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A Clinician's Guide to Co-occurring ADHD among Adolescent Substance Users: Comorbidity, Neurodevelopmental Risk, and Evidence-based Treatment Options

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Abstract

This article introduces neurodevelopmental and clinical considerations for treating adolescents with co-occurring Attention-Deficit/Hyperactivity Disorder (ADHD) and substance use (ASU) in outpatient settings. We first describe neurobiological impairments common to ADHD and ASU, including comorbidity with conduct disorder, that evoke a profile of multiplicative developmental risk. We then present two evidence-based options for targeting ADHD-related problems during ASU treatment. *Medication integration interventions* utilize family ADHD psychoeducation to prompt decision-making about ADHD medication and integrate medication management into behavioral services. Clinic-based *academic training interventions* utilize family interventions to improve the home academic environment and boost organization skills. We conclude with recommendations for ADHD assessment and intervention sequencing.

Keywords

Adolescent substance use treatment; ADHD; Medication; academic interventions

1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a behavioral disorder that is prevalent among adolescents who misuse substances and potentially impedes the course of adolescent substance use (ASU) treatment. It is therefore essential that ASU clinicians have access to effective interventions for ADHD that can be readily integrated into existing services. This article presents advances in the knowledge base on neurodevelopmental risk factors associated with co-occurring ADHD/ASU that can inform clinical diagnosis and treatment. It then describes two evidence-based behavioral treatment options for targeting ADHD-related problems during therapy: (1) *medication integration interventions* to prompt patient-

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centered decision-making about ADHD medication and integrate medication management into behavioral services; and (2) *academic training interventions* to improve the home academic environment and boost organization skills. It concludes with recommendations for enhancing ASU treatment planning for clients with ADHD.

2. Prevalence and Treatment Impact of ADHD among Adolescent Substance Users

2.1. Comorbidity Rates

Adolescents who meet diagnostic criteria for ADHD present well-documented behavioral deficits in attention, self-regulation, and social competence; academic deficits that include inconsistent attendance, poor grades, disruptive classroom behavior, and time management problems; a higher incidence of learning difficulties; and higher rates of other executive functioning deficits in areas such as cognitive flexibility, working memory, and processing speed (Barkley, 2006). Recent prevalence data gathered by the National Survey of Children's Health (Visser et al., 2014) indicate that 14% of children aged 11–17 have received an ADHD diagnosis at some point in their lives, confirming its status as the most common behavioral disorder among adolescents (Merikangas et al., 2011).

ADHD is also highly prevalent among adolescents enrolled in ASU treatment. Across a variety of treatment settings, estimates of ADHD comorbidity in ASU samples range from 25% to 66% (e.g., Chan, Dennis, & Funk, 2008; Gordon, Tulak, & Troncale, 2004; Turner et al., 2004). Based on national trends for average enrollment in ASU services, these data project that between 50,000 and 75,000 teenagers with ADHD are treated in the ASU care system annually (Substance Abuse and Mental Health Services Administration, 2007). These are conservative estimates of comorbidity prevalence given that ADHD is often underdiagnosed in adolescent samples (Sibley et al., 2012).

2.2. Developmental Co-Occurrence of ADHD and ASU

ADHD and ASU are strongly linked across the developmental span, accounting for the high comorbidity rates observed in adolescent clinical populations. As summarized by Molina and Pelham (2014), longitudinal studies of children diagnosed with ADHD confirm that this group has a greater likelihood of developing ASU problems than non-ADHD children. These authors also point out that studies of ASU development among children not diagnosed with ADHD have identified a core set of temperamental traits that strongly predict substance use (SU) risk and are highly correlated with (and in many cases, identical to) ADHD symptoms, including: impulsivity, hyperactivity, impersistence, and aggressiveness. Drawing from the substantial collection of studies linking ADHD-related traits to ASU risk, experts have proposed two overlapping developmental pathways from ADHD in childhood to substance misuse in adolescence. G*eneralized deviance proneness* suggests that ADHD-related impairments predict academic failure, social difficulties, and serious conduct problems that collectively elevate risk for exposure to deviant peer affiliations and environments, which ultimately predispose both ASU and other antisocial behaviors (Beauchaine & McNulty, 2013; Chassin, Colder, Hussong, & Sher, 2013; Molina & Pelham, 2014). *Substance use-specific risk* suggests that ADHD-related impairments predict

heterogeneous socioemotional difficulties (e.g., negative affect, impaired coping skills, conduct problems), risky expectancies about SU, and differential biological response to substance ingestion that collectively elevate risk for deviant peer affiliations and ultimately for ASU (Chassin et al., 2013; Molina & Pelham, 2014).

Many question whether the developmental link between ADHD and ASU is primarily mediated by conduct disorder (CD)—that is, whether ADHD predisposes ASU mostly because it strongly predisposes CD, which itself strongly predisposes ASU; or, whether ADHD strongly predicts ASU even among adolescents who do not develop CD. Reviews in this area (e.g., Lee et al., 2011; Serra-Pinheiro et al., 2013) have concluded that the direct association between ADHD and SU is modest once CD-related symptoms are controlled. However, longitudinal research on specific behavioral processes remains scarce, and studies that impose blanket statistical controls for shared ADHD-CD symptoms (e.g., impulsivity, aggression) may inadvertently mute direct relations between ADHD and SU (Molina & Pelham, 2014). Two exceptions stand out: (1) Sibley, Pelham, and colleagues (2014) found that both early (starting age 5) and later-developing ADHD and CD symptoms respectively conferred unique risk for ASU; furthermore, worsening of ADHD symptoms over childhood was the strongest predictor of growth in CD symptoms, which in turn was the most consistent predictor of ASU. (2) Howard and colleagues (2015) reported that ADHD symptoms and delinquency behaviors that worsened during adolescence subsequently predicted higher SU levels in early adulthood. Amidst this complexity stands the simple consensus that having both ADHD and CD in childhood confers much greater risk for ASU than having either condition alone (Sibley, Pelham, et al., 2014).

A concern frequently raised by clinicians and clients alike is whether using stimulant medications to treat ADHD during childhood has the adverse effect of increasing risk for ASU. At this time the specific developmental relation between childhood ADHD medication and ASU is not fully known. Several well-controlled longitudinal studies (e.g., Groenman et al., 2013) and naturalistic clinic-based studies (e.g., Hammerness, Petty, Faraone, & Biederman, 2012; Steinhausen & Bisgaard, 2014) have found that ADHD medication helps prevent ASU, and moreover, that earlier medication use may exert a stronger protective effect. However, a recent meta-analytic review of longitudinal studies concluded that medication neither increases nor decreases ASU risk (Humphreys, Eng, & Lee, 2013; see also Molina et al., 2013). Many experts underscore the lack of consistent evidence that long-term medication use significantly improves the ADHD-related problems that most directly predispose ASU (e.g., social maladjustment, school underperformance; Molina & Pelham, 2014). Others caution that longitudinal studies have not yet fully accounted for important moderating factors such as age of first medication use, medication compliance and duration, ADHD severity, and presence of psychiatric comorbidities (see Humphreys et al., 2013). Currently two conclusions are warranted: (a) It appears safe to say that medications for childhood ADHD *do not* increase the likelihood of substance misuse; (b) The jury remains out on whether childhood medication helps prevent ASU. Specific risks and guidelines for prescribing ADHD medications among substance-using teenagers are discussed below in the section on pharmacological treatment options for ADHD/ASU.

2.3. ADHD as a Moderator of ASU Treatment Success

Although ASU clinicians are invariably knowledgeable about the behavioral deficits associated with ADHD and the developmental risk it presents for ASU, they may not always recognize the urgency to incorporate targeted interventions for ADHD into treatment planning for ADHD/ASU youth. The course of treatment for ASU is significantly complicated by the presence of comorbid ADHD, in several ways (Mariani & Levin, 2007). Compared to substance users without ADHD, those with ADHD tend to transition more quickly from less severe to more severe use (Tapert, Baratta, Abrantes, & Brown, 2002), drop out of treatment earlier (Wise, Cuffe, & Fischer, 2001), have a more severe symptom course and worse treatment outcomes (Biederman et al., 1998), and return to substance use in greater numbers and more rapidly after treatment (Tomlinson, Brown, & Abrantes, 2004). For these reasons, the ultimate success of ASU interventions for comorbid clients may depend in large part on success in addressing their ADHD-related problems.

One large controlled trial tested a combined treatment package that directly targeted both ADHD symptoms and SU problems among comorbid youth. Riggs and colleagues (2011) randomized 303 adolescents into two treatment conditions: cognitive-behavioral therapy (CBT) for ASU plus stimulant medication for ADHD; or CBT for ASU plus placebo. Both conditions showed clinically significant declines in ADHD symptoms and illicit drug use. The combined group (CBT plus medication) showed better ADHD outcomes than the placebo group based on parent report but not teen report (though note that teens may be less accurate reporters due to their proclivity for underreporting symptoms [Sibley et al., 2012] and conflating their ADHD symptoms with other behavioral symptoms [Hogue, Dauber, Lichvar, & Spiewak, 2012]). The combined group was also superior in drug use reduction according to biological assays.

The above findings suggest benefits to integrating evidence-based interventions for ADHD into SU treatment planning for teens with dual diagnoses. Unfortunately, integrated treatment of this kind has proven elusive, for many reasons (Institute of Medicine, 2006). As one step to address this shortcoming, the following section introduces emerging research on neurodevelopmental risk factors associated with co-occurring ADHD and ASU. The section first describes neurobiological risk processes related to ASU; it then describes points of overlap with neurodevelopmental impairments common to ADHD that together evoke a profile of multiplicative risk for this comorbid group. This research area offers valuable insights to ASU clinicians for advancing integrated assessment and intervention strategies.

3. Neurodevelopmental Risk of Co-occurring ADHD and ASU

3.1. Developmental Neurobiology of ASU Risk: Dual Systems Model

The emerging field of developmental neuroscience (Spear, 2000), boosted by advances in genetics research and brain imaging technology, has contributed new insights to understanding substance use vulnerability among adolescents. Contemporary theories about ASU risk specify two levels of proximal risk that influence drug use behaviors. The first level pertains to *individual risk factors*: ASU vulnerability conferred by the personal characteristics of the given teen. The prevailing conceptual framework for individual ASU

risk centers on neurobehavioral disinhibition (see Tarter, Vanyukov, & Kirisci, 2008), a constellation of dysregulation factors across several domains of functioning that collectively predispose a given youth to ASU and related externalizing spectrum disorders (Beauchaine & McNulty, 2013). These factors include cognitive (e.g., impaired executive functions), affective (e.g., difficult temperament, emotional lability), and behavioral (e.g., impulsivity, aggression) characteristics—factors that overlap considerably with the developmental pathways from childhood ADHD to ASU described above.

The second level pertains to *developmental risk factors*: ASU vulnerability conferred by maturational characteristics common to adolescence. The prevailing conceptual framework for developmental risk is the dual systems model (Casey, Jones, & Somerville, 2011; Steinberg, 2008), which is familiar to many due to recent coverage in popular media focused on adolescent lifestyle and parenting issues (e.g., Kolbert, 2015; von Ogtrop, 2015). The dual systems model asserts that during the adolescent years, maturational changes in the brain's *motivation and reward system* (MRS) interact with changes in the *cognitive control system* (CCS) to shape risky behavior of all kinds, including ASU. The MRS is a distributed neural network with nodes primarily in the midbrain (especially the core limbic, ventral striatal [including nucleus accumbens], and medial prefrontal regions). MRS development, which is driven by remodeling of dopaminergic activity in early to middle adolescence, is linked to reward processing, value-based decision making, and pleasure seeking. The CCS includes nodes located primarily in the forebrain (especially the lateral prefrontal, parietal, and anterior cingulate cortices). CCS development, which is driven by synaptic pruning and gradual myelination of neural pathways throughout adolescence, is linked to self-regulation, planned behavior, and other executive functions (the above is detailed in Casey et al., 2011; Steinberg, 2007, 2008).

According to the dual systems model, adolescent decision-making about risky behavior is conjointly influenced by the propensity for reward-seeking combined with the capacity for self-regulation, which mature on different neurodevelopmental timetables (Dahl, 2004; Nelson, Leibenluft, McClure, & Pine, 2005; Steinberg, 2007). Around puberty, there is a spike in novelty- and reward-seeking, especially in the presence of peers, that abates in later adolescence; in contrast, improvement in the capacity for self-regulation occurs gradually over time during adolescence until adulthood is reached. The disjointed timing of these maturational processes make mid-adolescence a time of heightened vulnerability to risky behavior: The typical 14-to-16 year-old is like a new sportscar with powerful gas infusion but comparatively weak and slow-to-respond brakes (Steinberg, 2008). This view is borne out by a large accumulation of cognitive neuroscience research that describes the adolescent brain as characterized by under-estimation of risk, over-valuation of reward, deficient anticipation of and learning from punishment, and immature self-regulatory functions (see Albert & Steinberg, 2011; Casey & Jones, 2010).

3.2. Double Jeopardy: Multiplicative Risk for Adolescent Substance Users with ADHD

Continued advances in basic research on neurodevelopmental risk for ASU could have enormous implications for ASU interventions. Although several effective treatments exist for ASU, clinical effect sizes are small to moderate, and most clients show few lasting gains

(Hogue, Henderson, Ozechowski, & Robbins, 2014). Findings from research on the MRS and CCS, judiciously applied to clinical assessment and treatment procedures, may help shift the balance of success (for an excellent primer on these possibilities for adult SU treatment see Morgenstern, Naqvi, Debellis, & Breiter, 2013). Consider that SU problems for any given teen can be attributed to underdeveloped self-regulation, overactive reward-seeking, or both (Riggs & Greenberg, 2009). Theory-based assessment procedures for measuring ASU-related facets of MRS and CCS functioning in adolescent clients, coupled with hypotheses for tailoring interventions to better address specific motivational and cognitive characteristics that govern drug use and treatment response (Chacko, Kofler, & Jarrett, 2015; Conrod, Castellanos-Ryan, & Mackie, 2011), might be formulated, tested, and applied.

Advances of this kind in basic neuroscience are well underway. Neuroimaging studies of self-regulation among adolescent substance users has verified the prototypical presence of CCS impairment in both alcohol and cannabis users. For example, working memory paradigms have uncovered increased activity in basal ganglia, postcentral gyrus, precuneus, and superior parietal lobes, but decreased dorsal lateral prefrontal cortex activity in spatial memory tasks (Padula, Schweinsburg, & Tapert, 2007); increased hippocampal activity in associative memory tasks (Luijten et al., 2007); and increased parietal activation in a verbal working memory task (Jacobsen et al., 2007), relative to healthy controls. A response inhibition task showed increased activity in posterior parietal and prefrontal regions (Tapert et al., 2007), while a verbal encoding task showed decreased inferior frontal activity but increased dorsal frontal and parietal activity (Schweinsburg et al., 2010). Altogether these findings suggest that ASU is associated with over-recruitment of attentional, working memory, and executive neural resources during cognitively demanding tasks—earmarks of an immature behavior regulation system.

Contemporary neurobiological models of addiction also underscore the central role played by the MRS. One conceptual framework focuses on a shift in reward set resulting from substance-induced dysregulation in the brain’s reward system, specifically the mesolimbic dopamine, opioid, and stress hormone pathways (Berridge & Robinson, 2003; Koob & LeMoal, 2008). This framework posits that addiction entails hypersensitivity to drug-related cues and under-responsiveness to non-drug rewards (e.g., Nestor, Hester, & Garavan, 2010). A second framework focuses on substance-induced alterations in multiple neural networks characterized by weakening of inhibitory control functions in the frontocortical area combined with enhanced dopamine activity in the mesolimbic and mesocorticolimbic systems (Goldstein & Volkow, 2002; Kalivas & O’Brien, 2008)—a framework that aligns perfectly with the dual process model and demarcates adolescence as a critical period of vulnerability to the rewarding effects of drugs (Beauchaine & McNulty, 2013; Chambers, Taylor, & Potenza, 2003). With regard to adolescents specifically, animal studies suggest that juveniles are more sensitive than adults to the rewarding effects of substances and less sensitive to their aversive properties (Barron et al., 2005; Doremus-Fitzwater, Varlinskaya, & Spear, 2010), trends borne out so far in the small number of MRS studies with high-risk (e.g., Bjork, Chen, Smith, & Hommer, 2010) and substance-using (e.g., De Bellis et al., 2013) teens.

For substance-using teens with ADHD, dysfunctions in the MRS and CCS that are shared (to some degree) across the two disorders constitute a potent multiplicative risk profile. Like those with SU disorders, persons with ADHD demonstrate MRS deficits in the form of poor delay of gratification, preference for smaller immediate rewards over larger delayed rewards (delay discounting), and failure to modify behavior when faced with changing rewards (Sonuga-Barke, Bitsakou, & Thompson, 2010; Tripp & Wickens, 2008). Neuroimaging studies of brain processes among persons with ADHD provide confirmatory evidence of underactivity in the dopamine reward pathway (Volkow, Swanson, & Newcorn, 2010) and decreased nucleus accumbens activation (Strohle et al., 2008) when anticipating and receiving rewards. The pattern of shared dysfunction is similar for CCS deficits, wherein youth with ADHD, like those with SU, show immature inhibition and self-regulation capacities (Barkley, 2006; Bunford, Evans, & Wymbs, 2015; Sonuga-Barke et al., 2010) that have been linked via neuroimaging to dysfunction in the frontal and anterior cingulate cortices (for inhibition) and the prefrontal cortex and parietal and cerebellar areas (for attention; Hart et al., 2013).

Although these early findings point to several MRS and CCS impairments apparently common to ADHD and ASU, it is far too soon to label specific ADHD-related neurobiological deficits as uniquely or reliably predictive of ASU problems. Only a handful of neuroimaging studies have sampled comorbid ADHD/ASU youth, and these cannot easily disentangle the distal effects of childhood ADHD from the proximal neurocognitive effects of substance use. Also, several studies with ADHD youth have found no direct connection between CCS functioning and later SU (e.g., Groenman et al., 2015), suggesting that ASU initiation may not substantially exacerbate pre-existing executive dysfunctions among teens with ADHD (Tamm et al., 2013). Whatever the developmental sequence might be, the weight of existing evidence suggests that ADHD/ASU teens generally exhibit a wide range of deficits across the motivation and self-regulation spectra—deficits that have real-world implications for effective treatment planning.

3.3. Adopting Practical Solutions to Neurodevelopmental Problems

As the above findings make clear, most adolescents with ADHD who enroll in SU treatment have accumulated a “neurodevelopmental pileup” of risk: behavioral inhibition and executive functioning deficits throughout childhood; which interacted with a surging cascade of affective and social vulnerabilities; all of which bowled into normative imbalances between reward seeking versus behavior regulation in early to middle adolescence. It is an enormous challenge for teens with this formidable profile to steer back to healthy developmental tracks, and equally challenging for clinicians to identify and deliver interventions that help.

We contend that to optimize treatment success for adolescent substance users with ADHD, therapists need to systematically incorporate ADHD-targeted interventions into treatment plans. Three basic options are available to practitioners: (1) *cognitive enhancement* interventions to improve aspects of executive functioning; (2) *pharmacological* interventions to correct or compensate for imbalances in brain neurochemistry; (3) *behavioral or training*

interventions to reduce symptoms and/or enhance coping skills and developmental achievement.

Cognitive enhancement interventions are a category of ADHD training interventions (see Evans, Owens, & Bunford, 2014) designed to remediate executive functioning deficits in ADHD youth, particularly working memory (e.g., Beck et al, 2010; Chacko et al., 2013). In theory these interventions offer the most direct route to addressing deficits in CCS functioning associated with ADHD. Unfortunately they remain unproven for adolescents, given inconsistent efficacy among children (Chacko et al., 2013; Rapport, Orban, Kofler, & Friedman, 2013) and absence of testing with teens (Sibley, Kuriyan, et al., 2014). Chacko and colleagues (2014) assert that these interventions have misspecified the primary targets of training by focusing on short-term memory storage and rehearsal, rather than targeting neurocognitive deficits that are signature for youth with ADHD, such as central working memory and sustained attention (see also Rapport et al., 2013). They further suggest that improving the specification and potency of neurocognitive training can have both direct benefits—enhanced executive functioning—and indirect benefits—upgrades in the brain's cortical foundation itself that will allow youth to benefit more from skills-based behavioral interventions. That said, at this time cognitive enhancement interventions have a promising future but no immediate rewards for ASU clinicians.

The remainder of this article describes evidence-based interventions that ASU clinicians can readily adopt to address ADHD-related issues. It is quite common for behavior therapists treating ADHD/ASU youth to lament, "ADHD is a problem in brain functioning, what can I possibly do about it?" or "I don't think stimulant medication is a safe option for substance-using teenagers". Below we present clinical strategies in both the pharmacological and behavioral categories that represent practical solutions for front-line clinicians motivated to address ADHD. Note that the strategies presented in the pharmacological category are psychosocial interventions that behavior therapists can utilize to more effectively integrate ADHD medications (prescribed by a licensed provider) into behavioral treatment planning and ongoing psychotherapy sessions.

4. Evidence-based Pharmacological Treatment: Stimulant Medication

4.1. Putting ADHD Medications on the Table for ASU

Medication is an evidence-based option for treating ADHD in adolescents (American Academy of Pediatrics, 2011) and is considered an essential component of effective treatment planning for this population (Obioha & Adesman, 2014). Stimulant medications in particular have strong research support for adolescents. Rapid-acting stimulants such as methylphenidate (e.g., Ritalin), and extended-release formulations such as osmotic-release oral system methylphenidate (OROS-MPH, i.e., Concerta), have proven consistently effective in reducing ADHD symptoms and improving social functioning (Sibley, Kuriyan, et al., 2014). One study conducted in a high school setting documented medication effects on grades and academic habits, though effect sizes were smaller than typically found in controlled settings (Pelham, Smith, et al., 2013). Non-stimulant medications have also shown symptom reduction benefits for teens (e.g., Greenhill et al., 2006), and partial responders to stimulant medication may receive additional benefits from supplemental

medication (Kollins et al., 2011). Thus available data indicate that ADHD medication can have substantive effects in multiple domains for adolescents.

Much less is known about the effectiveness of ADHD medication for ADHD/ASU youth. A recent systematic review of treatments for adolescents with comorbid ADHD and SU disorders (Zaso, Park, & Antshel, 2015) identified 7 studies in total, all of which focused on medication interventions but only some of which included a behavioral treatment targeting SU (including Riggs et al. [2011], described above). The pool contained 2 studies testing extended-release stimulants, 2 testing immediate-release stimulants, and 3 testing non-stimulants. Findings were mixed overall, with some reductions reported for ADHD symptoms (support was strongest for extended-release stimulants) but no reliable decreases in SU. Based on the minimal evidence accumulated to date, stimulant medication can be considered a promising but not yet well established option for ADHD/ASU clients.

A headline factor in considering whether to utilize stimulant medication when treating ADHD/ASU youth is the potential for negative effects due to (1) adverse interactions with other ingested substances and (2) misuse or diversion of the prescription. Concerns about adverse interactions with alcohol or illicit drugs are not supported in existing studies. Among adults, prescribed stimulants for ADHD do not increase drug cravings among serious adult users (Mariani & Levin, 2007), although their therapeutic benefits for ADHD symptoms may be lessened when drug use is ongoing (for one example see Levin et al., 2008). Recent research on adults with ADHD and severe SU has been highly favorable for ADHD medication use: A naturalistic study found that medication was linked to gains in several SU-related outcomes (Muld, Jokinen, Bolte, & Hirvikoski, 2015), and a controlled trial demonstrated that potent medication doses combined with CBT produced improvement in both ADHD and SU problems (Levin et al., 2015). Among adolescents, ADHD medications have proven safe and well-tolerated among active substance users in the context of controlled research settings (Riggs et al., 2011; Zaso et al., 2015). Of course medication liability in everyday clinical settings is another matter. Stimulant medication misuse among college students, in the form of off-prescription use (e.g., ingesting large doses in order to increase wakefulness and/or cognitive stamina) or pill diversion (e.g., providing pills to another student), is commonplace and seemingly on the rise (Benson, Flory, Humphreys, & Lee, 2015). Stimulant misuse is thought to be a less common but still distinct risk among high school students (Kaye & Darke, 2012).

In an effort to curb the risk of stimulant misuse among ADHD/ASU youth, the American Academy of Pediatrics (2014) has crafted specific recommendations for prescribing and monitoring ADHD medications for substance-using adolescents. These “safe prescribing practices” include delivering SU psychoeducation and anticipatory guidance about prescription misuse; contracting with caregivers and teens to maintain an accountable pill monitoring system; and carefully tracking prescription records in pharmaceutical databases.

4.2. Barriers to Medication Uptake among All Adolescents with ADHD

With these cautions in mind, ASU providers are encouraged to consider the appropriateness of ADHD medication for clients who might benefit clinically (via symptom reduction) and developmentally (via improved social, and perhaps academic, functioning). As it stands

medications remain underutilized among all adolescents who meet full diagnostic criteria for ADHD. Just over half of teens who may benefit from ADHD medications actually receive them, compared with more than two-thirds of younger children (Visser et al., 2014). This developmental gap in quality care is even more pronounced among ethnic minorities (Yeh et al., 2014), with Hispanic and African American teens having significantly lower rates of ADHD medication prescriptions than their majority peers (Visser et al., 2014).

Many factors contribute to this developmental gap in medication services. As mentioned previously ADHD is routinely under-diagnosed among teens entering specialty care, which forecloses medication options for many youth with the most severe behavioral needs. Even among those correctly diagnosed, the widespread fragmentation of pharmacological versus behavioral services in routine care (Institute of Medicine, 2006) creates additional barriers to medication uptake. Behavior therapists are not routinely trained to access pharmacological services when ADHD symptoms constitute a secondary diagnosis or emerge after treatment begins (Sobell & Sobell, 2007). Also, few evidence-based resources exist to guide clinicians in merging medication interventions into behavioral treatment planning for teens (Bukstein & Cornelius, 2006). As a result families are often poorly informed about choices of available ADHD medications and the risk and benefits of each (Yeh et al., 2014), especially whenever behavior therapists themselves have insufficient knowledge about ADHD or harbor general biases against psychiatric medication (Murphy, 2005).

Finally, even among those families who receive competent psychopharmacology consultation, medication acceptance and compliance are difficult to achieve. Caregivers of children and teens alike much prefer behavioral intervention to medication as a primary treatment option (Smith, Waschbusch, Willoughby, & Evans, 2000). There are also several age-specific barriers. Compared to children, adolescents have increased sensitivity to medication stigma (Walker et al., 2008), bigger misperceptions about or disregard for medication effects (Pelham, Gnagy, et al., 2013; Pelham, Smith, et al., 2013), and less parental monitoring and influence on their daily self-care (Smith et al., 2000). For all these reasons, ADHD medication adherence declines precipitously from childhood through adolescence (Sanchez, Crismon, Barner, Bettinger, & Wilson, 2005), with up to 90% of ADHD-diagnosed teens either refusing or desisting medication by the end of high school (Sibley, Kuriyan, et al., 2014).

4.3. Promoting ADHD Medication Uptake among Teens via Patient-Centered Decision-Making

In order to reduce the medication quality-of-care gap for adolescents with ADHD, it is essential to develop innovative clinical procedures designed to support the integration of ADHD medication into behavioral care (Robin, 2014). Such procedures would enhance therapist confidence in addressing ADHD within their caseloads as well as supply basic clinical tools for working toward integration. Specifically, procedures are needed to (1) increase opportunities for families to make informed decisions about ADHD medication acceptance and (2) support family participation and compliance in medication regimens (Davis et al., 2012). This section describes two patient-centered, evidence-based strategies that can advance ADHD medication integration efforts in this manner: family ADHD

psychoeducation and family-based medication decision-making. It concludes by introducing an existing clinical tool that incorporates these strategies within a protocol that can be implemented by any outpatient clinician treating teens with ADHD.

Family ADHD Psychoeducation.—Family ADHD psychoeducation provides consumer-friendly information about prevalence rates, etiology and symptoms, course of the disorder, impacts on multiple domains of functioning, co-occurring problems, and individual differences associated with ADHD in adolescents (Robin, 2014). It sometimes includes collaborative clinical assessment of the individual profile of ADHD-related characteristics for the given teen (Hogue, Bobek, Tau, & Levin, 2014). ADHD psychoeducation has been shown to enhance medication and behavioral treatment effects (Lincoln, Wilhelm, & Nestoriuc, 2007) and improve treatment adherence (Vieta, 2005) and medication compliance (Cummings & Fristad, 2007) for clients with a variety of co-occurring mental health problems. Family-focused psychoeducation models (i.e., parent-only or conjoint parent-youth sessions) have proven helpful for youth who are prescribed psychiatric medication (Fristad, 2006), including medications for ADHD (Lopez et al., 2005; McCleary & Ridley, 1999). Family ADHD psychoeducation has also shown direct positive effects on ADHD symptom reporting and prosocial functioning (Ferrin et al., 2014).

Family-based Medication Decision-Making.—Family-based medication decision-making interventions, in which family attitudes about medication are systematically processed in the context of collaborative benefit-cost decisions about treating ADHD, are essential for facilitating patient-centered decisions about medication use among teens. This is especially true for ADHD, a “preference-sensitive” condition in which no single treatment option is considered a good fit for all youth (Davis et al., 2012). ADHD medication selection is related to caregiver beliefs about ADHD etiology, in that parents who ascribe ADHD to primarily physical causes are more prone to favor medication use (Yeh et al., 2014). Importantly for clinicians, beliefs about the causes of ADHD can be mutable over time when families engage in active decision-making with providers (Davis et al., 2012). Family factors also heavily influence ADHD medication acceptance among teens (Smith et al., 2000) and factor prominently in safety and polypharmacy issues associated with prescribing medications to at-risk youth (Kollins, 2007). And as mentioned previously, the primary reason for ADHD medication desistance among adolescents is lack of teen motivation to continue (Sibley, Kuriyan, et al., 2014). Thus there is growing focus on the benefits of active involvement by adolescents as well as caregivers in structured decision-making processes that target ADHD stigma and medication receptivity (Bussing et al., 2011; Schachter, Tharmalingam, & Kleinman, 2011). Several family therapy models for adolescent behavior problems contain interventions explicitly designed to engage teens in treatment participation (e.g., Liddle, 1995); such interventions are ideal candidates for boosting the effectiveness of medication decision-making (Hogue, Lichvar, & Bobek, 2015).

Existing Clinical Tool: Medication Integration Protocol (MIP).—MIP is a family-based protocol designed to integrate medication services into behavioral treatment planning for adolescents with ADHD (Hogue, Bobek, et al., 2014). It contains five modular tasks. In *ADHD Assessment & Medication Consult*, therapists consult with prescribers to confirm

ADHD diagnosis and medication eligibility; they also help families understand the results of psychiatric evaluation. In *ADHD Psychoeducation & Client Acceptance*, therapists and families review ADHD psychoeducational materials to prompt interactive discussions about key ADHD issues, promote basic acceptance of the condition and practical expectations for change, and complete checklists of ADHD-related personality characteristics and common impairments in three domains (family, school, peer) in order to generate each teen's unique "ADHD profile". In *ADHD Symptoms & Family Relations*, therapists engage teens as active participants in remaining therapeutic activities, address negative attributions about ADHD-related behavior by highlighting mislabeled causes ("relabeling"), redefine adolescent referral problems as family problems with potential family solutions ("reframing"), assess home environment characteristics that might support or impede treatment success, and gauge family readiness to make therapeutic changes. In *ADHD Medication & Family Decision-Making*, therapists educate families about potential benefits and side effects of ADHD medications in various contexts (home, school, peer), detail the trial-and-error approach to medication dosing, raise issues regarding stigma and medication misuse, and collaborate with families to process key factors that inform decisions about medication fit. In *Medication Management & Integration Planning*, for families that initiate medication, therapists play a lead role in case coordination for medication management that is tailored to each family, with therapists and prescribers working in integrated fashion to support prescription compliance and monitor benefits and side effects. Pilot study results (Hogue et al., 2015) support the implementation feasibility of MIP and its positive impact on ADHD medication utilization (medication evaluation, acceptance, and duration) in routine outpatient behavioral care.

5. Evidence-based Behavioral Treatment: Academic Training Interventions

5.1. Medication May Not Be Enough to Improve School Functioning for Teens with ADHD

The confluence of poor attention and self-regulation, learning difficulties, and for many, executive functioning deficits creates a profile of compounded impairment that compromises school performance among most adolescents with ADHD (Barkley, 2006). Unfortunately, at this time there is little compelling evidence from controlled or naturalistic research that, beyond the indirect benefits of symptom reduction, ADHD medications meaningfully improve school functioning in teens. For example, the landmark Multimodal Treatment of ADHD (MTA) controlled trial found that children assigned to a stimulant medication regimen who were still taking medication 6 to 8 years later showed virtually no advantages in academic functioning over study youth who were no longer taking medication, with the exception of math achievement scores (Molina et al., 2009). A meta-analysis of longitudinal naturalistic studies found that ADHD medication produced minimal gains in standard scores and negligible effects on school grades and retention across the age span (Langberg & Becker, 2012). Certainly, medication compliance is a complicating variable in all such research—for example, MTA studies document that only 30–45% of participants reported taking medication on at least half the prescribed days (Langberg et al., 2011; Molina et al., 2009)—and few studies contain sufficiently detailed data to examine variability in compliance levels and duration, or sufficient power to test medication effects in high-compliance subgroups. Even so, current best practices suggest that in order to boost school

performance among teens with ADHD, clinicians should provide evidence-based academic interventions that directly target scholastic outcomes.

5.2. School-Based Training Interventions: Meeting the Academic Needs of Teens with ADHD

Evidence-based psychosocial interventions for childhood ADHD can be separated into two broad treatment approaches: behavior management (BM) and training interventions (TIs; Evans et al., 2014). BM, which promotes behavior change by manipulating contingencies in the target environment, has been a well-established approach for childhood ADHD for over two decades and includes strong empirical support for several BM models, notably behavioral parent training, behavioral classroom management, and behavioral peer interventions. However, the wealth of evidence demonstrating BM effectiveness is restricted to children between 4 and 12 years of age (Evans et al., 2014). Moreover, BM interventions for adolescents face steep implementation barriers: teens are monitored by adults less closely than younger children; identifying salient behavioral rewards for adolescents is challenging; and in school settings, numerous teachers interact with teens throughout the school day, with individual teachers seeing students for relatively brief amounts of time. It therefore appears doubtful that BM can be readily adapted to address school functioning in the older age group (see Fabiano et al., 2009).

In contrast, TIs induce change primarily by improving the skill set of the child. TIs include social skills training programs, which have been tested in various formats for decades but are not generally successful for ADHD youth (Evans et al., 2014), and an emerging roster of academic skills training programs (e.g., Abikoff et al., 2013; Ciesielski, Tamm, Vaughn, Cyran, & Epstein, 2015). Academic TIs, which impart both general organization skills and specific academic skills (e.g., note taking, school materials organization, homework planning), are now well-established for children with ADHD and considered highly promising for teens as well (see Evans et al., 2016; Evans, Schultz, DeMars, & Davis, 2011; Langberg et al., 2012).

5.3. Adapting Academic Training Interventions for Outpatient Settings

Academic TI studies for adolescents with ADHD remain planted almost entirely in school settings (Evans et al., 2014). Yet it is usually impractical for ASU clinicians to refer clients to school-located TIs given that such programs exist in very few school districts. Also, substance-using adolescents are often disengaged from school or otherwise unprepared to benefit from school-based TIs due to compromised home environments that cannot easily support the generalization of newly trained skills. Recently a handful of models have surfaced that adapt school-based academic TIs, which are usually provided over several months of the school year, for delivery in outpatient care settings over 8–16 treatment sessions. These clinic-based academic TIs share a cornerstone element that distinguishes them from school-based versions: They hinge on family engagement and emphasize family-focused clinical interventions. Clinical family interventions are well-positioned to overcome fundamental limitations in the clinical reach of school-based TIs. They can directly target parent and youth motivation for school involvement among teens enrolled in outpatient care but disconnected in whole or part from school (Hogue & Liddle, 2009). They are also an

appropriate vehicle for intervening in the family processes and overall home ecology of adolescents with ADHD in order to engineer more productive homework routines and stronger family-school connections (Robin, 2014). This includes incorporation of BM interventions (e.g., behavior contracting) as needed to promote school attendance among truant teens. In this manner clinical family interventions can be leveraged to prepare the home soil so that academic TIs for ADHD/ASU youth can take proper root.

Two academic TI protocols developed specifically for high school students with ADHD appear most suitable for delivery in clinical settings with ADHD/ASU clients. Supporting Teens' Academic Needs Daily (STAND;Sibley et al., 2016) is an 8–10 week protocol that utilizes separate and conjoint caregiver and adolescent sessions to provide behavioral training in parenting skills, teen organization skills, homework management, and family problem-solving. STAND has produced promising results in both individual (Sibley et al., 2016) and group (Sibley, Altszuler, et al., 2014) formats. Changing Academic Support in the Home for Adolescents with ADHD (CASH-AA: Hogue, Bobek, & Evans, 2016) is a four-module protocol that utilizes family and individual sessions to improve school performance. *Module 1 ADHD Psychoeducation* assesses family educational background and current school functioning, and educates family members about links between ADHD and academic performance. *Module 2 Motivation and Preparation* engages adolescents as active participants in improving school performance, assesses home environment characteristics that support or impede school success, and determines caregiver and adolescent readiness to make changes in the home academic setting. *Module 3 Behavior Change* implements family-centered interventions designed to boost school attendance (as needed), collaboratively develops a homework management plan to incrementally increase the amount of distraction-free time spent nightly on school assignments, and helps the teen create an efficient system for organizing school assignments and materials. *Module 4 Therapist-Family-School Partnership* provides family education and advocacy training on special education rights and school-based services, and assists families in solidifying partnerships with in-school advocates to monitor education plans and academic progress. Although these models await rigorous testing to validate their effectiveness, both STAND-G and CASH-AA have the twin virtues of containing (1) academic TI components that are empirically supported for adolescents with ADHD and (2) standardized intervention modules and fidelity procedures ready for delivery in outpatient care.

6. Enhancing ASU Treatment Planning for Teens with ADHD

6.1. Assessing Academic, Learning, and Family Functioning at Clinical Intake

The above sections detail various evidence-based interventions for ADHD that can be incorporated into routine behavioral services for ASU. Certainly, quality treatment for ADHD/ASU youth begins with multidomain assessment of ADHD and SU symptomatology along with related areas of functioning (American Academy of Pediatrics, 2014). We have three recommendations for assessing ADHD-related functioning in ASU clients. First, whenever possible clinicians should gather academic assessment data directly from school personnel. This enables clinicians to make a confident and specific ADHD diagnosis, obtain reliable data on history and current standing of school performance indicators, and track

documented changes in school functioning. Second, clinicians should ensure that ADHD/ASU clients are assessed for learning deficits, which have high rates of co-occurrence among youth with ADHD (see McGrath et al., 2011). Keep in mind that only licensed educational practitioners can validly assess learning disabilities; most school districts offer this service as part of individualized educational planning for students with special needs. Third, clinicians should carefully review, or systematically collect, intake assessment data pertaining to prior treatment utilization and baseline family functioning. This information sets the course for informed treatment planning and provides an invaluable head start for the many family-focused interventions described above.

6.2. Assuming a Leadership Role in Integrating ADHD Medications into Behavioral Services

Although the vast majority of ASU clinicians are not certified to prescribe medications, they can still be well positioned to play a lead role in fostering integrated delivery of ADHD medications for ADHD/ASU clients if they expand their traditional duties in two ways (as detailed in MIP; Hogue, Bobek, et al., 2014). First, they must acquire reasonable fluency in the types, dosing algorithms, anticipated effects, and potential side effects of ADHD medications for teenagers. This will allow them to consult knowledgably with prescribers, work effectively to assist families in medication decision-making, and appraise the ongoing clinical impacts of medications on behavioral issues they customarily track in therapy sessions (Robiner, Tumlin, & Tompkins, 2013). Acquiring such fluency is quite feasible for motivated behavior therapists. Numerous self-education resources on ADHD medications for adolescents are designed for non-medical clinicians (e.g., Dendy, 2000, 2006), including online distance learning courses that offer consumer certification (e.g., www.dcplearner.com/chadd_ceu).

Second, non-prescribing behavior therapists should assume a lead role in coordinating treatment goals and case activities shared among the family, therapist, and prescriber. Because behavior therapists invariably have more frequent contact with families and more extensive knowledge about diverse areas of client functioning than prescribers, they have best vantage for integrating services across disciplines and settings. This expanded liaison role is not new territory for behavior therapists; case coordination models for multidisciplinary clinical teams are widely practiced (e.g., Mitchell, Tieman, & Shelby-James, 2008). Coordinated pharmacological and behavioral intervention planning for ADHD/ASU youth includes: gaining family consent for therapist and prescriber to consult regularly about issues that arise in either therapy or medication management sessions and bear upon medication titration, compliance, and liability; working to establish a coordinated service plan to support medication maintenance; minimizing client burden related to keeping appointments with multiple providers; involving the prescriber as indicated in therapy sessions; and involving him/herself as needed in monitoring medication benefits and side effects, especially as client sessions with the prescriber become less frequent.

7. Summary: Sequencing ADHD Assessment and Treatment Activities for ADHD/ASU Youth

This article introduces neurodevelopmental and clinical considerations for treating adolescents with co-occurring ADHD and SU problems in outpatient care and describes clinical strategies and resources that can enhance treatment planning for this challenging population. Figure 1 summarizes a recommended sequence of assessment and treatment activities, with the caveat that ADHD intervention selection and timing should be tailored to meet the unique needs of the given client, and that ADHD interventions should be suitably prioritized within the governing context of a multicomponent ASU treatment plan. Equally important, decisions about treatment options for ADHD/ASU youth can be robustly informed by knowledge of neurodevelopmental risk factors that impact clinical presentation and treatment success.

As depicted in Figure 1, clinical intake procedures should include diagnostic assessment of ADHD for every adolescent presenting with SU problems. Those meeting ADHD criteria should be assessed for school problems, learning deficits, and baseline family functioning. ASU clinicians should then initiate ADHD treatment activities by providing family ADHD psychoeducation and compiling each teen's unique profile of ADHD-related problems and personality characteristics. These activities create a springboard for discussing the family's academic motivations and the home academic environment; when indicated, clinical family interventions can be used to fruitfully engage the teen in treatment planning for ADHD-related problems, particularly school attendance and performance. Once academic-focused treatment goals are established, academic training interventions can be delivered, along with interventions to strengthen the family-school partnership as needed. Concurrent with academic TIs, clinicians can initiate family-based medication decision-making (which is useful even for families already possessing an ADHD prescription); for those accepting medication, medication integration interventions should be woven throughout the remainder of treatment. To access specific guidelines and practical tools for any of the ADHD intervention activities described in Figure 1, clinicians are encouraged to obtain and put into practice the various clinical resources cited in this article, which are designed to enrich treatment planning and improve clinical outcomes for ADHD/ASU cases.

Finally, the most important ingredient of effective treatment planning for co-occurring ADHD must not be overlooked: patience. Due to the pileup of neurodevelopmental risk, adolescents with ADHD have typically experienced a veritable lifetime of delays, missteps, and sometimes outright failures to meet developmental milestones. Thus initiating a medication regimen or homework management plan will not lift grade point averages higher overnight. It may take months, or years, for consistent adherence to ADHD medication and/or behavioral interventions to produce reliable gains in social and academic functioning. For immediate impacts ASU clinicians can look instead for increases in client hopefulness ("I think this could really help"), confidence ("I feel like I have a better handle on things now"), and symptom moderation ("I can pay attention longer"; "I get more much work done at night") as essential preludes to longer-term developmental successes.

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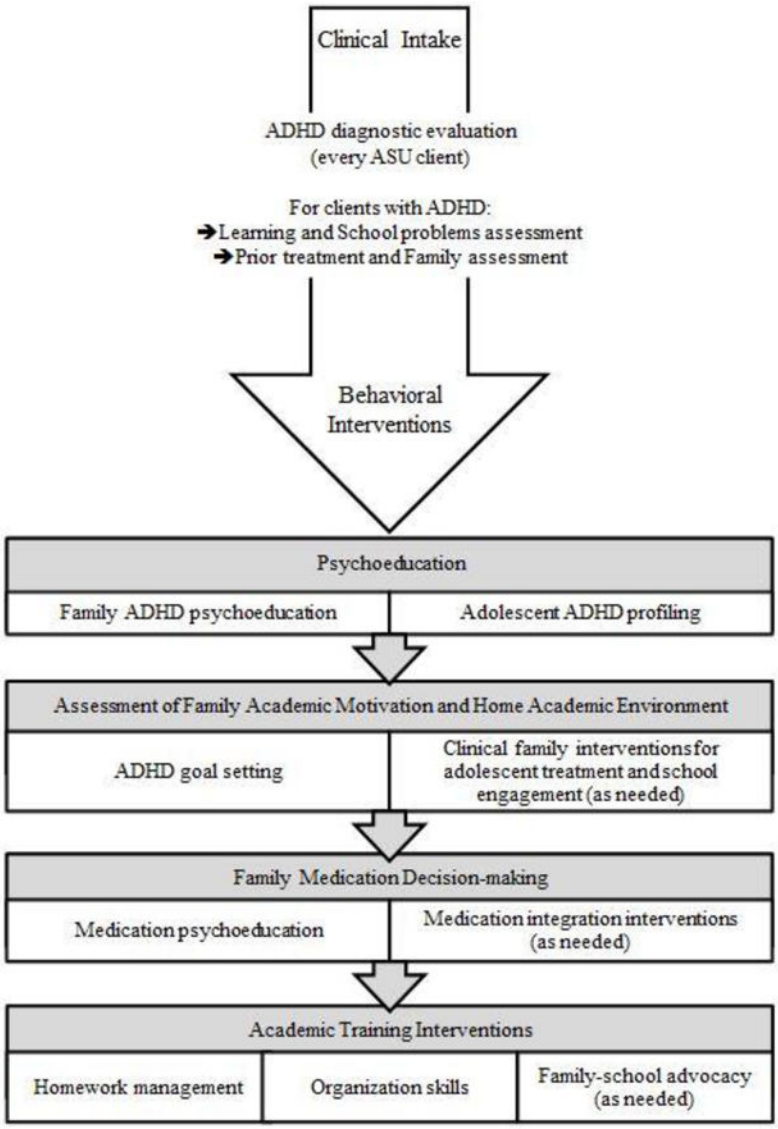

Figure 1.

Sequence of ADHD Treatment Planning Activities for Adolescents with Comorbid ADHD/ASU.