

NIH Consensus Statement

Volume 16, Number 2
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Diagnosis and Treatment of Attention Deficit Hyperactivity Disorder (ADHD)

NATIONAL INSTITUTES OF HEALTH
Office of the Director

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NIH Consensus Statements are prepared by nonadvocate, non-Federal panels of experts, based on (1) presentations by investigators working in areas relevant to the consensus questions during a 2-day public session, (2) questions and statements from conference attendees during open discussion periods that are part of the public session, and (3) closed deliberations by the panel during the remainder of the second day and morning of the third. This statement is an independent report of the consensus panel and is not a policy statement of the NIH or the Federal Government.

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This statement reflects the panel's assessment of medical knowledge available at the time the statement was written. Thus, it provides a "snapshot in time" of the state of knowledge on the conference topic. When reading the statement, keep in mind that new knowledge is inevitably accumulating through medical research.



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Disclosure Statement

All of the panelists who participated in this conference and contributed to the writing of this consensus statement were identified as having no financial or scientific conflict of interest, and all signed conflict of interest forms attesting to this fact. Unlike the expert speakers who present scientific data at the conference, the individuals invited to participate on NIH consensus panels are selected specifically because they are not professionally identified with advocacy positions with respect to the conference topic or with research that could be used to answer any of the conference questions.

Abstract

Objective

The objective of this NIH Consensus Statement is to inform the biomedical research and clinical practice communities of the results of the NIH Consensus Development Conference on Diagnosis and Treatment of Attention Deficit Hyperactivity Disorder (ADHD). The statement provides state-of-the-art information regarding effective treatments for ADHD and presents the conclusions and recommendations of the consensus panel regarding these issues. In addition, the statement identifies those areas of study that deserve further investigation. Upon completion of this educational activity, the reader should possess a clear working clinical knowledge of the state of the art regarding this topic. The target audience of clinicians for this statement includes, but is not limited to, psychiatrists, family practitioners, pediatricians, internists, neurologists, psychologists, and behavioral medicine specialists.

Participants

Participants were a non-Federal, nonadvocate, 13-member panel representing the fields of psychology, psychiatry, neurology, pediatrics, epidemiology, biostatistics, education and the public. In addition, 31 experts from these same fields presented data to the panel and a conference audience of 1215.

Evidence

The literature was searched through Medline and an extensive bibliography of references was provided to the panel and the conference audience. Experts prepared abstracts with relevant citations from the literature. Scientific evidence was given precedence over clinical anecdotal experience.

Consensus Process

The panel, answering predefined questions, developed their conclusions based on the scientific evidence presented in open forum and the scientific literature. The panel composed a draft statement that was read in its entirety and circulated to the experts and the audience for comment. Thereafter, the panel resolved conflicting recommendations and released a revised statement at the end of the conference. The panel finalized the revisions within a few weeks after the conference. The draft statement was made available on the World Wide Web immediately following its release at the conference and was updated with the panel's final revisions.

Conclusions

Attention deficit hyperactivity disorder or ADHD is a commonly diagnosed behavioral disorder of childhood that represents a costly major public health problem. Children with ADHD have pronounced impairments and can experience long-term adverse effects on academic performance, vocational success, and social-emotional development which have a profound impact on individuals, families, schools, and society. Despite progress in the assessment, diagnosis, and treatment of ADHD, this disorder and its treatment have remained controversial, especially the use of psychostimulants for both short and long-term treatment.

Although an independent diagnostic test for ADHD does not exist, there is evidence supporting the validity of the disorder. Further research is needed on the dimensional aspects of ADHD, as well as the comorbid (coexisting) conditions present in both childhood and adult forms.

Studies, (primarily short term, approximately three months) including randomized clinical trials, have established the efficacy of stimulants and psychosocial treatments for alleviating the symptoms of ADHD and associated aggressiveness and have indicated that stimulants are more effective than psychosocial therapies in treating these symptoms. Because of the lack of consistent improvement beyond the core symptoms and the paucity of long-term studies (beyond 14 months), there is a need for longer term studies with drugs and behavioral modalities and their combination. Although trials are underway, conclusive recommendations concerning treatment for the long term cannot be made presently.

There are wide variations in the use of psychostimulants across communities and physicians, suggesting no consensus regarding which ADHD patients should be treated with psychostimulants. These problems point to the need for improved assessment, treatment, and follow-up of ADHD patients. A more consistent set of diagnostic procedures and practice guidelines is of utmost importance. Furthermore, the lack of insurance coverage preventing the appropriate diagnosis and treatment of ADHD and the lack of integration with educational services are substantial barriers and represent considerable long-term costs for society.

Finally, after years of clinical research and experience with ADHD, our knowledge about the cause or causes of ADHD remain largely speculative. Consequently, we have no documented strategies for the prevention of ADHD.

Introduction

Attention deficit hyperactivity disorder (ADHD) is the most commonly diagnosed behavioral disorder of childhood, estimated to affect 3 to 5 percent of school-age children. Its core symptoms include developmentally inappropriate levels of attention, concentration, activity, distractibility, and impulsivity. Children with ADHD usually have functional impairment across multiple settings including home, school, and peer relationships. ADHD has also been shown to have long-term adverse effects on academic performance, vocational success, and social-emotional development.

Despite the progress in the assessment, diagnosis, and treatment of children and adults with ADHD, the disorder has remained controversial. The diverse and conflicting opinions about ADHD have resulted in confusion for families, care providers, educators, and policymakers. The controversy raises questions concerning the literal existence of the disorder, whether it can be reliably diagnosed, and, if treated, what interventions are the most effective.

One of the major controversies regarding ADHD concerns the use of psychostimulants to treat the condition. Psychostimulants, including amphetamine, methylphenidate, and pemoline, are by far the most widely researched and commonly prescribed treatments for ADHD. Because psychostimulants are more readily available and are being prescribed more frequently, concerns have intensified over their potential overuse and abuse.

This 2½-day conference brought together national and international experts in the fields of relevant medical research and health care as well as representatives from the public.

After 1½ days of presentations and audience discussion, an independent, non-Federal consensus panel chaired by Dr. David J. Kupfer, Thomas Detre Professor and Chair, Department of Psychiatry, University of Pittsburgh, weighed the scientific evidence and wrote a draft statement that was

presented to the audience on the third day. The consensus statement addressed the following key questions:

- What is the scientific evidence to support ADHD as a disorder?
- What is the impact of ADHD on individuals, families, and society?
- What are the effective treatments for ADHD?
- What are the risks of the use of stimulant medication and other treatments?
- What are the existing diagnostic and treatment practices, and what are the barriers to appropriate identification, evaluation, and intervention?
- What are the directions for future research?

The lead organizations of this conference were the National Institute on Drug Abuse, the National Institute of Mental Health, and the National Institutes of Health (NIH) Office of Medical Applications of Research. The conference was also supported by the National Institute of Environmental Health Sciences, the National Institute of Child Health and Human Development, the U.S. Food and Drug Administration, and the Office of Special Education Programs, U.S. Department of Education.

What Is the Scientific Evidence To Support ADHD as a Disorder?

The diagnosis of ADHD can be made reliably using well-tested diagnostic interview methods. However, as of yet, there is no independent valid test for ADHD. Although research has suggested a central nervous system basis for ADHD, further research is necessary to firmly establish ADHD as a brain disorder. This is not unique to ADHD, but applies as well to most psychiatric disorders, including disabling diseases such as schizophrenia. Evidence supporting the validity of ADHD includes the long-term developmental course of ADHD over time, cross-national studies revealing similar risk factors, familial aggregation of ADHD (which may be genetic or environmental), and heritability.

Additional efforts to validate the disorder are needed: careful description of the cases, use of specific diagnostic criteria, repeated followup studies, family studies (including twin and adoption studies), epidemiologic studies, and long-term treatment studies. To the maximum extent possible, such studies should include various controls, including normal subjects and those with other clinical disorders. Such studies may provide suggestions about subgrouping of patients that will turn out to be associated with different outcomes, responses to different treatment, and varying patterns of familial characteristics and illnesses.

Certain issues about the diagnosis of ADHD have been raised that indicate the need for further research to validate diagnostic methods.

- Clinicians who diagnose this disorder have been criticized for merely taking a percentage of the normal population who have the most evidence of inattention and continuous activity and labeling them as having a disease. In fact, it is unclear whether the signs of ADHD represent a bimodal distribution in the population or one end of a continuum of characteristics. This is not unique to ADHD as other

medical diagnoses, such as essential hypertension and hyperlipidemia, are continuous in the general population, yet the utility of diagnosis and treatment have been proven. Nevertheless, related problems of diagnosis include differentiating this entity from other behavioral problems and determining the appropriate boundary between the normal population and those with ADHD.

- ADHD often does not present as an isolated disorder, and comorbidities (coexisting conditions) may complicate research studies, which may account for some of the inconsistencies in research findings.
- Although the prevalence of ADHD in the United States has been estimated at about 3 to 5 percent, a wider range of prevalence has been reported across studies. The reported rate in some other countries is much lower. This indicates a need for a more thorough study of ADHD in different populations and better definition of the disorder.
- All formal diagnostic criteria for ADHD were designed for diagnosing young children and have not been adjusted for older children and adults. Therefore, appropriate revision of these criteria to aid in the diagnosis of these individuals is encouraged.

In summary, there is validity in the diagnosis of ADHD as a disorder with broadly accepted symptoms and behavioral characteristics that define the disorder.

What Is the Impact of ADHD on Individuals, Families, and Society?

Children with ADHD experience an inability to sit still and pay attention in class and the negative consequences of such behavior. They experience peer rejection and engage in a broad array of disruptive behaviors. Their academic and social difficulties have far-reaching and long-term consequences. These children have higher injury rates. As they grow older, children with untreated ADHD in combination with conduct disorders experience drug abuse, antisocial behavior, and injuries of all sorts. For many individuals, the impact of ADHD continues into adulthood.

Families who have children with ADHD, as with other behavioral disorders and chronic diseases, experience increased levels of parental frustration, marital discord, and divorce. In addition, the direct costs of medical care for children and youth with ADHD are substantial. These costs represent a serious burden for many families because they frequently are not covered by health insurance.

In the larger world, these individuals consume a disproportionate share of resources and attention from the health care system, criminal justice system, schools, and other social service agencies. Methodologic problems preclude precise estimates of the cost of ADHD to society. However, these costs are large. For example, additional national public school expenditures on behalf of students with ADHD may have exceeded \$3 billion in 1995. Moreover, ADHD, often in conjunction with coexisting conduct disorders, contributes to societal problems such as violent crime and teenage pregnancy.

Families of children impaired by the symptoms of ADHD are in a very difficult position. The painful decision-making process to determine appropriate treatment for these children is often made substantially worse by the media war between those who overstate the benefits of treatment and those who overstate the dangers of treatment.

What Are the Effective Treatments for ADHD?

A wide variety of treatments have been used for ADHD including, but not limited to, various psychotropic medications, psychosocial treatment, dietary management, herbal and homeopathic treatments, biofeedback, meditation, and perceptual stimulation/training. Of these treatment strategies, stimulant medications and psychosocial interventions have been the major foci of research. Studies on the efficacy of medication and psychosocial treatments for ADHD have focused primarily on a condition equivalent to DSM-IV combined type, meeting criteria for Inattention and Hyperactivity/Impulsivity. Until recently, most randomized clinical trials have been short term, up to approximately 3 months. Overall, these studies support the efficacy of stimulants and psychosocial treatments for ADHD and the superiority of stimulants relative to psychosocial treatments. However, there are no long-term studies testing stimulants or psychosocial treatments lasting several years. There is no information on the long-term outcomes of medication-treated ADHD individuals in terms of educational and occupational achievements, involvement with the police, or other areas of social functioning.

Short-term trials of stimulants have supported the efficacy of methylphenidate (MPH) dextroamphetamine, and pemoline in children with ADHD. Few, if any, differences have been found among these stimulants on average. However, MPH is the most studied and the most often used of the stimulants. These short-term trials have found beneficial effects on the defining symptoms of ADHD and associated aggressiveness as long as medication is taken. However, stimulant treatments may not “normalize” the entire range of behavior problems, and children under treatment may still manifest a higher level of some behavior problems than normal children. Of concern are the consistent findings that despite the improvement in core symptoms, there is little improvement in academic achievement or social skills.

Several short-term studies of antidepressants show that desipramine produces improvements over placebo in parent and teacher ratings of ADHD symptoms. Results from studies examining the efficacy of imipramine are inconsistent. Although a number of other psychotropic medications have been used to treat ADHD, the extant outcome data from these studies do not allow for conclusions regarding their efficacy.

Psychosocial treatment of ADHD has included a number of behavioral strategies such as contingency management (e.g., point/token reward systems, timeout, response cost) that typically is conducted in the classroom, parent training (where the parent is taught child management skills), clinical behavior therapy (parent, teacher, or both are taught to use contingency management procedures), and cognitive-behavioral treatment (e.g., self-monitoring, verbal self-instruction, problem-solving strategies, self-reinforcement). Cognitive-behavioral treatment has not been found to yield beneficial effects in children with ADHD. In contrast, clinical behavior therapy, parent training, and contingency management have produced beneficial effects. Intensive direct interventions in children with ADHD have produced improvements in key areas of functioning. However, no randomized control trials have been conducted on some of these intensive interventions alone or in combination with medication. Studies that compared stimulants with psychosocial treatment consistently reported greater efficacy of stimulants.

Emerging data suggest that medication using systematic titration and intensive monitoring methods over a period of approximately 1 year is superior to an intensive set of behavioral treatments on core ADHD symptoms (inattention, hyperactivity/impulsivity, aggression). Combined medication and behavioral treatment added little advantage overall, over medication alone, but combined treatment did result in more improved social skills, and parents and teachers judged this treatment more favorably. Both systematically applied medication (monitored regularly) and combined treatment were

superior to routine community care, which often involved the use of stimulants. An important potential advantage for behavioral treatment is the possibility of improving functioning with reduced dose of stimulants. This possibility was not tested.

There is a long history of a number of other interventions for ADHD. These include dietary replacement, exclusion, or supplementation; various vitamin, mineral, or herbal regimens; biofeedback; perceptual stimulation; and a host of others. Although these interventions have generated considerable interest and there are some controlled and uncontrolled studies using various strategies, the state of the empirical evidence regarding these interventions is uneven, ranging from no data to well-controlled trials. Some of the dietary elimination strategies showed intriguing results suggesting the need for future research.

The current state of the empirical literature regarding the treatment of ADHD is such that at least five important questions cannot be answered. First, it cannot be determined if the combination of stimulants and psychosocial treatments can improve functioning with reduced dose of stimulants. Second, there are no data on the treatment of ADHD, Inattentive type, which might include a high percentage of girls. Third, there are no conclusive data on treatment in adolescents and adults with ADHD. Fourth, there is no information on the effects of long-term treatment (treatment lasting more than 1 year), which is indicated in this persistent disorder. Finally, given the evidence about the cognitive problems associated with ADHD, such as deficiencies in working memory and language processing deficits, and the demonstrated ineffectiveness of current treatments in enhancing academic achievement, there is a need for application and development of methods targeted to these weaknesses.

What Are the Risks of the Use of Stimulant Medication and Other Treatments?

Although little information exists concerning the long-term effects of psychostimulants, there is no conclusive evidence that careful therapeutic use is harmful. When adverse drug reactions do occur, they are usually related to dose. Effects associated with moderate doses may include decreased appetite and insomnia. These effects occur early in treatment and may decrease with continued dosing. There may be negative effects on growth rate, but ultimate height appears not to be affected.

It is well known that psychostimulants have abuse potential. Very high doses of psychostimulants, particularly of amphetamines, may cause central nervous system damage, cardiovascular damage, and hypertension. In addition, high doses have been associated with compulsive behaviors and, in certain vulnerable individuals, movement disorders. There is a rare percentage of children and adults treated at high doses who have hallucinogenic responses. Drugs used for ADHD other than psychostimulants have their own adverse reactions: tricyclic antidepressants may induce cardiac arrhythmias, bupropion at high doses can cause seizures, and pemoline is associated with liver damage.

The degree of assessment and followup by primary care physicians varies significantly. This variance may contribute to the marked differences in appropriate prescribing practices. Adequate followup is required for any prescribed medications, especially for higher doses of psycho-stimulants.

Although an increased risk of drug abuse and cigarette smoking is associated with childhood ADHD (see Question 2), existing studies come to conflicting conclusions as to whether use of psychostimulants increases or decreases the risk of abuse. A major limitation of inferences from observational databases is the inability to examine independently the use of stimulant medication, the diagnosis and severity of ADHD, and the effect of coexisting conditions.

The increased availability of stimulant medications may pose risks for society. The threshold of drug availability that can lead to oversupply and consequent illicit use is unknown. There is little evidence that current levels of production have had a substantial effect on abuse. However, there is a need to be vigilant in monitoring the national indices of use and abuse of stimulants among high school seniors. One of the indices is the Drug Abuse Warning Network (DAWN).

What Are the Existing Diagnostic and Treatment Practices, and What Are the Barriers to Appropriate Identification, Evaluation, and Intervention?

The American Academy of Child and Adolescent Psychiatry has published practice parameters for the assessment and treatment of ADHD. The American Academy of Pediatrics has formed a subcommittee to establish parameters for pediatricians, but those guidelines are not available at this time. Primary care and developmental pediatricians, family practitioners, (child) neurologists, psychologists, and psychiatrists are the providers responsible for assessment, diagnosis, and treatment of most children with ADHD. There is wide variation among types of practitioners with respect to frequency of diagnosis of ADHD. Data indicate that family practitioners diagnose more quickly and prescribe medication more frequently than psychiatrists or pediatricians. This may be due in part to the limited time spent making the diagnosis. Some practitioners invalidly use response to medication as a diagnostic criterion, and primary care practitioners are less likely to recognize comorbid (coexisting) disorders. The quickness with which some practitioners prescribe medications may decrease the likelihood that more educationally relevant interventions will be sought.

Diagnoses may be made in an inconsistent manner with children sometimes being overdiagnosed and sometimes underdiagnosed. However, this does not affect the validity of the diagnosis when appropriate guidelines are used. Some practitioners do not use structured parent questionnaires, rating scales, or teacher or school input. Pediatricians, family practitioners, and psychiatrists tend to rely on parent rather than teacher input. There appears to be a “disconnect” between developmental or educational (school-based) assessments and health-related (medical practice-based) services. There is often poor communication between diagnosticians and those who implement and monitor treatment in schools.

In addition, followup may be inadequate and fragmented. This is particularly important to ensure monitoring and early detection of any adverse effect of therapy. School-based clinics with a team approach that includes parents, teachers, school psychologists, and other mental health specialists may be a means to remove these barriers and improve access to assessment and treatment. Ideally, primary care practitioners with adequate time for consultation with such school teams should be able to make an appropriate assessment and diagnosis, but they should also be able to refer to mental health and other specialists when deemed necessary.

What are the barriers to appropriate identification, evaluation, and intervention?

Studies identify a number of barriers to appropriate identification, evaluation, and treatment. Barriers to identification and evaluation arise when central screening programs limit access to mental health services. The lack of insurance coverage for psychiatric or psychological evaluations, behavior modification programs, school consultation, parent management training, and other specialized programs presents a major barrier to accurate classification, diagnosis, and management of ADHD. Substantial cost barriers exist in that diagnosis results in out-of-pocket costs to families for services not covered by managed care or other health insurance. Mental health benefits are carved out of many policies offered to families, and thus access to treatment other than medication might be severely limited. Parity for mental health conditions in insurance plans is essential. Another cost implication lies in the fact that there is no funded special education category specifically for ADHD, which leaves these students underserved, and there is currently no tracking or monitoring of children with ADHD who are served outside of special education. This results in educational and mental health service sources disputing responsibility for coverage of special educational services.

Barriers exist in relationship to gender, race, socioeconomic factors, and geographical distribution of physicians who identify and evaluate patients with ADHD.

Other important barriers include those perceived by patients, families, and clinicians. These include lack of information, concerns about risks of medications, loss of parental rights, fear of professionals, social stigma, negative pressures from families and friends against seeking treatment, and jeopardizing jobs and military service. For health care providers, the lack of specialists and difficulties obtaining insurance coverage as outlined above present significant obstacles to care.

What Are the Directions for Future Research?

Basic research is needed to better define ADHD. This research includes the following: (1) studies of cognitive development, cognitive processing, and attention/inattention in ADHD and (2) brain imaging studies before the initiation of medication and following the individual through young adulthood and middle age.

Further research should be conducted with respect to the dimensional aspects of this disorder, as well as the comorbid (coexisting) conditions present in both childhood and adult ADHD. Therefore, an important research need is the investigation of standardized age- and gender-specific diagnostic criteria.

The impact of ADHD should be determined. Studies in this regard include (1) the nature and severity of the impact on individuals, families, and society of adults with ADHD beyond the age of 20 and (2) determination of the financial costs related to diagnosis and care of children with ADHD.

Additional studies are needed to develop a more systematized treatment strategy. These include:

- Studies of the Inattentive type of ADHD, especially since it might include a higher proportion of girls than the subtypes with hyperactivity/impulsivity.
- Studies of long-term treatment (treatment lasting longer than 1 year), which are needed because of the persistence of the disorder.
- Prospective controlled studies, up to adulthood, of the risks and benefits associated with childhood treatment with psychostimulants.
- Studies to determine the effects of psychotropic therapy on cognitive function and school performance.
- Studies of the effects of instructional treatments on the academic achievement of children with ADHD.

- Studies to determine whether the combination of stimulants and psychosocial treatments can improve functioning with a reduced dose of stimulants.
- Studies to determine the risks and benefits associated with treating children younger than age 5 with stimulants.
- Studies of the effects of various stimulants in adolescents and adults.

Greater attention should be given to developing integrated programs for diagnosis and treatment. These include:

- Model projects to demonstrate methods of training teachers to recognize and provide appropriate special programs for children with ADHD.
- Incorporation of classroom strategies to effectively serve a greater variety of students and thereby reduce the need for ADHD referral and diagnosis.
- Determination of the extent to which individuals with ADHD are being served in postsecondary education and, if so, where they are being served, with what types of accommodations, and with what level of success.

Conclusions

Attention deficit hyperactivity disorder or ADHD is a commonly diagnosed behavioral disorder of childhood that represents a major public health problem. Children with ADHD usually have pronounced difficulties and impairments resulting from the disorder across multiple settings. They can also experience long-term adverse effects on academic performance, vocational success, and social-emotional development.

Despite progress in the assessment, diagnosis, and treatment of ADHD, this disorder and its treatment have remained controversial in many public and private sectors. The major controversy regarding ADHD continues to be the use of psychostimulants both for short-term and long-term treatment.

Although an independent diagnostic test for ADHD does not exist, evidence supporting the validity of the disorder can be found. Further research will need to be conducted with respect to the dimensional aspects of ADHD, as well as the comorbid (coexisting) conditions present in both childhood and adult ADHD. Therefore, an important research need is the investigation of standardized age- and gender-specific diagnostic criteria.

The impact of ADHD on individuals, families, schools, and society is profound and necessitates immediate attention. A considerable share of resources from the health care system and various social service agencies is currently devoted to individuals having ADHD. Often the services are delivered in a nonintegrated manner. Resource allocation based on better cost data leading to integrated care models needs to be developed for individuals with ADHD.

Effective treatments for ADHD have been evaluated primarily for the short term (approximately 3 months). These studies have included randomized clinical trials that have established the efficacy of stimulants and psychosocial treatments for alleviating the symptoms of ADHD and associated aggressiveness and have indicated that stimulants are more effective than psychosocial therapies in treating these symptoms.

Lack of consistent improvement beyond the core symptoms leads to the need for treatment strategies that utilize combined approaches. At the present time, there is a paucity of data providing information on long-term treatment beyond 14 months. Although trials combining drugs and behavioral modalities are underway, conclusive recommendations concerning treatment for the long term cannot be made easily.

The risks of treatment, particularly the use of stimulant medication, are of considerable interest. Substantial evidence exists of wide variations in the use of psychostimulants across communities and physicians, suggesting no consensus among practitioners regarding which ADHD patients should be treated with psychostimulants. As measured by attention/activity indices, patients with varying levels and types of problems (and even possibly unaffected individuals) may benefit from stimulant therapy. However, there is no evidence regarding the appropriate ADHD diagnostic threshold above which the benefits of psychostimulant therapy outweigh the risks.

Existing diagnostic and treatment practices, in combination with the potential risks associated with medication, point to the need for improved awareness by the health service sector concerning an appropriate assessment, treatment, and followup. A more consistent set of diagnostic procedures and practice guidelines is of utmost importance. Current barriers to evaluation and intervention exist across the health and education sectors. The cost barriers and lack of coverage preventing the appropriate diagnosis and treatment of ADHD and the lack of integration with educational services represent considerable long-term cost for society. The lack of information and education about accessibility and affordability of services must be remedied.

Finally, after years of clinical research and experience with ADHD, our knowledge about the cause or causes of ADHD remains speculative. Consequently, we have no strategies for the prevention of ADHD.

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Bibliography

Overview and Introduction

Conners CK, Erhardt D. Attention-deficit hyperactivity disorder in children and adolescents: clinical formulation and treatment. In: Hersen M, Bellack A, editors. *Comprehensive Clinical Psychology*. New York: Elsevier Science; 1998.

Goldman LS, Genel M, Bezman RJ, Slanetz PJ. Diagnosis and treatment of attention-deficit/hyperactivity disorder in children and adolescents. Council on Scientific Affairs, American Medical Association. *JAMA* 1998;279:1100-7.

Richters JE, Arnold LE, Jensen PS, Abikoff H, Conners CK, Greenhill LL, 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.

Weiss G, Hechtman L. *Hyperactive children grown up: ADHD in children, adolescents, and adults*. New York: Guilford; 1993.

ADHD as a Disorder in Children, Adolescents, and Adults

Applegate B, Lahey BB, Hart EL, Biederman J, Hynd GW, Barkley RA, et al. Validity of the age-of-onset criterion for ADHD: a report from the DSM-IV field trials. *J Am Acad Child Adolesc Psychiatry* 1997;36:1211-21.

Carey WB, McDevitt SC. *Coping with children's temperament*. New York: Basic Books; 1995.

Castellanos FX, Giedd JN, March WI, Hamburger SD, Vaituzis AC, Dickstein DP, et al. Quantitative brain magnetic resonance imaging in attention-deficit hyperactivity disorder. *Arch Gen Psychiatry* 1996;53:607-16.

Diller LH. *Running on Ritalin*. New York: Bantam; 1998.

Lahey BB, Applegate B, McBurnett K, Biederman J, Greenhill L, Hynd GW, et al. DSM-IV field trials for attention deficit/hyperactivity disorder in children and adolescents. *Am J Psychiatry* 1994;151:1673-85.

Lahey BB, Pelham WE, Stein MA, Loney J, Trapani C, Nugent K, et al. Validity of DSM-IV attention-deficit/hyperactivity disorder for younger children. *J Am Acad Child Adolesc Psychiatry*. In press.

Lahey BB, Carlson CL, Frick PJ. Attention deficit disorder without hyperactivity: a review of research relevant to DSM-IV. In: Widiger TA, Frances AJ, Davis W, First M, editors. *DSM-IV Sourcebook*, Vol 1. Washington (DC): American Psychiatric Press; 1997.

Levine MD. Neurodevelopmental variation and dysfunction among school children. In: Levine MD, Carey WB, Crocker AC, editors. *Developmental-behavioral pediatrics*. 3rd ed. Philadelphia: Saunders; 1998.

Lou HC. Etiology and pathogenesis of attention-deficit hyperactivity disorder (ADHD): Significance of prematurity and perinatal hypoxic-haemodynamic encephalopathy. *Acta Paediatr* 1996;85:1266-71.

Maziade M. Should adverse temperament matter to the clinician? An empirically based answer. In: Kohnstamm GA, Bates JE, Rothbart MK, editors. *Temperament in childhood*. New York: Wiley; 1989.

Oosterlaan J, Logan GD, Sergeant JA. Response inhibition in AD/HD, CD, comorbid AD/HD+CD, anxious and control children: a meta-analysis of studies with the stop task. *J Child Psychol Psychiatry* 1998;39:411-26.

Pennington BF, Ozonoff S. Executive functions and developmental psychopathology. *J Child Psychol Psychiatry* 1996;37:51-87.

Seidman LJ, Biederman J, Faraone SV, Weber W, Ouellette C. Toward defining a neuropsychology of attention deficit-hyperactivity disorder: performance of children and adolescents from a large clinically referred sample. *J Consul and Clin Psychol* 1997;65:150-60.

Swanson JM, Sunohara GA, Kennedy JL, Regino R, Fineberg E, Wigal T, et al. Association of the dopamine receptor D4 (DRD4) gene with a refined phenotype of attention deficit hyperactivity disorder (ADHD): a family-based approach. *Mol Psychiatry* 1998;3:38-41.

Tannock R. Attention deficit hyperactivity disorder: advances in cognitive, neurobiological, and genetic research. *J Child Psychol Psychiatry* 1998;39:65-99.

Volkow ND, Ding YS, Fowler JS, Wang GJ, Logan J, Gatley JS, et al. Is methylphenidate like cocaine? Studies on their pharmacokinetics and distribution in human brain. *Arch Gen Psychiatry* 1995;52:456-63.

Impact

Barkley RA, Fischer M, Edelbrock CS, Smallish L. The adolescent outcome of hyperactive children diagnosed by research criteria: I. An 8-year prospective follow-up study. *J Am Acad Child Adolesc Psychiatry* 1990;29:546-57.

Barkley RA. Developmental course, adult outcome, and clinic-referred ADHD adults. In: Barkley RA, *Attention deficit hyperactivity disorder*. 2nd ed. New York: Guilford Press; 1998.

Biederman J, Faraone SV, Spencer T, Wilens T, Norman D, Lapey KA, et al. Patterns of psychiatric comorbidity, cognition, and psychosocial functioning in adults with attention deficit hyperactivity disorder. *Am J Psychiatry* 1993;150:1792-8.

- Biederman J, Faraone S, Milberger S, Guite J, Mick E, Chen L, et al. A prospective 4-year follow-up study of attention-deficit hyperactivity and related disorders. *Arch Gen Psychiatry* 1996;53:437-46.
- Bird H. Epidemiology of childhood disorders in a cross-cultural context. *J Child Psychol Psychiatry* 1996;37(1):35-49.
- Bussing R, Zima BT, Belin TR, Forness SR. Children who qualify for LD and SED programs: do they differ in level of ADHD symptoms and comorbid psychiatric conditions? *J Emot Beh Disord* 1998;22:88-97.
- Cocozza JJ, editor. Responding to the mental health needs of youth in the juvenile justice system. Seattle: The National Coalition for the Mentally Ill in the Criminal Justice System; 1992.
- Danckaerts M, Taylor EJ. The epidemiology of childhood hyperactivity. In: Verhulst FC, Koot HM, editors. *The epidemiology of child and adolescent psychopathology*. New York: Oxford University Press; 1995.
- DuPaul GJ, Eckert TL. The effects of school-based interventions for attention deficit hyperactivity disorder: a meta analysis. *Sch Psych Rev* 1997;26:5-27.
- Forness SR, Walker HM. Special education and children with ADD/ADHD. Mentor (OH). National Attention Deficit Disorder Association; 1994.
- Greene R, Biederman J, Faraone SV, Sienna M, Garcia-Jetton J. Adolescent outcome of boys with attention-deficit/hyperactivity disorder and social disability: results from a 4-year follow-up study. *J Consult Clin Psychol* 1997;65:758-67.
- Hinshaw SP, Melnick SM. Peer relationships in children with attention-deficit hyperactivity disorder with and without comorbid aggression. *Dev Psychopathol* 1995;7:627-47.
- Lahey BB, Pelham WE, Stein MA, Loney J, Trapani C, Nugent K, et al. Validity of DSM-IV attention-deficity/hyperactivity disorder for younger children. *J Am Acad Child Adolesc Psychiatry* 1998;37:435-42.
- Leung PW, Luk SL, Ho TP, Taylor E, Mak FL, Bacon-Shone J. The diagnosis and prevalence of hyperactivity in Chinese schoolboys. *Br J Psychiatry* 1996;168(4):486-96.
- Loeber R, Farrington D, editors. *Serious and violent juvenile offenders: risk factors and successful interventions*. Thousand Oaks: Sage Publications; 1998.
- Mann EM, Ikeda Y, Mueller CW, Takahashi A, Tao KT, Humris E, et al. Cross-cultural differences in rating hyperactive-disruptive behaviors in children. *Am J Psychiatry* 1992; 149(11):1539-42.
- Mannuzza S, Klein R, Bessler A, Malloy P, LaPadula M. Adult outcome of hyperactive boys. Educational achievement, occupational rank, and psychiatric status. *Arch Gen Psychiatry* 1993;50:565-76.

Mannuzza S, Klein RG, Bessler A, Malloy P, Hynes ME. Educational and occupational outcome of hyperactive boys grown up. *J Am Acad Child Adolesc Psychiatry* 1997;36:1222-7.

Reid R, Maag JW, Vasa SF, Wright G. Who are the children with attention deficit-hyperactivity disorder? A school-based survey. *J Spec Ed* 1994;28:117-37.

Slomkowski C, Klein RG, Mannuzza S. Is self-esteem an important outcome in hyperactive children? *J Abnorm Child Psychol* 1995;23:303-15.

Snyder HN. *Juvenile arrests 1996*. Washington, DC: U.S. Department of Justice, Office of Juvenile Justice and Delinquency Prevention; 1997.

Stahl AL. *Delinquency cases in juvenile courts, 1995*. OJJDP Fact sheet #79. Washington, DC: U.S. Department of Justice, Office of Juvenile Justice and Delinquency Prevention; 1998.

Weiss G, Hechtman LT. *Hyperactive children grown up*. 2nd ed. New York: Guilford Press; 1993.

Safety and Efficacy of Treatments — Short and Long Term

Arnold L, Abikoff H, Cantwell D, Conners C, Elliott G, Greenhill L, et al. NIMH collaborative multimodal treatment study of children with ADHD (MTA): design challenges and choices. *Arch Gen Psychiatry* 1997;54:865-70.

Biederman J, Thisted R, Greenhill L, Ryan N. Estimation of the association between desipramine and the risk for sudden death in 5 to 14 year old children. *J Clin Psychiatry* 1995;56:87-93.

Biederman J, Baldessarini RJ, Wright V, Keenan K, Faraone S. A double-blind placebo controlled study of desipramine in the treatment of attention deficit disorder: III. Lack of impact of comorbidity and family history on clinical response. *J Am Acad Child Adolesc Psychiatry* 1993;32:199-204.

Borcherding BG, Keysor CS, Rapoport JL, Elia J, Amass J. Motor/vocal tics and compulsive behaviors on stimulant drugs: Is there a common vulnerability? *Psychiatry Res* 1990;33:83-94.

Breggin PR. *Talking back to Ritalin*. Monroe (ME): Common Courage Press; 1998b.

Carlson CL, Pelham WE, Milich R, Dixon J. Single and combined effects of methylphenidate and behavior therapy on the classroom performance of children with ADHD. *J Abnorm Child Psychol* 1992;20:213-32.

Dunnick JK, Hailey JR. Experimental studies on the long-term effects of methylphenidate hydrochloride. *Toxicology* 1995;103:77-84.

- Goldman LS, Genel M, Bezman RJ, Slanetz PJ. Diagnosis and treatment of attention-deficit/hyperactivity disorder in children and adolescents. Council on Scientific Affairs. American Medical Association. *JAMA* 1998;279:1100-7.
- Hechtman L, Abikoff H. Multimodal treatment plus stimulants vs. stimulant treatment in ADHD children: results from a two year comparative treatment study. Paper presented at the Annual Meeting of the American Academy of Child and Adolescent Psychiatry; October 1995; New Orleans, Louisiana.
- Hinshaw SP. Stimulant medication and the treatment of aggression in children with attentional deficits. *J Clin Child Psychol* 1991;20:301-12.
- Horn WF, Ialongo NS, Pascoe JM, Greenberg G, Packard T, Lopez M, et al. Additive effects of psychostimulants, parent training, and self-control therapy with ADHD children. *J Am Acad Child Adolesc Psychiatry* 1991;30:233-40.
- Jensen PJ, Abikoff H. Tailoring treatment interventions for individuals with ADDs. In: Brown T, editor. *Attention deficit disorders and comorbidities in children, adolescents, and adults*. American Psychiatric Press. In press.
- Klein RG, Abikoff H. Behavior therapy and methylphenidate in the treatment of children with ADHD. *J Attention Disord* 1997;2:89-114.
- Klein RG, Abikoff H, Klass E, Ganeles D, Seese LM, Pollack S. Clinical efficacy of methylphenidate in conduct disorder with and without attention deficit hyperactivity disorder. *Arch Gen Psychiatry* 1997;54:1073-80.
- Klein RG, Landa B, Mattes JA, et al. Methylphenidate and growth in hyperactive children. *Arch Gen Psychiatry* 1988;45:1127-30.
- Marotta PJ, Roberts EA. Pemoline hepatotoxicity in children. *J Pediatr* 1998;132:894-7.
- McMaster University Evidence-Based Practice Center. *The treatment of attention-deficit/ hyperactivity disorder: an evidence report*. Contract no. 290-97-0017. Agency for Health Care Policy and Research. 1998.
- Melega WP, Raleigh MJ, Stout DB, Lacan G, Huang SC, Phelps ME. Recovery of striatal dopamine function after acute amphetamine- and methamphetamine-induced neurotoxicity in the vervet monkey. *Brain Res* 1997;766:113-20.
- Nasrallah H, Loney J, Olson S, McCalley-Whitters M, Kramer J, Jacoby C. Cortical atrophy in young adults with a history of hyperactivity in childhood. *Psychiatry Res* 1986;17:241-6.
- Pelham WE, Wheeler T, Chronis A. Empirically supported psychosocial treatments for attention deficit hyperactivity disorder. *J Clin Child Psychol* 1998;27:189-204.

Pelham WE, Murphy HA. Attention deficit and conduct disorder. In: Hersen M, editor. *Pharmacological and behavioral treatment: an integrative approach*. New York: John Wiley & Sons; 1986. p. 108-48.

Pelham WE, Hoza B. Intensive treatment: a summer treatment program for children with ADHD. In: Hibbs E, Jensen P, editors. *Psychosocial treatments for child and adolescent disorders: empirically based strategies for clinical practice*. New York: APA Press; 1996. p. 311-40.

Pliszka S. Effect of anxiety on cognition, behavior, and stimulant response in ADHD. *J Amer Acad Child Adolesc Psychiatry* 1989; 28:882-7.

Safer D, Zito J, Fine E. Increased methylphenidate usage for attention deficit hyperactivity disorder in the 1990s. *Pediatrics* 1996;98:1084-8.

Safer DJ, Zito JM, Fine EM. Increased methylphenidate usage for attention deficit disorder in the 1990's. *Pediatrics* 1996;98:1084-8.

Spencer T, Biederman J, Wilens T, Harding M, O'Donnell D, Griffin S. Pharmacotherapy of attention-deficit hyperactivity disorder across the life cycle. *J Am Acad Child Adolesc Psychiatry* 1996;35:409-32.

Swanson JM, Flockhart D, Udrea D, Cantwell DP, Connor DF, Williams L. Clonidine in the treatment of ADHD: questions about safety and efficacy. *J Child Adolesc Psychopharmacol* 1995;5:301-4.

Wilens TE, Biederman J. Stimulants. In: Schaffer D, editor. *Psychiatric Clinics of North America*. Philadelphia: W.B. Saunders; 1992. p. 191-222.

Substance Abuse Risks of Stimulant Treatments

Beck L, Langford W, MacKay M, Sum G. Childhood chemotherapy and later drug abuse and growth curve: a follow-up study of 30 adolescents. *Am J Psychiatry* 1975;132:436-8.

Biederman J, Wilens TE, Mick E, Milberger S, Spencer TJ, Faraone SV. Psychoactive substance use disorders in adults with attention deficit hyperactivity disorder (ADHD): effects of ADHD and psychiatric comorbidity. *Am J Psychiatry* 1995;152:1652-8.

Carroll KM, Rounsaville BJ. History and significance of childhood attention deficit disorder in treatment-seeking cocaine abusers. *Compr Psychiatry* 1993;34:75-82.

Drug Enforcement Administration, Office of Diversion Control. *Methylphenidate review: eight factor analysis*. Washington DC; 1995.

Drug Enforcement Administration, Office of Diversion Control. *Conference report: stimulant use in the treatment of ADHD*. Washington DC; 1996.

Gaytan O, al-Rahim S, Swann A, Dafny N. Sensitization to locomotor effects of methylphenidate in the rat. *Life Sci* 1997;61:101-7.

- Hartsough CS, Lambert NM. Pattern and progression of drug use among hyperactives and controls: a prospective short-term longitudinal study. *J Child Psychol Psychiatry* 1987;28:543-53.
- Hechtman L. Adolescent outcome of hyperactive children treated with stimulants in childhood: a review. *Psychopharmacol Bull* 1985;21:178-91.
- Herrero ME, Hechtman L, Weiss G. Antisocial disorders in hyperactive subjects from childhood to adulthood: predictive factors and characterization of subgroups. *Am J Orthopsychiatry* 1994;64:510-21.
- Jaffe SL. Intranasal abuse of prescribed methylphenidate by an alcohol and drug abusing adolescent with ADHD. *J Am Acad Child Adolesc Psychiatry* 1991;30:773-5.
- Klein RG, Mannuzza S. The importance of childhood hyperactivity in the development of substance use disorders. In: Bailly D, editor. *Addictions et Psychiatrie*. Paris (France): Editions Masson. In press.
- Kramer J, Loney J. Childhood hyperactivity and substance abuse: a review of the literature. In: Gadow KD, Bialer I, editors. *Advances in learning and behavioral disabilities*. Greenwich (CT): Jai Press; 1982.
- Lambert NM, Hartsough CS. Prospective study of tobacco smoking and substance dependence among samples of ADHD and non-ADHD subjects. *J Learn Disabil* 1998;31:533-44.
- Lambert NM, Sandoval J, Sassone D. Prevalence of hyperactivity in elementary school children as a function of social system definers. *Am J Orthopsychiatry* 1978;48:446-63.
- Lambert NM. Adolescent outcomes for hyperactive children: perspectives on general and specific patterns of childhood risk for adolescent educational, social, and mental health problems. *Am Psychol* 1988;43:786-99.
- Lambert NM, Hartsough CS, Sandoval J. *Children's attention and adjustment survey—home and school versions*. Circle Pines (MN): American Guidance Service; 1990.
- Levin FR, Kleber HD. Attention deficit hyperactivity disorder and substance abuse: relationships and implications for treatment. *Harv Rev Psychiatry* 1995;2:246-58.
- Loney J, Kramer J, Salisbury H. *Medicated vs. unmedicated hyperactive boys as adults: attitudes toward and use of substances*. Stony Brook: State University of New York; 1998.
- Lynskey MT, Fergusson DM. Childhood conduct problems, attention deficit behaviors, and adolescent alcohol, tobacco, and illicit drug use. *J Abnorm Child Psychol* 1995;23:281-302.
- McDougall SA, Duke MA, Bolanos CA, Crawford CA. Ontogeny of behavioral sensitization in the rat: effects of direct and indirect dopamine agonists. *Psychopharmacology* 1994;116:483-90.

Milberger S, Biederman J, Faraone S, Chen L, Jones J. ADHD is associated with early initiation of cigarette smoking in children and adolescents. *J Am Acad Child Adolesc Psychiatry* 1997;36:37-43.

Piazza PV, Deroche V, Rouge-Pont F, Le Moal M. Behavioral and biological factors associated with individual vulnerability to psychostimulant abuse. In: Wetherington CL, Falk JL, editors. *Laboratory Behavioral Studies of Vulnerability to Drug Abuse*. NIDA monograph #169. NIH Publication 98-4122. Rockville, MD; 1998.

Pierce RC, Kalivas PW. A circuitry model of the expression of behavioral sensitization to amphetamine-like psychostimulants. *Brain Res Brain Res Rev* 1997;25:192-216.

Post RM. Intermittent versus continuous stimulation: effect of time interval on the development of sensitization or tolerance. *Life Sci* 1980;26:1275-82.

Rappley MD. The descriptive epidemiology of methylphenidate in Michigan. *Arch Pediatr Adolesc Med* 1995;149:675-97.

Report of the International Narcotics Control Board for 1996. (E/INCB/1996/1)

Wilens TE, Biederman J, Mick E, Faraone SV, Spencer T. Attention deficit hyperactivity disorder (ADHD) is associated with early onset substance use disorders. *J Nerv Ment Dis* 1997;185:475-82.

Existing Practices and Barriers Regarding Assessment and Treatment

Costello EJ, Edelbrock C, Costello AJ, Dulcan MK, Barne BJ, Brent, D. Psychopathology in pediatric primary care: the new hidden morbidity. *Pediatrics* 1988;81:415-24.

Diller LH. The run on Ritalin: attention deficit disorder and stimulant treatment in the 1990's. *Hastings Cent Rep* 1996;26:12.

Horwitz SM, Leaf PJ, Leventhal JM, Forsyth B, Speechley KN. Identification and management of psychosocial and developmental problems in community-based primary care pediatric practices. *Pediatrics* 1992;89:480-5.

Jensen PS, Kettle L, Roper MT, Sloan MT, Dulcan MK, Hoven CW, et al. Are stimulants over-prescribed? Treatment of ADHD in four U.S. communities. *J Am Acad Child Adolesc Psychiatry*. In press.

Kelleher KJ, Childs GE, Wasserman RC, McInerney TK, Nutting PA, Gardner WP. Insurance status and recognition of psychosocial problems: a report from pediatric research in office settings and the ambulatory sentinel practice networks. *Arch Pediatr Adolesc Med* 1997;151:1109-15.

Knapp M. Economic evaluations and interventions for children and adolescents with mental health problems. *J Child Psychol Psychiatry* 1997;38(1):3-25.

Leaf PJ, Alegria M, Cohen P, Goodman SH, Horwitz SM, Hoven CW, et al. Mental health service use in the community and schools: results from the four-community MECA study. *J Am Acad Child Adolesc Psychiatry* 1996;35:889-97.

Offord DR, Boyle MH, Szatmari P, Rae-Grant NI, Links PS, Cadman DT, et al. Ontario Child Health Study. II. Six-month prevalence of disorder and rates of service utilization. *Arch Gen Psychiatry* 1987;44:832-6.

Rapley MD, Gardiner JC, Jetton JR, Houang RT. The use of methylphenidate in Michigan. *Arch Pediatr Adolesc Med* 1995;149:675-9.

Wolraich ML, Hannah JN, Pinnock TY, Baumgaertel A, Brown J. Comparison of diagnostic criteria for attention deficit hyperactivity disorder in a county-wide sample. *J Am Acad Child Adolesc Psychiatry* 1996;35:319-24.

Wolraich ML, Lindgren S, Stromquist A, Milich R, Davis C, Watson D. Stimulant medication use by primary care physicians in the treatment of attention deficit hyperactivity disorder. *Pediatrics* 1990;86:95-101.

Wolraich ML, Hannah JN, Pinnock TY, Baumgaertel A, Brown J. Comparison of diagnostic criteria for attention deficit hyperactivity disorder in a county-wide sample. *J Am Acad Child Adolesc Psychiatry* 1996;35:319-23.



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Diagnosis and Treatment of Attention Deficit Hyperactivity Disorder (ADHD)

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OBJECTIVE

The objective of this NIH Consensus Statement is to inform the biomedical research and clinical practice communities of the results of the NIH Consensus Development Conference on Diagnosis and Treatment of Attention Deficit Hyperactivity Disorder (ADHD). The statement provides state-of-the-art information regarding the diagnosis and various treatment options for patients with ADHD, and presents the conclusions and recommendations of the consensus panel regarding these issues. In addition, the statement identifies those areas of study that deserve further investigation. Upon completing this educational activity, the reader should possess a clear working clinical knowledge of the state-of-the-art regarding this topic.

ACCREDITATION

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EXPIRATION

This form must be completed and **postmarked by November 18, 2001**, for eligibility to receive continuing medical education credit for this continuing medical education activity. The expiration date for this test may be extended beyond November 18, 2001. Beginning November 19, 2001, please check the NIH Consensus Development Program web site (<http://consensus.nih.gov>) or call the NIH Office of Medical Applications of Research at 301-496-1144 for information regarding an extended expiration date for this continuing medical education activity.

INSTRUCTIONS

The consensus statement contains the correct answers to the following 15 questions. Select your answer(s) to each question and write the corresponding letter(s) in the answer space provided. Mail the completed test by the expiration date shown above to *CME Program, Office of Medical Applications of Research, National Institutes of Health, Building 31, Room 1B03, 31 Center Drive, MSC 2082, Bethesda, MD 20892-2082*. You will receive notification of your test results within 2 to 3 weeks. If you have successfully completed the test (11 or more correct answers), you will receive a certificate for 1 hour of continuing education credit along with your test results. The estimated time to complete this educational activity is 1 hour. Photocopies of this form are acceptable. There is no fee for participating in this continuing education activity.



1. **ADHD appears to affect about 1 to 2% of U.S. school-aged children.**

- a. True
- b. False

ANSWER: _____

2. **There is clear evidence that ADHD as a valid disorder with broadly accepted symptoms and behavioral characteristics that define it.**

- a. True
- b. False

ANSWER: _____

3. **Evidence supporting the validity of ADHD includes the following:**
(You must indicate all that are true.)

- a. long-term developmental course of ADHD over time,
- b. cross-national studies revealing similar risk factors,
- c. familial aggregation of ADHD and heritability
- d. recent evidence of biologic markers for ADHD.
- e. similar prevalence rates across countries

ANSWER(S): _____

4. **Given the variability of ADHD behaviors across settings, and differences in people's opinions about what is abnormal, ADHD cannot be reliably diagnosed.**

- a. True
- b. False

ANSWER: _____

5. **Recent brain imaging studies have demonstrated that ADHD is due to a specific type of brain malfunction.**

- a. True
- b. False

ANSWER: _____

6. **Research evidence has demonstrated that the following agents are efficacious treatments for ADHD:** *(You must indicate all that are true.)*

- a. tricyclic antidepressants
- b. psychostimulant medications
- c. the SSRIs, or selective serotonin uptake inhibitors
- d. various dietary supplements, such as long-chain fatty acids

ANSWER(S): _____

7. **Research evidence has demonstrated that the following non-pharmacologic treatments are efficacious for ADHD:** *(You must indicate all that are true.)*

- a. biofeedback
- b. contingency management
- c. elimination diets
- d. behavior therapy
- e. social skills training
- f. parent training
- g. cognitive behavioral therapy

ANSWER(S): _____

8. Stimulant medications are generally safe, taken as prescribed.

- a. True
- b. False

ANSWER: _____

9. Which of the following statements are true? (You must indicate all that are true.)

- a. ADHD is a serious public health problem.
- b. School expenditures for ADHD exceed \$10 billion/year.
- c. ADHD results in significant impairment across multiple settings.
- d. Most children with ADHD grow out of it.
- e. Side effects of stimulants tend to be mild, are dose-related, and tend to decrease over time.

ANSWER(S): _____

10. Which of the following statements are true? (You must indicate all that are true.)

- a. ADHD has been recognized and diagnosed in other countries, usually at rates similar to the U.S.
- b. children with ADHD have higher injury rates
- c. stimulant treatments appear to be generally more effective than behavioral treatments
- d. after decades of use, it can now be concluded that long-term treatments with stimulants are safe and effective.
- e. recent evidence suggests that there may be some advantages to combining medication and behavioral treatments versus using either treatment alone.

ANSWER(S): _____

11. In daily clinical practice, ADHD tends to be diagnosed in an inconsistent manner, with children sometimes being overdiagnosed and sometimes underdiagnosed.

- a. True
- b. False

ANSWER: _____

12. In general, there is good communication between diagnosticians and those who monitor treatment in schools.

- a. True
- b. False

ANSWER: _____

13. Given the abuse potential of psychostimulants, most recent evidence suggests that follow-up treatment is generally carefully done and closely supervised.

- a. True
- b. False

ANSWER: _____

14. Given recent evidence about the etiology of ADHD from neurophysiologic, genetic, and brain imaging studies, new opportunities for prevention are now apparent, and studies of these new preventive approaches should be mounted.

- a. True
- b. False

ANSWER: _____

15. Most insurance companies and managed care plans now provide coverage for ADHD on par with most other medical disorders.

- a. True
- b. False

ANSWER: _____

Your response to the following four questions is optional and will have no effect on the grading results of this test.

To what extent did this CME activity meet the stated objectives?

- a. not at all
- b. very little
- c. somewhat
- d. considerably
- e. completely

ANSWER: _____

To what extent will participation in this CME activity enhance your professional effectiveness?

- a. not at all
- b. very little
- c. somewhat
- d. considerably
- e. completely
- f. does not apply

ANSWER: _____

Do you have additional comments you think would enhance the utility or impact of this NIH Consensus Statement?

Are there new topics you would like to have covered in a similar or related NIH Consensus Development Conference or Statement?

NAME *(Please type or print clearly)* _____

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