with an 18-gauge needle be added to your first aid kit to be used with the filtered water from your unit.

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Visual Analog Scales for Assessment of Severe Acute Mountain Sickness on Aconcagua

Background.—The Lake Louise AMS Self-report Score (LLSelf) is a commonly used, validated method of assessing acute mountain sickness (AMS).

Objectives.—Compare a visual analog scale (VAS) method of quantifying AMS with the LLSelf among trekkers to 6962 m for both overall symptoms and the 5 individual constituent categories of the LLSelf.

Methods.—*Setting:* Plaza de Mulas base camp (4365 m), Aconcagua Provincial Park, Argentina. *Inclusion criteria:* volunteer trekkers to Aconcagua (6962 m) in January 2009 who provided written informed consent. *Exclusion criteria:* pregnancy, age <18 years. *Study protocol:* Subjects were prospectively enrolled while ascending, instructed to complete a questionnaire when symptoms were maximal, and return it upon descent. The questionnaire consisted of maximum altitude reached, the LLSelf, and standard 100-mm VAS for each LLSelf component, as well as overall AMS. *Statistics:* means with 95% confidence interval (CI), interrater reliability with Cohen's κ , and correlation of VAS with LLSelf with Spearman's rank correlation coefficient (r) were computed using Stata (Stata Corp, College Station, TX).

Results.—A total of 45 subjects completed both VAS and LLSelf. Twenty-two (49%) climbers reached the summit (6962 m). Mean maximum altitude reached was 6467 m. Mean altitude of maximal symptoms was 5859 m. Mean LLSelf was 5.1 (95% CI, 4.3–5.9). Interrater reliability for measurement of VAS was high ($\kappa = 0.9998$). All individual VAS categories were highly correlated with their respective LLSelf symptoms: headache $r = 0.85$; gastrointestinal symptoms $r = 0.57$; fatigue $r = 0.79$; lightheadedness $r = 0.72$; and difficulty sleeping $r = 0.75$. Overall VAS was also highly correlated with total LLSelf: $r = 0.71$.

Conclusions.—In this study of VAS and LLSelf at extreme altitude on Aconcagua (6962 m), individual VAS and overall VAS were highly correlated with both individual constituent categories of LLSelf and overall LLSelf. Further studies comparing VAS, LLSelf, and physician assessment of AMS are needed to determine optimal measurement of AMS, especially on expeditions where multiple languages are encountered.

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Safety and Efficacy of Attempts to Reduce Shoulder Dislocations by Nonmedical Personnel in the Wilderness Setting

Shoulder dislocations are common in wilderness sports. Early reduction of the dislocated shoulder significantly relieves the patient's pain and increases the likelihood of a safe evacuation from the wilderness environment. Our hypothesis is that reduction attempts on scene by nonmedical personnel are safe, effective, and can significantly reduce the time to reduction.

The objectives of this study were to define the success rate and the complication rate for shoulder reduction attempts by nonmedical personnel in the wilderness setting, and to compare the average time to reduction for those done on scene versus those that waited for reduction at a medical facility.

In this prospective, cross-sectional study we administered surveys to users of wilderness sports internet forums between October 2008 and April 2009. These surveys asked respondents to describe previous wilderness sports injuries they experienced. Descriptive statistics were calculated using SPSS software, and the Mann-Whitney U test was used to compare average reduction times, with an alpha of .05 selected as the significance threshold.

Overall, there were 112 responses with 58 describing shoulder dislocations that were reduced either on scene or at a medical facility. Reduction on scene, in the absence of a medically trained person, was attempted in 39 of these 58 cases with a success rate of 71.8% (28/39). The median time to reduction on scene was 10 minutes, compared to 180 minutes from the time of injury for those that waited for reduction at a medical facility ($P < .001$). Other than pain during the reduction, there were no reports of serious complications associated with the reduction attempts. These seminal data suggest that reduction of dislocations in the wilderness setting by nonmedical personnel may be safe and effective, and can significantly decrease the time to reduction. These findings may help guide future teachings of participants in high-risk wilderness sports.

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Chronic Mountain Sickness in the Peruvian Andes

First described by Carlos M. Monge in 1925, chronic mountain sickness (CMS), also known as Monge's disease, is the inability of usual acclimation to life at high altitudes in indigenous or long-term high altitude dwellers above 3000 m.

Diagnostic criteria for CMS still remains controversial; however, patients will exhibit a form of erythrocytosis and a myriad

of clinical symptoms, which may include headache, mental confusion, altered mental status, fatigue, anorexia, cyanosis, shortness of breath, palpitation, tinnitus, dizziness, sleep disturbances, and/or dilatation of veins. These various symptoms and polycythemia generally will resolve at lower altitudes.

We report a case of CMS seen in Andahuaylillas, a small village outside of Cusco (3360 m), in the Peruvian Andes. A 55-year-old male farmer presented to our medical clinic during a 2-week project with a local nongovernmental organization (NGO). The patient's symptoms and laboratory data confirmed the diagnosis.

Treatment of CMS in patients living in the Peruvian Andes may be impeded by several obstacles. Currently, relocating to lower altitudes or periodic therapeutic phlebotomy are the mainstays of therapy. These interventions pose a financial burden for the majority of patients and may contribute to poor treatment adherence. However, recent research suggests that the medication, acetazolamide, which is used primarily for the prevention of acute mountain sickness, can be helpful in cases of CMS.

The diagnosis and treatment of CMS is challenging in the remote Peruvian Andes. Education of physicians and other medical providers working in high-altitude regions requires a high index of suspicion for appropriate diagnosis and care.

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Are Mountain Athletes Adequately Educated in the Evaluation and Treatment of Acute Wilderness Medicine Conditions?

Mountain athletes are often accompanied by guides that have appropriate medical knowledge and training. Very little is known about the medical knowledge of the unguided mountain athlete. The purpose of this study was to assess the medical knowledge of unguided rock climbers, skiers, and mountaineers.

This was a prospective, cross-sectional study that surveyed adult subscribers to 2 popular rock climbing and mountaineering online magazines. The survey consisted of demographic questions, previous medical training, and an 8-question examination adapted from Paul Auerbach's *Wilderness Medicine* textbook and the Advanced Wilderness Life Support certification course. Descriptive statistics were calculated and differences between subgroups were compared using the Mann-Whitney *U* test.

There were 111 responders to the online survey with 107 retained for analysis (average age 32.37; 96.3% male). Most subjects had completed a first responder course (66.4%), and half had completed a wilderness medicine course (50.5%). Only 21.5% worked in the health care field. Overall, the group

scored 72.31% on the examination. Performance varied by specific topic area as follows: trauma management (60.7% gave the correct answer), high-altitude medicine (89.7%), hypothermia (99.1%), frostbite (43.9%), avalanche (93.5%), wound management (67.3%), and infectious disease (55.7%). Exam performance was better for those who had taken a wilderness medicine course (76.85% vs 67.31%; $P = .002$) or a first-responder course (75.35% vs 66.32%; $P = .004$), or who had worked in health care (79.89% vs 70.24%; $P = .01$).

Unguided wilderness athletes likely have adequate knowledge of medical management for hypothermia, high-altitude emergencies, and avalanche rescue, but more than 1 in 3 gave the incorrect answer for management of trauma, frostbite, and infectious diseases. Previous medical training was associated with significantly higher wilderness medicine knowledge. These results may guide the development of courses to educate unguided wilderness athletes as these activities become increasingly popular.

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Feasibility of the 6-Minute Walk Test in Healthy Adults at High Altitude on Aconcagua

Background.—The 6-minute walk test (6MWT) has been used as an inexpensive, noninvasive single measurement of functional status in patients with cardiovascular diseases such as chronic obstructive pulmonary disease and congestive heart failure. The 6MWT has not been applied to the high-altitude setting.

Objective.—Perform a feasibility study of the 6MWT in a high-altitude setting.

Methods.—*Study design:* prospective observational cohort study. *Setting:* Plaza de Mulas base camp (4365 m), Aconcagua Provincial Park, Argentina. *Inclusion criteria:* volunteer trekkers to Aconcagua (6962 m) during January 2009 who signed written informed consent. *Exclusion criteria:* pregnant women, age <18 years. *Study protocol:* Subjects completed a questionnaire that included demographic information. Heart rate (HR), respiratory rate (RR), blood pressure, and oxygen saturation (Sao_2) were measured for all subjects before and after completion of a 6MWT using a standardized protocol on a 40-m course. Six-minute walk distance (6MWD) and maximal heart rate (max HR) during 6MWT were recorded. *Statistical analysis:* means, standard deviations, 95% confidence intervals (CIs), and *t* tests were calculated for normally distributed data using Stata (Stata Corp, College Station, TX).

Results.—A total of 124 subjects completed the 6MWT. One hundred nine (88%) were male and 15 (12%) were female. Subject demographics (mean $\pm$ SD) were as follows: age 40.1 ± 11.7 years; weight 75.5 ± 10.4 kg; height 1.77 ± 0.10 m; body mass index 24.2 ± 2.8 . Mean 6MWD was 457.5 m (95% CI: 442.8–472.2; range 190–750) with max HR 115.3 ± 13.0 bpm. There was a significant change in HR (82.4 vs 102.4 bpm,