Pharmacotherapy for the treatment of attention-deficit/hyperactivity disorder (ADHD) originally consisted primarily of stimulant medications in immediate-release preparations dosed multiple times per day. Data demonstrating the efficacy of these stimulant medications for the treatment of ADHD and their role in treating children was well established by the 1970s. Multiple formulations of the stimulant medications have subsequently been developed during the past 40 years. Recent studies, including the NIMH Collaborative Multisite Multimodal Treatment Study of Children With Attention-Deficit/Hyperactivity Disorder and the Preschool ADHD Treatment Study, have helped to clarify the role of stimulant medications in the treatment of ADHD.1–5 Significant data supporting the use of nonstimulant pharmacotherapy have also emerged in the last decade.1 This review summarizes the recent advances in ADHD treatment, providing advantages, disadvantages, and clinical pearls for the use of these treatments.

SHORT-ACTING STIMULANT PREPARATIONS

Advantages: The stimulant medications have an extensive database supporting their safety, robust efficacy, and rapid onset of action. Studies of the stimulant medications have consistently shown that approximately two of every three patients treated with stimulants respond, with an effect size generally cited at around 1.0.3 Their absorption is rapid, with clinical effects noticeable as early as 30 minutes after ingestion.

Disadvantages: The shorter duration of action limits consistent efficacy as well as compliance because these medications must be taken two to three times daily.

Helpful Hints:

• In medications containing only the methylphenidate d-enantiomer (e.g., d-methylphenidate [Focalin]), a 50% reduction in dose may be needed compared with methylphenidate products containing both the d- and l-isomers (methylphenidate [Ritalin]). Adderall contains d-amphetamine and l-amphetamine salts in the ratio of 3:1; however, no recommendations are made for converting the dosing of Adderall to a product containing only d-amphetamine (d-amphetamine [Dexedrine]).1
• One immediate-release methylphenidate product (Methylin) is available as chewable tablets as well as an oral solution, for children who have difficulty swallowing pills or capsules.
• Growth should be regularly monitored during treatment with stimulants because data from several studies suggest that, as a group, consistently medicated children have a temporary modest slowing in growth rate while taking stimulant medication.1–4,6
• Blood pressure and heart rate should be monitored before and during stimulant treatment for every patient. In addition to an individual and family health

Psychopharmacology Perspectives aims to discuss practical approaches to everyday issues in pediatric pharmacotherapy. The discussions may address aspects of clinical care related to psychopharmacology for which we do not have adequate applicable controlled trials, and includes discussions that are “off-label” from the perspective of the U.S. Food and Drug Administration. Although we fully appreciate that for virtually all disorders, medication is only one aspect of comprehensive care, this column focuses primarily on psychopharmacological management. These are not meant to be practice guidelines, but rather examples of the thought process that may go into pharmacotherapy decision making. Accepted November 23, 2008.

Drs. Daughton and Kratochvil are with the University of Nebraska Medical Center.

Correspondence to Joan Daughton, M.D., 985584 Nebraska Medical Center, Omaha, NE 68198-5584; e-mail: jdaughto@unmc.edu.


DOI: 10.1097/CHI.0b013e318197748f
history, inquiries should be made regarding a history of severe heart palpitations, fainting, exercise intolerance, chest pain, or family history of sudden death. A physical examination focused on signs of cardiovascular disease should be performed before initiating treatment as well.

- Consultation with a cardiologist is recommended if stimulants are considered a clinically necessary intervention in patients with cardiomyopathy, serious heart rhythm abnormalities, or other serious cardiac problems because sudden death has been reported in patients with these conditions. The recent joint advisory of the American Academy of Pediatrics and the American Heart Association recommends obtaining an electrocardiogram as part of the evaluation of patients with serious cardiac problems who are being considered for ADHD pharmacotherapy.6

When to Use:

- Short-acting stimulants may be used as initial treatment in children weighing less than 16 kg, for whom sufficiently low doses do not exist in a long-acting form.3

- A short-acting medication can be useful as an additional treatment when used in conjunction with a long-acting stimulant. For example, early afternoon is often when a long-acting medication’s effects are starting to wear off, and a short-acting medication can be given to resolve ADHD symptoms during homework time or other after-school activities that require focus and concentration. Similarly, a short-acting medication can be given upon awakening to help reduce ADHD symptoms during the morning routine and allow the long-acting medication to be given before leaving for school to increase the likelihood of its duration of action lasting throughout the school day.

- Inexpensive generic formulations of the immediate-release stimulants are available (Fig. 1).7 Table 1 summarizes the short-acting methylphenidate and amphetamine Food and Drug Administration (FDA)–approved treatments for ADHD.

LONG-ACTING STIMULANT PREPARATIONS: PULSE, PEARLS, PUMP, PATCH, AND PRODRUG

Table 2 summarizes the long-acting methylphenidate and amphetamine FDA-approved treatments for ADHD.

Advantages: The longer acting stimulants are equally as efficacious as the short-acting stimulants and provide a longer effective response that limits the need for multiple daily doses. This also decreases the stigma of having to receive medications within the school setting.

Disadvantages: Because of their longer duration of action, if side effects do emerge, they may extend later into the day. Cost is an important consideration when choosing a medication, and many of the extended-release medications are more expensive. A cost comparison between all FDA-approved ADHD medications can be found in Figure 1.

Helpful Hints:

- One of the differences between the various long-acting stimulant medications is the duration of action (Table 2), which can be helpful in tailoring treatment for each patient.

- The long-acting stimulant medications require the same caution as short-acting stimulants in regard to cardiac as well as growth problems.

When to Use:

- The long-acting stimulant preparations are considered first-line treatments for ADHD. Either the methylphenidate or the amphetamine class may be used because they have equal efficacy and similar side-effect profiles.8,9

Pulse

Single-pulse sustained-release methylphenidate products include Ritalin SR, Metadate ER, and Methylin ER.

Helpful Hint:

- These wax-matrix products must be swallowed whole to retain the long-acting properties.

Pearls

These bead-filled capsules generally contain half the dose as immediate-release beads and half as entericoated delayed-release beads. This mimics the use of two doses of immediate-release medication dosed 4 hours apart. Products using this general type of technology include Dexedrine Spansule, Ritalin LA, Focalin XR, Adderall XR, and Metadate CD. Metadate CD is slightly different from the other beaded formulations in...
that 30% of the beads are immediately released, and 70% are released 3 hours later.

**Helpful Hint:**

- The beaded formulations may be helpful for children who have difficulty swallowing pills because the capsules may be opened and the beads sprinkled into applesauce, yogurt, or other soft foods. The beads should not be chewed.

**Pump**

The osmotic-release oral system methylphenidate capsule (Concerta) uses an osmotic delivery system in which the tablet is coated with a 22% immediate-release methylphenidate for initial dosing. The long-duration

---

**Fig. 1** Cost comparison of Food and Drug Administration–approved medications for attention-deficit/hyperactivity disorder.
A component is delivered by an osmotic pump (osmotic-release oral system) that gradually releases methylphenidate producing an ascending serum concentration curve to approximate a three-times-daily dosing schedule.

**Helpful Hints:**
- This capsule should not be opened or chewed.
- Clinicians should notify parents and youths that the capsule is passed through the gastrointestinal tract and into the stool intact.
- Children with reduced gastrointestinal absorption or intestinal resections may not receive the full benefit from this medication because of decreased absorption.

**Patch**
The transdermal delivery system for methylphenidate (Daytrana) contains methylphenidate in a multipolymeric adhesive layer attached to a transparent backing. Methylphenidate is steadily absorbed after application of the patch, but levels do not peak until 7 to 9 hours later, with a noticeable reduction of symptoms by the end of the first 2 hours. Mild skin reactions to the patch are common, and insomnia is often reported when worn for more than 9 hours.

**Helpful Hints:**
- This capsule is particularly useful for those who cannot swallow pills and are unable to tolerate the oral form of the patch.
- More methylphenidate is bioavailable because the drug does not go through first-pass metabolism.
- More drug may be particularly useful for those who have not received methylphenidate before.

**Prodrug**
Lisdexamfetamine dimesylate (Vyvanse) is a therapeutically inactive prodrug in which d-amphetamine is pharmacologically activated after oral ingestion. This medication has been shown in two recent studies to be well tolerated, effective, and long-lasting (10 hours).

### TABLE 1
FDA-Approved Short-Acting Stimulant ADHD Pharmacotherapies

<table>
<thead>
<tr>
<th>Medication (Trade Name)</th>
<th>Mode of Delivery</th>
<th>FDA Approval</th>
<th>Generic Available Preparations</th>
<th>Doses, mg</th>
<th>Typical Starting Dose Per Day</th>
<th>Maximum Dose Per Day</th>
<th>Duration of Action, h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylphenidate (Ritalin)</td>
<td>Immediate release</td>
<td>Age ≥ 6</td>
<td>Yes</td>
<td>Tablet</td>
<td>5, 10, 20</td>
<td>5 mg</td>
<td>60 mg</td>
</tr>
<tr>
<td>Methylphenidate (Methylin)</td>
<td>Immediate release</td>
<td>Age ≥ 6</td>
<td>No</td>
<td>Tablet, chewable tablet, solution</td>
<td>5, 10, 20 tablets, 2.5, 5, 10 chewable tablet, 5 mg/5 mL and 10 mg/5 mL solution</td>
<td>5 mg</td>
<td>Lesser of 2 mg/kg/day or 60 mg</td>
</tr>
<tr>
<td>d-Methylphenidate (Focalin)</td>
<td>Immediate release</td>
<td>Ages 6–17</td>
<td>Yes</td>
<td>Tablet</td>
<td>2.5, 5, 10</td>
<td>2.5 mg b.i.d.</td>
<td>Lesser of 1 mg/kg/day or 20 mg</td>
</tr>
<tr>
<td>Mixed amphetamine salts (Adderall)</td>
<td>Immediate release</td>
<td>Age ≥ 3</td>
<td>Yes</td>
<td>Tablet</td>
<td>5, 7.5, 10, 12.5, 15, 20, 30</td>
<td>3–5 y: 2.5 mg q.d.; ≥6 y: 5 mg q.d. to b.i.d.</td>
<td>Lesser of 1 mg/kg/day or 40 mg</td>
</tr>
<tr>
<td>Amphetamine (Dexedrine)</td>
<td>Immediate release</td>
<td>Age ≥ 3</td>
<td>Yes</td>
<td>Tablet</td>
<td>5</td>
<td>2.5 mg q.d.</td>
<td>40 mg</td>
</tr>
<tr>
<td>Amphetamine (Dextrostat)</td>
<td>Immediate release</td>
<td>Age ≥ 6</td>
<td>Yes</td>
<td>Tablet</td>
<td>5, 10</td>
<td>5 mg q.d. to b.i.d.</td>
<td>40 mg</td>
</tr>
</tbody>
</table>

*Note: ADHD = attention-deficit/hyperactivity disorder; FDA = Food and Drug Administration; q.d. = medication delivered once per day.*
<table>
<thead>
<tr>
<th>Medication (Trade Name)</th>
<th>Mode of Delivery</th>
<th>FDA Approval</th>
<th>Generic</th>
<th>Available Preparations</th>
<th>Doses, mg</th>
<th>Typical Starting Dose</th>
<th>Maximum Dose Per Day</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylphenidate (Ritalin SR)—pulse</td>
<td>Gradually released from wax matrix</td>
<td>Age ≥6</td>
<td>No</td>
<td>Tablet</td>
<td>20</td>
<td>10 mg</td>
<td>60 mg</td>
<td>Up to 8 h</td>
</tr>
<tr>
<td>Methylphenidate (Metadate ER)—pulse</td>
<td>Gradually released from wax matrix</td>
<td>Age ≥6</td>
<td>No</td>
<td>Tablet</td>
<td>10, 20</td>
<td>10 mg</td>
<td>Lesser than 2 mg/kg/day or 60 mg</td>
<td>7–8 h</td>
</tr>
<tr>
<td>Methylphenidate (Methyl SR)—pulse</td>
<td>Gradually released from wax matrix</td>
<td>Age ≥6</td>
<td>No</td>
<td>Tablet</td>
<td>10, 20</td>
<td>10 mg</td>
<td>Lesser than 2 mg/kg/day or 60 mg</td>
<td>7–8 h</td>
</tr>
<tr>
<td>Methylphenidate (Metadate CD)—pearls</td>
<td>Beaded delivery system—30% immediate release and 70% 3 h later</td>
<td>Age ≥6</td>
<td>No</td>
<td>Capsule (may be opened and sprinkled)</td>
<td>10, 20, 30, 40, 50, 60</td>
<td>20 mg</td>
<td>Lesser than 2 mg/kg/day or 60 mg</td>
<td>8–9 h</td>
</tr>
<tr>
<td>Methylphenidate (Ritalin LA)—pearls</td>
<td>Beaded delivery system—50% immediate release and 50% 4 h later</td>
<td>Age ≥6</td>
<td>No</td>
<td>Capsule (may be opened and sprinkled)</td>
<td>10, 20, 30, 40</td>
<td>20 mg</td>
<td>Lesser than 2 mg/kg/day or 60 mg</td>
<td>7–9 h</td>
</tr>
<tr>
<td>d-Methylphenidate (Focalin XR)—pearls</td>
<td>Beaded delivery system—50% immediate release and 50% 4 h later</td>
<td>Age ≥6</td>
<td>No</td>
<td>Capsule</td>
<td>5, 10, 15, 20</td>
<td>5 mg</td>
<td>Lesser than 1 mg/kg/day or 30 mg</td>
<td>Up to 12 h</td>
</tr>
<tr>
<td>Methylphenidate (Concerta)—pump</td>
<td>OROS delivery system—18% immediate release outer coating and 82% gradually released osmotically; designed to replicate t.i.d. immediate release</td>
<td>Age ≥6</td>
<td>No</td>
<td>Tablet</td>
<td>18, 27, 36, 54</td>
<td>18 mg</td>
<td>Lesser than 2 mg/kg/day or 72 mg</td>
<td>Up to 12 h</td>
</tr>
<tr>
<td>Methylphenidate (Daytrana)—patch</td>
<td>Patch worn up to 9 h per day, gradually releasing methylphenidate</td>
<td>Ages 6–12</td>
<td>No</td>
<td>Transdermal film</td>
<td>10, 15, 20, 30</td>
<td>10 mg</td>
<td>Lesser than 1 mg/kg/day or 30 mg</td>
<td>12 h</td>
</tr>
<tr>
<td>Mixed amphetamine salts (Adderall XR)—pearls</td>
<td>Beaded delivery system—50% immediate release and 50% 4 h later</td>
<td>Age ≥6</td>
<td>No</td>
<td>Capsule (may be opened and sprinkled)</td>
<td>5, 10, 15, 20, 25, 30</td>
<td>10 mg q.d.</td>
<td>Lesser than 1.0 mg/kg or 30 mg</td>
<td>10 h</td>
</tr>
<tr>
<td>Amphetamine (Dexedrine Spansule)—pearls</td>
<td>Beaded delivery system—initial dose released immediately and remainder gradually released</td>
<td>Age ≥6</td>
<td>No</td>
<td>Capsule</td>
<td>5, 10, 15</td>
<td>5–10 mg q.d. to b.i.d.</td>
<td>Lesser than 1.0 mg/kg or 40 mg</td>
<td>10 h</td>
</tr>
<tr>
<td>Lisdexamfetamine (Vyvanse)—prodrug</td>
<td>Amphetamine with lysine attached, activated in gastrointestinal tract when lysine is cleaved</td>
<td>Ages 6–12 and adults</td>
<td>No</td>
<td>Capsule</td>
<td>20, 30, 40, 50, 60, 70</td>
<td>30 mg q.d.</td>
<td>Lesser than 1.0 mg/kg or 70 mg</td>
<td>10 h</td>
</tr>
</tbody>
</table>

Note: ADHD = attention-deficit/hyperactivity disorder; FDA = Food and Drug Administration; OROS = osmotic-release oral system; q.d. = medication delivered once per day.
Helpful Hint:
• It is hypothesized that this medication may be associated with diminished risk for abuse because of its decreased and/or delayed release after intravenous or intranasal administration and delayed blood level spike after ingestion, decreasing any immediate effects.

NONSTIMULANT PREPARATIONS

One overall advantage of nonstimulant medications is the decreased substance abuse liability.

Atomoxetine

Atomoxetine (Strattera) is a nonstimulant approved by the FDA for the treatment of ADHD (Table 3). It works by blocking presynaptic uptake at noradrenergic neurons. Atomoxetine is well absorbed after oral administration and is metabolized primarily through the cytochrome P450 2D6 (CYP2D6) pathway.

Advantages: Possible advantages of atomoxetine over stimulants include a lower potential for abuse, long-lasting therapeutic effects, and the fact that it is not a controlled substance.

Disadvantages: The efficacy of atomoxetine seems to be less than that of the stimulants. In one meta-analysis, atomoxetine’s effect size was 0.62, in comparison to 0.91 for immediate-release stimulants and 0.95 for sustained-release stimulants. Furthermore, the initial therapeutic effects of atomoxetine are gradual, developing a peak efficacy during 2 to 6 weeks. Atomoxetine holds a bolded warning for increased potential for suicidal ideation, at a rate of 3.7 cases per 1,000 children compared with none in placebo-treated children. Patients and their families should be educated about this risk, and patients should be monitored closely for suicidality during the first few months of treatment and during any dose changes. There is another bolded FDA warning stating atomoxetine should be discontinued if a patient develops jaundice or laboratory evidence of liver injury develops. Although no reports of liver injury occurred during clinical trials with atomoxetine, liver injury recurred on rechallenge in one patient and is likely a rare side effect of the drug.

Studies show acute growth effects but limited long-term effects on growth parameters with atomoxetine.1,2,3

Helpful Hints:
• Taking atomoxetine with food may help to avoid the common side effects of nausea or upset stomach.
• Dosing may be started as a split dose or initially given near bedtime to diminish the effects of tiredness or drowsiness, which is more apt to be present during initiation and titration of the medication.
• Doses of atomoxetine should initially be reduced if administered with agents that inhibit the cytochrome P450 2D6(CYP2D6) enzyme, such as paroxetine or fluoxetine, because of the potential for significant increases in atomoxetine blood levels.

When to Use:
• In general, atomoxetine is considered after trials of methylphenidate and amphetamine have been ineffective or poorly tolerated.
• Atomoxetine may be first-line treatment in children with a history of substance abuse or dependence and with significant anxiety symptoms or based on family preference.

<p>| TABLE 3 | FDA-Approved Nonstimulant ADHD Pharmacotherapy |
|-------------------|----------------------------------|----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>Medication (Trade Name)</th>
<th>Mode of Delivery</th>
<th>FDA Approval</th>
<th>Generic Available Preparations</th>
<th>Doses, mg</th>
<th>Typical Starting Dose&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atomoxetine (Strattera)</td>
<td>Immediate release—generally dosed q.d. but can be dosed b.i.d.</td>
<td>Age ≥6</td>
<td>No Capsule</td>
<td>10, 18, 25, 40, 60, 80, 100</td>
<td>&lt;70 kg: 0.5 mg/kg/day for 4 days, then 1 mg/kg/day for 4 days, then 1.2 mg/kg/day; &gt;70 kg: 40 mg/day</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------</td>
<td>--------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>

Note: ADHD = attention-deficit/hyperactivity disorder; FDA = Food and Drug Administration; q.d. = medication delivered once per day.
**TABLE 4**

Non-FDA-Approved Medications Used in ADHD Pharmacotherapy

<table>
<thead>
<tr>
<th>Medication (Trade Name)</th>
<th>Mode of Delivery</th>
<th>FDA Approval</th>
<th>Generic Available Preparations</th>
<th>Doses, mg</th>
<th>Typical Starting Dose</th>
<th>Maximum Dose Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bupropion (Wellbutrin/Zyban)</td>
<td>Immediate release</td>
<td>No</td>
<td>Yes Film-coated tablet</td>
<td>75, 100</td>
<td>Lesser than 3 mg/kg or 150 mg/day</td>
<td>Lesser than 6 mg/kg or 300 mg/day (no single dose &gt;150 mg)</td>
</tr>
<tr>
<td>Bupropion SR</td>
<td>Typically dosed b.i.d.; mimics bupropion given three times daily</td>
<td>No</td>
<td>Yes Film-coated tablet</td>
<td>100, 150, 200</td>
<td>Lesser than 3 mg/kg or 150 mg/day</td>
<td>Lesser than 6 mg/kg or 300 mg/day (no single dose &gt;150 mg)</td>
</tr>
<tr>
<td>Bupropion XL</td>
<td>Typically dosed q.d.; mimics bupropion t.i.d. and bupropion SR b.i.d. dosing</td>
<td>No</td>
<td>Yes Tablet</td>
<td>150, 300</td>
<td>Lesser than 3 mg/kg or 150 mg/day</td>
<td>Lesser than 6 mg/kg or 300 mg/day (no single dose &gt;150 mg)</td>
</tr>
<tr>
<td>Modafinil (Provigil)</td>
<td>Immediate release; q.d. dosing</td>
<td>No</td>
<td>—concerns of rash characteristic of Stevens-Johnson syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guanfacine (Tenex)</td>
<td>Results seen within 1 wk</td>
<td>Approvability letter received</td>
<td>Yes Tablet</td>
<td>1, 2</td>
<td>&lt;45 kg: 0.5 mg; &gt;45 kg: 1 mg</td>
<td>27–40.5 kg: 2 mg; 40.5–45 kg: 3 mg; &gt;45 kg: 4 mg</td>
</tr>
<tr>
<td>Clonidine (Catapres)</td>
<td>Immediate release for oral tablet; 2–3 days for results with transdermal film</td>
<td>No</td>
<td>Yes Tablet; 7-day extended-release transdermal film</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** ADHD = attention-deficit/hyperactivity disorder; FDA = Food and Drug Administration; q.d. = medication delivered once per day.
See Table 4 for all non–FDA-approved medications. See Figure 2 for a cost comparison for all non–FDA-approved medications summarized below.

**Alpha Agonists (Not FDA Approved for ADHD)**

Clonidine (Catapres) and guanfacine (Tenex) are alpha agonists, which seem to stimulate inhibitory presynaptic autoreceptors in the central nervous system at lower doses. They have demonstrated use alone or in combination with stimulants.¹

**Advantages:** The alpha agonists may be useful for core symptoms of ADHD, as well as associated sleep and tic disorders.

**Disadvantages:** Their half-lives may necessitate multiple daily doses. Because of their antihypertensive properties, use of these medications may lead to hypotension and orthostasis. There have been several case reports of unexpected sudden death in children taking the combination of clonidine and methylphenidate, although a controlled study of the combination of these two medications found no evidence of cardiac toxicity.

**Helpful Hints:**

- Clonidine is available in a patch, allowing once-daily dosing.
- An extended-release guanfacine preparation has recently received a letter of approvability by the FDA.

**When to Use:** Their current role in the treatment of ADHD is primarily as adjunctive medication in those patients who do not respond to and/or those who cannot tolerate the FDA-approved treatments.

**Bupropion (Not FDA Approved for ADHD)**

Bupropion (Wellbutrin, Wellbutrin SR, and Wellbutrin XL) is an antidepressant that acts via dopamine and norepinephrine.

**Advantages:** Although its therapeutic effect seems to be less than that of stimulants or atomoxetine, it does have demonstrated efficacy in the treatment of ADHD.³

**Disadvantages:** Common side effects include irritability, anorexia, insomnia, and, less commonly, development of tics. The risk for drug-induced seizures increases 10-fold at dosages greater than 450 mg/day.

**Helpful Hint:**

- It is also approved for smoking cessation (Zyban).

**When to Use:**

- This is another medication that is primarily adjunctive treatment or after first-line treatments have failed.

---

**Fig. 2** Cost comparison of non–Food and Drug Administration–approved medications.
• It may have a role in patients with co-occurring mood disorders, substance abuse, or smoking.

NON-FDA-APPROVED STIMULANT

Modafinil (Provigil) is an antinarcoleptic stimulant agent that is believed to produce a wakeful effect by activating the cortex and may be useful for enhancing general arousal, attention, and motivation. 

Advantages: Modafinil demonstrated efficacy in three double-blind placebo-controlled studies of ADHD in children. 

Disadvantages: Commonly reported side effects include insomnia, decreased appetite, and headache. This medication was not approved by the FDA for the treatment of ADHD because, at least in part, of safety concerns about a rare but serious rash (e.g., erythema multiforme) characteristic of Stevens-Johnson syndrome. Lastly, the cost of this medication often limits its use.

Helpful Hint:

• Studies have shown increased efficacy doses in the range of 340 to 425 mg/day.

When to Use:

• This medication, if used at all, should be used with great caution because of the risk for Stevens-Johnson–like rash.

RESOURCES

Parents and Clinicians
http://www.Chadd.org
http://www.cdc.gov/ncbddd/adhd/

Parents
http://www.parentsmedguide.com/pmg_adhd.html

Clinicians
http://www.massgeneral.org/schoolpsychiatry/screeningtool_table.asp

DISCUSSION

1. Short-acting stimulant medications may be useful in lower weight children, in conjunction with a long-acting stimulant, and when cost is a limiting factor.

2. Differences between long-acting stimulant preparations that influence treatment planning include duration of action, cost, ability for children to swallow pills, and abuse risk.

3. Nonstimulant medications are effective as primary as well as adjunctive treatments for ADHD.

4. Non–FDA-approved medications can be used effectively and safely as adjunctive treatments for ADHD or when first-line treatments have failed.

5. Awareness of the various characteristics of each medication that has been studied in the treatment of ADHD allows for optimal care for each individual patient.

Disclosure: Dr. Kratochvil receives research funding from NIMH Grant SK23MH06612701A1. He receives grant support from Eli Lilly, McNeil, Shire, Abbott, Somerset, and Cephalon; is a consultant for Eli Lilly, AstraZeneca, Abbott, and Pfizer. He is the editor of the Brown University Child & Adolescent Psychopharmacology Update, a member of the REACH Institute Primary Pediatric Psychopharmacology Steering Committee, a member of the American Professional Society for ADHD and Related Disorders Board of Directors, and on the CME Outfitters Professional Advisory Board. He receives study drugs for an NIMH-funded study from Eli Lilly. The other author reports no conflicts of interest.

REFERENCES


