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Review Papaer

What Do We Currently Know About Functional Tic-Like Behaviors: A Topical Review

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ABSTRACT

Background: During the last 5 years, functional tic-like behaviors (FTLBs) have been the center of an increasing amount of scientific research.
Purpose: The purpose of this review was to collect this research and create an overview of what is currently known about the patient group.
Methods: PubMed, EMBASE, and Web of Science were systematically searched for relevant papers, which were then sorted based on set inclusion and exclusion criteria. This process resulted in twenty-four papers selected for extraction, the results of which were summarized.
Results: The results were split into three topics: characteristics, follow-ups, and treatment. Across studies on characteristics, patients with FTLB have overall higher symptom severity and complexity and a higher prevalence of anxiety and depression compared to the patients with Tourette syndrome included in the studies. The patients with Tourette syndrome had a higher prevalence of simple tics and comorbid attention-deficit/hyperactivity disorder and obsessive-compulsive disorder. However, in both populations there was considerable heterogeneity in both comorbidity profile as well as the characteristics of vocalizations and movements. The follow-up literature was relatively small but showed a general reduction in FTLB patients' symptoms over time, although spontaneous remission was rare. The treatment literature, which consisted of just two articles, showed good benefit of cognitive therapies.
Conclusions: Overall, the FTLB patient group presents with a wide variety of symptoms, which tends to persist but responds well to cognitive treatment. More research is needed particularly within the treatment literature.

Introduction

Functional tic-like behaviors (FTLBs) are a type of functional neurological disorder simulating tics[1] Although previously less recognized, the number of patients presenting with FTLBs increased dramatically during the COVID-19 pandemic.[2] As the number of patients presenting with this symptom increased, so did the research attention toward this topic. Five years since the onset of the pandemic, it is time to review the literature on FTLB

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characteristics, trajectory, and treatment, and highlight gaps in our knowledge. This review will summarize the known knowns and the known unknowns about FTLB.

Materials and Methods

EMBASE, PubMed, and Web of Science were searched on the 22nd of January 2025 for all articles on FTLB published after 2020 (for search strings, see Appendix A). A total of 229 articles were found and imported into Covidence. Ninety were identified as duplicates, and 139 were included for abstract screening. During the screening, the following inclusion and exclusion criteria were used:

Inclusion criteria: Original articles including a population of patients with FTLB and focus on clinical characterization, follow-up (FU), or treatment.

Exclusion criteria: Conference abstracts, reviews, opinion pieces, or case reports. Articles in languages other than English or Danish were excluded.

Forty-nine studies were included in full text screening, while 25 were excluded. A total of 24 studies were found eligible for extraction, 16 on general FTLB characteristics, 6 reporting on FUs, and 2 about treatment. The other articles were excluded for the reasons listed above, predominantly for being case studies and opinion pieces, or having a different focus.

A quick comment on terminology and validity

A challenge when reviewing the literature on FTLB is the change in terminology throughout the last 5 years and the lack of reporting on the diagnostic process (see the study by Andersen et al[3] for discussion). Initially, this population was referred to with a wide variety of terms including "functional tics,"[4] "Tik Tok tics,"[5] "Mass social media-induced functional Tourette-like behaviors,"[6] and "Functional Tourette-like behaviors."[7] Over time, the term "functional tic-like behaviors" rose in prominence and is now primarily used. In this review, all these terms are assumed to refer to the same group of patients, although there are stated differences in their definition. The term "Mass social media-induced functional Tourette-like behaviors", for example, was specifically used to describe patients who had seen tic content on social media before developing their symptoms[6,7]; it is currently unclear whether this group is different enough from the general FTLB group to warrant a separate categorization.

The labeling of the symptoms has also developed over time. As with the disorder, there has been a move toward adding the suffix "-like," i.e., going from "tic" and "coprolalia" to "tic-like" and "coprolalia-like".[8] The trend of adding of "-like" to both the symptoms and disorder labels is interesting, as this is not seen in other functional movement disorders, i.e., "functional tremor"[9] and "functional dystonia".[10] In this review, "tic" and "tic-like" are assumed to refer to the same symptoms. Moving forward, coming to a consensus about the labeling of the diagnosis, movements, and vocalizations, as well as whether differences in labeling (i.e., coprolalia vs coprolalia-like) reflect a difference in phenomenology or etiology may be important.

Previous work addressed issues with the diagnostic process of FTLB and circular reasoning[2,3] which could affect the validity of the included studies, especially pertaining to symptom characteristics. Thus, the purpose of this review is to summarize the current evidence and highlight gaps and future directions. Whether the current evidence maps accurately onto a well-defined patient group is a different topic, which required further work.

Typical characteristics of FTLB

The literature describing the typical characteristics of FTLB consists of 16 studies in total with a combined 583 patients with FTLB and 168 patients with FTLB + Tourette syndrome (TS). FTLB + TS patients were defined as patients who either were diagnosed with both disorders or had been noted as previously having tics. For the data summation, the FTLB + TS patients were included with the FTLB patients, as only one paper had a separate dataset on FTLB + TS patients.[11] The included studies also contained data on 3092 patients with TS or chronic tic disorder, used as a comparison group for the FTLB and FTLB + TS patients. These are the total number of patients reported across the literature, but it should be noted that, in some cases, the same patients were included across multiple studies.[12,13] This has been corrected for in the summation tables and discussion below, so that the same result has only been included once. Furthermore, some studies sex- and/or age-matched their patients with TS to their patients with FTLB;[14] these have been excluded from the results on TS patients' age and sex.

Age, sex, family history, and comorbidities

Across all studies reporting average age at symptom onset, patients with FTLB were older compared to patients with TS, averaging 15.6 years compared to 7.4 years (Table 1). Furthermore, on average, a higher percentage of patients with FTLB were female (81.4% on average in FTLB and 29.1% on average for TS), while a lower percentage had a family history of tics in comparison to patients with TS (15% on average for patients with FTLB vs 29% for patients with TS; Table 1). Seven of the studies reported other gender identities than male/female,[5,12,13,15-18] but the difference in label use made it difficult to include these identities in the summation tables. Briefly, Berg and colleagues'[12,13] patients with FTLB were significantly more likely to identify as transgender/gender diverse compared to their patients with TS and their neurotypical participants, but there was no significant difference in symptom severity between trans/gender diverse patients and cisgender patients. A similar result was found in Nilles and colleagues,[17] where presence of trans and gender diverse identities were not found to impact tic severity at FU, and in Tomczak and colleagues[5] where gender diverse patients with FTLB did have a significantly worse overall functioning, but there was no difference in terms of improvement of tic-like behaviors.

Patients with TS had a slightly higher average prevalence of comorbid attention-deficit/hyperactivity disorder (ADHD) and obsessive-compulsive disorder (OCD) compared to patients with FTLB, while a higher percentage of patients with FTLB were diagnosed with anxiety and depression (Table 1). The average prevalence of other functional neurological disorders and precipitating stressors is difficult to compare between groups as only one study recorded these for patients with TS (Table 1). While averaging the results across papers gives some information about differences between patients with TS and FTLB, it is worth noting significant discrepancies across the articles. Especially for the psychiatric comorbidities there are substantial differences between the minimum and maximum values reported. For example, the rate of anxiety in TS ranges between 6.5% and 69%, and the prevalence of ADHD in FTLB ranges from 7.7% to 68% (Table 1). The prevalence of OCD showed the least consistent directionality, with some studies reporting higher prevalence in TS,[8,12,19,20] and others in FTLB.[11,21-23] The psychiatric comorbidities also differed in how they were recorded. Some studies used patients' medical records,[7,21-25] others asked the patients or their parents[7,21,22,24]), and others used different assessment tools to make the diagnoses[7,8,12,13,19,20] Some

TABLE 1.
Basic Demographic Data

Group of Patients	TS	FTLB and FTLB + TS	TS	FTLB and FTLB + TS	TS	FTLB and FTLB + TS
Variable	Average Age at Onset	Average Age at Onset	Female Sex (%)	Female Sex (%)	Positive Family History of Tics (%)	Positive Family History of Tics (%)
Number of studies	9	14	7	15	5	7
Average	7.4	15.6	26.6%	81.4%	29.1%	15%
Min	5	13.7	21%	38%	18.8%	7.7%
Max	10.8	19.2	34%	100%	42%	29%
Comorbidities	ADHD (%)	ADHD (%)	OCD (%)	OCD (%)	Depression (%)	Depression (%)
Number of studies	7	11	7	10	5	8
Average	37.5%	30.5%	22.4%	15.2%	17.1%	38.1%
Min	15%	7.7%	8%	0%	4%	28%
Max	81%	68%	38.9%	58%	27.8%	55%
Comorbidities	Anxiety (%)	Anxiety (%)	Other FND (%)	Other FND (%)	Precipitating stressors (%)	Precipitating stressors (%)
Number of studies	7	10	1	5	1	5
Average	31.7%	54.9%	0%	20%	13.5%	69.5%
Min	6.5%	26.4%		6.3%		54%
Max	69%	90%		34%		81.8%

Abbreviations:
ADHD = Attention-deficit/hyperactivity disorder
FND = Other functional neurological disorder
FTLB = Functional tic-like behavior
Max = Maximum
Min = Minimum
OCD = Obsessive-compulsive disorder
TS = Tourette syndrome
Age at onset, percentage of female patients, and percentage of patients with positive family history of tics, along with comorbidity data for patient with TS and FTLB, respectively, as well as number of studies reporting each measurement.

studies did not describe their methodology at all.[14,18] It is possible that these differences in recording techniques may account for at least some of the variability in the data— at least it is a limitation of summarizing across studies. Another possible explanation for the data variability is the variance in sample sizes.

Characteristics of movements and vocalizations

Compared to patients with TS, patients with FTLB or FTLB + TS had a higher average score using the gold standard for tic assessment to measure tics, the Yale Global Tic Severity Scale (YGTSS; Table 2) and a higher percentage of patients had complex tics and complex behaviors such as tic attacks (1.7% vs 40.6%) and self-harming behaviors (50.9% and 12.1%) (Tables 3 and 4). Patients with TS, on the other hand, had a higher prevalence of both simple motor and vocal tics (Table 4).

A core challenge when summarizing characteristics of movements and vocalizations within the FTLB literature is the difference in reporting. There is currently no assessment for FTLB in specific nor has any assessment used for tics been validated in this patient group. Some studies stick to the usual gold standard for tics and report YGTSS scores for FTLB,[8,12,13,19,23,25] while other studies take a different approach and report the average number of different types of tic-like behaviors that patient group has or the percentage of patients that have each type of tic-like behaviors.[6,11,14,18,20-22,24-26] A few studies do describe the FTLB phenomenology in such detail that these results cannot be meaningfully summarized in a table along with other data.[14,18,26] For the complex behaviors (Table 3), we decided to report data as "copropraxia," "coprolalia," and "coprophenomena," as some studies report these symptoms separately,[26] while others report them together.[21] The type of complex behaviors that were reported also varied widely.

It is notable that simple tic-like behaviors in patients with FTLB are reported in fewer studies compared to complex behaviors (Tables 3 and 4). This preference toward reporting complex

TABLE 2.
Average YGTSS Scores Across Studies in Patients With TS and FTLB, as Well as Number of Studies Reporting Each Measurement

Group of Patients	TS	FTLB and FTLB + TS	TS	FTLB and FTLB + TS	TS	FTLB and FTLB + TS	TS	FTLB and FTLB + TS
Variables	Average Total YGTSS Score	Average Total YGTSS Score	Average YGTSS Impairment Score	Average YGTSS Impairment Score	Average YGTSS Motor Severity	Average YGTSS Motor Severity	Average YGTSS Vocal Severity	Average YGTSS Vocal Severity
Number of studies	3	3	3	3	2	2	2	2
Average	22.7	35.5	17.7	27.5	11	15.3	7.2	12.6
Min	14	29	15.8	20	10.7	13.8	6.2	10.5
Max	35.7	44.3	19.1	33.8	11.2	16.9	8.1	14.6

Abbreviations:
FTLB = Functional tic-like behavior
Max = Maximum
Min = Minimum
TS = Tourette syndrome
YGTSS = Yale Global Tic Severity Scale

TABLE 3.
Percentage of Patients With TS and FTLB With Coprolalia, Coprophenomena, Self-Harming Behaviors, and "Tic Attacks", as Well as Number of Studies Reporting Each Measurement

Variable	TS	FTLB and FTLB + TS	TS	FTLB and FTLB + TS	TS	FTLB and FTLB + TS	TS	FTLB and FTLB + TS	TS	FTLB and TS + FTLB
	Coprolalia (%)	Coprolalia (%)	Copropraxia (%)	Copropraxia (%)	Coprophenomena (%)	Coprophenomena (%)	Self-Harm (%)	Self-Harm (%)	Tic Attacks (%)	Tic Attacks (%)
Number of studies	4	4	3	3	3	5	5	7	2	4
Average	6.9%	56.6	4.6%	45.1%	19.5%	63%	12.6%	50.9%	1.7%	40.6%%
Min	4%	38.5%	2%	37%	1.8%	30.2%	0.8%	43.8%	0%	13.2%
Max	10%	77%	7.69%	53.8%	28.1%	96.9%	39.4%	581%	3.4%	67%

Abbreviations:
FTLB = Functional tic-like behavior
Max = Maximum
Min = Minimum
TS = Tourette syndrome

TABLE 4.
Average Number of Motor and Vocal Tics and Percentage of Patients With TS and FTLB Who Have These Tics as Well as Number of Studies Reporting Each Measurement

Group of Patients	TS	TS	FTLB and FTLB + TS	FTLB and FTLB + TS	TS	TS	FTLB and FTLB + TS	FTLB and FTLB + TS
Variables	Average Number of Simple Motor Tics	Average % Of Patients With Simple Motor Tics	Average Number Of Simple Motor Tics	Average % of Patients With Simple Motor Tics	Average Number of Complex Motor Tics	Average % of Patient With Complex Motor Tics	Average Number of Complex Motor Tics	Average % of Patients With Complex Motor Tics
Number of studies	1	2	2	3	1	2	2	6
Average	4	97.7%	1.2	74%	1	34.1%	7.45	84.5%
Min		95.4%	1	59.4%		13%	3	70%
Max		100%	1.4	89%		55.2%	11.9	100%
Variables	Average Number of Simple Vocal Tics	Average % of Patients With Simple Vocal Tics	Average Number of Simple Vocal Tics	Average % Of Patients With Simple Vocal Tics	Average Number of Complex Vocal Tics	Average % of Patients With Complex Vocal Tics	Average Number of Complex Vocal Tics	Average % of Patients With Complex Vocal Tics
Number of studies	1	2	2	5	1	3	2	8
Average	1	78.2%	1.6	62.9%	0	12.6%	9.9	65.3%
Min		56.3%	1	13%		8%	1	25%
Max		100%	2.2	88%		15%	18.8	100%

Abbreviations:
FTLB = Functional tic-like behavior
Max = Maximum
Min = Minimum
TS = Tourette syndrome

TABLE 5.
Average Total, Severity, and Impairment Scores Along With Treatment Across T1 (Baseline), T2 (Follow-Up 1), and T3 (Follow-Up 2), as Well as Number of Studies Reporting Each Measurement

Variables	T1 Total YGTSS	T2 Total YGTSS	T3 Total YGTSS	T1 YGTSS Impairment	T2 YGTSS Impairment	T3 YGTSS Impairment
Number of studies	4	4	2	3	3	1
Average	32.1	23.8	19.5	29.9	15.7	12.2
Min	29.8	19.2	14.6	27.6	13.3	
Max	34.5	29.7	24.4	32.2	18.8	
	T1 YGTSS Motor Severity	T2 YGTSS Motor Severity	T3 YGTSS Motor Severity	T1 YGTSS Vocal Severity	T2 YGTSS Vocal Severity	T3 YGTSS Vocal Severity
Number of studies	3	3	1	3	3	1
Average	16.8	11.9	8.3	15.1	9.9	6.2
Min	15.8	10.4		14	8.8	
Max	17.7	14		16.7	11.2	

	T1 SSRI%	T2 SSRI%	T3 SSRI%	T1 CBT%	T2 CBT%	T3 CBT%	T1 CBIT%	T2 CBIT%	T3 CBIT%
Number of studies	1	4	1	1	5	0	1	5	1
Average	47%	54.5%	61%	63.6%	59.7%		0%	19.6%	13%
Min		33%			34.5%			5%	
Max		82%			100%			33.9%	

Abbreviations:
CBIT = Comprehensive Behavioral Intervention for Tics
Max = Maximum
Min = Minimum
SSRI = Selective serotonin reuptake inhibitor
YGTSS = Yale Global Tic Severity Scale

behaviors may be problematic, as it can lead to a misrepresentation of the FTLB phenotype, especially as our results show that when reported, a large proportion of FTLB patients do have simple motor tics (74%) or simple vocal tics (62.9%) on average.

Future directions for patient characterization

Patients with FTLB have overall higher YGTSS scores, a higher prevalence of complex tic-like behaviors, and of anxiety and depression compared to patients with TS. Patients with TS, on the other hand, have a higher prevalence of simple tics and comorbid ADHD and OCD. However, this general description does seem to be an oversimplification; in both populations, there is considerable heterogeneity in both comorbidity profile as well as the characteristics of vocalizations and movements. A possible next step would be to explore this heterogeneity and ensure standardized data collection measures in future prospective studies. Similarly, there is a relative lack of data on simple tics in patients with FTLB, which represents a challenge for the complete understanding of the FTLB phenotype. Finally, the literature may overall benefit from a consensus on which clinical characteristics should be reported and a more structured way of data collection. An aid in doing so could be to develop a structured assessment for FTLB and determine whether YGTSS is suitable for use in patients with FTLB.

FU studies

Of the 6 FU studies, four included one FU (T2)[5,15,27,28]) and two included two FUs (T2 +T3).[17,29] For the summation below, the study by Howlett and colleagues[15] is counted as two different studies, due to the inclusion of two different patient groups (adults and children).

Altogether, 206 patients with FTLB and 45 with FTLB + TS were seen at the baseline visit (T1), 154 patients with FTLB were seen at the first FU (T2), and 32 at the second FU (T3). The total number of patients seen at the first FU is, however, an underestimate as two of the studies did not specify the number of patients.[5,29] Furthermore, the time between T1, T2, and T3 did vary between studies (range average 6 months-2.6 years), and in one study the time between T1 and T2 was not reported.[27]

Overall, average YGTSS scores decreased from T1 to T2 to T3 (Table 5). A high percentage of patients received selective serotonin reuptake inhibitors, cognitive behavioral therapy (CBT), and/or Comprehensive Behavioral Intervention for Tics (CBIT) at T2 and T3, but the lack of reporting on these treatments at T1 makes it difficult to draw conclusions about their potential impact on the symptoms' trajectory (Table 5). Conversely, comorbidities were generally only reported at T1 and have therefore been excluded from the data analysis.

While the general trend was toward symptom improvement, relatively few patients had experienced full remission at FU. In Howlett and colleagues'[15] the sample consisted of 15 adolescents, 2 had an YGTSS Global Score of 0 at FU, while the same was true for one of their 9 adults. Both Tomczak and colleagues'[5] and Mathew and colleagues'[27] studies on 56 and 29 patients, respectively, found that all patients still experienced some symptoms and interference from FTLB at FU as measured on the Clinical Global Impression Severity Scale and Clinical Global Impression Improvement Scale. Ducroizet and colleagues,[28] who have the longest FU period with a mean of 2.6 years, found that 6 out of their 43 patients (14%) had completely remitted. Neither Nilles and colleagues[17] nor Prato and colleagues[29] recorded data pertaining to remission.

There were differences in the percentage of patients receiving each treatment between the studies. CBT, for example, was provided to between 33% and 100% of patients at T2. This variance in treatment may indicate different treatment approaches between clinics, the diverse needs and comorbidity profile of the patients, or a combination of both.

Future directions for FU studies

Overall, FTLB symptoms seem to reduce over time, and a high percentage of patients received some kind of treatment. However, it is difficult to fully assess the findings given the data limitations, particularly related to comorbidities and treatment

interventions. Thus, longer-term FU are needed providing more detailed data in particular with respect to effects of different treatments, improvement of comorbidities, changes in specific FTLB symptoms, and overall prognostic factors. It is, however, worth noting that in contrast with what was initially believed,[30] relatively few FTLB patients seem to spontaneously remit, further exacerbating the need for further FU and evidence regarding treatment.

Treatment

Only two studies evaluated treatments for patients with FTLB. As such, each will be described independently.

Maxwell and colleagues[31] described a series of eight patients (7 female, one nonbinary, all with onset of FTLB between ages 13-20 years) all of whom fulfilled the European Society for the Study of Tics criteria for FTLB[1] with several psychiatric comorbidities, the most prevalent being generalized anxiety disorder. The treatment applied was a novel technique called Integrated Comprehensive Behavioral Intervention for Functional tics, which is a combination of CBIT and third wave CBT, which applies a particular focus on stress reduction. Patients had regular treatments both at home and in the clinic and showed high compliance. All patients experienced clinically relevant reduction in the frequency of FTLB after treatment, with four of them being symptom free or only having mild symptoms once per month. Furthermore, 7/8 patients were able to suppress their symptoms for at least one hour post-treatment, and a series of *t*-tests revealed significant reduction in YGTSS total tic and impairment scores. Additionally, patients also observed a reduction in panic symptoms and attended school more frequently post-treatment.

Duncan and colleagues[16] described the impact of one session of online psychoeducation on 58 young people with FTLB, their families, and the professionals working with them. The diagnosis of FTLB was made following a comprehensive assessment by experienced clinicians. Eighty-five percent of the patients were female, and mean age at assessment was 14.3 (S.D. 2.07). Age at symptom onset and comorbidities were not reported. The psychoeducation session lasted 2.5 hours and used polls, break out rooms, and chat rooms to increase engagement. The goal was to increase understanding of FTLB and maintaining factors along with developing behavioral strategies for coping with the symptoms. The sessions were evaluated by 21 patients and 15 parents using goal-based outcomes. Here, participants rated on a scale from 0 to 10 how well they felt they had achieved different goals they had set, i.e., understanding FTLB better or to learn strategies to manage FTLB. A significant increase in rated achievement was seen after the session compared to before. Furthermore, a service evaluation form also showed that patients, parents, and professionals were satisfied with the session.

Future directions for treatment studies

In the general literature, most of the focus has been on CBT, CBIT, and psychoeducation as promising treatment candidates; it may be worth exploring if combining these treatments with medical treatment such as selective serotonin reuptake inhibitors can increase the effect, as seen in research on anxiety and OCD. Furthermore, most patients with FTLB have multiple comorbidities and therefore multiple contact points in the health care system. An exploration of how different medical professionals can work together to ensure the best possible treatment, as well as how patients with FTLB experience their journey through the medical system, may be useful.

Conclusions

Across the literature, a general pattern of differences between patients with FTLB and patients with TS can be observed. Patients with FTLB generally have a higher symptom severity, and higher prevalence of mood disorders, whereas patients with TS have a higher prevalence of ADHD and OCD. Fortunately, there is an overall tendency toward symptom reduction over time for patients with FTLB, although the majority does not spontaneously remit. The treatments explored have predominantly been CBT and CBIT and psychoeducation with positive results.

Despite these general patterns, the literature is highly heterogenous in terms of the recording and reporting of data. Data are extracted from medical records or recorded using a wide variety of questionnaires or interviews, a difference in methodology that makes it difficult to generalize across studies. Central to this problem is the current lack of a structured assessment for FTLB symptoms. Similarly, there is a difference in the numbers reported, with different reported groups of patients with FTLB and TS having widely varying comorbidity profiles and symptoms. An example could be ADHD which frequency varied between 7.7% and 68% for patients with FTLB and between 15% and 81% for patients with TS reported. Some of this variation could be explained by the heterogenous data recording, but they also do indicate a necessity for conservatism when it comes to the general tendencies for the patient groups. A development of a standardized assessment for FTLB along with a consensus for which measurements should be included on studies of the patient group would improve the current generalization issues. Furthermore, it may be interesting to explore the heterogeneity in the patient group further, for example, via a cluster analysis.

The FU and treatment literature is still relatively small but does indicate that symptoms tend to persist but do improve, and can be addressed with cognitive treatment. Further studies into the treatment of FTLB (i.e., a combination of cognitive and medical treatment) would be beneficial.

CRediT authorship contribution statement

Kaja Andersen: Writing – original draft, Visualization, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Natalia Szejko:** Writing – review & editing, Project administration, Methodology, Conceptualization. **Kirsten R. Müller-Vahl:** Writing – review & editing, Project administration, Methodology, Conceptualization. **Andrea E. Cavanna:** Writing – review & editing, Project administration, Methodology, Conceptualization. **Tammy Hedderly:** Writing – review & editing, Project administration, Methodology, Conceptualization. **Erica Greenberg:** Writing – review & editing, Project administration, Methodology, Conceptualization. **Nanette Mol Debes:** Writing – review & editing, Supervision, Project administration, Methodology, Conceptualization.

Declaration of competing interest

The authors declare no conflict of interest or financial disclosures concerning the materials or methods used in this study or the findings specified in this article.

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Supplementary data

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