

Chest Pain in Young Athletes

Christopher Davis, MD, PhD
Pediatric Cardiology
Rady Children's Hospital San Diego
cdavis@rchsd.org
858-966-5855



Disclosures

- None

Chest Pain: the good news and the bad news:

- GOOD: Of all children and adolescents with a chief complaint of chest pain, very few have life threatening disease.
- BAD: Chest pain is common in children: you will encounter it.
- GOOD: A history and physical exam are usually all that is needed to approach a diagnosis.

Chest Pain

- In adults, chest pain is a heart attack until proven otherwise
- In children, chest pain is virtually never caused by a heart attack (i.e. a true myocardial infarction)
 - Multitude of causes, most of which are benign

Chest Pain Clues

- Factors associated with “real” disease:
 - Acute onset of pain that is now unrelenting
 - Presence of fever and systemic illness
 - Pain waking the patient at night
 - ONLY during exertion/exercise

Differential Diagnosis

- Major Categories:
 - Idiopathic (~30% of cases) → like headaches
 - Musculoskeletal (~25%)
 - Pulmonary (~15%)
 - Psychogenic (~10%)
 - Gastrointestinal (~5 – 10%)
 - Cardiac (~5%)

Specific Diagnoses

- Musculoskeletal Chest Pain:
 - Costochondritis: *sharp* pain involving 2-4 costochondral junctions, several seconds to minutes, exacerbated by *deep breathing*, and reproducible on exam
 - Tietze Syndrome: Inflammation of a costochondral junction with a *warm, tender, and swollen* area on the chest (rare in children).

Musculoskeletal Causes

- Precordial Catch Syndrome: brief, sharp, stabbing pain in the left chest, often pleuritic (worse with deep breaths).
- Muscle Strain/Trauma
- Acute Chest Syndrome in Sickle Cell Disease

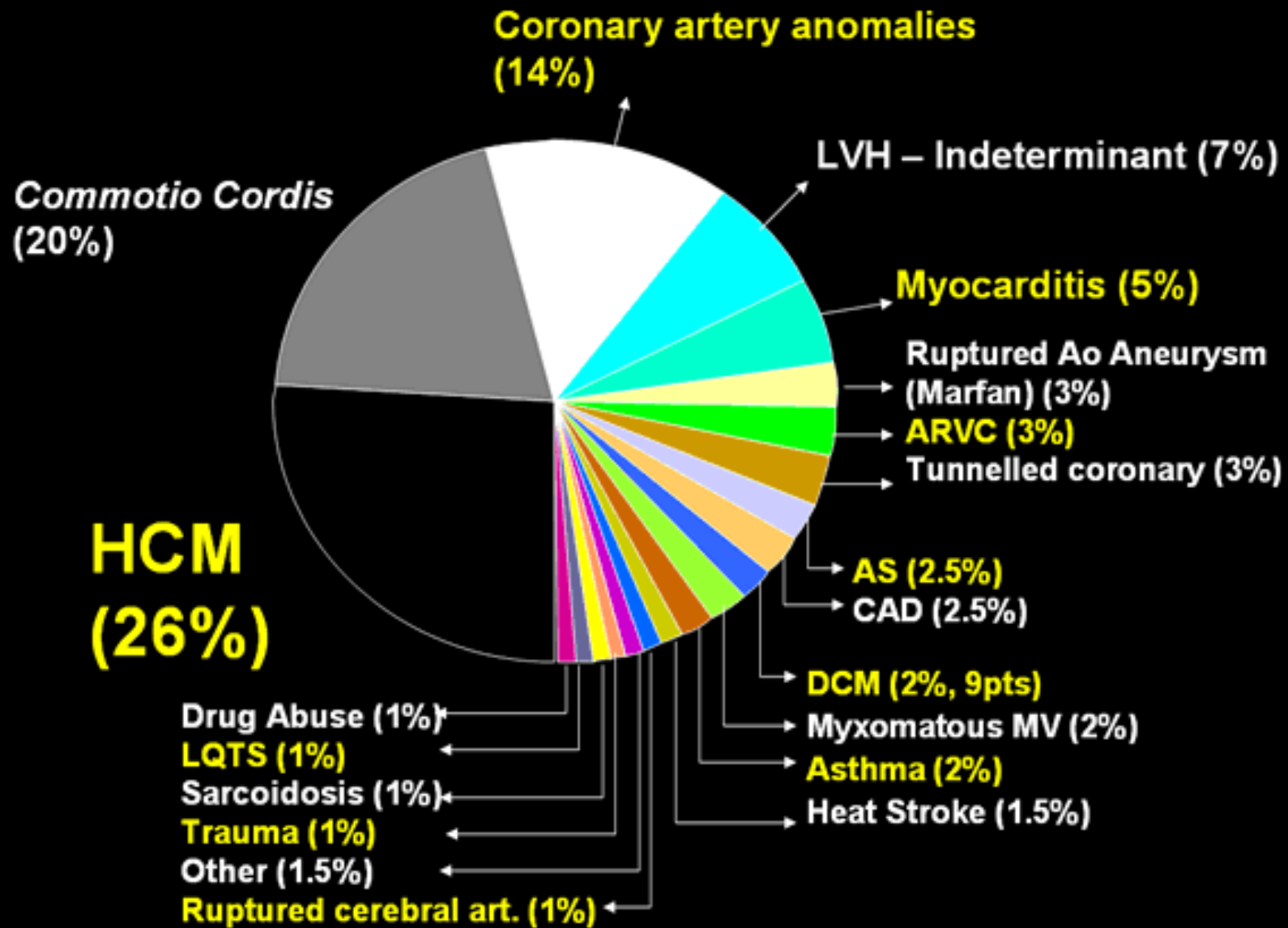
Other Causes

- Asthma, especially exercise-induced (more “tightness” than pain)
- Infection: pneumonia, bronchitis, Shingles
- GE Reflux
- Pneumothorax
- Psychogenic (more common in teenagers, especially with a + FH of chest pain)

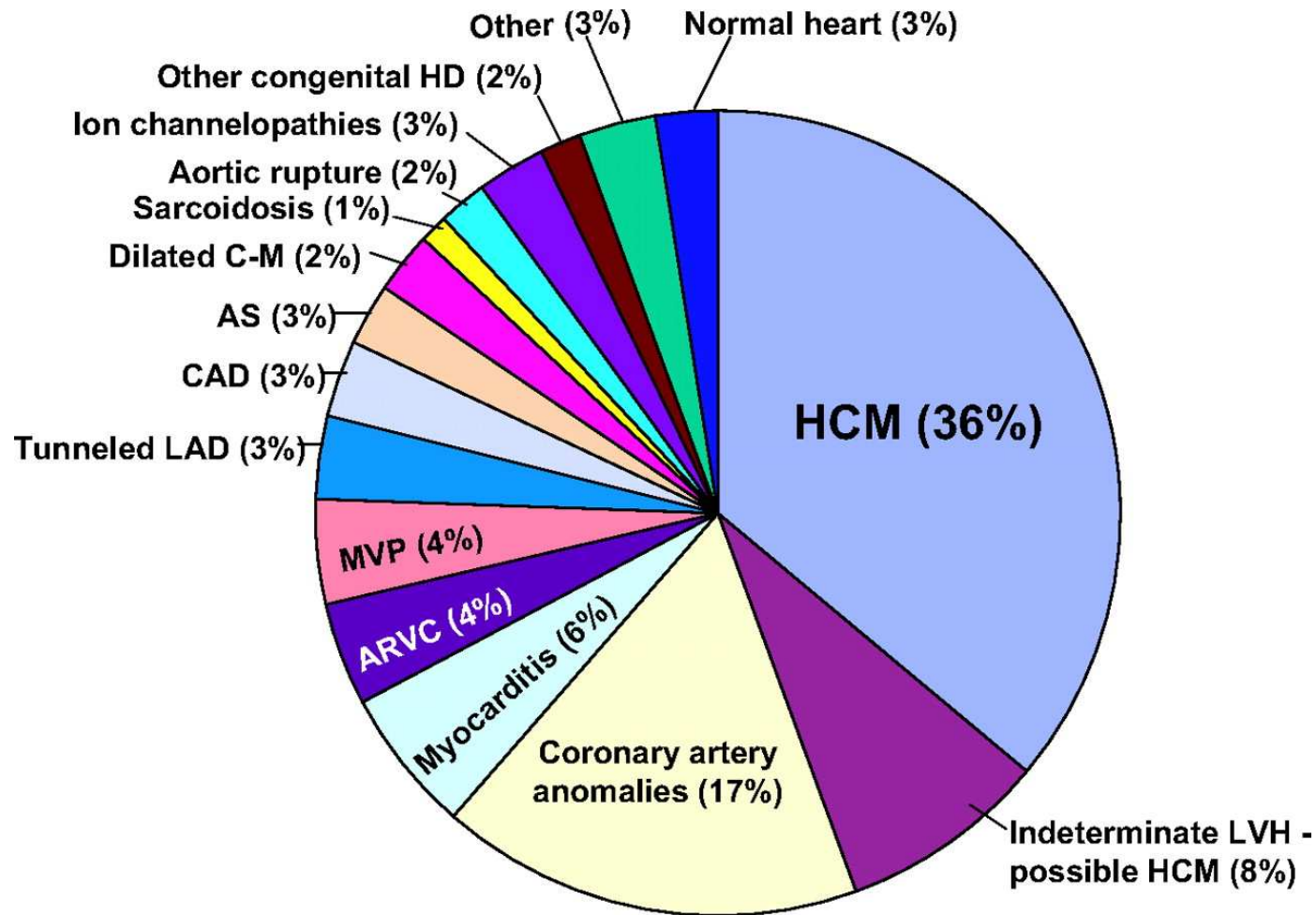
Cardiac Causes

- Hypertrophic Cardiomyopathy
- *Aortic Stenosis*
- *Pericarditis/Myocarditis*
- *Arrhythmias*
- Coronary Disease (usually congenital)
- *Dissecting Aortic Aneurysm* (previous surgery or Marfan Syndrome)

Causes of Sudden Death in 387 Young Athletes



Distribution of cardiovascular causes of sudden death in 1435 young competitive athletes



Maron, B. J. et al. *Circulation* 2007;115:1643-1455

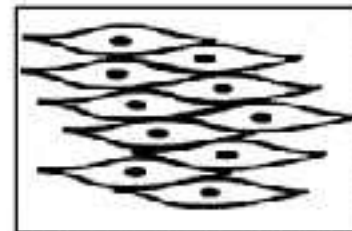
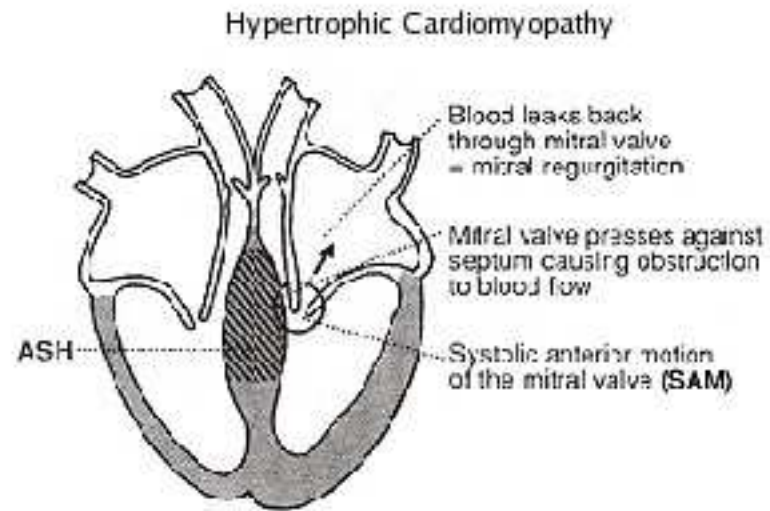
Circulation

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Hypertrophic Cardiomyopathy

- Chest pain and or syncope with exercise
- Characteristic murmur
- Family history of sudden death in young people
- Often no signs or symptoms until sudden death



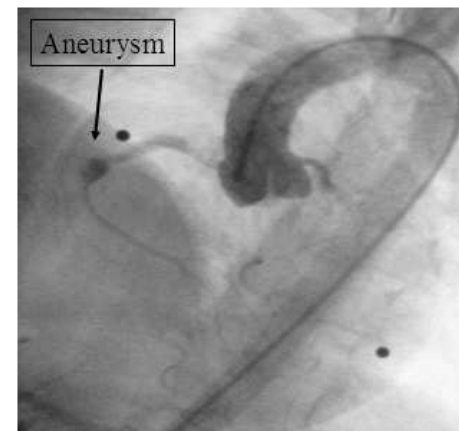
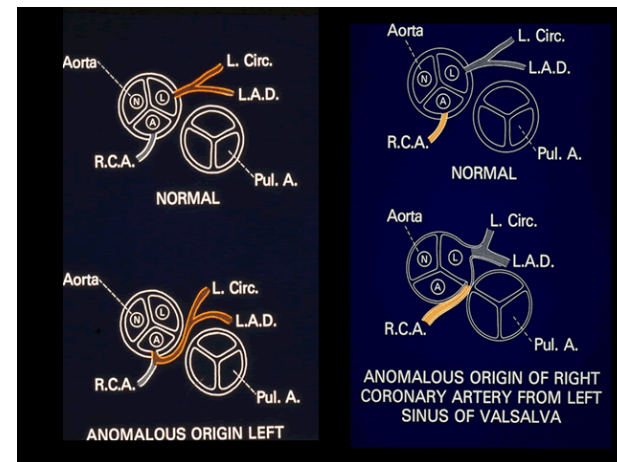
Normal muscle structure



Myocardial disarray

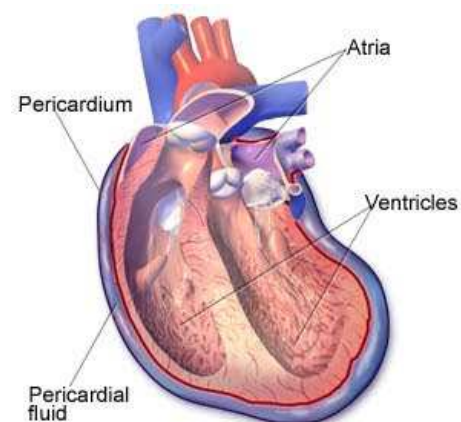
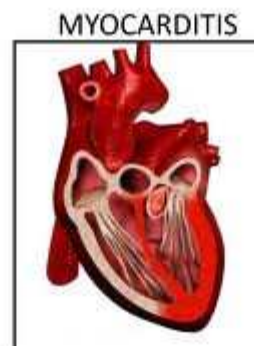
Coronary Abnormalities

- Abnormal origin of either artery
- History of Kawasaki Disease
- Can present with typical angina or with sudden death
- Often no specific PE findings



Myocarditis/Pericarditis

- Infection and/or inflammation of:
- Heart muscle (myocarditis)
- Pericardium (pericarditis)



Inflammation of the Pericardium in the Heart

Cardiac causes of chest pain

- These are the diseases that can cause sudden cardiac arrest and sudden death in the young athlete
 - They cause fatal arrhythmias: ventricular tachycardia, ventricular fibrillation, asystole
- **Exertional chest pain, and/or fainting or nearly fainting during or after exercise, is a red flag warning**

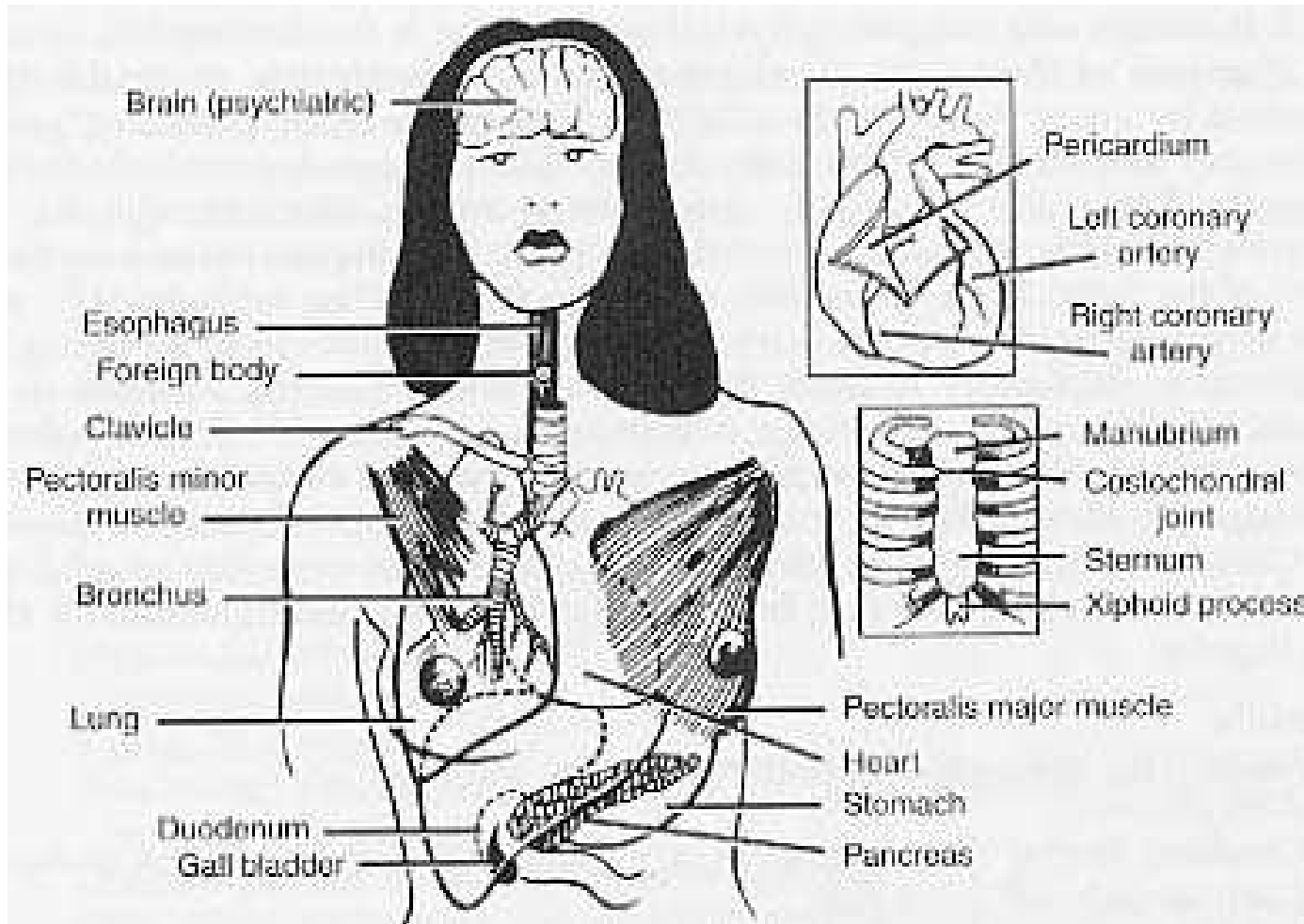
History

- Family History
 - Cardiac disease in children / young adults
 - Sudden Death
- Past Medical History
 - Kawasaki Disease
 - Previous chest pain
 - Previous heart surgery
- Social History
 - Stressors, substance abuse

Physical Exam

- Vital Signs and general appearance
- Inspection and palpation of entire chest wall, muscles, bones, and abdomen
- Auscultation (murmur, click, gallop, rub) and for breath sound abnormalities

Anatomic Approach to the Exam



“Red Flags”

- Exertional pain
- Exertional pre-syncope or syncope
- + Family History of genetic heart disease
- Abnormal cardiac exam
- True angina
- Fever
- Young age (less often psychogenic)

Laboratory Studies

- Generally not needed after thorough H&P
- ECG and CXR if cardiac disease is suspected
 - CXR: heart size, lung opacities, pneumothorax
 - ECG: arrhythmia, ST changes (pericarditis, ischemia, old infarct), WPW (delta wave), abnormal voltages (HCM)
- Cardiac enzymes (CKMB, troponin) tend to be over-utilized to “rule-out” heart disease

The 12-Element AHA Recommendations for Pre-participation Cardiovascular Screening of Competitive Athletes

Medical History

Personal History

1. Exertional chest pain/discomfort
2. Unexplained syncope/near-syncope
3. Excessive exertional and unexplained dyspnea/fatigue, associated with exercise
4. Prior recognition of a heart murmur
5. Elevated systemic blood pressure

Family History

6. Premature death (sudden and unexpected, or otherwise) before age 50 years due to heart disease, in 1 relative
7. Disability from heart disease in a close relative <50 years of age
8. Specific knowledge of certain cardiac conditions in family members: hypertrophic or dilated cardiomyopathy, long-QT syndrome or other ion channelopathies, Marfan syndrome, or clinically important arrhythmias

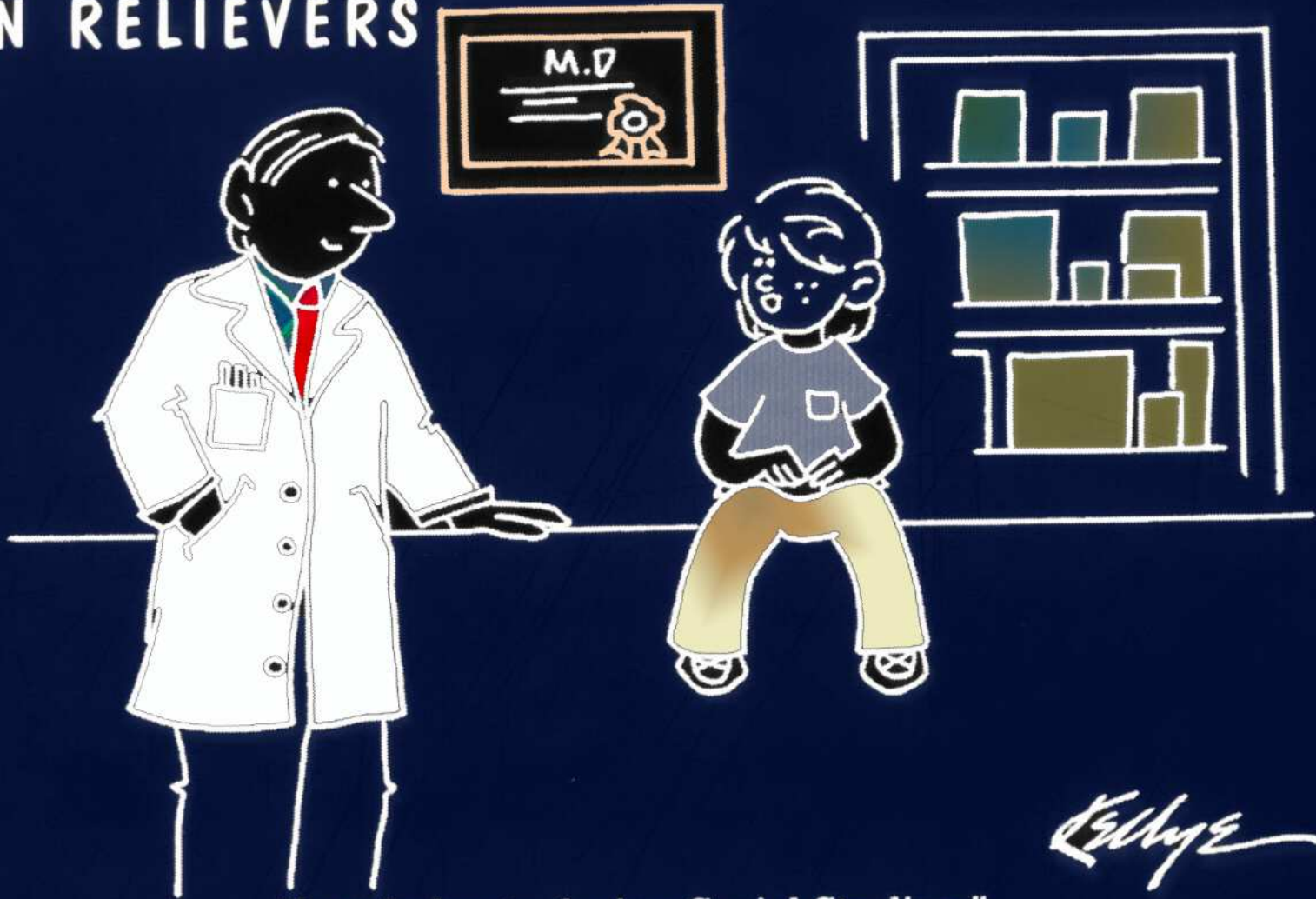
The 12-Element AHA Recommendations for Pre-participation Cardiovascular Screening of Competitive Athletes

Physical Examination

9. Heat murmur
10. Femoral pulses to exclude aortic coarctation
11. Physical stigmata of Marfan syndrome
12. Brachial artery blood pressure (sitting position)
5. Elevated systemic blood pressure

- Parental verification is recommended for high school and middle school athletes.
- Judged not to be neurocardiogenic (vasovagal); of particular concern when related to exertion.
- Auscultation should be performed in both supine and standing positions (or with Valsalva maneuver), specifically to identify murmurs of dynamic left ventricular outflow tract obstruction.
- Preferably taken in both arms.³⁷

PAIN RELIEVERS



"It only hurts during Social Studies."

References

- Kocis, K. Chest Pain in Pediatrics. *Pediatric Clinics of North America*. 46 (2), April 1999
- Selbest, SM et al. Pediatric Chest Pain: A Prospective Study. *Pediatrics* Vol 82 (3) September 1988
- Selbst, SM et al. Chest Pain in Children: Follow-up of Patients Previously Reported. *Clinical Pediatrics*. Vol 29 (7), July 1990.
- Driscoll, D. Chest Pain in Children and Adolescents. *Moss and Adams' Heart Disease in Infants, Children, and Adolescents*. 7th Edition, Lipincott, Williams & Wilkins.
- Wiens, L et al. Chest Pain in Otherwise Healthy Children and Adolescents is Frequently Caused by Exercise-Induced Asthma. *Pediatrics* Vol 90 (3) September 1992.
- www.suddendeathathletes.org (Minneapolis Heart Institute Foundation)
- Maron, B et al. Recommendations and Considerations Related to Preparticipation Screening for Cardiovascular Abnormalities in Competitive Athletes: 2007 Update: A Scientific Statement From the American Heart Association Council on Nutrition, Physical Activity, and Metabolism: *Endorsed by the American College of Cardiology Foundation*, *Circulation* 2007.