Pre-participation Exams

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Financial Disclosure

Dr. Rudy Navarro has no relevant financial relationships with commercial interests to disclose.

Objectives

- Understand the purpose of a pre-participation exam
- Understand screening nature of the PPE
- Understand Sudden Cardiac Death 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

The underlying intent 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
- Ideally, the PPE identifies all potentially injurious abnormalities
  - So as to prevent injury
  - More importantly, to prevent fatality

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?
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 500 persons may have an occult CV condition that places them at risk for SCD.
- Incidence of SCD estimated at 1/100,000 – 1/200,000
- Can we identify these on a PPE (to prevent death)?
  - With limited ability, yes

Electrocardiogram Screening?

- ECG has shown a good sensitivity and negative predictive values
- 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 has limited specificity, historically about 15% false-positive rate
- Newer guidelines on ECG interpretations for athletes has reduced false-positive rate

Electrocardiogram Screening?

- 2007: AHA reaffirmed recommendation for a 12-point history and physical specific to the cardiovascular system
- Unable to recommend a national ECG-based screening process based on cost-effectiveness and feasibility
- 10+ 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
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, Ears, 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)

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

- Clearance options are:
  - Unlimited participation
  - Full participation only after evaluation and clearance for a certain issue
  - No participation at all at this time
- Duty to provide clearance to participate in a particular (or general) sports
  - Any positive response or concerning finding should require further, directed interview and exam
  - Participation may need to be restricted or deferred

PPE Clearance

- AAP has outlined relative restriction guidelines for numerous conditions
  - (Details of individual guidelines are too extensive to list here)
- 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

Physical Demands of Sports

PPE Clearance
- 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
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 remains controversial and 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.

Thank you very much....