

# **Cardiovascular Red Flags in Preparticipation Screening of Competitive Athletes**

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## **Cardiovascular Red Flags**

### **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!

## Cardiovascular Red Flags

**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!**

## Cardiovascular Red Flags

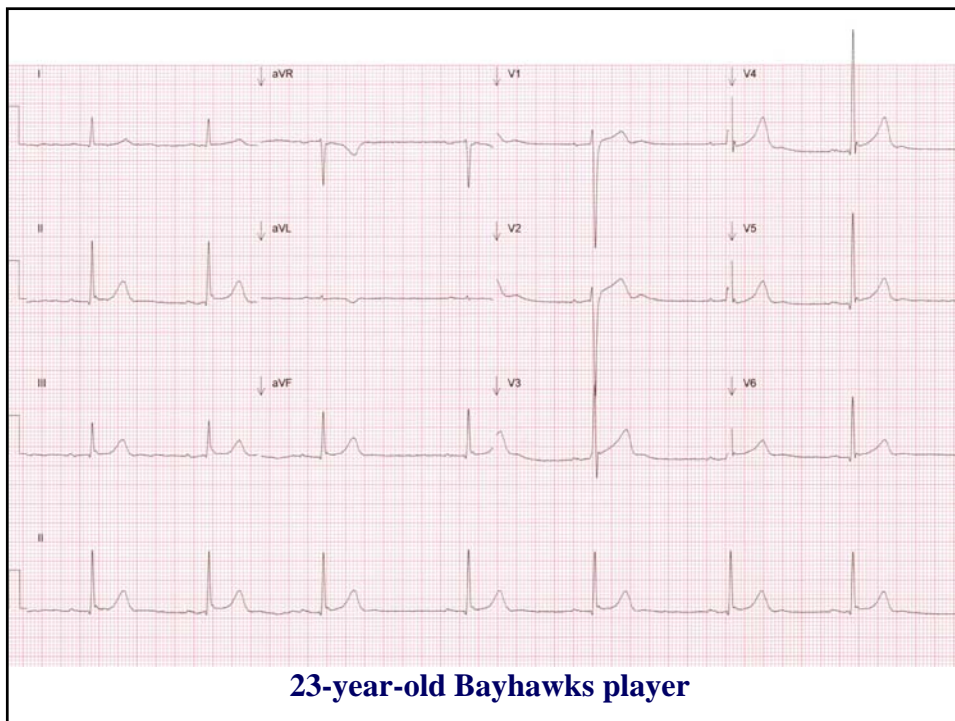
**Physical Findings Requiring Further Investigation:**

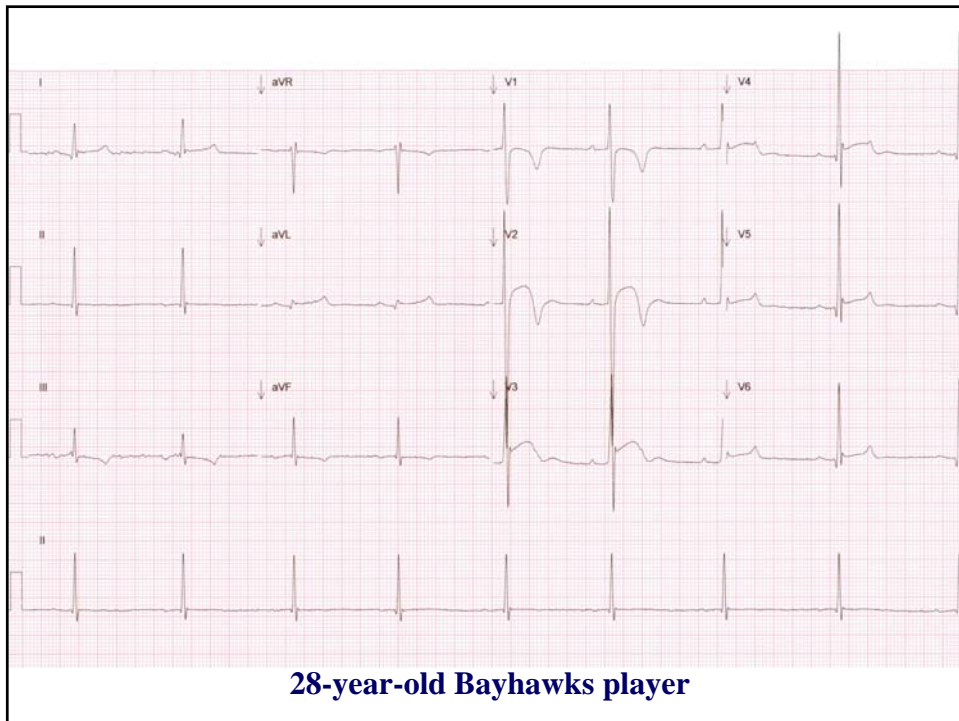
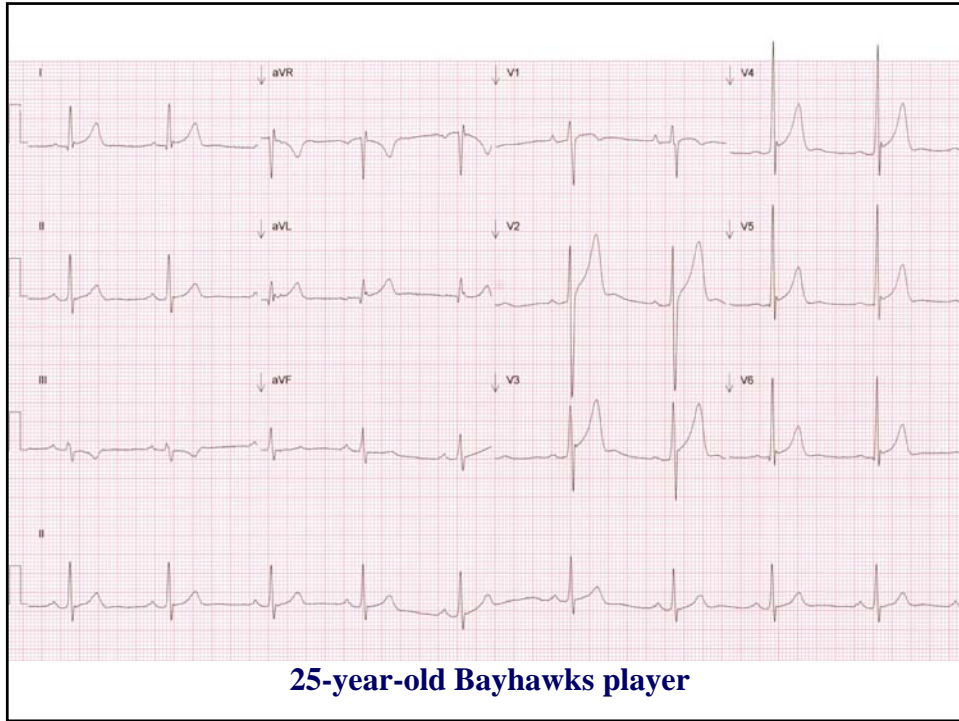
- **Loud (> grade 2/6) systolic murmurs**
- **Any systolic murmur that gets louder during Valsalva maneuver (or having the patient stand from squatting or the supine position)**
- **Any diastolic murmur**
- **Weak lower extremity pulses compared to upper**
- **Findings suggestive of Marfan syndrome**

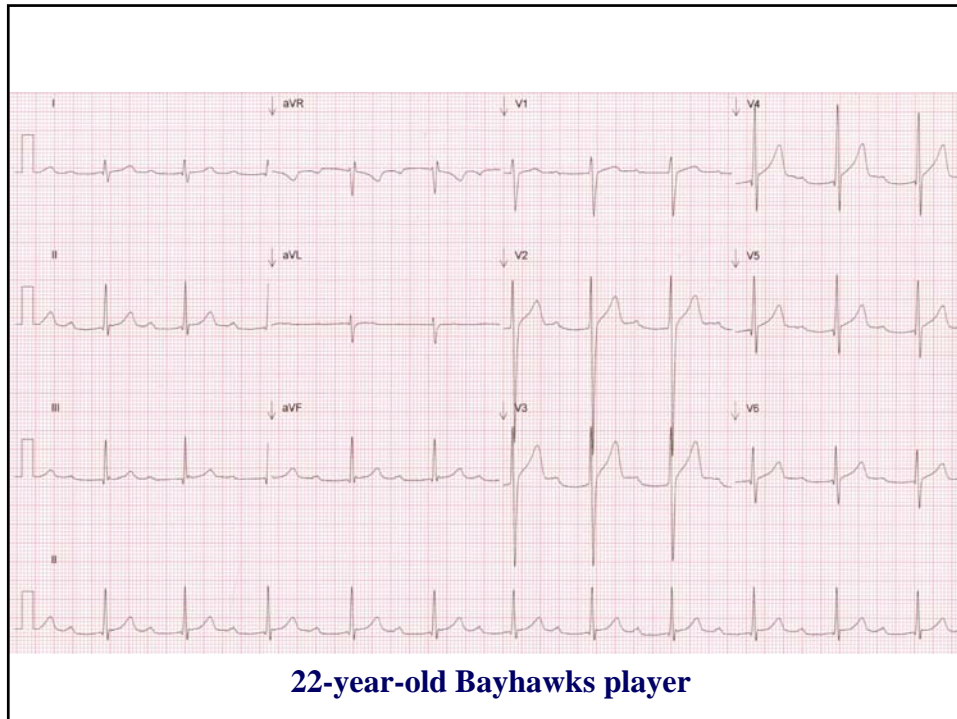
## Cardiovascular Red Flags

# 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, V<sub>1</sub>-V<sub>4</sub> (especially in African-American males)





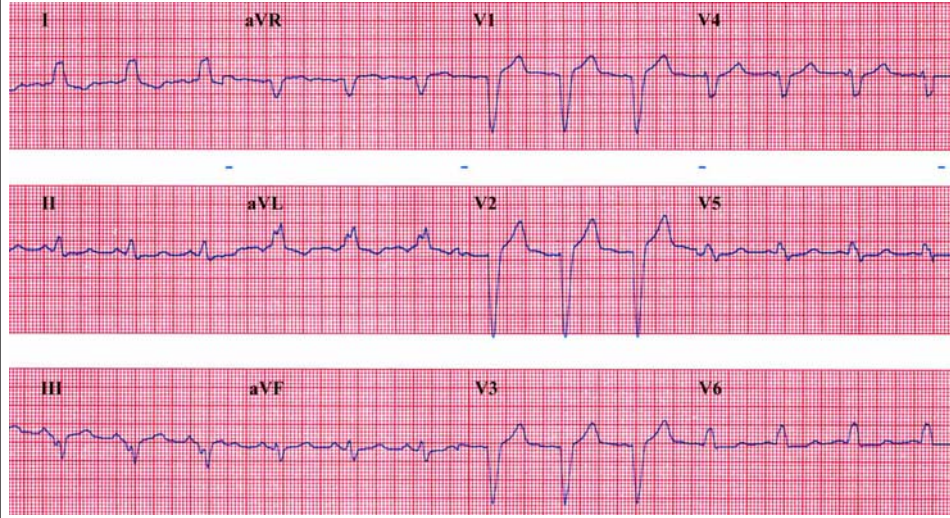


### Cardiovascular Red Flags

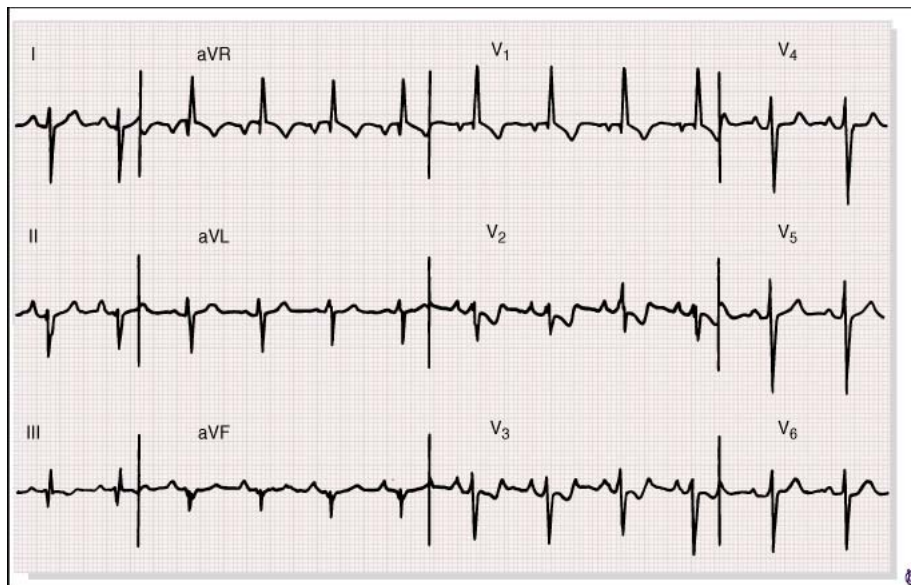
## EKG Changes (cont.)

- **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<sub>5</sub>-V<sub>6</sub>, lateral limb leads, inferior leads**
  - **Pathological Q waves**
  - **Long or short QTC interval, ventricular preexcitation, Brugada pattern, ARVC pattern**

### Left bundle branch block:

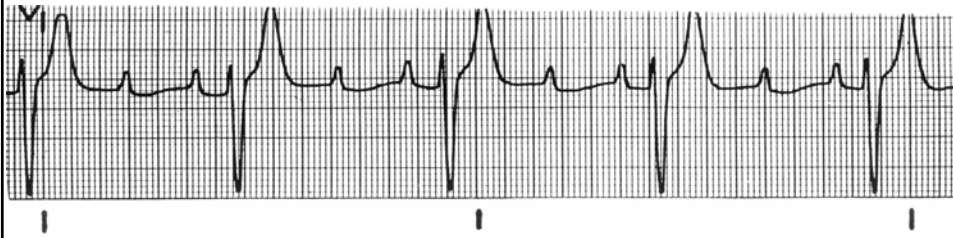


### Right ventricular hypertrophy:

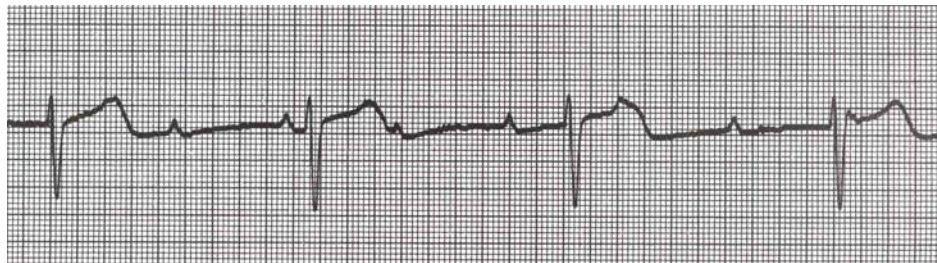


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**Type II second-degree AV block:**



**Third-degree AV block:**

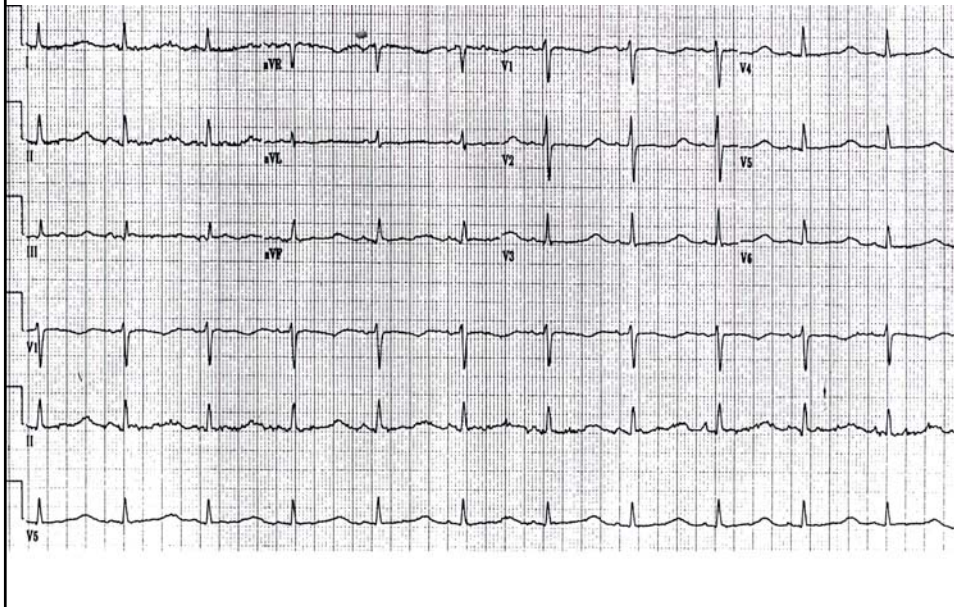


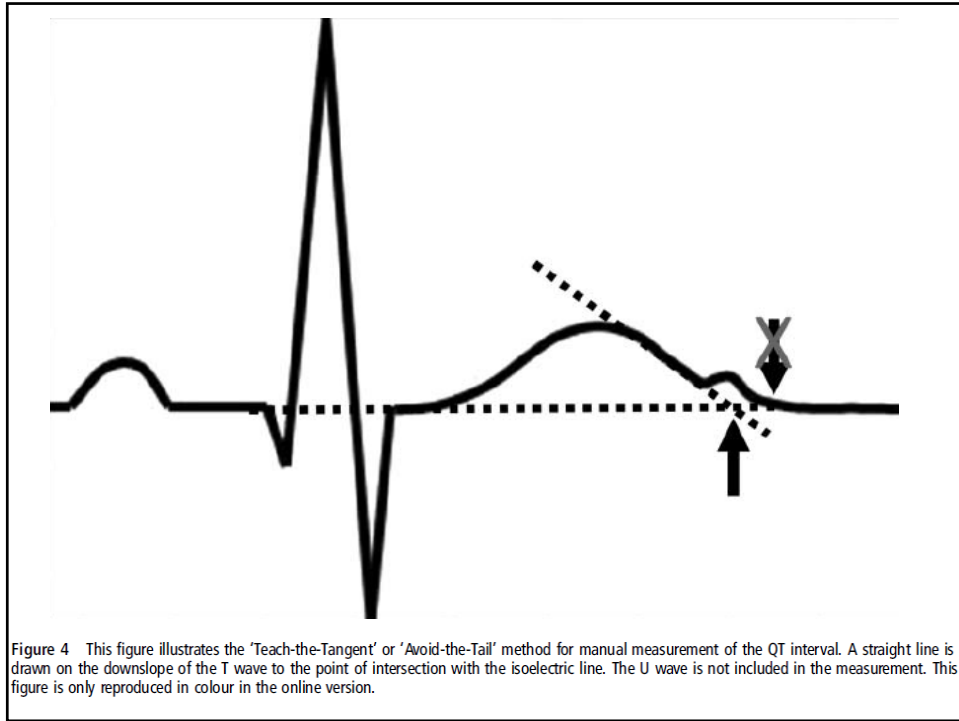


## Cardiovascular Red Flags

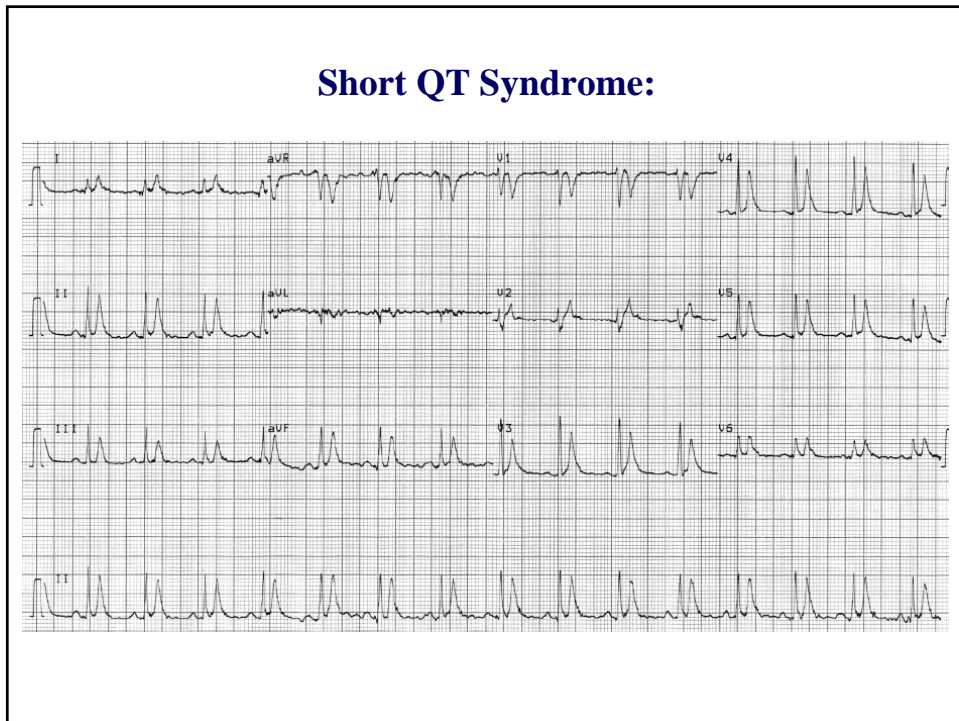
**EKG Changes (cont.)**

- **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

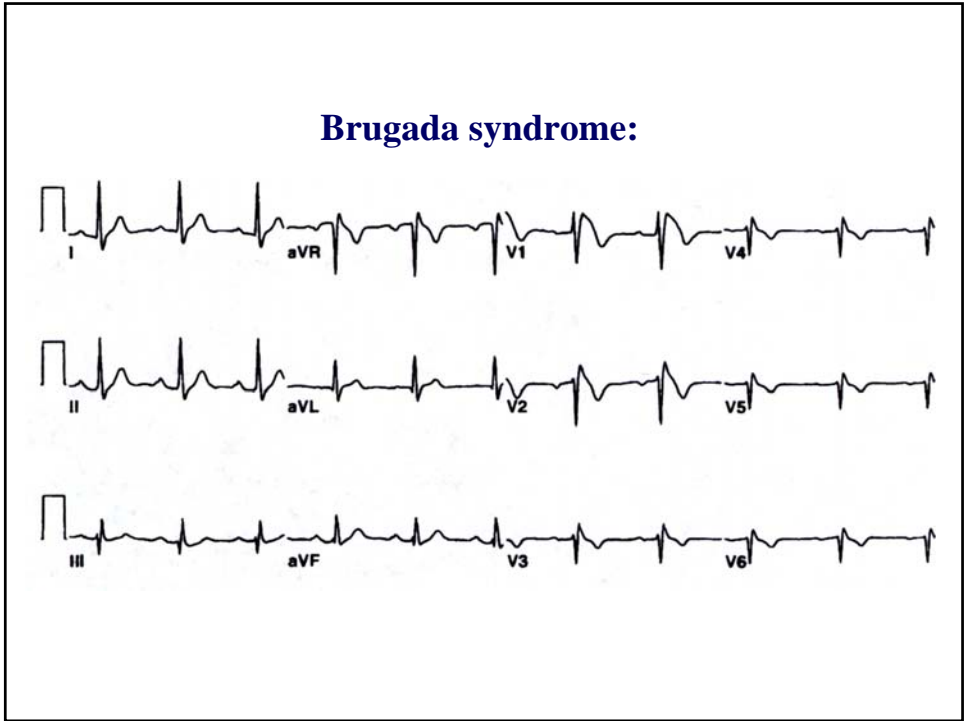
**Long QT Syndrome:**



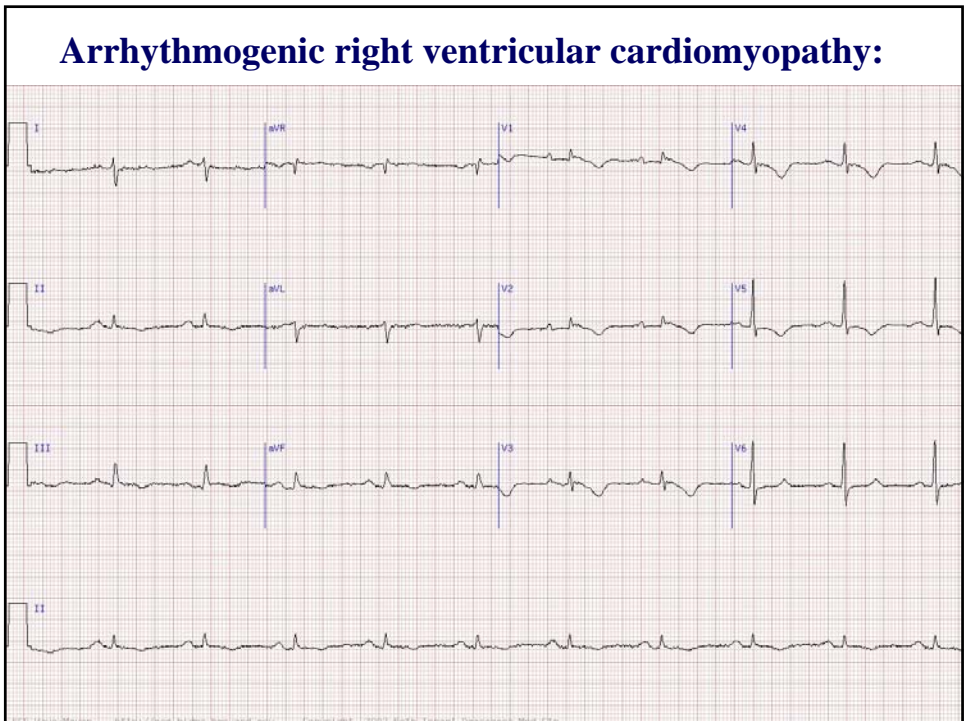
### Short QT Syndrome:



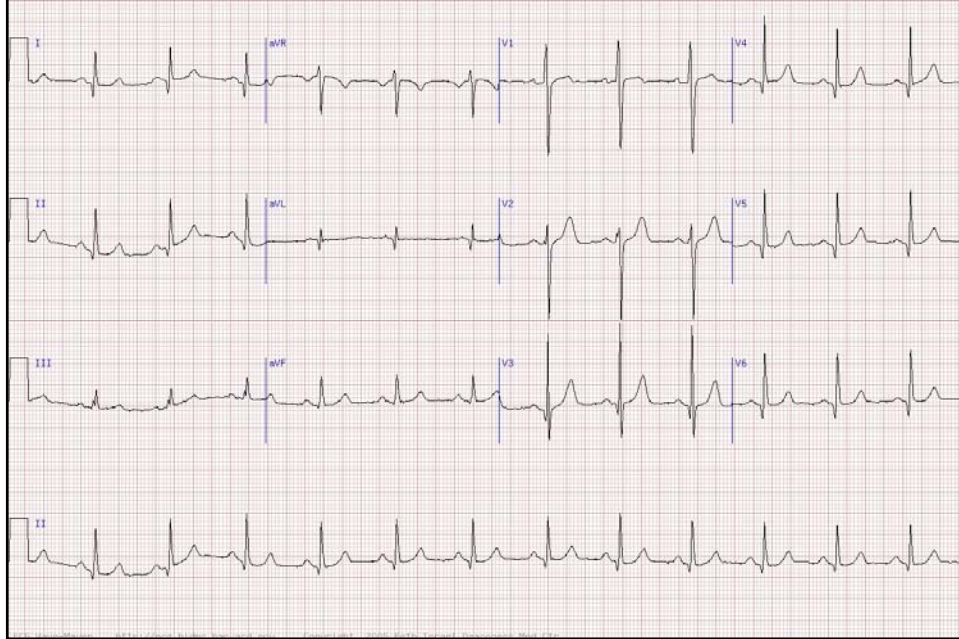
**Brugada syndrome:**



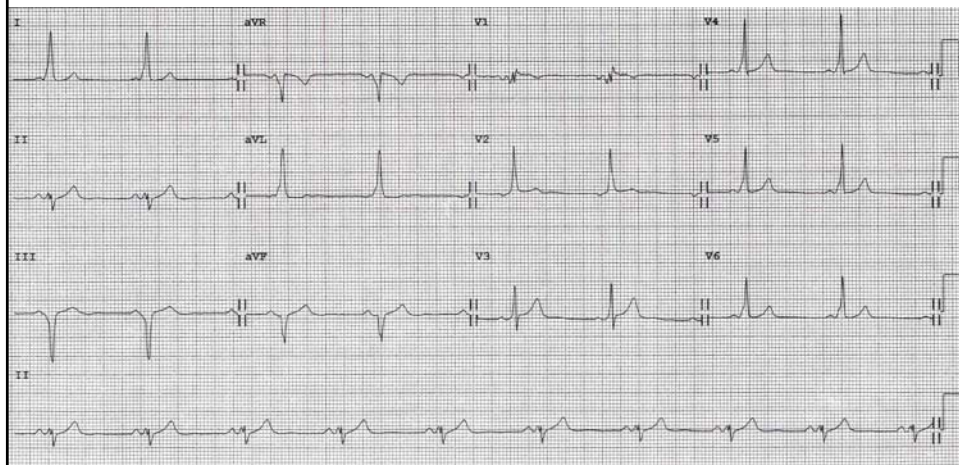
**Arrhythmogenic right ventricular cardiomyopathy:**



### Hypertrophic cardiomyopathy:



### Ventricular preexcitation (WPW pattern):



**Cardiovascular Red Flags****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.**

(cont.)

**Cardiovascular Red Flags****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.**