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Clinical Pediatrics: Open Access

Research Article

Care of Pediatric Patients with Tic Disorders by Provider Type: An Observational Study

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ABSTRACT

Tic disorders are common conditions treated by different health care providers. Provider availability, patient and family preferences, and community resources may affect which providers see these patients. This retrospective study evaluates how provider type influences treatment patterns in the care of patients with tic disorders. It includes a series of patients (age<18) presenting to Penn State Health's Movement Disorder Clinic between August 2008 and September 2019 who were assessed by either a pediatrician or pediatric neurologist and diagnosed with tic disorder or Tourette syndrome. Demographics, diagnoses, medications, referrals, and follow-up statuses were evaluated. Chi-square tests were performed to compare treatment patterns between pediatrician and pediatric neurologists. A total of 399 patients were evaluated, 121 by a pediatrician and 278 by a pediatric neurologist. Pediatric neurologists were more likely than the pediatrician to prescribe any medication for tics (21.58% vs. 9.09%, p=0.003), particularly clonidine (7.55% vs. 0.83%, p=0.007) and topiramate (8.63% vs. 1.65%, p=0.009). Pediatric neurologists were also more likely to schedule patients for follow-up (71.58% vs. 31.40%, p<0.001). In contrast, the pediatrician more frequently referred patients for cognitive behavioral therapy (52.07% vs. 2.52%, p<0.001) and comprehensive behavioral intervention for tics (26.45% vs. 7.55%, p<0.001). In this observational study, the pediatric neurologists prescribed more medications and followed up with patients more often, while the pediatrician tended to refer patients for behavioral interventions.

Keywords: Tic disorders; Tourette syndrome; Behavioral therapy; CBIT; Medication; Pediatrics; Observational study

INTRODUCTION

Tics, defined as involuntary, patterned movements or vocalizations, are relatively common in children with prevalence ranging from 4% to 24% [1]. Tics are diagnosed as tic disorders when they cause significant clinical impairment [2]. Tourette Syndrome (TS) is a tic disorder characterized by multiple motor tics and at least one vocal tic that begin in childhood and persist for at least one year [1]. In addition to tics, children with TS frequently have coexisting neurodevelopmental and psychiatric conditions such as Attention Deficit Hyperactivity Disorder (ADHD), Obsessive-Compulsive Disorder (OCD), anxiety, disruptive behaviors, Autism Spectrum Disorder (ASD), and learning difficulties [1-5]. The combination of tics, ADHD, and OCD is often referred to as the "Tourette's syndrome triad" [6]. These comorbidities are often more debilitating than the tics and may require co-management by different provider types [4].

The availability of providers, patient and family preferences, and community resources can influence the type of provider that treats children with tic disorders and TS. According to one study, the majority of children with TS are diagnosed by specialists (i.e., neurologist, psychiatrist, or developmental and behavioral pediatrician), followed by general practitioners (i.e, pediatrician or family physician) [5]. Given the shortage of specialists across the country, it would improve access if primary care providers could diagnose and manage a greater number of children with tic disorders and TS.

Tic disorders and TS can be treated by a variety of interventions including psychoeducation, behavioral therapy, pharmacotherapy, deep brain stimulation, or a combination of therapies [1,2,6-8]. While standards of care exist, there are variations in treatment plans because none of these treatments result in complete resolution of symptoms. Treatment plans are tailored to each individual patient and may vary based on tic severity, the presence of comorbidities, and patient and family preferences and goals [1,2,8]. In addition, treatment plans may depend on provider type, though this topic

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Received: September 17, 2021; **Accepted:** October 1, 2021 ; **Published:** October 08, 2021

Citation: Chen K, Lehman E, Byler D, Kumar A, Mainali G, Duda L (2021) Care of Pediatric Patients with Tic Disorders by Provider Type: An Observational Study. Clin Pediatr. 6:188.

has not been explored. As such, the present study aims to compare treatment patterns of pediatricians and pediatric neurologists in the management of pediatric patients with tic disorders and TS.

METHODS

This retrospective, observational study was approved by the Penn State College of Medicine Institutional Review Board. The cohort included pediatric patients (age <18 years) presenting to the Movement Disorder Clinic at the Penn State Health Milton S. Hershey Medical Center between August 2008 and September 2019 who were evaluated by a provider from the Tourette Research Working Group (either a pediatrician or one of four pediatric neurologists) and diagnosed with tic disorder or TS. Electronic medical records were reviewed for the following variables: patient demographics (age, sex, race, ethnicity, median income by zip code, and health insurance status); diagnoses including comorbidities (tic disorder, TS, ADHD, anxiety, ASD, and OCD); and treatment patterns (medications, referrals, and follow-up statuses). Using SAS version 9.4 (SAS Institute, Cary, NC), chi-square tests for categorical variables and two-sample t-tests for continuous variables were performed to evaluate patient characteristics and compare treatment patterns between pediatrician and pediatric neurologist. Variables with a p-value <0.05 were deemed to be statistically significant.

RESULTS

Final included cohort

Six hundred fifty-eight pediatric patients with ICD codes for tic disorders and TS were identified. Two hundred fifty-nine patients were excluded for various reasons including: being seen by a pediatrician or pediatric neurologist outside the Tourette Research Working Group (n=136), being seen outside of pediatrics or pediatric neurology (n=99), not having a tic disorder (n=19), having an unclear diagnosis (n=4), or having an encounter not focused on the patient's tics (n=1). A total of 399 patients were included in the final analysis, with 121 seen by a pediatrician and 278 seen by a pediatric neurologist.

Characteristics of the cohort are displayed in Table 1. The average age at first encounter was 9.1 years (SD 2.7). Seventy-eight percent were male, 81% were white, and 8% identified as Hispanic. TS was diagnosed in 52% of the cohort, while the remaining patients were diagnosed with a tic disorder. Forty percent had coexisting ADHD, 32% with anxiety, 22% with OCD, and 10% with ASD. Compared to patients who saw pediatric neurologists, those who saw the pediatrician were more likely to be older (p=0.004) and to live in zip codes with a higher median income (p=0.006). In addition, the pediatrician managed a greater proportion of children with TS (p<0.001) and anxiety (p<0.001), while the pediatric neurologists saw more patients with tic disorders (p<0.001) and other diagnoses (p<0.001) including neurologic disorders such as migraine and seizure.

Treatment patterns by provider type

Table 2 displays treatment patterns regarding medications, referrals, and follow-up status within the entire cohort and by provider type. Overall, 28% of pediatric patients were prescribed medications with 18% taking them for tics, 11% for ADHD, and 3% for anxiety. The majority of patients (64%) did not receive referrals. Out of those referred for behavioral interventions, 18% were referred for Cognitive Behavioral Therapy (CBT) and 13% for Comprehensive Behavioral Intervention for Tics (CBIT). Fifty-nine percent of the cohort were scheduled for follow-up, while the rest were seen on an as needed basis.

Both provider types had similar rates of prescribing certain medications for tics (including guanfacine, haloperidol, and risperidone) and any medications for both ADHD and anxiety. Compared to the pediatrician, however, the pediatric neurologists were more likely to prescribe any medication for tics overall (22% vs. 9%, p=0.003), and more specifically, clonidine (8% vs. 1%, p=0.007) and topiramate (9% vs. 2%, p=0.009). Furthermore, the pediatric neurologists were more likely to schedule patients for follow-up appointments rather than see them on an as needed basis (72% vs. 31%, p<0.001). In contrast, the pediatrician more frequently referred patients for behavioral interventions including CBT (52% vs. 3%, p<0.001) and CBIT (26% vs. 8%, p<0.001) compared to the pediatric neurologists.

Table 1: Patient characteristics of those seen by a pediatrician versus those seen by a pediatric neurologist.

Variables	Entire cohort (n=399)	Pediatrician (n=121)	Pediatric neurologist (n=278)	P-value
Demographics				
Age, mean years (SD)	9.1 (2.7)	9.7 (2.8)	8.9 (2.6)	0.004
Sex, n male (%)	312 (78)	91 (75)	221 (80)	0.30
Race, n white (%)	322 (81)	99 (86)	223 (82)	0.236
Ethnicity, n Hispanic (%)	31 (8)	9 (8)	22 (9)	0.894
Income, median by zip code	61927.2	64457.2	60831.1	0.006
(SD) Health insurance				
Private	245 (61)	74 (61)	171 (62)	0.947
Public (Medicaid/CHIP)	158 (40)	44 (36)	114 (41)	0.383
None/Self-pay	28 (7)	10 (8)	18 (6)	0.50
Diagnoses				
Tic disorder, n (%)	193 (48)	38 (31)	155 (56)	<0.001
Tourette syndrome, n (%)	206 (52)	83 (69)	123 (44)	<0.001
ADHD, n (%)	160 (40)	46 (38)	114 (41)	0.575
Anxiety, n (%)	129 (32)	68 (56)	61 (22)	<0.001
ASD, n (%)	41 (10)	12 (10)	29 (10)	0.876
OCD, n (%)	87 (22)	26 (21)	61 (22)	0.919
Other, n (%)	164 (41)	32 (26)	132 (47)	<0.001

Table 2: Comparison of treatment patterns between pediatrician and pediatric neurologist.

Variables	Entire cohort (n=399)	Pediatrician (n=121)	Pediatric neurologist (n=278)	P-value
Medications by diagnosis				
Any diagnosis, n (%)	113 (28)			
Tics				
Any medication, n (%)	71 (18)	11 (9)	60 (22)	0.003
Clonidine, n (%)	22 (6)	1 (1)	21 (8)	0.007
Guanfacine, n (%)	17 (4)	4 (3)	13 (5)	0.533
Haloperidol, n (%)	2 (1)	1 (1)	1 (0.4)	1.000
Risperidone, n (%)	6 (2)	2 (2)	4 (1)	1.000
Topiramate, n (%)	26 (7)	2 (2)	24 (9)	0.009
Other, n (%)	5 (1)	1 (1)	4 (1)	0.692
ADHD				
Any medication, n (%)	42 (11)	18 (15)	24 (9)	0.062
Atomoxetine, n (%)	16 (4)	-	-	-
Clonidine, n (%)	7 (2)	-	-	-
Dextroamphetamine-amphetamine, n (%)	4 (1)	-	-	-
Guanfacine, n (%)	2 (1)	-	-	-
Lisdexamfetamine, n (%)	2 (1)	-	-	-
Methylphenidate, n (%)	6 (2)	-	-	-
Other, n (%)	6 (2)	-	-	-
Anxiety				
Any medication, n (%)	10 (3)	4 (3)	6 (2)	0.731
Citalopram, n (%)	1 (0.3)	-	-	-
Escitalopram, n (%)	0 (0)	-	-	-
Fluoxetine, n (%)	2 (1)	-	-	-
Paroxetine, n (%)	0 (0)	-	-	-
Sertraline, n (%)	5 (1)	-	-	-
Other, n (%)	3 (1)	-	-	-
Referrals		-	-	-
CBT, n (%)	70 (18)	63 (52)	7 (3)	<0.001
CBIT, n (%)	53 (13)	32 (26)	21 (8)	<0.001
Other, n (%)	47 (12)	11 (9)	36 (13)	0.272
None, n (%)	255 (64)	-	-	-
Follow-up	-	-	-	<0.001
As needed, n (%)	162 (41)	83 (69)	79 (28)	-
Scheduled, n (%)	237 (59)	38 (31)	199 (72)	-

DISCUSSION

Our findings suggest that provider type may influence the treatment prescribed for pediatric patients with tic disorders and TS. A greater proportion of patients evaluated by pediatric neurologists were prescribed pharmacologic treatment for their tics. On the other hand, those who saw the pediatrician were more likely to be referred for behavioral interventions such as CBT or CBIT. While tics cannot be cured, recent studies have shown that behavioral interventions such as CBIT can be more effective in improving tic severity compared to supportive psychotherapy or medications [9-11]. Though this study is the first to demonstrate that treatment of patients with tic disorders vary by provider type, our results are consistent with those seen in a prior study comparing specialist and generalist treatment patterns of Alzheimer's disease. Results showed that specialists prescribed disease-specific medications more frequently, but made referrals less often than generalists [12].

Our data further demonstrate that the pediatric neurologists scheduled follow-up appointments more often than the pediatrician. The higher follow-up frequency may be associated with the increased rates of pediatric neurologists prescribing medication for tics, as patients on medications require follow-up for proper dosing and management of side effects Patients with associated comorbidities such as migraine and seizures also require more scheduled follow-ups.

Our study is not without limitations. First, our cohort comes from a single, rural academic center. In addition, this study excluded other provider types who see patients with tic disorders such as family physicians and psychiatrists. Furthermore, a major limitation is the unbalanced representation of the two provider types included in the study. Due to referral process, the pediatric neurologists saw more patients with other comorbid neurologic diagnoses beyond the TS triad. These additional diagnoses may have impacted the ability to access or the desire to pursue behavioral therapies. However, when we removed patients with other diagnoses beyond the TS triad, the difference in referral pattern remained statistically significant: the pediatrician was still more likely than the pediatric

neurologists to refer patients for CBT (83% vs. 17%, p=0.005) and CBIT (67% vs. 33%, p=<0.001).

CONCLUSION

Despite these limitations, our results reflect important observations that treatment of pediatric patients with tic disorders may differ by provider type. Both pediatrician and pediatric neurologists prescribed similar rates of certain medications for tics and any medication for ADHD and anxiety. However, the pediatric neurologists overall prescribed medication for tics and scheduled patients for follow-up more often than the pediatrician. In addition, the pediatrician referred more patients for behavioral intervention compared to the pediatric neurologists. Further studies comparing treatment patterns of a large cohort of different providers are warranted to elucidate if variability in practice found in this study are reproduced. It would also be important to look at outcomes of care of different providers, as well as to clarify if all patients with tic disorders or some subset of them can be cared for effectively by pediatricians. This knowledge could help provide increased access to care for patients with tics given scarcity of specialists such as pediatric neurologists or child psychiatrists.

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