Primary Prevention of Sudden Cardiac Death in Young Athlete—Are we asking the right questions?
• Devastates a community
• Estimated 0.8-6.2 per 100,000 per year (Maron et al., 2007)
• Recent studies suggest that the frequency of Sudden Cardiac Death (SCD) in children and adolescents is increasing (Berger, Utech & Hazinzinski, 2004)

Can we prevent this tragedy?
CAUSES OF SUDDEN CARDIAC DEATH

- Hypertrophic Cardiomyopathy (HCM), Dilated Cardiomyopathy, Arrhythmogenic Right Ventricular Dysplasia (ARVD)
- Congenital Anomalies of the Coronary Arteries
- Valvular heart disease, Aortic rupture caused by Marfan syndrome
- Long QT syndrome, Brugada Syndrome, WPW
- Many of these disorders have a genetic component.
Figure 2a- A normal heart is shown on the left compared to a heart with a hypertrophic cardiomyopathy on the right. Note the increased thickness of the walls of the left ventricle.
Figure 1a- A normal heart is shown on the left compared to a heart with dilated cardiomyopathy on the right. Note the increased dimensions of the left ventricle.
Diagram Illustrating the Aberrant Course Taken by the Left Main Coronary Artery.
• LCA courses in narrow area between pulmonary and aortic roots
• Theory is that roots expand during vigorous exercise and pinch off coronary
• Difficult to diagnose
• Repetitive chest pain, near syncope or dysrhythmia with exercise
• Recent data implicates ARCA
AORTIC STENOSIS (AS)

- 3 - 6% of children with congenital heart defects
- Systolic ejection murmur radiating to the carotids and initiated by an ejection click if valvar
- Risk about 1%/year
- No restriction for bicuspid valve w/o AS
• Connective Tissue Disorder
• Unusually tall, arachnodactyly, chest deformity, high arch palate, arm span > height, bony abnormality, lens subluxation
• Aortic root dilation and rupture
• May also have MVP
• SVT - rare
• Sick Sinus Syndrome and Complete Heart Block - rare except in post operative patients
• Ventricular Dysrhythmias - rare except post operatives
• Prolonged QT
The preparticipation cardiovascular screening is used to identify or at least raise the suspicion of abnormalities that could cause disease progression or death.

Great debate regarding the most appropriate screening strategy.
2007 American Heart Association scientific statement:

12 point screening process could help reduce SCD in young athlete

- Personal History
  - Chest pain with exertion
  - Unexplained syncope/near syncope
  - Excessive fatigue/sob associated with exertion
  - Prior history of heart murmur
  - History of elevated systemic blood pressure
AHA RECOMMENDATIONS FOR PREPARTICIPATION SCREENING

- **Family History**
  - Premature sudden and unexpected death before the age of 50
  - Disability from heart disease in first degree relative
  - Specific knowledge of certain cardiac conditions:
    - HCM, Dilated Cardiomyopathy, LongQT syndrome or other clinically important arrhythmias, Marfan Syndrome

- **Physical Exam**
  - Heart murmur
  - Femoral pulses
  - Brachial BP
  - Physical appearance of Marfan syndrome
• 2005 European Society of Cardiology and International Olympic Committee Protocol
  (Corrado et al., 2005)
  – Family and personal history
  – Physical Examination
  – 12 lead ECG

Based on >25 year Italian state subsidized program in which all individuals 12-35 years who participate in sports are mandated to get annual clearance with an ECG
• Difficult to consider European/Italian strategy on USA
  – 10 million athletes each year in USA
  – Financial resources
  – Manpower
  – Not cost effective

• Studies agree that a good medical and family history is the foundation of any screening program (Corrado et al., 2005; Maron et al., 2007).
• Sudden unexpected death-especially in young person
• History of Long QT Syndrome, congenital deafness, SIDS or drowning
• History of “enlarged heart”- Hypertrophic Cardiomyopathy or Dilated Cardiomyopathy
• History of Heart Attack before the age of 50, Stroke, Diabetes, High Cholesterol
• Marfan Syndrome
• Sudden unexpected death—especially in young person
• History of Long QT Syndrome, congenital deafness, SIDS or drowning
• History of “enlarged heart”—Hypertrophic Cardiomyopathy or Dilated Cardiomyopathy
• History of Heart Attack before the age of 50, Stroke, Diabetes, High Cholesterol
• Marfan Syndrome
• Gathered forms from 110 school districts
  • Public and private schools
  • Suffolk and Nassau Counties
  • Obtained from school’s websites
  • Publicly accessible

• Utilized SPSS to assess frequency of personal history, family history and physical examination questions on school forms

• Caitlin Heyden D.O. PGY-2\textsuperscript{1}, Marybeth Heyden DNP\textsuperscript{1}, Catherine Messina PhD\textsuperscript{2}, James Nielsen M.D.\textsuperscript{1}, Laurie Panesar M.D.\textsuperscript{1}

  \textsuperscript{1}Pediatrics, Stony Brook University Medical Center, Stony Brook, NY
  \textsuperscript{2}Preventive Medicine, Stony Brook University Medical Center, Stony Brook, NY
Results

Most Commonly Asked

Personal History Data

- chest pain: 41.8%
- syncope: 58%
- dyspnea: 42.7%
- previous murmur: 51.8%
- h/o HTN: 54.5%

As asked on <50% of forms
Results

Total Personal History Data

62% asked ≤3/5 history questions
Results

Total History Data

- 20%
- 12%
- 6%
- 5%
- 11%
- 11%
- 9%

6%
Results

Physical Exam Data

- New murmur: 100%
- BP measured: 98.1%
- Femoral pulses: 4.5%
- Marfanoid features: 3.6%
Only 3.6% ask all.

95% of forms ask <half PE points.
Results

Total PPE Points

71% ask <50% of recommended questions
• 62% of PPE forms asked \( \leq 3/5 \) personal history questions

• Nearly 70% of PPE forms asked no family history questions

• Only 6% addressed all recommended history questions

• 95% of forms addressed \( \leq 50\% \) of recommended physical examination questions

• 71% of the PPE forms addressed less than half of the recommended questions

• Only 3.6% of school district forms had all 12/12 endorsed points
• There was significant variability in the questions asked on PPE forms among school districts

• The majority of PPE forms were markedly deficient in identifying personal history, family history and physical examination risk factors for SCD in young athletes