Attention-deficit/hyperactivity disorder (ADHD) is a clinically important neuropsychiatric developmental disorder that affects children, adolescents, and adults. The disorder is characterized by core symptoms of inattention, hyperactivity, distractibility, impulsivity, and impaired executive functioning. It is estimated that 2% to 5% of the adult population in the United States has ADHD. Adults with ADHD are at an increased risk for experiencing comorbid psychiatric disorders, including mood disorders, anxiety disorders, and substance use disorders. The authors provide a brief clinical overview of ADHD and the treatment of adults with this disorder.


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Attention-deficit/hyperactivity disorder (ADHD) is characterized by core symptoms of inattention, hyperactivity, distractibility, and impulsivity. Unlike most other psychopathologic conditions, which were originally thought to occur only in adults, ADHD was initially believed to affect only children and adolescents. Sir George Frederic Still, MD, the proclaimed “father of British pediatrics,” provided the first clinical description of ADHD in a series of 3 lectures given to the Royal College of Physicians in London in 1902. From then until the mid-1970s, when Wood et al first described ADHD in adults, ADHD was thought to be “psychic acne” that an individual grew out of over time.

In reality, more than 50% of children with ADHD will carry the disorder into adulthood. The initial lack of recognition that an adult form of ADHD exists can be attributed to the fact that many of the presenting symptoms seen in children morph over time (Figure 1). An adult with ADHD is not likely to run around erratically in his or her place of work or in social settings. Instead, that person may feel restless and have a difficult time sitting still and maintaining focus.

Children typically have parents and teachers to help organize their lives, but adults typically do not. Thus, common dysfunctions of adults with ADHD include their inability to organize their lives, meet deadlines, avoid impulsive behavior, and attend to boring tasks. The life consequences resulting from these deficits can be devastating for patients and their families. Although the behaviors observed in children with ADHD may appear to change as they grow into adults, the core symptoms of inattention, impulsivity, and distractibility are relatively constant over time—unlike symptoms of mood and anxiety disorders, which are episodic and can wax and wane. The continuous nature of ADHD symptoms helps to explain why most adults with the disorder never receive a diagnosis or treatment. “It’s just who I am and always have been,” is a common explanation of patients with lifelong core symptoms. It is often a comorbid mood or anxiety disorder that causes an individual with ADHD to seek treatment.

Attention-deficit/hyperactivity disorder responds to pharmacotherapy and behavioral therapy, particularly cognitive...
behavioral therapy. According to a 2009 meta-analysis, recent clinical reports have suggested that neurofeedback, an advanced form of biofeedback, may be effective in treating adults and children with ADHD. To our knowledge, randomized controlled clinical trials have not been highlighted in top tier peer-reviewed journals to date. Some patients report receiving benefits from life coaches who are specifically trained to assist adults with ADHD. Regardless of the treatment modality selected, it is well established that untreated adults with ADHD score below average on measures of overall mental health, compared with matched adults without ADHD. In addition to the core symptoms of inattention, distractibility, impulsivity, and hyperactivity, an important area of clinical assessment when evaluating adults with ADHD should be executive functioning.

Executive Functioning
According to the age-of-onset criteria in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR), individuals diagnosed as having ADHD must present with clinically impairing symptoms by age 7 years (Figure 2). In actual clinical settings, however, many patients with ADHD first present for treatment in adulthood. Faraone et al question the DSM-IV age-of-onset criteria, arguing that the age is set too low. They assert that the diagnostic criteria should be revised to include patients whose condition was first diagnosed in adolescence. The key diagnostic feature is evidence of core ADHD symptoms before adulthood, even if the diagnosis was never made in childhood or early adolescence. It is now estimated that at least 4% of the adult population in the United States may have symptoms of ADHD.

Compared to matched individuals without ADHD, untreated patients with ADHD face serious disabilities and morbidities, including lower education levels, poorer employment records, and more partner separation and divorce. Many of these adverse life outcomes are directly related to difficulties with executive functioning. According to Brown et al, adults with ADHD experience difficulties with executive functioning on a daily basis, particularly in the areas of organizing one’s routine tasks, working within deadlines, making consistent efforts, remembering, and maintaining adequate focus.

To measure core executive functioning deficits in adults with ADHD, Brown developed a rating scale, known as the Brown Attention Deficit Disorder (ADD) Scale for Adults. He described these deficits as being related to the following 5 core areas of executive functioning: activation, focus, effort, emotion, and memory. Barkley et al expanded this concept, noting that expression of symptoms in these 5 areas can include distractibility, impulsiveness, poor concentration, lack of persistence, problems with working memory, and poor organizational skills.

Biederman et al performed an extensive evaluation of executive functioning in adults, focusing on measurements that were sensitive to detecting problems with sustained attention/vigilance, planning and organization, response inhibition, set shifting and categorization, selective attention and visual scanning, verbal and visual learning, and memory. The researchers’ tests were used to compare these areas of executive functioning among the following 4 groups of adults:

- adults with ADHD who did not have executive functioning problems
- adults with both ADHD and executive functioning problems

<table>
<thead>
<tr>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motric hyperactivity</td>
<td>Easily distracted</td>
</tr>
<tr>
<td>Aggressiveness</td>
<td>Inattentiveness</td>
</tr>
<tr>
<td>Low frustration tolerance</td>
<td>Shifts activities</td>
</tr>
<tr>
<td>Impulsiveness</td>
<td>Easily bored</td>
</tr>
<tr>
<td>Restlessness</td>
<td>Impatience</td>
</tr>
</tbody>
</table>

Figure 1. Developmental trends in symptoms of attention-deficit/hyperactivity disorder from childhood to adulthood. Adapted from Wilens et al and Millstein et al.
EVIDENCE-BASED CLINICAL REVIEW

Persistent pattern of inattention and/or hyperactivity-impulsivity

- Symptoms must be present for past 6 months
- Must have 6 or more symptoms of inattention and/or hyperactivity-impulsivity
- Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years
- Some impairment from symptoms must be present in 2 or more settings (eg, at home and at school or work)
- Clinically significant social, academic, or occupational impairment
- Symptoms not exclusively caused or better accounted for by another mental disorder

Figure 2. Diagnostic criteria for attention-deficit/hyperactivity disorder. Adapted from the American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR). [10]

- adults without ADHD but with executive functioning problems
- adults with neither ADHD nor executive functioning problems

Adults with both ADHD and executive functioning problems performed the worst in all measurements, and adults with neither ADHD nor executive functioning problems performed the best. In an analysis of the number of traffic tickets, traffic accidents, and arrest records of the study participants, the 2 groups with ADHD—despite differences in executive functioning—were found to have received more traffic tickets, been involved in more traffic accidents, and been arrested more often than those without ADHD. [14]

Interestingly, subtle deficits in executive functioning can affect adults with ADHD independently of intellectual capacity. Brown et al [15] studied the relationship between individuals’ IQ and executive functioning. The study sample included individuals who had ADHD and an IQ higher than 120, representing a group that was 1.5 standard deviations above the general population’s mean IQ of 100. Eight measures of executive functioning were assessed, and the ADD Scale for Adults was administered.

The study population consisted of 157 adults between ages 18 and 55 years. Analysis of the data revealed that more than 70% of the patients reported statistically significant impairment in 4 of the 5 core areas of executive functioning (activation, focus, effort, and memory). Overall, 73% of the patients reported statistically significant impairment in at least 5 of 8 additional executive functioning measures. Of note, patients with ADHD who had higher IQ scores were more functionally impaired than patients without ADHD who had lower IQ scores. [15]

These reported observations on executive functioning underscore the importance of establishing an accurate diagnosis and developing an effective treatment strategy. An important research finding is that having a high IQ does not preclude an individual from having ADHD. In fact, deficits in executive functioning may be more disabling in adult patients with high IQs. Adults with high IQs—even if they found ways of adapting to ADHD in childhood—are often frustrated by underachievement in school and work settings, knowing that their performance does not live up to their potential. [13,15] With adequate treatment, however, life goals can be achieved or exceeded. [16]

General Treatment Guidelines

A Google search of treatment of adult ADHD on November 4, 2011, yielded more than 3 million results. The Internet has become a primary source of health information for patients worldwide. This development is a double-edged sword. The Internet allows easy access to some credible, evidence-based information on health. However, not all Internet content is peer reviewed, making it difficult for the public to distinguish between genuine science vs personal opinions and marketing strategies. As treating physicians, we must consider it vital to educate our patients about ADHD.

Effective treatment starts with an accurate diagnosis. Although a number of excellent, valid, and reliable symptom screening techniques and diagnostic psychometric tools are available to assist physicians, an accurate diagnosis is dependent on a comprehensive interview with the patient conducted by a provider who is knowledgeable about ADHD. Extensive, and usually expensive, psychological testing is not necessary. Attaining corroborating information on patient history from family members is important to establish an accurate diagnosis. It is disappointing that, despite increased awareness among physicians that ADHD can persist into adulthood, only about 11% of adults with ADHD have received treatment. [13]

After confirmation of a diagnosis of ADHD, including any comorbid psychopathologic conditions, appropriate medication therapy (Figure 3) [19] and psychotherapy should be initiated. Long-acting stimulant medications are the most widely prescribed pharmacologic treatment for patients with ADHD and are generally the first drugs of choice for adult patients. Because of the potential for abuse and the need for multiple daily dosing, short-acting stimulant medications should be

Until the mid-1970s, ADHD was thought to be “psychic acne” that an individual grew out of over time.
used only rarely in treating adults with ADHD. For all adolescent and adult patients receiving stimulants, issues related to nonmedical use, diversion, substance abuse, and dependence should be monitored on an ongoing basis.

Atomoxetine hydrochloride is a nonstimulant medication approved by the US Food and Drug Administration (FDA) for the management of ADHD in adults. This drug may be particularly effective in patients with comorbid anxiety, tics, or a history of drug abuse. As a nonstimulant, atomoxetine prescriptions can be renewed over the phone, allowing clinically stable patients to receive multiple refills. For patients with contraindications (eg, high abuse liability, medical conditions, known hypersensitivity), a nonstimulant should be considered.

When initiating pharmacotherapy, it is important for physicians to inform patients about what to expect from treatment. Clinical concerns—such as decreased appetite, possible sleep problems, headache, and increased heart rate—should be reviewed with patients. Patients who have a personal or family history of cardiac disease, who report passing out while exercising, or who have cardiac murmur should be screened for baseline disease, including untreated hypertension, arrhythmias, and structural cardiac defects. To our knowledge, no data exist to warrant serial electrocardiogram monitoring in otherwise heart-healthy individuals.

Psychotherapeutic intervention (ie, “talk therapy”) is often an important component of treatment for adults with ADHD. Cognitive behavioral therapy for managing problems of focus, organization, motivation, and memory as they relate to executive functioning has been found to be successful in adults.

Given the high occurrence of comorbid psychopathologic conditions in adults with ADHD, a comprehensive treatment strategy is typically required. In a 2004 study, Biederman found that both men and women with ADHD had much higher lifetime prevalence of major depression (27% and 36%, respectively), compared with male and female controls (4% and 6%, respectively). Similarly, Biederman found that men and women with ADHD had higher lifetime prevalence of multiple (>2) anxiety disorders (46% and 52%, respectively), compared with male and female controls (10% and 15%, respectively). When comorbid conditions are present, pharmacologic treatment and psychotherapy aimed at all co-occurring disorders is important. Multiple medications may be required to achieve maximal clinical benefit.

Finally, all treatment strategies should be patient-centered and based on the concept of personalized medicine. For adults with ADHD, lifestyle changes should always be considered in patient care. An initial assessment of the patient for any unique lifestyle dysfunction is important. For example, an adult may be struggling in a job that requires intense concentration and attention to detail, but that same individual may enjoy success in a position that allows for less attention to detail and an emphasis on “big-picture” skills.

Treatment should address all problematic areas, including interpersonal relationships, occupational issues, self-esteem, and social functioning. Issues related to a lifelong history of feeling like an underachiever may need to be addressed in the patient with ADHD. Appropriate treatment for ADHD can positively impact a patient’s marriage, job, and overall self-esteem and life functioning.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Proprietary Name</th>
<th>Recommended Dosing Ranges for Adults, mg/d</th>
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</thead>
<tbody>
<tr>
<td><strong>Stimulants</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphetamine sulfate</td>
<td>Adderall XR (Shire US; Wayne, PA)</td>
<td>10-60</td>
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<tr>
<td></td>
<td>Dextroamphetamine Spansule (Amedra Pharmaceuticals; Middlesex, NJ)</td>
<td>5-60</td>
</tr>
<tr>
<td></td>
<td>Vyvanse (Shire US; Wayne, PA)</td>
<td>20-70</td>
</tr>
<tr>
<td>Methylphenidate hydrochloride</td>
<td>Concerta (Janssen Pharmaceuticals; Titusville, NJ)</td>
<td>18-72</td>
</tr>
<tr>
<td></td>
<td>Focalin XR (Novartis Pharmaceuticals; East Hanover, NJ)</td>
<td>10-40</td>
</tr>
<tr>
<td></td>
<td>Metadate CD (UCB; Smyrna, GA)</td>
<td>20-60</td>
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<tr>
<td></td>
<td>Methylphenidate ER (Shionogi USA; Florham Park, NJ)</td>
<td>10-60</td>
</tr>
<tr>
<td></td>
<td>Ritalin LA (Novartis Pharmaceuticals; East Hanover, NJ)</td>
<td>10-60</td>
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<tr>
<td></td>
<td>Ritalin SR (Novartis Pharmaceuticals; East Hanover, NJ)</td>
<td>10-60</td>
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<tr>
<td><strong>Nonstimulants</strong></td>
<td></td>
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<tr>
<td>Atomoxetine hydrochloride</td>
<td>Strattera (Eli Lilly and Co; Indianapolis, IN)</td>
<td>60-100</td>
</tr>
<tr>
<td>Guanfacine hydrochloride</td>
<td>Intuniv (Shire US; Wayne, PA)</td>
<td>1-4</td>
</tr>
</tbody>
</table>

**Figure 3.** Medications used, with available proprietary brands and dosing ranges, for the treatment of adults with attention-deficit/hyperactivity disorder. Adapted from Physicians’ Desk Reference (http://www.pdr.net).

Only about 11% of adults with ADHD have received treatment.
Recent epidemiologic studies report at least 4% of the adult population in the United States may have ADHD. A crucial area of clinical assessment when evaluating adults with ADHD is executive functioning. Serious life disturbances, such as relationship and occupational problems, resulting from dysfunction in executive functioning underscore the importance of establishing an accurate diagnosis and developing an effective treatment strategy for patients with ADHD. Adults with ADHD respond well to pharmacotherapy and behavioral therapy, particularly cognitive behavioral therapy (eg, managing problems of focus, organization, motivation, and memory). Short-acting stimulants should be avoided in treating adults with ADHD. Lifestyle changes should be a consideration in treatment.

References