The Pre-Participation Exam

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Objectives

• Understand the purpose of a pre-participation exam
• Understand screening nature of the PPE
• Understand Sudden Cardiac Death (SCD) and screening
• Understand how to perform a PPE
• Understand concepts of clearance

Why do the PPE?

• To "screen for medical diseases or processes that may affect an athlete’s participation in physical activity" (American College of Sports Medicine)
• In particular:
  • To "reduce CV risks associated with physical activity and enhance the safety of athletic participation" (American Heart Association)
  • To detect “silent cardiovascular abnormalities that can lead to SCD" (The American College of Cardiology)
  • To meet legal requirements for sports participation
Why do the PPE?

- The additional benefit is to screen for possible medical conditions
- Too difficult to diagnose and manage a chronic pathology in the given construct of a PPE
- Depends on the ability of the screener to quickly and efficiently prioritize and recognize possible physical, mental, or other medical limitations and counsel the athlete appropriately

What are we doing?

- However, PPE is fairly controversial in itself
- Have progressed from minimal PPE in past (or none!) to considering (multiple) medical tests
- Can the PPE prevent injury?
  - No evidence that an abnormal musculoskeletal exam screening itself predicts an increased risk for injury
  - Increased risk of injury does not always equal incidence
- Can we prevent death?
  - Most sport-related fatalities have been related to either head/neck injuries or sudden cardiac death
  - How to prevent these two?

Head/Neck Issues

- Injuries/fatalities related to head impact
  - Relative to gameplay and compounded by multiple factors
  - Prevention is related to multiple factors:
    - Protective equipment, game situation and awareness, physical maturation, experience, history of prior injuries, etc
  - PPE may suggest congenital or acquired structural defects that predispose to serious head/neck injuries
  - Growing concern for identification of persons with a concussion history and potential pre-participation prevention
    - Difficult and complex concept of concussion prevention
The Pre-Participation Exam

- Medical history
  - Standardized questionnaire forms (PPE, 4th Ed) exist
  - Forms useful due to breadth of screening information
  - Should be completed with help of parents/family
- Divided into major sections of:
  - Past medical history
  - Cardiovascular:
  - Musculoskeletal
  - General medical conditions
  - Females Only (if applicable)

The Pre-Participation Exam

- Highlights of Medical History:
  - Known past medical history
    - Including surgical, current medications, allergies
  - Cardiovascular:
    - Personal history of chest pain, syncope, palpitations, fatigue, cardiac testing
    - Family history of cardiac-related deaths, known congenital cardiac abnormalities, suggestive symptoms
  - Musculoskeletal
    - Prior and current history of injuries and their status

The Pre-Participation Exam

- Highlights of Medical History:
  - General medical conditions
    - Asthma, or similar symptoms, and current status
    - History of concussions and head injuries
    - History of seizures
    - Screen for nutrition and body image issues and misconceptions
  - Females Only (if applicable)
    - Menstrual cycle abnormalities (suggestive for female triad)
The Pre-Participation Exam

- Examination
- Broad-spectrum physical exam
- History and Exam are independent of each other
- Unlike “normal” patient encounters where history leads to the focus of the exam
- Emphasizes the screening concept that an “abnormal” finding warrants an additional detailed evaluation

The Physical Exam

- Often best to consider a station-based format
- Includes:
  - Vital signs and visual acuity
  - Head, Ear, Eyes, Nose, and Throat
  - Cardiovascular
  - Pulmonary
  - Abdominal
  - Musculoskeletal

The Physical Exam

- Personal preference will determine format of the exam
- Key inclusions:
  - Repeat blood pressures, if necessary
  - Notable undiagnosed reactive airways disease
  - Auscultation of the heart in the standing and supine positions
  - Simultaneous femoral and radial pulse palpation
  - Notable organomegaly or abdominal bruits
  - Musculoskeletal screening for joint mobility, strength (ie. Garrick Ortho Screen)
Marfan’s Screening

• Include screening for Marfan’s stigmata:
  • Kyphoscoliosis
  • High-arched palate
  • Pectus excavatum
  • Arachnodactyly (Walker, Steinberg signs)
  • Arm span greater than height
  • Joint hyperlaxity
  • Myopia
  • Mitral valve prolapse
  • Aortic insufficiency

PPE Clearance

• Any positive response or concerning finding should require further, directed interview and exam
• Any restriction – full or qualified – needs to be clearly explained to the athlete, parents, coaches, athletic training staff
• PPE should be repeated and reviewed on a predetermined frequency
• AHA recommends reviewing cardiac history and physical at least every two years
PPE Clearance

- AAP has outlined relative restriction guidelines for numerous conditions in: Medical Conditions Affecting Sports Participation. Committee on Sports and Fitness. *Pediatrics* Vol. 107 No. 5 May 1, 2001 pp. 1205 - 1209
- Restriction of participation is a complex decision
  - Factors include: further evaluation for undiagnosed or uncontrolled issues, surgical clearance, desired sport and competition level, stabilization of chronic medical diseases, need for fitness level testing, nutrition counseling, etc
  - Orthopedic issues may require re-evaluation or rehabilitation prior to full clearance

“Qualified Yes”

- Hypertension
- Congenital Heart Disease
- Irregular heart rhythms
- Marfan’s Syndrome
- Vasculitis
- Diabetes Mellitus
- Malabsorption/Short-gut
- Hepatitis C/HIV
- Single kidney
- Neoplasm
- Myopathies
- Seizure disorder
- Obesity
- Pregnancy
- Cystic Fibrosis
- Rheumatologic disease
- Sickle Cell Trait
- Splenomegaly

Participation Restrictions

- Absolute Disqualification:
  - Carditis
  - Fever of any source
- "Qualified No”
  - Hypertrophic cardiomyopathy
  - Coronary artery anomalies
  - Arrhythmogenic right ventricular cardiomyopathy
  - Acute rheumatic fever
  - Ehlers-Danlos syndrome
  - Infectious Diarrhea
  - Infectious conjunctivitis

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Sudden Cardiac Death

- Most common cause of sudden death in young persons (<35 y/o) during exercise
- Hypertrophic cardiomyopathy and congenital coronary artery anomalies account for 1/3 of all SCD cases
  - "Others" account for less than 5%
  - ARVC, Long QT, other arrhythmias, early CAD
- Approximately 1 in 300-500 persons may have an occult CV condition that places them at risk for SCD.
  - Incidence of SCD estimated at 1/40,000 – 1/300,000
- Can we identify those on a PPE (to prevent death)?
  - With limited ability, yes

Electrocardiogram?

- Used to detect cardiac electrical abnormalities that signify cardiac arrhythmias and structural disorders
- For detection of cardiac abnormalities
  - Classic PPE history alone has 31% false-positive rate
  - PE alone has a 9% false-positive rate
  - History, PE, & ECG has a 3-6% false-positive rate
Athlete’s Heart

- ECG interpretations for “athlete’s heart” allows for these as normal adaptations to exercise:
  - Sinus bradycardia or sinus arrhythmia
  - First degree AV block
  - Incomplete Right Bundle Branch Block
  - Early repolarization
  - Isolated QRS voltage criteria for left ventricular hypertrophy

ECG Usefulness

- Particularly sensitive for HCM, Long/short QT syndrome, and Arrhythmogenic Right Ventricular Cardiomyopathy, pre-excitation syndromes, Brugada syndrome
  - Unable to detect certain structural abnormalities, such as abnormal coronary artery anomalies, and early coronary artery disease
  - ECG manifestations of cardiomyopathy may occur before the physiologic changes occur

At This Time

- Despite international movements towards ECG screening, AHA continues to not recommend a mandated ECG-screening process for athletes
  - Cost-effectiveness, feasibility, and physician access
  - At this time, the decision to ECG an athlete should be made on an individual basis, as part of a workup or on a personal pre-determined basis

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Mass ECG Screening

- August Heart Foundation (San Antonio)  
  - www.augustheart.org
- Championship Hearts Foundation (Austin)  
  - www.championhearts.org
- Cody Stephens Go Big or Go Home Foundation (Houston)  
  - www.codystephensfoundation.org
- Cypress Creek ECG Project (Cypress)  
  - www.cypresscreekproject.org
- Living for Zachary (Plano, Denton, McKinney)  
  - www.livingforzachary.org
- Hearts (Houston)  
  - www.memorialhermann.org/hearts/
- The Brandon Goyne Foundation (Waskom, Elysian Fields, Marshall)  
  - www.thebrandongoynefoundation.com

Electrocardiogram Screening?

- Since 2007, AHA unable to recommend a national ECG-based screening process based on cost-effectiveness and feasibility
- 8+ million potential athletes needing screening ECGs, at a cost of $2+ billion per year
- Physician and resource shortages, and lack of national standard of PPE
- Multiple studies cite need for improved SCD statistics nationally
- At this time, decision to ECG an athlete should be made on an individual basis, as part of a workup or a predetermined decision

Summary

- The purpose of a PPE is to prevent injury and death related to sports participation, and to meet potential legal requirements.
- The PPE is intended, not to diagnose or manage medical conditions, but to identify potential medical limitations to sports participation.
- Sudden Cardiac Death is a leading cause of sports-related deaths and can be effectively screened for during a PPE, with an appropriate history and physical.
- The use of an electrocardiogram in a PPE has proven benefits but there remain logistical barriers to its full implementation.
- A proper PPE utilizes a standard medical history questionnaire and comprehensive screening examination.
- Clearance for sports participation can be a complex decision requiring detailed evaluations and/or testing.

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Thank you very much....