



Medical Coverage Policy

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Attention-Deficit/Hyperactivity Disorder (ADHD): Assessment and Treatment

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Overview

This Coverage Policy addresses services for the assessment and treatment of attention-deficit hyperactivity disorder.

Coverage Policy

Coverage for behavioral services varies across plans. Refer to the customer's benefit plan document for coverage details. Services provided by a psychiatrist, psychologist or other behavioral health professionals may be subject to the provisions of the applicable behavioral health benefit. Assessment

and treatment for comorbid behavioral health and/or medical diagnoses and associated symptoms and/or conditions may be covered under applicable medical and behavioral health benefit plans. Coverage of medications related to the treatment of ADHD is subject to the pharmacy benefit of the applicable benefit plan.

When coverage is available, services for the treatment of ADHD are considered medically necessary when the criteria of the Diagnostic and Statistical Manual of Mental Health Disorders, Fifth Edition (DSM-5) are met.

Services that are considered primarily educational or training in nature or related to academic or work performance are not covered under many benefit plans. The following services for the assessment and/or treatment of ADHD are considered primarily educational and training in nature and not medically necessary:

- education and achievement testing, including Intelligence Quotient (IQ) testing
- educational intervention (e.g., classroom environmental manipulation, academic skills training, and parental training)

Each of the following procedures/services is considered experimental, investigational or unproven for the assessment and/or treatment of ADHD:

Assessment:

- actometer
- computerized electroencephalogram (EEG) (e.g., brain mapping, neurometrics, or quantitative electroencephalography [QEEG], Neuropsychiatric EEG-Based Assessment Aid [NEBA] System)
- computerized tests of attention and vigilance
- event-related potentials (i.e., evoked potential studies)
- hair analysis
- neuroimaging (e.g., computerized tomography [CT], magnetic resonance imaging [MRI], positron emission tomography [PET] and single-photon emission computerized tomography [SPECT])
- Quotient ADHD Test/System

Treatment:

- acupuncture/acupressure
- anti-candida albicans and antifungal medications
- anti-motion sickness medication
- auditory integration therapy
- brain training/cognitive programs/games
- chiropractic manipulation
- cognitive rehabilitation
- dietary treatments
- Dore program/Dyslexia Dyspraxia Attention Treatment (DDAT)
- EEG biofeedback/neurofeedback
- herbal remedies
- intensive behavioral intervention programs (e.g., early intensive behavior intervention [EIBI] intensive behavior intervention [IBI], Lovaas therapy, applied behavior analysis [ABA])
- megavitamin therapy
- metronome training
- movement therapy
- Neuro-Emotional Technique (NET)
- sensory integration therapy
- transcranial magnetic stimulation/cranial electrical stimulation

- vision therapy

General Background

Attention-deficit/hyperactivity disorder (ADHD) is a common disorder of childhood and adolescence that is characterized by symptoms of inattention and/or hyperactivity/impulsivity. In this disorder, the symptoms have persisted for at least six months, to a degree that is maladaptive and inconsistent with developmental level. The hyperactive-impulsive or inattention symptoms that cause impairment are present before age seven, although many individuals are diagnosed after the symptoms have been present for a number of years. Some impairment from the symptoms is present in two or more settings (e.g., at home and at school).

The Diagnostic and Statistical Manual of Mental disorders, Fifth edition (DSM-5) notes that there are three subtypes of ADHD (American Psychiatric Association [APA], 2013):

Diagnostic Criteria from Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) for:

314.01 (F90.2) Attention-Deficit/Hyperactivity Disorder, combined type: If both Criterion A1 (inattention) and Criterion A2 (hyperactivity/impulsivity) are met for the past six months.

314.00 (F90.0) Attention-Deficit/Hyperactivity Disorder, predominantly inattentive type: If Criterion A1 (inattention) is met but Criterion A2 (hyperactivity/impulsivity) is not met for the past six months.

314.01 (F90.1) Attention-Deficit/Hyperactivity Disorder, predominantly hyperactive-impulsive type: If Criterion A2 (hyperactivity/impulsivity) is met but Criterion A1 (inattention) is not met for the past six months.

A. A persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development as characterized by (1) or (2):

1) Inattention: six (or more) of the following symptoms of inattention have persisted for at least six months to a degree that is inconsistent with developmental level and that negatively impacts directly on social and academic/occupational activities:

Note: The symptoms are not solely a manifestation of oppositional behavior, defiance, hostility, or failure to understand tasks or instructions. For older adolescents and adults (age 17 and older), at least five symptoms are required.

- a) Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or during other activities (e.g., overlooks or misses detail, work is inaccurate).
- b) Often has difficulty sustaining attention in tasks or play activities (e.g., has difficulty remaining focused during lectures, conversations, or lengthy reading).
- c) Often does not seem to listen when spoken to directly (e.g., mind seems elsewhere, even in the absence of any obvious distraction).
- d) Often does not follow through on instructions and fails to finish school work, chores, or duties in

2) Hyperactivity-impulsivity: six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least six months to a degree that is inconsistent with developmental level and that negatively impacts directly on social and academic/occupational activities:

Note: the symptoms are not solely a manifestation of oppositional behavior, defiance, hostility, or a failure to understand tasks or instructions. For older adolescents and adults (age 17 and older), at least five symptoms are required.

- a) Often fidgets with or taps hands or feet or squirms in seat.
- b) Often leaves seat when remaining seated is expected (e.g., leaves his or her place in the classroom, in the office or other workplace, or in other situations that require remaining in place).
- c) Often runs about or climbs in situations in where it is inappropriate (**Note:** in adolescents or adults, may be limited to feeling restless).
- d) Often unable to play or engage in leisure activities quietly.
- e) Is often "on the go" acting as if "driven by a motor" (e.g., is unable to be or uncomfortable being still for extended time, as in restaurants, meetings; may be

<p>the workplace (e.g., starts tasks but quickly loses focus and is easily sidetracked).</p> <p>e) Often has difficulty organizing tasks and activities (e.g., difficulty managing sequential tasks; difficulty keeping materials and belongings in order; messy, disorganized work; has poor time management; fails to meet deadlines).</p> <p>f) Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (e.g., schoolwork or homework; for older adolescents and adults, preparing reports, completing forms, reviewing lengthy papers).</p> <p>g) Often loses things necessary for tasks or activities (e.g., school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).</p> <p>h) Is often easily distracted by extraneous stimuli (for older adolescents and adults, may include unrelated thoughts).</p> <p>i) Is often forgetful in daily activities (e.g., doing chores, running errands, for older adolescents and adults, returning calls, paying bills, keeping appointments).</p>	<p>experienced by others as being restless or difficult to keep up with).</p> <p>f) Often talks excessively.</p> <p>g) Often blurts out an answer before a question has been completed (e.g., completes people's sentences' cannot wait for turn in conversation).</p> <p>h) Often has difficulty waiting his or her turn (e.g., while waiting in line).</p> <p>i) Often interrupts or intrudes on others (e.g., butts into conversations, games, or activities; may start using other people's things without asking or receiving permission; for adolescents and adults, may intrude into or take over what others are doing).</p>
<p>B. Several inattentive or hyperactive-impulsive symptoms were present prior to age 12 years.</p> <p>C. Several inattentive or hyperactive-impulsive symptoms are present in two or more settings (e.g., at home, school, or work; with friends or relatives; in other activities).</p> <p>D. There is clear evidence that the symptoms interfere with, or reduce the quality of social, academic, or occupational functioning.</p> <p>E. The symptoms do not occur exclusively during the course of schizophrenia or other psychotic disorder and are not better explained by another mental disorder (e.g., mood disorder, anxiety disorder, dissociative disorders, personality disorder, substance intoxication or withdrawal).</p>	

It should be specified if the condition is in partial remission: when full criteria were previously met, fewer than the full criteria have been met for the past six months, and the symptoms still result in impairment in social, academic or occupational functioning.

The severity should be specified:

Mild: Few, if any, symptoms in excess of those required to make the diagnosis are present and symptoms results in no more than minor impairments in social or occupational functioning.

Moderate: Symptoms or functional impairment between "mild" and "severe" are present.

Severe: Many symptoms in excess of those required to make the diagnosis, or several symptoms that are particularly severe, are presents, or the symptoms results in marked impairment in social or occupational functioning.

The DSM-5 notes that the designation of "other specified" (DSM-5 code 314.01) (F90.8) applies to presentation in which symptoms characteristic of attention-deficit/hyperactivity disorder that cause clinically significant distress or impairment in social, occupational or other important areas of functioning predominate but do not meet the full criteria for attention-deficit/hyperactivity disorder or any of the disorders in the neurodevelopmental disorders diagnostic class. The other specified attention-deficit/hyperactivity disorder category is used in situations n which the clinician chooses to communicate the specific reason that the presentation does not meet the criteria for attention-deficit/hyperactivity disorder or any specific neurodevelopmental disorder. This is done by recording "other specified attention-deficit/hyperactivity disorder" followed by the specific reason (e.g. "with insufficient inattention symptoms").

The DSM-5 notes that the designation of “not otherwise specified” (NOS) (DSM-5 code 314.01) (F90.9) applies to presentations in which symptoms characteristic of attention-deficit/hyperactivity disorder that cause clinically significant distress or impairment in social, occupational or other important areas of functioning predominate but not meet the full criteria of attention-deficit hyperactivity disorder or any of the disorder in the neurodevelopmental disorders diagnostic class. This should be used in situations in which the clinician chooses not to specify the reason that the criteria are not met for attention-deficit hyperactivity disorder or for a specific neurodevelopmental disorder, and includes presentations in which there is insufficient information to make a more specific diagnosis.

Attention-deficit/hyperactivity disorder is diagnosed less often, and medication treatment is used at a lower rate, for children from racial and ethnic minority backgrounds, adolescents, and those experiencing poverty (Barbarese, et al., 2020). It is important for the treating clinician to be aware that parents from different racial and ethnic backgrounds may have differing experiences, perceptions, and attitudes about ADHD and its treatment. Motivational interviewing strategies, assistance in reducing barriers to care, opportunities for social support and problem solving among peers, and increased coaching during behavior therapy may be helpful in improving family engagement and therefore treatment outcomes (Barbarese, et al., 2020).

Assessment

The diagnosis is clinical, based on findings that are derived from the history, physical and patient/family interviews. There are no specific diagnostic tests for ADHD. The established diagnostic tools used in the assessment of ADHD include:

- parent/child interview (to rule out other psychiatric or environmental causes of symptoms)
- medical evaluation with a complete medical history and physical examination (to assess for co-existing conditions)
- electroencephalogram (EEG) or neurological consult when the presence of focal signs or clinical findings is suggestive of a seizure disorder or a degenerative neurological condition

The use of the DSM-5 criteria is a standard of care for practitioners of all types (e.g., primary care, subspecialty, psychiatry and non-physician mental health providers) to use in the assessment and diagnosis of ADHD (APA, 2013). Diagnosis usually requires several steps, and clinicians will generally need to carry out the evaluation in more than one visit, often two to three visits. The behaviors must adversely affect functioning in school or in a social setting. Information obtained from the parent and school can assist the physician in assessing the effects that the symptoms are having on classroom performance, self-esteem, and family and social relationships.

Other psychological and developmental disorders, including oppositional defiant disorder, conduct disorder, depression, anxiety disorder, and learning disabilities, frequently coexist in children who are evaluated for ADHD. Assessment and examination for such coexisting disorders are an integral part of the evaluation process for ADHD patients. Evidence for most of these coexisting disorders may be readily detected by the primary care clinician. For example, a family history of anxiety disorders, coupled with a patient's history of frequent fears and difficulties with separation from caregivers, may suggest the presence of anxiety disorder either as the primary diagnosis or as a comorbid diagnosis to ADHD. Several screening tests are available that can detect areas of concern for many of the mental health disorders that coexist with ADHD. Although these scales have not been tested for use in primary care settings and are not diagnostic tests for either ADHD or associated mental health conditions, some clinicians may use them to establish high risk for coexisting psychological conditions.

Other coexisting medical conditions may be present and include speech delays, auditory and visual processing disorders (American Academy of Pediatrics [AAP], 2011). Depending on the clinical findings, evaluation of the coexisting conditions may be needed; including speech and language evaluations, occupational therapy evaluation, audiological evaluations, central auditory testing. In addition to ADHD there are other conditions that may affect the ability to understand auditory information. An individual with ADHD may be a poor listener and have difficulty understanding or remembering verbal information; however, the actual neural processing of auditory input in the central nervous system (CNS) is intact. Rather, it is the attention deficit that is impeding their ability to access or use the auditory information that is coming in. Central auditory processing disorder, or

auditory processing disorder, refers to the efficiency and effectiveness by which the CNS utilizes auditory information (American Speech-Language-Hearing Association [ASHA]).

According to the literature, several medical screening tests and laboratory measures have been used to evaluate children with suspected ADHD. These include neuroimaging (e.g., computerized tomography [CT], magnetic resonance imaging [MRI]), EEG, and neurological screening exams, as well as other miscellaneous laboratory assessments (Brown, et al., 2001). The association between elevated lead levels and impairments in cognitive functioning, including attention problems, has been consistently reported in the literature. Brown et al. (2001) reviewed six studies and found no statistically significant associations in three of them. One study reported a positive association between lead level and behavioral problems. Two studies examined children screened for disruptive behavioral problems and found associations between elevated lead levels and behavioral problems. Since these studies did not assess ADHD, however, the extent to which their findings may apply to children with this disorder is unknown (Brown, et al., 2001). The studies' findings suggest an association between elevated lead levels and a range of behavioral problems, including inattention, but do not support the routine use of lead screening as a diagnostic indicator for ADHD. Only when clinical or environmental factors are present is the measurement of blood lead levels appropriate.

Neuropsychiatric EEG-Based Assessment Aid (NEBA) System (NEBA Health, Augusta, GA) is a device that is based on electroencephalogram (EEG) technology. It records different kinds of electrical impulses (waves) given off by neurons (nerve cells) in the brain and the number of times (frequency) the impulses are given off each second. The NEBA System is a 15- to 20-minute non-invasive test that calculates the ratio of two standard brain wave frequencies, known as theta and beta waves. It is theorized that the theta/beta ratio has been shown to be higher in children and adolescents with ADHD than in children without it.

The NEBA system was recently reviewed by the FDA through the de novo classification process, a regulatory pathway for some low- to moderate-risk medical devices that are not substantially equivalent to an already legally marketed device. The FDA notice noted that the manufacturer submitted data including a clinical study that evaluated 275 children and adolescents ranging from six to 17 years old with attention or behavioral concerns. Clinicians evaluated all 275 patients using the NEBA System and using standard diagnostic protocols, including the DSM-IV-TR criteria, behavioral questionnaires, behavioral and IQ testing, and physical exams to determine if the patient had ADHD. An independent group of ADHD experts reviewed these data and arrived at a consensus diagnosis regarding whether the research subject met clinical criteria for ADHD or another condition. The manufacturer noted that the study results showed that the use of the NEBA System aided clinicians in making a more accurate diagnosis of ADHD when used in conjunction with a clinical assessment for ADHD, compared with doing the clinical assessment alone. This study appears to be unpublished and preliminary.

There is insufficient evidence in the medical literature to support the use of computerized methods of electroencephalogram EEG (EEG) (e.g., brain mapping, neurometrics, or quantitative electroencephalography [QEEG], Neuropsychiatric EEG-Based Assessment Aid (NEBA) System) in the assessment of ADHD.

When another condition is present along with ADHD, genetic testing may be considered. While there is ongoing research into the genetic causes of ADHD, it is preliminary and currently there is no established role for genetic testing, in the assessment of this condition.

The Quotient ADHD Test/System is a computerized system that has been proposed to be used in the assessment of ADHD and for re-assessment at follow-up visits. It is purported that it will measure micro-motion and analyze impulsivity and shifts in attention state to provide an objective and quantitative picture of the core symptom areas of ADHD. There is insufficient evidence to support the clinical utility of this testing in the assessment or management of ADHD.

Treatment

The most widely researched and commonly prescribed treatments for ADHD are psychostimulant medications, including methylphenidate and other amphetamines (NIH, 1998). The U.S. Food and Drug Administration (FDA) approved Stattera® (atomoxetine) (Eli Lilly and Co., Indianapolis, IN) in November 2002 as a new non-stimulant treatment for ADHD.

Literature Review—Treatment:

The Agency for Healthcare Research and Quality (AHRQ) published an update to the previous comparative effectiveness review: Attention Deficit Hyperactivity Disorder: Diagnosis and Treatment in Children and Adolescents (Kemper, et al., 2018).

The review included 21 studies related to diagnosis, 69 studies related to treatment, and no studies were identified regarding monitoring. Findings included:

- The Attention and Executive Function Rating Inventory and Childhood Executive Functioning Inventory performed better than the Cambridge Neuropsychological Test Automated Battery for the diagnosis of ADHD for ages 7–17 years (strength of evidence [SOE]=low).
- Evidence was insufficient on the use of electroencephalography (EEG) or neuroimaging to establish the diagnosis of ADHD for ages 7–17 years. No studies directly assessed the harms to children labeled as having ADHD.
- Limited additional evidence published since the original 2011 report was available on ADHD medications approved by the Food and Drug Administration (FDA) compared with placebo or compared to different FDA-approved ADHD medications (SOE=insufficient).
- For atomoxetine and methylphenidate, the most commonly reported adverse events were somnolence and mild gastrointestinal problems. Atomoxetine had slightly higher gastrointestinal effects than methylphenidate (SOE=low).
- Cognitive behavioral therapy improved ADHD symptoms (SOE=low).
- Child or parent training improved ADHD symptoms (SOE=moderate) but made no difference in academic performance (SOE=low).
- Omega-3/6 fatty acid supplementation made no difference in ADHD symptoms (SOE=moderate).
- Across all treatments, little evidence was reported on the risk of serious adverse events, including cardiovascular risk.

The review concluded that this targeted update found insufficient evidence regarding new approaches to the diagnosis (e.g., EEGs, neuroimaging). The authors noted that although cognitive behavioral therapy or child or parent training may decrease symptoms of ADHD, more information is needed regarding the relative benefit of these approaches compared to, or combined with, medication treatment; Omega-3/6 supplementation does not appear to improve ADHD outcomes; and, no information was identified regarding the optimal strategy for monitoring after diagnosis.

Definition of strength of evidence grades:

Moderate: moderately confident that the estimate of effect lies close to the true effect for this outcome. The body of evidence has some deficiencies. The findings are likely to be stable, but some doubt remains.

Low: limited confidence that the estimate of effect lies close to the true effect for this outcome. The body of evidence has major or numerous deficiencies (or both). The authors believe that additional evidence is needed before concluding either that the findings are stable or that the estimate of effect is close to the true effect.

Insufficient: no evidence, unable to estimate an effect, or have no confidence in the estimate of effect for this outcome. No evidence is available or the body of evidence has unacceptable deficiencies, precluding reaching a conclusion.

The Agency for Healthcare Research and Quality (AHRQ) published a comparative effectiveness review: Attention Deficit Hyperactivity Disorder: Effectiveness of Treatment in At-Risk Preschoolers; Long-Term Effectiveness in All Ages; and Variability in Prevalence, Diagnosis, and Treatment (Charach, 2011). The conclusions of the review include:

Treatment of preschoolers with disruptive behavior disorders:

- Parental behavior training is an efficacious treatment option for preschoolers with disruptive behavior disorders or ADHD symptoms. Benefits for children with disruptive behavior disorders are maintained at least 6 months and up to 2 years in some studies. Parents who attend more parental behavior training sessions see more improvement in their child's behavior. (strength of evidence [SOE]: high)
- Methylphenidate (MPH)* is efficacious and generally safe for treating ADHD symptoms, but there has been limited long-term follow-up in preschoolers beyond 12 months. (SOE: low)

- Evidence is insufficient to know if there is an additional benefit to combining different treatments. (SOE: insufficient)
- It should be noted that where there is socioeconomic burden, a school-based intervention appears to be the primary beneficial intervention. Benefits, however, diminished over 2 years. This appears to be related to lack of parental engagement and attendance at sessions. (SOE: insufficient)

Long-term (>1 Year) Effectiveness of Interventions for ADHD in Individuals 6 Years of Age or Older:

Pharmacologic:

- Psychostimulants provide control of ADHD symptoms and are generally well tolerated for months to years at a time. The best evidence for benefits is for MPH* in the setting of careful medication monitoring for up to 14 months. (SOE: low)
- Atomoxetine appears to be safe and effective for treating ADHD symptoms over a period of 12 months. (SOE: low)
- Extended-release guanfacine may reduce ADHD symptoms, but evidence is insufficient to permit an evidence-based conclusion about its long-term effectiveness. (SOE: insufficient)

Nonpharmacologic:

- Evidence is insufficient to know if behavioral or psychosocial treatment alone is an effective long-term treatment option for children ages 6 years or older with ADHD. (SOE: insufficient)
- There are not enough studies to know if parental behavior training or school-based interventions are effective as long-term treatment options for children ages 6 years or older with ADHD. However, one good-quality study and its extension showed that school-based programs to enhance academic skills are effective in improving achievement scores in multiple domains. (SOE: insufficient)

Combined Treatments

- Both psychostimulant medication alone and a combination of medication and behavioral treatment are effective in treating ADHD plus ODD symptoms in children. Results are most applicable to elementary school-age boys of normal intelligence with the combined subtype of ADHD. (SOE: low)

Strength of Evidence (SOE) Scale:

High: There are consistent results from good-quality studies. Further research is very unlikely to change the conclusions.

Moderate: Findings are supported, but further research could change the conclusions.

Low: There are very few studies, or existing studies are flawed.

Insufficient: Research is either unavailable or does not permit estimation of a treatment effect.

Many studies have documented the efficacy of stimulants in reducing the core symptoms of ADHD. Numerous short-term studies have established the safety and efficacy of stimulants and psychosocial treatments for alleviating the symptoms of ADHD, as well as for improving function in a number of domains. Most studies of stimulants have been short-term, demonstrating efficacy over several days or weeks. The National Institute of Mental Health (NIMH) Multimodal Treatment Study (MTA) of ADHD extended the demonstrated efficacy to 14 months (MTA, 2004). The NIMH research indicates that the two most effective treatment modalities for elementary school children with ADHD are a closely monitored medication treatment and a treatment that combines medication with behavior treatment. The study involved 579 elementary school children with ADHD (ages 7.0–9.9 years) across multiple sites. The participants were randomized to four treatment groups: medication management alone; medication management and behavior treatment; behavior treatment alone; and standard community care. The results showed that nine out of ten children with ADHD showed marked reduction in core ADHD symptoms over a 14-month period when treated with medication management alone or a combination of medication and behavior treatment. While the medications were extremely beneficial to most children, MTA findings indicated that medications alone may not necessarily be the best strategy for many children. For example, children who had accompanying problems (e.g., anxiety, stressful home circumstances, social skills deficits) over and above the ADHD symptoms appeared to obtain maximal benefit from the combined treatment.

In April 2004, the MTA group published an evaluation of the persistence of the beneficial effects of medication management and the combination of medication and behavior treatment for 10 months beyond the 14 months previously reported. Ninety-three per cent of the original group participated in the follow-up. It was noted that the

medication management strategy showed persisting significant superiority over the behavior treatment and community comparison, although not as great as at 14 months (MTA, 2004).

In August 2007, a three-year follow-up of the MTA study was published with 83.8% participating (Jensen, et al., 2007). Once the delivery of randomly assigned treatments by MTA staff ended at 14 months, the MTA became an observational study in which the subjects and their parents were able to choose their own treatment in the context of availability and barriers to care existing in their communities. It was noted that in contrast to the significant advantage of medication management and combination treatment over behavior treatment and community comparison for ADHD symptoms at 14 and 24 months, treatment groups did not differ significantly on any measure at 36 months. The percentage of children taking medication > 50% of the time changed between 14 and 36 months across the initial treatment groups: Behavior therapy significantly increased (14% to 45%), combination of medication and behavior treatment significantly decreased (91% to 71%), and community care remained relatively constant (60%–62%). The report indicated that regardless of their treatment use changes, all of the groups showed symptom improvement over baseline. The authors theorized that the results may be due to age-related decline in ADHD symptoms, changes in the medication management intensity, starting or stopping medications altogether, or other factors that have not been evaluated.

Molina et al. (2009) reported on long-term effects of this study six and eight years after childhood enrollment of the MTA study. In nearly every analysis, it was found that the originally randomized treatment groups did not differ significantly on repeated measures or newly analyzed variables (e.g., grades earned in school, arrests, psychiatric hospitalizations, other clinically relevant outcomes). The medication use decreased by 62% after the 14-month controlled trial, but adjusting for this did not change the results. The ADHD symptom trajectory in the first three years predicted 55% of the outcomes. The MTA participants fared worse than the local normative comparison group on 91% of the variables tested. The results indicated that the type or intensity of 14 months of treatment for ADHD in childhood does not predict functioning six to eight years later, but rather the early ADHD symptom trajectory regardless of treatment type is prognostic. The researchers noted that the finding implies that children with behavioral and sociodemographic advantage, with the best response to any treatment, will have the best long-term prognosis.

Chan et al (2016) conducted a systematic review for pharmacological and psychosocial treatment of ADHD in adolescents. The review included sixteen randomized clinical trials and one meta-analysis (2668 participants), of pharmacological and psychosocial treatments for ADHD in adolescents aged 12 years to 18 years. The review found that the evidence supports the use of extended-release methylphenidate and amphetamine formulations, atomoxetine, and extended-release guanfacine to improve symptoms of ADHD in adolescents and that psychosocial treatments incorporating behavior contingency management, motivational enhancement, and academic, organizational, and social skills training techniques were associated with inconsistent effects on ADHD symptoms and greater benefit for academic and organizational skills. The authors noted that additional treatment studies in adolescents, including combined pharmacological and psychosocial treatments, are needed.

Goode et al. (2018) conducted a systematic review to assess the comparative effectiveness of nonpharmacologic treatments for ADHD among individuals 17 years of age and younger. The study included 54 studies of nonpharmacologic treatments, including neurofeedback, cognitive training, cognitive behavioral therapy, child or parent training, dietary omega fatty acid supplementation, and herbal and/or dietary approaches. No new guidance was identified regarding the comparative effectiveness of nonpharmacologic treatments. The authors noted that limitations of the studies were that studies often did not reflect the primary care setting and had short follow-up periods, small sample sizes, variations in outcomes, and inconsistent reporting of comparative statistical analyses. The authors concluded that despite wide use, there are significant gaps in knowledge regarding the effectiveness of ADHD nonpharmacologic treatments.

Other Treatment: A variety of nonpharmacological treatments for ADHD other than behavior therapy were reviewed by the AACAP in developing their practice parameters (Pliszka, et al., 2007). These include cognitive-behavioral therapy and dietary modifications. It was found that there was no evidence to support these interventions

Other alternative interventions have been proposed for treatment of ADHD. These include the use of anti-candida albicans, antifungal medications and anti-motion sickness medication, chiropractic manipulation, herbal

remedies, megavitamin therapy, vision therapy, sensory (auditory) integration therapy, transcranial magnetic stimulation/cranial electrical stimulation, metronome training, movement therapy or cognitive rehabilitation. There is insufficient evidence in the medical literature to support the use of these interventions for ADHD.

Acupuncture/Acupressure: Acupuncture is a form of complementary and alternative medicine involves the insertion of needles and the stimulation of the needles through manual, electrical, heat, laser or other forms of stimulation. Acupressure, which may be with non-penetrating needles, is the application of pressure needles to acupuncture points. Brain integration technique/therapy is a form of acupressure that has been proposed as a treatment of learning difficulties such as attention deficit disorder (ADD) both with and without hyperactivity, sensory integration, dyslexia, poor coordination, closed head traumas and brain injuries, autism and nervous breakdowns.

A Cochrane review was conducted to assess the efficacy and safety of acupuncture as a treatment for ADHD (Li, et al., 2011). No randomized or quasi-randomized studies were found to support the use of acupuncture as a treatment for ADHD in children and adolescents.

Acupuncture and acupressure, including brain integration therapy, has not been proven effective in the peer-reviewed published scientific literature for the treatment of ADHD.

Brain Training Games/Cognitive Training Programs: There is an increased interest in the use of computer-based cognitive training as a treatment of ADHD. Brain training video games are also being studied as treatment for symptoms of ADHD. These programs are computer-based and purport to improve cognitive, behavior and academic ability in ADHD. The duration of training session, number of sessions and frequency vary according to the specific protocol employed, although they typically involve a large number of sessions spread over several weeks. Training may be implemented at school, home, or clinic/research facility.

The programs include but are not limited to:

- Project: EVO (Akili Interactive Labs, Boston, MA): computer game that purports to provide a targeted way to potentially improve cognition and disease symptoms through at-home videogame play. It is currently undergoing trials to validate each product in a variety of specific patient populations.
- Cogmed Working Memory Training® (Pearson Education, Indianapolis, IN): a computer-based program for attention problems caused by poor working memory.
- CogniPlus (Schuhfried, Austria): computer based program that is designed for training cognitive functions.
- RehaCom (Magdeburg, Germany): computer based program for cognitive therapy in areas of alertness, attention, memory, executive functions, visual Field, neglect

Rapport et al. (2013) reported on a meta-analysis of 25 studies of facilitative intervention training (i.e., cognitive training) for children with ADHD on cognitive, academic, and behavioral outcomes. Inclusion criteria included that pre- and post-treatment metrics for dependent measures from which an effect size could be estimated were reported. Exclusion criteria included repeat data, single subject designs, non-empirical/review articles, and non-English articles. Random effects models corrected for publication bias and sampling error revealed that studies training short-term memory alone resulted in moderate magnitude improvements in short-term memory, while training attention did not significantly improve attention, and training mixed executive functions did not significantly improve the targeted executive functions (both nonsignificant: 95% confidence intervals). Far transfer effects of cognitive training on academic functioning, blinded ratings of behavior (both nonsignificant), and cognitive tests were nonsignificant or negligible. Unblinded raters reported significantly larger benefits relative to blinded raters and objective tests. Critical examination of training targets revealed incongruence with empirical evidence regarding the specific executive functions that are most impaired in ADHD, and functionally related to the behavioral and academic outcomes these training programs are intended to ameliorate. The authors concluded that collectively, meta-analytic results indicate that claims regarding the academic, behavioral, and cognitive benefits associated with extant cognitive training programs are unsupported in ADHD.

A review of the published literature for computerized cognitive training approaches, (e.g., working memory training) targeting both the symptoms and the underlying neuropsychological deficits in patients with attention-deficit/hyperactivity disorder (ADHD) (Sonuga-Barke et al. 2014). The review examined 14 randomized

controlled trials (RCTs) with ADHD outcomes. The authors note given the inconsistency of extant findings, increased evidence from well-blinded trials are required before cognitive training can be supported as a frontline treatment of ADHD. The review concludes that future research should focus on ways to improve the content and implementation, and increase the scope, of these potentially therapeutic approaches.

Dore Program/Dore Program for Attention Deficit Disorder: The Dore program, also known as Dore Program for Attention Deficit Disorder, or Dyslexia Dyspraxia Attention Treatment (DDAT), is an exercise-based program that was originally developed to treat dyslexia. The program is aimed at treating dyslexia, ADHD, dyspraxia and Asperger's Syndrome. The program consists of a specialized neurological evaluation and series of patient-specific exercises designed to simulate the cerebellum or "hind brain." The proponents of this program theorize that cerebellar size and function are related to a constellation of learning disorders that are referred to as cerebellar developmental delay (CDD). A review of this treatment (Bishop, 2007) notes that published studies regarding this program "are seriously flawed." The review notes that two studies were published regarding this treatment for children with dyslexia. Regarding the use of the Dore program for ADHD, the review notes that, "There is nothing here to justify the claims made that the Dore Programme is more effective than state-of-the-art medication for ADHD, especially in view of the fact that only one child in the study had an ADHD diagnosis." There is insufficient evidence to support the efficacy of the Dore program for treatment of ADHD.

EEG Biofeedback/Neurofeedback: The AACAP guidelines note that the efficacy of EEG feedback (e.g., neurofeedback), either as primary treatment or an adjunct to medications, has not been established (Pliszka, et al., 2007).

Barth et al. (2021) conducted a randomized-controlled neurofeedback trial in adult patients with ADHD. The authors aimed to compare slow cortical potential (SCP)- and functional near-infrared spectroscopy (fNIRS) NF to a semi-active electromyography biofeedback (EMG-BF) control condition regarding changes in symptoms and the impact of learning success, as well as changes in neurophysiological parameters in an adult ADHD population. The patients were randomly assigned to SCP-NF (n = 26), fNIRS-NF (n = 21) or EMG-BF (n = 20). Outcome parameters were assessed over 30 training sessions (pre, intermediate, post) and at six-months follow-up (FU) including three booster sessions. EEG was recorded during two auditory Go/NoGo paradigms assessing the P300 and contingent negative variation (CNV). fNIRS measurements were conducted during an n-back- as well as a Go/NoGo task. All three groups showed equally significant symptom improvements suggesting placebo- or non-specific effects on the primary outcome measure. Only when differentiating between learners and non-learners, fNIRS learners displayed stronger reduction of ADHD global scores compared to SCP non-learners at FU, and fNIRS learners showed specifically low impulsivity ratings. 30.8% in the SCP-NF and 61.9% of participants in the fNIRS-NF learned to regulate the respective NF target parameter. The authors concluded that some adults with ADHD learn to regulate SCP amplitudes and especially prefrontal hemodynamic activity during NF. There was no significant differences in outcome between groups when examining the whole sample; when evaluating learners only, there appeared to be superior effects as compared to non-learners. The study is limited by the small number of participant and lack of blinding.

Cortese et al. (2016) performed meta-analyses of randomized controlled trials to examine the effects of neurofeedback on ADHD symptoms and neuropsychological deficits in children and adolescents with ADHD. The review included 13 trials (520 participants). Significant effects were found on ADHD symptoms rated by assessors most proximal to the treatment setting, that is, the least blinded outcome measure (standardized mean difference [SMD]: ADHD total symptoms = 0.35, 95% CI = 0.11–0.59; inattention = 0.36, 95% CI = 0.09–0.63; hyperactivity/impulsivity = 0.26, 95% CI = 0.08–0.43). Effects were not significant when probably blinded ratings were the outcome or in trials with active/sham controls. Results were similar when only frequency band training trials, the most common neurofeedback approach, were analyzed separately. Effects on laboratory measures of inhibition (SMD = 0.30, 95% CI = –0.10 to 0.70) and attention (SMD = 0.13, 95% CI = –0.09 to 0.36) were not significant. In most studies it was found that the risk of bias was unclear for many Cochrane Risk of Bias domains. The authors concluded that evidence from well-controlled trials with probably blinded outcomes currently fails to support neurofeedback as an effective treatment for ADHD and that future efforts should focus on implementing standard neurofeedback protocols, ensuring learning, and optimizing clinically relevant transfer.

In a randomized controlled trial, Gevensleben et al. (2010) reported on the six-month follow-up of 61 of 94 children, ages 8–12 years, with ADHD who were treated with a computerized attention skills training (AST)

(n=35) or neurofeedback (n=59) with a system developed by the authors. Based on parental responses, there was a significant group overall effect ($P < 0.005$) on the FBB-HKS ADHD rating scale and a significant group effect on the FBB-HKS inattention subscale ($p < 0.005$), but no significant time effect following neurofeedback at the six-month follow-up. Compared to pre-training scores, reductions of inattention and hyperactivity/impulsivity at follow-up were 25–30% in the neurofeedback group compared to 10–15% in the AST control group. A significant group effect ($p < 0.005$) was seen on the Strength and Difficulties Questionnaire hyperactivity subscale (SDQ) in the neurofeedback group. A significant group difference ($p < 0.05$) was also seen in homework in the neurofeedback group. A total of 50% of children in the neurofeedback group showed a $\geq 25\%$ reduction in the primary outcome measure following post-training and at the six-month follow-up. In the control group, 26.1% were responders at post-training and 30.4% at six-months. Limitations of the study include the small patient population, short-term follow-up, number of patients lost to follow-up (n=33), neurofeedback system developed by the authors and outcomes reported by parents.

Logemann et al. (2010) reported on a sham-controlled, double-blind evaluation of 27 participants who were selected on relatively high scores on impulsivity/inattention questionnaires. They were assigned to a neurofeedback treatment or a sham group. Neurofeedback training was planned for 15 weeks consisting of a total of 30 sessions, each lasting 22 min. Before and after 16 sessions, qEEG was recorded and impulsivity and inattention was assessed using a stop signal task and reversed continuous performance task and two questionnaires. The results of the interim analyses demonstrated that participants were blind with respect to group inclusion, but no trend towards an effect of neurofeedback on behavioral measures was observed. As a result, in line with ethical guidelines the experiment was ceased.

Duric, et al. (2012) conducted a randomized, controlled study to evaluate the use of neurofeedback (NF) to treat attention-deficit/hyperactivity disorder (ADHD) in children and adolescents. Ninety-one participants were ADHD participants were randomized into three groups, with 30 in the NF group, 31 controls in a group that was given methylphenidate, and 30 in a group that received NF and methylphenidate. Two ADHD core symptoms (attention and hyperactivity) were reported by parents with the parent form of the Clinician's Manual for Assessment by Russell A. Barkley. The parents reported significant effects of the treatments. The change was quite strong for hyperactivity, but weak for attention. There was no significant differences between the treatment groups were observed. The study was limited by the low number of participants.

Ogrim et al. (2013) reported on a randomized, controlled trial that compare the effects of 30 sessions of neurofeedback (NF) with stimulant medication on 32 ADHD patients. There was no difference in other actions, such as parent management training, information, or support in school. All participants were assessed before treatment on two rating scales, each with parent and teacher forms. Along with quantitative electroencephalogram (QEEG) and event-related potentials (ERPs), which included behavioral data from a go/no go test, were administered. NF training took place in the clinic over a period of 7–11 months, and was followed by a repeat of the same assessment tools. The 18 symptoms of ADHD (American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV)) were used as the primary outcome measure. The results noted that analysis of covariance revealed a significant difference between the groups at evaluation in favor of medication, with a large effect size. This was confirmed by the other outcome measures. The authors concluded that the study supports effects for stimulants, but not for NF.

Sonuga-Barke et al. (2013) published a systematic review and meta-analyses of randomized controlled trials of non-pharmacological interventions for ADHD. The review included eight studies that involved neurofeedback using the visualization of brain activity to teach children to increase attention and impulse control. The study found that for neurofeedback the effects were substantially lower for probably blinded than for most proximal assessments, despite attempts in some trials to blind parents to treatment allocation by using sham and/or active control conditions. The authors concluded that, "While the most proximal assessment data on neurofeedback, cognitive training, and restrictive elimination diets were potentially more positive, evidence of efficacy from blinded assessments is required before they are likely to be supported as ADHD treatments." The authors note that properly powered, randomized controlled trials with blinded, ecologically valid outcome measures are urgently needed, especially in the psychological treatment domain.

Intensive Intervention Programs: Intensive intervention programs, also known as early intensive behavior intervention (EIBI) intensive behavior intervention (IBI), Lovaas therapy, and applied behavior analysis {ABA}.

These programs incorporate behavior modification and applied behavior analysis. The programs were developed initially to treat children with autism spectrum disorders (ASD) and have recently been proposed to treat children with learning disabilities and ADHD. These programs may be prescribed by school systems as an intervention that is part of the individualized educational plan (IEP). The program is intensive and usually involves hours of treatment (usually more than 15 hours per week) delivered over a long period of time. There is a lack of scientific evidence to support the efficacy of the programs for ADHD.

Neuro Emotional Technique (NET): NET has been described as methodology of finding and removing Neuro Emotional Complexes (NECs) which are defined as a subjective maladaptation syndrome adopted by the organism in response to a real or perceived threat to any aspect of its survival (Karpouzis, et al., 2009). NET has been proposed as a treatment designed to address negative distressing stimuli, by removing these patterns by accessing the nervous system via stimulation of the spine. It was first developed as a branch of chiropractic care, but is now being provided by other practitioners such as psychologists and licensed acupuncturists to treat many other disorders including ADHD. It is purported that there is a mind-body connection with these conditions that can be corrected with NET. There is insufficient evidence in published peer-reviewed scientific literature to support the efficacy of this treatment for ADHD.

Transcranial magnetic stimulation (TMS)/cranial electrical stimulation (CMS): there is insufficient evidence in the published peer-reviewed literature to support the efficacy of TMS/CES for treatment of ADHD. A systematic review (Westwood, et al., 2020) examined repetitive transcranial magnetic stimulation (rTMS) or transcranial direct current stimulation (tDCS) for a treatment alternative to stimulant medication for attention-deficit/hyperactivity disorder (ADHD). The review found that rTMS and tDCS showed positive effects in some functions but not others, and little evidence for clinical improvement and that the meta-analyses of one to five sessions of anodal tDCS over mainly the left or bilateral DLPFC showed trend-level improvements in inhibition and processing speed, but not in attention. The studies were limited by heterogeneity in stimulation parameters, patient age and outcome measures limited the interpretation of findings.

Adult ADHD

It was previously thought that ADHD did not continue beyond adolescence, but long-term, controlled, follow-up studies have shown that the disorder persists in a sizable number of adults who were diagnosed with ADHD in childhood. ADHD occurs in approximately 4% of adults, and the condition can impair work and social functioning (Goroll, 2009). The clinical features are highly reminiscent of the pediatric form of the disorder. The condition frequently coexists with anxiety, depression and substance abuse. ADHD can be diagnosed reliably in adults who currently have symptoms of ADHD as defined in the DSM-5 and who, on careful questioning, give a history of such symptoms since childhood.

Unlike treatment for childhood ADHD, treatment for adult ADHD has not been well-established by randomized, controlled trials, nor are there any published treatment guidelines (Goroll, 2009). Modalities include cognitive-behavioral therapy and pharmacotherapy. Support groups, such as Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD) assist newly diagnosed adults by providing information about ADHD and available resources, including peer support groups. Coaching and training in organizational skills appear useful but remain unstudied.

The benefit of pharmacotherapy for the treatment of ADHD in children has been established, but the usefulness of medication as a treatment for adults with ADHD has not been well-established. To date, the FDA has approved the following agents for adult use: mixed amphetamine compounds, the noradrenergic-specific reuptake inhibitor, Strattera. In May 2005, the FDA approved Focalin XR® (dexamfetamine HCl) (Novartis, East Hanover, NJ) for treatment of ADHD in adults, adolescents and children. One review article notes that the stimulants, methylphenidate and amphetamine, are the most commonly used and are highly effective in a dose-dependent manner for adults with ADHD (Wilens, 2004). Other available medication shown to be effective for adults with ADHD includes bupropion, desipramine and pemoline (Wilens, 2004).

Professional Societies/Organizations

American Academy of Child and Adolescent Psychiatry (AACAP): the AACAP published practice parameters for the assessment and treatment of children and adolescents with attention-deficit/hyperactivity disorder. They include the following recommendations regarding evaluation of ADHD (Pliszka, et al., 2007a):

- Screening for ADHD should be part of every patients' mental health assessment: if a patient or the parent reports that the patient suffers from any symptom of ADHD that induce impairment or if the patient scores in the clinical range for ADHD symptoms on a rating scale, then a full evaluation is indicated
- Evaluation of preschooler, child or adolescent for ADHD should consist of clinical interviews with the parent and patient, obtaining information about the patient's school or day care functioning, evaluation for comorbid psychiatric disorders and review of patient's medical, social and family histories.
- If the patient's medical history is unremarkable, laboratory or neurological testing is not indicated. The guidelines note that there are few medical conditions that pose as ADHD, and the vast majority of patients with ADHD will have an unremarkable medical history. The parameters note that, "Unless there is strong evidence of such factors in the medical history, neurological studies (electroencephalography [EEG], magnetic resonance imaging, single-photon emission computed tomography [SPECT], or positron emission tomography [PET]) are not indicated for the evaluation of ADHD." They note that the American Psychiatric Association Council on Children, Adolescents and Their Families in their report of brain imaging and child and adolescent psychiatry have warned against the exposure of children to intravenous radioactive nucleotides as part of the diagnosis or treatment of childhood psychiatric disorders, citing both a lack of evidence of validity and safety issues.
- Psychological and neuropsychological tests are not mandatory for the diagnosis for ADHD, but should be performed if the patient's history suggests low general cognitive ability or low achievement in language or mathematics relative to the patient's intellectual ability. The guidelines note that, "Psychological testing of the ADHD patient usually consists of a standardized assessment of intellectual ability (IQ) to determine any contribution of low general cognitive ability to the academic impairment, and academic achievement. Neuropsychological testing, speech-language assessments, and computerized testing of attention or inhibitory control are not required as part of a routine assessment for ADHD, but may be indicated by the findings of the standard psychological assessment."

The clinician must evaluate the patient with ADHD for the presence of comorbid psychiatric disorders. The guidelines note that it should be determined if the patient meets criteria for separate comorbid disorder in addition to ADHD, the comorbid disorder is the primary disorder and ADHD is caused by it, or the comorbid symptoms do not meet criteria for separate disorder but rather represent secondary symptoms that are caused by the ADHD.

American Academy of Child and Adolescent Psychiatry (AACAP): The AACAP guidelines (Pliszka, et al., 2007a) contain the following recommendations regarding treatment of ADHD:

- A well-thought-out and comprehensive treatment plan should be developed for the patient with ADHD. The treatment plan may consist of pharmacological and/or behavior therapy. The plan should consider the most recent evidence concerning effective therapies as well as family preferences and concerns. The treatment plan should be reviewed on a regular basis and modified if the patient is not responding.
- The initial psychopharmacological treatment of ADHD should be a trial with an agent approved by the FDA for treatment of ADHD. These medications include dextroamphetamine (DEX), D, L-methylphenidate (MPH), mixed salts amphetamine and atomoxetine. The guidelines also include typical dosing of medications. Regarding selection of which agent, the guidelines note that it is the sole choice of the family and the clinician as to which agent should be used, and each patient's treatment must be individualized.
- If none of the FDA approved agents results in satisfactory treatment of the patient with ADHD, the clinician should undertake a careful review of the diagnosis and then consider behavior therapy and/or use of medications not approved by the FDA for treatment of ADHD. As part of the review of diagnosis, it should be examined whether any undetected comorbid conditions are present, such as affective disorders, anxiety disorders, or subtle developmental disorders. Among the medications that may be used at this time are bupropion, tricyclic antidepressants (TCAs), and alpha-antagonists. The guidelines note that the evidence base for these medications is far weaker than for the FDA-approved agents.
- While receiving psychopharmacological interventions, the patient should be monitored for treatment-emergent side effects. This assessment may necessitate the use of a different stimulant or a nonstimulant medication.

- If there is a robust response to psychopharmacological treatment and subsequently normative functioning in academic, family and social functioning, the psychopharmacological treatment of the ADHD alone is satisfactory. The guidelines note that it is not mandatory that behavior therapy be added to the regimen, although parental preferences should be taken into account.
- When there is a less than optimal response to medication, the patient has a comorbid disorder, or experiences stressors in their family life, then psychosocial treatment in conjunction with medication is often beneficial.
- The patient should be assessed at regular intervals to determine whether there is continued need for treatment or if symptoms have been decreased. The treatment should continue as long as symptoms remain present and cause impairment. The guidelines note that signs that ADHD has diminished include: lack of any need to adjust despite robust growth, lack of deterioration when a dose of stimulant medication is missed, or newfound abilities to concentrate during drug holidays.
- While treated with medication, height and weight should be monitored.

The American Academy of Pediatrics (AAP): The AAP published updated clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. The guidelines include the following key action statements (Wolraich, et al., 2019):

- The pediatrician or other (primary care clinician) PCC should initiate an evaluation for ADHD for any child or adolescent age four years to the 18th birthday who presents with academic or behavioral problems and symptoms of inattention, hyperactivity, or impulsivity. (Grade B: strong recommendation.)
- To make a diagnosis of ADHD, the PCC should determine that DSM-5 criteria have been met, including documentation of symptoms and impairment in more than one major setting (i.e., social, academic, or occupational), with information obtained primarily from reports from parents or guardians, teachers, other school personnel, and mental health clinicians who are involved in the child or adolescent's care. The PCC should also rule out any alternative cause. (Grade B: strong recommendation.)
- In the evaluation of a child or adolescent for ADHD, the PCC should include a process to at least screen for comorbid conditions, including emotional or behavioral conditions (e.g., anxiety, depression, oppositional defiant disorder, conduct disorders, substance use), developmental conditions (e.g., learning and language disorders, autism spectrum disorders), and physical conditions (e.g., tics, sleep apnea). (Grade B: strong recommendation.)
- ADHD is a chronic condition; therefore, the PCC should manage children and adolescents with ADHD in the same manner that they would children and youth with special health care needs, following the principles of the chronic care model and the medical home. (Grade B: strong recommendation.)
- Recommendations for treatment vary depending on the patient's age and are presented for the following age ranges:
 - preschool-aged children: age 4 years to the sixth birthday;
 - elementary and middle school-aged children: age 6 years to the 12th birthday; and
 - adolescents: age 12 years to the 18th birthday.
- For preschool-aged children (age 4 years to the sixth birthday) with ADHD, the PCC should prescribe evidence-based behavioral PTBM and/or behavioral classroom interventions as the first line of treatment, if available (grade A: strong recommendation). Methylphenidate may be considered if these behavioral interventions do not provide significant improvement and there is moderate-to-severe continued disturbance in the 4- through 5-year-old child's functioning. In areas in which evidence-based behavioral treatments are not available, the clinician needs to weigh the risks of starting medication before the age of 6 years against the harm of delaying treatment. (Grade B: strong recommendation.)
- For elementary and middle school-aged children (age 6 years to the 12th birthday) with ADHD, the PCC should prescribe US Food and Drug Administration (FDA)-approved medications for ADHD, along with PTBM and/or behavioral classroom intervention (preferably both PTBM and behavioral classroom interventions). Educational interventions and individualized instructional supports, including school environment, class placement, instructional placement, and behavioral supports, are a necessary part of any treatment plan and often include an Individualized Education Program (IEP) or a rehabilitation plan (504 plan). (Grade A: strong recommendation for medications; grade A: strong recommendation for PTBM training and behavioral treatments for ADHD implemented with the family and school.)

- For adolescents (age 12 years to the 18th birthday) with ADHD, the PCC should prescribe FDA-approved medications for ADHD with the adolescent's assent (grade A: strong recommendation). The PCC is encouraged to prescribe evidence-based training interventions and/or behavioral interventions as treatment of ADHD, if available. Educational interventions and individualized instructional supports, including school environment, class placement, instructional placement, and behavioral supports, are a necessary part of any treatment plan and often include an IEP or a rehabilitation plan (504 plan). (Grade A: strong recommendation.)
- The PCC should titrate doses of medication for ADHD to achieve maximum benefit with tolerable side effects. (Grade B, strong recommendation)
- The PCC, if trained or experienced in diagnosing comorbid conditions, may initiate treatment of such conditions or make a referral to an appropriate subspecialist for treatment. After detecting possible comorbid conditions, if the PCC is not trained or experienced in making the diagnosis or initiating treatment, the patient should be referred to an appropriate subspecialist to make the diagnosis and initiate treatment. (Grade C, recommendation)

Grades of recommendations:

- grade A: consistent level A studies;
- grade B: consistent level B or extrapolations from level A studies;
- grade C: level C studies or extrapolations from level B or level C studies;

The supplemental information published along with the AAP guidelines includes information regarding complementary and unproven therapies that may include: megavitamins and other dietary alterations, vision and/or visual training, chelation, EEG biofeedback, and working memory (e.g., cognitive training) programs. The report notes, "there is insufficient evidence to suggest that these therapies lead to changes in ADHD's core symptoms or function. For many complementary and alternative therapies, limited information is available about their safety. Both chelation and megavitamins have been proven to cause adverse effects and are contraindicated. For these reasons, complementary and alternative therapies are not recommended (AAP 2019).

The American Board of Internal Medicine's (ABIM) Foundation Choosing Wisely® Initiative:

The American Academy of Pediatrics – Section on Cardiology and Cardiac Surgery includes the recommendation (Nov 2, 2020):

Do not order a screening ECG prior to initiation of attention-deficit/hyperactivity disorder (ADHD) therapy in asymptomatic, otherwise healthy pediatric patients with no personal or family history of cardiac disease.

Use Outside of the US

Spanish National Healthcare System: This organization published Clinical Practice Guideline on Attention Deficit Hyperactivity Disorder (ADHD) in Children and Adolescents (2010). Recommendations regarding evaluation include:

- Diagnostic criteria: To diagnose ADHD in children and adolescents the use of the diagnostic criteria of DSM-IV-TR or ICD-10 is recommended (grade of recommendation: D*).
- Diagnosis in children and adolescents(grade of recommendation: D*):
 - The diagnosis of ADHD in children and adolescents is exclusively clinical.
 - The diagnosis of ADHD in children and adolescents must be carried out by a health professional with training and experience in the diagnosis of ADHD and its most frequent comorbidities.
- Evaluation areas must be included in the diagnosis of ADHD: The diagnosis of ADHD in children and adolescents must be done via clinical interviews with parents and the patient, obtaining information from the school, reviewing family and personal background as well as the physical and psychopathological examination of the patient(grade of recommendation: D*).
- Neuropsychological assessment:
 - The neuropsychological assessment is not essential for the diagnosis of ADHD in children and adolescents (grade of recommendation: C*).
 - The neuropsychological examination of ADHD in children and adolescents is useful to get to know the profile of skills and difficulties in cognitive functioning and comorbidity with specific learning disorders (grade of recommendation: consensus*).

- To diagnose ADHD it is not necessary for there to be an alteration in the results of the neuropsychological tests that assess executive functions (grade of recommendation: C*).
- Supplementary examinations: To diagnose ADHD in children and adolescents supplementary laboratory, neuroimage or neurophysiological tests are not indicated unless the clinical evaluation justifies this (grade of recommendation: B*).

Recommendations regarding complementary and alternative therapies include:

- The elimination of artificial coloring agents and additives from the diet is not recommended as general treatment applicable in children and adolescents with ADHD (grade of recommendation: D*).
- A supplementary diet of fatty acids is not recommended as general treatment applicable in children and adolescents with ADHD (grade of recommendation: D*).
- Treatment with optometry, auditory stimulation, osteopathy and psychomotricity is not recommended to treat ADHD in children and adolescents (grade of recommendation: consensus*).
- Treatment with homeopathy, herbal medicine and encephalogram biofeedback is not recommended to treat ADHD in children and adolescents (grade of recommendation: B*).
- Health professionals must place emphasis, as with any other child and adolescent, on the importance of a balanced diet and regular exercise for children and adolescents with ADHD(grade of recommendation: consensus*).
- Health professionals must ask the families about the use of complementary and alternative therapies to identify and inform about their possible risks or side effects to treat ADHD in children and adolescents (grade of recommendation: consensus*).

*Grades of recommendation:

B: A body of evidence including studies rated as 2++, directly applicable to the target population of the guideline and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+.

C: A body of evidence including studies rated as 2++, directly applicable to the target population of the guideline and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+.

D: Scientific evidence level 3 or 4; or extrapolated scientific evidence from studies rated as 2+.

Consensus: Recommended practice based on the clinical experience and the consensus of the development group.

1++: High quality meta-analysis, systematic reviews of clinical trials or high-quality clinical trials with a very low risk of bias.

1+: Well-conducted meta-analyses, systematic reviews of clinical trials or well-performed clinical trials with a low risk of bias.

1- : Meta-analyses, systematic reviews of clinical trials, or clinical trials with high risk of bias.

2++: High-quality systematic reviews of case control or cohort studies. Well-conducted case control or cohort studies with a very low risk of bias and a high probability that the relationship is causal.

2+: Well-conducted case control or cohort studies with a low risk of bias and a moderate probability that the relationship is causal.

2- : Case control or cohort studies with a high risk of bias and a significant risk that the relationship is not causal.

3: Non-analytical studies, such as case reports and case series.

4: Experts' opinion.

National Institute for Health and Clinical Excellence (NICE): NICE clinical guideline published guidelines for diagnosis and management of ADHD in children, young people and adults (NICE 2008; updated 2018). The recommendations regarding diagnosis include:

- A diagnosis of ADHD should only be made by a specialist psychiatrist, pediatrician or other appropriately qualified healthcare professional with training and expertise in the diagnosis of ADHD, on the basis of:
 - a full clinical and psychosocial assessment of the person; this should include discussion about behavior and symptoms in the different domains and settings of the person's everyday life
 - a full developmental and psychiatric history
 - observer reports and assessment of the person's mental state
- A diagnosis of ADHD should not be made solely on the basis of rating scale or observational data. However rating scales such as the Conners' rating scales and the Strengths and Difficulties

questionnaire are valuable adjuncts, and observations (for example, at school) are useful when there is doubt about symptoms.

- For a diagnosis of ADHD, symptoms of hyperactivity/impulsivity and/or inattention should:
 - meet the diagnostic criteria in DSM-5 or ICD-10 (hyperkinetic disorder)
 - cause at least moderate psychological, social and/or educational or occupational impairment based on interview and/or direct observation in multiple settings
 - be pervasive, occurring in two or more important settings including social, familial, educational and/or occupational settings
- As part of the diagnostic process, include an assessment of the person's needs, coexisting conditions, social, familial and educational or occupational circumstances and physical health. For children and young people, there should also be an assessment of their parents' or caregivers' mental health.
- ADHD should be considered in all age groups, with symptom criteria adjusted for age-appropriate changes in behavior.
- In determining the clinical significance of impairment resulting from the symptoms of ADHD in children and young people, their views should be taken into account wherever possible

The recommendations regarding treatment for children under five include:

- Offer an ADHD-focused group parent-training programme to parents or carers of children under 5 years with ADHD as first-line treatment.
- If after an ADHD-focused group parent-training programme, ADHD symptoms across settings are still causing a significant impairment in a child under five years after environmental modifications have been implemented and reviewed, obtain advice from a specialist ADHD service with expertise in managing ADHD in young children (ideally a tertiary service).
- Do not offer medication for ADHD for any child under 5 years without a second specialist opinion from an ADHD service with expertise in managing ADHD in young children (ideally a tertiary service).

The recommendations regarding treatment for children aged five and over and young people include:

- Give information about ADHD and offer additional support to parents and carers of all children aged 5 years and over and young people with ADHD. The support should be ADHD focused, can be group based and as few as 1 or 2 sessions. It should include:
 - education and information on the causes and impact of ADHD
 - advice on parenting strategies with consent, liaison with school, college or university both parents and carers if feasible
- If a child aged 5 years or over or young person has ADHD and symptoms of oppositional defiant disorder or conduct disorder, offer parents and carers a parent-training programme in line with recommendations, as well as group-based ADHD-focused support.
- Consider individual parent-training programmes for parents and carers of children and young people with ADHD and symptoms of oppositional defiant disorder or conduct disorder when:
 - there are particular difficulties for families in attending group sessions (for example, because of disability, needs related to diversity such as language differences, learning disability [intellectual disability], parental ill-health, problems with transport, or where other factors suggest poor prospects for therapeutic engagement)
 - a family's needs are too complex to be met by group-based parent-training programmes
- Offer medication for children aged 5 years and over and young people only if:
 - their ADHD symptoms are still causing a persistent significant impairment in at least one domain after environmental modifications have been implemented and reviewed they and their parents and carers have discussed information about ADHD
 - a baseline assessment has been carried out
- Consider a course of cognitive behavioural therapy (CBT) for young people with ADHD who have benefited from medication but whose symptoms are still causing a significant impairment in at least one domain, addressing the following areas:
 - social skills with peers
 - problem-solving
 - self-control
 - active listening skills
 - dealing with and expressing feelings

The recommendations regarding treatment for adults include:

- Offer medication to adults with ADHD if their ADHD symptoms are still causing a significant impairment in at least one domain after environmental modifications have been implemented and reviewed
- Consider non-pharmacological treatment for adults with ADHD who have:
 - Attention deficit hyperactivity disorder: diagnosis and management
 - made an informed choice not to have medication
 - difficulty adhering to medication
 - found medication to be ineffective or cannot tolerate it
- Consider non-pharmacological treatment in combination with medication for adults with ADHD who have benefited from medication but whose symptoms are still causing a significant impairment in at least one domain
- When non-pharmacological treatment is indicated for adults with ADHD, offer the following as a minimum:
 - a structured supportive psychological intervention focused on ADHD
 - regular follow-up either in person or by phone
 - treatment may involve elements of or a full course of CBT

Medicare Coverage Determinations

	Contractor	Policy Name/Number	Revision Effective Date
NCD		No National Coverage Determination found	
LCD		No Local Coverage Determination found	

Note: Please review the current Medicare Policy for the most up-to-date information.

Coding/Billing Information

- Note:** 1) This list of codes may not be all-inclusive.
 2) Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

Considered Not Medically Necessary for the assessment and/or treatment of ADHD:

HCPCS Codes	Description
G0176	Activity therapy, such as music, dance, art or play therapies not for recreation, related to the care and treatment of patient's disabling mental health problems, per session (45 minutes or more)
G0177	Training and educational services related to the care and treatment of patient's disabling mental health problems per session (45 minutes or more)
H2027	Psychoeducational service, per 15 minutes
S9445	Patient education, not otherwise classified, non-physician provider, individual, per session
S9446	Patient education, not otherwise classified, non-physician provider, group, per session
T1018	School-based individualized education program (IEP) services, bundled

Considered Experimental/Investigational/Unproven when used to report the assessment and/or treatment of ADHD:

Assessment

CPT®* Codes	Description
76390	Magnetic resonance spectroscopy

CPT®* Codes	Description
78600	Brain imaging, less than 4 static views;
78601	Brain imaging, less than 4 static views; with vascular flow
78605	Brain imaging, minimum 4 static views;
78606	Brain imaging, minimum 4 static views; with vascular flow
78610	Brain imaging, vascular flow only
78803	Radiopharmaceutical localization of tumor, inflammatory process or distribution of radiopharmaceutical agent(s) (includes vascular flow and blood pool imaging, when performed); tomographic (SPECT) single area (of head, neck, chest, pelvis), single day imaging
78830	Radiopharmaceutical localization of tumor, inflammatory process or distribution of radiopharmaceutical agent(s) (includes vascular flow and blood pool imaging, when performed); tomographic (SPECT) with concurrently acquired computed tomography (CT) transmission scan for anatomical review, localization and determination/detection of pathology, single area (eg, head, neck, chest, pelvis), single day imaging
83655	Lead
92650	Auditory evoked potentials; screening of auditory potential with broadband stimuli, automated analysis
92651	Auditory evoked potentials; for hearing status determination, broadband stimuli, with interpretation and report
92652	Auditory evoked potentials; for threshold estimation at multiple frequencies, with interpretation and report
92653	Auditory evoked potentials; neurodiagnostic, with interpretation and report
95705	Electroencephalogram (EEG), without video, review of data, technical description by EEG technologist, 2-12 hours; unmonitored
95706	Electroencephalogram (EEG), without video, review of data, technical description by EEG technologist, 2-12 hours; with intermittent monitoring and maintenance
95707	Electroencephalogram (EEG), without video, review of data, technical description by EEG technologist, 2-12 hours; with continuous, real-time monitoring and maintenance
95711	Electroencephalogram with video (VEEG), review of data, technical description by EEG technologist, 2-12 hours; unmonitored
95712	Electroencephalogram with video (VEEG), review of data, technical description by EEG technologist, 2-12 hours; with intermittent monitoring and maintenance
95713	Electroencephalogram with video (VEEG), review of data, technical description by EEG technologist, 2-12 hours; with continuous, real-time monitoring and maintenance
95717	Electroencephalogram (EEG), continuous recording, physician or other qualified health care professional review of recorded events, analysis of spike and seizure detection, interpretation and report, 2-12 hours of EEG recording; without video
95718	Electroencephalogram (EEG), continuous recording, physician or other qualified health care professional review of recorded events, analysis of spike and seizure detection, interpretation and report, 2-12 hours of EEG recording; with video (VEEG)
95803	Actigraphy testing, recording, analysis, interpretation, and report (minimum of 72 hours to 14 consecutive days of recording)
95812	Electroencephalogram (EEG) extended monitoring; 41-60 minutes
95813	Electroencephalogram (EEG) extended monitoring; 61-119 minutes
95816	Electroencephalogram (EEG); including recording awake and drowsy
95819	Electroencephalogram (EEG); including recording awake and asleep
95930	Visual evoked potential (VEP) checkerboard or flash testing, central nervous system except glaucoma, with interpretation and report
95957	Digital analysis of electroencephalogram (EEG) (eg, for epileptic spike analysis)
96020	Neurofunctional testing selection and administration during noninvasive imaging functional brain mapping, with test administered entirely by a physician or other qualified healthcare professional (ie, psychologist), with review of test results and report

CPT®* Codes	Description
97151	Behavior identification assessment, administered by a physician or other qualified health care professional, each 15 minutes of the physician's or other qualified health care professional's time face-to-face with patient and/or guardian(s)/caregiver(s) administering assessments and discussing findings and recommendations, and non-face-to-face analyzing past data, scoring/interpreting the assessment, and preparing the report/treatment plan
97152	Behavior identification-supporting assessment, administered by one technician under the direction of a physician or other qualified health care professional, face-to-face with one patient, each 15 minutes
0362T	Behavior identification supporting assessment, each 15 minutes of technicians' time face-to-face with a patient, requiring the following components: administration by the physician or other qualified health care professional who is on site; with the assistance of two or more technicians; for a patient who exhibits destructive behavior; completion in an environment that is customized to the patient's behavior

HCPCS Codes	Description
P2031	Hair analysis (excluding arsenic)
S8035	Magnetic source imaging
S8040	Topographic brain mapping

Treatment

CPT®* Codes	Description
90867	Therapeutic repetitive transcranial magnetic stimulation (TMS) treatment; initial, including cortical mapping, motor threshold determination, delivery and management
90868	Therapeutic repetitive transcranial magnetic stimulation (TMS) treatment;; subsequent delivery and management, per session
90869	Therapeutic repetitive transcranial magnetic stimulation (TMS) treatment; subsequent motor threshold re-determination with delivery and management
90901	Biofeedback training by any modality
92065	Orthoptic and/or pleoptic training with continuing medical direction and evaluation
97112	Therapeutic procedure, one or more areas, each 15 minutes; neuromuscular reeducation of movement, balance, coordination, kinesthetic sense, posture, and/or proprioception for sitting and/or standing activities
97129	Therapeutic interventions that focus on cognitive function (eg, attention, memory, reasoning, executive function, problem solving, and/or pragmatic functioning) and compensatory strategies to manage the performance of an activity (eg, managing time or schedules, initiating, organizing, and sequencing tasks), direct (one-on-one) patient contact; initial 15 minutes
97130	Therapeutic interventions that focus on cognitive function (eg, attention, memory, reasoning, executive function, problem solving, and/or pragmatic functioning) and compensatory strategies to manage the performance of an activity (eg, managing time or schedules, initiating, organizing, and sequencing tasks), direct (one-on-one) patient contact; each additional 15 minutes (List separately in addition to code for primary procedure)
97153	Adaptive behavior treatment by protocol, administered by technician under the direction of a physician or other qualified health care professional, face-to-face with one patient, each 15 minutes
97154	Group adaptive behavior treatment by protocol, administered by technician under the direction of a physician or other qualified health care professional, face-to-face with two or more patients, each 15 minutes
97155	Adaptive behavior treatment with protocol modification, administered by physician or other qualified health care professional, which may include simultaneous direction of technician, face-to-face with one patient, each 15 minutes

CPT®* Codes	Description
97156	Family adaptive behavior treatment guidance, administered by physician or other qualified health care professional (with or without the patient present), face-to-face with guardian(s)/caregiver(s), each 15 minutes
97157	Multiple-family group adaptive behavior treatment guidance, administered by physician or other qualified health care professional (without the patient present), face-to-face with multiple sets of guardians/caregivers, each 15 minutes
97158	Group adaptive behavior treatment with protocol modification, administered by physician or other qualified health care professional, face-to-face with multiple patients, each 15 minutes
97533	Sensory integrative techniques to enhance sensory processing and promote adaptive responses to environmental demands, direct (one-on-one) patient contact, each 15 minutes
97810	Acupuncture, 1 or more needles; without electrical stimulation, initial 15 minutes of personal one-on-one contact with the patient
97811	Acupuncture, 1 or more needles; without electrical stimulation, each additional 15 minutes of personal one-on-one contact with the patient, with re-insertion of needle(s) (List separately in addition to code for primary procedure)
97813	Acupuncture, 1 or more needles; with electrical stimulation, initial 15 minutes of personal one-on-one contact with the patient
97814	Acupuncture, 1 or more needles; with electrical stimulation, each additional 15 minutes of personal one-on-one contact with the patient, with re-insertion of needle(s) (List separately in addition to code for primary procedure)
98940	Chiropractic manipulative treatment (CMT); spinal, 1-2 regions
98941	Chiropractic manipulative treatment (CMT); spinal, 3-4 regions
98942	Chiropractic manipulative treatment (CMT); spinal, 5 regions
98943	Chiropractic manipulative treatment (CMT); extraspinal, 1 or more regions
0373T	Adaptive behavior treatment with protocol modification, each 15 minutes of technicians' time face-to-face with a patient, requiring the following components: administration by the physician or other qualified health care professional who is on site; with the assistance of two or more technicians; for a patient who exhibits destructive behavior; completion in an environment that is customized to the patient's behavior

HCPCS Codes	Description
G0176	Activity therapy, such as music, dance, art or play therapies not for recreation, related to the care and treatment of patient's disabling mental health problems, per session (45 minutes or more)
S8930	Electrical stimulation of auricular acupuncture points; each 15 minutes of personal one-on-one contact with patient

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