

REVIEW

MICHAEL J. MANOS, PhD

Head, Center for Pediatric Behavioral Health,
Cleveland Clinic Children's; Assistant Professor,
Cleveland Clinic Lerner College of Medicine of
Case Western Reserve University, Cleveland, OH

KIMBERLY GIULIANO, MD

General Pediatrics, Cleveland Clinic Children's;
Clinical Assistant Professor, Cleveland Clinic
Lerner College of Medicine of Case Western
Reserve University, Cleveland, OH

ERIC GEYER, BA

Center for Pediatric Behavioral Health,
Cleveland Clinic Children's

ADHD: Overdiagnosed and overtreated, or misdiagnosed and mistreated?

ABSTRACT

In today's changing medical climate, physicians need to treat attention-deficit/hyperactivity disorder (ADHD) better and more cost-effectively. The authors review recommendations supported by recent research and offer simple practices that integrate medicine and behavioral health for patients with ADHD.

KEY POINTS

Despite concerns about overdiagnosis and overtreatment, many children and youth diagnosed with ADHD still receive no treatment or insufficient treatment.

Today, more children are prescribed drug therapy when ADHD is diagnosed, but the initial titration of medication is often done without sufficient physician supervision.

ADHD symptoms improve with drug therapy, but improvement is inconsistently sustained due to poor treatment adherence.

Drug therapy and behavioral therapy work together. Outcomes can be determined by measuring both improved behaviors and reduced symptoms.

PHARMACOTHERAPY AND BEHAVIORAL therapy are currently used with success in treating attention-deficit/hyperactivity disorder (ADHD) in children, adolescents, and adults. Ongoing changes in healthcare require physicians to improve the quality of care, reduce costs of treatment, and manage their patients' health, not just their illnesses. Behavioral and pharmacologic studies provide us with an opportunity to maximize treatment of ADHD and adapt it to the needs of individuals.

This article identifies common problems in treating ADHD, discusses limits of care in pharmacotherapy and behavioral intervention, and offers practical recommendations for treating ADHD in the changing world of healthcare.

■ A CHANGING MEDICAL CLIMATE

The Affordable Care Act of 2010 sought to transform medical care in the United States from procedures to performance, from acute episodes of illness to integrated care across the lifespan, and from inefficient care to efficient and affordable care with measurable outcomes. At the time of this writing, nobody knows whether the Affordable Care Act will survive, but these are still good goals. Because ADHD is the most common behavioral disorder of childhood, value-based care is essential.¹

■ ADHD ON THE RISE—WHY?

The prevalence of ADHD increased 42% from 2003 to 2011,² with increases in nearly all demographic groups in the United States regardless of race, sex, and socioeconomic status.

doi:10.3949/ccjm.84a.15051

More than 1 in 10 school-age children (11%) in the United States now meet the criteria for the diagnosis of ADHD; among adolescents, 1 in 5 high school boys and 1 in 11 high school girls meet the criteria.²

Rates vary among states, from a low of 4.2% for children ages 4 to 17 in Nevada to a high of 14.6% in Arkansas.³ Worldwide estimates of ADHD prevalence range from 2.2% to 17.8%,⁴ with the most recent meta-analysis for North America and Europe indicating a 7.2% worldwide prevalence in people age 18 and younger.⁵

Such data have sparked criticism, with some saying that ADHD is overdiagnosed, others saying it is underdiagnosed, and most agreeing that it is misdiagnosed.

Changing definitions of ADHD may have had a small effect on the increase in prevalence,⁶ but the change is more likely a result of heightened awareness and recognition of symptoms. Even so, guidelines for diagnosing ADHD are still not rigorously applied, contributing to misdiagnosis. For example, in a study of 50 pediatric practices, only half of clinicians said they followed diagnostic guidelines to determine symptom criteria from at least 2 sources and across 2 settings, yet nearly all (93%) reported immediately prescribing medications for treatment.⁷

The *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition,⁸ requires evidence of a persistent pattern of inattention or hyperactivity/impulsivity, or both, with a severity that interferes with developmental functioning in 2 or more settings; was present before age 12; and cannot be accounted for by another behavioral health disorder such as depression, anxiety, or trauma. The diagnosis should document the presence of at least 6 of 9 symptoms of inattention (or 5 symptoms for teens age 17 or older), or at least 6 of 9 symptoms of hyperactive/impulsive behavior (5 symptoms for teens age 17 and older). Symptoms are best documented when reported by at least 2 observers.

■ COSTS OF ADHD

ADHD is expensive to society. National yearly healthcare costs have ranged from \$143 billion to \$266 billion,⁹ with over half this

amount assumed directly by families.¹⁰ Even in previous decades when prevalence rates hovered around 5%, the cost of workday loss in the United States was high for adult patients and for parents of young children with ADHD needing to take time off from work for doctors' visits.¹¹ Projections across 10 countries indicated that adults with ADHD lost more workdays than did workers without ADHD.¹²

There is also a trend toward visits that are more expensive. Between 2000 and 2010, the number of visits for ADHD to psychiatrists rose from 24% to 36%, while the number of less-costly visits to pediatricians decreased from 54% to 47%.¹³

Thus, over the past 15 years, symptoms of ADHD have become more readily recognized, prevalence rates in the population have increased significantly, and associated costs have increased dramatically, with costs extending beyond individual impairment to a loss of productivity at the workplace. And treatment, typically with drugs, has been used without sufficient application of current diagnostic criteria. What impact does this have on the practicing physician?

■ DRUG TREATMENT: GOLD STANDARD OR NATIONAL DISASTER?

Stimulants are considered the standard of medical care for the symptoms of ADHD, according to the 2011 practice guidelines of the American Academy of Pediatrics.¹⁴ They are efficacious and cost-effective when optimal dosing is achieved, since the patient usually manages treatment independently, requiring minimal physician input in the months and years after successful titration.

For these reasons, the use of stimulants to treat ADHD has increased dramatically in the last decade. According to the National Survey of Children's Health, as a result of an increase in parent-reported ADHD, more US children were receiving medical treatment for the disorder in 2011 than in any previous year reported, and the prevalence of pharmacotherapy in children ages 14 to 17 increased 28% over the 4 years from 2007 to 2011.²

Dr. Keith Conners, an early advocate for recognition of ADHD, has called the staggering increase in the rates of diagnosis and drug treat-

The prescribe-and-wait approach to drug therapy seldom results in optimal treatment

ment a “national disaster of dangerous proportions.”¹⁵ Nevertheless, many children and families have benefited in a cost-effective manner.

■ STRATEGIES FOR TITRATION

Physicians typically rely on 4 strategies to titrate stimulants,¹⁶ presented below in order of increasing complexity.

Prescribe-and-wait

Often, physicians write a prescription and direct the parent to call back or visit the office to relay the child’s response after a specified period, typically 1 week to 1 month.

This method is convenient in a busy practice and is informative to the physician in a general way. The drawback to this method is that it seldom results in optimal treatment. If the parent does not call back, the physician may assume the treatment was successful without being certain.

Dose-to-improvement

In this approach, the physician monitors titration more closely and increases the dose until a positive response is achieved, after which the dose is maintained. This method reduces symptoms but does not ensure optimal treatment, as there still may be room for improvement.

Forced-dose titration

This method is often used in clinical trials. The dose is ramped up until side effects occur and is then reduced until the side effects go away.

This method often results in optimal dosing, as a forced dose yields a greater reduction in symptoms. But it requires close monitoring by the physician, with multiple reports from parents and teachers after each dose increase to determine whether benefit at the higher dose outweighs the side effects and whether side effects can be managed.

Blinded placebo trial

Also often used in research, this method typically requires a research pharmacy to prepare capsules of stimulant medicine in low, moderate, high, and placebo doses.¹⁷ All doses are blinded and given over 4 weeks in a forced-dose titration—a placebo capsule with 3 active medication doses in escalating order, which is typical of outpatient pediatric practice. Placebo capsules are randomly assigned to 1 of the 4 weeks, and

behavior is monitored over the 7 days of administration by teachers and parents.

This strategy has benefits similar to those of forced-dose titration, and it further delineates medicine response—both side effects and behavior change—by adding a no-medicine placebo condition. It is a systematic, monitored “experiment” for parents who are wary or distrustful of ADHD pharmacotherapy, and it has notable benefits.¹⁸ It is also useful for teenagers who are reluctant to use medicine to treat symptoms. It arrives at optimal treatment in a timely manner, usually about 4 to 5 weeks.

On the other hand, this approach requires diligence from families, teachers, and caregivers during the initiation phase, and it requires consistent engagement of the physician team.

Some pediatricians designate a caregiver to monitor titration with the parent; with each new weekly dose, the caregiver reports the child’s progress to the physician.

■ ENSURING ADHERENCE

Essential to effective stimulant treatment for ADHD is not whether the medicine works (it does),¹⁹ but whether the patient continues to use it.

In treatment studies and pharmacy database analyses, rates of inconsistent use or discontinuation of medication (both considered nonadherence) were 13.2% to 64% within the first year,²⁰ and more than 95% of teenagers discontinue pharmacotherapy before age 21.²¹

Clinician engagement at the onset of stimulant titration is instrumental to treatment adherence.^{22,23} When pharmacotherapy is loosely monitored during initiation, adherence is highly inconsistent. Some physicians wait as long as 72 days after first prescribing a medication to contact the patient or family,⁷ and most children with ADHD who discontinue their medications do so within the first year.²⁴

■ FACTORS THAT INHIBIT ADHERENCE

What factors inhibit adherence to successful pharmacotherapy for ADHD?

Treatment nonadherence is often associated with a parent’s perception that the medication is not working.²⁵ Physicians can often overcome this perception by speaking

Adherence is essential to effective drug therapy for ADHD

Improved behavior in a summer treatment program

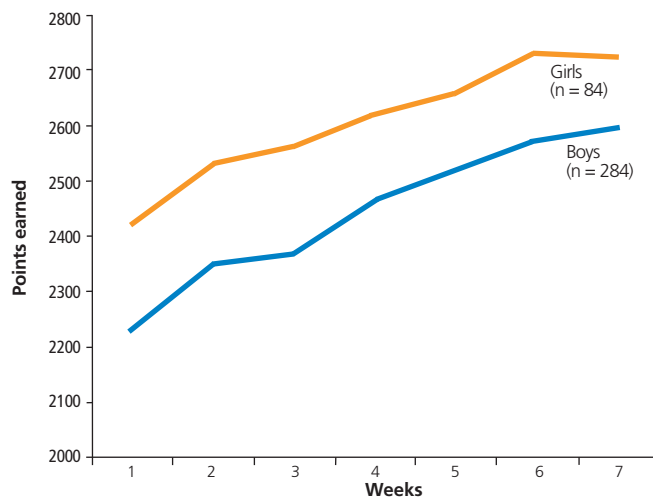


FIGURE 1. Points earned represent positive behaviors exhibited during 7-week summer treatment programs held from 2000 to 2013. Data are aggregated to show the positive behavior change for boys and girls across cohorts.

Based on outcomes data from the Center for Pediatric Behavioral Health, Cleveland Clinic Children's.

Combining drug therapy and behavioral therapy permits lower dosages for results similar to those achieved with drug therapy alone

with the parent, conveying that at the start of treatment titrating to the optimal dose takes time, and that it does not mean “something is wrong.” But without physician contact, parents do not have the occasion to discuss side effects and benefits and tend not to voice fears such as whether the medicine will affect the child’s physical development or result in drug abuse later in life.²⁶

At the beginning of treatment, a child may become *too* focused, alarming the parent. This overfocused effect is often misunderstood and does not always persist. In addition, when a child better manages his or her own behavior, the contrast to previous behavior may look like something is wrong, when instead the child’s behavior is actually normalizing. Medicine-induced anxiety—in the child or, by association, in the parent—may be misunderstood, and subsequently the parent just stops the child’s treatment rather than seek physician guidance.

Nonadherence is also more prevalent with immediate-release than with extended-release formulations.^{27,28}

Problems can be summarized as follows⁷:

- Systematic physician observation of response to stimulant titration is often missing at the onset of treatment

- “Best dose” is inconsistently achieved
- Patient adherence to treatment is inconsistently monitored.

The long-term consequences of nonadherence to therapy for ADHD have not been sufficiently examined,²⁰ but some groups, especially adolescents, show problematic outcomes when treatment is not applied. For example, in one longitudinal study, substance use disorder was significantly higher in youths with ADHD who were never treated with medicine than in “neurotypical” youths and those with ADHD who were treated pharmacologically.²⁹

BEHAVIORAL INTERVENTION

Although opinions vary as to the advantages of drug therapy vs behavioral intervention in ADHD, there is evidence that a combined approach is best.^{30–33} Pharmacotherapy works inside the skin to reduce symptoms of inattention and overactivity, and behavioral therapy works outside the skin to teach new skills.

Studies have shown evidence of benefits of behavioral therapy distinct from those of pharmacotherapy.^{34,35} Results of summer treatment programs in the United States and Japan for children ages 6 to 14 have replicated the findings of a US National Institute of Mental Health study that showed that the programs improved performance and resulted in positive behavior changes (Figure 1).

A report from the US Centers for Disease Control and Prevention in 2016 stated that behavioral therapy should be the first treatment for young children with ADHD (ages 2 to 5), but noted that only 40% to 50% of young children with ADHD receive psychological services.³⁶ At the same time, the use of pharmacotherapy has increased tremendously.

Beginning treatment with behavioral therapy rather than medicine has been found to be more cost-effective over time. For children ages 4 to 5, behavioral therapy is recommended as the first line by the clinical practice guidelines of the American Academy of Pediatrics.¹⁴ Beginning treatment with behavioral intervention has been shown to produce better outcomes overall than beginning with medication and indicates that lower doses may be used compared with pharmacotherapy that is not preceded by behavioral therapy.³⁷

Findings also indicate that starting with behavioral therapy increases the cost-effectiveness of treatment for children with ADHD.³⁸

In the long term, combination therapy leads to better outcomes³⁸ and enables the use of lower medication dosages to achieve results similar to those with drug therapy alone (Figure 2).³⁹⁻⁴¹

Behavioral intervention has modest advantages over medicine for non-ADHD symptoms,⁴² as the practice satisfies the adage “pills don’t teach skills.”²⁶ One advantage is that caregivers take an active role in managing child compliance, social interactions, and classroom deportment, as opposed to the relatively passive role of prescribing medicine only. Parents and teachers form collaborative partnerships to increase consistency and extend the reach of change. In the National Institute of Mental Health multimodal treatment study, the only children whose behavior normalized were those who used medicine and whose caregivers gave up negative, harsh, inconsistent, and ineffective discipline⁴³; that is, parents changed their own behavior.

Parent training is important, as parents must often manage their children’s behavior on their own the best they can, with little coaching and assistance. Primary care physicians may often refer parents to established local programs for training, and ongoing coaching can ensure that skills acquired in such training programs continue to be systematically applied. Pharmacotherapy is focused almost solely on reducing symptoms, but reducing symptoms does not necessarily lead to improved functioning. A multimodal approach helps individuals adapt to demanding settings, achieve personal goals, and contribute to social relationships. Outcomes depend on teaching what to do as well as reducing what not to do. Behavioral therapy⁴⁴ shaped by peers, caregivers, teachers, and other factors can be effectively remediate the difficulties of children with ADHD.

The disadvantages of behavioral therapy are that it is not readily available, adds initial cost to treatment, and requires parents to invest more time at the beginning of intervention. But behavioral therapy reduces costs over time, enhances ADHD pharmacotherapy, often reduces the need for higher dosing, reduces visits to the doctor’s office, maintains behavior improvement and symptom reduc-

Behavioral therapy permits lower medication dosages

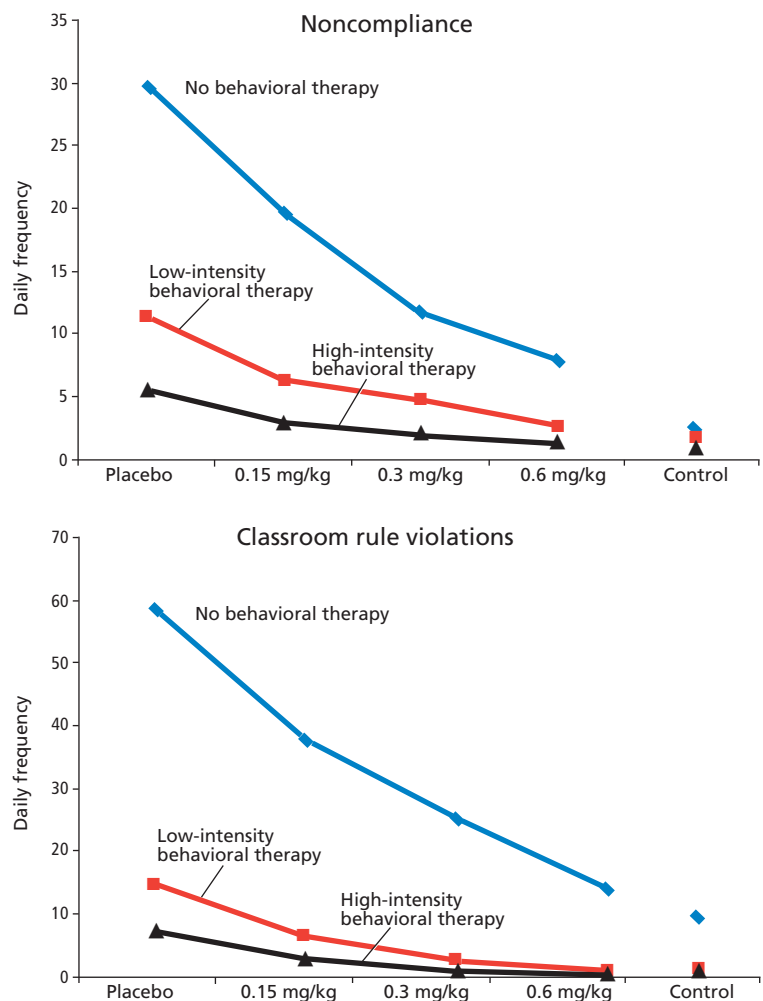


FIGURE 2. In 2 dose-ranging studies of combined drug and behavioral therapy, low- to high-intensity behavioral therapy reduced targeted behaviors at lower drug dosages. Behaviors measured were noncompliance with directives and violations of classroom rules during daily activity in a summer camp.

Upper graph from Pelham WE, Burrows-MacLean L, Gnagy EM, et al. A dose-ranging study of behavioral and pharmacological treatment in social settings for children with ADHD. *J Abnorm Child Psychol* 2014; 42:1019-1031. Copyright 2014, Springer. Reprinted with permission. Lower graph from Fabiano GA, Pelham WE Jr, Gnagy EM, et al. The single and combined effects of multiple intensities of behavior modification and methylphenidate for children with attention deficit hyperactivity disorder in a classroom setting. *School Psychology Rev* 2007; 36:195-216. Copyright 2007 by the National Association of School Psychologists, Bethesda, MD. Reprinted with permission of the publisher. www.nasponline.org.

tion in the long term, and significantly increases quality of care.⁴²

A RECOMMENDED ADHD CARE PATH

How do we increase quality of care, reduce costs, and improve value of care for patients with ADHD? The treatment of ADHD as a

chronic condition is collaborative. Several practices may be combined in a quality care path.

Follow up more frequently at the start of drug treatment

Physicians may give more frequent attention to the process of pharmacotherapy at the start of treatment. Pharmacotherapy is typically introduced by the prescribe-and-wait method, which often produces less than optimal dosing, limited treatment adherence, and inconsistent outcomes.^{45,46} Though the cost of giving a prescription is low, the cost for unsustained treatment is high, and this undermines the usefulness of medical therapy. The simple solution is systematic titration through frequent contact between the prescribing physician and the parents in the first few weeks of pharmacotherapy. Subsequent ongoing monitoring of adherence in the first year is likely to reduce costs over time.⁴⁷

Achieve optimal dosing

Pharmacotherapy should be applied with a plan in mind to produce evidence that optimal dosing has been achieved, ie, improvement is consistently observed in school and home.⁴⁸

If side effects occur, parents and physician must determine whether they outweigh the benefits. If the benefits outweigh the side effects, then the physician and parents should maintain treatment and manage side effects accordingly. If the side effects outweigh the benefits, the titration process should continue with different dosing or delivery until optimal dosing is achieved or until the physician determines that pharmacotherapy is no longer appropriate.

Though different procedures to measure optimal dosing are available, medication effectiveness can be determined in 7-day-per-dose exposure during a period when the child's schedule is consistent. A consistent schedule is important, as medicine effects are difficult to determine during loosely defined schedules such as during school vacations or holidays. Involving multiple observers is important as well. Teachers, for example, are rarely consulted during titration⁴⁹ though they are excellent observers and are with the child daily when medication is most effective.

Integrate behavioral therapy

Given the evidence that behavioral intervention enhances drug therapy,⁵⁰ behavioral therapy should be integrated with drug therapy to create an inclusive context for change. Behavioral therapy is delivered in a variety of ways including individual and group parent training, home management consultation, daily school report cards, behavioral coaching, classroom behavior management, and peer interventions. Behavioral intervention enhances stimulant effectiveness⁵¹ to improve compliance, on-task behavior, academic performance, social relationships and family functioning.⁵²

Behavioral therapy is now generally included in health insurance coverage. In addition, many clinics now offer shared medical appointments that combine close monitoring of drug therapy with behavioral coaching to small groups of parents in order to manage symptoms of ADHD at a minimal cost.

Measure outcomes

Measuring outcomes of ADHD treatment over time improves care. The primary care physician may use electronic medical record data management to track a patient's progress related to ADHD features. The Clinical Global Improvement scale is a 7-point assessment that is easily done by parents and the physician at well visits and is ubiquitous in ADHD clinical trials.⁵³ Change over time indicates when to suggest changes in treatment.

Finally, clinicians can demonstrate that appropriate, comprehensive care does not simply relieve ADHD symptoms, but also promotes quality of life. Healthcare providers can guide parents to improve existing abilities in children rather than leave parents with the notion that something is wrong with their child.

For example, research suggests that some patients with ADHD show enhanced creativity^{54,55}; cognitive profiles with abilities in logical thinking, reasoning, and common sense⁵⁶; and the capacity for intense focus in areas of interest.⁵⁷ Some authors have even speculated that historical figures such as Thomas Edison and Albert Einstein would have been diagnosed with ADHD by today's standards.⁵⁸

If side effects occur, parents and physician must determine if they outweigh the benefits

MEETING THE DEMANDS OF AFFORDABLE CARE

Many children and youth diagnosed with ADHD still receive no or insufficient pharmacotherapy and behavioral therapy. More than one-third of children reported by their parents as not receiving treatment were also reported to have moderate or severe ADHD.^{59,60}

At the same time, though more children today are being prescribed pharmacotherapy when ADHD is diagnosed, physician involvement is often limited during titration,⁷ and treatment usually consists of reducing symptoms without increasing adaptive behaviors with behavioral therapy.⁴⁵ In addition, even though ADHD symptoms initially improve with pharmacotherapy, improvement is not sustained because of poor adherence.

The healthcare costs of ADHD are high because impairment extends beyond the patient to disrupt family life and even the

workplace, as parents take time off to manage children. Because of uncertain costs of quality treatment, the best-practice treatment option for ADHD—ie, combined behavioral therapy and medicine—is increasingly accessible but still not as widely accessible as medication treatment. The value of care improves slowly while the number of patients continues to increase. However, caregivers have the opportunity to add value to the treatment of ADHD.

When we improve medication management, improve adherence to treatment, combine behavioral therapy and pharmacotherapy, consistently measure outcomes, and recognize positive traits of ADHD in our patients, we may turn the demands of affordable care into a breakthrough for many who live with the condition.

ACKNOWLEDGMENT: The authors wish to thank Ralph D'Alessio, BA, for his services in reference review and for his conscientious participation in the Cleveland Clinic Medication Monitoring Clinic, ADHD Center for Evaluation and Treatment.

REFERENCES

- Rostain A, Jensen PS, Connor DF, Miesle LM, Faraone SV. Toward quality care in ADHD: defining the goals of treatment. *J Atten Disord* 2015; 19:99–117.
- Visser SN, Danielson ML, Bitsko RH, et al. Trends in the parent-report of health care provider-diagnosed and medicated attention-deficit/hyperactivity disorder: United States, 2003–2011. *J Am Acad Child Adolesc Psychiatry* 2014; 53:34–46.e2.
- Visser SN, Blumberg SJ, Danielson ML, Bitsko RH, Kogan MD. State-based and demographic variation in parent-reported medication rates for attention-deficit/hyperactivity disorder, 2007–2008. *Prev Chronic Dis* 2013; 10:E09.
- Skounti M, Philalithis A, Galanakis E. Variations in prevalence of attention deficit hyperactivity disorder worldwide. *Eur J Pediatr* 2007; 166:117–123.
- Thomas R, Sanders S, Doust J, Beller E, Glasziou P. Prevalence of attention-deficit/hyperactivity disorder: a systematic review and meta-analysis. *Pediatrics* 2015; 135:e994–1001.
- McKeown RE, Holbrook JR, Danielson ML, Cuffe SP, Wolraich ML, Visser SN. The impact of case definition on attention-deficit/hyperactivity disorder prevalence estimates in community-based samples of school-aged children. *J Am Acad Child Adolesc Psychiatry* 2015; 54:53–61.
- Epstein JN, Kelleher KJ, Baum R, et al. Variability in ADHD care in community-based pediatrics. *Pediatrics* 2014; 134:1136–1143.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition. Arlington VA: American Psychiatric Association Publishing, 2013.
- Doshi JA, Hodgkins P, Kahle J, et al. Economic impact of childhood and adult attention-deficit/hyperactivity disorder in the United States. *J Am Acad Child Adolesc Psychiatry* 2012; 51:990–1002.e2.
- Abright AR. Estimating the costs of attention-deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry* 2012; 51:987–989.
- Birnbaum HG, Kessler RC, Lowe SW, et al. Costs of attention deficit-hyperactivity disorder (ADHD) in the US: excess costs of persons with ADHD and their family members in 2000. *Curr Med Res Opin* 2005; 21:195–206.
- de Graaf R, Kessler RC, Fayyad J, et al. The prevalence and effects of adult attention-deficit/hyperactivity disorder (ADHD) on the performance of workers: results from the WHO World Mental Health Survey Initiative. *Occup Environ Med* 2008; 65:835–842.
- Garfield CF, Dorsey ER, Zhu S, et al. Trends in attention deficit hyperactivity disorder ambulatory diagnosis and medical treatment in the United States, 2000–2010. *Acad Pediatr* 2012; 12:110–116.
- Subcommittee on Attention-Deficit/Hyperactivity Disorder, Steering Committee on Quality Improvement and Management, Wolraich M, Brown L, Brown RT, et al. ADHD: clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. *Pediatrics* 2011; 128:1007–1022.
- Schwarz A. The selling of attention deficit disorder. *New York Times* December 14, 2013:A1.
- Manos MJ, Tom-Revzon C, Bukstein OG, Crismon ML. Changes and challenges: managing ADHD in a fast-paced world. *J Manag Care Pharm* 2007; 13(suppl B):S2–S16.
- Rapport MD, Denney C. Titrating methylphenidate in children with attention-deficit/hyperactivity disorder: is body mass predictive of clinical response? *J Am Acad Child Adolesc Psychiatry* 1997; 36:523–530.
- Sandler A, Glesne C, Geller G. Children's and parents' perspectives on open-label use of placebos in the treatment of ADHD. *Child Care Health Dev* 2008; 34:111–120.
- Faraone SV, Buitelaar J. Comparing the efficacy of stimulants for ADHD in children and adolescents using meta-analysis. *Eur Child Adolesc Psychiatry* 2010; 19:353–364.
- Adler LD, Nierenberg AA. Review of medication adherence in children and adults with ADHD. *Postgrad Med* 2010; 122:184–191.
- McCarthy S, Asherson P, Coghill D, et al. Attention-deficit hyperactivity disorder: treatment discontinuation in adolescents and young adults. *Br J Psychiatry* 2009; 194:273–277.
- Bussing R, Narwaney KJ, Winterstein AG, et al. Pharmacotherapy for incident attention-deficit/hyperactivity disorder: practice patterns and quality metrics. *Curr Med Res Opin* 2014; 30:1687–1699.
- O'Callaghan P. Adherence to stimulants in adult ADHD. *Atten Defic Hyperact Disord* 2014; 6:111–120.

24. Toomey SL, Sox CM, Rusinak D, Finkelstein JA. Why do children with ADHD discontinue their medication? *Clin Pediatr (Phila)* 2012; 51:763–769.
25. Bussing R, Koro-Ljungberg M, Noguchi K, Mason D, Mayerson G, Garvan CW. Willingness to use ADHD treatments: a mixed methods study of perceptions by adolescents, parents, health professionals and teachers. *Soc Sci Med* 2012; 74:92–100.
26. Schoenfelder EN, Sasser T. Skills versus pills: psychosocial treatments for ADHD in childhood and adolescence. *Pediatr Ann* 2016; 45:e367–e372.
27. López FA, Leroux JR. Long-acting stimulants for treatment of attention-deficit/hyperactivity disorder: a focus on extended-release formulations and the prodrug lisdexamfetamine dimesylate to address continuing clinical challenges. *Atten Defic Hyperact Disord* 2013; 5:249–265.
28. Atzori P, Usala T, Carucci S, Danjou F, Zuddas A. Predictive factors for persistent use and compliance of immediate-release methylphenidate: a 36-month naturalistic study. *J Child Adolesc Psychopharmacol* 2009; 19:673–681.
29. Yule AM, Martelon M, Faraone SV, Carrellas N, Wilens TE, Bierderman J. Examining the association between attention deficit hyperactivity disorder and substance use disorders: a familial risk analysis. *J Psychiatr Res* 2017; 85:49–55.
30. Hauk L. AAP releases guideline on diagnosis, evaluation, and treatment of ADHD. *Am Fam Physician* 2013; 87:61–62.
31. Arnold LE, Abikoff HB, Cantwell DP, et al. National Institute of Mental Health collaborative multimodal treatment study of children with ADHD (the MTA). Design challenges and choices. *Arch Gen Psychiatry* 1997; 54:865–870.
32. Greenhill LL, Abikoff HB, Arnold LE, et al. Medication treatment strategies in the MTA study: relevance to clinicians and researchers. *J Am Acad Child Adolesc Psychiatry* 1996; 35:1304–1313.
33. Richters JE, Arnold LE, Jensen PS, et al. NIMH collaborative multisite multimodal treatment study of children with ADHD: I. Background and rationale. *J Am Acad Child Adolesc Psychiatry* 1995; 34:987–1000.
34. Manos MJ, Caserta DA, Short EJ, et al. Evaluation of the duration of action and comparative effectiveness of lisdexamfetamine dimesylate and behavioral treatment in youth with ADHD in a quasi-naturalistic setting. *J Atten Disord* 2015; 19:578–590.
35. Evans SW, Owens JS, Bunford N. Evidence-based psychosocial treatments for children and adolescents with attention-deficit/hyperactivity disorder. *J Clin Child Adolesc Psychol* 2014; 43:527–551.
36. Visser SN, Danielson ML, Wolraich ML, et al. Vital signs: national and state-specific patterns of attention deficit/hyperactivity disorder treatment among insured children aged 2–5 years—United States, 2008–2014. *MMWR Morb Mortal Wkly Rep* 2016; 65:443–450.
37. Pelham WE Jr, Fabiano GA, Waxmonsky JG, et al. Treatment sequencing for childhood ADHD: a multiple-randomization study of adaptive medication and behavioral interventions. *J Clin Child Adolesc Psychol* 2016; 45:396–415.
38. Page TF, Pelham WE 3rd, Fabiano GA, et al. Comparative cost analysis of sequential, adaptive, behavioral, pharmacological, and combined treatments for childhood ADHD. *J Clin Child Adolesc Psychol* 2016; 45:416–427.
39. Fabiano GA, Schatz NK, Pelham WE Jr. Summer treatment programs for youth with ADHD. *Child Adolesc Psychiatr Clin N Am* 2014; 23:757–773.
40. Pelham WE, Burrows-MacLean L, Gnagy EM, et al. A dose-ranging study of behavioral and pharmacological treatment in social settings for children with ADHD. *J Abnorm Child Psychol* 2014; 42:1019–1031.
41. Fabiano GA, Pelham WE Jr, Gnagy EM, et al. The single and combined effects of multiple intensities of behavior modification and methylphenidate for children with attention deficit hyperactivity disorder in a classroom setting. *School Psychology Rev* 2007; 36:195–216.
42. Reeves G, Anthony B. Multimodal treatments versus pharmacotherapy alone in children with psychiatric disorders: implications of access, effectiveness, and contextual treatment. *Paediatr Drugs* 2009; 11:165–169.
43. Hinshaw SP. Moderators and mediators of treatment outcome for youth with ADHD: understanding for whom and how interventions work. *J Pediatr Psychol* 2007; 32:664–675.
44. Hayes SC, Villatte M, Levin M, Hildebrandt M. Open, aware, and active: contextual approaches as an emerging trend in the behavioral and cognitive therapies. *Annu Rev Clin Psychol* 2011; 7:141–168.
45. Epstein JN, Langberg JM, Lichtenstein PK, et al. Attention-deficit/hyperactivity disorder outcomes for children treated in community-based pediatric settings. *Arch Pediatr Adolesc Med* 2010; 164:160–165.
46. Manos MJ. Pharmacologic treatment of ADHD: road conditions in driving patients to successful outcomes. *Medscape J Med* 2008; 10:5.
47. Braun S, Russo L, Zeidler J, Linder R, Hodgkins P. Descriptive comparison of drug treatment-persistent, -nonpersistent, and nondrug treatment patients with newly diagnosed attention deficit/hyperactivity disorder in Germany. *Clin Ther* 2013; 35:673–685.
48. Pliszka SR, Crismon ML, Hughes CW, et al; Texas Consensus Conference Panel on Pharmacotherapy of Childhood Attention Deficit Hyperactivity Disorder. The Texas Children's Medication Algorithm Project: revision of the algorithm for pharmacotherapy of attention-deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry* 2006; 45:642–657.
49. Pelham WE Jr, Fabiano GA, Massetti GM. Evidence-based assessment of attention deficit hyperactivity disorder in children and adolescents. *J Clin Child Adolesc Psychol* 2005; 34:449–476.
50. Fabiano GA, Pelham WE Jr, Coles EK, Gnagy EM, Chronis-Tuscano A, O'Connor BC. A meta-analysis of behavioral treatments for attention-deficit/hyperactivity disorder. *Clin Psychol Rev* 2009; 29:129–140.
51. Pelham WE Jr, Fabiano GA. Evidence-based psychosocial treatments for attention-deficit/hyperactivity disorder. *J Clin Child Adolesc Psychol* 2008; 37:184–214.
52. Knight LA, Rooney M, Chronis-Tuscano A. Psychosocial treatments for attention-deficit/hyperactivity disorder. *Curr Psychiatry Rep* 2008; 10:412–418.
53. Reimherr FW, Williams ED, Strong RE, Mestas R, Soni P, Marchant BK. A double-blind, placebo-controlled, crossover study of osmotic release oral system methylphenidate in adults with ADHD with assessment of oppositional and emotional dimensions of the disorder. *J Clin Psychiatry* 2007; 68:93–101.
54. Healey D, Rucklidge JJ. An investigation into the relationship among ADHD symptomatology, creativity, and neuropsychological functioning in children. *Child Neuropsychol* 2006; 12:421–438.
55. Abraham A, Windmann S, Siefen R, Daum I, Güntürkün O. Creative thinking in adolescents with attention deficit hyperactivity disorder (ADHD). *Child Neuropsychol* 2006; 12:111–123.
56. Ek U, Fernell E, Westerlund J, Holmberg K, Olsson PO, Gillberg C. Cognitive strengths and deficits in schoolchildren with ADHD. *Acta Paediatr* 2007; 96:756–761.
57. Ozel-Kizil ET, Kokurcan A, Aksoy UM, et al. Hyperfocusing as a dimension of adult attention deficit hyperactivity disorder. *Res Dev Disabil* 2016; 59:351–358.
58. Hartmann T. ADD Success Stories: A Guide to Fulfillment for Families With Attention Deficit Disorder. Nevada City, CA: Underwood Books, 1995.
59. Visser SN, Danielson ML, Bitsko RH, Perou R, Blumberg SJ. Convergent validity of parent-reported attention-deficit/hyperactivity disorder diagnosis: a cross-study comparison. *JAMA Pediatr* 2013; 167:674–675.
60. Visser SN, Lesesne CA, Perou R. National estimates and factors associated with medication treatment for childhood attention-deficit/hyperactivity disorder. *Pediatrics* 2007; 119(suppl 1):S99–S106.

ADDRESS: Michael J. Manos, PhD, Center for Pediatric Behavioral Health, Cleveland Clinic Children's, CR11, 2801 MLK Jr. Drive, Cleveland, OH 44104; manosm@ccf.org