in the suboptimal adherence group compared to White children. However, these results should be interpreted with caution, given the relatively small sample sizes of the comparator groups ($n = 20$ and 15, respectively).

TABLE 2 Final ORs ($N = 177$)

Predictors	OR	SE	*p*
Duncan (SES)	0.98	0.01	.02
Marital status	1.04	0.25	.88
Race	3.67	0.55	.02
Seizures since last visit	1.30	0.44	.55
Side effects	0.98	0.02	.38
Externalizing symptoms (CBCL)	0.97	0.03	.32
Internalizing symptoms (CBCL)	0.98	0.03	.47
Adaptive skills (CBCL)	0.98	0.03	.44
History of psychosocial problems	2.04	0.50	.16
FAD problem-solving	1.74	0.94	.55
FAD communication	4.53	0.92	.10
FAD roles	2.19	0.82	.342
FAD affective responsiveness	0.86	0.74	.84
FAD affective involvement	0.91	0.69	.89
FAD behavioral control	3.11	0.97	.24
FAD general	0.08	1.22	.04
Epilepsy knowledge	0.96	0.03	.22
BSI GSI (parent distress)	1.05	0.02	.03

Abbreviations: BSI, Brief Symptom Inventory; CBCL, Child Behavior Checklist; FAD, Family Assessment Device; GSI, Global Severity Index; OR, odds ratio; SES, socioeconomic status.

4 | DISCUSSION

The current study is a comprehensive evaluation of demographic, medical, child, caregiver, and family factors that relate to adherence behaviors in young children with newly diagnosed epilepsy. Building from the Pediatric Self-Management Model, we identified four key predictors of suboptimal adherence. These factors include both nonmodifiable and modifiable factors that should be assessed and addressed within clinical practice settings.

Nonmodifiable factors included SES and race/ethnicity, which are intrinsically linked.[28] Specifically, lower SES and the child being of color were associated with being in the suboptimal adherence group, and exploratory analyses found that relative risk of being in the suboptimal adherence group was even higher among children with Black racial identities. Lower SES being associated with suboptimal adherence has long been established in the pediatric epilepsy adherence literature.[3] However, findings related to the child's race are novel in the field and mirror some of the adult epilepsy adherence literature. Specifically, Bautista et al.[29] found that relative to White non-Hispanic adults, Black adults had lower ASM adherence after controlling for key adherence predictors (e.g., education, age, epilepsy type). The reasons for these differences may be attributed to the perception that ASMs are more harmful than beneficial among groups that have faced historic mistreatment and therefore have broken trust with medical providers and systems.[30,31] Furthermore, the outcomes for individuals with epilepsy who are socially disadvantaged and/or Black appear to be worse.[29,32] This may be due to historic barriers that have resulted in a lack of resources and access to comprehensive multidisciplinary epilepsy care[33] or systemic and institutional racism that exists in our medical system. Furthermore, recent research by our team has identified that barriers to adherence are different for White families as compared to Black families.[34]

This intersectionality of SES and race on adherence highlights the need to identify families seen in epilepsy care that are less resourced due to these nonmodifiable factors and speaks to the need to provide proactive

interventions. Because historic systems of racism and inequality have contributed to this current disparity for Black children, the proactive identification of systemic barriers and subsequent interventions to mitigate these barriers are essential to adherence promotion among Black children with epilepsy. For instance, perhaps adherence interventions should first seek to assess and address systemic barriers (e.g., access to pharmacies), and then provide individual adherence interventions only if adherence problems persist once barriers are addressed. Social workers may be ideally positioned to identify systemic barriers together with families and connect them with appropriate resources. The Epilepsy Learning Healthcare System is currently evaluating ways to systematically assess adherence barriers, with the goal of addressing both the systems and individual/family barriers.[35] Another approach is to address adherence barriers at point of care[36] via interdisciplinary teams, which are timely and cost-effective.[37] Valenzuela and Smith[31] encourage interdisciplinary care with psychologists to promote patient–provider interactions that are sensitive to the family and likely contribute to reductions in health disparities. In general, adherence interventions at point of care need to be culturally tailored when possible, as this typically facilitates improved adherence behaviors.[38,39]

Modifiable factors that predicted suboptimal adherence group status included general family functioning and parental distress. These findings are consistent with the literature,[9,40] as caring for a child with a chronic condition can be stressful to caregivers[41] and lead to parental distress. Studies have demonstrated that caregivers of children with chronic conditions are more likely to be have symptoms of depression, anxiety, and posttraumatic stress disorder.[42-44] Thus, it is critical for pediatric epilepsy health care providers to recognize the critical need to address the family unit in care, as parent functioning is directly linked to child outcomes.[45-47] Despite a growing body of literature that delineates the role of parent psychosocial factors in medication adherence among children with epilepsy, screening for parent distress and family functioning has largely been confined to research endeavors and is virtually nonexistent during pediatric clinical health encounters. Thus, the current standards for clinical practice fail to capture dynamics critical to patient success, and thereby miss opportunities to address modifiable factors that influence medication adherence.

Overall, these data highlight several areas that warrant attention in clinical settings. Although comprehensive screening of child, parent, and family factors that lead to suboptimal adherence is recommended, the busy pace of clinic visits and inability to screen in smaller clinical practices makes this recommendation difficult to implement. Furthermore, interdisciplinary epilepsy care is vital in the treatment of both physical and mental health symptoms of youth with epilepsy. Having psychologists integrated into routine epilepsy visits would allow for clinical assessment and short-term therapeutic solutions that are proactive and preventative in nature. For example, if a young child is exhibiting more behavioral issues, which could lead to parent distress, a psychologist may be able to provide strategies for behavior early on to mitigate larger behavioral issues. Such interventions likely would influence adherence and self-management, given that children with oppositional behaviors are less likely to adhere to their treatment regimen. As noted above, psychologists can also serve to improve patient–provider communications within the team, which could additionally benefit family adherence and thereby health (e.g., seizure control) and patient-reported outcomes (e.g., quality of life).

Although the study has several strengths, including a large sample size and well operationalized outcomes, there are several notable limitations. First, the larger STAR randomized clinical trial was conducted at only a single site, which limits its generalizability. Multisite adherence intervention studies, some of which are ongoing (NCT03817229, NCT03958331), should replicate these study findings. Although electronic monitors are used for research purposes, they have not been supported well for clinical use due to cost in epilepsy. Thus, identifying new biomarkers of adherence (e.g., hair samples, blood levels) or having robust and simple adherence patient-reported outcomes[48] could prove useful in clinical settings. Families enrolled in clinical trials, as represented in the current study, may not represent all families seen in clinical practice,[49] and thus the sample may not be generalizable. This may be especially true for families of color.[50] Furthermore, the inclusion criteria for this study may limit the generalizability of these findings to those with treatment-resistant epilepsy who may be on polytherapy or who are not newly diagnosed. Adherence predictors may change as children's medical regimens become more complicated and as they manage their epilepsy for longer. Thus, further research in this area is essential. Finally, this study was completed as a secondary data analysis, and therefore we did not conduct a priori power analyses. This may limit the interpretation of our findings and speaks to the importance of replication through ongoing prospective research on these predictors of adherence.

Despite limitations of this study, the current data suggest the importance of finding creative and practical solutions for assessment and treatment of key adherence predictors. These may include streamlined screening for parental distress and family functioning, as well as recognition that families of lower SES and communities of color may be at heightened risk for suboptimal adherence.

Thus, interdisciplinary care is highly recommended to optimize outcomes for youth with epilepsy.

AUTHOR CONTRIBUTIONS

Dana M. Bakula: Conceptualization, formal analysis, methodology, validation, visualization, writing–original draft preparation, writing–review & editing. Katherine W. Junger: Conceptualization, visualization, writing–review & editing. Shanna M. Guilfoyle: Conceptualization, visualization, writing–review & editing. Constance A. Mara: Conceptualization, formal analysis, methodology, visualization, writing–review & editing. Avani C. Modi: Conceptualization, visualization, writing–review & editing, funding acquisition, investigation, methodology, project administration, resources, supervision, validation, writing–original draft preparation.

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CONFLICT OF INTEREST

None of the authors has any conflict of interest to disclose. We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

ETHICAL APPROVAL

This study received Institutional Review Board approval and followed ethical guidelines of the American Psychological Association.

PATIENT CONSENT STATEMENT

All patients enrolled in this study provided informed consent for participation.

DATA AVAILABILITY STATEMENT

These data will be available upon request and we will follow journal guidelines for data sharing and availability.

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