The Preparticipation Physical Examination

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Objectives

• Discuss
  – Basic goals and expectations of preparticipation athletic examination
  – Screening strategies for conditions that are associated with sudden death of athletes
  – Conditions that impact safety and advisability of athletic participation
  – Elements of history and physical that alert examiner to increased risk for sudden death
Goals of PPE

• Pick up asymptomatic illness
• Find athletes at risk for sudden death
• Identify athletes at risk for injury
  – The most consistent predictor of new injury is a history of previous injury
• Give athletes access to health care
• Meet legal requirements
The “Bible”

  – Published by AAP Books
Interval

• Annual complete exam
• Entry level (+/- yearly history)
• Prior to each season
• Every 2 years
• Every so often?
Individual vs Station Exam

• Individual
  – Advantages
    • Allows counseling at an important stage of life
    • Establishes the importance of preventive medical care
    • Continuity of Care
Individual vs Station Exam

- **Individual**
  - Disadvantages
    - Expense
    - Expertise may vary
Individual vs Station Exam

• Station
  – Advantages
  • Inclusion of specialized personnel - sports physicians, athletic trainers, exercise physiologists, physical therapists, RNs, etc.
  • Time and cost efficiency
  • Ability to include performance testing
Individual vs Station Exam

• **Station**
  – Disadvantages
    • Tendency toward disorganization
    • Somewhat impersonal
    • Advantages of both can be had by including local primary care physicians in the stations

• **Avoid Gymnasium Exams**
  – No privacy
  – No
Sudden Death

• **Under Age 30**
  – Hypertrophic Cardiomyopathy (HCM)
  – Anomalous Coronaries
  – CAD
  – Myocarditis?
  – Sickle cell crisis
  – Heatstroke
  – Asthma

• **Over Age 30**
  – CAD
  – Anomalies are less common (Pete Maravich)
Non-Cardiac Sudden Death

- Sickle cell trait
- Exercise-induced asthma and respiratory arrest
- Exercise-induced anaphylaxis
- Sarcoidosis
- Malignant hyperthermia
- Heat stroke
- Gastrointestinal bleeding
- Rhabdomyolysis
- Head trauma
- Spine trauma
- Non-penetrating neck blow with rupture of cerebral artery (ice hockey) or carotid (baseball)
Drugs Linked to Sudden Death

- Ephedrine (Ma-Huang or herbal ephedra)
- Cocaine
- Amphetamines
- Anabolic steroids
- Erythropoietin
- Alcohol
- Ergotamine derivatives
Sudden Death

- Incidence of Congenital Heart Disease ~0.5% - only a small number of these at risk for sudden death
- Estimates of risk of sudden death in American athletes range from 1 in 3100k in Division I MBB to 1 in 200k in general athletic population

– Harmon Circulation 2011
Sudden Death

- AHA Guidelines:
  - Personal history
    - Exertional chest pain/discomfort
    - Unexplained syncope/near-syncope
      - Judged not to be neurocardiogenic (vasovagal); of particular concern when related to exertion
    - Excessive exertional and unexplained dyspnea/fatigue, associated with exercise
  - Prior recognition of a heart murmur
Sudden Death

• AHA Guidelines:
  – Family history
    • Premature death (sudden and unexpected, or otherwise) before age 50 years due to heart disease, in 1 relative
    • Disability from heart disease in a close relative <50 years of age
    • 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
Sudden Death

• **AHA Guidelines:**
  
  – Physical examination
    
    • Heart murmur
      
      – 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
    
    • Femoral pulses to exclude aortic coarctation
    
    • Physical stigmata of Marfan syndrome
    
    • Brachial artery blood pressure (sitting
Sudden Death

Figure. Distribution of cardiovascular causes of sudden death in 1435 young competitive athletes. From the Minneapolis Heart Institute Foundation Registry, 1980 to 2005. ARVC indicates arrhythmogenic right ventricular cardiomyopathy; AS, aortic stenosis; CAD, coronary artery disease; C-M, cardiomyopathy; HD, heart disease; LAD, left anterior descending; LVH, left ventricular hypertrophy; and MVP, mitral valve prolapse.

AHA Screening Guidelines, Circulation. 2007
HCM

- Genetic form of cardiomyopathy
  - 1 in 500
  - Usually detectable during/after adolescent growth spurt

- Obstructive & Nonobstructive
  - Obstructive may be more lethal
  - 75% of cases nonobstructive

- Fatalities likely due to dysrhythmia
HCM

• History
  – Family History
  – Sudden death is usually the presenting event
  – Most common nonlethal symptom is syncope during exertion (not after)
  – Other symptoms may include exertional dyspnea, chest pain, dizziness and fatigue
HCM

- **Exam**
  - Obstructive
    - Systolic murmur at LLSB & apex
    - Increases with standing and Valsalva
    - Decreases with squatting
HCM

- Typically no murmur
- Soft murmurs behave as above

EKG
- LVH, ST-T-wave abnormalities, large negative T-waves, prominent Q waves
- Normal EKG nearly excludes HCM
HCM

• Diagnosis - Echocardiography
  – Hypertrophied, non-dilated left ventricle in the absence of other disease
  – Variable spectrum, sometimes only segmental abnormality
  – Absolute thickness of left ventricle wall nearly always greater than 15 mm
  – “Athlete heart” virtually always dilated hypertrophy
  – “Time off” can be the best clinical approach to Dx in difficult cases 3-6 months rest
History

• **Asthma**
  – Coughing, Excessive SOB with Exercise

• **Athletic Amenorrhea**
  – Number of periods last year
  – Longest time between periods
Past Medical History

- "Memory Jogger" checklist
  - Injuries
  - Illnesses
  - Heart Murmurs
- Medications
- Supplements
- Surgeries
- Immunizations
Past Medical History

- Substance Abuse
  - Smoking/smokeless
  - Alcohol
  - Cocaine, stimulants
  - Anabolic Steroids
Family History

• Sudden Death

• Heart Disease Risk Factors
  – Hypertension
  – Dyslipidemias

• Diabetes

• Heart Disease

• Marfan Syndrome
Family History

• Sickle Cell Disease/Trait
  – SCT has been associated with death and profound illness in military recruits and athletes

• Due to rhabdomyolysis, DIC, renal failure from myoglobinuria

• Dehydration is a common theme in these cases

• Acidosis and hypoxemia shift the oxygen dissociation curve which predisposes to sickling

• Many cases fatal
Sickle Cell Trait

- Usually benign
- Strenuous exercise in high heat or altitude, sudden death may occur
- Hypoxemia/acidosis of exercise results in sickling of RBC’s clogging the coronary arteries and cardiac arrest
- Symptoms: legs weak and cramping, SOB, collapse, LUQ abdominal pain (splenic infarct)
- With crisis, athlete may be obtunded, hyperventilating and hypotensive
Sickle Cell Disease/Trait

• Precautions:
  – Start training gradually (avoid max effort on first day or two of practice).
  – Wear cool clothing.
  – Caution in high temp or humidity, or at altitude.
  – Stop activity if cramps occur!
Sickle Cell Disease/Trait

- Risk factors: dehydration, extreme exertion, altitude
- Do not exclude, but counseling is important
- Educate: Make athlete aware of the risk
- Emphasize hydration before, during and after exercise
- Avoid prolonged maximal-intensity anaerobic exposure (>45s)
Medical History

• **Dietary History**
  – Checklist can be efficient way to gather dietary information
  – Ask about vitamins/supplements
  – Ask High/Low weights for past year; Ideal weight as perceived by the athlete (screen for eating disorders)
History & Examination

Forms

• Have available to athletes before the time of the examination
• Poor correlation when athletes and parents fill out forms separately
Laboratory Studies

• Screening generally not indicated
  – UA - High false-positives
  – Hemoglobin may be useful in endurance athletes
  – Exception may be Sickle Prep in endurance athletes or athletes subject to high-intensity activities in heat or altitude stress & NCAA athletes
  – Appropriate lab work as guided by exam and history
Exam

• Vitals
• Height & Weight
• Body composition (Especially important for wrestling)
• Visual Acuity, fundoscopy & fields
  – Color testing as possible
  – 20/40 or better in worst eye
  – Counsel re: eye protection
• Remainder of HEENT
Exam

- **Cardiovascular**
  - Check BP, Pulse, (radial & femoral)

- **Cardiac**
  - Heart size, rate, rhythm, murmur, quality of S1, S2
  - Valsalva or squat to stand

- **Pulmonary**

- **Abdominal**
  - Organomegaly, hernia
  - Hernia check important if athlete has groin pain
Exam

• Skin - infectious rashes (impetigo, herpes), nevi
• Genitalia, single or undescended testis, mass, hernia
• Tanner staging
Exam

• Musculoskeletal Screening - not necessarily diagnostic
• Range of motion, stability, strength
• More extensive examination of problematic areas
Musculoskeletal Exam

- Cervical Spine
- Shoulder
- Elbow
- Wrist
- Hand
- Back
- Hip
- Knee
- Ankle
- Foot
Medical Clearance

Preparticipation Physical Evaluation

Clearance Form

Name __________________________ Sex  □ M  □ F  Age ______________ Date of birth ______________

☐ Cleared for all sports without restriction
☐ Cleared for all sports without restriction with recommendations for further evaluation or treatment for ________________________________

☐ Not cleared
  ☐ Pending further evaluation
  ☐ For any sports
  ☐ For certain sports
  Reason __________________________________________

Recommendations __________________________________________

________________________________________

I have examined the above-named student and completed the preparticipation physical evaluation. The athlete does not present apparent clinical contraindications to practice and participate in the sport(s) as outlined above. A copy of the physical exam is on record in my office and can be made available to the school at the request of the parents. If conditions arise after the athlete has been cleared for participation, the physician may rescind the clearance until the problem is resolved and the potential consequences are completely explained to the athlete (and parents/guardians).

Name of physician (print/type) __________________________ Date ______________

Address __________________________________________ Phone __________________________

Signature of physician __________________________ MD or DO
Sports Classifications

- Collision
- Limited Contact/Impact
- Noncontact
  - Strenuous
  - Moderately Strenuous
  - Nonstrenuous
To clear, or not to clear

- After a problem is found, the following factors should be considered in deciding whether to clear an athlete to participate:
  - Does the problem place the athlete at increased risk of injury?
  - Is any other participant at risk of injury because of the problem?
  - Can the athlete safely participate with treatment (medication, rehabilitation, bracing or padding)?
  - Can limited participation be allowed while treatment is being initiated?
  - If clearance is denied only for certain activities, in what activities can the athlete safely participate?
To clear, or not to clear

• Right to Participate
  – Occasionally the opinion of the examining physician conflicts with an athlete’s desire to participate when PPE findings lead to a recommendation for “no participation” in an athlete’s sport. Athletes may sue to force participation under the Rehabilitation Act of 1973 or the American’s With Disabilities Act of 1990.
To clear, or not to clear

- **Exculpatory Waiver**
  - Contract in which the athlete promises not to sue the physician, school or activity sponsor and releases them from liability.
  - Questionable validity
  - Some legal experts recommend that physicians have the athlete write in their own words and handwriting, a signed letter indicating their understanding of the risks and willingness to assume them.
HIPAA

• Health Insurance Portability and Accountability Act
  – Expressly allows release of medical information without the individual’s authorization for treatment, consulting with other providers, referring the patient to other providers, and notifying the patient’s family.
  – Also allows for the “cleared” or “not cleared” decision (without other medical information) to be given to coaches and school administrators who need to know a player’s eligibility without the player’s consent.
  – Wise to include release in PPE form to allow communication with coach, AD
Summary

• PPE is often the only interaction the young athlete has with the medical profession
• History is more sensitive than physical examination in finding conditions that predispose to sudden death
• Pay attention to previous injuries and illnesses
• Try to find highest appropriate level of participation
Thank You!

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Resources

- PPE Monograph, 4th Ed, AAP Books
- PPE History & Exam forms in syllabus