



Second of two parts

Tourette syndrome— much more than tics

Management tailored to the entire patient

By Samuel H. Zinner, MD

The management of Tourette syndrome is highly individualized and, when it comes to medical therapy, largely trial and error. In general, consider medication for tics but one prong of a comprehensive approach.

Although Tourette syndrome (TS) was first described in the medical community more than a century ago, there is still no consistent practice parameter for managing the condition and there is considerable controversy in pharmacotherapy for TS. The Medical Advisory Board of the Tourette Syndrome Association (TSA) is working to produce a practice guideline for TS drug therapy. In addition to medication considerations, the most successful and sustaining management plans for TS focus on educating oneself and others about the syndrome, enhancing behavioral approaches, obtaining academic accommodations, and building psychodynamic supports.

Your role in creating the family's "medical home" cannot be overstated. Information on constructing the medical home is available (see "Resources" on page 48). While you may not become an "expert" on TS, you can become an advocate and expert for this child and other patients with special needs. Explore the opportunities to help the family navigate resources, and empower them and their child to advocate for themselves. Be available to address questions or partner with the family to look for solutions. Your time is limited, so learn your regional resources! Knowing where to direct families for ongoing help is one of your most robust tools. The national TSA is a good starting point. There are also regional chapters in most large cities. (TSA publishes materials on a variety

of topics to educate families, educators, and health-care professionals.)

Specific management approaches that you may decide to recommend or that the family may ask you about include behavioral modification, drug therapy, complementary and alternative therapies, and surgery. In many cases, what might be considered the most conservative approach—patient education—will be the single most important one.

First things first

Remembering that children and their families are apt to feel confused or ashamed, emphasize that TS is an involuntary neurologic condition. For many patients, this reassurance is all the management needed.

Prioritize the most interfering or troubling problems, rather than what *appears* most severe. The severity of symptoms does not necessarily equate to the degree of psychosocial or functional impairment. What is it that should be treated? The answer may depend on whom you ask. A teacher may seek a quieter child; a parent, a more competitive student; and a child, more social ease with peers. And you may have a different opinion. It is wise to determine areas of functional and psychosocial impairment imposed by tics and comorbid conditions, and to address management in a stepwise, team-based manner.

Social discomfort and shame are often the most disturbing features of TS and require prompt and often intensive intervention, particularly for older children. Your immediate and long-term goals are to bridge sources of support in the family, among peers and school personnel, and in the community. Personal

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strengths should be emphasized and cultivated in each child. Counseling for the child and family may be necessary to overcome harmful sentiments or dysfunctional behaviors and interpersonal dynamics.

Behavioral and psychosocial treatments may also, or preferentially, address comorbid conditions such as depression, anxiety, obsessions and compulsive behaviors, learning disabilities, attention deficit hyperactivity disorder (ADHD), social skills challenges, elimination disorders, and sleep hygiene. Mental health counselors, support-advocacy organizations, and preprinted guidelines for parents are useful resources to keep in mind. Indeed, families are best served by directing them to support groups and legitimate online sources of information about TS (examples are listed in the “Resources” box), and by helping them understand their rights at school or in the workplace and the advocacy role they can play in obtaining special education services.

Most children with TS have tics of mild or moderate severity, and tic control is not their priority. But, for many children, tics are significantly embarrassing or so disruptive that specific therapy targeting tics is indicated. I encourage families to monitor tics daily or weekly to chart the progress of any instituted therapy, as short-term changes may be subtle. A Tic Severity Form is available online (www.dbpeds.org/handouts).

Behavioral approaches

Several behavior-based approaches have been studied in tic control. To date, only “habit reversal” has shown consistent clinical efficacy in adults, with limited data available for children.¹ Habit reversal was first described in 1973 and works by increasing awareness of tics and the premonitory urges, and then performing competing responses.² For example, if a child has a wrist-flexing tic, a competing response might be a wrist extension at the moment a tic is imminent. The child then holds this extension until the sensory urge passes. Competing responses do not necessarily have to interfere physically with the actual tic, however.³ So, a wrist-flex tic may be reduced by tightening of the thighs, for example. Successful use of habit reversal results in less noticeable tics and may, over time, decrease the degree of the urge by eliminating the

KEY POINTS

Dispelling misconceptions about the management of Tourette syndrome

▼ **Fallacy:** The presence of tics warrants the use of drug therapy.

▼ **Fact:** Having tics does not alone justify treatment with medication. The tics must be disturbing enough to the patient, physically or psychosocially, to warrant intervention.

▼ **Fallacy:** Tics are the only manifestation that needs to be treated in patients with Tourette syndrome (TS).

▼ **Fact:** Treating tics alone, without consideration to the presence and influence of comorbid conditions, does not constitute treatment of TS. Further, often tics require no treatment at all.

▼ **Fallacy:** Psychostimulants should not be prescribed for children with attention deficit hyperactivity disorder (ADHD) and TS.

▼ **Fact:** Psychostimulant medication, with rare exception, is safe to use for treatment of ADHD in children with tic disorders, including TS, with little risk of tic exacerbation.

▼ **Fallacy:** Dietary modification, allergy testing, and environmental allergen control can minimize tics.

▼ **Fact:** Despite the popular appeal of these approaches, any role they might have in the management of tics has yet to be proved.

subliminal reinforcement of the tic relief. Because success depends on awareness of the sensory urge preceding tics, habit reversal is not likely to be successful in younger children.

Trials with other behavior-based strategies are not well documented. Limited reports suggest success with anxiety-reduction using deep breathing or progressive muscle relaxation, and with increasing the patient’s awareness of tics with videotapes or mirrors so that voluntary tic suppression can be better achieved.³

The advantage of a behavioral approach over drug treatment is the absence of the drawbacks associated with the latter: lack of response to medication, difficulty with compliance, unpleasant side effects, and patient or parent reluctance.³ At the same time, behavioral approaches do take time and patience, and benefits are not immediate.

Building the child’s functional behaviors and adaptive skills, and enhancing self-esteem, will provide more stable and portable strengths than any other form of therapy. To that end, modification of the school environment is a cornerstone of management. Classroom accommodations can include tic breaks, untimed tests, test-taking in private rooms, and, for children with handwriting or other functional writing difficulties, scribes or tape recorders. Semiformal classroom presentations and educational videos on TS can be arranged for teachers and peers, often supported by professionals or parents of other children with TS. Further information about school-based supports is



available through TSA. The handbook “Teaching the Tiger” (www.hopepress.com) is available specifically for those involved in educating children with TS.

Tourette syndrome is not federally protected under the Individuals with Disabilities Education Act (IDEA) provisions for special education accommodation, although advocates with TSA are working to have TS included in the IDEA category of “other health impairment.” Some states do include TS within this protected category. Alternatively, many accommodations can be made under a Section 504 plan, which is not part of IDEA. Accommodations determined under either IDEA or Section 504 may be included as part of an Individual Education Plan (IEP) designed specifically for the child.

Medication management

Medications are available not only for tics but also for many of the comorbid conditions of TS, including anxiety, obsessions and compulsions, mood disorders, poor concentration and focus, hyperactivity, and impulsive behavior. When the tics of TS and the symptoms associated with these comorbid conditions are responsive to the same medication, it is always best to simplify the medication regimen using monotherapy if possible.

Simply having tics is not an indication for treatment. Often, tics are not sufficiently interfering to warrant medication use and their resulting side effects. When tics are neither self-injurious nor severe, comorbid depression or anxiety

must be ameliorated before treating tics, because assessment of quality of life and motivation can be overshadowed by underlying psychiatric symptoms.

No drug will eliminate tics entirely. The primary goals in using medication are tic attenuation and improved academic, psychosocial, or family functioning. Success in reaching these goals will help accomplish a secondary goal: enhance the efficacy of, and compliance with, non-medication-based management. In general, medication for tics should be considered a

More and more, Botox is being used to treat severe focal tics.

useful adjunct to more comprehensive management, with consideration of periodic trials of weaning of medication once the patient’s response has stabilized. Emphasize to the family that medications treat symptoms but are not curative. A balance between tic reduction and tolerable side effects is optimal.

The use of most medications to treat tics and comorbid conditions is off-label or not specifically approved for children. Controlled medication trials typically use adult subjects only, so the results may not apply to children. Side effects and efficacy can be unpredictable for any individual, and often patients will require a trial of more than one medication before getting a satisfactory response.

As a strategy, less is more: The fewer medications, the better. With multiple comorbid conditions, it is not uncommon for children to be treated with many medications, leading to increased likelihood of side effects, confusion as to what is or is not working, mounting expense, and frustration. “Start low, go slow” is useful advice when initiating medication. In general, it is beneficial to begin with a single agent and to start at a lower, often subtherapeutic, dosage. Increase the dosage slowly and watch for side effects and efficacy. Be mindful that, because symptoms vary over time in character and severity, an adequate trial of a medication should be given before determining its suitability. This door swings both ways: Significant improvement in tics may be unrelated to the medication. Be mindful of environmental circumstances that can influence tic severity, such as the stress of starting a new school year. Also, some medications require weeks to achieve efficacy, even at a therapeutic dosage.

Opinions vary widely in the literature and among experts regarding optimal medications for tics. Several medication options representing an array of medication classes are used. In this article, the more customary selections are presented, as well as two less common, but promising, options (Baclofen and Pergolide) (Table 1). In general, I recommend consulting with a pediatric psychopharmacology specialist for the management of complicated medication regimens. For more detailed in-

TABLE 1

Medications can alleviate tics, but proceed cautiously

Drug class and name	Dosage	Comments and precautions
α_2-adrenergic agonists		
Clonidine (Catapres) ^a	Begin 0.025–0.05 mg qhs Goal: 0.1–0.3 mg/day bid – qid dosing	Adverse effects include sedation, dry mouth, postural hypotension Available as a skin patch, but skin rash is common May take 8 or more weeks to achieve efficacy Must taper if deciding to discontinue clonidine to avoid rebound
Guanfacine (Tenex) ^{a,b}	Begin 0.5 mg/day; titrate to maximum 4 mg/day qd – bid dosing	Longer acting and less sedating than clonidine
Atypical neuroleptics		
Risperidone (Risperdal) ^{a,b}	Begin 0.25–0.5 mg/day qhs, titrate q5–7 days to maximum 3 mg/day qd – bid dosing	Adverse effects include sedation, weight gain, galactorrhea, dystonia, prolongation of QTc interval, some risk of hepatotoxicity and diabetes mellitus
Ziprasidone (Geodon) ^{a,b}	Ideal dose not established Range: 5–40 mg/day	Less likely to cause weight gain than other atypical neuroleptics
Olanzapine (Zyprexa) ^{a,b}	Begin 2.5 mg qhs Maximum: 20 mg/day qd	
Typical neuroleptics		
Pimozide (Orap)	Begin 0.5–1 mg/day qhs, titrate q5–7 days to maximum 8 mg/day	Adverse effects include sedation, extrapyramidal side effects, risk of tardive dyskinesia, prolongation of QTc interval Less sedation and fewer extrapyramidal side effects than haloperidol with possibly superior efficacy; prolongation of QTc interval
Haloperidol (Haldol) ^c	Begin 0.25–0.5 mg/day, titrate q5–7 days to 1–5 mg/day	
Fluphenazine (Prolixin) ^{a,b}	Begin 0.5–1.0 mg/day, titrate q5–7 days to 2–15 mg/day	
Benzodiazepine		
Clonazepam (Klonopin) ^a	0.5–6 mg/day bid – qid dosing	Adverse effects include drowsiness, dizziness Short-term course, especially to alleviate anxiety, especially with comorbid ADHD
GABA agonist/muscle relaxant		
?Baclofen (Kemstro) ^a	20 mg tid	Adverse effects include constipation, nausea, stomach pains May be effective, but may be acting on anxiety rather than tics
Dopamine agonist		
?Pergolide (Permax) ^{a,b}	Low doses, ?0.15–0.3 mg/day	Adverse effects include nausea, headache May also treat restless legs syndrome

a = Off-label use

b = Not specifically approved for use in children

c = Not approved for children under 3 years

formation, Sandor provides an excellent overview.⁴

Alpha₂-adrenergic agonists are often a good first choice. They have relatively mild side effects and may treat comorbid ADHD, anxiety, and insomnia. Common side ef-

fects include sedation, dry mouth, headaches, dysphoria, and postural hypotension. Guanfacine (Tenex) is longer lasting and less sedating than clonidine (Catapres).

Atypical neuroleptics are less likely than typical neuroleptics to

cause extrapyramidal side effects, such as dystonia or parkinsonism, and it is believed that there is less risk of tardive dyskinesia. Significant side effects include somnolence, weight gain, and depression, and in some instances risks of hepato-

toxicity and diabetes mellitus. Some atypical neuroleptics cause prolonged QTc. These agents are effective in about two-thirds of patients with tics. Risperidone (Risperdal) enjoys the widest use among this class. Ongoing trials with newer agents show promising results for effective tic control, safety profile, and tolerability.

Conventional or typical neuroleptics act to block dopamine receptors, as do atypical neuroleptics. Once a first-line treatment, typical neuroleptics have been largely replaced by the newer atypical agents for initial management. For very severe tics, however, a typical neuroleptic, rapidly titrated to a higher dosage and followed by gradual weaning of the dosage, may be more effective than an atypical neuroleptic. Pimozide (Orap) shows the most consistent efficacy within this class.

For severe focal tics, botulinum toxin A (Botox) is increasingly becoming an option. The protein is injected into tic-affected muscle groups, such as the vocal cords, upper thorax, neck, face, or extremities. A surprising discovery in trials is that the use of botulinum toxin A appears to reduce or eliminate the premonitory urge, in addition to denervating muscle. The effect lasts three or four months and may be quite effective for very specific severe tics, but is not a good option for generalized tics.

Other medications are available that may provide reasonable relief from tics, either as single-agent therapies or in conjunction with other medications. In general, these

medications are second-line agents when used specifically for tics. However, because of their potential efficacy in treating symptoms of both tics and comorbid conditions, they are often first-line choices, some of which are described in the discussion that follows.

In considering medications used to treat comorbid conditions (Table 2), the diagnosis of ADHD deserves special focus. A particular area of concern in the treatment of ADHD is the use of psychostimulants in children with, or predisposed to developing, tics. These agents had been contraindicated in these children because of their presumed potential to unmask or exacerbate tics. But several recent studies firmly challenge this longstanding belief, so that, with some exception, psychostimulants are considered safe to prescribe for children with TS for the treatment of ADHD.⁵ In most cases, either a psychostimulant, an α -adrenergic agonist, or both together should be the first approach for ADHD medication treatment. If tic symptoms become worse on psychostimulant treatment for ADHD, consider a slightly lower dosage or change to a different psychostimulant to see if tic symptoms abate, rather than immediately discontinuing use of psychostimulants altogether. Additionally, consider a two-week trial with the psychostimulant if tics appear to worsen, because some children will experience a transient worsening of tics that will subside.

TABLE 2

Medications for conditions that coexist with tics

Comorbid ADHD

Psychostimulants

Amphetamines (Adderall, Dexedrine)^c

Methylphenidate (Ritalin, Concerta, Metadate, Methylin)^d

α -adrenergic agonists

Clonidine (Catapres)^a

Guanfacine (Tenex)^{a,b}

Selective norepinephrine reuptake inhibitor

Atomoxetine (Strattera)

Tricyclic antidepressant

Desipramine (Norpramin)^{a,d}

Other antidepressant

Bupropion (of potential efficacy in treating ADHD) (Wellbutrin)^{a,b}

Dopamine agonist

Pergolide (tic reduction and ?ADHD) (Permax)^{a,b}

Comorbid obsessive-compulsive behaviors

Selective serotonin reuptake inhibitors

Citalopram (Celexa)^{a,b}

Fluoxetine (Prozac)^e

Fluvoxamine (available only as generic in US)^f

Paroxetine (Paxil)^b

Sertraline (Zoloft)^d

Tricyclic antidepressant

Clomipramine (Anafranil)

Benzodiazepine

Clonazepam (Klonopin)^a

Other comorbid problems

Medications are available for other anxiety disorders, sleep disorders, mood disorders, rage attacks

a = Off-label use

b = Not specifically approved for use in children

c = Not approved for children under 3 years

d = Not approved for children under 6 years

e = Not approved for children under 7 years

f = Not approved for children under 8 years

Concerns have been raised about the sudden deaths of four children who were prescribed the α -adrenergic agonist clonidine together with

A word about coding and reimbursement

Tourette syndrome is listed in *International Classification of Diseases-9* as a “psychiatric” diagnosis (307.23). (The psychiatric coding of TS represents the historic legacy of the misconception of TS at the time the ICD code was assigned.) As a result, some insurance companies may deny reimbursement. To secure payment, several clinicians have found it helpful to attach to the insurance claim a printed statement found on the Tourette Syndrome Information Page of the National Institute of Neurological Disorders and Stroke (NINDS), a branch of the National Institutes of Health (www.ninds.nih.gov/health_and_medical/disorders/tourette.htm). NINDS states unambiguously that “Tourette Syndrome is an inherited neurological disorder.” Other practitioners may list additional primary diagnoses, such as “static encephalopathy” (348.3) or “unspecified disorder of the nervous system” (349.9).

methylphenidate (Ritalin, Concerta, Metadate, Methylin). Each of these four cases has been noted to have significant confounding factors that strongly challenge any interpretation of causality in the association between medication exposure and death.⁶ In general, α_2 -adrenergic agonists should not be prescribed for behavioral management to children and adolescents with pre-existing cardiac or vascular disease. When there is no history of heart disease and no abnormal finding on physical examination, screening electrocardiography is not routinely recommended before instituting α_2 -adrenergic agonist therapy (although this point is somewhat controversial). As a precaution, monitor vital signs, including pulse and blood pressure, before using clonidine or guanfacine and during dosage titration.⁷

Alternatives to psychostimulants are available. Atomoxetine (Strattera) is a selective norepinephrine reuptake inhibitor and may have fewer side effects than the psychostimulants. Pergolide (Permax) is a dopamine agonist, but may down-regulate the release of dopamine into the synaptic cleft. This agent appears to reduce tic severity and

symptoms of ADHD.⁸ Among the tricyclic antidepressants (TCAs), desipramine (Norpramin) has been recently shown to be effective for both tics and ADHD symptom reduction.⁹ However, most TCA agents are not approved by the Food and Drug Administration for use in children, are potentially cardiotoxic, and require baseline and serial ECG monitoring. Further, accidental ingestion by a young child may be fatal, so particular caution in their use is indicated.

The selective serotonin reuptake inhibitors (SSRIs) are effective for children and adolescents in the treatment of comorbid obsessions and compulsions, anxiety, and, possibly, depression. Mixed observations with regard to impact on tics suggest that the SSRIs may decrease tics (perhaps by reducing anxiety), increase tics (perhaps by uplifting mood), or have no impact on tics. The FDA recently determined that a prominent warning label is warranted on SSRIs, given concerns—but no concrete evidence—that these agents contribute to suicides or suicidal thoughts. This statement, endorsed by the American Academy of Pediatrics, warrants caution in the use of SSRIs in youth with TS. In addition, it is critical that

SSRIs be tapered rather than withdrawn abruptly, owing to risks related to “SSRI discontinuation syndrome,” marked by disequilibrium, flu-like symptoms, unpleasant sensory disturbances, and suicidal thoughts.

Among benzodiazepines, clonazepam (Klonopin) may be particularly helpful as short-term treatment, both for its direct effect on tics and to alleviate comorbid anxiety.

Internal and environmental factors modify the course of tics and comorbid conditions over time. Periodic trials at tapering and discontinuing medication are reassuring and empowering to children and families, and medically indicated given the natural history of tics.

What about complementary and alternative approaches?

Peer-reviewed published trials investigating complementary and alternative management for tics, using double-blinded, placebo-controlled design, are scarce. Despite the paucity of research, families are overwhelmingly using complementary and alternative approaches for their children’s developmental and behavioral concerns, including TS. The National Center for Complementary and Alternative Medicine (NCCAM) within the National Institutes of Health provides health information guidelines for consumers and health-care professionals considering CAM approaches.

Research into the effects on tics of the use of fish oil is under way. Hypnosis has been suggested, and rejected, as a treatment for tics

Resources

Tourette Syndrome Association

www.tsa-usa.org

Tourette Syndrome Foundation of Canada

www.tourette.ca

Tourette Syndrome “Plus”

www.tourettesyndrome.net

Planet Tic

www.planettic.com

Habit Reversal

www.dbpeds.org/handouts, then click “Habit Reversal”

Tic Severity Form

www.dbpeds.org/handouts, then click “Tic Severity Form”

National Initiative for Children’s Healthcare Quality (NICHQ) ADHD Toolkit

www.nichq.org/resources/toolkit

Child Behavior Checklist

Can be purchased at www.aseba.org (click “Products”)

Pediatric Symptom Checklist

www.dbpeds.org/pdf/psc.pdf
and scoring instructions
www.dbpeds.org/pdf/jellinek.pdf

Children and Adults with Attention-Deficit/Hyperactivity Disorder

www.chadd.org

Developmental-Behavioral Pediatrics Online Community

www.dbpeds.org

Learning Disabilities Association of America

www.ldanatl.org

Medical Home: The National Center of Medical Home Initiatives for Children with Special Needs

www.medicalhomeinfo.org

National Center for Complementary and Alternative Medicine

<http://nccam.nih.gov>

National Institute of Neurological Disorders and Stroke (NINDS) – Tourette Syndrome Information Page

http://www.ninds.nih.gov/health_and_medical/disorders/tourette.htm

Teaching the Tiger – A Handbook for Individuals Involved in the Education of Students with Attention Deficit Disorders, Tourette Syndrome or Obsessive-Compulsive Disorder

www.hopepress.com

TOURETTE SYNDROME—TAILORING MANAGEMENT

since the original description of TS in 1885. Limited case reports have shown the use of self-hypnosis, which may include relaxation-imagery, as a useful tool to treat tics. Hypnosis arguably has an important role in reducing comorbid phobias and other anxiety-based disorders. Despite the popular appeal of dietary modification, allergy testing, and environmental allergen control for the management of tics, no role has been proven for any of these approaches.

Surgery: Still too experimental for most

There are no controlled or prospective studies of neurosurgical treatment of tics. Limited case reports describe several different attempted surgical procedures, all highly experimental and each presenting a risk of serious adverse neurologic outcome. Very recently, a surgical treatment referred to as high-frequency deep brain stimulation (DBS) was performed on a young adult with TS. An immediate remarkable improvement in tics was reported and the case was heralded in the popular press. At about the same time, a Dutch group reported successful reduction of tics using DBS on three adults with TS.¹⁰ This highly experimental procedure was developed in 1993 and has been used in patients with other movement disorders, such as Parkinson disease, and in those with chronic pain syndromes.

In DBS, electrodes are implanted into implicated brain regions, such as the basal ganglia or thalamus. The electrodes are connected to a device that is surgically implanted

in the upper chest, which delivers pulses through the electrodes to the implicated brain region. Potential advantages of DBS over other neurosurgical techniques include the avoidance of inflicting direct brain lesions, the relative reversibility of the procedure, and the ability to titrate features of the stimulation pulse, such as voltage or frequency.¹¹ But, there are risks with DBS, including intracranial bleeding, stroke and infection, and device-related complications that may result in temporary or permanent problems. There are also risks of side effects from stimulation, including mood changes and changes in motor function, sensation, or cognition. In addition, data on long-term outcome are unavailable.

There have been no case reports of DBS to treat TS in children. Because tics often improve in adulthood, DBS is not an appropriate option for children with TS at this time. Controlled studies will be necessary to determine the usefulness of this potential management technique.

When to seek consultation

Consultation for further evaluation or subspecialist management will depend on the presence and degree of interference from tics and comorbid conditions. As discussed in Part 1 of this article (page 22), a careful history and physical examination should be completed and considered with input from parents, teachers, and the patient. Screen specifically for comorbid conditions and for psychosocial consequences, including bullying



LOWELL HANDLER

and poor self-esteem. Screening tools completed by parents and teachers are widely available, many online and without cost. The Pediatric Symptom Checklist is useful for psychosocial screening. The Vanderbilt Scales and the Child Behavior Checklist screen for attention deficit disorders and for some comorbid conditions (see the resource box on page 48).

Specific consultation sources depend on the areas of concern, but may include the school district for psychoeducational assessment, therapists for individual or family counseling or behavioral interventions, and support groups or advocacy agencies. Consultation with a pediatric psychopharmacology specialist is indicated for complex psychotropic medication management that is beyond your level of comfort or experience. Consultation with a pediatric neurologist is indicated if there is any diagnostic uncertainty after you have completed a careful history; for unrelated neurologic assessments; or for complex psychotropic medication management. A referral for a neurologic examination is not otherwise likely to influence management.¹² The World Wide Web provides an accessible and economic route to many resources for education, guidance, and support. Without exception, I recommend that families contact the Tourette Syndrome Association.

Many, if not most, children with TS function well without any specific intervention or referral. Basic education about TS and reassurance often are endpoint management measures. Patients should be periodically monitored for symptom

exacerbation and the emergence of new complications.

Course and long-term outcome

Most recent data suggest that the majority of children with TS experience the greatest severity and frequency of tics in early adolescence; the severity and frequency gradually decline in most adolescents and young adults. While some studies suggest most patients will have persistent tics in adulthood,¹³ another study shows that half of adults with TS will be virtually tic free.¹⁴

Tics and comorbid conditions may not follow a parallel course. It is not uncommon to see tics improve over time, while mood disorders or problems related to executive functions worsen. Ongoing monitoring should consider global functioning and interference, rather than simply one aspect of the syndrome such as tics.

Future research will lead to better treatment

Biomedical and clinical research in TS and other developmental-behavioral disorders continues to shed light on their genetic and environmental sources and links. Earlier identification of TS in health-care settings, schools, and the community will reduce confusion about the behaviors, and can build stronger support for children and families. Efforts are ongoing to specifically include TS in federal special education law and to require appropriate scholastic accommodations.

With time and continued research, the natural course of the

syndrome will become clearer, and this understanding will assist in guiding more precise management. Further research is needed to determine ideal behavioral and pharmacologic measures, and widespread interest in complementary and alternative health care may open new avenues of effective treatment. □

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