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Management of Pediatric Attention Deficit & Hyperactivity Disorder (ADHD)

Clinical Practice Guideline
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"These guidelines are provided to assist physicians and other clinicians in making decisions regarding the care of their patients. They are not a substitute for individual judgment brought to each clinical situation by the patient's primary care provider in collaboration with the patient. As with all clinical reference resources, they reflect the best understanding of the science of medicine at the time of publication, but should be used with the clear understanding that continued research may result in new knowledge and recommendations".

INTRODUCTION

The essential feature of attention deficit and hyperactivity disorder is the persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development. (AAP, DSM- IV p 80 http://justines2010blog.files.wordpress.com/2011/03/dsm-iv.pdf). The prevalence of Attention-Deficit/Hyperactivity Disorder is estimated at 3%-5% in school-age children.

Data on prevalence in adolescence and adulthood however are limited. Usually, the disorder is first diagnosed during elementary school years, when school adjustment is compromised. In the majority of cases seen in clinical settings, the disorder is relatively stable through early adolescence.

The primary care provider should recognize that ADHD is a chronic condition and therefore consider children and adolescents with ADHD as children and youth with special health needs. Care of such children should utilize the principles of medical home and chronic care models to guide treatment.

SUMMARY OF RECOMMENDATIONS

Evaluation

The primary care provider should evaluate a child 4-18 years old who present with academic and behavioral problems accompanied by reported symptoms of inattention, hyperactivity, or impulsivity. The provider should first determine that diagnostic criteria is met as defined by American Psychiatric Association, 2013, Diagnostic and Statistical Manual of Mental Disorders – 5th Edition (http://www.psychiatry.org/practice/dsm/dsm5/online-assessment-measures) documenting impairment of the child in more than one setting (e.g. school and home).

The provider should also utilize supporting documents utilizing a validated instrument such as the Vanderbilt Assessment (http://www.nichq.org/childrens-health/adhd/resources/adhd-toolkit) to from schools, mental health providers, teachers, guardians, parents, and/or other school clinicians/other significant adults. Assessment for the coexistence of other conditions such as emotional, behavioral, developmental, or physical disorders (e.g. anxiety, depression, oppositional defiance, conduct disorder, learning or language disorders, neurodevelopmental disorders, tics, sleep apnea, etc.).

Careful consideration should be given to rule out any other possible cause such as undetected seizure conditions, middle ear infections resulting in hearing change or loss, undetected vision or hearing problems, medical conditions that may affect thinking and behavior, learning disabilities, or significant and sudden life changes such as death of a family member, a divorce, or parental job loss.

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Risk Factors for ADHD

Attention-Deficit/Hyperactivity Disorder has been found to be more common in the first-degree biological relatives of children with Attention-Deficit/Hyperactivity Disorder. Studies also suggest that there is a higher prevalence of Mood and Anxiety Disorders, Learning Disorders, Substance-Related Disorders, and Antisocial Personality Disorder in family members of individuals with Attention-Deficit/Hyperactivity Disorder.
Other causes of note are genetic predisposition, environmental factors, brain injuries, sugar, and food additives.
Diagnostic criteria for Attention-Deficit/Hyperactivity Disorder

A. Either (1) or (2):

(1) six (or more) of the following symptoms of **inattention** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

(a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
(b) often has difficulty sustaining attention in tasks or play activities
(c) often does not seem to listen when spoken to directly
(d) often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
(e) often has difficulty organizing tasks and activities
(f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
(g) often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)
(h) is often easily distracted by extraneous stimuli
(i) is often forgetful in daily activities

(2) six (or more) of the following symptoms of **hyperactivity/impulsivity** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

(a) often fidgets with hands or feet or squirms in seat
(b) often leaves seat in classroom or in other situations in which remaining seated is expected
(c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
(d) often has difficulty playing or engaging in leisure activities quietly
(e) is often "on the go" or often acts as if "driven by a motor"
(f) often talks excessively

Impulsivity

(g) often blurts out answers before questions have been completed

(h) often has difficulty awaiting turn
(i) often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Treatment

Treatment of children and youth with ADHD vary depending on age:

1. Age 4-5 (preschool) – evidence based parent and/or teacher administered behavior therapy is first line treatment and may prescribe a stimulant medication if the behavior interventions do not provide significant improvement and there is moderate to severe behavior continuing disturbance in the child's function. If behavioral treatment is not available, providers should weigh risk of starting medication at an early age against harm of delaying diagnosis and treatment.

2. Age 6-11 (elementary school) – providers should prescribe US FDA approved medication for ADHD and/or evidence based parent and/or teacher administered behavior therapy as treatment, preferably both. Per AAP's 2011 guideline on ADHD, the evidence is particularly strong for stimulant medications and sufficient but less strong for atomexetine, extended release guanfacine, and extended release clonidine (in that order). The school environment, program, or placement is part of any treatment plan.

3. Age 12-18 (adolescents) – the provider should prescribe US FDA approved medications for ADHD with the assent of the adolescent and may prescribe behavior therapy as treatment for ADHD, preferably both.

The provider should titrate doses of medication for ADHD to achieve maximum benefit with minimum adverse effects. Providers should also be cautioned that there is a risk of psychoactive drug interactions and should consult psychiatry on medications.

Taken from AAP ADHD guideline please access pg. 10-12 of AAP ADHD Guideline at
http://pediatrics.aappublications.org/content/early/2011/10/14/peds.2011-2654.full.pdf

See ADHD medication list (Appendix A)

PARENT EDUCATION:

Education of parent is central to treatment and to ensure cooperation to reach goals. Parents should be warned that frequent titration of medication and/or change of medication is sometimes necessary to reach optimal medication management as well as successful treatment and may take several months to achieve.

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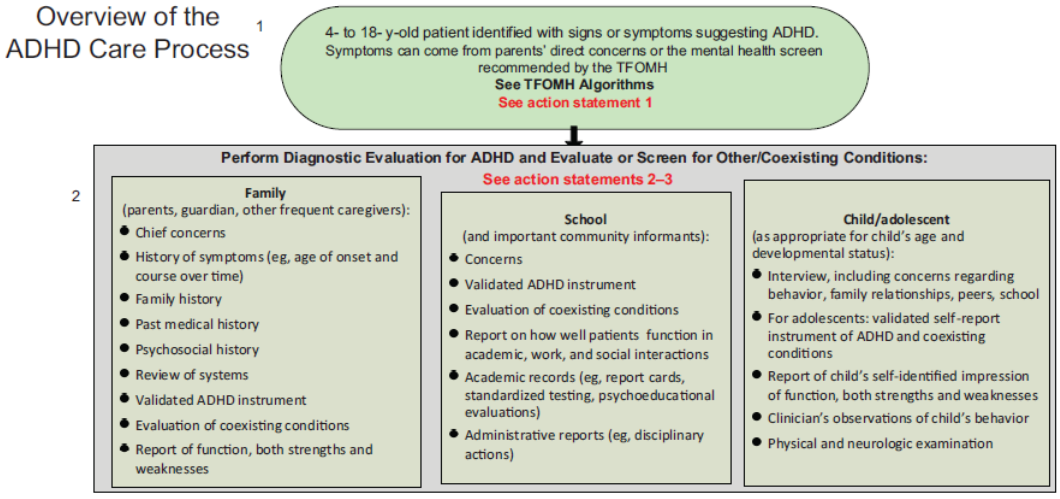
The AAP released new guidelines for treatment of ADHD in 2011 and were endorsed by the AAFP in 2012 and can be fully accessed at http://pediatrics.aappublications.org/content/128/5/1007.ful

CHADD/NICHQ Vanderbilt Assessment Tools can be found at http://www.nichq.org/childrens-health/adhd/resources/adhd-toolkit



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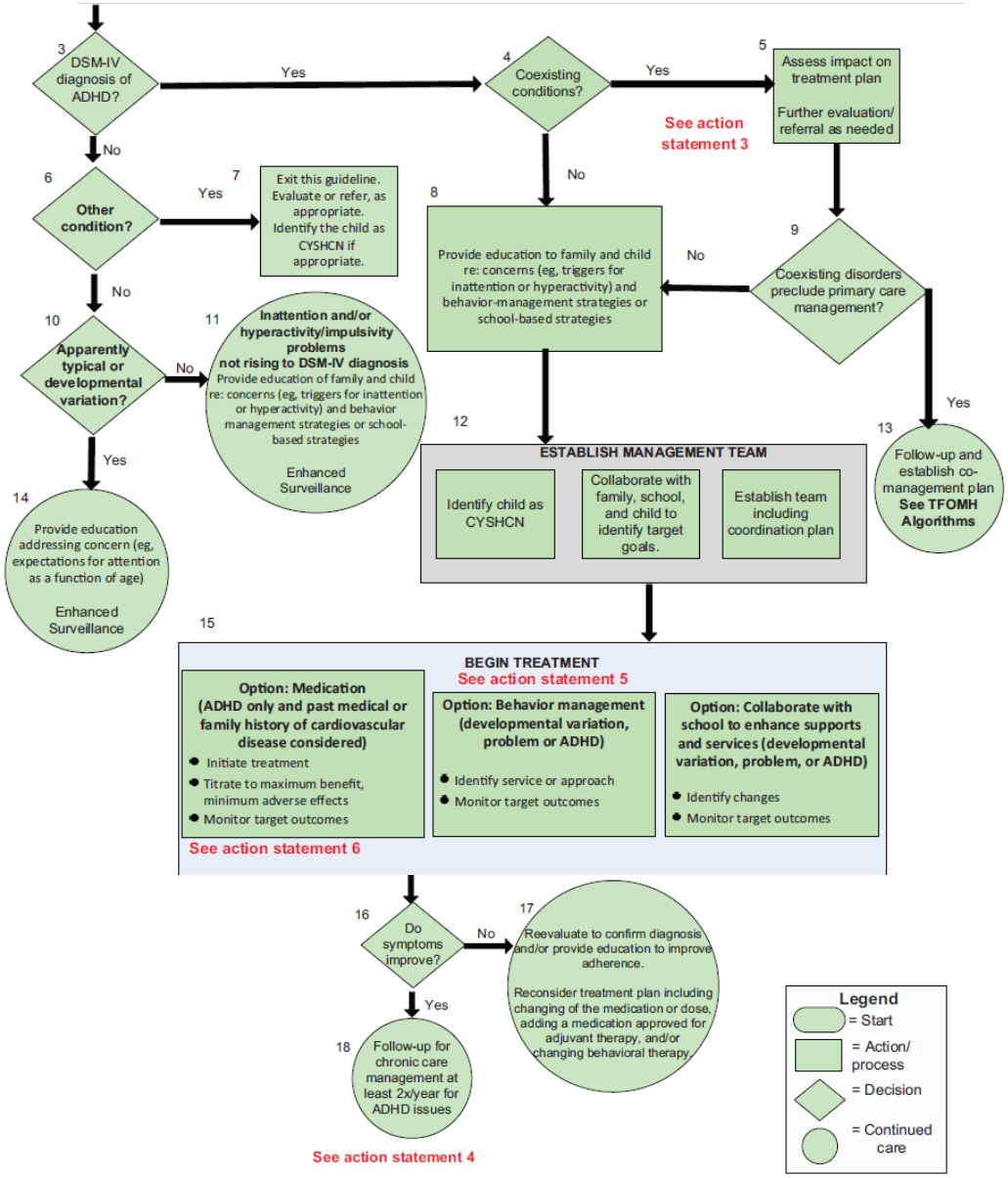

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Appendix A

ADHD Medications

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Product	Dosage Forms Cost/Month*	Duration of Action (approx)	Initial Dose	Max Daily Dose
Immediate Release (IR) Methylphenidate				
Ritalin and generics	5, 10, 20 mg tabs $56.19 (10 mg BID)	3 to 5 h	Initial (children 6 years and older): 5 mg BID to TID (AM, noon, 4 PM if needed), preferably 30 to 45 minutes before meals.	FDA: 60 mg
Methylin Chewable Tabs and generics	2.5, 5, 10 mg chewable tabs $357.55 (10 mg BID)	3 to 5 h	Initial (children 6 years and older): 5 mg BID to TID (AM, noon, 4 PM if needed), preferably 30 to 45 minutes before meals.	FDA: 60 mg
Methylin Oral Solution and generics	5 mg/5 mL, 10 mg/5 mL oral solution $357.83 (10 mg BID)	3 to 5 h	Initial (children 6 years and older): 5 mg BID to TID (AM, noon, 4 PM if needed), preferably 30 to 45 minutes before meals.	FDA: 60 mg
Immediate Release (IR) dexmethylphenidate				
Focalin (Novartis) and generics	2.5, 5, 10 mg tabs $54.11 (5 mg BID)	3 to 5 h	Initial: 2.5 mg BID (children 6 yrs and older) 4 hours apart without regard to meals	FDA: 20 mg
Extended Release (ER) dexmethylphenidate				
Focalin XR and genrics	5, 10, 15, 20, 25, 30, 35, 40 mg caps $289.66 (10 mg daily)	8 to 12 h	Initial: 5 mg (children 6 yrs and older) Given once daily in the morning. May be taken whole or sprinkled over applesauce. If sprinkled over applesauce, should be used immediately and not be stored for future use. Capsule and/or capsule content should not be crushed, chewed, or divided.	FDA: 30 mg
Extended Release (ER) methylphenidate				
Ritalin LA Bead-filled capsule (½ IR and ½ enteric coated, delayed release) plus generic	10, 20, 30, 40, 60 mg LA caps $237.38 (20 mg daily)	6 to 9 h	Initial: 10 to 20 mg (children 6 yrs and older) Given once daily in the morning. May be taken whole or sprinkled on applesauce. Applesauce should not be warm. If sprinkled over applesauce, should be used immediately and not stored for future use. Capsule and/or	FDA: 60 mg

			capsule content should not be crushed, chewed, or divided.	
Metadate ER Wax matrix tab	20 mg ER tabs $54.18 (20 mg daily)	2 to 8 h	Initial: 20 mg q AM for children tolerating 10 mg IR AM and noon Given once daily or BID. Must be swallowed whole.	FDA: 60 mg
Metadate CD Bead-filled capsule (30% IR and 70% ER) and generics	10, 20, 30, 40, 50, 60 mg ER caps $206.56 (20 mg daily)	6 to 9 h	Initial: 20 mg (children 6 yrs and older) Given once daily in the morning before breakfast. May be taken whole or sprinkled over about a tablespoon of applesauce and taken immediately. Capsule/capsule content should not be crushed or chewed.	FDA: 60 mg
Concerta OROS (osmotic system has hole for drug release) with IR overcoat plus generics	18, 27, 36, 54 mg ER tabs $291.29 (36 mg daily)	12 h	Initial: 18 mg (children 6 yrs and older) Titration: 18 mg (a 27 mg tablet is available for titration between 18 mg and 36 mg). Given once daily in the morning without regard to meals. Must be swallowed whole.	FDA: 54 mg children; 72 mg adolescents
Daytrana (Noven) transdermal patch	1.1 mg/hr (10 mg/9 hr) 1.6 mg/hr (15 mg/9 hr) 2.2 mg/hr (20 mg/9 hr) 3.3 mg/hr (30 mg/9 hr) $275.82 (all strengths)	12 h (with 9-h wear time)	Initial: 10 mg Titration: Next highest patch strength Dosing based on studies in children 6 to 17 years old. Worn daily for 9 hours (apply 2 hours before desired effect). Can be worn up to 16 hours if longer effect needed. Remove at least 3 hours before bedtime. Replace patch once daily in the morning. Apply to hip area. Change application site daily.	FDA: 30 mg
QuilliChew ER cherry chewable tablet ER mechanism: drug is released from sodium polystyrene sulfonate particles via ion exchange. (30% IR, 70% ER)	20, 30, 40 mg chewable ER tabs (20 mg and 30 mg tabs are scored) $270 (all strengths)	8 h	Initial (patients 6 yrs and older): 20 mg Given once daily in the morning, without regard to meals.	FDA: 60 mg
Quillivant XR (Pfizer) oral suspension Contains approximately 20% IR and 80% ER methylphenidate.	5 mg/mL oral suspension $192.94 (all sizes)	12 h	Initial: 20 mg (patients 6 yrs and older) Titration: 10 to 20 mg Pharmacist must reconstitute. Given once daily in the morning with or without food. Shake bottle vigorously for at	FDA: 60 mg

			least 10 seconds prior to dose. Measure dose with oral dosing dispenser provided. Store reconstituted suspension in original container at room temp for up to 4 months.	
Aptensio XR Capsules filled with multi-layered beads. IR layer contains 40% of the dose, controlled-release layer contains 60% of the dose. Peaks at two and eight hours post-dose.	10, 15, 20, 30, 40, 50, 60 mg caps $195 (any strength daily)	12 h	Initial: 10 mg (patients 6 yrs and older) Given once daily in the morning, at a consistent time in regard to meals. May be taken whole or sprinkled on applesauce and taken immediately. Capsule/capsule content should not be crushed, chewed, or divided.	FDA: 60 mg
Amphetamines				
*M*ixed amphetamine salts Adderall - Brand immediate release discontinued. Generics available	5, 7.5, 10, 12.5, 15, 20, 30 mg tabs $≤34.56 (20 mg daily)	6 h (dose-dependent)	Initial: 2.5 mg once daily (3 to 5 yrs of age) or 5 mg once or twice daily (6 yrs and older) Given one to three times daily (usually once or twice daily) at four- to six-hour intervals.	FDA: 40 mg
Adderall XR (mixed amphetamine salts extended-release capsule) or generics	5, 10, 15, 20, 25, 30 mg ER caps $213.69 (any strength daily)	10 to 12 h	Initial: 5 to 10 mg (children 6 to 12 yrs old), 10 mg (adolescents) Given once daily in the morning without regard to meals. May be taken whole or sprinkled on applesauce and taken immediately. Capsule/capsule content should not be crushed, chewed, or divided.	FDA: 30 mg
Adzenys XR-ODT (amphetamine extended-release orally disintegrating tablets)	3.1, 6.3, 9.4, 12.5, 15.7, 18.8 mg Tablet strengths reflect amount of amphetamine base. Pricing info N/A.	10 to 12 hours	Initial: 6.3 mg q AM (6 to 17 yrs of age) Given once daily in the morning without regard to meals. Tablet is placed on tongue and allowed to disintegrate. Tablet should not be not chewed, crushed, or swallowed whole.	FDA: 18.8 mg (ages 6 to 12 yrs)[44] 12.5 mg (ages 13 yrs and older)
Dextroamphetamine *Dextrostat* Brand discontinued; generics available	5, 10 mg tabs $≤174.97 (5 mg BID)	4 to 6 h	Initial: 2.5 mg q AM (3 to 5 yrs of age),2.5 mg q AM and noon, or 5 mg q AM +/- noon dose (children 6 yrs and older) Given BID to TID. First dose upon awakening;	FDA: 40 mg, rarely higher

			additional doses at 4 to 6 hour intervals.	
Dexedrine Spansule (dextroamphetamine) or generics Bead-filled capsule (50% released immediately, 50% delayed release)	5, 10, 15 mg SR caps $504.57 (any strength daily)	6 to 8 h	Initial: 5 mg q AM or BID (children 6 yrs and older) Usually once daily in the morning, or BID.	FDA: 40 mg, rarely higher
Dyanavel XR (amphetamine ER suspension)	2.5 mg/mL oral suspension $235.99 (10 mg daily)	at least 12 h	Initial: 2.5 to 5 mg (children 6 years and older) Given once daily in the morning without regard to meals. Shake bottle prior to dose.	FDA: 20 mg
Evekeo (amphetamine [1:1 ratio of dextroamphetamine/ amphetamine])	5, 10 mg scored tabs $324.38 (any strength BID)	at least 9.25 h	Initial: 2.5 mg once daily (children 3 to 5 yrs old) or 5 mg once or twice daily (children 6 yrs and older) Given one to three times daily. First dose upon awakening; additional doses at 4 to 6 hour intervals	FDA: 40 mg, rarely higher
ProCentra (dextroamphetamine) or generic	1 mg/mL oral solution $507.40 (5 mg BID)	4 to 6 h	Initial: 2.5 mg q AM (3 to 5 yrs of age), 2.5 mg q AM and noon, or 5 mg q AM +/- noon dose (children 6 yrs and older) First dose upon awakening additional doses at 4 to 6 hour intervals.	FDA: 40 mg, rarely higher
Vyvanse (Shire) (lisdexamfetamine Converted to active dextroamphetamine in the bloodstream.	10, 20, 30, 40, 50, 60, 70 mg caps $227.78 (any strength daily)	10 to 12 h (up to 14 h, adults)	Initial: 30 mg (children 6 yrs and older and adults) Given once daily in the morning without regard to meals. May be taken whole or contents dissolved in water, yogurt, or orange juice and taken immediately	FDA: 70 mg
Nonstimulants				
Strattera (atomoxetine) Response rate is lower compared to methylphenidate. Consider atomoxetine for patients with anxiety, tics, insomnia, or substance abuse	10, 18, 25, 40, 60, 80, 100 mg caps $365.70 (40 mg daily)	At least 10 to 12 h	Initial: 0.5 mg/kg/day (patients weighing up to 70 kg), or 40 mg/day (over 70 kg) Given once daily or divided BID (i.e., morning and late afternoon/early evening) without regard to meals	FDA: children and adolescents up to 70 kg, lesser of 1.4 mg/kg or 100 mg; children and adolescents over 70 kg 100 mg

disorders. Note psychiatric safety concerns.				
Kapvay (Concordia) (clonidine extended-release) and generics May be a good alternative for children who are intolerant to stimulants (e.g., kids with tics, insomnia, etc). May be an add-on agent for children who do not receive enough benefit from stimulants alone (FDA approved for monotherapy or as an add-on to stimulants).	0.1, 0.2 mg extended-release tabs $324.45 (0.1 mg BID)	At least 10 to 12 h[27]	Initial: 0.1 mg at bedtime Titration: 0.1 mg Dosing based on studies in children 6 to 17 years of age. Tablets should not be crushed, chewed, or broken before swallowing. Do not substitute for other clonidine products on a mg-per-mg basis due to different pharmacokinetic profile. Doses above 0.1 mg/day should be divided twice daily with an equal or higher split dosage being given at bedtime. When discontinuing, taper the dose in decrements of no more than 0.1 mg every 3 to 7 days.	FDA: 0.4 mg
Intuniv (guanfacine) plus generics May be a good alternative for children who are intolerant to stimulants (e.g., kids with tics, insomnia, etc) or those with anxiety or aggression. Appears at least as effective as other nonstimulants. FDA approved for monotherapy or as an add-on to stimulants.	1, 2, 3, 4 mg extended-release tabs $291.42 (any strength daily)	At least 8 to 12 h	Initial: 1 mg once daily Efficacy is evident at doses of 0.05 to 0.08 mg/kg once daily. Doses up to 0.12 mg/kg once daily may provide additional benefit. Dosing based on studies in children 6 to 17 years of age. Given once daily; avoid high-fat meals. Tablets should not be crushed, chewed, or broken. Do not substitute for immediate-release guanfacine tablets on a mg-per-mg basis due to different pharmacokinetic profiles. When discontinuing, taper the dose in decrements of no more than 1 mg every 3 to 7 days.	FDA: 7 mg Doses above 4 mg have not been evaluated in children 6 to 12 years of age.

*Cost = wholesale acquisition cost

Adapted from Comparison of ADHD Drugs. Pharmacist's Letter 2016: 32(3):32030

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Initial Approval Date and Reviews:	**Most Recent Revision and Approval Date:** November 2017	**Next Scheduled Review Date:**
April 2014, April 2016		November 2019 Condition: **ADHD**