Diagnosing Attention-Deficit/Hyperactivity Disorder in Patients With Substance Use Disorders

Frances Rudnick Levin, M.D.

Diagnosing attention-deficit/hyperactivity disorder (ADHD) in adults can be complicated by several factors including the inability to meet appropriate developmental criteria as listed in the DSM-IV. The stringent DSM-IV criteria for ADHD may make diagnosing ADHD in adults difficult, which may lead to an underdiagnosis of ADHD in the adult population. Clinicians must rely on the diagnosis of ADHD not otherwise specified for adults with ADHD symptomatology, but this category does not provide clear delineations for patients whose symptoms vary within this category. Further complications arise due to high rates of comorbid psychiatric disorders, especially substance use disorders, in individuals with ADHD. Comorbid substance use disorders in individuals with ADHD can have a negative impact on the course of illness and quality of life. Further, cognitive deficits associated with substance abuse can hinder the ability to recall ADHD symptoms for appropriate diagnostic purposes. On the other hand, symptoms associated with intoxication or withdrawal may mimic ADHD symptoms, which can lead to an overdiagnosis of ADHD in the substance use disorder population. Another factor that can lead to the overdiagnosis of ADHD in the substance use disorder population is that patients may feign ADHD symptoms in order to obtain stimulant medication. If proper attention is paid to age-appropriate symptoms of ADHD, and careful longitudinal data are obtained from patients presenting with ADHD or substance use disorders, proper treatment can be given to patients with these comorbid disorders. *(J Clin Psychiatry 2007;68[suppl 11]:9–14)*

Attention-deficit/hyperactivity disorder (ADHD) is an impairing condition that afflicts 3% to 7% of children.[1] Until recently, ADHD was thought to remit in adolescence and/or early adulthood. However, longitudinal studies have found that 75% of children continue to have symptoms into adolescence and approximately 65% of children continue to have impairing symptoms into adulthood.[2] This results in a prevalence rate of 3% to 5% in adult populations.[3]

Several studies have shown that substance use disorders are more common in adults with ADHD compared to those without ADHD.[3–6] Similarly, ADHD is overrepresented in substance-abusing populations. For opiate-dependent individuals, the rates range from 5% to 22%. For cocaine-dependent individuals, the rates range from 10% to 35%, and for alcoholics, the rates range from 33% to 71%.[7] The wide range in the prevalence rates can be partially explained by the fact that different diagnostic criteria as well as methods of assessment were used in obtaining the ADHD diagnosis. More recent studies that have used a structured diagnostic instrument that followed DSM-IV criteria found relatively similar rates. Regardless of the primary drug of abuse, the rates of ADHD ranged from 10% to 24%.[8–11] The low rate of 10% found in the Levin et al.[10] study was based on using "strict" ADHD criteria, that is, some impairing symptoms had to occur prior to the age of 7 years. As will be discussed later, requiring this criterion may lead to underdiagnosis of the disorder, and fulfillment of the criterion may be particularly difficult to ascertain in substance-abusing populations.

There are clear negative ramifications of having ADHD in adulthood, such as increased divorce rates, less educational attainment, more arrests, and an increased number of driving tickets compared to those without ADHD.[12,13] Further, substance abusers with ADHD have a worse course of illness compared to substance users without ADHD. Specifically, those with ADHD have an earlier onset of substance abuse, are more likely to continue to have problematic abuse rather than go into remission if they develop substance dependence, and do less well with treatment. Further, those with ADHD have higher rates of psychiatric comorbidities, which may complicate treatment.[7,10,11,14,15] Taken together, these data suggest that ADHD should be identified and treated in substance-abusing populations.

From the Division on Substance Abuse, Columbia University/New York State Psychiatric Institute, New York.

This article is derived from the planning teleconference series "Attention-Deficit/Hyperactivity Disorder and Comorbid Substance Use Disorder," which was held in November and December 2006 and supported by an educational grant from Shire Pharmaceuticals Inc.

Dr. Levin is a past consultant for Shire, Ortho-McNeil, and Cephalon/Alkermes and has received grant/research support from Ortho-McNeil, Eli Lilly, Shire, AstraZeneca, and UCB Pharma.

Corresponding author and reprints: Frances Rudnick Levin, M.D., New York State Psychiatric Institute, 1051 Riverside Dr., New York, NY 10032 (e-mail: frl2@columbia.edu).

DIAGNOSING ADHD IN ADULTS

The full diagnosis of ADHD, as described in DSM-IV-TR,[16] requires 6 or more symptoms of inattention and/or 6 or more symptoms of hyperactivity/impulsivity. The additional 4 criteria include (1) some impairing symptoms prior to 7 years of age; (2) some impairing symptoms present in at least 2 settings; (3) clear evidence of significant impairment in social, school, or work functioning; and (4) symptoms that do not happen only during the course of a pervasive developmental disorder, schizophrenia, or other psychotic disorder. Further, symptoms are not better accounted for by another mental disorder. Individuals can meet the full diagnostic criteria in 3 ways: (1) attention-deficit/hyperactivity disorder, inattentive type; (2) attention-deficit/hyperactivity disorder, hyperactivity-impulsive type; and (3) attention-deficit/hyperactivity disorder, combined type. Adult ADHD, hyperactive-impulsive type, is substantially less common than the other 2 types. Individuals who met full criteria in childhood but currently have symptoms that no longer meet full criteria are considered to be in partial remission.

ISSUES THAT COMPLICATE DIAGNOSING ADHD IN ADULTS

There are numerous issues that complicate making the diagnosis. These include (1) the developmental "appropriateness" of the symptoms, (2) the age criterion, (3) deciding how to define ADHD not otherwise specified (NOS), (4) additional psychopathology, and (5) assuring that all DSM-IV criteria are met. Further, there are issues specific to substance abusers that complicate making the diagnosis. Specifically, alcohol and drugs may mimic ADHD symptoms, corroborative data may not be available, and there may be a lack of staff with adequate training to make the diagnosis in substance abuse treatment settings.

Developmental Appropriateness of Symptoms

Since ADHD was initially conceptualized as a childhood disorder, some of the core symptoms of ADHD are child-specific and manifest differently in adults. Hyperactivity often changes to inner restlessness. Symptoms listed in DSM-IV for ADHD such as "can't stay seated," "runs/climbs excessively," and "can't play/work quietly" may not be readily endorsed by adults. Instead, the interviewer's questions need to modified for adult situations. Adult patients may be more likely to report that they "self-select" for very active jobs rather than endorse that they have trouble sitting in their seat. They may not report difficulties working quietly but may report that their constant activity causes family tension. They may report that on vacation they are unable to unwind. Instead, they overschedule their vacation days with activities when their spouse may simply want to relax. Instead of endorsing symptoms such as "squirms or fidgets" or being "on the go/driven by a motor," an adult patient may be more likely to report being a workaholic or feeling overscheduled/overwhelmed. Thus, the observation that hyperactive symptoms remit in adulthood may not be entirely true. Instead, it may be that clinicians are asking the wrong questions when assessing adults.

Often, impulsivity persists into adulthood and carries consequences more serious than those observed in childhood. Whereas the childhood symptoms consist of blurting out answers to questions, not waiting one's turn, or intruding/interrupting, the adult manifestations can lead to serious consequences and substantial functional impairment. In adults, impulsivity is demonstrated by impulsively ending relationships, quitting jobs, having a low frustration tolerance, losing one's temper, having a greater number of arrests, and driving violations.[12,13,17] Again, these are not the exact symptoms listed in DSM-IV, but they are more adult-relevant. For example, the question of whether a patient can wait his or her turn should be posed in an adult context. Patients might report, for example, that they "gun" their motor at a traffic light or frequently cross over traffic lanes to get to their destination faster.

Most of the symptoms of inattention are relatively easy to apply to adults. For example, some of the core symptoms include having difficulty sustaining attention, not listening, lacking the ability to organize, losing important items they need for functioning, and being easily distractible/forgetful. While adults may endorse these symptoms, they may be more likely to endorse paralyzing procrastination, poor time management, or being slow/inefficient in their work/daily activities. Again, adult-relevant questions may lead to greater endorsement of ADHD symptoms and higher detection of adult ADHD.

The Validity of ADHD NOS

Another reason why adult ADHD may go undetected and treated is the current classification system. At present, ADHD can be diagnosed in adults only if all childhood criteria are met. If the full childhood criteria are not met, then the individual with adult symptoms is diagnosed with ADHD NOS. While this is a valid DSM-IV-TR diagnosis, clinicians may feel that it is too vague and, instead, forgo diagnosing the individual with ADHD NOS and not provide treatment. Perhaps the 2 most common situations that would lead to an ADHD NOS diagnosis are late-onset ADHD and subthreshold ADHD. In the first situation, the patient meets all childhood criteria except the prior to age 7 criterion; in the second situation, the patient has never met full symptom criteria for ADHD as a child, yet has several persistent impairing symptoms.

Mannuzza et al.[5,18] observed that many adults do not recall their childhood symptoms, even when they are followed longitudinally for their ADHD symptoms from

childhood. Experts in the field, such as Barkley and Biederman[19] and others,[7] have questioned the validity of the age criterion. The recognition that many adult patients have difficulty remembering when their ADHD symptoms began led Faraone et al.[12] to assess the validity of 2 ADHD NOS diagnoses, late-onset ADHD and subthreshold ADHD, by comparing the psychiatric comorbidity, functional impairment, and familial transmission of ADHD seen in full ADHD with those seen in these 2 ADHD NOS variants. Adults seeking psychiatric treatment or responding to advertisements were placed in one of 4 groups: (1) those with childhood ADHD and persistent ADHD symptoms in adulthood, (2) those with late-onset ADHD (description below), (3) those with subthreshold ADHD (description above), and (4) those with no ADHD. Strikingly, those with full ADHD and late onset ADHD most resembled each other in terms of psychiatric comorbidity (e.g., major depression, bipolar illness, substance use disorders), functional impairment (e.g., more arrests, driving accidents, driving tickets), and familial transmission than those with subthreshold ADHD and no ADHD. Interestingly, most of those diagnosed with late onset of ADHD had symptoms start younger than age 12 (83% of the sample). Thus, while the age at onset criterion of less than 7 years may be too stringent, the vast majority of individuals will recall having symptoms prior to the age of 12. Prior to the Faraone et al. study, a commonsense approach has been applied by experts in the field. For example, Ward et al.[20] developed a screening instrument, the Wender Utah Rating Scale, that asks individuals to recall symptoms during elementary school, without a specific age cut-off. However, this approach has not yet been adopted by the DSM. Faraone and colleagues'[12] recently published article, which demonstrated the concurrent validity of the late-onset variant, may support changes in the future diagnostic criteria and improve the recognition of ADHD in adults.

Adults who have impairing symptoms of ADHD yet do not meet criteria for ADHD often fall into 2 categories: (1) adult ADHD in partial remission, in which patients met full ADHD criteria in childhood but as adults have an attenuated version of the disorder, and (2) late-onset ADHD, in which ADHD symptoms are present, but childhood criteria are not met. Interestingly, Faraone et al.[12] found that approximately 30% of individuals with adult ADHD *or* late-onset ADHD do not meet the full symptom count as adults. Although there are no specific data, it would not be surprising if clinicians are less likely to diagnose and treat individuals who are in "partial remission," compared to those with full symptom count. If there is increased awareness that a substantial minority of adults do not meet full DSM-IV criteria but still have substantial impairment as adults, then increased detection of the group in partial remission and treatment intervention might occur.

Psychiatric Comorbidity

The presence of psychiatric comorbidity can complicate making the diagnosis of ADHD. Regardless of whether one is assessing individuals in community settings or treatment settings, those with adult ADHD have higher rates of other psychiatric disorders compared to those without ADHD. Kessler et al.[3] found that the 12-month prevalence rates for major depression, bipolar illness, and anxiety disorders among individuals with ADHD were more than double the rates in non-ADHD individuals. Notably, the 12-month prevalence rate for bipolar disorder was 19% in the ADHD group and 4% in the non-ADHD group. Similarly, in the Faraone et al.[12] study, the prevalence rates of numerous psychiatric disorders were higher in the ADHD group compared to the non-ADHD group. Further, although the methodologies were somewhat different, it is not surprising that the rates of various psychiatric disorders (e.g., major depression, bipolar disorder, substance use disorders, generalized anxiety disorder) were higher in Faraone and colleagues' treatment-seeking sample of adults with ADHD compared to Kessler and colleagues'[3] community sample of adults. What this suggests is that patients who come for treatment who have ADHD, whether it be in a psychiatric clinic or a substance abuse treatment program, are likely to have multiple comorbidities.

Often, the first question that needs to be addressed is whether there are 2 or more disorders present or whether 1 disorder best explains the set of observable symptoms.

Although it is beyond the scope of the article to discuss all of the comorbid conditions that may exist with ADHD, 2 disorders, major depression and bipolar disorder, are frequently comorbid with ADHD and may lead to diagnostic uncertainty. Further, it may be more difficult to determine whether the "milder" variants of these conditions (e.g., dysthymia, hypomania) are comorbid with ADHD, not present, or the sole diagnosis.

There are common symptoms associated with having either a depressive disorder or ADHD. These include inattention, problems with concentration, psychomotor agitation or restlessness, and sleep difficulties. Although having a sleep disturbance is not a criterion of having ADHD, it is a common clinical experience that children with ADHD have trouble with sleep.[21] Further, having a sleep disturbance, whether due to apnea or an underlying psychiatric disorder, can produce symptoms that mimic ADHD.[22]

Compared to those with depressive disorders, individuals with ADHD are more likely to have chronic work/school impairment (unless the depressive symptoms are long-standing), greater problems with organization, and impulsive behaviors. Alternatively, those with depressive disorders are more likely to have fatigue, irritability, or feelings of guilt/worthlessness. A caveat to this, however, is that individuals with ADHD may have had a life-long

history of poor achievement and being told by family members, teachers, or friends that they were "not living up to their potential" or "lazy." These statements may certainly lead to chronic feelings of worthlessness and low self-esteem. However, there are certain symptoms that are much more likely or uniquely associated with depressive disorders or ADHD. Suicidality or psychosis is not consistent with having ADHD alone. Similarly, excessive talkativeness or constant activity is not consistent with a diagnosis of depression alone.

Perhaps it is even more difficult to distinguish ADHD from bipolar disorder. Again, if there are overlapping symptoms, the more severe symptoms are likely to be associated with having bipolar illness, and this may need to be addressed first. However, the bipolar symptoms may be more subtle and consistent with a diagnosis of bipolar II disorder or bipolar disorder NOS, making the distinction of these disorders from ADHD more difficult. Although hyperactivity, inattention, talkativeness, work dysfunction, and impulsivity are present in both disorders, these symptoms are more extreme and more often cyclical among individuals with a bipolar disorder. If there are other symptoms that are severe, such as depression or irritability, along with impulsivity or excessive talkativeness, then a diagnosis of bipolar illness needs to closely considered. Similar to depression, if an individual reports symptoms of psychosis or suicidality, then bipolar disorder or another psychiatric disorder (including unsuspected substance abuse) needs to be considered. Grandiosity, decreased need for sleep, and expansive mood are consistent with bipolar illness rather than ADHD. Another crucial piece of information to gather is family history. If a patient has a strong family history for bipolar illness, it is incumbent on the clinician to carefully assess the patient for bipolar illness. However, this does not mean that an individual with overlapping symptoms consistent with ADHD or bipolar illness should be diagnosed with bipolar illness based on a positive family history alone.

Taken together, whether an individual has ADHD alone, has multiple psychiatric disorders, or has a psychiatric disorder other than ADHD rests on clinical judgment. When it is determined that a psychiatric disorder other than ADHD is present, then the treatment is usually first focused on the more severe illness. However, this should not preclude attention to the other disorder when improvement in symptoms of the more severe illness occurs. Even among ADHD experts, there is a tendency to detect the more severe condition and not focus on the ADHD diagnosis. In his recent book *Scattered Minds*,[23] Dr. Lenard Adler described a case from his practice in which he was treating a patient for major depression. After several years, the patient continued to have a partial response, and it was at this point that the patient was reexamined for ADHD. Although the patient had not endorsed attentional difficulties in school or at home as a child at the initial evaluation, when the patient was reexamined, a life-long pattern of procrastination emerged. After further probing, it became clear that the patient had ADHD along with severe depression. This scenario is not uncommon and demonstrates that clinicians should assess patients for ADHD when other comorbidities are diagnosed. Further, the possibility of an ADHD diagnosis needs to be revisited, particularly if there is an inadequate treatment response to the other comorbidities.

Other Issues That Impact on Making a Diagnosis of Adult ADHD

There are additional issues that lead to both the underdiagnosis and overdiagnosis of adult ADHD. As mentioned previously, the child-specific aspect of some of the ADHD symptoms and the requirement that symptoms occur prior to the age of 7 may lead to underdiagnosis. Perhaps a more common reason for underdiagnosis is the clinician simply not asking the questions to elicit the diagnosis. This may be due to not thinking of the diagnosis, not knowing the questions to ask, or believing that other psychiatric disorders take precedence. Most clinicians are taught to worry about severe depression, suicidality, psychosis, and severe anxiety. Given that the validity of adult ADHD as a diagnosis was questioned until a decade ago, the evaluation and treatment of adult ADHD were not commonly taught to most psychiatrists or internists during their medical training. Therefore, they may feel uncomfortable making the diagnosis, particularly for those patients that do not easily fit full DSM-IV criteria for ADHD. Similarly, as mentioned above, even those clinicians who are well acquainted with making the diagnosis may not consider it in patients with severe psychiatric symptoms.

There are other factors that might lead to overdiagnosis. Clearly, medical conditions that may mimic some of the symptoms of ADHD need to be ruled out. These include anemia and thyroid problems.[24] Also, symptoms need to occur in more than one setting. For example, if an individual has trouble concentrating at work, other factors such as job dissatisfaction need to be considered. Similarly, if a patient drives too fast but does not demonstrate any additional impulsive behavior in other situations, then his aggressiveness while driving may be due to other reasons. Importantly, many of the symptoms of ADHD are not uncommonly experienced by individuals without ADHD. The difference is that individuals with ADHD suffer substantial impairment from these symptoms. Therefore, if the clinician does not ensure that there is significant impairment in functioning, ADHD may be overdiagnosed.

Another less common reason for overdiagnosis is that some individuals may feign ADHD symptoms in order to get special consideration with test-taking. If there is strong insistence by the patient on focusing on test-taking diffi-

culties to the exclusion of other problems associated with having ADHD, then a higher index of suspicion regarding whether ADHD is present should be maintained.

Specific Diagnostic Issues for Patients With Substance Use Disorders

There are numerous factors that can complicate the diagnosis in substance abusers. If an individual is surreptitiously using alcohol or drugs, acute use or withdrawal symptoms may "mimic" ADHD and lead to overdiagnosis. The acute effects of cocaine can produce restlessness or agitation. Similarly, many substances such as alcohol, sedative-hypnotics, marijuana, nicotine, and cocaine can, when used chronically, produce restlessness and agitation during withdrawal.[25,26] Further, both nicotine and cocaine withdrawal can produce concentration difficulties.

In order to distinguish "substance-induced" ADHD symptoms from underlying ADHD symptoms, it may be helpful to complete 2 timelines, one for ADHD symptoms and another for drug use. For the ADHD symptoms, the timeline might include onset of symptoms, types of symptoms, and change in symptoms over time. For the drug use, the timeline might include onset of substance use, heavy substance use, problematic substance use, and periods of abstinence or low use. This allows the clinician to determine if the ADHD symptoms occurred prior to the drug use (for most individuals this should be the case) and during periods of abstinence. Symptoms that are not present during abstinence or "come and go" are not consistent with ADHD diagnosis. Another caveat to this is that many drugs can produce "substance-induced" depression. As mentioned previously, there are several symptoms that overlap with ADHD and depression. Thus, the difficulties in diagnosing ADHD in patients with substance use disorders may be compounded by the restlessness/agitation associated with withdrawal as well as the substance-induced depressive symptoms.

Although it is tempting, reliance on screening instruments alone (e.g., the Adult ADHD Rating Scale[27]) to determine if someone has ADHD, without a follow-up evaluation, can lead to overdiagnosis. This may be more likely in substance-abusing populations. Computer testing can provide useful ancillary information and show areas of dysfunction that may or may not be consistent with ADHD.[2] However, the utility of these tests in actively using substance abusers for the purpose of carrying out a diagnostic evaluation for ADHD has not been established. Also, since alcohol and drug use "runs" in families, a child growing up in a household with parents who use alcohol or drugs may exhibit a number of ADHD symptoms such as highly distractible, oppositional, and impulsive behavior and concentration difficulties. Thus, if current substance users endorse ADHD symptoms but are not asked about the familial context of the symptoms, childhood ADHD may be overdiagnosed.

Perhaps of greatest clinical concern is that substance abusers may feign ADHD symptoms in order to obtain stimulant medication. While this may occasionally happen and lead to "overdiagnosis," a more common problem is that individuals appropriately diagnosed with ADHD give or sell their medication to other individuals. This problem is particularly worrisome among college students.[28] College students who take nonprescribed stimulants are most likely to report using medication for concentration, although a substantial number will use stimulants to get high.[29] The long-acting formulations are less likely to produce euphoria and are the preferable formulations when stimulants are being considered for substance-abusing populations.[30,31]

Also, some general issues that lead to underdiagnosis of ADHD in adults are exacerbated in patients with substance use disorders. For example, although adults frequently have difficulty recalling symptoms prior to the age of 7, this may be compounded in adults who have cognitive deficits due to drugs such as alcohol, opiates, marijuana, or methamphetamine.[32–34] Further, abstinent alcoholics may have persistent deficits that make recall of childhood symptoms more difficult.[32] Whereas adults with ADHD may be able to obtain ancillary information from report cards or history from older family members to support ADHD symptoms in childhood, this may be less likely in substance abusers. They may be unable to obtain elementary or middle school report cards or have estranged relationships with their family such that ancillary information is less likely to be available.

While it is common for other severe psychiatric disorders to take precedence in a psychiatric evaluation, this may be even more likely in substance abuse treatment settings. In some treatment programs, psychiatrists are available to provide consultations, but often on a limited basis. Therefore, they may need to focus on evaluating patients for severe conditions that require immediate intervention. Needless to say, ADHD may go undetected. Further, there are numerous programs in which there is no psychiatric consultation. Counselors or other clinicians may be even less familiar than psychiatrists with assessing patients for ADHD or may lack the expertise to differentiate ADHD from other psychiatric disorders. These factors may also lead to low detection of this disorder. While some patients who enter substance abuse treatment programs report having been diagnosed with ADHD as a child, this remains uncommon.

CONCLUSION

There is clear evidence that ADHD is overrepresented in substance abusers. Further, ADHD exacerbates treatment outcome. Therefore, it is incumbent on clinicians to diagnosis ADHD, despite all the complicating factors associated with making the diagnosis in adults with and

without comorbid substance abuse. Although there are no specific diagnostic tests that conclusively make the diagnosis, there are clinical approaches that improve the likelihood of detecting the disorder. Clinicians who have expertise in diagnosing ADHD are sorely needed in substance abuse treatment settings. Clearly, recognition of this disorder is the first step in improved treatment.

Disclosure of off-label usage: The author has determined that, to the best of her knowledge, no investigational information about pharmaceutical agents that is outside U.S. Food and Drug Administration–approved labeling has been presented in this article.

REFERENCES

1. Barkley RA. Primary symptoms, diagnostic criteria, prevalence, and gender differences. In: Attention-Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment. 3rd ed. New York, NY: Guilford Press; 2006:76–121
2. Barkley RA. ADHD in Adults. In: Attention-Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment. 3rd ed. New York, NY: Guilford Press; 2006:248–296
3. Kessler RC, Adler L, Barkley R, et al. The prevalence and correlates of adult ADHD in the United States: results from the National Comorbidity Survey Replication. Am J Psychiatry 2006;163:716–723
4. Biederman J, Faraone SV, Spencer T, et al. Patterns of psychiatric comorbidity, cognition, and psychosocial functioning in adults with attention deficit hyperactivity disorder. Am J Psychiatry 1993;150:1792–1798
5. Mannuzza S, Klein RG, Bessler A, et al. Adult outcome of hyperactive boys: educational achievement, occupational rank, and psychiatric status. Arch Gen Psychiatry 1993;50:565–576
6. McGough JJ, Smalley SL, McCracken JT, et al. Psychiatric comorbidity in adult attention deficit hyperactivity disorder: findings from multiplex families. Am J Psychiatry 2005;162:1621–1627
7. Wilens TE, Dodson W. A clinical perspective of attention-deficit/hyperactivity disorder into adulthood. J Clin Psychiatry 2004;65:1301–1313
8. Clure C, Brady KT, Saladin ME, et al. Attention-deficit/hyperactivity disorder and substance use: symptom pattern and drug choice. Am J Drug Alcohol Abuse 1999;25:441–448
9. King VL, Brooner RK, Kidorf MS, et al. Attention deficit hyperactivity disorder and treatment outcome in opioid abusers entering treatment. J Nerv Ment Dis 1999;187:487–495
10. Levin FR, Evans SM, Kleber HD. Prevalence of adult attention-deficit hyperactivity disorder among cocaine abusers seeking treatment. Drug Alcohol Depend 1998;52:15–25
11. Schubiner H, Tzelepis A, Milberger S, et al. Prevalence of attention-deficit/hyperactivity disorder and conduct disorder among substance abusers. J Clin Psychiatry 2000;61:244–251
12. Faraone SV, Biederman J, Spencer TJ, et al. Diagnosing adult attention deficit hyperactivity disorder: are late onset and subthreshold diagnoses valid? Am J Psychiatry 2006;163:1720–1729
13. Mannuzza S, Klein RG. Long-term prognosis in attention-deficit/hyperactivity disorder. Child Adolesc Psychiatr Clin North Am 2000;9:711–726
14. Carroll KM, Rounsaville BJ. History and significance of childhood attention deficit disorder in treatment-seeking cocaine abusers. Compr Psychiatry 1993;34:75–82
15. Wilens TE, Biederman J, Mick E. Does ADHD affect the course of substance abuse? findings from a sample of adults with and without ADHD. Am J Addict 1998;7:156–163
16. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision. Washington, DC: American Psychiatric Association; 2000
17. Weiss M, Hechtman LT, Weiss G. ADHD in Adulthood: A Guide to Current Theory, Diagnosis and Treatment. Baltimore, Md: The Johns Hopkins University Press; 1999
18. Mannuzza S, Klein RG, Addailli KA. Young adult mental status of hyperactive boys and their brothers: a prospective follow-up study. J Am Acad Child Adolesc Psychiatry 1991;30:743–751
19. Barkley RA, Biederman J. Toward a broader definition of the age-of-onset criterion for attention-deficit hyperactivity disorder. J Am Acad Child Adolesc Psychiatry 1997;36:1204–1210
20. Ward MF, Wender PH, Reimherr FW. The Wender Utah Rating Scale: an aid in the retrospective diagnosis of childhood attention deficit hyperactivity disorder. Am J Psychiatry 1993;150:885–890
21. Weiss MD, Gadow K, Wasdell MB. Effectiveness outcomes in attention-deficit/hyperactivity disorder. J Clin Psychiatry 2006;67(suppl 8):38–45
22. Corkum P, Tannock R, Moldofsky H. Sleep disturbances in children with attention-deficit/hyperactivity disorder. J Am Acad Child Adolesc Psychiatry 1998;37:637–646
23. Adler L, Florence M. Scattered Minds: Hope and Help for Adults With ADHD. New York, NY: GP Putnam's Sons; 2006
24. Murphy KR, Gordon M. Assessment of adults with ADHD. In: Barkley RA, ed. Attention-Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment. 3rd ed. New York, NY: Guilford Press; 2006:425–450
25. Graham AW, Schultz TK, Mayo-Smith MF, et al, eds. Principles of Addiction Medicine. 3rd ed. Chevy Chase, Md: American Society of Addiction Medicine; 2003
26. Miller NS, Gold MS. Management of withdrawal syndromes and relapse prevention in drug and alcohol dependence. Am Fam Physician 1998;58:139–146
27. DuPaul GJ, Schaughency EA, Weyandt LL, et al. Self-report of ADHD symptoms in university students: cross-gender and cross-national prevalence. J Learn Disabil 2001;34:370–379
28. McCabe SE, Knight JR, Teter CJ, et al. Non-medical use of prescription stimulants among US college students: prevalence and correlates from a national survey. Addiction 2005;100:96–106
29. Teter CJ, McCabe SE, Cranford JA, et al. Prevalence and motives for illicit use of prescription stimulants in an undergraduate student sample. J Am Coll Health 2005;53:253–262
30. Kollins SH, Rush CR, Pazzaglia PJ, et al. Comparison of acute behavioral effects of sustained-release and immediate-release methylphenidate. Exp Clin Psychopharmacol 1998;6:367–374
31. Spencer TJ, Biederman J, Ciccone PE, et al. PET study examining pharmacokinetics, detection and likeability, and dopamine transporter receptor occupancy of short- and long-acting oral methylphenidate. Am J Psychiatry 2006;163:387–395
32. Bates ME, Bowden SC, Barry D. Neurocognitive impairment associated with alcohol use disorders: implications for treatment. Exp Clin Psychopharmacol 2002;10:193–212
33. Maxwell JC. Emerging research on methamphetamine. Curr Opin Psychiatry 2005;18:235–242
34. Pope GH Jr, Gruber AJ, Hudson JI, et al. Early-onset cannabis use and cognitive deficits: what is the nature of the association? Drug Alcohol Depend 2003;69:303–310

