Cardiovascular Red Flags in Preparticipation Screening of Competitive Athletes

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Overview

- Learning objectives
- Personal history red flags
- Family history red flags
- Physical examination findings requiring further investigation
- Training-related (physiological) EKG changes commonly seen in athletes
- Training-unrelated (pathological) EKG changes requiring further investigation
- Summary
Cardiovascular Red Flags

Learning Objectives

• List the findings from an athlete’s personal history that warrant further cardiovascular evaluation.

• List the findings from an athlete’s family history that warrant further investigation.

• List the findings from an athlete’s physical examination that warrant further cardiovascular evaluation.

• Differentiate training-related (physiological) EKG changes from pathological EKG changes in athletes.

Cardiovascular Red Flags

Personal History Red Flags*

• Unexplained syncope/near-syncope

• Exertional chest discomfort and/or palpitations

• Dyspnea out of proportion to level of exertion

*The patient may not offer this information unless specifically asked by the health care provider!
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Family History Red Flags**

- Premature sudden cardiac death
- Hypertrophic cardiomyopathy
- Marfan syndrome

*Most meaningful when positive for first-degree relatives.

*The patient may not offer this information unless specifically asked by the health care provider!

Physical Findings Requiring Further Investigation:

- Loud (> grade 2/6) systolic murmurs
- *Any* systolic murmur that gets louder during Valsalva maneuver (or having the patient stand from squatting or the supine position)
- *Any* diastolic murmur
- Weak lower extremity pulses compared to upper
- Findings suggestive of Marfan syndrome
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**EKG Changes**

- Training-related (physiological) EKG changes commonly seen in athletes include:
  - Sinus bradycardia
  - Sinus arrhythmia
  - Early repolarization
  - First-degree AV block
  - Type I second-degree AV block (Wenckebach)
  - Incomplete right bundle branch block (IRBBB)
  - Voltage criteria for left ventricular hypertrophy
  - Inverted T waves, V1-V4 (especially in African-American males)

23-year-old Bayhawks player
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**EKG Changes (cont.)**

- Training-unrelated (pathological) EKG changes requiring further investigation:
  - Left bundle branch block
  - Right ventricular hypertrophy
  - Type II second-degree AV block
  - Third-degree AV block
  - Inverted T waves, $V_5-V_6$, lateral limb leads, inferior leads
  - Pathological Q waves
  - Long or short QTC interval, ventricular preexcitation, Brugada pattern, ARVC pattern
Left bundle branch block:

Right ventricular hypertrophy:
Type II second-degree AV block:

Third-degree AV block:
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EKG Changes (cont.)

- Potentially lethal cardiac disorders to which the 12-lead EKG may provide a clue:
  - Long QT syndrome
  - Short QT syndrome
  - Brugada syndrome
  - Arrhythmogenic right ventricular cardiomyopathy
  - Hypertrophic cardiomyopathy
  - Wolff-Parkinson-White syndrome

Long QT Syndrome:
Short QT Syndrome:
Brugada syndrome:

Arrhythmogenic right ventricular cardiomyopathy:
Hypertrophic cardiomyopathy:

Ventricular preexcitation (WPW pattern):
Summary

- Thorough medical history and physical examination remain the cornerstones of preparticipation screening of athletes.

- Unexplained syncope/near-syncope, exertional chest discomfort and/or palpitations, and dyspnea out of proportion to level of exertion warrant further investigation.

- Family history of premature sudden cardiac death, hypertrophic cardiomyopathy, or Marfan syndrome require further investigation.

Summary (cont.)

- Loud systolic murmurs, any systolic murmur that increases during Valsalva maneuver, and all diastolic murmurs require further investigation.

- Individuals with physical findings suggestive of Marfan syndrome should have an echocardiogram performed.

- In this country, inclusion of an EKG in the preparticipation screening of all competitive athletes remains controversial.