Pre-participation Screening

Purpose

Approximately 46.5 million children and 7.7 million high-school students in the United States participate in organized sports each year [1]. As the number of individuals participating in sports continues to increase, so does the number of sport-related injuries. In 2012, over 1.35 million children received emergency care for sports-related injuries [2], and 39 young athletes suffered from sports-related death [1]. The purpose of pre-participation screening in sports is to decrease the number of sport-related injuries and death by identifying individual abnormalities that may predispose an athlete to injury [3].
Traditionally, pre-participation screenings consisted of a medical examination and a subjective history to identify potential risk factors for further injury such as cardiovascular conditions, asthma, diabetes, etc. [4]. The American Heart Association (AHA) provides an outline of appropriate examination components and subjective history questions. Protocols such as the one provided by the AHA ensure consistent and uniform assessments [5]; however, many professionals argue these protocols are not individualized enough to thoroughly analyze injury risk [4] [3]. In more recent years, professions suggest functional movement assessments be incorporated into pre-participation screens to identify any abnormalities in movement patterns that may predispose to musculoskeletal injuries [3]. In addition, incorporation of neurocognitive and balance assessments, such as the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT) and Balance Error Scoring System (BESS), into the pre-participation screening protocol provide a baseline measurement that can be compared to post-injury scores to identify the severity of an injury [6].

Timing, Setting, and the Medical Team

Currently, no legal guidelines govern the administration of pre-participation screenings.[7] However, many sports organizations have adapted their own regulations in regards to administration of a pre-participation exam. In all fifty states, the National Federation of State High School Associations requires students to complete some form of examination prior to participation in high school sports.[8] In addition, the National Collegiate Athletic Association (NCAA) requires a medical evaluation upon entrance into the athletic program.[8] For the non-athletic population, the ACSM recommends that a pre-exercise evaluation be performed before an individual begins a new

exercise program in order to ensure exercise training can be initiated safely.[9] For the athletic population, literature suggests a pre-participation examination take place at least six weeks prior to the start of practice in order to allow adequate time for rehabilitation prior to participation.[8]
Pre-participation screenings can take place in a variety of settings including a clinician's office, a high school gym, athletic training room, physical therapy gym, etc. In general, a screening can be conducted in any setting in which administrators have access to the needed assessment tools.[9]
Many members of the health care team can be involved with pre-participation screening including a physician, nurse practitioner, physical therapist, athletic trainer, dentist, exercise psychologist, and/or chiropractor.[8] In general, there are two strategies for administration of a pre-participation exam: group based and office based.[8] An office-based exam is administered by an individual's primary care physician in his or her office.[8] The non-athletic population typically receives office-based screenings. Group screenings typically occur in an athletic setting and involve all members of the healthcare team, coaches, and the athlete.[8] When multiple members of the medial team are involved in screening, the final step of screening is typically a review of the medical team's findings by the physician who signs off on completion of the screening.[8]

Subjective History

Typically, pre-participation screenings begin with a subjective examination. The American College of Sports Medicine recommends for the medical examination to include content regarding the following topics: past and present medical history, present symptoms, recent illnesses or surgeries, medication, exercise history, work history, and family history.[9] Medical history such as hypertension, obesity, diabetes, metabolic syndrome, dyslipidemia, or cardiovascular disease places the individual at risk for cardiac arrest during exercise.[4] Identifying present symptoms, recent illnesses or surgeries may aid clinicians in identifying pre-existing musculoskeletal, cardiac, etc. symptoms that predispose an individual to injury or more serious condition. Medications, such as beta-blockers, may alter an individual's heart rate when exercising. Other habits, such as tobacco, alcohol, caffeine, or recreational drug use, can alter the body's response to exercise.[9] Exercise and work history provides an overview of the quality, intensity, and duration of activity the individual is accustomed to performing and their tolerance for exercise. Finally, family history identifies conditions the individual may be pre-disposed to and allows for further precautions to be taken.[9]

Physical Examination

It is important to screen athletes before they participate in sports in order to establish a baseline of ability, evaluate the athlete's risk for injury, and direct the interventions that might be required. There is not a great deal of research that backs specific processes and components but some professional organizations have some general recommendations [8]. There are many possible elements to a PPE which can include, a medical history, medical examination, musculoskeletal examination, performance testing, and laboratory studies[8]. The sports physical therapists can conduct musculoskeletal physical examinations as a part of the PPE. There are many ways that a musculoskeletal examination can be carried out. Traditionally we have seen impairment based PE's administered that look at strength, range of motion, endurance, and so on [3]. Recently a growing trend has involved looking at functional movements to assess an athlete's risk for participating in sports. The functional movement system (FMS) was developed as a systematic way to examine movement and classify injury risk[3]. The FMS has 7 fundamental movement patterns that challenge mobility and stability of an individual[3]. A score is calculated from these 7 fundamental movement patterns that can determine whether someone is at risk for injury[3]. The FMS can also be used with Y balance test scores, and demographic risk factors to calculate an injury risk with an algorithm. This algorithm can categorize athletes at risk before participation and can be used for return to sport decisions as well [10]. This article is referenced below and the website to use the algorithm is move2perform.com. In summary there are endless combinations of items that can make up a physical examination for a PPE. The growing trend is to move away from an impairment-based examination into a functional standardized assessments that determines a quantifiable risk number.

Cardiac Screening

A cardiac screen is a very important aspect of pre-participation screening. This will typically occur during the medical portion of the PPE [8]. Some items that should be included are blood pressure, pulse, respiration, auscultation for heart murmurs, palpation of femoral pulses, examination for the physical stigmata of Marfan Syndrome, and a brachial artery blood pressure taken from the sitting position [7] . Sudden Cardiac Death or SCD is a rare but potential hazard that can occur with sports participation. It can often be the first and definitive manifestation of an underlying cardiac pathology[11]. A figure in the referenced article below shows a clinical decision tree for

cardiovascular pre-participation screening [11]. It is evident that an ECG is vital to determine the risk according to this study and a few others. This ECG screening allows for the identification of still asymptomatic athletes with at risk cardiovascular diseases [11]. The American College of Sports Medicine or ACSM also has a risk classification that is well researched and useful for the cardiac component of a pre-participation. It uses risk factors to classify individuals into risk groups and advises whether or not there should be a medical test or exercise test recommended before participation in exercise or activity. A link to this article and its risk classification schema can be found below[12] . As with the physical examination portion of the PPE there are no concrete guidelines to the cardiac screening but there are recommendations that can be trusted and relied upon for screening purposes. If any irregularities are found or observed the patient should be referred on to the appropriate individual.

Economic Considerations

Economic considerations for pre-participation screenings largely deal with whether or not to implement ECG testing in America. The American Heart Association (AHA) estimates that if an ECG costs about $50 per student, the added total expense would be $50 million nationwide for the initial encounter. When one considers the number of kids who require follow-up visits and secondary evaluations based on ECG data, the AHA estimates an annual cost of $2 billion[13]. However these estimates have been debated. Chaitman states that ECGs in Florida cost as little as $29.24 through Medicare. He estimates that health programs could negotiate the cost for an ECG to around $10, which would significantly decrease the total cost[14].

Research suggests that ECG testing in addition to the traditional history and physical examination might be cost effective at saving lives[15]. Fuller states that ECG testing is more cost effective than simply using a history and physical exam to detect cardiac abnormalities[16]. This approach of combining ECG testing with a history and physical exam is already being used in Italy, and early evidence suggests that there are significant reductions (almost 90%) in sudden cardiac death risk[17].

Clearance for Sports

After conducting a pre-participation screen that identifies an athlete at possible risk, the medical professional must decide whether the athlete is fit to compete. When determining if an athlete should be cleared the following

questions should be considered [18]:
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?
After considering these questions along with findings of the screen, the medical professional must make a decision whether the athlete should be cleared to participate. Sanders, Blackburn, and Boucher [8] state that clearance should be one of four conditions:
1. Unconditional clearance, cleared for all sports and all levels of participation.
2. Cleared with recommendation for follow-up – including either evaluation or treatment
3. Not cleared with clearance status to be determined after further evaluation, treatment, or rehabilitation
4. Not cleared in any sport or level of competition.

Medicolegal Considerations

Currently in the United States, a governing body that regulates the content of pre-participation screenings does not exist in professional sports, college sports, or high school sports. Additionally there is nothing that regulates cardiovascular screening. Consequently, professional teams and college teams rely on their team physicians to handle the process while high schools rely on primary care providers and volunteers[19].

The law allows for physicians to determine the components of a pre-participation screening as long as it meets the minimum standard of care determined by the members of the profession. It is important to note that physicians are not automatically liable if an athlete has an underlying serious condition that causes that athlete to die during his or her sport. For a physician to be liable in America, it has to be proven in a court of law that the physician did not meet the minimum standard of care for performing a screening and that performing a screening according to the accepted standard of care would have detected an underlying serious condition. For physicians to stay within the law and avoid legal action, they should follow the guidelines put forth by medical organizations like the American Heart Association, the American College of Sports Medicine, or the European Society of Cardiology.

Regarding cardiac pathologies, American law allows for physicians to determine the scope of screening on an athlete-by-athlete basis as long as they act according to standard, accepted practice.[20]

Recent Related Research (from Pubmed)

In 2010 a collaboration of 6 committees developed the Preparticipation Physical Evaluation 4th ed. (PPE-4) [18] in order to provide a standard preparticipation screen that was based on current literature, expert opinion, position and consensus statements, and policies. Caswell et al. [21] conducted a study that examined all 50 states and Washington DC to see what PPE polices each state used. They found that only 23 states require or recommend the PPE-4 while 27 states required or recommended forms that were out of date or came from unknown source. In addition, only 22 states used included all 12 of the PPE-4 personal and family cardiovascular screening items and 26 states only had three of those items or less concluding there is a lack of standardization among how PPE are administered in the US and some may not be adequately screening athletes.

Currently, there is debate concerning whether examiners should use ECG in all pre-participation examination. Burns, Encinosa, Pearson and Kaltman [22] preformed a retrospective study to the use of ECG during prepaticipation examinations. Research was gathered from between 2005-2010 from MarketScan insurance database for subjects between 5-21 years of age who had a PPE with ECG or PPE alone. They found that of the over 500,000 PPEs only 2% had ECG. PPE's with ECG led to cardiac referral in 13% of the cases compared to 0.5 % of PPE without. Researchers found cardiac disease that limited activity in 2% of the PPE with ECG and 0.03% PPE without ECG.

The National Athletic Trainers Association has also developed their own PPE guidelines[23]. This comprehensive evidence based guideline gives recommendations for what should be included in a PPE. Their recommendations include medical and family history and a comprehensive physical examination, which include multiple categories such as orthopedic, cardiovascular, and general health. Each recommendation has a level of recommendation grade, literature review, and disqualifying conditions.

- Source: http://www.physio-pedia.com/Pre-participation_Screening