Sudden Cardiac Death

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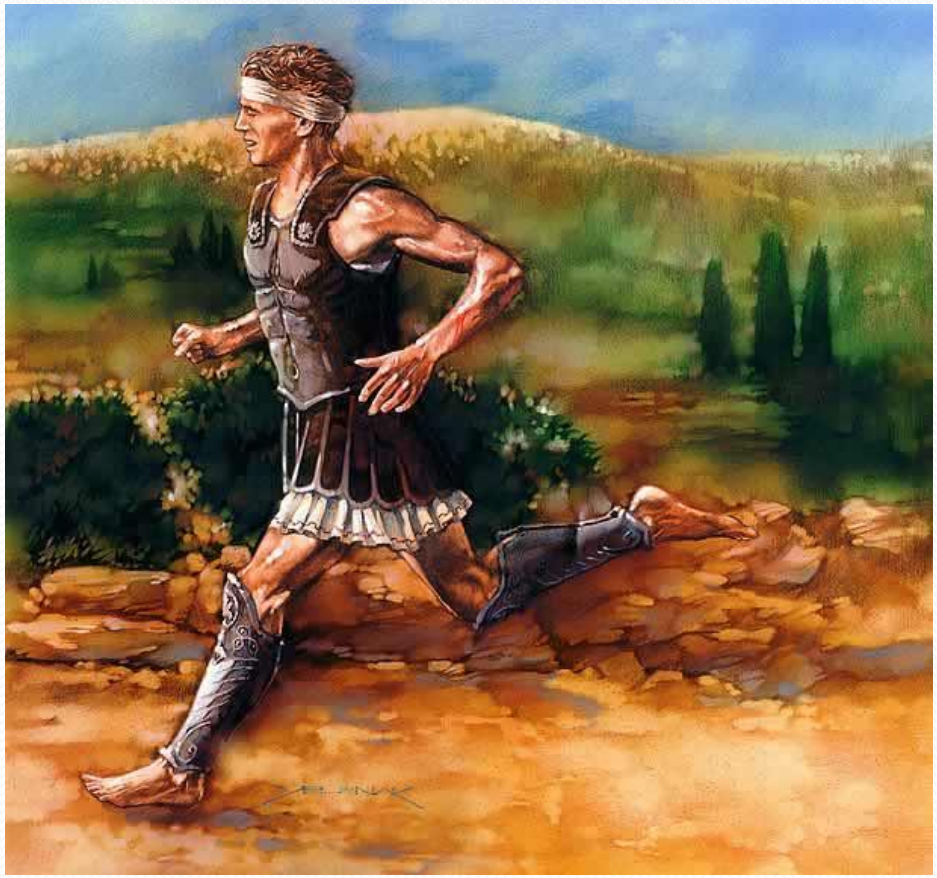
Sudden Cardiac Death

- Pheidippides
  - 490 BC
  - Greek Soldier
  - Ran from Marathon to Athens to announce victory over Persia (about 26 miles)
  - Shouted “Nike” (Victory), then collapsed



Sudden Cardiac Death

Definition

- Witnessed or unwitnessed natural death resulting from sudden cardiac arrest occurring unexpectedly within 6 hours of a previously normal state of health. (Maron, *J Am Coll Cardiol*, 1986)
- World Health Organization: "Sudden collapse occurring within one hour of symptoms." (Goldstein, *Am Heart J*, 1982)





AUTOMATED EXTERNAL
DEFIBRILLATOR
AED

American Heart Association

New CPR Sequence

American Heart Association.

Use an AED

- If you start CPR and then use an AED within a few minutes, you will have the best chance of saving a life
- AEDs are safe, accurate, and easy to use

Cardiac Care

CHAIN OF SURVIVAL

Early Access	Early CPR	Early Defibrillation	Early Advanced Care
1	2	3	4

QUICK USE INSTRUCTIONS

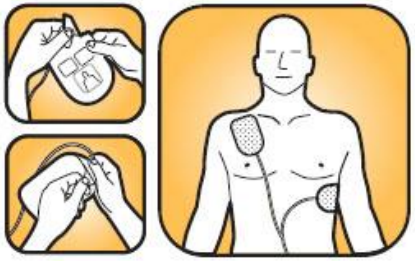
PRESS "ON" BUTTON

1

APPLY PADS

FOLLOW AED INSTRUCTIONS

2



IF INSTRUCTED, PRESS "SHOCK" BUTTON

3

WHEN TO USE

WHEN TO USE THE AED

Use the AED when the patient is:

- Unconscious
- Unresponsive
- Not breathing

For patients under 8 years old or less than 55 pounds (25kgs), use child/infant electrode pads. Do not delay therapy to determine exact age or weight.

WHEN NOT TO USE THE AED

The AED should not be used if the patient is:

- Conscious and/or responsive
- Breathing
- Has a detectable pulse

WHO SHOULD USE THE AED

The user should have:

- Defibrillation training as required by local, state, provincial, or national regulations.
- Any additional training as required by the authorizing physician.
- Thorough knowledge and understanding of the material presented in this Operating Guide and in the User Manual (on Defibtech User CD).

SCD in the Young

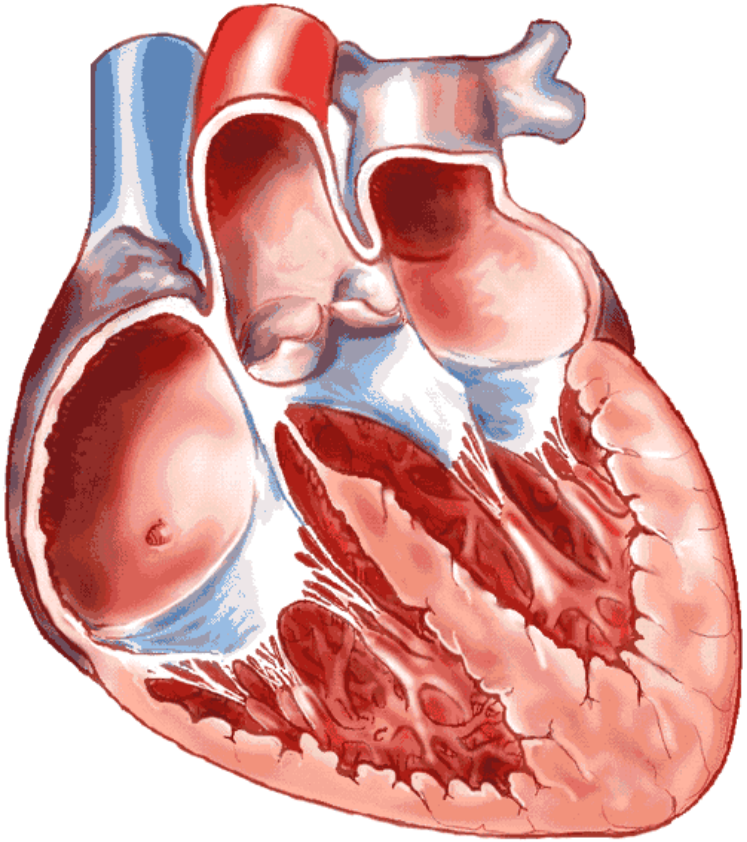
- **Structural Disease**
  - Hypertrophic Cardiomyopathy
  - Anomalous Coronary Artery
  - Arrhythmogenic RV Dysplasia
  - Myocarditis
  - Marfan Syndrome / Ruptured Aneurysm
  - Mitral Valve Prolapse
  - Atrial Septal Defect

SCD in the Young

- **Non-Structural Disease**
  - Commotio Cordis
  - Ion Channelopathies:
    - Long QT Syndrome
    - Short QT Syndrome
    - Brugada Sndrome
  - Wolff-Parkinson-White Syndrome
  - Idiopathic VF

The Athlete's Heart

- Thickened wall AND increased LV chamber size
- Echocardiographic findings reverse by 1/3 with 3 weeks of no training



Hypertrophic Cardiomyopathy

- 1:350 to 1:625 of general population
- More common cause of SCD in African-Americans than Caucasians

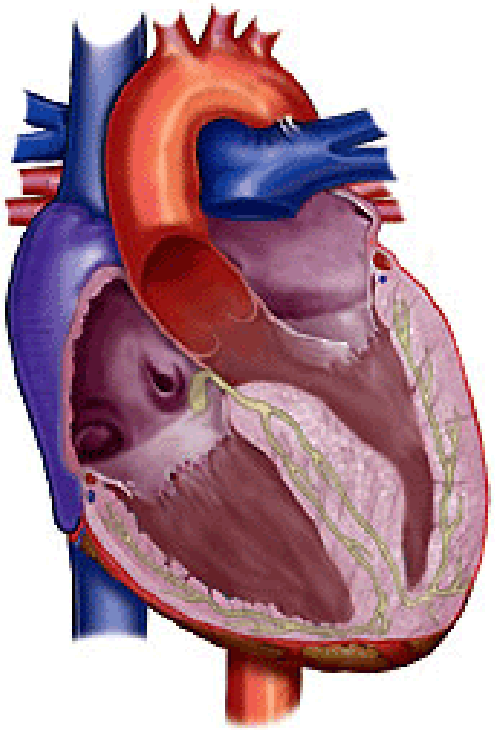


Figure 5

Asymmetric Septal Hypertrophic **without** obstruction

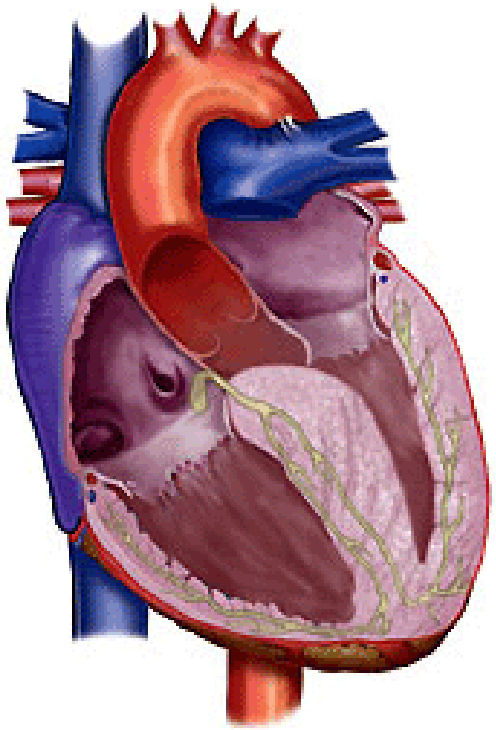
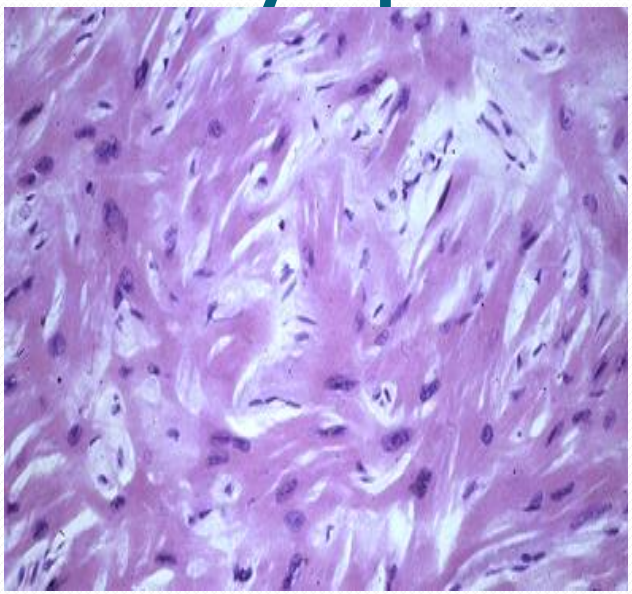


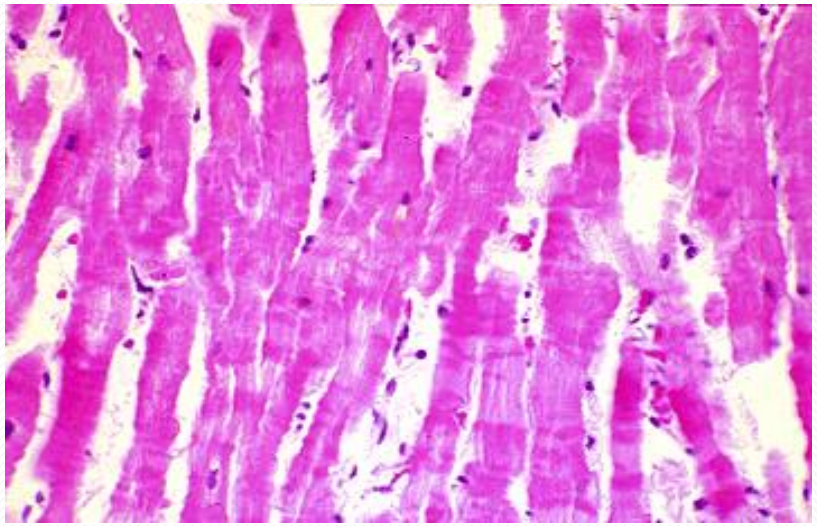
Figure 6

Asymmetric Septal Hypertrophic **with** obstruction

Hypertrophic Cardiomyopathy

- Autosomal Dominant with variable expression
- Many different mutations in components of heart muscle
- Disorganized architecture / structure





Hypertrophic Cardiomyopathy

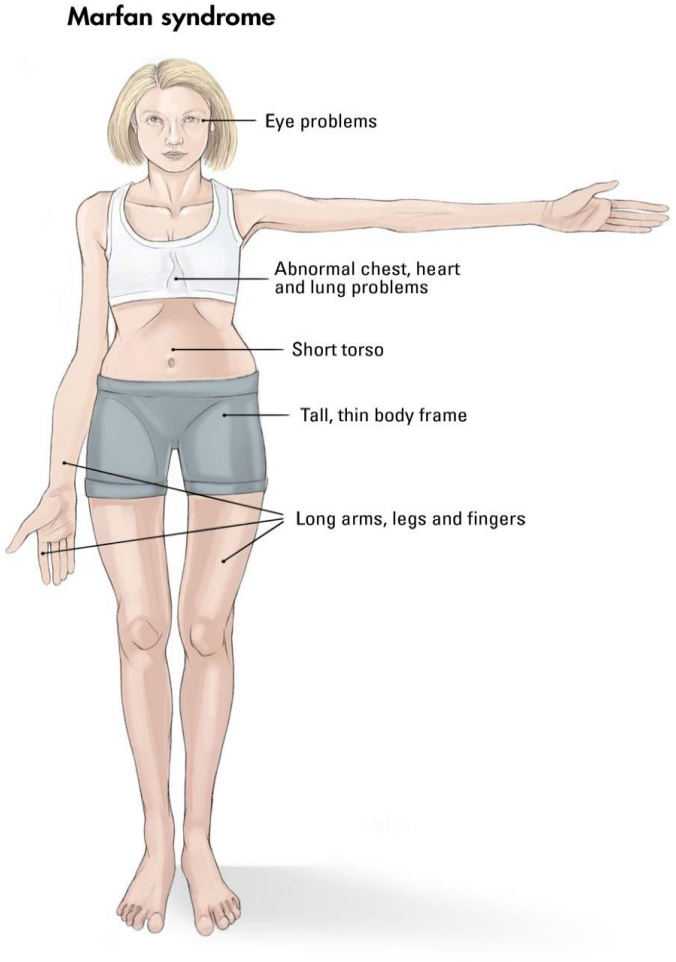
- Symptoms
  - Most have **NONE**
  - Light headedness
  - Syncope
  - Shortness of breath out of proportion to exercise
  - Chest Pain
- Objective findings
  - Exam: Systolic Ejection Murmur, best at left lower sternal border
  - ***INVERSELY PROPORTIONAL*** TO VENOUS RETURN
    - Increases with decreased venous return (valsalva, standing)
    - Decreases with increased venous return (squatting, hand gripping)

Myocarditis

- Inflammation of the heart muscle
- Most often from acute viral infection
- Symptoms of progressive exercise intolerance and congestive symptoms of dyspnea, cough, orthopnea
- Leads to weakness of heart muscle and disturbance in conduction secondary to scarring of heart muscle

Marfan Syndrome

- Autosomal dominant disorder of connective tissue. 1:10,000 to 1:20,000



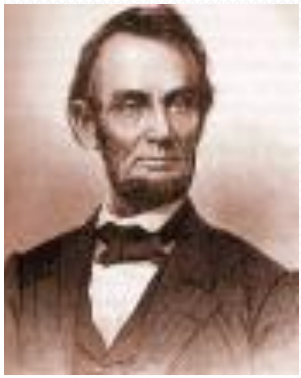
PARTS OF THE BODY AFFECTED BY MARFAN SYNDROME

EYESIGHT
near-sighted (myopic)
eye (or ocular) lens dislocation
retinal detachment

LUNGS
spontaneous lung collapse (pneumothorax)

CARDIO-VASCULAR SYSTEM
aorta widening or dilatation
aortic aneurysms
mitral and/or aortic valve(s) prolapse / leakage

SKELETON
curvature of the spine (scoliosis)
pigeon or funnel chest (pectus deformity)
tall stature
loose jointedness



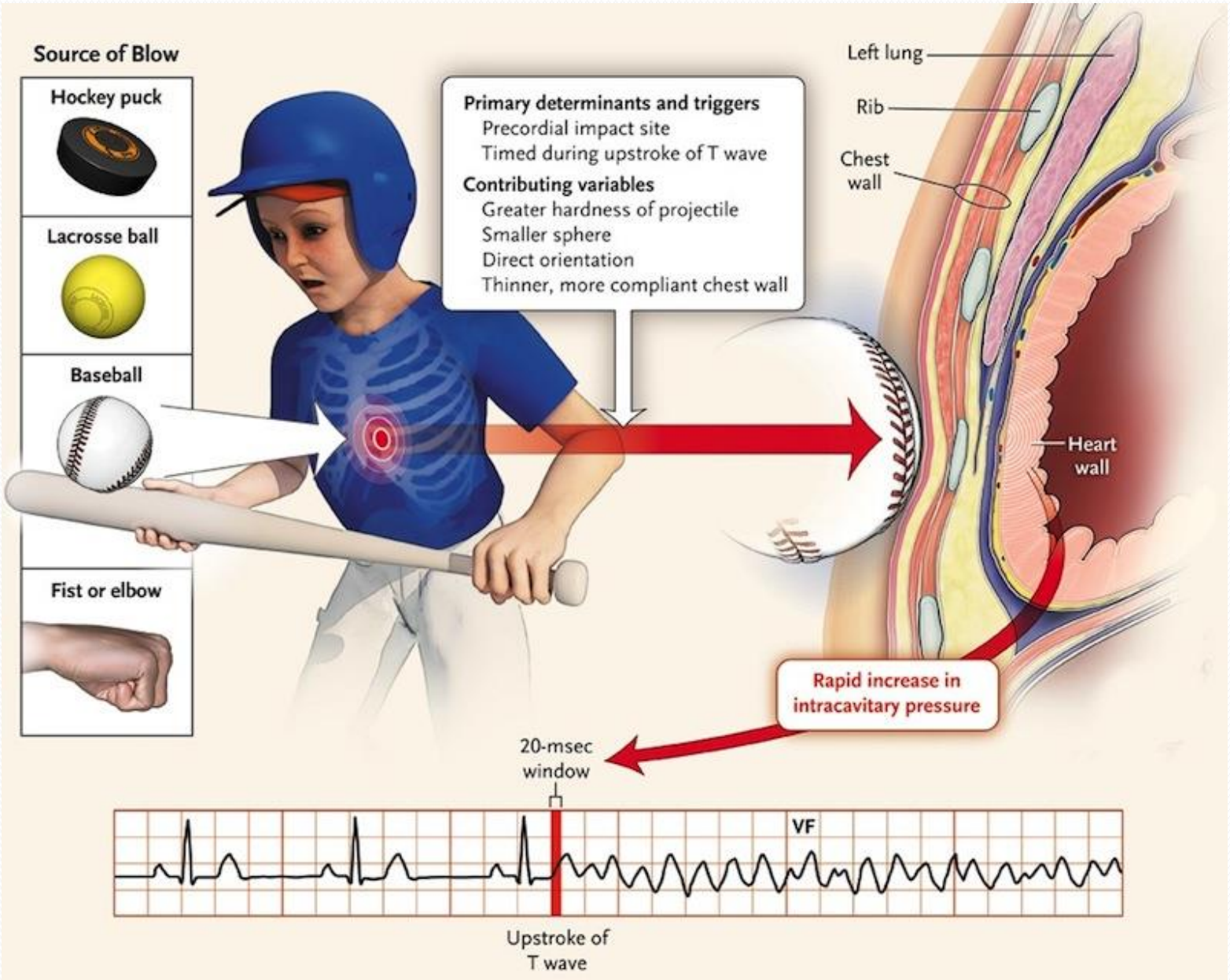
Coronary Artery Disease

- Peak incidence of ventricular fibrillation within first 48 hours after acute MI (Goldberg, *Am J Cardiol*, 1987)
- 50% deaths due to acute MI occur out of the hospital, and most episodes occur within 1 hour of symptom onset (Gheeraert, *J Am Coll Cardiol*, 2000)
- Plaque rupture more common with exercise (n=141)
  - 72% who died during exercise had plaque rupture compared to 23% of those who died at rest
  - Histological evidence of acute MI was present in 0 of 25 in the exertion group and in 15 (13%) of 116 in the rest group. (Burke, *JAMA*, 1999)

Commotio Cordis

- "Cardiac Contusion"
- Fatal arrhythmia triggered by chest trauma
- 87% Caucasian, 95% males, ages 4-16 (mean of 14)
- Most commonly from baseball, softball, and hockey, where projectile was pitched, thrown, batted. (Avg. speed 30-50 mph)
- Also in karate, lacrosse, football, martial arts, motor vehicle accidents (32% bodily contact)

Yabek, *eMedicine*, 2003 Maron, *JAMA*, 2002


Source of Blow
Hockey puck
Lacrosse ball
Baseball
Fist or elbow
Primary determinants and triggers
Precordial impact site
Timed during upstroke of T wave
Contributing variables
Greater hardness of projectile
Smaller sphere
Direct orientation
Thinner, more compliant chest wall
Left lung
Rib
Chest wall
Heart wall
Rapid increase in intracavitary pressure
20-msec window
VF
Upstroke of T wave

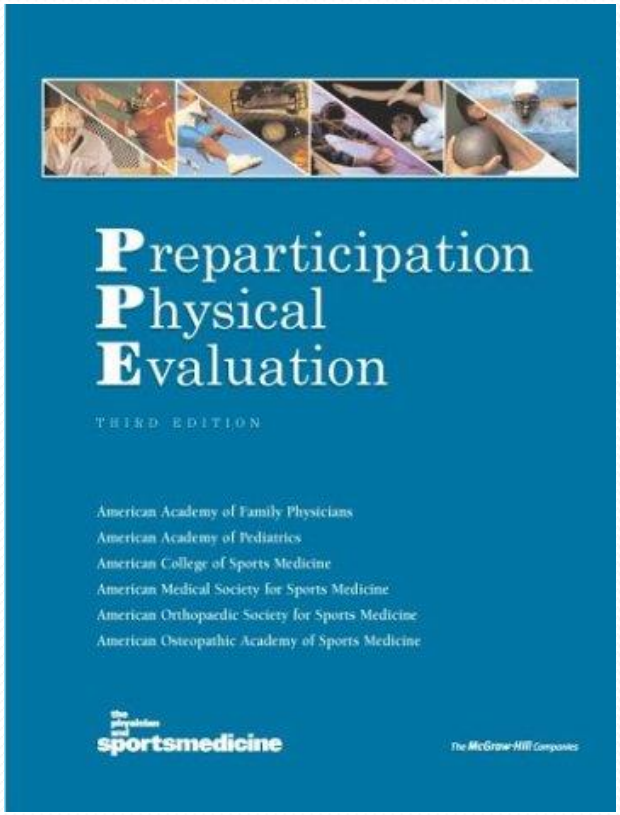
Commotio Cordis

- Participation recommendations:
  - PREVENTION:
    - Protective equipment and softer-than-normal safety baseballs
  - TREATMENT:
    - With correct mechanism, don't underestimate injury
    - ABC's. **Readily available AED's**
    - Time to defibrillation important
      - **Within 3 minutes – Survival 50%**
      - 10% decrease for every minute thereafter

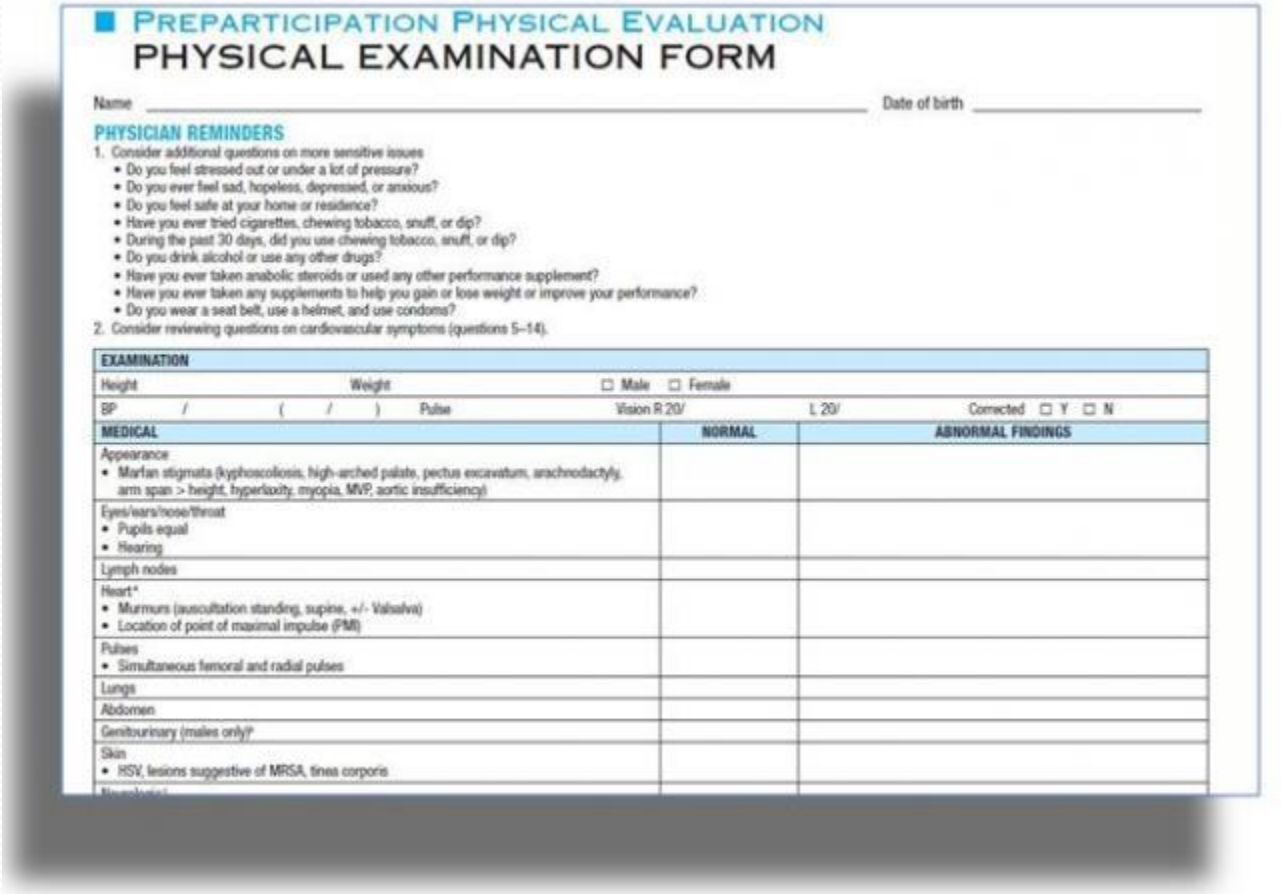
Yabek, *eMedicine*, 2003

Legal Issues – Screening

- **Preparticipation Physical Evaluation**
  - Drafted in 1992
  - Updated in 1997
  - Third Edition Published 2004
  - Endorsed by 6 major sports medicine organizations



www.riil.org



PREPARTICIPATION PHYSICAL EVALUATION
PHYSICAL EXAMINATION FORM

Name _____ Date of birth _____

PHYSICIAN REMINDERS

1. Consider additional questions on more sensitive issues
   - Do you feel stressed out or under a lot of pressure?
   - Do you ever feel sad, hopeless, depressed, or anxious?
   - Do you feel safe at your home or residence?
   - Have you ever tried cigarettes, chewing tobacco, snuff, or dip?
   - During the past 30 days, did you use chewing tobacco, snuff, or dip?
   - Do you drink alcohol or use any other drugs?
   - Have you ever taken anabolic steroids or used any other performance supplement?
   - Have you ever taken any supplements to help you gain or lose weight or improve your performance?
   - Do you wear a seat belt, use a helmet, and use condoms?
2. Consider reviewing questions on cardiovascular symptoms (questions 5–14).

EXAMINATION		
Height Weight ☐ Male ☐ Female		
BP / (/) Pulse Vision R 20/ L 20/ Corrected ☐ Y ☐ N		
MEDICAL	**NORMAL**	**ABNORMAL FINDINGS**
Appearance • Marfan stigmata (kyphoscoliosis, high-arched palate, pectus excavatum, arachnodactyly, arm span > height, hyperlaxity, myopia, MVP, aortic insufficiency)		
Eyes/ears/nose/throat • Pupils equal • Hearing		
Lymph nodes		
Heart* • Murmurs (auscultation standing, supine, +/- Valsalva) • Location of point of maximal impulse (PMI)		
Pulses • Simultaneous femoral and radial pulses		
Lungs		
Abdomen		
Genitourinary (males only)†		
Skin • HSV, lesions suggestive of MRSA, tinea corporis		

SUDDEN CARDIAC DEATH

- CAD overwhelming cause as age increases above 30-35 years old

- **Structural Disease**
  - Hypertrophic Cardiomyopathy
  - Anomalous Coronary Artery
  - Arrhythmogenic RV Dysplasia
  - Myocarditis
  - Marfan Syndrome / Ruptured Aneurysm
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  - Commotio Cordis
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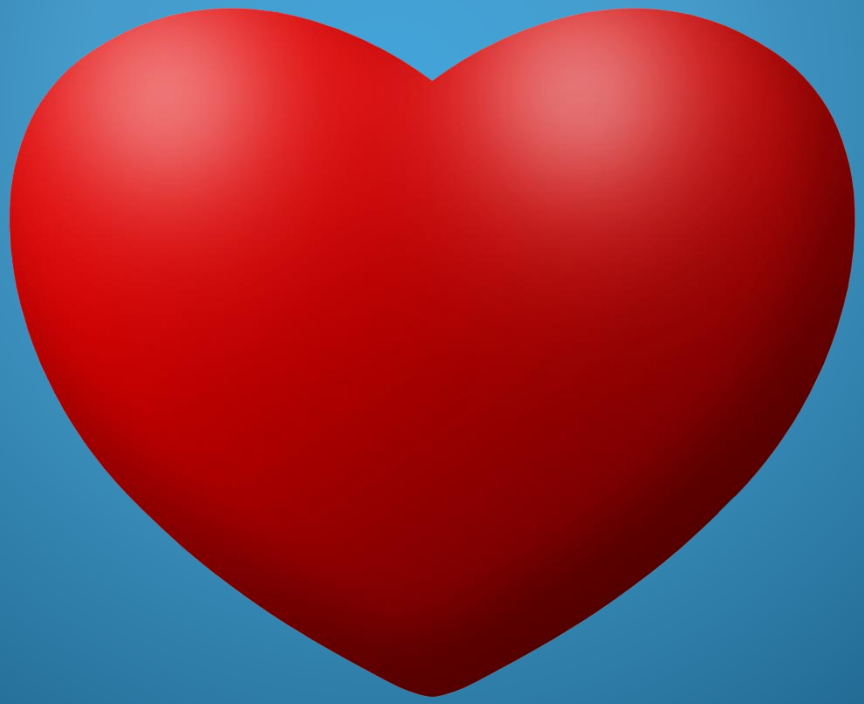
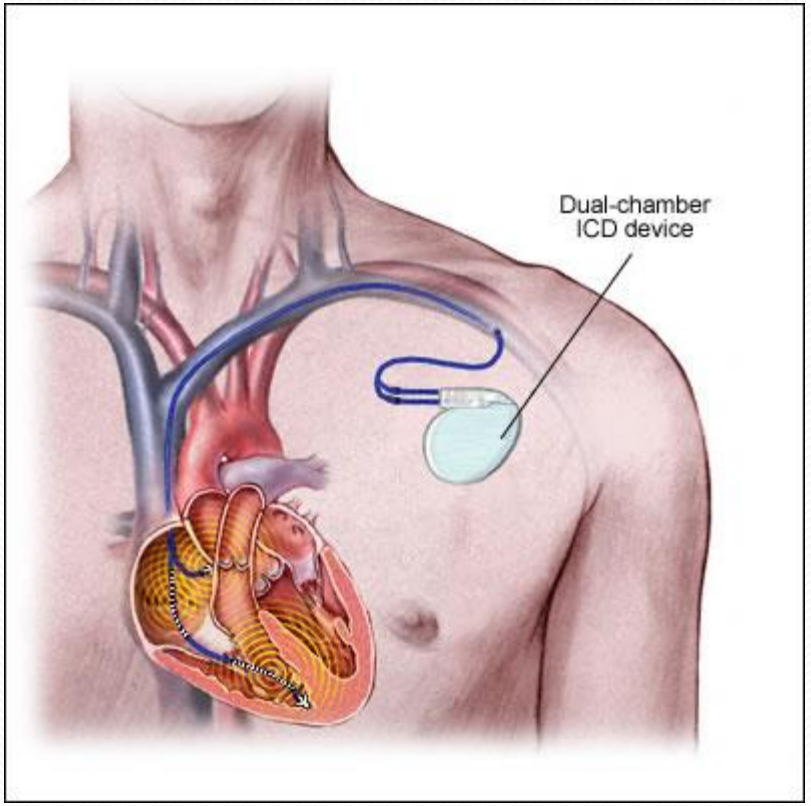
Non-traumatic collapse

Think.....




Dual-chamber
ICD device

ICD's and Athletes

- 2005 36th Bethesda Conference:
  - Should not engage in sports with high danger of bodily collision (football, rugby, boxing, martial arts, hockey, and lacrosse)
  - Protective padding advisable for other sports
  - Must wait 6 months to participate after last episode of clinical arrhythmia requiring intervention

What can we do?

PREPARTICIPATION PHYSICAL EVALUATION
HISTORY FORM

(Note: This form is to be filled out by the patient and parent prior to seeing the physician. The physician should keep a copy of this form in the chart.)

Date of Exam: May 1, 2012

Name: MARY XXXTESTPATIENT Date of birth: 02/03/1998

Sex: F Age: 14 Grade: _____ School: _____ Sport(s): _____

Medicines and Allergies: Please list all of the prescription and over-the-counter medicines and supplements (herbal and nutritional) that you are currently taking.

Do you have any allergies? ☐ Yes ☐ No If yes, please identify specific allergy below.
☐ Medicines ☐ Pollens ☐ Food ☐ Stinging Insects

Explain "Yes" answers below. Circle questions you don't know the answers to.

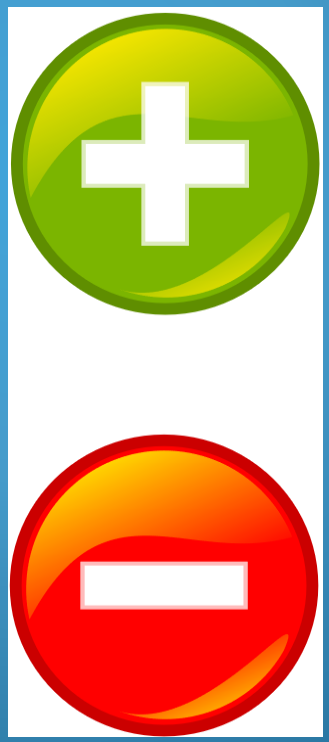
GENERAL QUESTIONS	Yes	No
1. Has a doctor ever denied or restricted your participation in sports for any reason?		
2. Do you have any ongoing medical conditions? If so, please identify below: ☐ Asthma ☐ Anemia ☐ Diabetes ☐ Infections Other:		
3. Have you ever spent the night in the hospital?		
4. Have you ever had surgery?		
HEART HEALTH QUESTIONS ABOUT YOU	**Yes**	**No**
5. Have you ever passed out or nearly passed out DURING or AFTER exercise?		
6. Have you ever had discomfort, pain, tightness, or pressure in your chest during exercise?		
7. Does your heart ever race or skip beats (irregular beats) during exercise?		
8. Has a doctor ever told you that you have any heart problems? If so, check all that apply: ☐ High blood pressure ☐ A heart murmur ☐ High cholesterol ☐ A heart infection ☐ Kawasaki disease Other:		
9. Has a doctor ever ordered a test for your heart? (For example, ECG/EKG, echocardiogram)		
10. Do you get lightheaded or feel more short of breath than expected during exercise?		
11. Have you ever had an unexplained seizure?		
12. Do you get more tired or short of breath more quickly than your friends during exercise?		
HEART HEALTH QUESTIONS ABOUT YOUR FAMILY	**Yes**	**No**
13. Has any family member or relative died of heart problems or had an unexpected or unexplained sudden death before age 50 (including drowning, unexplained car accident, or sudden infant death syndrome)?		
14. Does anyone in your family have hypertrophic cardiomyopathy, Marfan syndrome, arrhythmogenic right ventricular cardiomyopathy, long QT syndrome, short QT syndrome, Brugada syndrome, or catecholaminergic polymorphic ventricular tachycardia?		
15. Does anyone in your family have a heart problem, pacemaker, or implanted defibrillator?		
16. Has anyone in your family had unexplained fainting, unexplained seizures, or near drowning?		
BONE AND JOINT QUESTIONS	**Yes**	**No**
17. Have you ever had an injury to a bone, muscle, ligament, or tendon that caused you to miss a practice or a game?		
18. Have you ever had any broken or fractured bones or dislocated joints?		
19. Have you ever had an injury that required x-rays, MRI, CT scan, injections, therapy, a brace, a cast, or crutches?		
20. Have you ever had a stress fracture?		
21. Have you ever been told that you have or have you had an x-ray for neck instability or atlantoaxial instability? (Down syndrome or dwarfism)		
22. Do you regularly use a brace, orthotics, or other assistive device?		
23. Do you have a bone, muscle, or joint injury that bothers you?		
24. Do any of your joints become painful, swollen, feel warm, or look red?		
25. Do you have any history of juvenile arthritis or connective tissue disease?		

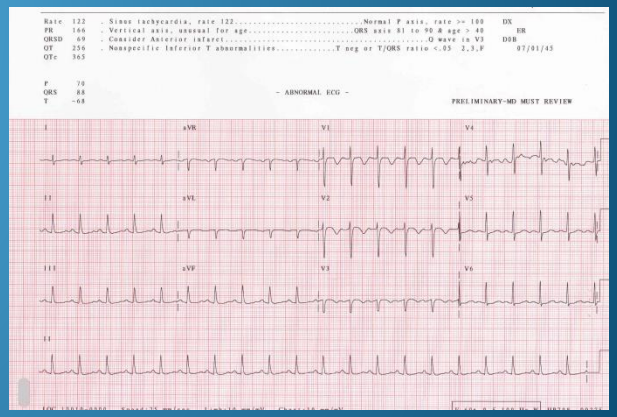
MEDICAL QUESTIONS	Yes	No
26. Do you cough, wheeze, or have difficulty breathing during or after exercise?		
27. Have you ever used an inhaler or taken asthma medicine?		
28. Is there anyone in your family who has asthma?		
29. Were you born without or are you missing a kidney, an eye, a testicle (males), your spleen, or any other organ?		
30. Do you have groin pain or a painful bulge or hernia in the groin area?		
31. Have you had infectious mononucleosis (mono) within the last month?		
32. Do you have any rashes, pressure sores, or other skin problems?		
33. Have you had a herpes or MRSA skin infection?		
34. Have you ever had a heart injury or concussion?		
35. Have you ever had a hit or blow to the head that caused confusion, prolonged headache, or memory problems?		
36. Do you have a history of seizure disorder?		
37. Do you have headaches with exercise?		
38. Have you ever had numbness, tingling, or weakness in your arms or legs after being hit or falling?		
39. Have you ever been unable to move your arms or legs after being hit or falling?		
40. Have you ever become ill while exercising in the heat?		
41. Do you get frequent muscle cramps when exercising?		
42. Do you or someone in your family have sickle cell trait or disease?		
43. Have you had any problems with your eyes or vision?		
44. Have you had any eye injuries?		
45. Do you wear glasses or contact lenses?		
46. Do you wear protective eyewear, such as goggles or a face shield?		
47. Do you worry about your weight?		
48. Are you trying to or has anyone recommended that you gain or lose weight?		
49. Are you on a special diet or do you avoid certain types of foods?		
50. Have you ever had an eating disorder?		
51. Do you have any concerns that you would like to discuss with a doctor?		
FEMALES ONLY		
52. Have you ever had a menstrual period?		
53. How old were you when you had your first menstrual period?		
54. How many periods have you had in the last 12 months?		

Explain "yes" answers here

I hereby state that, to the best of my knowledge, my answers to the above questions are complete and correct.

Signature of athlete _____ Signature of parent/guardian _____ Date _____





What can we do?

What can we do?

Thank You

Questions?

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