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Wilderness Preparticipation Evaluation and Considerations for Special Populations

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Children, older adults, disabled and special needs athletes, and female athletes who participate in outdoor and wilderness sports and activities each face unique risks. For children and adolescents traveling to high altitude, the preparticipation physical evaluation should focus on risk assessment, prevention strategies, early recognition of altitude-related symptoms, management plans, and appropriate follow-up. As the risk and prevalence of chronic disease increases with age, both older patients and providers need to be aware of disease and medication-specific risks relative to wilderness sport and activity participation. Disabled and special needs athletes benefit from careful pre-event planning for the potential medical issues and equipment modifications that may affect their health in wilderness environments. Issues that demand special consideration for female adventurers include pregnancy, contraceptive use, menses, and ferritin levels at altitude. A careful preparticipation evaluation that factors in unique, population- specific risks will help special populations stay healthy and safe on wilderness adventures. The PubMed and SportDiscus databases were searched in 2014 using both MeSH terms and text words and include peer-reviewed English language articles from 1977 to 2014. Additional information was accessed from Web-based sources to produce this narrative review on preparticipation evaluation for special populations undertaking wilderness adventures. Key words include children, adolescent, pediatric, seniors, elderly, disabled, special needs, female, athlete, preparticipiation examination, wilderness medicine, and sports.

Key words: preparticipation evaluation, pediatrics, altitude, older adult, disabled and special needs athlete, pregnancy

Introduction

Preparticipation physical evaluations (PPE) are a regular, and typically required, component of screening and evaluation before participation in organized sports for younger athletes (eg, junior high, high school, and college). A standardized approach to the PPE (Fourth Edition PPE Monograph) was developed and endorsed by 6 major medical societies—the American College of Sports Medicine, the American Medical Society for Sports Medicine, the American Academy of Family Physicians, the American Academy of Pediatrics, the American Orthopedic Society for Sports Medicine, and the American Osteopathic Academy for Sports Medicine.[1] The purpose of the PPE is to identify health conditions that may put the athlete at risk for illness or injury as a result of their participation in sport.

Millions of American youth undergo a PPE as a result of organized sport participation each year; however, athletes who participate in sports and activities that are not school based are likely to not undergo such

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screening. As youth participation in "nontraditional" adventure and wilderness sports and activities such as rock-climbing, mountaineering, downhill mountain bike riding, and free skiing increases, physicians should be knowledgeable regarding the risks associated with those activities, and guidelines regarding screening and clearance need to be established.

Individuals of all ages enjoy sports and activities in the wilderness. Middle-aged and senior athletes and adventurers likely outnumber youth in outdoor sports participation. Pregnant women are adjusting climbing harnesses to continue rock climbing during pregnancy. Adults of all ages are scaling mountains, careening down mountain bike trails, and skiing in both competitive and noncompetitive settings. When one considers that chronic diseases, such as hypertension, diabetes, and heart disease, increase in incidence with age, then these are the individuals to screen before participation in wilderness sports and activities.

It is important to bear in mind that there are few randomized control trials and systematic reviews examining the relationship between environmental exposures and risk of injury, illness, or death among the special populations of athletes included in this review. However, authors attempted to comprehensively review and summarize the published literature with the objective of providing a broad overview of risks and considerations to assist Sports Medicine and Primary Care physicians in evaluating athletes considering participation in wilderness adventures. Understanding these unique risks, as well as their interaction with age, chronic disease, disabilities, and conditions such as pregnancy, will help health care providers better care and prepare their patients for safe participation.

Pediatric Altitude Travel (Yaron)

OVERVIEW

Altitude illness ranges from the relatively benign acute mountain sickness (AMS) to life-threatening high-altitude cerebral edema (HACE) and high-altitude pulmonary edema (HAPE). Children can develop these illnesses when traveling to high-altitude locations particularly after rapid ascent, and clinicians may be asked to perform preparticipation evaluations to assess individual risks and provide altitude illness prevention and treatment strategies.

PHYSIOLOGY

Acute hypoxia initiates physiologic responses in children associated with development of altitude illness. While most of these responses are similar to adults, young children have significant differences. The circulatory transition from fetal to postfetal life deserves special mention. Fetal circulation is characterized by low fetal Po_2 and minimal pulmonary blood flow secondary to high pulmonary vasoconstriction and vascular resistance. Right to left shunting across the foramen ovale and ductus arteriosus diverts blood around the lungs and toward the placenta. At birth, pulmonary vascular resistance falls, blood flow increases immediately, and a cardiopulmonary transition begins that gradually closes shunts and remodels endothelial and muscular structures. Among infants at sea level, this transition is generally complete by 4 to 6 weeks.[2] Ascent to altitude among infants younger than 4 to 6 weeks may induce a return to fetal circulation patterns without the benefit of a placenta causing sudden severe hypoxemia. Infants with a history of premature birth, supplemental oxygen use, or living at altitude are particularly at risk.[3]

Normal newborn infants have periodic breathing patterns that decrease over the first 6 months.[4] This periodicity increases during both sleep and with altitude exposure resulting in recurrent oxygen desaturation. As such, ascent among premature babies should be delayed until they mature because severe periodicity and desaturation may occur at altitude.[5]

EPIDEMIOLOGY

Altitude illness is common with rapid ascent to moderate altitude (2500-3500 m; 8000-11 500 ft), although most serious cases (HAPE and HACE) are seen at very high altitude (3500-5500 m; ~11 500-18 000 ft). Extreme high altitude (above 5500 m; ~18 000 ft) poses the greatest risk for severe illness and is no place for young children.

Most evidence suggests that the incidence of AMS in children is similar to adults.[6–13] Approximately 25% of all visitors to moderate altitudes develop AMS symptoms.[14] The high-altitude pulmonary edema is much less common: 1.5% of children at 4500 m[6] and 0.2% to 15% of adults depending on altitude and ascent rate. Children living at high altitude develop reentry HAPE much more frequently (6%-17%) than adults.[15,16] The HACE in children is rare with only 5 cases reported in adolescents.[17,18] The recent trend of young climbers on Mt. Everest may result in more HACE in this age group.

With millions of families traveling to high altitude,[19] AMS is a significant public health issue, demanding improved education of the populations at risk and careful preparticipation evaluation by the clinicians who care for them.[20]