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A New Simulation Model for Skin Abscess Identification and Management

Objective.—Cutaneous abscesses are common, and abscess identification with incision and drainage is a curative procedure that can be performed in out-of-hospital environments. While medical simulation models can enable proficiency in such skills, current abscess models described in the literature suffer from limitations. The author presents a novel abscess management training simulator evaluated by physicians.

Methods.—To create the simulator, mock purulent material is injected into an artificial “abscess wall” that has been tunneled near the surface of a chicken breast. The simulation model was evaluated by 20 physicians familiar with abscess identification and management. Evaluators assessed the model and answered 2 closed-ended questions regarding the model with an opportunity for open-ended feedback. Physicians were then shown ultrasound images of the simulated abscess along with 2 real abscesses and evaluated the sonographic fidelity of the ultrasound model via a closed-ended question.

Results.—All 20 physician evaluators agreed that an abscess simulator model would be a useful teaching tool and that this particular abscess model would be a useful teaching tool. Evaluators commented on the excellent realism of the model and also a limitation from an absence of mock purulent loculations. When evaluators responded to the statement “the ultrasound image of the simulated abscess appears realistic,” 10% of individuals “strongly agreed” and 90% of individuals “agreed” with this statement ($n = 20$).

Conclusions.—This new simulation model is realistic, simple to create, and may be an effective tool to teach cutaneous abscess management. Physicians who evaluated the simulated abscess found that it replicates the classic palpable fluctuance and ultrasound findings of an actual abscess and can be surgically incised and drained in a similar fashion. While physicians agreed that this model would be useful, future studies may validate this task trainer as an effective teaching tool.

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10% Povidone-Iodine May Be a Practical Field Water Disinfectant

Objective.—The search for an ideal field water disinfectant persists, despite many available products. While other forms of iodine have demonstrated effectiveness, there is a paucity of data available regarding the use of iodophores such as povidone-iodine (PVI) to disinfect water. *Escherichia coli* is the most common cause of traveler’s diarrhea and is found in tropical, temperate, and cold waters. We sought to experimentally determine the minimal disinfecting concentration of 10%

PVI over different contact times when added to water inoculated with *E coli* at varying water temperatures.

Methods.—Full-strength 10% PVI was added to sterile deionized water to create 1:100, 1:1000, and 1:10 000 dilutions. *E coli* were exposed to these strengths of PVI for 5, 15, and 30 minutes. The bactericidal activity of PVI was neutralized with 0.5% sodium thiosulfate. The number of viable colony forming units was determined after 24 hours of incubation at 37°C on Luria-Bertani agar. Effective bactericidal activity was defined as a 5-log reduction (99.999% bacterial kill). This procedure was repeated at 10°C, 20°C, and 30°C.

Results.—The lowest concentration of 10% PVI resulting in effective disinfection of water inoculated with *E coli* was the 1:1000 dilution and was seen after 5 minutes of contact time. The 1:100 concentration of 10% PVI always resulted in effective disinfection, while the 1:10 000 concentration never effectively disinfected the water. No significant differences were observed across the experimental temperatures.

Conclusions.—A 10% PVI concentration between 1:1000 to 1:10 000 has been suggested by past authors as a possible but unproven strength for water disinfection. Our experiment supported this suggestion against *E coli*, the organism most commonly responsible for traveler’s diarrhea. This amount of available iodine per liter of treated water is safe, but further studies are needed to assess the effectiveness of PVI against more virulent waterborne pathogens.

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The Practicality of Backcountry Water Purification Units for Wound Irrigation

Background.—Each year millions of Americans venture to the backcountry to enjoy the outdoors. Lacerations and abrasions are some of the most common injuries encountered. Previous research shows that the best treatment to limit infection in contaminated wounds is irrigation of the wound with pressures between 6 and 15 pounds per square inch (psi).

Methods.—We took 4 of the most popular water purifications units available to the consumer and measured the impact pressures of each to see if they would consistently produce the required 6 psi necessary for adequate wound irrigation. Impact pressures were calculated by directing the stream onto a metal bending beam that allowed measurement of force. PSI was then calculated by dividing the force of the stream by its surface area.

Results.—Using 3 separate measurements added together and divided for 1 average the following psi were calculated. Katadyn Hiker Pro, 1.38 psi; MSR Sweetwater microfilter, 3.68 psi; First need deluxe water purifier, 1.84 psi; and MSR Miniworks EX microfilter, 0.82 psi.

Conclusions.—While any type of irrigation and cleansing of a contaminated wound is better than nothing, none of the 4 water purification units reached the suggested 6 psi necessary for wound irrigation. It is suggested that a 35- to 50-mL syringe

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