operations.[3] On the other hand, Fortenberry et al (again from Dr Van Tilburg's references) described 8 cases of epinephrine administration in over 2 million visitors to a national park system.[4] So, taking both references into account, our best estimate of the extent of anaphylaxis in the wilderness may be expressed as a handful of cases per million travelers.

We appreciate Dr Van Tilburg's mountain rescue experience involving the misdiagnosis of anaphylaxis. Indeed, the epinephrine roundtable remarked that anaphylaxis may be either under-diagnosed or over-diagnosed—thereby emphasizing the importance of a good training program for providers who may be called upon to administer epinephrine. Moreover, the fundamental importance of a good training program would speak against reclassifying epinephrine autoinjectors as over-the-counter medication.

As for which providers or organizations should carry epinephrine into the field, or how to best obtain the legal support for such providers or organizations—the full answer to these questions lay beyond the scope of the roundtable discussion. Depending on its field of operations, as well as the ages and medical conditions of the people it serves, each organization must make its own risk-benefit analysis regarding the decision to carry epinephrine. The roundtable sought to provide general guidelines and academic support for those organizations whose risk-benefit analysis would weigh in favor of the decision to carry epinephrine. Future political or legal work in this area may be undertaken more properly by political-action arms of the WMS or like-minded groups.

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Six-Minute Walking Test at High Altitude

To the Editor:

The abstract from the Wilderness Medical Society's 2009 Annual Scientific Meeting by Lazio et al[1] provides data regarding 6-minute walking test (6MWT) feasibility at high altitude (4365 m) in 124 healthy trekkers. The authors regard these data as the first reported experience of 6MWT in a high-altitude setting.

However, in 2006 we performed extensive 6MWTs at low and high altitudes (500, 2000, and 2900 m) in both healthy people (24 subjects) and cardiac patients with left ventricular dysfunction (45 subjects).[2]

Our own experience refers to a lower altitude, but in a mountain setting (Monte Rosa, Western Alps). At each altitude tests were repeated 3 times, and data from the second and third tests were averaged (while the first, performed to get the subject familiar with the test, was discarded). We recorded heart rate and blood pressure at the beginning and at the end of the exercise;[2] during the test respiratory parameters (ventilation, oxygen uptake, carbon dioxide output, oxygen saturation [SpO_2], and all derived parameters) were recorded by a portable device (unpublished data).

A total of 621 tests were performed (of which 207 were at 2900 m); each subject's performance was directly compared to his own at low altitude. A comparison between healthy people and cardiac patients was available at each altitude.

As expected, healthy subjects performed better than cardiac patients at each altitude. Data are shown in the Table (mean values).

Table. Results of 6-minute walking tests

Altitude (m)	*Distance walked (m)*	*Max heart rate (bpm)*	*Min SpO_2 (%)*
Panel A: healthy subjects (n = 24)			
500	652	112	98
2000	645	115	96
2900	619	125	92
Panel B: cardiac patients (n = 45)			
500	517	103	97
2000	520	120	95
2900	461	135	91

The table reports performance and vital parameters of healthy subjects (panel A) and cardiac patients (panel B) at different altitudes. Abbreviations: n = number of patients; m = meters; bpm = beats per minute; max = maximum; min = minimum; SpO_2 = peripheral oxygen arterial saturation.

Performance at high altitude proved to be predictable by noninvasive functional evaluation at low altitude (echocardiogram, cardiopulmonary exercise stress test).

We believe our previous experience in 6MWTs at high altitude provided an extensive pool of data both in healthy subjects and cardiac patients. Despite the fact that the primary interest of our work was focused on rehabilitation of cardiac patients, we presented reference values of healthy subjects, compared to low altitude.

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"Rewarming" an Important Issue from the Cold: Simulated Avalanche Survival and the Physiology of Afterdrop

To the Editor:

The recent article by Grissom and colleagues[1] is an interesting report regarding core temperature afterdrop in simulated avalanche survival. This paper has a number of strengths including near-comprehensive physiological monitoring, detailed methodology, and clear practical implications. However, there is much still to be determined regarding the underlying mechanisms of afterdrop under these conditions.

This study was conducted outdoors, which is a major strength considering that most acute cooling studies are conducted in a laboratory setting.[2–4] The number of dependent variables collected is impressive: esophageal and rectal temperature, heart rate, oxygen saturation, and minute ventilation, as well as inspired and expired gases. Measuring both rectal and esophageal temperature is a tremendous strength in afterdrop research because of the clear differences between sites.[5] However, the title of the paper and the main reason for conducting the study was based on shivering thermogenesis, which was not measured. The lack of oxygen consumption data and/or electromyography (EMG) prevents clinicians and researchers from discerning *why* the afterdrop occurred. The underlying mechanisms will need to be identified before widespread guidelines for rewarming avalanche victims can be implemented.

The methods section and figures in this paper[1] present very detailed information. The authors make it clear that the extrication and blanket wrapping were done quickly in an effort to minimize exercise-induced increases in afterdrop. Although technically difficult, it would have been ideal to keep posture consistent during the study. Going from seated (snow burial) to supine conditions (rewarming) likely loaded the baroreceptors, which might have caused increased blood flow and heat loss in the peripheral limbs. Furthermore, cold stress itself causes increased stroke volume in the seated position,[3] but not in the supine position[4] in young people. This, along with the lack of a control group, makes it impossible to definitively state that rewarming in an insulated bag is more effective than another intervention.

Burial in snow would predominantly involve conductive cooling. This type of cooling is more rapid than convective cooling, (eg, cold air exposure). Other factors such as clothing insulation, age, gender, ethnicity, fitness, and body fatness can also play a role in thermoregulation. The article by Grissom et al[1] employed a relatively small sample size (3 men and 3 women), and the individuals were smaller on average than other reports.[2,4] The cited studies by the authors show that avalanche survival is possible in young athletic people, even those with considerable hypothermia. Outdoor athletes would tend to have larger muscle mass and thus more shivering capacity. It is yet to be determined how fitness and body fatness might impact thermoregulation during and after snow burial.

Overall, the recent work by Grissom et al[1] is a huge step forward in regards to the afterdrop phenomenon. The study has clear practical implications and was relatively well controlled for being conducted in a real-life (ie, nonlaboratory) environment. However, shivering was not quantified in this study, and it remains to be determined how acute (eg, exercise, postural stress) and chronic (eg, age, diseases) processes may impact cooling rates during snow burial. Perhaps future studies could determine how individual factors play a role in the afterdrop phenomenon.

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