Evaluation of ECG Findings

ECGs should be interpreted by a pediatric cardiologist or pediatric electrophysiologist to obtain accurate results. If an ECG is deemed necessary after patient evaluation, please use the following list as a guideline to understand the results:

A. Normal or Normal Variant ECG Readings

These ECGs do not require further work-up unless clinical symptoms, examination or history suggest cardiac involvement. The following is a nonexhaustive list of normal or normal variant ECG readings:

1. Sinus bradycardia
2. Sinus arrhythmia
3. Appropriate sinus tachycardia
4. Right ventricular conduction delay or incomplete right bundle-branch block without right ventricular hypertrophy or right-axis deviation
5. Isolated intraventricular conduction delay
6. Rightward QRS axis ≤ 8 years of age
7. Early repolarization
8. Nonspecific ST-T – wave changes
9. Juvenile T-wave pattern
10. QTc ≥ 0.45 s by computer, but normal by hand calculation

B. Abnormal ECG Readings with Low Likelihood of Correlating with Cardiac Disease

It is possible that a patient with these readings may need to be seen by a cardiologist. The prescribing physician should correlate the ECG reading with the history, examination and any symptoms the patient might have and discuss the reading with a cardiologist to assess the need for an office visit. ADHD medication usually does not need to be stopped with these findings. If there is question about stopping medication, we recommend that this be discussed with a cardiologist before stopping. The following is a nonexhaustive list of abnormal ECG readings that have a low likelihood of correlating with cardiac disease:

1. Isolated atrial enlargement, especially right atrial enlargement; usually will not need further evaluation
2. Ectopic atrial rhythms; right atrial, left atrial, wandering atrial pacemaker at normal rates
   a. Low right atrial rhythms are common, usually are normal variants, and rarely need further evaluation; other ectopic atrial rhythms less common
3. First-degree AV block
4. Borderline QTc 0.44–0.45 s

C. Abnormal ECG Readings that may Correlate with the Presence of Cardiac Disease

As with B above, the prescribing physician should correlate the ECG reading with the history, examination and any symptoms the patient might have, and discuss the reading with a cardiologist to assess the need for a cardiology office visit. It is likely that a patient with this reading will need to be seen by a cardiologist. However, a cardiology office visit with examination and further testing/evaluation may not result in diagnosis of cardiac disease. In fact, many of these patients have small likelihood of having significant cardiac pathology that would result in change in the plan of treatment for their ADHD. Therefore, it is not necessary in most cases to immediately stop the medication, but we recommend that this question be discussed with a cardiologist. The following is a nonexhaustive list of abnormal ECG readings that may correlate with the presence of cardiac disease:

1. Left ventricular hypertrophy
2. Right ventricular hypertrophy
3. Wolff-Parkinson-White anomaly or pattern (WPW)
4. Left axis deviation, "north-west axis"
5. Right axis deviation, especially >8 years of age
6. Right atrial enlargement and right axis deviation
7. Right ventricular conduction delay and right axis deviation
8. Second- and third-degree atrioventricular block
9. Right bundle-branch block, left bundle-branch block, intraventricular conduction delay >0.12 s in patients 12 y of age (>0.10 s in patients <8 years of age)
10. Prolonged QTc >0.46 s
    a. The prescribing physician should ask about medications that might prolong QTc, which could cause mild QTc prolongation, and can be found online at qtdrugs.org.
11. Abnormal T waves with inversion V_5, V_6; bizarre T-wave morphology, especially notched or biphasic, or flat and/or ST-segment depression suggesting ischemia or inflammation
12. Atrial, junctional or ventricular tachyarrhythmias, including frequent premature atrial contractions or premature ventricular contractions

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The Heart Center

Evaluating ECG Results and Screening for ADHD

NATIONWIDE CHILDREN'S

When your child needs a hospital, everything matters.℠

Is there a need for cardiovascular monitoring and stimulant drugs for attention-deficit/hyperactivity disorder (ADHD)?

It is recommended that a thorough patient evaluation is conducted after ADHD diagnosis is made, but prior to when medical therapy is initiated, including complete family history, patient history, symptom and medication review, and a physical examination.

A pediatric cardiololgy consult should be obtained before stimulant medication is started, if there are any significant findings on physical examination, ECG, or history (such as known structural heart disease, arrhythmias, or a family history of sudden cardiac death in members <35 years of age, SIDS, drowning or unexplained seizures).

When is an ECG screening needed?

It is reasonable to consider adding an ECG to the history and physical examination in the cardiovascular evaluation of children who need to receive treatment with drugs for ADHD, if the physical evaluation and family history leads to cardiac concerns that help identify cardiovascular abnormalities.

Once medication is started, if the initial ECG was obtained before the child was 12 years of age, a repeat ECG may be useful after the child is 12 years of age. A similar situation is the development of symptoms or a change in family history after the initial ECG was obtained, in which case a repeat ECG may be useful.

As a guide, please reference this practice tool outlining ECG findings for normal and abnormal readings.

For an urgent consultation, call the Physician Direct Connect Line at (614) 355-0221 or (877) 355-0221. To make a referral, call (614) 722-6200 or (877) 722-6220, or visit **NationwideChildrens.org/HeartCenter.**

Patient Evaluation: Suggested Questions and Checklist

Patient History

The patient history should include questions to elicit the following:

- ☐ History of fainting or dizziness (particularly during exercise)
- ☐ Seizures
- ☐ Rheumatic fever
- ☐ Chest pain or shortness of breath with exercise
- ☐ Unexplained, noticeable change in exercise tolerance
- ☐ Palpitations, increased heart rate, or extra or skipped heartbeats
- ☐ History of high blood pressure
- ☐ History of heart murmur, other than innocent or functional murmur, or history of other heart problems
- ☐ Intercurrent viral illness with chest pains or palpitations
- ☐ Current medications (prescribed and over the counter)
- ☐ Health supplements (nonprescribed)

Family History

The family history should include questions to elicit the following:

- ☐ Sudden or unexplained death in someone young
- ☐ Sudden cardiac death or "heart attack" in members <35 years of age
- ☐ Sudden death during exercise
- ☐ Cardiac arrhythmias
- ☐ Hypertrophic cardiomyopathy or other cardiomyopathy, including dilated cardiomyopathy and right ventricular cardiomyopathy (arrhythmogenic right ventricular dysplasia, ARVD)
- ☐ Long-QT syndrome, short-QT syndrome or Brugada syndrome
- ☐ Wolff-Parkinson-White or similar abnormal rhythm conditions
- ☐ Event requiring resuscitation in young members (<35 years of age), including syncope requiring resuscitation
- ☐ Marfan syndrome

Physical Examination

The physical examination should include an evaluation of the child for the presence of the following:

- ☐ Abnormal heart murmur
- ☐ Other cardiovascular abnormalities, including hypertension and irregular or rapid heart rhythm
- ☐ Physical findings suggestive of Marfan syndrome

References

Cardiovascular monitoring of children and adolescents with heart disease receiving medications for attention deficit/hyperactivity disorder: a scientific statement from the American Heart Association Council on Cardiovascular Disease in the Young Congenital Cardiac Defects Committee and the Council on Cardiovascular Nursing. Vetter VL, Elia J, Erickson C, Berger S, Blum N, Uzark K, Webb CL; American Heart Association Council on Cardiovascular Disease in the Young Congenital Cardiac Defects Committee; American Heart Association Council on Cardiovascular Nursing. Circulation. 2008 May 6;117(18):2407-23.

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