

# ADHD and the Adolescent Driver: A Guide to Promoting Safety Behind the Wheel

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**ABSTRACT: Adolescent drivers with attention deficit hyperactivity disorder (ADHD) are more likely to be involved in—and to die of—a driving accident than any other cause. The higher occurrence of driving mishaps is not surprising given that the core symptoms of ADHD are inattention, impulsivity, and hyperactivity. Safe driving habits can diminish the risk, however. The first step is to inform patients of the dangers of driving; the significance of adolescence, ADHD, and medication can be underscored in a written “agreement.” Strategies to promote safer driving—especially optimally dosed long-acting stimulant medication taken 7 days a week—may be critical. A number of measures lead to safer driving by reducing potential distractions during driving (eg, setting the car radio before driving, no drinking or eating or cell phone use while driving, no teenage passengers in the car for the first 6 months of driving, and restricted night driving).**

Key words: Attention deficit hyperactivity disorder (ADHD), Driving, Stimulants

Driving is a dangerous undertaking for any adolescent. Automobile collisions account for 47% of all female and 37% of all male adolescent (16 to 19 years old) deaths in the United States.<sup>1</sup> In 2002, the cost of police-reported crashes (both fatal and non-fatal) involving drivers aged 15 to 20 years was \$40.8 billion.<sup>2</sup> These collisions are 4 times more likely to occur at night.<sup>3</sup> In addition, they are twice as likely to take place on weekends<sup>4</sup>

and more likely to happen during the summer.<sup>3</sup>

While this is disturbing enough, driving becomes even more problematic for adolescents who have attention deficit hyperactivity disorder (ADHD). Teenage drivers with ADHD are 8 times more likely to lose their license, 4 times more likely to be involved in a collision, 3 times more likely to sustain a serious injury, and 2 to 4 times more likely to receive a moving vehicle violation.<sup>5,6</sup> This is not surprising considering that the core symptoms of ADHD are inattention, impulsivity, and hyperactivity. Also, alcohol use commonly influences driving mishaps among adolescents; 24% of young drivers who died in crashes in 2002 had a blood alcohol level of 0.08% or higher.<sup>2</sup> Given the same blood alcohol levels, persons with ADHD have been shown to be more impaired while driving than those without ADHD.<sup>7</sup>

## PHARMACOLOGIC THERAPY

The good news is that methylphenidate has been shown to improve the driving performance of adolescents with ADHD—both in virtual-reality driving simulators in which drivers are exposed to high-risk driving demands<sup>8</sup> and routine on-road driving in their own vehicle.<sup>5</sup> Ours is the only group that has published studies that compare the efficacy of different medications on driving performance in adolescents with ADHD. Preliminary study results in-

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dicate that controlled-release OROS methylphenidate taken once a day improves driving performance significantly more in the evenings than short-acting methylphenidate taken 3 times a day or mixed amphetamine salts, long-acting, taken once a day.<sup>8-10</sup>

In the only study that evaluated atomoxetine, the drug was found to improve self-reported driving ability but not simulated driving performance.<sup>11</sup> Another pilot study suggests the arousal and attention demand of a manual transmission may enhance the

attention of ADHD adolescent drivers and promote safer driving than automatic transmissions.<sup>12</sup>

Two other studies offer in-depth reviews.<sup>13,14</sup>

**INITIATING AND MONITORING THERAPY**

Before considering treatment options, it might be useful to review the diagnosis of ADHD. The *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)* outlines diagnostic criteria for childhood ADHD.<sup>15</sup>

We have converted these criteria to be adolescent-relevant (**Table 1**). To qualify for a diagnosis of ADHD, a patient must have had at least 6 symptoms in the inattentive or 6 symptoms in the impulsive/hyperactive categories in at least 2 areas of their lives (eg, school, work, home) since age 6. These behaviors must occur often, not just periodically. Adolescents may qualify for the inattentive, impulsive/hyperactive, or the combined subtype. Consider stimulant medication therapy only if the ado-

**Table 1 – Adolescent ADHD symptom checklist\***

Behavioral symptoms	Frequency		
<b>Inattentive</b>			
Makes careless mistakes; does not pay attention to details	0	1	2
Has difficulty in keeping attention on tasks or play	0	1	2
Does not listen when spoken to directly	0	1	2
Does not follow through on instructions and fails to finish work	0	1	2
Has difficulty in organizing tasks and activities	0	1	2
Avoids or is reluctant to engage in tasks that require sustained mental effort	0	1	2
Loses things necessary for tasks or activities (eg, school assignments, pencils, keys, cell phone)	0	1	2
Is distracted by things around him/her	0	1	2
Is forgetful in daily activities	0	1	2
<b>Impulsive/hyperactive</b>			
Fidgets with hands or feet or squirms in seat	0	1	2
Cannot stay in seat (eg, at dinner); always getting up to do something	0	1	2
Moves around when he/she should be still	0	1	2
Talks loudly, makes a lot of noise	0	1	2
“On the go” or acts as if “driven by a motor”	0	1	2
Talks too much	0	1	2
Blurts out answers before questions have been completed	0	1	2
Has difficulty in taking turns or staying in line	0	1	2
Interrupts conversations of others	0	1	2

ADHD, attention deficit hyperactivity disorder.

\*At least 6 symptoms of inattention or hyperactivity must occur frequently in at least 2 settings since age 6.

lescent meets the criteria for one of these subtypes.

Treatment should involve a long-acting stimulant medication, which may need to be supplemented with short-acting methylphenidate if the adolescent drives more than 15 hours after ingesting a long-acting stimulant. The dosage should be increased until there is no further improvement in ADHD symptoms or unacceptable adverse effects develop.

Clinicians typically strive to optimize the dosage of medication used to manage such chronic diseases as asthma and epilepsy. However, we sometimes adjust the dosage in patients with ADHD only until beneficial effect is detected. To evaluate whether symptoms are responding to the medication, it is not enough to rely on simple global reports, such as, "things are a lot better." It is more helpful to systematically review and record the symptoms shown in **Table 1** before starting any medication, and then after each increase in medication dose. It is not unusual to find that one set of symptoms improves with a lower dose and a different cluster of symptoms improves with a higher dose. The patient, parent, and/or teacher may describe especially worrisome symptoms that also need to be monitored.

## ADHERENCE

Medication holidays are not indicated for adolescents who drive. If adolescents take long-acting medications year-round, high-risk driving periods (ie, evenings, weekends, and summer vacation) are covered.

When an adolescent does not adhere to daily therapy (because of lack of effect or unpleasant adverse effects), consider adjusting the dosage or prescribing an alternative medication. If non-adherence is attributed to "forgetfulness," then a plan is needed in which the adolescent is reminded to take his or her medication first

## Table 2 – Driving diary

### Did I:

- Go over the speed limit?
- Swerve in my lane?
- Drift out of my lane over the center line or off the road or run over a curb?
- Only half focus on driving?
- Get distracted by things *outside* the car (like signs, pedestrians, other cars)?
- Get distracted by things *inside* the car (like passengers, cell phone ringing)?
- Get distracted by things I did (like eating, changing music, using cell phone)?
- Take some risks while driving because it was *fun*?
- Take some risks because I was *in a hurry*?
- Yell or curse because of crazy drivers?
- Not use my turn signal when I should have?
- Not slow down to let merging traffic in?
- Go through a yellow light that turned red?
- Try to be first to move after a red light turned green?
- Hit my brakes to avoid something?
- Hesitate when I should not have?
- Over-correct my steering when trying to avoid something?
- Follow cars ahead of me very closely (tailgate)?
- Not completely stop at a stop sign or red light?
- Drive through a stop sign or red light?
- Not look in my rearview mirror when I should have?

thing in the morning. For example, it may be useful to put the medication in one's shaving kit or to set one's cell phone alarm as a prompt.

For adolescents disinclined to take medication, it can be useful to have them keep a driving diary for a medication-free period and for a similar period when they are taking optimally dosed medications, as an "experiment." A review of a diary (**Table 2**) may offer objective evidence that the patient drives more safely when taking medication. Patients also may be motivated to take medication if parents have the teen driver pay for his own car insurance and any expenses resulting from a driving mishap (eg, repairs, court and lawyer fees, and fines).

In attempting to persuade adolescents to take medication daily, remind them that just as they may have to wear glasses all the time while driving to optimize performance, they also need ADHD medication to optimize their performance.

Research suggests that younger drivers are motivated more by legal and fiscal consequences, whereas older drivers may be more motivated by risk to their physical well-being.<sup>16</sup> Thus, it may not be useful to threaten the adolescent with loss of life or physical injury but rather have him consider the possible consequences of having his license suspended for 6 months, not being able to drive on a date, having to pay increased insurance rates, or not being able to play a

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favorite sport or to participate in a favorite activity because of some debilitating injury.

While coercion is never a good foundation on which to compel an adolescent into compliance, rules can be established between the parent and teen. For example, the car keys are only available if medication has been taken or the car insurance will not be paid unless the teen routinely takes his medication.

### NON-MEDICAL INTERVENTIONS

It can be useful to have parent and adolescent read, understand, and sign an agreement of understanding (Table 3). Such an agreement has several advantages. Because patients

generally retain only about half of what they have been told in a consultation room,<sup>17</sup> a written statement ensures they will have this information once they get home. An agreement educates the parties as to the significance that adolescence, ADHD, and medication play in driving safety. A signature emphasizes the importance you place in these issues. Patients and parents are making a personal recognition that they understand this information—not that they necessarily agree with it. Your copy of the agreement serves as documentation that your patient has been informed of the risks related to driving.

Also, advise patients (and parents) to reduce potential distractions while driving (Table 4). Drivers with

ADHD tend to be more distracted than drivers without ADHD. As such, measures to reduce potential distractions may lower risk. For example, ADHD drivers should select their radio station or CD before starting to drive.<sup>18</sup> Cell phones should be turned off while driving.

Because basic driving skills are acquired during the first 6 months of independent driving and the risk for accidents is high, there should be no teenage passengers to distract the driver. This is important because for every teenage passenger in a car driven by a teenager, death rates increase 130%.<sup>3</sup> There should be no eating or drinking in the car, both because these activities can be distracting (particularly if the items fall to

**Table 3 – Driving safety and ADHD: An agreement for patients and parents**

#### I understand that:

- Motor vehicle collisions are the leading cause of death in adolescents; they account for 46% of all female adolescent and 35% of all male adolescent deaths.
- Driving collisions are 4 times more likely to occur at night.
- Young drivers with ADHD are:
  - 2 to 4 times more likely to have traffic accidents.
  - 3 times as likely to be injured.
  - 4 times as likely to be at fault.
  - 6 to 8 times more likely to have their license suspended.
- This extends to females as well as males.
- An appropriate dose of stimulant medication has been repeatedly demonstrated to improve driving in teenagers with ADHD.
- Medication only works if it is active in the body.
- For the sake of driving safety, ADHD medications should be taken every day and should be active in your system when you are driving (such as late at night). (It's like wearing your glasses whenever you drive.)
- Because alcohol impairs your ability to drive, and because ADHD impairs driving skills even more, it is critical that drivers with ADHD avoid drinking and driving.
- Routine use of a safety belt is important for all drivers.
- It is dangerous to drive while you are sleepy. Loud radios and open windows won't wake you up, but brief naps will help.
- Avoid distractions while driving (such as eating, cell phones, looking at maps, reading newspapers).

Teenager

Parent

Date

the floor) and can block vision. The patient should know the route to his destination before initiating a trip so that it will not be necessary to look at maps or for street addresses or signs while driving.

Teenagers with ADHD receive more moving vehicle violations (in particular, speeding tickets) than their non-ADHD counterparts.<sup>13,14</sup> Therefore, teens should be reminded not to speed. Inattention can be especially problematic when a driver is speeding and tailgating. Because adolescent driving accidents are 4 times more common after 9 PM,<sup>3</sup> evening driving during the first 6 months of independent driving should be significantly restricted. However, most important are both good role modeling by parent drivers and supportive and positive counseling by responsible adult drivers.

There are studies demonstrating that driving with a manual transmission is more stimulating than with an automatic transmission. One pilot study involved 10 adolescents with ADHD who drove a virtual-reality driving simulator in both the automatic mode and the 4-speed manual mode at 8 PM and 11 PM.<sup>12</sup> These participants reported being more alert when driving in manual mode; objective measures showed they drove more safely than with an automatic transmission.<sup>12</sup>

The pilot study was preceded by clinical reports of adolescents who said they were less able to daydream when driving a manual transmission. For example, an adolescent reported, "If I don't pay attention to what I'm doing, the car will jerk and stall, and, boy, is that embarrassing." Although using a manual transmission may be a possible non-pharmacological intervention, it may take ADHD adolescents longer to learn how to coordinate use of the clutch and gearshift. It could be that manual transmission may be even more beneficial when

### Table 4 – Keys to being a safe driver

- Always wear a seat belt.
- Never drink and drive.
- Never drive while sleepy.
- No cell phone use while driving.
- No eating or drinking while driving.
- No teenage passengers for first 6 months of driving.
- Select a radio station or CD before driving.
- Know directions to your destination before driving.
- No speeding.
- No running stop signs or red lights.
- Minimize nighttime driving.
- Inform parents of your destination and return time.
- No tailgating.
- Do not use "cruise control" if this takes your mind off driving.

using stimulant medications. It could be counterproductive for an ADHD adolescent to drive a manual transmission if he uses this as a mode to engage in reckless driving (eg, "burn rubber," or beat another driver "off the line"). ■

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