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REVIEW

Wilderness event medicine: planning for mass gatherings in remote areas

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Summary *Background*. An increasing number of large recreational events are taking place in remote environments where medical care is far away. Such events include adventure races and large outdoor trips. Wilderness event medicine (WEM) has been previously defined as the healthcare response at any discrete event with more than 200 persons located more than 1 h from hospital treatment. However, there is little literature describing the steps for providing medical care at such events.

Methods. This article provides a framework for planning and executing WEM. It reviews the published data on wilderness injury and illness rates and describes the nature of injuries as they relate to specific activities. The article then discusses the three stages of WEM: pre-event planning, medical treatment at the event, and post-event tasks.

Results. Wilderness events include myriad activities, including orienteering, mountain biking, mountaineering, and whitewater paddling. The injury and illness rates are in the range of 1–10 per 1000 person-days of exposure, with rates one order of magnitude greater for events which last many days, include extremes of environment (heat, altitude), or are competitive in nature. Professional adventure racers may present for medical evaluation at rates as high as 1000 encounters per 1000 racer-days. Injuries depend largely on activity. Illnesses are mostly gastrointestinal, 'flu-like' malaise, or related to the event environment, such as humidity or altitude. Providing medical care requires the proper staff, equipment, and contingency plans. The remoteness of these events mandates different protocols than would be used at an urban mass gathering.

Conclusions. WEM will likely continue to grow and evolve as a specialty. Additional reports from wilderness events, perhaps facilitated through a web-based incident reporting system, will allow medical providers to improve the quality of care given at remote events. Research into wilderness activity physiology will also be useful in understanding the prevention and treatment of injuries and illnesses encountered.

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Introduction

Wilderness event medicine (WEM) has been defined previously as the healthcare response at any discrete event with more than 200 persons located more than 1 h from hospital treatment.[1] Events may include fundraiser hikes, adventure races, large outdoor education groups, or commercial trips.[1-4] Medical encounters will be driven by the interaction of geography (terrain, weather, and time), numbers of participants and staff, their baseline health, and the injury rates of the activities. Medical staff and equipment needs must be based on the estimated number and type of medical encounters. Since WEM is an emerging field, planning is often based on data from urban mass events and anecdotal or personal experience from a limited number of wilderness events.

Urban mass gatherings have similar rates of injuries as most wilderness activities.[5-7] One review found an average of 5.5 medical encounters per 1000 person-days, with a range from 1.5 to 18.5.[6] US National Parks have injury patterns similar to urban events. At eight National Parks in California, assaults and drug use accounted for three times as many injuries as rock-climbing.[8] Cardiac illness, motor vehicle accidents, and plane crashes together accounted for more deaths (33%) than 'wilderness' injuries of falls and drownings (30%); animal attacks represented one of the least common causes of death (0.23%). Wilderness events, in contrast, have a wider range of injury/illness rates. The mechanisms of injury are also different and result in injury patterns different than those of urban areas or US National Parks.

From here, this article diverges from the publications about urban mass care and offers an overview of WEM. The first section reviews the morbidity and mortality rates of wilderness activities, as well as the distribution of injuries and illnesses by type of wilderness activity. The article then describes the three phases of WEM: pre-event planning, surveillance and treatment of injuries and illnesses during events, and the tasks of the post-event phase.

Epidemiology of wilderness injuries and illnesses

The published reports for wilderness events meeting the strict definition above are few, and they consist mostly of case presentations.[1,3,4,9,10] Most reports of gatherings involving outdoor activities do not meet the definition due to their small number of participants,[11] diffuse nature (e.g. Appalachian Trail hikers), the lack of a discrete event,[12-14] or the proximity to hospitals.[15,16] Nevertheless, these reports do provide valuable insight into the nature and rates of injuries, the rate of presentation to the medical workers, the frequency of evacuations, and the resource requirement of gatherings in remote locations.

Wilderness events may involve a single activity, or a combination of different activities as in the case of multisport adventure races. Each activity comes with its unique risks: rate and severity of injury and illness, nature of the medical complaint, and difficulty of evacuation. Defining these risks is difficult, as participants may not report minor injuries, may seek treatment outside the event organization (and therefore not be detected), or may have an injury or illness which is not noticed until days or weeks after the conclusion of the event, as in the case of infection or overuse injury.[9,17] Although there has been some attempt to predict rates of injury, experience from past events of similar nature remains the best model for future encounters.[5] Injury rates tend to be higher during competitive events,[4,18,19] and extremes of environment such as altitude, heat, and humidity.[1,4,5,20-22]

Morbidity rates. Three reviews present voluminous data from outdoor education groups.[12-14] Leemon and Schimelpfenig (2003) discuss more than 2.1 million person-days from National Outdoor Leadership School (NOLS). Trips included backpacking, mountaineering, paddling, and other outdoor activities. The overall injury rate was 1.5 per 1000 person-days. One-half of the injuries were sprain/strain, most commonly of the knee (35%) or ankle (30%). Thirty percent of all injuries were soft tissue (abrasion, laceration, burn, contusion). Fractures and dislocations, almost equally common, together represented 7% of injuries and occurred in the upper extremity in half of the cases. Head injuries accounted for 4% of injuries, and only one tenth of those involved loss of consciousness. Illness was only slightly less common than injury with a rate of 1.1 per 1000 person-days. Gastrointestinal symptoms and 'flu-like' illness each represented approximately one third of all illnesses. Evacuations occurred at a rate of 1 per 1000 person-days, and half of these persons were able to rejoin the trip after treatment. Ninety-five percent of evacuees were able to ambulate unassisted. Compared with backpacking, injury rates were higher in backcountry skiing ($p<0.001$) and white water paddling ($p<0.001$), but less likely in rock climbing ($p<0.05$). Illness was more likely in all three activities and caving ($p<0.001$) than in backpacking.[14]

Injury and illness rates in specific wilderness activities are commonly on the order of 1 −10 per 1000 person-days, but may range from 0.2 to 1000 per