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DIAGNOSIS AND TREATMENT OF ADHD DURING ADOLESCENCE IN THE PRIMARY CARE SETTING: REVIEW AND FUTURE DIRECTIONS

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Abstract

Introduction—Attention deficit hyperactivity disorder (ADHD) is a chronic neurodevelopmental disorder with a worldwide prevalence of about 5% in school age children.

Objective—The goal of this review is to assist primary care providers (PCPs) in diagnosing and treating ADHD in adolescents.

Methods—PubMed, PsychInfo and Science Citation Index databases were searched from March 1990–2015 with the key words: attention deficit hyperactivity disorder, primary care/pediatrics and children/adolescents, abstracts addressing diagnosis and/or treatment with 105 citations identified including supplementary treatment guidelines/books.

Results—Adolescent ADHD presents with significant disturbances in attention, academic performance and family relationships with unique issues associated with this developmental period. Diagnostic challenges include the variable symptom presentation during adolescence, complex differential diagnosis and limited training and time for PCPs to conduct thorough evaluations. The evidence-base for treatments in adolescence in comparison to those in children or adults with ADHD is relatively weak. Providers should be cognizant of prevention, early

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identification and treatment of conditions associated with ADHD that emerge during adolescence as substance use disorders.

Conclusions—Adolescent ADHD management for the PCP is complex, requires further research, and perhaps new primary care-psychiatric models, to assist in determining the optimal care for patients at this critical period.

Keywords

ADHD; adolescent; attention deficit hyperactivity disorder; primary care; treatment; evaluation

Introduction

Attention deficit hyperactivity disorder (ADHD) ¹ is a neurodevelopmental disorder with prevalence rates in school-aged children of about 5% worldwide ² and 7–9% in the United States ³. Primary Care providers (PCPs), including pediatricians, family medicine and other physicians, nurse practitioners and mid-level professionals are increasingly, screening and treating ADHD. There is some concern that insufficient training for PCPs caring for these youth contributes to the increasing prevalence rates for the diagnosis and treatment of ADHD ⁴, which calls for greater education for PCPs serving persons with ADHD. Reviews addressing the assessment and management of pediatric and adult ADHD ^{5,67} in primary care have been published though none of these have focused on adolescents. Given the unique challenges in assessing and managing ADHD in this age group, a focused review addressing adolescent ADHD can fill this gap. About 80–85% of pre-teens continue to experience symptoms into the adolescent years and 60% into adulthood ^{8–10}. Adolescents with ADHD have difficulties in sustaining attention in routine tasks ¹, academic performance ¹¹, peer relations (e.g., increased victimization), and family cohesiveness ^{12–15}. Untreated patients have higher rates of risky sexual behaviors ¹², suicidal thoughts in college ¹⁶, incarcerations ¹³, automobile accidents ^{17,18}, occupational difficulties and medical burden ¹⁹. They have lower self-esteem, social functioning, economic achievement and higher rates of substance use ^{20,21}. Medical problems include smoking, obesity, non-adherence and comorbid medical illnesses ¹⁹. These risks associated with ADHD lead to a higher demand for assessment and treatment in the teenage years and the primary care setting is at the heart of service delivery ^{22–24}. Pediatricians and family medicine providers are increasingly conducting more screening, treating more patients and maintaining treatment longer ²⁵. However there is wide variability in the care provided by pediatricians for mental health issues ²⁶. In order to provide optimal care for adolescents with ADHD, PCPs have to consider symptom progression and treatment interventions in adolescence and adulthood within a developmental framework. There are two key junctures of care transitions: 1) the child's transition to a health care system geared for adolescents; and 2) the adolescent's transition to the adult system that may be less familiar with the disorder. Child-adolescent-adult systems are beginning to employ the use of a range of ages (e.g., 18–21), rather than stopping at a fixed age (e.g., 18 years) in recognition of these challenges. Regardless, the care plan is more complex and often requires a multidisciplinary approach, including input from mental health, primary health, education/vocation, social services and legal/correctional perspectives.

The goal of this review is to identify challenges to the evaluation and treatment of adolescents for ADHD in the primary care setting and present findings to inform a course to address those challenges. We begin by discussing the most common challenges encountered by PCPs in working with adolescents with ADHD. Next, we describe a suggested developmental framework to assist in the diagnostic and treatment decision-making. Specific diagnostic and treatment quandaries as well as potential solutions are presented followed by a discussion of practical aspects of treatment modalities for adolescents. Finally, we provide a guide for referring adolescents to a specialist, because even with the best efforts, expertise by a care provider with specialized training in adolescence and ADHD may be necessary.

Common Challenges

There are many factors that affect PCPs' comfort and ability to screen, diagnose and treat adolescent ADHD. Historically, treatment providers thought children outgrew ADHD during adolescence. By the 1990s, longitudinal studies²⁷⁻³² firmly established that ADHD persisted for a significant number of children through adolescence into adulthood²⁰ and is associated with significant disability³³⁻³⁶. Furthermore, many are uncomfortable prescribing stimulant medication, the best supported treatment for ADHD due to concerns regarding lack of documentation of the disorder³⁷.

Unfortunately, there is no standardized acceptable minimum of training via didactics, supervised caseloads or access to peers/specialists to which PCPs are exposed to in order to continue learning about ADHD over the lifespan³⁸. Over 90% of pediatricians report familiarity with published ADHD guidelines though only about 60% of family physicians acknowledge fluency with the basic guidelines for the disorder³⁹. The most significant barriers cited for making the diagnosis were limited experience with ADHD in adults and difficulty in distinguishing ADHD from other conditions⁴⁰. All of this may lead PCPs to view ADHD as a disorder outside of their scope of practice. It may also result in PCPs missing diagnoses when they are warranted.

Further, ADHD during adolescence may be challenging for the PCP to diagnose and treat because the most noticeable, observable symptom associated with the disorder, hyperactivity, wanes in adolescence, and other hallmark symptoms, impulsivity and inattention, may be hard to distinguish from typical adolescent behavior. Furthermore, demands for all adolescents grow with expected increases in responsibility, planning, future-orientation and organization, yet these are the key areas that are problematic for those with ADHD. Thus, it can be difficult to determine if the adolescent is exhibiting "typical immaturity" within the range of the healthy adolescence or ADHD. The consequences of poor inattention and higher risk taking during the adolescent years can have profound long-term impact for both teens with or without ADHD. Thus, these issues warrant careful consideration, but determining whether or not they are associated with ADHD will guide the type of intervention required.

Developmental Framework

Development viewed from a bio-psycho-social framework can help explain the changes of adolescence and their impact on ADHD including gender-based differences. Normative biological development includes hormonal and physical changes with a tendency for sexual and substance experimentation^{41,42} that may partially be driven by a relatively immature prefrontal cortex and/or a heightened reward sensitivity^{43–45}. Psychologically, teens grapple with forming a sense of identity with an increasing need for independence, while managing internal and external (family, peer & societal) expectations. Sexual maturity with a growing focus on interpersonal relationships becomes increasingly prioritized. There is greater sensitivity to peer evaluation and a heightened degree of emotional intensity associated with activation in socio-affective brain regions and circuits⁴⁶. In today's environment, access to technology, such as cell phones and tablets, presents new modes for immediate gratification that may have serious consequences for the adolescent with ADHD. The overlay of ADHD on top of typical adolescent development presents additional challenges. The core symptoms of ADHD and their presentation in the context of adolescence are described in Table 1.

Gender differences

In addition to stage of development, the sex of the adolescent can also impact the diagnosis of ADHD and its symptom expression. Males are more likely to be diagnosed with ADHD during childhood due to the predominance of hyperactivity/impulsivity symptoms, while females are more likely to be diagnosed with ADHD, inattentive presentation^{21,47}. Differences in the rates of diagnosis between males and females decline during adulthood, with an approximately equivalent rate of women receiving the diagnosis as men⁴⁸. Thus, it is likely during adolescence that ADHD symptoms become more prominent in females that may not have been evident during childhood.

Diagnosis of Adolescent ADHD

Diagnostic challenges

ADHD impacts functioning at home, school and other social settings in complex ways and requires coordination between multiple players/providers creating challenges in diagnosing and treating ADHD^{37,49}. Inattention is often the predominant symptom during adolescence²⁰, yet impulsivity and hyperactivity may be present in more subtle ways. Parents and teachers expect greater independence around completion of school work in the teen years. Organizational impairments may increase in severity when the patient has to manage being in multiple classrooms, being taught by several teachers and being required to use a locker. Academic underachievement becomes a significant concern for parents who are often apprehensive about their adolescent's potential for graduating high school and being admitted to college. PCPs are advised to ideally obtain input from all the involved parties: family, agency, teacher(s) and/or after school program staff. Adolescents are key contributors to the evaluation for their ADHD and good reporters about their negative social behaviors⁵⁰, however, they are not reliable and valid reporters of their ADHD symptoms. Collecting and integrating information from the teen, parent(s) and school personnel to make an accurate diagnosis and treatment plan is often a significant barrier to successful

management in primary care. The “myADHDportal®”⁵¹ is an important tool that aggregates information via an online system. The product provides basic information for parents and teachers (e.g., education resources and referral lists) and also facilitates communication, automatically scores ADHD rating scales and provides personalized health information. Use of the portal increases implementation of American Academy of Pediatrics-recommended care practices and improves the quality of ADHD treatment in community-based settings^{51,52}.

When considering a diagnosis of ADHD, it is important to screen for other disorders and factors that can mimic ADHD, such as stress and poor sleep. Adolescents tend to underreport symptoms^{50,53} and parents may be less accurate in rating symptoms as they often spend less time with teens than they do with younger children²³. There are prominent rates of co-morbidity with learning, mood^{54,55} and anxiety disorders, which cloud the presentation and diagnosis. Furthermore, delinquency and interpersonal conflict become more prevalent during this developmental period. With DSM-5, autism may also now be diagnosed with ADHD. It is crucial to arrive at a correct diagnosis(es), as an antidepressant used for the wrong disorder (e.g., bipolar disorder) could lead to symptom exacerbation or a misdiagnosis. Screening for substance use (SU), including prescribed medications, is critical with adolescent patients. ADHD is highly comorbid and predictive of substance abuse^{56–59} related to alcohol, marijuana and other drugs. SU often is higher in ADHD^{60–62} as persons with ADHD use illicit substances with less awareness of their negative effects^{63,64}. Environmental context also affects vulnerability for SU in ADHD, including low parental monitoring and warmth^{65–67} as well as peer group affiliation and rejection⁵⁴. Thus, interview questions or observations regarding parent-child interactions and peer group affiliation may be helpful.

Finally, parents often have questions regarding the readiness of their teen with ADHD for automobile driving. ADHD is associated with a number of negative driving outcomes including more accidents, citations, poor driving habits and skills²⁰. Thus, assessing the readiness of adolescents with ADHD to drive an automobile is a critical issue and the PCP should be ready to have frank discussions about the risks and readiness for a teen with ADHD to be driving.

The fairly recent publication of the Diagnostic and Statistical Manual¹ is more responsive to some of the challenges in diagnosing ADHD in adolescence and emerging adulthood. Similar to the previous DSM, in DSM-5, adolescents must still meet criteria for at least 6 symptoms from one of the symptom lists for inattention and/or hyperactivity/impulsivity. A change in this edition, is that persons 17 years or older can be diagnosed with ADHD with fewer symptoms (i.e., 5 instead of 6). Another, significant change from the earlier version, which required presentation before age 7, is that symptoms need to be present prior to 12 years of age. These symptoms do not need to cause impairment at younger ages with impairment at the time of evaluation being the only requirement. This last change recognizes that symptoms may change over time and become problematic during adolescence and may not have reached that threshold earlier in childhood.

The majority of rating scales used with children also have normative information for adolescents, including the ADHD:RS DSM 5⁶⁸, Conners' Parents and Teachers Rating Scales⁶⁹ and several others. Most ADHD rating scales screen for depression and anxiety, such as the Vanderbilt⁷⁰ and these items should be closely reviewed. Other measures such as the Child Behavior Checklist⁷¹ or Behavior Assessment System for Children⁷² provide a broader evaluation of functioning and have subscales to assess co-morbid issues. PCPs may also find a review of the adolescent's report cards from their child's elementary school years helpful to substantiate a history of ADHD symptoms before the age of 12 years of age and assist in establishing the trajectory of the symptoms. PCPs should also be aware of "Sluggish Cognitive Tempo SCT," in which teens may present as "hypoactive," with poor attention and co-morbid anxiety or depression^{73,74}. The symptoms overlap with inattention problems in ADHD and is being increasingly discussed in the literature as a subset of ADHD or overlapping, yet distinct disorder, however, SCT is not in DSM-5 and it is not confirmed as a disorder.

Treatment of Adolescent ADHD

Treatment Challenges

PCPs may be successful in working with adolescents with ADHD due to the longitudinal nature of their relationship. The adolescent may feel more comfortable with their PCP over a specialist⁶³ as there may be more stigma associated with receiving treatment from a psychiatrist, psychologist or other mental health professionals. However, even in situations where a PCP is able and willing to provide care for ADHD, poor insurance coverage or limited mental health resources limits assessment, treatment and follow-up - and amplifies PCP's time concerns at each visit as was endorsed by 50% of providers in a survey^{39,75}. A challenge in treating the adolescent with ADHD is the minimization of ADHD by teens in comparison to how their parents or teachers perceive it. Compared to other ages, adolescents are less accepting and adherent to parts of the treatment plan⁷⁶. Stigma often plays a role in this⁷⁷ and psychosocial interventions that directly address stigma may be necessary⁷⁸. Adolescents' increased ability to make decisions independent of their caregivers, needs to be sensitively balanced with the recognition that they are still minors. Empowering them to be instrumental in the process and respect for their confidentiality can be helpful in improving their willingness to engage in treatment.

Many physicians are reluctant to initiate treatment in adolescents with ADHD due to concern it will increase later risk of substance use; however, evidence does not support this concern⁶². A recent comprehensive meta-analytic review demonstrated that stimulant treatment has a neutral effect on developing later substance use disorders⁶². The issue of stimulant misuse and diversion is warranted. About 25% of patients with ADHD are approached by others to buy stimulants, and 11% of patients with ADHD have sold their stimulant medications⁷⁹ and studies have evaluated middle and high school students⁸⁰ and college students⁸¹ with similar results. Diversion of stimulant medication is slightly increasing for regular release stimulants, but not for sustained release preparations (e.g., roughly 0.2/100,000 prescriptions)⁸². PCPs should have a discussion with the patient preemptively about the dangers of diverting stimulants and using them without any

physician oversight including the possibility of developing a severe side effect, a psychotic response or in those with predisposing risks, development of cardiac problems including death.

The presence of comorbidities in the adolescent with ADHD presents additional significant challenges to the PCP. Depending on the diagnoses involved and the relative impairment from each, this might mean co-treating or using stepped care, initiating treatment for the most impairing disorder first followed by a gradual expansion to involve all comorbid illnesses. Co-morbidities such as depression and anxiety are the common co-occurring disorders that PCPs are familiar with and can initiate pharmacological treatment for, when indicated. Referrals to specialists for interpersonal or cognitive-behavioral therapy should be considered for depression⁸³ and anxiety⁸⁴ as they are efficacious in adolescents and have fewer associated side-effects⁸³. For bipolar disorder, autism, substance dependence, a consultation, co-treatment or referral may be appropriate. The benefits of nonpharmacologic factors including regular exercise, sleep hygiene, and nutrition, while avoiding substance use should be considered as well. Finally, there are pervasive reports and concerns that there is an over prescribing of stimulant medication for ADHD, including for adolescents. Over diagnosis and treatment is likely due to the absence of a thorough, comprehensive evaluation⁴. Thus, those PCPs who are reluctant to treat teens with ADHD out of concerns that they have inadequate training in ADHD or find a particular case warrants more thorough evaluation and expertise should refer those patients to colleagues or a specialist.

ADHD Treatment

Stimulant Medication—Several reviews of stimulant medications that include adolescents are published though few focus specifically on this age group^{85,86,23,87,88}. Stimulant medications are considered the most effective treatment for ADHD symptoms reduction⁸⁹, have an effect size of 0.73–0.86 or higher and are effective in adolescents as well as children⁹⁰. Interestingly, similar to children, adolescents with ADHD are relatively poor at discerning when they are on a placebo versus a stimulant medication in a clinical trial (i.e., 40% accuracy) and furthermore, they are unlikely to attribute either good or negative performance to whether or not they were taking medication⁹¹. Thus, they may have diminished motivation to follow recommendations from their PCP to take their medication if they do not discern that it helps their functioning⁹⁰. It is key to assess and track changes in side effects and symptoms using rating scales (e.g., Conners' Parent or Teacher Rating Scale⁶⁹ or Vanderbilt Rating Scale⁷⁰) with evidence pointing to moderate correlation between reduction in clinical scores and functional outcomes⁹².

Stimulants vary in their pharmacokinetic and pharmacodynamic profiles and can be broadly divided into methylphenidate (Ritalin; others) and amphetamine products (Table 2). Given that methylphenidate-based medications demonstrate more sustained and equivalent effects on norepinephrine and dopamine compared to amphetamines, they are considered first line treatment options in most adolescent patients⁹³. For patient with co-occurring substance use disorders, lisdexamphetamine - a pro-drug⁹⁴ that becomes active after first pass metabolism—maybe an option. Being aware of alternate formulations including liquid, capsules that can be opened up and sprinkled, and transdermal patches (e.g., Quillivant XR,

Adderall XR, Daytrana patch) may be helpful in providing adolescents with choices and getting buy-in. A common side effect of stimulant medications is appetite reduction. The majority of children prescribed stimulant medication experience little to no overall growth slowing secondary to the appetite reduction; however, individual patients may be more susceptible^{95,96}. This can be of concern to adolescents who frequently socialize around food. Frequent snacks and calorie dense food choices may help mitigate these issues. Sleep disturbances are also a common side effect, particularly with longer acting formulations. Baseline sleep differences of adolescents and abnormalities seen in ADHD even without the addition of medications must be considered. Moving up the dosing time or switching to a shorter acting medication may address this issue. Tics, independent of ADHD, has its highest incidence at ages 7–13⁹⁷. There is no “definitive and causal” relationship of the emergence of tics with stimulant use, though, some patients’ tics may worsen⁹⁷. In these patients, replacement of or the addition of a non-stimulant such as clonidine or guanfacine may be helpful⁹⁵.

Providers may be hesitant to prescribe stimulants due to uncertainty about cardiac side effects; however, the risk for sudden cardiac death in children and adolescents taking stimulants is lower than the risk in the general population (1.3–4.6/100,000 person years)⁹⁸. The routine practice of obtaining baseline EKGs before starting stimulant medication is not recommended, although a thorough personal and family history of cardiac disease should be obtained⁹⁹. While there are some small statistically significant, although not clinically significant, elevations in blood pressure and heart rate in children taking stimulants¹⁰⁰ there is no evidence for increased risk of QT prolongation¹⁰¹ or sudden cardiac death⁹⁹ due to stimulant treatment. A review for family physicians summarizes many of these data sets and suggestions¹⁰².

Approximately 70% of adolescents will respond to a stimulant medication trial^{88,85,87}. For no response in an adherent patient at a therapeutic or maximal dose, a switch to another medication is warranted⁸⁷. It is advisable to start with longer acting formulation first and use shorter acting formulations later in the day to extend the duration of action or in cases where it is preferable to have shorter acting medications. Follow-up care is critical to ensure adequate treatment as most patients who receive adequate treatment reach remission. The American Association of Pediatrics recommends monthly visits for adjusting medication, followed by at least semiannual visits until steady progress toward behavioral and functional goals has been achieved. Routine monitoring should include measurements of height, weight, blood pressure, and heart rate. Adverse reactions may change over time and should be assessed routinely. The duration of medication use depends on its effects on behavior and function over time.

Non-stimulant medications (Table 3)—Non-stimulant medications may be used as monotherapy or as adjunct medications. The most commonly prescribed medications include atomoxetine¹⁰³, bupropion, and alpha-adrenergic agonist agents such as guanfacine¹⁰⁴ and clonidine¹⁰⁵. Due to atomoxetine’s classification as an antidepressant, an FDA black box warning for the potential for increased risk for suicidal thoughts in teens and young adults under 25 years of age should be discussed.

Many studies show that children and adolescents switch forms of treatment over time and often discontinue the use of medication after 2 to 3 years¹⁰⁶. Follow-up of the MTA cohort 6 to 8 years after the trial, when participants were 13 to 18 years of age, showed that the original study groups did not continue to receive their randomly assigned treatment and did not differ significantly from each other with respect to any variables, including grades, arrests, and psychiatric hospitalizations¹⁰⁷. These findings underscore the importance of considering ADHD as a chronic condition and checking in with the adolescent throughout the teen years to reintroduce options for treatment.

Psychosocial treatments—Non-pharmacological interventions for adolescents can address self-efficacy, co-morbid diagnoses, other issues commonly present in ADHD and may permit lower doses of medication when used together¹⁰⁸. It may be advisable to consider initiating both treatments in close proximity to achieve the best outcomes and requires increased coordination with mental health clinics or private practitioners (e.g., therapists)³⁹. One of the primary targets for treatment with the adolescent involves conflict management between the teen and their parents. These conflicts are often related to the adolescent's desire for greater freedom and independence from their parents. Coercive interactions between the adolescent with ADHD and their parents, with each striving to accomplish their own goal can spiral out of control to clinically significant levels. Barkley has developed a four-factor model to characterize these interchanges that include: 1) the adolescent's characteristics; 2) parent characteristics; 3) family environment and stressors and 4) parenting practices¹⁰⁹. Barkley and Robin¹⁰⁹ have developed and tested a manualized therapy (e.g., *Defiant Teens*) to address teen-parent conflict based on this model¹⁰⁹. This approach includes educating parents and teens about ADHD and how it affects the adolescent's functioning and their interactions, teaching parents to "choose their battles" and reward positive behavior and follow-through with appropriate punishment, help parents and teens develop realistic expectations of one another, implement a problem solving approach to negotiate disagreements and learn to use more effective communication skills (e.g., avoid use of ultimatums and extreme comments)^{109,110}.

The Barkley and Robin treatment package¹⁰⁹ includes both problem solving communication training (PSCT) and behavior therapy (BT), with a greater emphasis on BT than cognitive therapy interventions. The intervention has demonstrated moderate effectiveness in improving conflict between parents and teens, however the authors note that medication was not maximized for the adolescents participating in the training and they stress that combining medication in addition to their treatment package needs to be tested. Studies have reviewed various components of behavior therapy including organizational skills coaching^{111,112} conducted individually and in the school setting¹¹³ and have found these to be beneficial.

Newer models of cognitive-behavior therapy (CBT) are being tested in adolescents with ADHD¹¹⁴ based on small scale success with adult trials of cognitive-behavior therapy for adults with ADHD, and there appears to be some suggestion for positive results on functional domains¹¹⁵. These results diverge from the child CBT studies that were not found to be effective for ADHD. Further evaluation of CBT for adolescents is required including identifying what particular adolescent (e.g., age, presence or absence of

comorbidity and type of comorbidity) and parent characteristics (e.g., stress, psychological health) are likely to engender greater success. The development of executive functioning processes and neural substrates that support them in the adolescent and young adult years may be associated with the potential for greater success of CBT during this developmental period. The wide variation in neural, physical and emotional maturity present in the adolescent years likely requires some tailoring of the strategies within the adolescent therapy approaches that match the individual adolescent characteristics, their parent characteristics and their pattern of interacting with one another.

Cognitive Training

Approaches such as working memory training (WMT), are being increasingly tested to target both the symptoms and the underlying neuropsychological deficits in patients with attention-deficit/hyperactivity disorder (ADHD). There are now 14 RCTs with ADHD outcomes; and there is some inconsistency of extant findings ¹¹⁶ with more research needed.

When to Refer

For providers in a system that does not have access to specialty consultation, integrated behavioral health or feature a medical home model (i.e., PCP with a team approach), it may be more reasonable to refer patients to specialists ¹¹⁷. There are many different reasons to refer adolescents for further evaluation and or treatment of ADHD. If at any time the provider feels uncomfortable with determining a diagnosis or treating an adolescent, it is appropriate to refer to another physician and or ask for a consultation. Common reasons for referral include unclear diagnosis, multiple comorbid disorders, failure to respond to treatment and difficulties with side effect management. Further evaluation is often indicated if an adolescent patient presents with their first significant symptoms subsequent to 12 years or older. If an individual fails both classes of stimulants (methylphenidate and amphetamine) it might be time to think about referral. Common referral sources are child and adolescent psychiatrists, general psychiatrists, and developmental pediatricians/neurologists.

Discussion

It is critical to be educated about the unique challenges of evaluating and treating adolescent ADHD due to the potential morbidity and later functional impairments when adolescent ADHD goes untreated. PCPs are best suited to be the first point of contact for adolescents because they often have a long-term relationship with the teen that is crucial for successful engagement. Implementing an effective treatment plan will require a good relationship between the teen and the PCP with a healthy alliance. Providers will need to be well-acquainted with the specialized needs and practical aspects to provide care for this developmental stage in relation to ADHD. This includes how to address co-morbidity with other mental health issues, medication seeking and diversion issues and substance abuse. There is still limited research available on how to align clinical practice, particularly for PCPs with evidence-based guidelines, for this developmental period.

Summary and Implications and Contributions

Adolescent ADHD is a challenging condition presenting to PCPs, which requires a perspective unique from childhood and adult ADHD. Ultimately, there is a need for new primary care-psychiatric models that take into account the complexity of working with this population and the challenges working in a primary care setting.

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Table 1

Attention Deficit Hyperactivity Disorder Diagnostic Criteria from The Diagnostic And Statistical Manual, Fifth Edition (DSM-5) Contextual issues and examples related to attention deficit hyperactivity disorder (ADHD) in adolescence

ADHD symptom	Presentation in adolescence
Inattention	<ul style="list-style-type: none"> • Inattentive symptoms may exceed coping mechanisms and result in academic problems prompting the adolescent or college student [50–51] to seek out the primary care provider • Makes careless mistakes and errors in tasks, may not attend to details resulting in poor school /work performance and can impact extracurricular activities • Detailed and tedious tasks are stressful and often incomplete • Avoidance of tasks and chores at home and in school • Challenges in remaining focused for extended periods of time (e.g., lectures, reading, tasks with minimal interactive component) • Jumping from page to page when browsing the Internet or when researching a topic for homework • May compensate by selecting tasks/jobs that require less sustained attention and are more active (e.g., field jobs vs desk jobs) • Poor follow-through with task completion and deadlines and/or messy work • Easily distracted by external social and nonsocial distractors that impairs task performance and completion • Frequently does not pay attention during conversations or when given instructions, as may be distracted by other thoughts • Poor or insufficient planning (e.g., waits until last minute to complete tasks, does not have necessary materials, does not follow logical, sequential steps in task completion) • Poor organization in home or work tasks (e.g., may not keep track of homework assignments, cannot find materials for home or work tasks) • Difficulty with time management and meeting deadlines • Over scheduled • Aware of social impairment but can do little about it due to poor inhibition • Loses valuable items such as cellphones, homework, books, keys, or clothes • Forgets to complete regular duties or activities (e.g., turning in homework, chores at home, meeting friends or colleagues)
Hyperactivity/Impulsivity	<ul style="list-style-type: none"> • Answering questions without full instructions; interrupting peers, teachers, and family members • Interrupting others in conversations/excessive talking, often with tangents/making impulsive comments to others • Engaged in frequent or intense physical activity and/or talking • Trouble staying seated for long periods of time (e.g., movies, plays, lectures, religious functions) • Fidgety and has trouble sitting still or keeping hands or feet still; may have restless thoughts • Impulsivity including not thinking through decisions and long-term consequences; abrupt actions in school or work, impatience and interrupting of peers, parents, and teachers, and engaging in sexual activities without considering risks • Is loud or makes excessive noise while engaged in leisure activities • Impatience for others or waiting

ADHD symptom	Presentation in adolescence
	<ul style="list-style-type: none"> <li data-bbox="191 184 256 1501">• Seeking out highly rewarding activities and peer approval and engaging in risky actions related to driving [14] and substance use due to the differences in the development of heightened response to reward during adolescence and an underdeveloped cognitive control system that, theoretically, monitors and modulates responses to rewards [55-59] <li data-bbox="269 995 293 1501">• Acts with emotion resulting in interpersonal arguments <li data-bbox="306 1199 331 1501">• Quits jobs, ends relationships <li data-bbox="344 995 368 1501">• Emotional lability/loses temper easily (e.g., road rage)

Table 2 Attention deficit hyperactivity disorder (ADHD) medication treatment options: methylphenidate and amphetamine products

Short or Immediate Acting Formulations					
Drug Name	Trade name/s	Duration of action (approx.)	Usual dose range*	Comments/Tips	
Methylphenidate	Ritalin	3–4 hours	2.5mg–60 mg	Generic	
	Methyin	3–4 hours	2.5mg–60 mg	Branded generic for Ritalin- available in liquid and chewable tablets	
	Focalin	3–4 hours	5 mg–30 mg	Twice as potent as mixed salts/use half doses. Beads can be sprinkled	
	Ritalin SR	4–6 hours	20mg–60 mg	Generic	
	Methlyin SR/Metadate ER	4–6 hours	20 mg–60mg	Branded generic for Ritalin SR	
Amphetamine salts	Adderall	4–5 hours	2.5–60 mg	Generic. Can be crushed	
	Dexedrine	4–5 hours	5–30 mg	Twice as potent as mixed salts/ use half doses	
Sustained or Long Acting Formulations					
Drug Name	Trade Name/s	Duration of action (approx.)	Dose range	Comments/Tips	
Methylphenidate	Ritalin LA	8–10 hours	10–60 mg	Beads can be sprinkled	
	Focalin XR	6–8 hours	5–40 mg	When switching to Focalin –use half the dose of previous medication and vice versa. Can be sprinkled	
	Metadate CD	6–8 hours	10–60 mg	-	
	Concerta	Up to 10 hours	18–54 mg	Generic, has to be swallowed whole due to osmotic pump	
	Daytrana	Up to 15 hours	10–60 mg	Daily 9 hour patch. Patches can be cut.	
Amphetamines	Adderall XR	8–12 hours	5–60 mg	Can be sprinkled	
	Vyvanse	Up to 14 hours	20–70 mg	Pro-drug, safer in case of substance abuse	

Table 3
Attention deficit hyperactivity disorder (ADHD) medication treatment options: antidepressant and other medications

Drug Name	Trade name/s	Duration of action (approx.)	Usual dose range*	Comments/Tips
Atomoxetine	Strattera	Ongoing	5–100 mg	Antidepressant- discuss black box warning Start at 0.5mg/kg/day and max of 1.2 mg /kg/day Will take weeks for effect
Bupropion	Wellbutrin	Ongoing	20–60 mg	Anti-depressant-discuss black box warning Risk for lowering seizure threshold
Guanfacine	Tenex	Short acting	0.5–4 mg	Can cause sedation and decreased blood pressure Can be used in divided doses
	Intuniv	Long acting	1–4 mg	Do not crush. Use once/day typically at bedtime
Clonidine	Catapres	Short acting	0.05–0.3 mg	More sedating than guanfacine Taper down to avoid rebound hypertension
	Catapress patch	Week	0.1–0.3 mg	Once weekly patch
	Kapvay	Long acting	0.1–0.4 mg	Do not crush. Use once/day typically at bedtime