

# Cardiovascular Risk and Stimulant Medication

## What Parents & Caregivers Need to Know

by Ashraf Harahsheh, MD, FACC, FAAP,  
and Elizabeth D. Sherwin, MD, FHRS

**T**HE FAMILIES OF CHILDREN WITH ADHD FACE MANY CHALLENGES, including caring for those affected and dealing with the potential side effects associated with therapy. The healthcare system unfortunately has added confusion to ADHD management.

In 2006, the FDA released a warning on ADHD medications based on twenty-five reported cases of sudden death in children and adults who were taking stimulant medications. This led the American Heart Association (AHA) to suggest that it was reasonable for providers to obtain an electrocardiogram (ECG) prior to starting ADHD therapy. On the other hand, the American Academy of Pediatrics (AAP) strongly argued against this recommendation. In this article, we discuss cardiovascular side effects of stimulant medications and provide a practical approach to parents and primary care physicians.

## Stimulant medications and severe cardiovascular events

Interestingly, when you look at the total number of children who receive stimulant medications, the reported incidence of death is less than two per 1,000,000. This is actually less than the reported incidence of death in the general pediatric population, which is estimated to be eight to sixty-two per 1,000,000 children (see Perrin, 2008).

There is no known association between any specific congenital heart disease and sudden death related to stimulant medication. In a 2011 *New England Journal of Medicine* paper, there was no evidence of increased risk of severe cardiovascular events among 1,200,438 children and young adults who were taking stimulant medications (see Cooper, 2011).

Knowing these limitations, a joint statement from the AAP and AHA now recognizes that it is **not** a requirement to obtain an ECG prior to starting therapy, and that therapy should not be delayed before a patient undergoes an ECG evaluation (see Cortese, 2013).

## Cardiovascular effect of stimulant medications


Stimulant medications can be associated with an increase in heart rate (1-2 beats per minute), systolic blood pressure (1-4 mmHg), and diastolic blood pressure (1-2 mmHg). Rarely, the increase in heart rate and blood pressure may reach above the 95th percentile (see Cortese, 2013).

Patients need to be monitored at their primary care office prior to and periodically after starting therapy. Those with persistent blood pressure elevation above the 95 percent, despite adjustment of stimulant medication dosage and/or hypertension treatment, should not receive stimulant therapy.

On an ECG, the QT interval measures the relaxation phase in the heart's electrical cycle. A prolonged QT could increase the risk of serious arrhythmias and sudden death. Although there has been interest in obtaining ECGs to measure the QT interval before and after any ADHD medication adjustment, there is no evidence that stimulant medications cause a significant change in the QT interval (see Martinez-Raga, 2013). Current data does not show an increased risk of serious cardiac events in children without underlying heart disease.

## Special cardiac populations

While data is limited, intuitively one wonders if certain populations with known heart disease may be at higher risk with use of stimulant medications due to their effect on heart rate and blood pressure. Children with congenital heart disease (CHD) are at higher risk of having



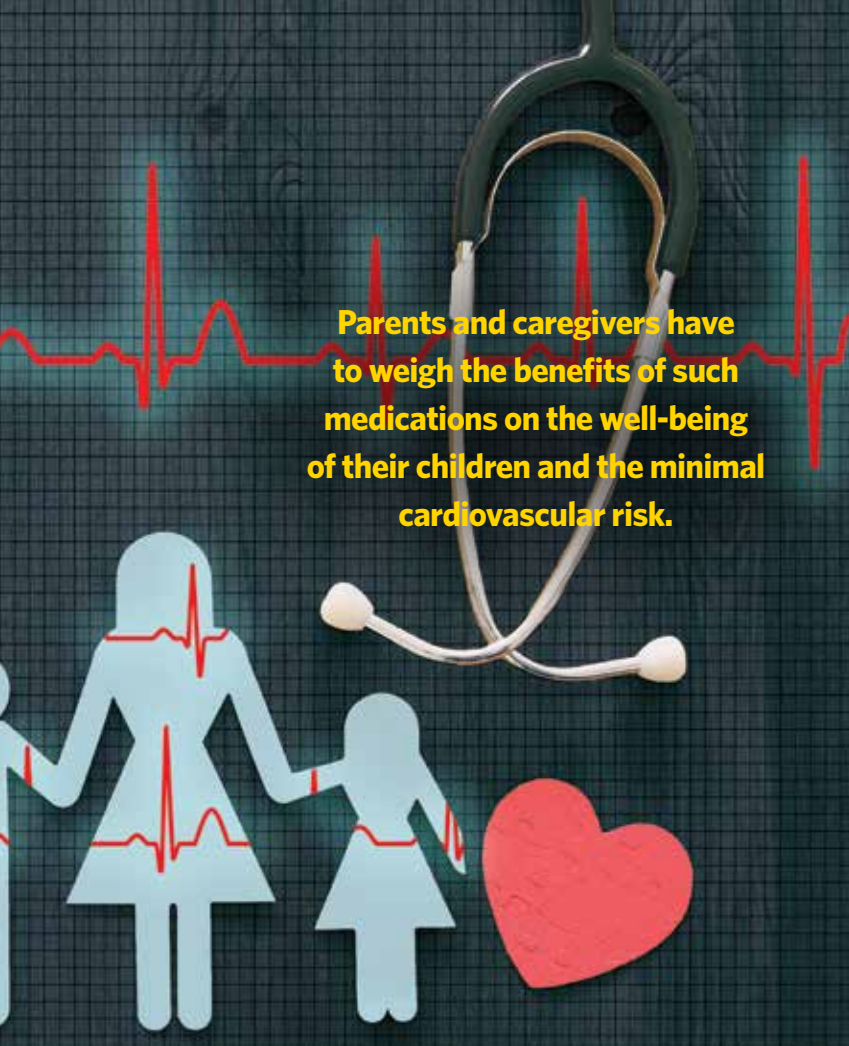
**Although stimulant medications have had a concerning cardiovascular reputation in the past, current evidence highlights their safety at the current doses in pediatrics.**

ADHD. There has been no evidence to date, however, of children with CHD having serious cardiovascular complications while on stimulant medications. A discussion with the child's cardiologist about the risks and benefits of ADHD medications is warranted.

Children with inherited arrhythmia syndromes may be at increased risk with stimulant therapy. Long QT syndrome (LQTS) and catecholaminergic polymorphic ventricular tachycardia (CPVT) are two arrhythmia syndromes. While data on stimulant medications in CPVT is nonexistent, there are a few reports evaluating stimulant medications in LQTS. In one study, 48 patients with congenital LQTS on ADHD medications were found to have an increased probability of cardiac events, particularly fainting. There was no difference in the rate of cardiac arrest (see Zhang, 2015). Conversely, another review of 28 children with LQTS and ADHD found no LQTS-triggered events during 56 person-years of treatment and a statistically lower rate of events compared to peers with LQTS but no ADHD (see Rohatgi, 2015).

With limited and conflicting data, many ADHD medications are listed on the special risk category for patients with LQTS (see [www.crediblemeds.org](http://www.crediblemeds.org)). These medications are not strictly contraindicated but require caution and appropriate evaluation by a cardiologist.





**Parents and caregivers have to weigh the benefits of such medications on the well-being of their children and the minimal cardiovascular risk.**

### **Weigh the benefits**

In summary, although stimulant medications have had a concerning cardiovascular reputation in the past, current evidence highlights their safety at the current doses in pediatrics. Parents and caregivers have to weigh the benefits of such medications on the well-being of their children and the minimal cardiovascular risk.

Before prescribing medication for ADHD, your doctor should do the following:

- Thoroughly review your child's history of possible symptoms, including any chest pain, fainting, dizziness, shortness of breath, palpitations, and/or exercised induced complaints.
- Clarify the past medical history for any cardiac disease, unexplained faints, or seizures.
- Review the family history for any relatives with heart disease; including, heart muscle disease (cardiomyopathy), fainting, arrhythmia (ex. long QT), sudden unexplained death, sudden infant death syndrome, drowning, unexplained car accidents.
- Perform a thorough cardiovascular physical exam. Screen for genetic syndromes or other diseases that could affect the heart.

If there are any concerning elements in the child's personal history, family history, and/or physical exam, your

doctor should refer your child to a pediatric cardiologist for evaluation. An ECG alone cannot rule out many conditions that lead to sudden cardiac events. Therefore, a thorough evaluation tailored to each individual is important.

There is no evidence to support periodic ECG monitoring in children receiving stimulant medications even after dose adjustment. However, it is important that your doctor measures the child's heart rate and blood pressure at baseline and periodically after starting stimulant therapy. In children with persistent elevated heart rate and/or blood pressure greater than 95 percent, the physician may attempt reducing the dose of ADHD medication and initiate hypertension management. If the elevation persists, the physician should consider referring the child to a hypertension specialist for evaluation including ambulatory blood pressure monitoring.

After starting medication, if the child develops any concerning complaints as outlined in the bullet points above, he or she should be referred to a pediatric cardiologist. For children with known congenital heart disease or an arrhythmia who are being considered for stimulant medication, a discussion between primary cardiologists, primary physician, psychologist, patient and family must occur. At the discretion of the cardiologist, further testing might be needed. 🗨️

---

**Ashraf Harahsheh, MD, FACC, FAAP**, is an associate professor of pediatrics at the George Washington University School of Medicine and a pediatric cardiologist in charge of resident education in the division of cardiology at Children's National Health System.

**Elizabeth D. Sherwin, MD, FHRS**, is an assistant professor of pediatrics at the George Washington University School of Medicine and a pediatric cardiologist and electrophysiologist with the division of cardiology at Children's National Health System.

---

### **RESOURCES**

Perrin et al. "Cardiovascular Monitoring and Stimulant Drugs for Attention-Deficit/Hyperactivity Disorder," *Pediatrics* Volume 122, Number 2, August 2008.

Cooper et al. "ADHD Drugs and Serious Cardiovascular Events in Children and Young Adults," *New England Journal of Medicine* 365; 20 November 17, 2011.

Cortese et al. "Practitioner Review: Current best practice in the management of adverse events during treatment with ADHD medications in children and adolescents." *Journal of Child Psychology and Psychiatry* 54:3 (2013), pp 227-246.

Warren et al. "Cardiac risk assessment before the use of stimulant medications in children and youth: A joint position statement by the Canadian Paediatric Society, the Canadian Cardiovascular Society, and the Canadian Academy of Child and Adolescent Psychiatry." *Canadian Journal of Cardiology* Vol 25 No 11 November 2009.

Martinez-Raga et al. "Risk of Serious Cardiovascular Problems with Medications for Attention-Deficit Hyperactivity Disorder." *CNS Drugs* (2013) 27:15-30.

Zhang et al. "Long-QT syndrome and therapy for attention deficit/hyperactivity disorder." *Journal of Cardiovascular Electrophysiology* (2015) 26 (10): 1039-1044.

Rohatgi et al. "Stimulant therapy in children with attention-deficit/hyperactivity disorder and concomitant long QT syndrome: A safe combination?" *Heart Rhythm*. 2015 Aug;12(8):1807-12.