Figure 2. Images urticaria and angioedema were overlaid on patient actors during the augmented scenarios.

There is also risk of malfunction or environmental damage. Some students reported difficulty due to screen glare and low audio levels. These issues could be addressed with antiglare covers and louder recordings. Furthermore, this method does not allow for procedural practice as did the models mentioned above. Lastly, the small sample size of this pilot study limits the extent to which the results can be generalized.

Electronic tablet augmented simulation may represent an additional tool by which to improve medical instruction in the austere setting. Further research would be needed with a larger population to verify these results and to objectively demonstrate its effectiveness as a teaching tool. The applicability of the technique will increase as wilderness educators begin to develop a robust library of video and audio resources to use during simulated cases.

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Near-Fatal Outcome From Absence of Information About Exercise-Associated Hyponatremia in a Wilderness Medicine Field Guidebook

To the Editor:

We wish to alert your readers of a near-fatal outcome from incomplete information in a wilderness medicine field guidebook. Our hope is that this letter will stimulate efforts to appropriately update such books and educational programs on wilderness medicine to include information related to exercise-associated hyponatremia (EAH).

The situation involved a previously healthy young woman who was hiking in Grand Canyon National Park in early June 2014 with daytime high temperature of 41°C. She and her husband leisurely descended 13 km and more than 1200 m in 6 hours during which time she consumed 5 L of water and some food. The woman then began reporting fatigue and headache, and later experienced nausea and mental status changes. Her husband

reviewed a wilderness medicine field guidebook that was part of their first aid kit and found that her symptoms were consistent with heat exhaustion. Based on the recommendations in the book, he initiated cooling measures, initially using wet clothing, and encouraged more fluid intake. Her condition deteriorated with worsening somnolence, confusion, and weakness. She also stopped urinating despite the fluid intake. She subsequently had 3 grand mal seizures. Reading his field guidebook, he was convinced the seizures were the result of heatstroke despite his cooling and hydration efforts, and he treated her with cold-water immersion in a nearby creek for 10 to 20 minutes after each seizure. After her third seizure, she remained in an unconscious state. He eventually made the extremely difficult decision in the middle of the night to leave her to seek help. Approximately 6 hours later, the Grand Canyon National Park Search and Rescue Team arrived and found her responsive only to painful stimuli. Point-of-care testing revealed she had a serum sodium concentration of 124 mmol/L. She was promptly treated with three 100-mL intravenous boluses of 3% hypertonic saline. She was air lifted to the nearest hospital, and 1.3 hours after the initial hypertonic saline bolus, her serum sodium concentration had risen to 129 mmol/L. After a short hospital stay, she was released and has subsequently recovered fully.

This case appears as a classic case of EAH resulting from overhydration likely associated with nonosmotic secretion of arginine vasopressin (AVP). EAH is common with exertional activity in high temperatures because of excessive fluid intake related to concerns about dehydration. This case also demonstrates the effectiveness of hypertonic saline in treating EAH. However, a key message that is evident from this case is that distinguishing EAH from dehydration, heat exhaustion, or heat stroke in an austere setting can be challenging because there is considerable overlap of symptoms.^{1,2} Even oliguria caused by AVP secretion associated with EAH can easily be misconstrued as a sign of dehydration, which contributed to the misdiagnosis in this case.

Without consideration of the potential diagnosis of EAH, it can easily be missed and the patient will likely be mismanaged, as field treatments for dehydration and heatstroke are very different than that for EAH.² A false diagnosis of dehydration or heat illness with emphasis on further fluid intake and unnecessary cooling rather than fluid restriction will exacerbate EAH, as was the case with this patient. In EAH, fluid restriction should continue until there is spontaneous diuresis, and a sodium bolus should be provided. The sodium bolus can be delivered in the form of oral hypertonic saline (ie, 4 bouillon cubes in 125 mL of water, or similar mixture) or salty food with minimal fluid if oral intake is tolerated, or intravenously as 3% hypertonic saline if

supplies are available.^{1,3} It is especially critical that individuals with no medical training who are relying on a wilderness medicine field guidebook have some information about EAH at hand, preferably within the discussion about dehydration and heat illnesses because the presentations can be so similar. At the least, such books should include a section on EAH that suggests consideration of the potential for overhydration based on history of fluid intake and a description of appropriate treatment strategies including fluid restriction and provision of an oral sodium load if possible. In retrospect, we have noted that the book that was used in this case is not unlike several other wilderness medicine field guidebooks currently available that make no mention of EAH. We have also noted that several wilderness medicine courses do not list hyponatremia among the content.

Fortunately, this case has a happy ending because medical help was sought before it was too late, and the Search and Rescue Team promptly recognized and appropriately treated the patient's EAH. However, the availability of proper information about EAH in the wilderness medicine field guidebook that was consulted would have likely eliminated the need for the emergency response and the distress that was associated with the situation. We hope that by alerting your readers to this near-fatal episode, authors and publishers of wilderness medicine books and organizers of conferences on wilderness medicine will be more attentive to including information on EAH so that we will never hear of another case that comes so close to avoidable catastrophe.

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