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Attention-Deficit/Hyperactivity Disorder

Diagnosis

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common childhood behavioral disorders, with an average prevalence of about 11% (CDC, 2011). In 2011-2013, 13.3% of boys and 5.6% of girls between ages 4 to 17 had ever been given a diagnosis of ADHD (Pastor et al., 2015). In 2011, more than 6.4 million children had received a diagnosis of ADHD in the United States (CDC), with a ratio of about 2:1 males to females. Untreated ADHD is associated with significant reductions in functional outcomes for youth and adults as well as substantial economic costs (Gjervan et al., 2012).

ADHD represents a characteristic pattern of behavior and cognitive functioning defined in the DSM-5 as "a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development" (p.61). Inattention symptoms include such behaviors as forgetfulness, poor organization, distractibility, lacking persistence, and poor sustained focus. Hyperactivity symptoms include excessive motor activity, restlessness, fidgetiness, talking out of turn, or inability to remain seated when necessary. Impulsivity refers to rapid and poorly considered actions such as interrupting, social intrusiveness, and unsafe behaviors such as darting out into traffic. Symptoms must be evident during childhood (before age 12 years), and must be present across multiple settings. Diagnostic symptom criteria remain largely unchanged in DSM-5 relative to DSM-IV, with three presentations specified (i.e., Combined presentation, Predominantly inattentive presentation, and Predominantly hyperactive/impulsive presentation). It is important to note that the symptom presentation may change over time in individuals with ADHD, such that most children with the hyperactive-impulsive presentation are likely to show a different profile of symptoms (i.e., more inattention than hyperactivity) as they age (Lahey et al., 2005). Consistent with changes made to the DSM-5, a presentation that no longer meets full criteria (e.g., over the past 6 months) can be specified as "in partial remission." Furthermore, DSM-5 provides severity descriptors designed to present the level of symptomatology or impairment currently part of the individual's presentation. Finally, DSM-5 provides adjusted descriptors of symptom criteria for older adolescents and adults (i.e., rather than "runs about or climbs," in adults, hyperactivity "may be limited to feeling restless") as well as a reduced number of symptoms required for the diagnostic threshold in this population.

Diagnosis of ADHD can be challenging, as it is a diagnosis of both inclusion and exclusion. This means that the specific symptoms of inattention, distractibility, hyperactivity, and/or impulsivity must be present (as described above), but the clinician must also exclude or "rule out" other possible reasons for or potential causes of the observed symptoms, besides ADHD. As behavior disorders in children may stem from a variety of causes, it is important for those working with children for whom a diagnosis of ADHD may be appropriate to carefully consider both disorder-specific features, co-occurring conditions, environmental contributors, and conditions that may mimic features of ADHD but are actually

not consistent with the diagnosis of ADHD. Inclusion criteria include those behaviors described above and specified in the DSM-5. However, inattention, poor concentration, and/or motor restlessness may be evident in children with depression, medical illness or injury (such as traumatic brain injury, epilepsy, etc.), inadequate sleep or sleep disturbance such as obstructive sleep apnea, and stressful experiences or traumatic situations. Furthermore, children with significant language or intellectual disorders may display similar behaviors due to inability to fully comprehend tasks, instructions, and conversations. These conditions will likely require different treatments and failure to appropriately diagnose such underlying conditions may increase treatment failure and cost, frustration of the child and those working with him/her, and emotional burden.

There is a growing body of research examining the neurological bases of ADHD. The available evidence suggests that the brains of children with ADHD develop differently as compared to the brains of typically developing children. The data from several studies suggest brain differences in the specific regions of the brain that seem to be most responsible for behavioral control and concentration, as well as for effective integration of multiple pieces of information. Stimulant medications seem to show promise for possibly "normalizing" these atypical patterns of brain development.

Comorbidities and Complications

Children with ADHD are likely to have a least one co-occurring condition or disorder. Estimates suggest that more than two-thirds of children (66.9%) have at least one additional diagnosis (Larson et al., 2011). These diagnoses most commonly include learning disabilities and/or other behavioral difficulties such as oppositional defiant or conduct disorder, but may also include autism spectrum disorders, mood and anxiety disorders, speech-language disorders, and movement disorders such as tics/Tourette disorder. The risk for multiple diagnoses increases with poverty and related risk factors. Likewise, the risk for treatment resistance increases with comorbidity, as a more nuanced and complex treatment approach becomes necessary.

Youth with ADHD are more likely to experience school difficulty or grade failure, more suspensions and behavioral referrals, social relationship difficulties, and lower academic attainment than typically-developing peers. In addition, data suggest children with ADHD tend to have fewer friends, more peer conflict, more problematic behaviors, and poorer psychosocial adjustment than typical peers (Gjervan et al., 2011). As a consequence of both core symptoms and these social and academic impairments, they are also more likely to be underemployed or be fired from jobs, more likely to have trouble saving money, more likely to owe money, and less likely to have a savings account (Barkley et al., 2006). Across countries, it has been estimated that ADHD is associated with 143.8 million lost days of work productivity each year (CDC). Furthermore, individuals with ADHD are more likely to suffer injury, including both non-fatal and major injuries, and have more hospital visits relative to typically developing youth (CDC). As a result of all of these factors, the "cost of illness" for ADHD is estimated annually to fall between \$36 and \$52.4 billion dollars (in 2005 dollars; Pelham et al., 2007).

Assessment

Assessment of ADHD must therefore include evaluation of behavioral symptoms across settings (home, school, community/peers), as well as assessment of most relevant potentially co-occurring conditions and relevant environmental contributors. As DSM-5 requires that confirmation of symptoms across settings include consultation of "informants who have seen the individual in those settings" (p.61), assessment of behavioral symptoms commonly includes symptom checklists or rating scales completed by both parents and teachers. Although these data provide information about the appearance of the child's behavior in various settings, or the way in which the child's behavior is perceived by others, these data do not offer information regarding etiology or contributing factors. As such, evaluation of intellectual ability, learning abilities and academic skills, emotional functioning (e.g., depression, anxiety, etc.), and motor and language functioning, as well as comprehensive review of medical history are required to ensure that the diagnosis of ADHD is accurate and that any comorbid conditions are appropriately identified so that appropriate services may be provided.

Consideration of potential child or family stressors must also be part of the evaluation, to ensure that a situational reaction, trauma, or adjustment reaction is not misdiagnosed as ADHD. Furthermore, data from the U.S. (Elder, 2010) and internationally suggest that children who are "young for grade" (i.e., children whose birthdays fall just prior to the school entry cut-off) are more likely to be diagnosed with ADHD relative to their peers who are "old/age-appropriate for grade" (i.e., those whose birthdays fall just after the cut off and may have had to "wait" to enter kindergarten as a consequence); children who are "young for grade" are also more likely to be prescribed medication for ADHD. As such, assessment should also take situational factors into account as well as carefully consider developmental expectations. Given the complex nature of evaluation required for diagnosis of ADHD, a comprehensive neuropsychological evaluation should be considered (Pritchard et al., 2011).

Almost by definition, children with ADHD exhibit weaknesses in executive functioning, or those skills required for regulating behavior, attention, and affect to effectively achieve a goal. Inhibitory deficits have been considered the core symptom of ADHD (Barkley, 1997); however, weaknesses in working memory, processing speed, planning and problem solving, organization, and self-evaluation are also common in this population. These specific deficits impact performance across academic, community, and social settings. As such, assessment of executive dysfunction is an important component of evaluation of ADHD across the age span and treatment of ADHD frequently requires specific instruction and behavioral supports to address the executive dysfunction.

Treatment

Stimulant medication is typically considered the initial treatment of choice for ADHD. Although effective in reducing core symptoms, medication does not fully normalize functioning or address co-occurring impairments (e.g., learning difficulties, social skill deficits, depression, anxiety; Biederman et al., 1999; Coghill, 2010; Danckaerts et al., 2010; Frazier et al., 2010; Gilberg et al., 2004; Loe & Feldman, 2007). Similarly, evidence-based behavioral treatments for ADHD have been shown to reduce both core and co-occurring symptoms, but do not entirely normalize functioning and are not effective for all youth (Fabiano et al., 2009; Pelham & Fabiano, 2008; van der Oord et al., 2008). These findings may be explained by inappropriate or incomplete diagnostic conceptualizations, which lead to the provision of inappropriate or incomplete interventions. In fact, reanalysis of data from the Multimodal Treatment Study of ADHD (Hinshaw et al., 2015) found that the combination of careful and active medication management plus systematic and comprehensive behavioral treatment was superior to medication alone when examining children with comorbid ADHD and anxiety as well as when examining composite outcomes beyond core symptomatology (e.g., social functioning, adaptive skills and symptom reduction).

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ABOUT THE TECHNICAL ASSISTANCE NETWORK FOR CHILDREN'S BEHAVIORAL HEALTH

The [Technical Assistance Network for Children's Behavioral Health](#) (TA Network), funded by the Substance Abuse and Mental Health Services Administration, Child, Adolescent and Family Branch, partners with states and communities to develop the most effective and sustainable systems of care possible for the benefit of children and youth with behavioral health needs and their families. We provide technical assistance and support across the nation to state and local agencies, including youth and family leadership and organizations.

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