

Keeping Kids in the Game: What Not to Miss in the Preparticipation Physical Evaluation

September 22nd, 2024

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Disclosures

- I have no relevant financial disclosures
- Executive Committee, Council on Sports Medicine and Fitness

Objectives

1. Describe the purpose of the preparticipation physical evaluation
2. Outline the components of a routine sports physical
3. Recognize symptoms that may predispose athletes to more severe injury or adverse outcomes with participation in sport
4. Formulate return to play plans for athletes with concerning findings on preparticipation physical evaluations

Take Home Points

1. Preparticipation evaluation part of comprehensive medical care for all people
2. Mental health screening and social determinants of health screening
3. Use of standardized form improves efficacy and efficiency







Introduction

- Increased participation of adolescents in organized sports
 - 7.2 to 7.9 million
- Importance of sports involvement
- Younger ages of patients involved competitively
- Most frequent interaction with clinician during teenage years

Development of the PPE

- Created 30 years ago
- Primary objective
 - Screen for potentially life-threatening conditions
- Now mandated in 49 of 50 states
- In 21 of 50 states, NPs or PAs can complete
- 11 states allow chiropractors to clear
- No standardized form
- 8 states do not have a standardized history form

By Whom?

- Physician
 - MD/DO
 - Naturopathic
- Nurse practitioner
- Physician Assistant
- Chiropractor
- Podiatrist

The Controversy

- Is the PPE a waste of time?
 - Lack of “positives” that result in disqualification from sports
 - One recent study found only 1.9% of 2,729 high school athletes screened were disqualified
 - Poor reimbursement from insurance companies

Frequency

- Annual*
- Once every 2 years
- Once in high school
- After transition points
- After significant time loss injuries

When, Where, and How

- Timing at least 6 weeks before the start of the sport season
- Station-based school exam vs. physician office
 - Age based comparison
 - Sport-specific prevention programs
 - Promote physician-patient relationship
 - Counseling on “at-risk” behaviors
 - General preventative health measures
 - Exploration of more sensitive medical issues

Most Common Reasons for Sports Denial

1. Physical features of Marfan's syndrome
2. Delayed femoral arterial pulses
3. Single, wide or fixed splits in the second heart sound
4. Systolic or diastolic murmurs of G 2/6 or greater
5. Irregular rhythms; prolonged QT intervals; myocarditis, pericarditis
6. Hypertension
7. Orthopedic abnormalities such as joint problems
8. Poorly controlled convulsive disorders (no archery, riflery, swimming, weight lifting, strength training or sports involving heights)
9. Sickle cell disease (no high-exertion, contact or collision sports)
10. Eating disorders : anorexia, bulimia that are not under control
11. Spleen or liver enlargement

The Purpose of the PPE

- Most common reason for healthy adolescents to visit pediatricians
- Opportunity for health prevention
- Although only 1.9% of athletes were disqualified, 11.9% required follow-up (PT, nutritional counseling, referral for undiagnosed HTN)
- Injury prevention
- Legal and insurance requirements



Key Questions

GENERAL QUESTIONS Explain "Yes" answers at the end of this form. Circle questions if you don't know the answer.		Yes	No	HEART HEALTH QUESTIONS ABOUT YOU <i>(continued)</i>		Yes	No
1	Do you have any concerns that you would like to discuss with your provider?			8	Has a doctor ever requested a test for your heart? For example, electrocardiography (ECG) or echocardiography (ECHO)?		
2	Has a provider ever denied or restricted your participation in sports for any reason?			9	Do you get light-headed or feel shorter of breath than your friends during exercise?		
3	Do you have any ongoing medical issues or recent illnesses?			10	Have you ever had a seizure?		
HEART HEALTH QUESTIONS ABOUT YOU		Yes	No	HEART HEALTH QUESTIONS ABOUT YOUR FAMILY		Yes	No
4	Have you ever passed out or nearly passed out during or after exercise?			11	Has any family member or relative died of heart problems or had an unexpected or unexplained sudden death before age 35? (including drowning or unexplained car crash)		
5	Have you ever had discomfort, pain, tightness, or pressure in your chest during exercise?			12	Does anyone in your family have a genetic heart problem such as hypertrophic cardiomyopathy (HCM), Marfan Syndrome, arrhythmogenic right ventricular cardiomyopathy (ARVC), long QT syndrome (LQTS), short QT syndrome (SQTS), Brugada syndrome, or catecholaminergic polymorphic ventricular tachycardia (CPVT)?		
6	Does your heart ever race, flutter in your chest, or skip beats (irregular beats) during exercise?			13	Has anyone in your family had a pacemaker or an implanted defibrillator before age 35?		
7	Has a doctor ever told you that you have any heart problems?						



Cardiac Screening

- AHA guidelines
 - Personal history
 - Family history
 - Physical examination
 - 14-element screen

Red Flags – Family History

- Further cardiovascular evaluation
 - Early sudden cardiac death
 - Marfan syndrome
 - Cardiomyopathy
 - Arrhythmias
 - Unexplained or poorly characterized deaths

Red Flags – personal history

- Cardiology evaluation
 - Known congenital heart disease
 - Cardiac channelopathies
 - History of myocarditis
 - Coronary anomalies

Cardiac Screening

- During exercise?
- Associated symptoms?
 - Syncope
 - Near-syncope
 - Chest pain
 - Palpitations
 - Excessive shortness of breath
 - Fatigue with exertion
- Previous evaluation?
- Other variables – diet, heat

European Experience

- Italian PPE children 7-18 years
- Annual medical eval by sports med doctor
- Routine PPE + EKG + Stress testing
- Further cardiac testing – maximum stress test/cardiac MRI
 - + History
 - + Family history
 - Abnormal physical exam
 - Abnormal EKG
 - Abnormal stress test



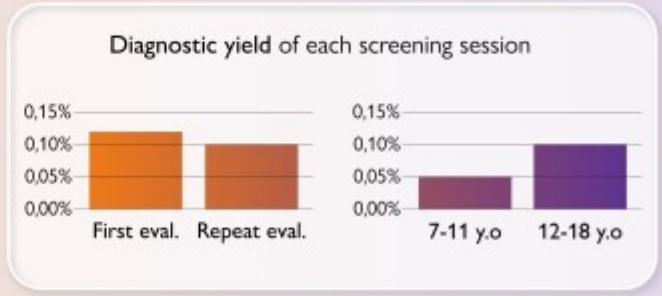
Cardiovascular preparticipation screening in young athletes

22,324 consecutive young athletes
(62% males, median age 12 [IQR 10–14])

Preparticipation screening
repeated every year (on average 2.9 times/young athlete)



- Congenital HD = 17
 - Ion channel dis = 14
 - Cardiomyopathies = 15
 - LV scar + arrhythm = 18
 - Other = 5
- 69 (0.3%)**
Diseases at risk of sudden death



Follow-up (7.5 ± 3.7 years)

1 case of resuscitated cardiac arrest (0.6/100,000/year)

Medical Disqualification

- Diagnosis of cardiac disease at risk for SCD ineligible for competitive sports
- Tailored leisure exercise program if medically disqualified
- Psychologic support

Cost per diagnosis of heart disease \$92,000



Sudden Cardiac Death Rate From Sport

- No different in the European system



Long-Term Outcome

- For the rare athlete picked up on the screening, their outcome MIGHT change
- What about the athlete picked up as positive on the screen who may have continued to be asymptomatic?
- What about the athlete who is symptomatic but would not have suffered a life altering event related to their condition?
- What about the risk of developing cardiovascular disease from a sedentary life?
 - Heart disease is a leading cause of death in the United States
 - Accounts for 1 in 4 deaths
 - Most common type of heart disease is coronary artery disease
 - One person dies every 33 seconds from cardiovascular disease
 - Inactivity
 - Obesity
 - Poor diet



Cardiovascular

- Quiet area
- Supine and standing
- Hypertrophic cardiomyopathy
 - Harsh, early systolic murmur
 - Right upper sternal border
 - Increases in intensity with activities that decrease cardiac preload – standing/Valsalva
- Femoral and radial pulse comparison

Sudden Cardiac Death

- 1 in 200,000 high school athletes per academic year
- Death rate fivefold higher in men than women
 - 7.5 per million per year men
 - 1.3 per million per year women
- 200,000 children and adolescents would have to be screened to detect 1,000 athletes at risk for SCD and 1 person would die

Targeted Screening

- African American Males
 - 1 in 80,000 athlete-years
- Men's basketball
 - 1 in 9,000 athlete-years

History

- Detects 90% of medical conditions
- 70% of musculoskeletal conditions
- Poor correlation between athlete and parent reports
 - <40%
- Chronic medical conditions
 - Diabetes
 - Allergies
 - Mononucleosis
 - Sickle cell trait and disease
 - Paired organs

Other Considerations

- Acute illness
 - Fever
- Supplements
 - Protein
 - 39% of 12th –grade males
 - 30% of 8th – grade males
 - Anabolic-androgen steroids
 - 3.2% lifetime prevalence
 - Contamination
 - 25% contaminated with AASs
 - 11% contaminated with stimulants

Neurologic Considerations

21	Have you had a concussion or head injury that caused confusion, a prolonged headache, or memory problems?		
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Concussion

- Number
- Date
- Symptoms
 - Persisting
- Severity
- Recovery from previous injuries
 - Graduated return to play
- Baseline neurocognitive testing
 - Poor sensitivity, specificity, test-retest reliability
 - Intentional underperformance

Pulmonary

- Exercise-induced bronchospasm
 - 12-15% athletes
 - More common with allergic rhinitis and/or allergic asthma
 - Pre-treatment
 - Asthma action plan

Female Athlete

- RED-S
 - Low-energy availability
 - With or without disordered eating
 - Menstrual dysfunction
 - Low bone mineral density
- 15-54% of high school female athletes have 1 component
- 1.2% have all 3 components

Female Athlete

QUESTION	INCLUDED ON THE 4TH- EDITION PPE FORM
1. Do you worry about your weight or body composition?	Yes
2. Do you limit or carefully control the foods that you eat?	Yes
3. Do you try to lose weight to meet weight or image/appearance requirements in your sport?	Yes
4. Does your weight affect the way you feel about yourself?	No
5. Do you worry that you have lost control over how much you eat?	No
6. Do you make yourself vomit or use diuretics or laxatives after you eat?	No
7. Do you currently or have you ever suffered from an eating disorder?	Yes
8. Do you ever eat in secret?	
9. What age was your first menstrual period?	Yes
10. Do you have monthly menstrual cycles?	Yes
11. How many menstrual cycles have you had in the last year?	Yes
12. Have you ever had a stress fracture?	Yes

What's New

Patient Health Questionnaire version 4 (PHQ-4)

Over the past two weeks, how often have you been bothered by any of the following problems? (Circle response)

	Not at all	Several days	Over half of the days	Nearly everyday
Feeling nervous, anxious, or on edge	0	1	2	3
Not being able to stop or control worrying	0	1	2	3
Little interest or pleasure in doing things	0	1	2	3
Feeling down, depressed, or hopeless	0	1	2	3

Psychological

- Eating disorders
- Depression
- Anxiety
- PSQ-4

Immunization

- Influenza
- COVID
- Hepatitis
- Meningitis
- HPV

Well Visit vs Preparticipation Visit

- Disease Screening
- Medication review
- Growth and development
- Promote wellness
- Anticipatory guidance
- Promote safe participation
- Prevent sudden cardiac death
- Injury assessment and prevention
- Meet liability standards

Social Determinants of Health



TableII. Types of social needs reported, number of youth/families screened, and the percentage of social needs endorsed

Social needs	Endorsed, n (%)*
General social need	
Any general social need	56 253 (12.01)
Food: <i>Within the past 6months, you worried that your food would run out before you had money to buy more?</i>	56 181 (5.87)
Housing: <i>Do you think you are at risk of becoming homeless?</i>	56 213 (1.84)
Transportation: <i>In the past 12months, has lack of transportation kept you from medical appointments or from getting medications?</i>	56 181 (5.07)
Utilities: <i>In the past year, has the utility company shut off your service for not paying your bills?</i>	56 052 (4.07)
Urgent social need if social need identified	
Any urgent social need	6729 (27.70)
Food: <i>Do you need emergency food today?</i>	3287 (31.94)
Housing: <i>Are you currently homeless?</i>	1030 (29.51)
Transportation: <i>Do you have a plan to get home today?</i>	2840 (16.09)
Utilities: <i>Are your utilities shut off now?</i>	2254 (13.89)

*

Number screened and percentage reflect the percentage of positive screens.

Social Needs Screening Tool

HOUSING

- Are you worried or concerned that in the next two months you may not have stable housing that you own, rent, or stay in as a part of a household?²
 - Yes
 - No
- Think about the place you live. Do you have problems with any of the following? (check all that apply)²
 - Bug infestation
 - Mold
 - Lead paint or pipes
 - Inadequate heat
 - Oven or stove not working
 - No or not working smoke detectors
 - Water leaks
 - None of the above

FOOD

- Within the past 12 months, you worried that your food would run out before you got money to buy more.³
 - Often true
 - Sometimes true
 - Never true
- Within the past 12 months, the food you bought just didn't last and you didn't have money to get more.³
 - Often true
 - Sometimes true
 - Never true

TRANSPORTATION

- Do you put off or neglect going to the doctor because of distance or transportation?⁴
 - Yes
 - No

UTILITIES

- In the past 12 months has the electric, gas, oil, or water company threatened to shut off services in your home?⁴
 - Yes
 - No
 - Already shut off

CHILD CARE

- Do problems getting child care make it difficult for you to work or study?²
 - Yes
 - No

EMPLOYMENT

- Do you have a job?²
 - Yes
 - No

EDUCATION

- Do you have a high school degree?²
 - Yes
 - No

FINANCES

- How often does this describe you? I don't have enough money to pay my bills:²
 - Never
 - Rarely
 - Sometimes
 - Often
 - Always

PERSONAL SAFETY

- How often does anyone, including family, physically hurt you?²
 - Never (1)
 - Rarely (2)
 - Sometimes (3)
 - Fairly often (4)
 - Frequently (5)
- How often does anyone, including family, insult or talk down to you?²
 - Never (1)
 - Rarely (2)
 - Sometimes (3)
 - Fairly often (4)
 - Frequently (5)

- How often does anyone, including family, threaten you with harm?²
 - Never (1)
 - Rarely (2)
 - Sometimes (3)
 - Fairly often (4)
 - Frequently (5)

- How often does anyone, including family, scream or curse at you?²
 - Never (1)
 - Rarely (2)
 - Sometimes (3)
 - Fairly often (4)
 - Frequently (5)

ASSISTANCE

- Would you like help with any of these needs?²
 - Yes
 - No

SCORING INSTRUCTIONS:

For the housing, food, transportation, utilities, child care, employment, education, and finances questions: Underlined answers indicate a positive response for a social need for that category.

For the personal safety questions: A value greater than 10, when the numerical values are summed for answers to these questions, indicates a positive response for a social need for personal safety.

Sum of questions 11–14:
Greater than 10 equals positive screen for personal safety.

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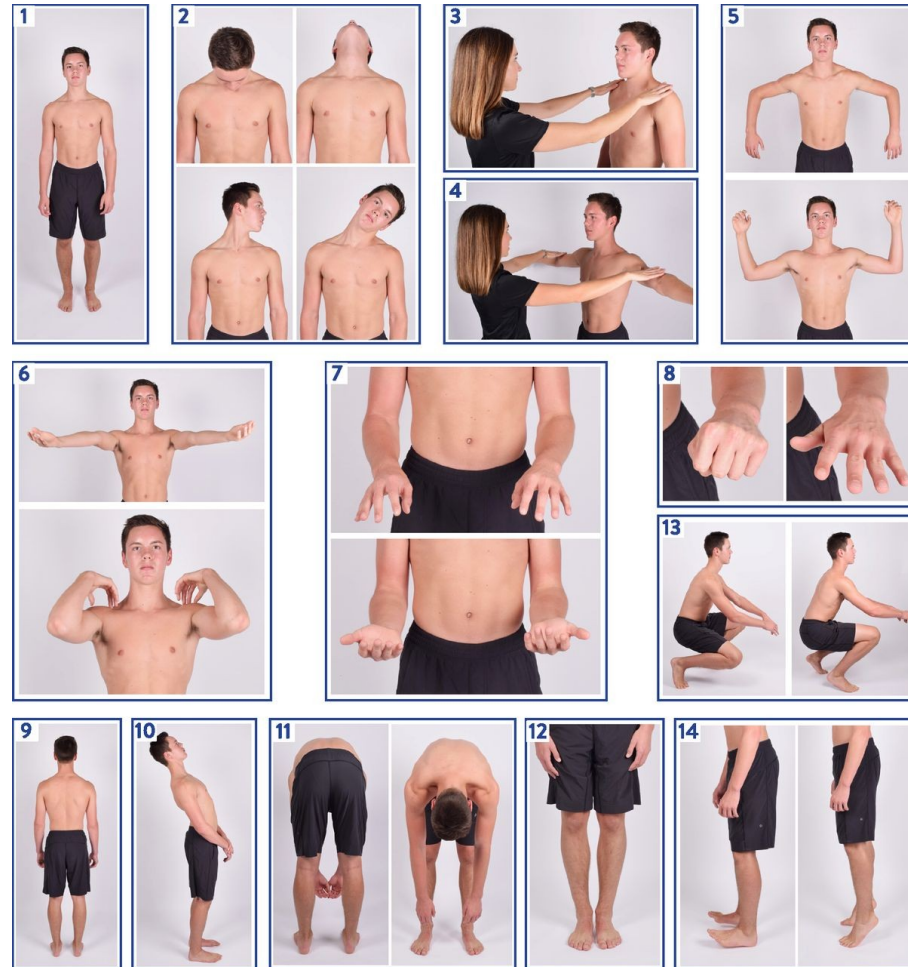
Solutions?

Physical Examination

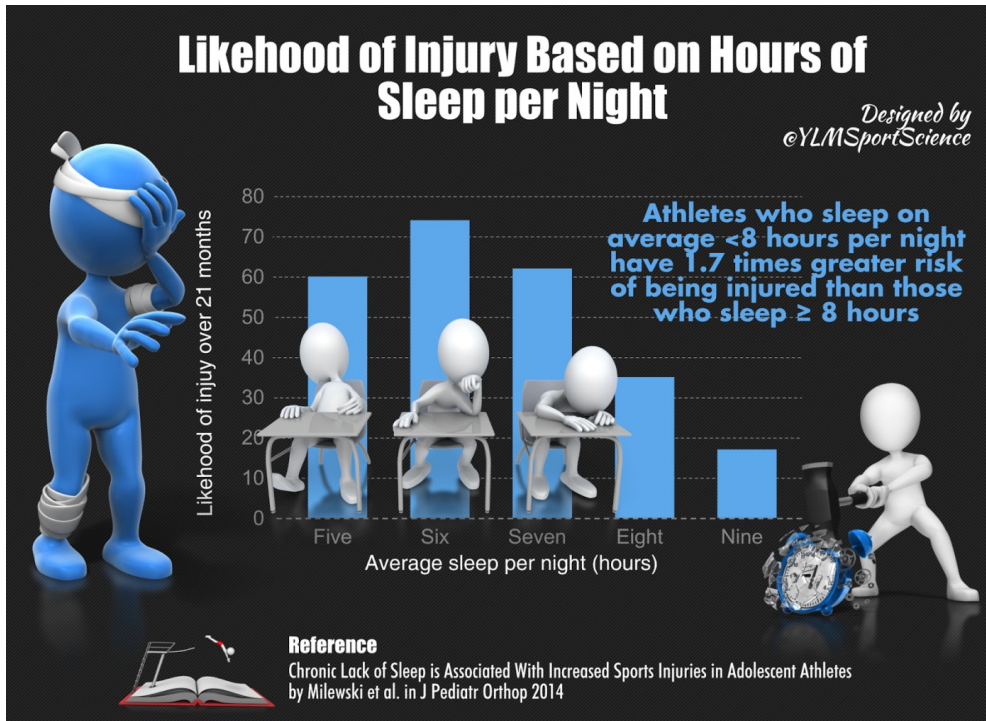
- Vital signs
 - Height
 - Weight
 - BMI
 - Blood pressure
 - Rest for 5 minutes
 - Appropriate size cuff
- Hypertension most common cardiovascular disease in athletic population
 - 6.4% of athletes with elevated blood pressure
 - Average systolic BP and/or diastolic BP \geq 95th percentile for gender, age, and height on \geq 3 occasions
 - Medications, caffeine, drug, tobacco, stimulant use



Pediatr Rev. 2019;40(3):108-128. doi:10.1542/pir.2016-0216



Reduce injury - Sleep



Sleep and Injury in Young Athletes

Référence : Fox et al. Sports Med 2019

Designed by @YLMsportScience

STUDY	POPULATION	FINDINGS
Luke et al. (2011)	360 young elite athletes (13.8 ± 2.6 years)	The number of fatigue-related injuries was higher when athletes' normal sleep duration was less than 6 h per night
Milewski et al. (2014)	112 young athletes (15±2 years)	The risk of injury increased by 110% when athletes usually sleep less than 8 h of sleep per night
Rosen et al. (2017)	340 young elite athletes (17±1 years)	When a minimum of 8 h of sleep was obtained, injury risk was reduced by 61%
Van Rosen et al. (2017)	496 adolescent elite athletes (17±2 years)	Decreased sleep volume (sleep prior to the injury compared to the preceding 4 weeks) was a risk factor for injury
Watson et al. (2017)	75 youth soccer players (16±2 years)	Sleep duration & quality were not significant predictors of injury

While there is some variability in the threshold where sleep duration is associated with increased injury risk in young athletes, existing research suggests that higher injury rates occur concomitantly with lower sleep durations

CHECKLIST FOR ATHLETES TO CONSIDER TO ENHANCE SLEEP

- 1 Quiet environment
 - 2 Maintain room temperature (~18°C)
 - 3 Ensure that bedding/clothing does not cause an environment that is too hot
 - 4 Sleep routine: consistent time each night for falling asleep to begin and waking up
 - 5 Avoid caffeine and food/fluid ingestion leading up to sleep (no nap, however)
 - 6 Avoid the use of computer, tablet, TV before sleeping
 - 7 Napping not later than midafternoon
 - 8 At least 7 h sleep a night
 - 9 Ensure dark room with no light source present
-

Reference: by Marshall & Turner, Strength Cond J, 2016

Designed by @YLMsportScience

Reduce Injury - Nutrition

Ten Things You Need to Know About Sports Nutrition

1. Look Beyond Weight When Determining Health



2. Building Muscle Takes More Than Just Protein



3. Protein: It's Not Just More, But When and How Much



4. Infrequent Meals Cause Problems



5. Fresh foods help the microbiome keep you healthy



6. Good Food, Bad Food, Wrong Choice



7. Relative Energy Deficiency in Sport (RED-S) can be a Problem



8. Poor Hydration, Poor Performance



9. Recovery from Exercise is Just as Important as the Exercise



10. It Is Important to Learn How to Lower Stress



<https://tinyurl.com/nutritionfactsblog>

Summary

- PPE important in overall health screening for athletes
- Opportunity to evaluate for other risk factors
 - GAPS
 - Bright Futures
- Social determinants of health, mental health screening likely more important than the actual PPE screening related to traditional goals

Conclusions

- Everybody who comes into your office is an athlete
- Preparticipation physical evaluation should not be used only for organized sports participation
- Minimal effect on morbidity and mortality related to sports participation
- Social determinants of health screening should be a priority
- Standardization
- Few athletes disqualified, individualized decision making based on condition, risk, and sport – shared decision making with athlete and family
- Research opportunities – questions that are sensitive/specific

Considerations to Changing Your Practice

- Integrate preparticipation evaluation into standard health supervision visits for every patient
- Consider how social situation, mental health, and PPE requirements may impact or limit opportunities for sports participation
- Standardize forms provide uniform assessment tool
- Consider bias in PPE
 - Efficacy of tests
 - Lives saved
 - Cost
 - Is it worth doing in isolation

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