

Preparticipation Physical Exams: The Rhode Island Perspective, A Call for Standardization

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ABSTRACT

As of 2015, 98% of U.S. states require preparticipation exams (PPE) before participating in scholastic sports. Despite widespread availability of a PPE monograph endorsed by six medical societies, a lack of uniformity exists regarding implementation of the PPE among Rhode Island health care providers (HCPs). Consequently, significant variability exists regarding how comprehensive a history and physical exam screening is conducted for adolescent athletes looking for sports participation clearance. The purpose of this document is to: 1) establish a uniform screening process in Rhode Island for the PPE utilizing a peer-reviewed history and physical exam; 2) familiarize HCPs with the 2010 PPE monograph, with emphasis on the cardiovascular and musculoskeletal (MSK) systems; 3) encourage HCPs to treat the PPE as a separate entity from the annual wellness visit; 4) engage HCPs and sports medicine providers in Rhode Island to improve the quality and process of evaluating adolescent athletes for sports participation.

KEYWORDS: preparticipation exam, adolescent, athlete, screening

BACKGROUND

In 2010, the fourth edition of the Preparticipation Physical Evaluation monograph was published by 6 medical societies, including the American Academy of Family Physicians, American Academy of Pediatrics (AAP), American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopedic Society for Sports Medicine, and American Osteopathic Academy of Sports Medicine. This comprehensive, peer-reviewed document was the culmination of an extensive review of the literature including position, policy, and consensus statements pertaining to provision of health care in the adolescent population. The objective of the authoring societies was to promote the PPE as an effective tool in identifying medical and orthopedic conditions that may affect an athlete's ability to participate safely in sports, particularly when performed thoroughly and consistently by qualified, licensed supervising physicians.¹ Critics of the PPE have questioned its utility, as 1) <2% of high school athletes are ultimately disqualified from sports participation²; 2) the PPE lacks capacity to effectively screen

athletes for risk factors associated with sudden cardiac death (SCD)³; 3) the PPE has little effect on the overall morbidity and mortality of athletes.⁴ Proponents of the PPE cite that 1) ≥75% of medical and orthopedic conditions which may require sports participation restriction are detected by history alone⁵; 2) it allows for establishment of a medical home, updating of immunizations, identification and management of chronic health conditions related to sports and other lifestyle risk factors.

In Rhode Island, wide variability exists regarding the implementation of the PPE. In many health care settings, the PPE is combined with the annual wellness visit, due to a variety of factors. Insurance companies restrict reimbursement for adolescent physical examinations to annual wellness visits only. As a result, HCPs cannot bill insurance for dedicated sports physical/PPE. Nationally, the PPE substitutes for the annual comprehensive health evaluation in 30-88% of adolescents.^{6,7} Time restrictions (e.g., timely need for physical forms for sports, camps, school enrollment) and appointment availability often impact the feasibility of scheduling separate annual wellness visits and PPE visits in most clinical practices. As a result, most HCPs utilize a state-issued School Physical Form (<http://www.health.ri.gov/forms/school/Physical.pdf>) which can be used for multiple purposes, including school-sponsored physical activity/sports participation and non-scholastic sports participation.

With the development of the 2010 PPE monograph comes new momentum to develop a standardized, uniform approach to the PPE. Currently, each state determines the content, comprehensiveness, and length of its respective PPE form, as well as the type of HCP licensed to perform the PPE.^{1,8,9} A 2015 study found that only 19 U.S. states (37%) required or recommended use of the 2010 PPE monograph.⁹ By adopting the 2010 PPE monograph, Rhode Island could assist in the establishment of a national, standardized approach to the PPE that would allow for meaningful data collection, with future editions transitioning from predominantly expert opinion-based content to evidence and outcome-driven content. Aside from the authoring societies of the 2010 PPE monograph, other organizations have recently joined in efforts to standardize the approach to PPE performance, including the Campaign and Coalition for Youth Sports Health and Safety.⁸ Ninety-five percent (95%) of Americans believe that PPE screenings must be conducted in a consistent manner across the country.¹⁰

MAKING THE TRANSITION

Physician-reported obstacles to the delivery of the PPE include time and scheduling limitations, lack of familiarity with the medical history and physical examination portions of the PPE, uncertainty regarding relative importance of each PPE component, length of the PPE form, time spent covering non-PPE topics, and lack of a standard approach.¹¹ When evaluating a patient for sports participation clearance, HCPs are responsible for conducting a detailed history and physical examination that screens an athlete for cardiovascular and MSK conditions that may ultimately predispose to a life-threatening event, disabling injury or illness during training or competition. A critical element for determining athletic participation is a targeted, albeit detailed PPE history and physical examination. PPEs were never intended to take the place of an annual wellness visit; conversely, the standard history and physical examination of an annual physical can effectively be integrated into the annual physical by utilizing the PPE monograph.

The authoring societies of the 2010 PPE monograph acknowledge that the athlete's personal physician's office is the ideal setting for the PPE given the established physician-patient relationship, accessibility to the complete medical record, and comfortable environment to discuss confidential issues. This endorsement assumes clinical comfort and competency in performing the PPE. Alternative arrangements for PPE administration, such as group-based assessments by a coordinated medical team, should be available to student-athletes if a comprehensive PPE cannot be accomplished in the medical home.

One of the overall purposes of the 2010 PPE monograph was to provide a resource for primary care physicians to improve the quality of the PPE performed in the medical home and to close the knowledge gap regarding the various components of the PPE.¹ Clinicians interested in familiarizing themselves with the various components of the screening examination (e.g., general MSK screening examination) should consider purchasing the 180-page 2010 PPE monograph in its entirety. For those clinicians who have access to the current or previous editions of the PPE monograph, detailed figures provide valuable information pertaining to screening examination assessments.

The authoring societies of the 2010 PPE monograph provide the history, physical exam, and clearance forms free of charge (available at AAP Council on Sports Medicine and Fitness website). Clinicians can download these forms for use in their practice settings (Figures 1A-B).

THE CARDIOVASCULAR AND MUSCULOSKELETAL EVALUATIONS: WHAT YOU SHOULD KNOW

While a comprehensive review of the history and physical exam sections of the PPE is beyond the scope of this article, specific attention to key elements of the cardiovascular and MSK evaluations is warranted.

Figures 1a and 1b. 2010 PPE monograph history and physical examination forms.

■ PREPARTICIPATION PHYSICAL EVALUATION HISTORY FORM
 (Note: This form is to be filled out by the patient and parent prior to seeing the physician. The physician should keep this form in the chart.)

Date of Exam _____
 Name _____ Date of Birth _____
 Sex _____ Age _____ Grade _____ School _____ Sport(s) _____

Medications and Allergies: Please list all of the prescription and over-the-counter medicines and supplements (herbal and nutritional) that you are currently taking _____
 Do you have any allergies? Yes No If yes, please identify specific allergy below:
 Medications Pollens Food Stinging insects

Explain "Yes" answers below. Circle questions you don't know the answers to.

GENERAL QUESTIONS	Yes	No	OTHER QUESTIONS	Yes	No
1. Has a doctor ever advised or restricted your participation in sports for any reason?			27. Have you ever used an inhaler or taken asthma medicine?		
2. Do you have any ongoing medical conditions? If so, please identify below: <input type="checkbox"/> Asthma <input type="checkbox"/> Diabetes <input type="checkbox"/> Seizures <input type="checkbox"/> Other: _____			28. Do you have anyone in your family who has asthma?		
3. Have you ever spent the night in the hospital?			29. When you have had a fall or any injury, a laceration, a bruise, a burn, a sprain, or any other injury?		
4. Have you ever had surgery?			30. Do you have any pain or a pulled ligament or tendon in the groin area?		
HEART HEALTH QUESTIONS ABOUT YOU	Yes	No	31. Have you had infectious mononucleosis (mono) within the last month?		
5. Have you ever passed out or nearly passed out (fainted) or felt lightheaded?			32. Have you had a seizure or MSK pain in the neck?		
6. Have you ever had dizziness, pain, tightness, or pressure in your chest during exercise?			33. Have you ever had a head injury or concussion?		
7. Does your heart ever race or skip beats (irregular beats) during exercise?			34. Have you ever had a faint or passed out due to heat, dehydration, prolonged heatstroke, or necessary practice?		
8. Has a doctor ever advised a test for your heart? (For example, ECG/EKG, echocardiogram)			35. Do you have a history of stroke or disorder?		
9. Has a doctor ever advised a test for your heart? (For example, ECG/EKG, echocardiogram)			36. Do you have bradycardia with exercise?		
10. Do you get lightheaded or feel more short of breath than expected during exercise?			37. Have you ever had weakness, tingling, or numbness in your arms or legs after being hit or falling?		
11. Have you ever had an unexplained seizure?			38. Have you ever become ill while exercising in the heat?		
12. Have you ever had a faint or passed out more quickly than your friends during exercise?			39. Do you get frequent muscle cramps when exercising?		
HEART HEALTH QUESTIONS ABOUT YOUR FAMILY	Yes	No	40. Do you or someone in your family have a stroke, fall, or disorder?		
13. Has any family member or relative died of heart problems or had an unexplained or unexpected sudden death before age 50 (including drowning, unexplained car accident, or sudden infant death syndrome)?			41. Have you had any eye injuries?		
14. Does anyone in your family have hypertrophic cardiomyopathy, Marfan syndrome, aortic aneurysm, aortic valve disease, bicuspid aortic valve, long QT syndrome, aortic CT syndrome, long QT syndrome, or catecholaminergic polymorphic ventricular tachycardia?			42. Do you wear glasses or contact lenses?		
15. Does anyone in your family have a heart problem, pacemaker, or implanted defibrillator?			43. Do you wear protective eyewear, such as goggles or a face shield?		
16. Has anyone in your family had unexplained fainting, unexplained seizures, or near drowning?			44. Do you worry about your weight?		
BONE AND JOINT QUESTIONS	Yes	No	45. Are you trying to lose weight or have anyone recommended that you gain or lose weight?		
17. Have you ever had an injury to a bone, muscle, ligament, or tendon that caused you to miss a practice or a game?			46. Are you on a special diet or do you avoid certain types of foods?		
18. Have you ever had any fractures or broken bones or dislocated joints?			47. Have you ever had an injury to your neck?		
19. Have you ever had an injury that required a cast, brace, or splint?			48. Do you have any chronic joint or muscle pain?		
20. Have you ever had a stress fracture?			49. Do you have any chronic joint or muscle pain?		
21. Have you ever been told that you have or have had an aortic aneurysm, dissection, or tear?			50. Do you have any chronic joint or muscle pain?		
22. Do you regularly use a brace, orthotic, or other assistive device?			51. Do you have any chronic joint or muscle pain?		
23. Do you have a bone, muscle, or joint injury that bothers you?			52. Do you have any chronic joint or muscle pain?		
24. Do any of your joints become painful, swollen, hot, warm, or stiff?			53. Do you have any chronic joint or muscle pain?		
25. Do you have any history of joint or connective tissue disorder?			54. Do you have any chronic joint or muscle pain?		

I hereby state that, to the best of my knowledge, my answers to the above questions are complete and correct.

Signature of athlete _____ Signature of parent/guardian _____ Date _____

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■ PREPARTICIPATION PHYSICAL EVALUATION PHYSICAL EXAMINATION FORM

Name _____ Date of Birth _____

PHYSICIAN REMINDERS

- Consider medical questions on team sensitive issues
- Do you feel stressed out or under a bit of pressure?
- Do you ever feel sad, hopeless, depressed, or anxious?
- Do you feel safe at your home or residence?
- Have you ever been diagnosed with alcohol, tobacco, drug, or other use?
- During the past 30 days, did you use chewing tobacco, snuff, or pipe?
- Have you ever taken anabolic steroids or used any other performance supplement?
- Have you ever taken any supplements to help you gain or lose weight or improve your performance?
- Do you wear a seat belt, use a helmet, and use condoms?
- Consider medical questions on cardiovascular symptoms (questions 3-16)

EXAMINATION

Height _____ Weight _____ Male Female
 BP _____ / _____ / _____ Pulse _____ Min 0-200 L 30P _____ Corrected Y N

HEENT

Appearance _____
 • Mucous membranes (conjunctivae, oral cavity, pharynx, oropharynx, nasopharynx, larynx)
 • Pupils (size, shape, reactivity, equality, MM, corneal reflexes)
 • Extraocular muscles
 • Hearing
 • Neck
 • Thyroid
 • Lymph nodes
 • Heart
 • Lungs
 • Abdomen
 • Genitourinary (males only)
 • Skin
 • MSK (muscle strength of MSK, bone integrity)
 • Neurology

MUSCULOSKELETAL

Neck
 Back
 Shoulder(s)
 Elbow(s)
 Wrist/Hand/Finger(s)
 Forearm(s)
 Hip(s)
 Knee(s)
 Ankle(s)
 Foot(s)
 Toe(s)
 Ligament(s)
 • Touch with single leg tip

• Consider CT, ultrasonography, and referral to orthopedic or general orthopedic history or exam.
 • Consider CT scan if a patient is having a fall that is present in a commercial setting.
 • Consider orthopedic evaluation of fracture and dislocation if a history of significant trauma.

Cleared for all sports without restrictions
 Cleared for all sports without restrictions with recommendations for further evaluation or treatment for _____
 Not cleared
 Pending further evaluation
 For any sports
 For certain sports
 Reason _____

Recommendations _____

I have examined the above-named student and completed the preparticipation physical evaluation. The athlete does not present apparent clinical contraindications to practice and participate in the sport(s) as outlined above. A copy of the physical exam is on record in my office and can be made available to the school at the request of the parents. If conditions other than the athlete have been observed for participation, the physician may restrict the clearance until the problem is resolved and the potential consequences are completely explained to the athlete (and parent/guardian).

Name of physician (print/type) _____ Date _____
 Address _____ Phone _____ MD or DO
 Signature of physician _____

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Preparticipation cardiovascular screening in athletes entails a detailed personal and family history and physical exam. Cardiovascular disorders are the leading cause of sudden death in young athletes, accounting for ~ 75% of all sudden death in athletes.¹² In the United States, hypertrophic cardiomyopathy (HCM) and congenital coronary artery anomalies are the most common etiologies of sudden cardiac death (SCD), with HCM accounting for one-third of SCD deaths in US athletes younger than 30 years.¹³ The prevalence of HCM is 1:500 in the general population, and ~ 1:1000-1500 in competitive athletes.¹⁴ Because HCM is the most common genetic cardiovascular disease,¹⁵ a targeted family history may trigger a referral to cardiology for additional screening and increase the yield of detection of this high-risk condition. Most athletes with HCM are asymptomatic, with SCD often the sentinel event of their disease. Only 25% of patients with HCM have a murmur,¹⁶ which characteristically is a harsh systolic ejection murmur, best heard at the left sternal border that increases in intensity with maneuvers decreasing venous return (e.g., Valsalva, moving from squat to stand) and diminishes with maneuvers increasing venous return (e.g., supine position, transitioning from stand to squat).¹ Coronary artery anomalies are the second-leading cause of SCD, accounting for ~ 17% of cases in athletes.¹³ Abnormal origin of the left coronary artery is the most common anomaly. <50% of SCD cases from coronary anomalies have prodromal symptoms identifiable by preparticipation history. The American Heart Association (AHA)¹³ recommends the PPE include:

1. Auscultation for heart murmurs: should be performed in both supine and standing positions (or with Valsalva) to identify dynamic LV outflow tract obstruction murmurs. Standing is preferred to sitting because the diagnostic HCM murmur becomes louder when the patient stands due to decreased venous return.

2. Palpation of the femoral pulses: delayed femoral artery pulses compared to radial artery pulses (radiofemoral delay) may indicate the presence of coarctation of the aorta and warrant further diagnostic assessment.

3. Examination for physical stigmata of Marfan syndrome: kyphoscoliosis, high-arched palate, pectus carinatum or excavatum, arachnodactyly (long, slender fingers), arm span greater than height (ratio > 1.05), mitral valve prolapse, aortic insufficiency murmur, myopia, and generalized hyperlaxity are clinical findings.

4. Brachial artery blood pressure: should be obtained on a bare upper arm supported at heart level, measured with an appropriate cuff size, with the patient in the sitting position with back supported.

Currently, noninvasive cardiovascular screening tests such as ECG or echocardiography are not recommended in the preparticipation screening of athletes. A discussion regarding this controversial topic is beyond the scope of

this article, but numerous articles¹⁷⁻¹⁹ illustrate the ongoing debate in sports medicine and cardiology communities.

Regarding the musculoskeletal evaluation, a focused history is the most important first step in the PPE²:

- Athletes with unresolved musculoskeletal pain require additional evaluation prior to sports clearance.
- Stress fractures may be associated with inadequate caloric, calcium, and vitamin D intake.
- Fractures or dislocated joints represent more serious orthopedic injuries, and often accompany each other. Neurologic deficits can be associated with such injuries. Referral to sports medicine specialists may be indicated prior to clearance.

While the overall yield of the MSK examination in detecting significant injuries in asymptomatic athletes with no history of injury is typically low (in contrast, history alone is 92% sensitive in detecting significant MSK injuries²⁰), a general MSK screening examination is recommended¹:

- Inspection: athlete faces examiner. Assess symmetry of trunk, upper and lower extremities, upper-to-lower segment ratio, arm span-to-height (should be < 1.05), general body habitus
- Assess cervical ROM (flexion, extension, lateral rotation, lateral flexion)
- Assess shoulder function (resisted shoulder shrug for trapezius strength, resisted abduction to 90° for deltoid strength, internal and external rotation for glenohumeral joint ROM)
- Assess upper extremity function (flexion/extension of elbows for ROM, pronation/supination of forearms for ROM, clench fist and spread fingers for ROM).
- Assess back/spine: athlete faces away from examiner. Assess forward flexion, extension, perform Adams forward bend testing to evaluate for scoliosis.
- Perform "duck walk" for 4 steps (hip, knee, and ankle ROM; strength and balance testing).
- Perform toe and heel walk (calf symmetry and strength, balance).

Clinicians should augment the general screening examination with a thorough joint-specific examination as indicated by historical or general screening findings (e.g., glenohumeral joint instability), and referral to an orthopedic specialist should be considered if diagnosis, clearance, or further treatment decisions are uncertain. Sport-specific examinations may be considered in addition to the general screening examination to assess strength, endurance, and flexibility testing in joints or segments under particular stress in a given sport (e.g., shoulders in swimmers and baseball pitchers).¹

SUMMARY AND RECOMMENDATIONS

Despite controversy regarding the effectiveness of the PPE as a screening tool for potentially life-threatening or disabling medical/MSK conditions, PPEs continue to be widely performed and a necessary requirement for scholastic sport participation. Currently in Rhode Island, there is no uniform or standardized process for conducting a PPE. Additionally, annual wellness visits and PPEs are commonly combined by HCPs out of convenience and necessity. Potential to miss the opportunity to identify conditions that may be life-threatening or disabling may occur if pertinent historical information is not gathered and a systems-based physical examination is not performed.

The 2010 PPE monograph is a comprehensive tool that is gaining traction nationally as a standard for all 50 states to utilize for preparticipation physical evaluation of adolescent athletes. The current Rhode Island School Physical Form includes a section to indicate any physical activity restrictions, but the form does not specifically require documentation that life-threatening or disabling medical and musculoskeletal conditions in athletes were screened for. Rhode Island physicians and affiliated health care providers can ensure a more comprehensive and consistent approach to the PPE by adopting the screening recommendations in the 2010 PPE monograph for the performance of PPEs in their respective clinical settings. It is not the charge of the clinician to find the one “needle in a haystack” diagnosis that will prevent a sports-related adverse event, but rather to provide a more uniform, systematic screening process. Adopting and implementing the 2010 PPE monograph history, physical examination, and clearance forms could assist in development of a national, standardized approach to the PPE. By utilizing the 2010 PPE monograph, clinicians can improve the quality of their PPE data collection, physical examination skills, and ultimately contribute to an evidence-based approach and expanding scientific basis for the preparticipation physical evaluation.

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Disclosures

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