

Preparticipation Physicals: Who Cannot Play

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Overview

- Review the goals and objectives of the Preparticipation Evaluation/Examination (PPE)
- Discuss disqualifying conditions
- Review special concerns regarding the Athlete with Special Needs

Preparticipation Evaluation Goal

“To promote the health and safety of the athlete in training and competition”

Bottom Line

MOST athletes can play
(some sport)

Introduction

- PPE Must be:
 - Able to Identify diseases or processes that will affect the athletes
 - Sensitive
 - Accurate
 - Practical
 - Affordable
- The purpose is to facilitate and encourage safe participation not to exclude athletes
 - 0.3%-1.3% are denied clearance
 - 3.2%-13.9% require further evaluation

Introduction

- [PPE Monograph \(2010\), 4th Edition](#)
- Created through a collaboration with the following organizations
 - AAFP
 - AAP
 - ACSM
 - AMSSM
 - AOSSM
 - AOASM
 - Endorsed by AHA and NATA

PPE Objectives

- Primary Objectives
 - Screen for conditions that may be life-threatening or disabling
 - Screen for conditions that predispose to injury or illness
 - Meet administrative requirement
- Secondary Objectives
 - Determine general health
 - Establish medical home
 - Opportunity to discuss health related issues

PPE Stats

- 25 million participate in school-organized athletics (8 million H.S. and college)
- >50% of injuries to H.S. athletes occur in practice
- Only 0.3%-1.3% of athletes are denied clearance
- 3.2%-13.5% require further evaluation

Rockwell, PG, Alvarez, DJ. Adolescent Sports Injuries and the Preparticipation Physical Examination. *Clinics in Family Practice*. 4(2). Dec 2000.

Clearance Questions

- 1. Does the condition pose an unacceptable risk or place the athlete at increased risk for further injury?
- 2. Does the condition place other participants at risk for injury?
- 3. Can the athlete safely participate with treatment (eg, medication, rehabilitation, bracing, padding)?
- 4. Can limited participation be allowed while treatment is being completed?
- 5. If clearance is denied for certain sports or sport categories only, in which activities can the athlete safely participate?



Classification of Sports

- Contact/Collision
 - Basketball
 - Boxing
 - **Cheerleading**
 - Diving
 - Extreme sports
 - Field hockey
 - Football (tackle)
 - Gymnastics
 - Ice hockey
 - Lacrosse
 - **Martial arts**
 - Rodeo
 - Rugby
 - Skiing, downhill
 - Ski jumping
 - Snowboarding
 - Soccer
 - Team handball
 - Ultimate Frisbee
 - Water polo
 - Wrestling

Classification of Sports

- Limited Contact

- Adventure racing
- Baseball
- Bicycling
- **Cheerleading**
- Canoeing or kayaking (white water)
- Fencing
- Field events (high jump, pole vault)
- Floor hockey
- Football (flag or touch)
- Handball
- Horseback riding
- **Martial arts**
- Racquetball
- Skating (inline, ice, roller)
- Skiing (cross-country, water)
- Skateboarding
- Softball
- Squash
- Volleyball
- Weight lifting
- Windsurfing or surfing

Classification of Sports

- Noncontact

- Badminton
- Body building
- Bowling
- Canoeing or kayaking (flat water)
- Crew or rowing
- Curling
- Dance
- Field events (discus, javelin, shot put)
- Golf
- Orienteering
- Power lifting
- Race walking
- Riflery
- Rope jumping
- Running
- Sailing
- Scuba diving
- Swimming
- Table tennis
- Tennis
- Track

Medical History

Cornerstone of the PPE

History determines ~75% of problems that affect athletic participation

Primary Questions

- Prior denial or restriction to participation
- Chronic medical conditions

Secondary Questions

- Reason for disqualification
- Any follow up for this condition
- Any changes in this condition since disqualification

PPE History Form

Physical Exam

- Originally designed to identify those ready to play
- Usefulness of the examination?
 - Not very clear
 - Identification of conditions during the exam is not predictive of an increased likelihood of subsequent injuries

Physical Exam

- Height
- Weight
- BMI
 - Underweight <5th percentile
 - At risk of overweight 85th-95th percentile
 - Overweight >95th percentile

Physical Exam Form

Cardiac Evaluation

- What are we looking for ?
 - Causes of Sudden Cardiac Death
 - Hypertrophic Cardiomyopathy
 - Coronary Artery Anomalies
 - Marfan Syndrome
 - Arrhythmogenic Right Ventricular Cardiomyopathy
 - Long QT, Brugada, Pre-excitation Syndromes
 - CAD

Sudden Death in Young Athletes

- Etiology – congenital cardiac anomalies:
 - Hypertrophic cardiomyopathy (36%)
 - Coronary artery abnormalities (19%)
 - Increased cardiac mass (10%)
 - Remainder: Myocarditis, Marfan syndrome (aortic rupture), MVP, dysrhythmias, aortic stenosis, WPW syndrome, idiopathic long QT syndrome, arrhythmogenic RV cardiomyopathy, cocaine use, bulimia, anorexia nervosa, bronchospasm, heat-related illness.

Cardiovascular Screening

The 12-Element American Heart Association
Recommendations for Preparticipation
Cardiovascular Screening of Competitive
Athletes

- Personal history
 1. Exertional chest pain/discomfort
 2. Unexplained syncope/near syncope
 3. Excessive exertional and unexplained dyspnea/fatigue, associated with exercise
 4. Prior recognition of a heart murmur
 5. Elevated systemic blood pressure
- Maron BJ, Thompson PO, Ackerman MJ, et al,. *Circulation*. 2007;115(12):1643–1655.●

Cardiovascular Screening

- Family history
 6. Premature death (sudden and unexpected, or otherwise) before age 50 years due to heart disease, in ≥ 1 relative
 7. Disability from heart disease in a close relative age < 50 years of age
 8. Specific knowledge of certain cardiac conditions in family members:
 - Hypertrophic or dilated cardiomyopathy
 - Long-QT syndrome or other ion channelopathies
 - Marfan syndrome
 - Clinically important arrhythmias

Cardiovascular Screening

- Physical examination
 9. Heart murmur
 10. Femoral pulses to exclude aortic coarctation
 11. Physical stigmata of Marfan syndrome
 12. Brachial artery blood pressure (sitting position)
- Parental verification of history elements recommended for HS and middle school athletes



Cardiac Examination

- Suspicious Murmur
 - Grade III or Louder
 - Diastolic
 - **LOUDER** with valsalva or standing
- HCM Murmur
 - Systolic Murmur
 - Loudest in 2nd intercostal and/or left sternal border
 - Increases with standing / Decreases with squatting
 - May radiate to neck
 - Lateral Displacement of Apical Impulse
 - Holosystolic Murmur rad to Axilla (MR)

Marfan Stigmata

- Ocular:
 - Ectopia Lentis (lens dislocation)
- Skeletal
 - Arm Span/Height > 1.05
 - Steinberg sign (thumb sign)
 - Tall stature, arachnodactyly, dolichostenomelia, hyperextensibility, scoliosis, chest wall deformity
- Cardiac
 - Aortic (root, descending) distention
 - MVP
 - Bicuspid aortic Valve

Cardiac Evaluation - BP

- HTN is the most frequent cause of exclusion during PPE
- HTN with no end-organ damage should not limit competitive physical activities
 - Adults (age ≥ 18 years of age)
 - $>140/>90$
 - Single measurement is screen, not diagnosis
 - Do measurement correctly
 - Children
 - Prehypertension BP 90th – 95th percentile for age, sex, and height
 - May participate, avoid power lifting
 - HTN defined as $> 95^{\text{th}}$ percentile
 - No participation until BP controlled

<http://www.nhlbi.nih.gov/health-pro/guidelines/current/cardiovascular-health-pediatric-guidelines/summary.htm#chap8>

Giese, et al *Am Fam Physician*. 2007 Apr 1;75(7):1008-1014

Absolute Contraindications to Sports Participation

- Active myocarditis or pericarditis until resolved
- Suspected coronary artery disease until fully evaluated and treated
- Recent concussion with ongoing symptoms or post-concussive syndrome
- Acute mononucleosis
 - For at least 4 weeks after symptom onset due to risk of splenic rupture
- Acute enlargement of spleen or liver due to other etiologies (risk of rupture)
- Fever – no participation while temp elevated



Relative Contraindications to Sports Participation

- HCM/ARVC/Ion Channel Diseases (LQTS, Brugada)
 - Phenotypic expression = ICD recommended and no competitive sports
 - + Genotype positive/phenotypic negative = all sports permitted
- LQTS
 - >0.47 sec in males/ >0.48 sec in females = low-intensity sports only (Class IA)
 - Billiards, Bowling, Cricket, Curling, Golf, Riflery
- Marfan Syndrome
 - Aortic root <40 mm, no mod-severe mitral regurgitation, no FH of SCD = low-moderate intensity sports (Class IA and IIA)
 - Above plus Archery, Auto racing, Diving, Equestrian, Motorcycling
 - Aortic root >40 mm, prior surgical repair, mod-severe mitral regurgitation or FH of SCD = only low-intensity sports (Class IA above)

Mitchell et al. JACC Vol. 45, No. 8, Task Force 8: Classification of Sports, 1364–7

Maron et al. JACC Vol. 45, No. 8, Task Force 4: HCM, Other Cardiomyopathies,

• and Marfan, 1340–5

Relative Contraindications to Sports Participation

- Asymptomatic WPW without structural cardiac abnormality
 - All sports permitted,
- PVC's that decrease or are stable with exercise
 - All sports permitted
- NSVT
 - No CV disease = all sports permitted
 - CV disease = only low-intensity sports (Class IA)
- ICD's
 - Restricted to low-intensity sports without the risk of trauma to the device

Zipes et al. JACC Vol. 45, No. 8, Task Force 7: Arrhythmias, 1354–63

Relative Contraindications to Sports Participation

- Poorly controlled seizure d/o
 - No archery, riflery, swimming, weight lifting or sports involving heights
- Recurrent episodes of UE burning pain or weakness, or episodes of transient quadriplegia
 - No contact or collision
 - Must ensure C-spine stability
- Sickle-cell trait
 - Ensure proper hydration and caution with exercise during extreme heat or altitude

Relative Contraindications to Sports Participation

- Skin infections
 - Active HSV, molluscum, impetigo, MRSA/MSSA infections, scabies, tinea are all contraindicated in wrestling and other sports with skin-skin contact
- Eye Disorders
 - Functionally one-eyed athlete (best corrected vision <20/40 in the worse eye) = avoid boxing, full-contact martial arts, other contact/collision sports with eye protection
- History of heat illness
 - All sports permitted with caution – ensure proper acclimatization, conditioning, hydration
- Solitary kidney
 - Individual assessment warranted for contact/collision sports
 - Protective equipment may be used
 - Risk in football << than cycling per the literature
- Grinsell et al Pediatrics Vol. 118 No. 3, 1019 -1027

The Athlete with Special Needs

PPE

- PPE must be tailored to address their special needs
- Office-based exam preferred
 - Frequency of abnormal findings
 - Diagnoses often associated with clusters of abnormal findings
 - Enhanced interpersonal communication

Exam Abnormalities in Non-Disabled Athletes vs Special Olympians

- Nondisabled athletes: 0.3 – 3% have disqualifying abnormalities
- Special Olympians- 39% have abnormalities
 - Not necessarily all disqualifying.

Atlantoaxial Instability (AAI)

- Up to 15% of Down syndrome have a laxity of the transverse ligament of C-1 (atlas) which stabilizes the articulation of the odontoid process of C-2 (axis) with C-1
- If excessively lax, C-1 may spontaneously sublux forward on C-2 resulting in compression of the cervical spinal cord
- All Down syndrome athletes must receive a diagnostic x-ray of the c-spine before entering Special Olympics participation

Atlantoaxial Instability and Athletics

- Refer for Neurosurgical consultation
- Avoid activities at risk for hyperextension, radical flexion, or direct pressure on the neck or upper spine
 - Butterfly stroke, diving, pentathlon, high jump, equestrian sports, gymnastics, soccer, squat lift, alpine skiing, and any warm-up exercise placing undue stress on the head and neck
- Non-contact sports OK with parental consent

Clearance

- Three categories of clearance
 - 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___
- Never clear the symptomatic athlete
- Disqualification from high-risk sports does not mean DQ from all activities



General Summary

- Part of preventive health screening for all active people
- PPE screening should not create unnecessary roadblocks to participation
- Accept imperfection of any screening tool
- Participation in athletics will always carry some risk
- Educate and advocate



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2. Preparticipation Physical Evaluation Monograph, 4th Edition: American Academy of Pediatrics, ISBN 978-1-58110-376-2.
3. Smith J, Laskowski ER. The preparticipation physical examination: Mayo Clinic experience with 2,739 examinations. *Mayo Clin Proc.* 1998;73:419-29.
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