Pre-Sports Cardiac Evaluation

J.R. Bockoven M.D., M.B.A.
The Heart Center Akron Children's Hospital

The Young Athlete

Pre-participation Evaluation

- Detect medical conditions- injury or illness
- Detect physical conditions- injury or illness
- Detect any condition- lead to sudden death
  - Identify who is at risk
  - Restrict those at risk
  - Prevent sudden death
- Most causes sudden death in athlete:

Cardiac

Sudden Death in the Athlete

Definition

- Abrupt unexpected death
- Cardiovascular etiology
- Loss of consciousness: within 1 hr of symptoms
- **No pre-existing symptoms: 33% to 45%**
- Usually occurs: conditioning or competition
- Final common pathway: ventricular fibrillation

Sudden Death in the Athlete

Prevalence

- Rare
- Incidence: 1-3/100,000 to 1/300,000
- Young Athletes: 10 to 12 million
- High School Athletes: 4 million
  - 15-25 U.S. high school athletes die suddenly each year
- Most frequent: Football & Basketball (67%)
- Gender: male/female = 9/1

Mayfield mourns death of 17-year-

USA TODAY HIGH SCHOOL SPORTS

USA TODAY SPORTS

Ohio teen dies after high school hockey practice

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By: USA TODAY High School Sports | February 15, 2017

A 17-year-old high school hockey player from suburban Cleveland died Tuesday, South Euclid Lyndhurst Schools confirmed in a news release.

Alec Kornet, a junior on the Brush High hockey team, complained of breathing difficulties during a practice at the Cleveland Heights Ice Rink on Tuesday and was transported to nearby hospital, where he later died, WOIO-TV reported.

"The South Euclid Lyndhurst Schools formally and regrettably releases the sad news that on Tuesday evening, one of our high school students, Alec Kornet, a junior, unexpectedly passed away," the district said in a statement released to USA TODAY Sports and other outlets Wednesday. "Alec was an honor student, involved in the Charles F. Brush High School band, soccer and hockey teams. Alec was an incredibly well-liked and well-respected student by his fellow

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Causes of Sudden Death in Young Athletes

- **Cardiomyopathy:**
  - Hypertrophic
  - Dilated (myocarditis)
  - Arrhythmogenic Right Ventricular Dysplasia (ARVD)
- **Connective Tissue Disease:**
  - Marfan Syndrome
- **Arrhythmias:**
  - Long QT Syndrome
  - Wolff-Parkinson-White Syndrome
  - Congenital Heart Block
- **Congenital Heart Disease:**
  - Aortic Stenosis
  - Coronary Artery Anomalies
  - Post-operative Congenital Heart Disease

The AHA Recommendations for pre-participation screening

A. Medical History: Prior cardiac testing
1. Exertional chest pain
2. Unexplained syncope/near syncope
3. Unexplained exertional dyspnea or fatigue
4. Prior recognition of a heart murmur
5. Elevated blood pressure

B. Family History: Congenital heart disease, SIDS
6. Premature death from heart disease relative 50 years
7. Disability from heart disease close relative 50 years
8. Familial cardiac condition: HCM, LQTSD, Marfan, other

C. Physical Exam: Click, gallop, rub, heaves or lifts
9. Murmur
10. Femoral pulses
11. Physical stigmata of Marfan syndrome
12. Brachial artery blood pressure

The Young Athlete

Screening for Cardiac Disease

How about universal screening:

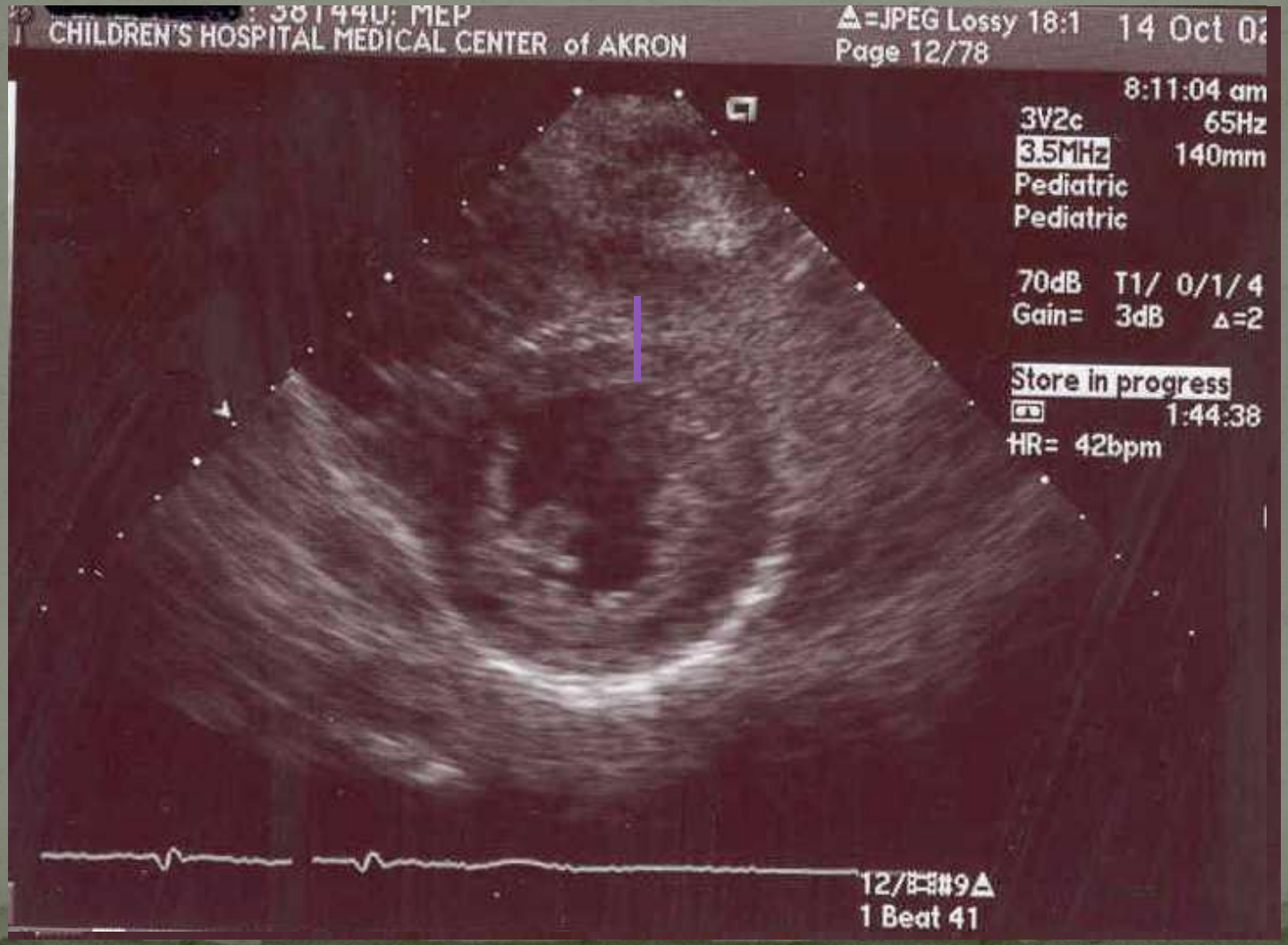
- H&P is currently required
- ECG: $100.00 and many false positives
- ECHO: $1000 to $1500
- Limited Echo: cost?, detect 50% disease
- The Numbers:
  - 200,000 athletes→ 1000 CHD→10 risk→ 1 death
- **Bottom Line: expensive, non-specific, false +s**
- M-Core (commercial service)- schools, limited ECG/echo

Case Study 1

- 15 year old female: non-athletic
- Ran a lap around a gym and collapsed
- Fire station 3 blocks away- AED
- De-fibrillated and transferred to a PICU
- Mental status changes
- Cardiac consultation ordered

- **AFD: Shock, Shock, Shock**

Case Study 1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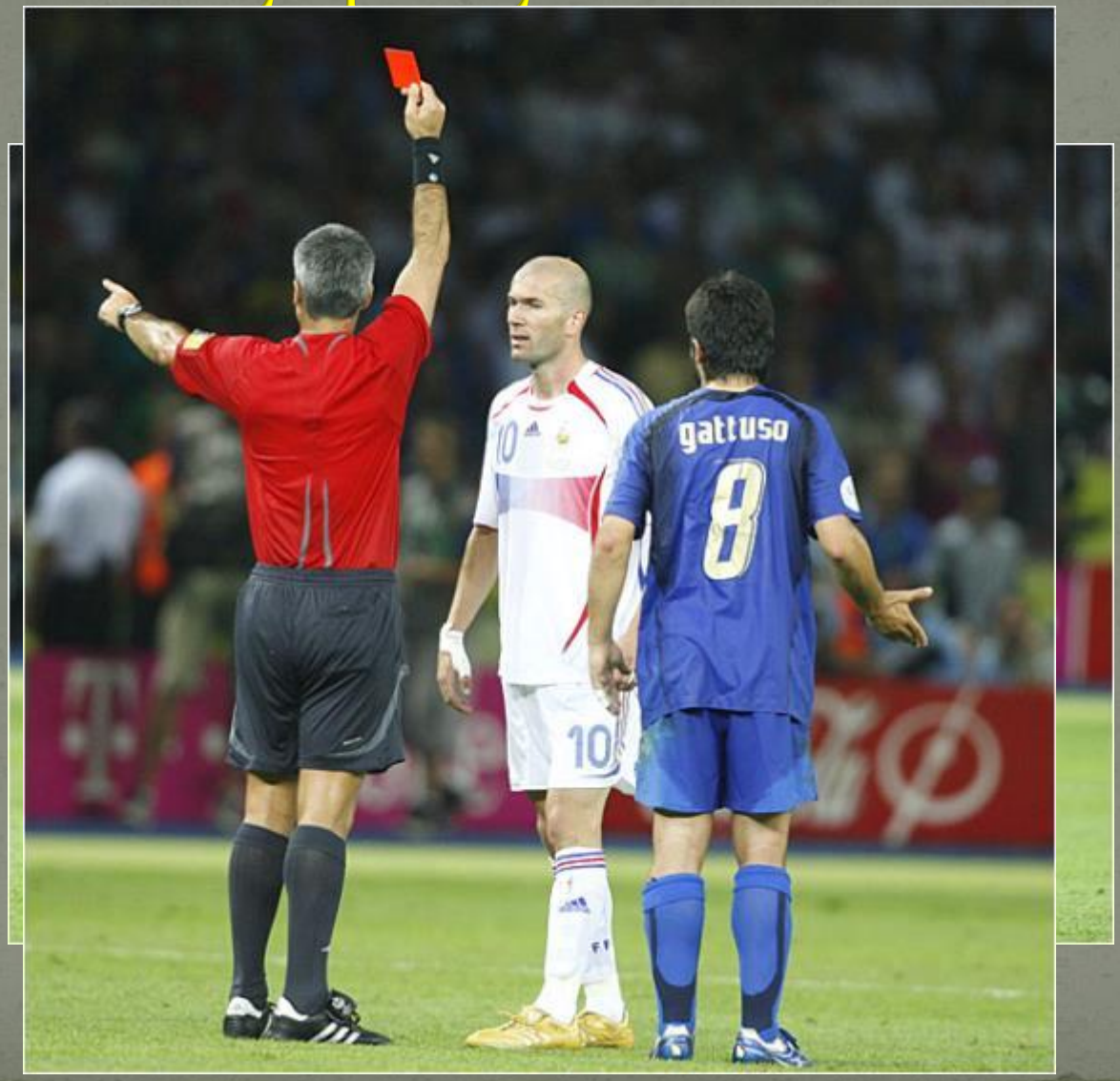
Hypertrophic Cardiomyopathy

- Autosomal Dominant disorder
- Many known genes- over 200 mutations
- Variable penetrance and expression
- Classic finding:
  - Asymmetric thickening of the interventricular septum
  - Localized thickening of any portion of ventricle
- Disease of cardiac myocyte- Ventricle, Mitral Valve , Coronaries
- Risk Stratify:
  - Syncope, cardiac arrest, VT, Fam HX, Massive LVH
  - MRI findings

Other Muscle Problems

- Dilated Cardiomyopathy:
  - Familial, Post-myocarditis
  - Rule of 1/3s
- Myocarditis:
  - Infection (viral- coxsackie B, Adenovirus)
  - Malignant arrhythmias
  - If recovery-no sports for 6 mos. & post evaluation
- Arrhythmogenic Right Ventricular Dysplasia
  - Familial, Fatty infiltration of the RV (free wall)
  - Sudden Death: Veneto Italy: 12% to 20%, U.S.: 3%
  - Diagnosis: ECG: T wave inversion V1; QRS prolonged
  - MRI: diagnostic

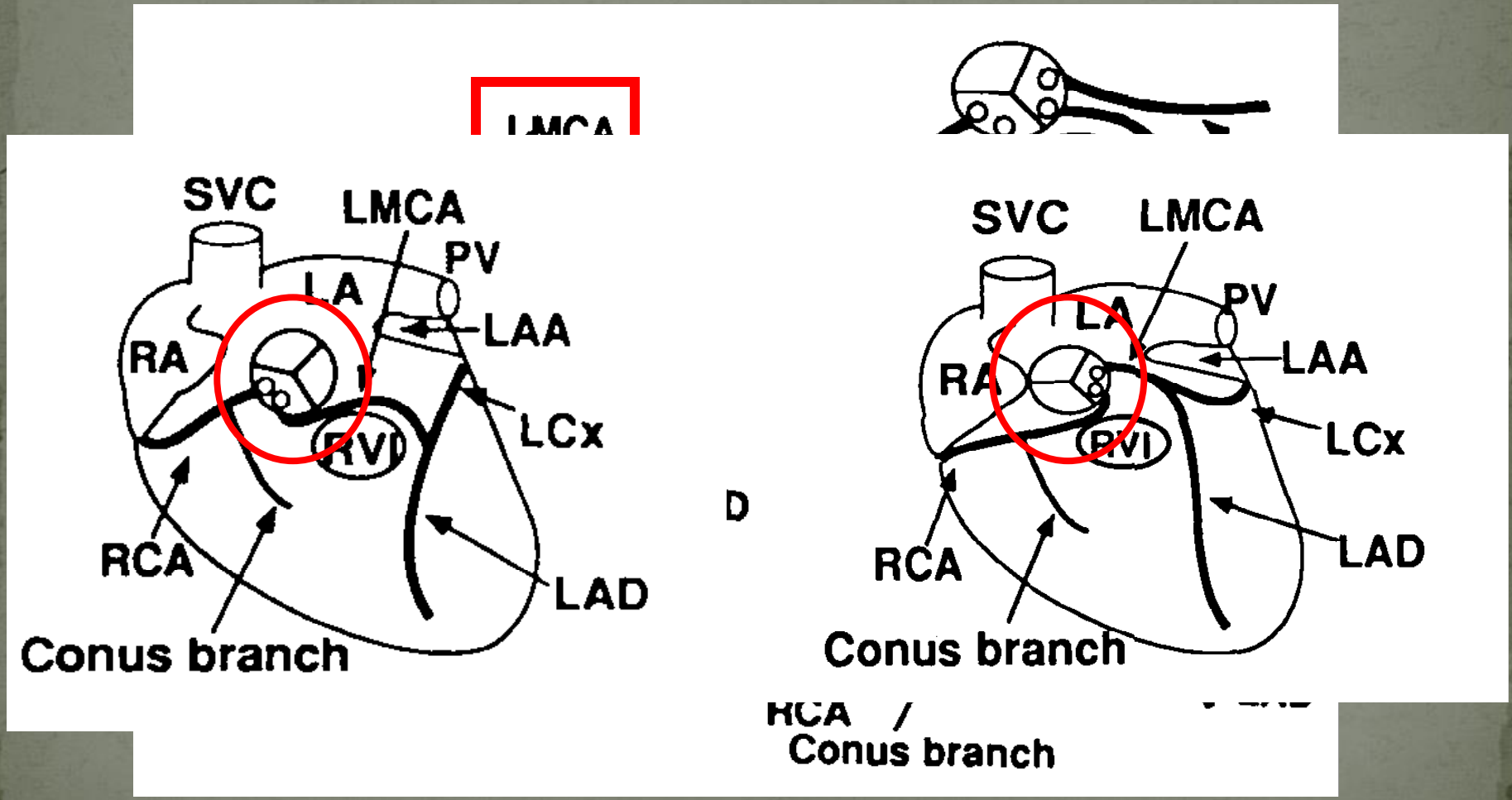
Not Cardiomyopathy



Coronary Artery Anomalies

- Congenital abnormality in location of origin
- Left main CA from right sinus
- Right CA from left sinus
- Sudden Death: 14% to 15% CA abnormalities
- Presentation: exertional CP, syncope, SD
- Mechanism:
  - Compression between aorta & pulmonary artery
  - Slit like orifice from acute angle of CA takeoff
  - Ventricular arrhythmias

Normal Coronary Artery Anatomy



Restriction in Young Adults with Known Congenital Heart Disease

Dear Dr. Ben

Thank you for leting me play sports and football. But I don't think I shoul play gym class. They're makin me do square dancing and I think it would hurt my heart to do square dancing. And they're making me dance with girls. And I think I might die if I do square dancing with girls. So could you write a note that I can't do square dancing please. But I can still play football.

Love,
Austin

CLASSIFICATION OF SPORTS

	Low Dynamic (Class A)	Moderate Dynamic (Class B)	High Dynamic (Class C)
LOW STATIC (Class 1)	Billiards Bowling Cricket Curling Golf Riflery	*Baseball Softball Table tennis Tennis Volleyball	Badminton Cross-country skiing Field hockey Orienteering Race walking Racquetball Running *Soccer Squash Tennis
MODERATE STATIC (Class 2)	Archery Auto racing Diving Equestrian Motorcycling	Fencing Field events Figure skating *Football Rodeoing Rugby Running Surfing Synchronized swimming	*Basketball Ice hockey Cross-country skiing Football LaCrosse Running Swimming Team handball
HIGH STATIC (Class 3)	Bobsledding Field events Gymnastics Karate/judo Luge Sailing Rock climbing Waterskiing Weight lifting Windsurfing	Body building Downhill skiing Wrestling	Boxing Canoeing/kayaking Cycling Decathlon Rowing Speed skating

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Arrhythmias

Normal

- Premature ventricular contractions
  - Decrease with exercise
- Ventricular tachycardia
  - Short, non-sustained, asymptomatic
  - Structurally normal heart
- First and second degree heart block
- ECG changes:
  - Hypertrophy
  - ST segment and T wave changes

The Young Athlete
Arrhythmias

NOT Normal

- Long QT Syndrome- changes in restrictions
- Wolff ParkinsonWhite- rare cause; ablation
- Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT)- No sports
- Congenital Heart Block

The Young Athlete and the Heart

Summary

- Sudden death during athletics: rare & devastating
- Routine screening with testing: very expensive
- Screening 2019: detailed history and physical exam
- If H/P abnormal, refer for consultation/testing
- Most common cause SD: Hypertrophic Cardiomyopathy
- Known CHD: Bethesda Guidelines
  - Symptoms
  - Testing (hemodynamics)
- **FINAL RECOMMENDATION**: Not testing but prevention and resuscitation

Prevention of Sudden Death in the Athlete

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POSTED 6:06 PM, FEBRUARY 14, 2018, BY ADRIENNE DIPIAZZA, *UPDATED AT 06:07PM, FEBRUARY 14, 2018*

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