Letters to the Editor

Health and Safety in Outward Bound

To the Editor,

In 1992, the *Journal of Wilderness Medicine* published an article of mine on the hazards of Outward Bound courses.¹ My attention has recently been drawn to an error in the mortality rate quoted in the paper. The mortality rate for the years 1962–1989 was quoted as 2.04 per 100 000 students per year. This was a mathematical error and, as calculated, should have been 204 per 100 000 students per year. However, both these figures are either wrong or confusing. The number 2.04 per year was too low because of the mathematical error, and the figure of 204 is confusingly high because it assumes a course length of 365 days. Courses were more typically 2 to 3 weeks in duration.

A more realistic way of recording mortality is to relate it to the number of days students spend on courses. Outward Bound, therefore, now calculates its annual mortality statistics based on the number of students, number of student days, cumulative death rate per 1000 students, and cumulative death rate per 1000 student days. These numbers take into account the lengths of different courses because the statistical risk of death on a course depends on the length of the course.

Looked at in this way, the cumulative death rate per 1000 student days for 1962–1970 was 0.0032. By the end of 1980, the cumulative rate (taking into account all deaths since the start of the school) was 0.0088, and by the end of 1989 had fallen to 0.0056. The cumulative mortality rate per 1000 student days at the end of 2005 was 0.0035. From January 1, 1999, to December 31, 2005, there were 1 347 587 student days without a student death. During the same period, 1 instructor died from a staphylococcal infection while conducting a training course for other instructors.

Twelve of the 17 deaths reported in the paper occurred during the decade from 1971–1980 (12 deaths in 1 169 010 student days). Three deaths occurred in a single kayaking accident off the Baja coast during a storm. A 57-year-old man died from a heart attack while participating in a ropes course event during a corporate training exercise. Three deaths occurred in non-program-related activities (2 deaths in a vehicular accident and a probable suicide) but were included in the statistics. The degree

to which non-program-related deaths inflated the overall death rate was not taken into account.

I asked Dr Dennis Lezotte, Professor and Director of Bioinformatics at the University of Colorado Health Sciences Center, to confirm the mortality rate in my article. He informed me that the correct mortality rate was 204 deaths per 100 000 student years but suggested that, “Since none of the Outward Bound sessions are 365 days long, this is not very descriptive information for participants/readers” (verbal communication, November 2006). Instead, he used the basis for the statistics used in the paper and did a Poisson Regression analysis, which showed that the risk for a 7-day course between 1962 and 1989 was 4.0 per 100 000 participant weeks, 1.5 per 100 000 for the period 1990–1999, and 0.63 per 100 000 for 2000–2005. This trend parallels the decrease in deaths per student days reported in the Outward Bound statistics.

Any errors in the original report were mine alone, and I appreciate the opportunity to correct them. Although I had been on the Board of the Colorado Outward Bound School, I was not active on the Board at the time the paper was written. Outward Bound provided me with the statistics but otherwise played no part in the preparation of the paper.

I would like to acknowledge the cooperation of Outward Bound in providing the most recent statistics and the help of Dr Dennis Lezotte in analyzing the data.

Bruce C. Paton, MD
Clinical Professor of Surgery
University of Colorado Health Sciences Center
Denver, CO, USA

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Improvised Airway Management Devices

To the Editor:

We found the article by Drs Platts-Mills et al to be of particular interest.¹ They evaluated an improvisational method of cricothyrotomy with commonly available ma-

terials, in this case a high-flow intravenous spike and drip chamber, in an austere setting. However, we wish to correct 2 central premises of their paper.

They state that “*considerable attention has focused on improvisational approaches that could be used in a wilderness or prehospital setting . . . but there are no reports of their use in the literature.*”¹ Actually, we previously described a roadside cricothyrotomy where one of us used a sports bottle straw and a pocketknife to obtain a surgical airway on a trauma victim.² Dr Platts-Mills’ reminder to occlude the victim’s mouth is well heeded, especially when performing mouth-to-tube ventilations. This improvisational technique with a sports bottle straw is also described in the Basic Disaster Life Support Course® manual.³ Furthermore, they state once in their abstract, twice in the introduction, and again in their conclusion that “no improvised airway devices of this type have been tested in a systematic manner.” We wish to respectfully direct the authors to our recent work in this field.² Using a body plethysmograph on normal volunteers, we compared the airway resistances (R_{aw}) of 2 types of sports bottle straws and the barrel from a ballpoint pen to standard cricothyrotomy airways (a 7.0 endotracheal tube and a 8.0 Shiley tracheostomy tube). The sports bottle straws were as effective as the standard airway devices, and we found no statistically significant difference in their R_{aw} . However, the pen barrel (even with its tip cut off to maximize its cross sectional area) had a much higher R_{aw} and is an unacceptable choice.

We commend the authors for validating this procedure because a rapid improvised airway can be a lifesaving bridge until advanced airway management can be implemented. Interestingly, there are now several anecdotal reports of improvised cricothyrotomy on the battlefields of Operation Iraqi Freedom using this technique which was pioneered by Fisher.^{4,5}

The views expressed in this article are those of the authors and do not reflect the official policy of the Department of the Army, the Department of Defense, or the US Government.

Bruce D. Adams, MD, FACEP
LTC (P), MC, US Army
Chief, Emergency Medical Services
Brooke Army Medical Center
San Antonio, TX, USA

Timothy R. Hurtado, DO, FACEP
MAJ, MC, US Army
Department of Emergency Medicine
121st Combat Support Hospital
Yongsan US Army Garrison
Republic of Korea

James Geracci, MD
MAJ, MC, US Army
Department of Family Medicine
Eisenhower Army Medical Center
Augusta, GA, USA

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Reply to Improvised Airway Management Devices

To the Editor:

We thank Drs Adams, Hurtado, and Geracci for bringing to our attention the description of improvised airways by Fisher¹ and the report by Adams and Whitlock of an improvised cricothyroidotomy and the accompanying measurements of air resistance using standard and improvised tracheostomy tubes.² We apologize for our failure to identify these publications in our initial study.

Although we accept the finding by Adams and Whitlock that the air resistance created by a ballpoint pen is higher than that of the other devices they tested,² we question the conclusion from that study and restated in their letter that a ballpoint pen would be unacceptable to use as a temporary tracheostomy tube. Poiseuille’s law states that the volume of air flowing through a tube for a given pressure gradient increases directly with tube radius raised to the fourth power and inversely with tube length. Following Poiseuille’s law, the device we tested,³ with an internal diameter of 3.5 mm and a length of 4 cm, would allow for less than half the volume of air flow than would their ballpoint pen with an internal diameter of 5 mm and a length of 7 cm for a given pressure gradient. However, it is our experience that one can maintain oxygenation adequate to remain conscious for at least 10 minutes on room air while breathing through