

## Evaluation of ECG findings

If an ECG is deemed necessary after patient evaluation, please use the following list as a guideline to read the results. ECGs should be read by a pediatric cardiologist, cardiologist or physician with expertise in reading pediatric electrocardiograms to obtain accurate results. The following are guidelines to consider in interpreting the ECG results:

### A. NORMAL OR NORMAL VARIANT ECG READINGS

These ECGs do not require further workup 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  $\leq 8$  y of age
7. Early repolarization
8. Nonspecific ST-T-wave changes
9. Juvenile T-wave pattern
10. QTc  $\geq 0.45$  s by computer but normal by hand calculation
11. Borderline QTc 0.44–0.45 s

### B. ABNORMAL ECG READINGS THAT HAVE 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 a cardiology 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; this usually will not need further evaluation.
2. Biventricular hypertrophy with only mild midprecordial voltages of 45 or 50 mm; this may need further evaluation.
3. 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 will rarely need further evaluation; other ectopic atrial rhythms are less common.
4. First-degree AV block.

### 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  $>8$  y 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  $<8$  y 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 on web site [www.qtdrugs.org](http://www.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

## 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 the act of 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 heart beats
- 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 family history of any of 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

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