Pre Participation Physical Exam

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Disclosure

I, William Hartrich MD nor any family member(s), author(s), have any relevant financial relationships to be discussed, directly or indirectly, referred to or illustrated with or without recognition within the presentation.

Goals

• To identify medical problems with a risk of life threatening or potentially disabling conditions.
• To identify conditions that require a treatment plan before or during participation.
• To identify and/or rehabilitate any condition that may predispose to injury.
• To identify and treat conditions that interfere with performance or may worsen with participation.
• To remove prior restrictions on participation.
• To fulfill state and local legal requirements and regulations for scholastic participation.
Caveat

– Awareness of the “evidence“
  • The evidence base for the PPE is limited
  • Based on at least fair evidence: A systematic literature review of 310 studies of the PPE concluded the evaluation does little to prevent morbidity and mortality in screened athletes and is ineffective for identifying athletes at risk for sudden cardiac death or orthopedic injuries and at detecting exercise induced bronchospasm
  • Use of PPE still endorsed by AAP, AAFP, ACOSM

Setting for PPE

• Two common methods of conducting a PPE:
  – The office setting in which one clinician conducts the entire examination.
  – The station approach in which the athlete goes through a series of stations (organ or region specific) and is examined by multiple examiners.
Yield of PPE

- Mayo Clinic – 1998  2,729 participants
  - 1.9% disqualified
  - 11.9% required follow up
- > 10,000 exams
  - 90% passed initially
  - 9.6% passed later
  - 0.4% disqualified
    - 38% based on hypertension, 12% eye disease (blind), 10% GU (absent testes), 8% neurologic (concussion)

Components of the PPP

- Comprehensive personal and family history
- Focused physical exam based on history
- Awareness of evidence based medicine of specific medical conditions
- Ancillary Testing
- Establishment of a close monitoring program
- Clearance decisions based on the individual athlete and other participants risk of injury and illness
  - Clearance is dynamic, seldom black and white, often based on physician and athlete comfort with follow up monitoring, therapy as well as participation status
History

• The most important aspect of the PPE (May identify 75% of problems that affect participation)
  – Time efficient
  – Simple to perform and can be tailored to population
  – It is sensitive and specific
  – Inexpensive and in-depth
  – Can be in a standardized electronic format or paper format
    • See attached PPE history form monograph from the AAP
• Determines further work up

Past Medical and Family History

• Should focus on
  – Major illnesses (DM, RAD, Seizures, concussions)
  – History of hospitalizations, ER visits and injuries
  – Past surgeries
  – Medications
    • OTC meds
      – Stimulants - ephedra and anticholinergics-increased risk of heat related illnesses
      – Creatine and energy drinks have a stimulant effect
    • Prescriptions
      – Floroquinolones, Macrolide antibiotics, decongestants, B-agonists can lead to arrhythmias, Floroquinolones are associated with tendinopathy
Approved Medications for Competition

• Physicians, training staff and athletes must be aware of therapeutic drugs that may be banned at certain levels of competition (diuretics, B-blockers)
• Comprehensive lists of banned substances can be found at:

Past Medical and Family History

– Recreational Drugs
– Allergies
  • Serious life threatening reactions require staff awareness of the availability and dosing indications of diphenhydramine and injectable epinephrine
– Immunizations
  • Reviewing allows updating given extensive travel of athletes at certain levels of participation
Past Medical History

- Cardiovascular Red Flags (Risk of sudden death 1:100,000-1:300,000)—Based on AHA recommendations
  - History of dizziness or light headedness (near syncope)
  - Syncope during exercise (ominous sign) or after exercise (more common)
  - Conduction abnormalities (Long QT or Brugada syndrome)
  - Structural heart disease (Congenital)—Prior EKG or Echo
  - Hypertension, high cholesterol, or heart murmur
  - Chest pain or palpitations on exertions
  - Excessive shortness of breath or fatigue on exertion
  - Myocarditis or coronary anomalies (Kawasaki’s disease)

Family History

- Cardiovascular Red Flags
  - Long QT or Brugada syndromes
  - Early ASHD/CAD (males < 50, females < 60)
  - Cardiomyopathy
    - HOCM
  - Marfan’s Syndrome
  - Embolic Disease (CVA or TIA)
  - Unexplained or poorly characterized deaths
Past Medical History

• Rashes and lesions
  – Molluscum Contagiosum
  – Tinea/fungal rashes
  – Impetigo
  – Herpes simplex infections
  – MRSA infection and colonization

Past Medical History

• Neurologic
  – Detailed history of concussions
    • Number, LOC, presence of post concussive symptoms, duration of time lost, any ancillary testing involved
  – Headaches
  – Seizures
  – Brachial plexus injuries (stingers, burners) and cervical cord neuropraxia (transient quadriplegia)
Past Medical History

• Pulmonary
  – Asthma and bronchopulmonary dysplasia
  – Exercise induced asthma
  – Vocal cord dysfunction
    • Isolated stridor associated with competition
    • Triggers: GERD, allergic rhinitis, anxiety, poorly controlled asthma

Past Medical History

• Gastrointestinal
  – Inflammatory bowel disease
  – GERD

• Infectious Disease
  – EBV (Mono), CMV
  – Hepatitis A, B, C
  – HIV
Past Medical History

- Genito-Urinary
  - Solitary testes
  - Solitary or horseshoe kidney
  - Inguinal or sports hernia
- Heat related illness
  - Dehydration or heat stroke
    • Puts an athlete at increased risk for further episodes

Past Medical History

- Psychological
  - Eating disorders
    • Anorexia
    • Bulimia
  - Depression
  - Anxiety
  - Drug abuse
  - ADHD
Physical Exam

• Vital Signs
  – Height, weight, BMI, blood pressure, pulse
    • Norms based on age-ht sex (HTN-95%)

• HEENT
  – Visual acuity and Anisocoria (unequal pupils) – physiologic vs. traumatic
  – Hearing acuity (sport specific)

• Neck Exam
  – Carotid bruits and pulse
  – Thyromegaly or thyroid nodules

Physical Exam

• Cardiovascular
  – Peripheral Pulses
    • R/O Coarctation of Aorta
  – Palpate PMI for lateral displacement
    • LVH or HOCM
  – Auscultation in standing and supine position
    • Heart murmur (innocent vs. pathologic)
    • Mid systolic click of Mitral valve prolapse
Physical Exam

• **Innocent/Physiologic /Flow heart murmur**
  – Increases with squatting (causing an increase in venous return (preload), stroke volume and systemic vascular resistance (afterload))
  – Decreases in length and intensity with standing and Valsalva (causing a decrease in venous return, right and left ventricular volumes)
  – < 4/6 intensity without diastolic component

• **Pathologic heart murmur (i.e: HOCM, MVP)**
  – Decreases with squatting (increased left ventricular volume and arterial pressure, increasing size of outflow tract)
  – Increases in length and intensity with Valsalva and standing (decreases venous return causing the left ventricular outflow size to decrease)
  – > 3/6 intensity with a diastolic component

Physical Exam

• **Pulmonary**
  – Wheezing, rales, stridor, and rhonchi or prolonged cough (RAD, pneumonia, CHF, atelectasis)

• **Abdomen**
  – Hepato-splenomegaly
  – Increased kidney size
  – Surgical scars

• **Genitalia**
  – Absence of testes or scrotal masses
  – Hernia
  – Tanner Stage
Physical Exam

• Skin lesions or rashes
  – As previously discussed
  – Restrictions based on specific lesion and contact risk to opponent and teammates

• Neurologic
  – Look for any focal abnormalities in cranial nerves, strength, or sensation

Diagnostic Tests

• Labs
  – Not indicated unless warranted by history or exam
  – Should be based on athlete population screened

• EKG and ECHO
  – Based on expert opinion of the AHA, screening by EKG and Echo should not be a routine part of the PPE
    • Still very controversial (Low PPV in low prevalence population—75 SCD/year)
  – Athletic Heart- Athletic training and cardiac conditions cause similar changes on the ECG/EKG (eg. Executive Testing)
  – Further testing is often required to separate these causes
Diagnostic Tests

• EKG
  – Based on Italian experience in the Venuto region since 1982, there was a 90% decrease in SCD (due to dx of ARVD/C), more common in Italy
    • Initial SCD rate was 1:27,000
  – A study of athletes in a comparable region in Minnesota (without EKG Screening) with similar geography, with a stable and ethnically homogeneous populations of similar size and demographics, from 1994 to 2004 showed similar deaths, (12 vs 11), age ranges (12-31 vs 12-35), and incidences (0.02/100,000 person-years) of SCD for athletes. Causes were similar but rates of each were different.

Cardiac Causes of Death in Young Athletes

potentially half detected by a screening ECG

HCM 26% + LQTS 1% + LVH 7% + ARVC/D 3% + myocarditis 5% + DCM 2% + clinically significant AS 2.5% + potentially 2 - 35% undiagnosed = > 50% can be recognized by the ECG

This figure does not consider Brugada syndrome and other genetic conditions since they occur in “normal” hearts and are not recognized post mortem nor the 2% to 35% undetermined after autopsy
Newer ECG Criteria that Enhance the Value of ECG for Screening

• Brugada Syndrome - since recognition in 1992, the Brugada syndrome has progressed from being a rare disease to one that is second only to automobile accidents as a cause of death among young adults in some countries; ECG criteria = ST elevation in V1-2 > 2mm plus shape of ST and T wave

• Right Ventricular Dysplasia/Cardiomyopathy (ARVD/C) - 25 years since first described. It appears worldwide with a prevalence of about 1 in 5000 persons; ECG criteria = T wave inversion V2, slurring of S wave V1-3.

• Hypertrophic Cardiomyopathy (HC) - 50 years since first described, it appears with a prevalence of about 1 in 500 persons; HCM is a disease of the sarcomere due to > 450 mutations in >10 genes; ECG criteria = total LVH voltage, septal Q’s, QRS duration

• T wave Inversion (2mm) in 3 or more leads – found in numerous risk conditions

Diagnostic Tests

• The ECG/EKG can be a useful, inexpensive screening tool for many of the conditions that are associated with sudden death in athletes but follow up testing may be required and may be expensive
  – Order when indicated based on population, history and physical

• Further Available testing
  – Exercise stress testing
    • When indicated, i.e.: older athletes
  – Ambulatory ECG monitoring
  – Provocative electrophysiological studies
Summary

• The Preparticipation Physical Exam and Clearance
  – Is an Exercise In Risk Assessment
    • Evaluation of Health Status
      – Based on Medical Factors found in history, physical, ancillary testing where indicated
    • Evaluation of Participation Risk
      – Using sport risk modifiers based on sport
  – Shared decision process with input from all members of the medical staff

References

References

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