

WILDERNESS MEDICAL SOCIETY PRACTICE GUIDELINES

# Wilderness Medical Society Practice Guidelines for the Use of Epinephrine in Outdoor Education and Wilderness Settings: 2014 Update

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The Epinephrine Roundtable took place on July 27, 2008, during the 25th Annual Meeting of the Wilderness Medical Society (WMS) in Snowmass, CO. The WMS convened this roundtable to explore areas of consensus and uncertainty in the field treatment of anaphylaxis. Panelists were selected on the basis of their relevant academic or professional experience. There is a paucity of data that address the treatment of anaphylaxis in the wilderness. Anaphylaxis is a rare disease, with a sudden onset and drastic course that does not lend itself to study in randomized, controlled trials. Therefore, the panel endorsed the following position based on the limited available evidence and review of published articles, as well as expert consensus. The position represents the consensus of the panelists and is endorsed by the WMS. In 2014, the authors reviewed relevant articles published since the Epinephrine Roundtable. The following is an updated version of the original guidelines published in *Wilderness & Environmental Medicine* 2010;21(4):185–187.

## Introduction

The field treatment of anaphylaxis with injected epinephrine can be a life-saving procedure. This is true especially when access to standard medical care will be delayed because of weather or geography. We therefore support the concept that properly trained, nonmedical professionals whose work responsibilities require them to provide emergency medical care be trained to appropriately administer epinephrine for the treatment of anaphylaxis (2014 level of evidence criteria of the American College of Chest Physicians; see online [Supplementary Table 1](#)).

Organizations that choose this expanded scope of practice for their staff should consult with legal counsel. The relevant laws and regulations vary from state to state. Where such practice is not supported by legislation, we encourage and support all efforts to change

existing laws or introduce legislation supportive of this concept.

The following should be included in the organization's operating procedures and staff training curriculum:

1. Assurance that all staff authorized to treat anaphylaxis be trained by qualified instructors or programs. Such training should occur at regular intervals, and include a review of the basic pathophysiology of anaphylaxis; assessment of the patient's signs and symptoms; methods of administering the treatment medications; and potential complications and relative contraindications of treatment.
2. Institutional authorization of staff to administer the patient's own medication or that provided by the organization.
3. Development of an organizational field treatment protocol.
4. Establishment of a quality-assurance program that includes the following functions:
  - protocol review process
  - review of every reported incident of anaphylaxis or allergic reaction

- a plan and chain of responsibility for the purchase, storage, and disposal of medication when the medications are provided by the organization, and for the disposal of all injection devices.
5. Oversight that includes a medical consultant or advisor or a medical control.

Notable points of the roundtable discussion are presented below for general interest. We have included sample protocols from 3 outdoor schools on the field use of epinephrine and an edited transcript of the roundtable discussion as online [Supplementary Appendices](#) to this article. In addition, the online [Supplementary Table 2](#) lists a brief summary and commentary of each of the main references used in this article.

### Legal Background

For decades, established schools in outdoor education have been carrying epinephrine into the field to treat the rare but potentially life-threatening condition of anaphylaxis. Recently, the legality of this practice has been questioned. Is it legal for a physician to write a prescription for an organization rather than a specific individual? Moreover, is it legal for a nonmedical professional with first-aid training to administer epinephrine, an injected medication, in a medical emergency? The law on these questions varies state by state. The majority of states allow trained personnel such as teachers or nurses in public schools to administer epinephrine by auto-injector to students in anaphylaxis. Moreover, the Federal School Access to Emergency Epinephrine Act preferentially grants money to states that allow this administration.<sup>1</sup> However, such laws may not apply outside school settings to private organizations in outdoor recreation or education.

Certain states do extend permission to individuals in private organizations to administer epinephrine for anaphylaxis. For example, in North Carolina, physicians legally may train lay people to administer epinephrine in the field.<sup>2</sup> In New York State, teachers and camp counselors may administer epinephrine after appropriate training.<sup>3</sup> In California and Alaska, nonmedical individuals may administer epinephrine for anaphylaxis after completing a certification course that meets state guidelines.<sup>4,5</sup>

In states that do not specifically allow nonmedical individuals to administer epinephrine, the administration of a prescription drug by a layperson may be prohibited or considered negligence. This may be true even if the intent of the layperson was to help the patient. Furthermore, liability or malpractice insurance(s) excludes coverage of an illegal act.

### Incidence of Anaphylaxis in the General Public and in Outdoor Education

There are approximately 150 recognized anaphylactic deaths from food allergies or insect stings per year in the United States.<sup>6</sup> Lack of recognition may be associated with underdiagnosis of anaphylaxis. The majority of anaphylactic fatalities are caused by food allergies, especially in adolescents and young adults, and asthma is a risk factor for fatal anaphylaxis.<sup>7</sup> If medications are considered along with food allergies and insect stings as causes of fatal anaphylaxis, then there are about 1500 deaths per year.<sup>8</sup> Medication-induced fatal anaphylaxis on average occurs in an older, adult population—often in hospital or healthcare settings. Besides medications, foods, and insect stings, anaphylaxis may also be induced by cold temperatures and by exercise. Overall, the risk of anaphylaxis in the general population is estimated at 0.05% to 2%, with a smaller percentage at risk for fatal anaphylaxis.<sup>9</sup> In life-threatening anaphylaxis, there is no absolute contraindication to properly dosed epinephrine from a vial or ampule. The National Outdoor Leadership School (NOLS) database records 2 cases of anaphylaxis in 20 years (2.5 million participant-days). In contrast, during the same period, NOLS also records 149 cases of acute allergic reactions. Retrospective review of the NOLS data reveals that instructors appropriately administered epinephrine in the 2 cases of anaphylaxis and an antihistamine in the 149 cases of acute allergic reactions.<sup>10</sup> There were no deaths among the cases of anaphylaxis or acute allergic reactions.

### Methods of Epinephrine Administration

Epinephrine may be administered by auto-injector into the anterolateral mid-thigh. This method minimizes the possibility of dosage error and reliably achieves effective serum drug concentration. Recent studies have questioned whether the auto-injector needle is long enough to deliver epinephrine into the muscle layer in all female patients, or in pediatric and adult patients with obesity.<sup>11,12</sup> This concern, however, has yet to be proven in specific pharmacological trials.

From 0.3 to 0.5 mL of the 1:1000 concentration of epinephrine may also be manually drawn from a vial or ampule into a syringe with an attached needle and administered intramuscularly into the anterolateral mid-thigh. This method is far less expensive than using an auto-injector and also achieves effective serum drug concentration, but is more prone to operator error.<sup>13</sup> Injection into the anterolateral mid-thigh by either method achieves higher serum drug concentration than intramuscular or subcutaneous injection into the deltoid.<sup>14</sup> In addition, auto-injectors can administer epinephrine through clothing.

Regardless of the delivery method, 25% to 35% of anaphylaxis victims may require a second dose.<sup>15</sup> This may occur within minutes of the first dose, or may occur hours later as part of a biphasic presentation of anaphylaxis. Biphasic presentations have been reported in 12% to 20% of hospital patients with anaphylaxis.<sup>16,17</sup> However, the incidence of a biphasic reaction may be much lower (<1%) in patients treated early with epinephrine, antihistamines, and steroids.<sup>18</sup> Nonetheless, because of the life-threatening nature of anaphylaxis, as well as the possibility of a biphasic reaction, field victims of anaphylaxis should be evacuated if possible to definitive or hospital-based care.

### Adverse Outcomes From Field Administration of Epinephrine

There are reports of arrhythmias, stroke, and myocardial infarctions in people who received epinephrine for anaphylaxis.<sup>19</sup> Most of these adverse events occurred in the elderly, in individuals with preexisting heart disease, in patients who did not actually have anaphylaxis, or in overdose situations. Indeed, a Colorado youth experienced ventricular dysrhythmias and myocardial ischemia from an overdose of epinephrine after 2 emergency medical technicians drew 9 times the recommended dose into a syringe.<sup>20</sup> In this respect, auto-injectors or prepackaged medication kits should decrease the possibility of overdose. On the other hand, in life-threatening anaphylaxis, there is no absolute contraindication to properly dosed epinephrine. It should also be noted that there is an increased awareness of anaphylactic sequelae on the heart itself and that ischemic electrocardiographic changes and dysrhythmias can occur in the absence of epinephrine administration.

### Future Directions

An outdoor organization with responsibility for students at risk for anaphylaxis—particularly children with asthma or food allergies, who may also be a long way from help—should require that such students carry personal auto-injectors. However, a backup system is necessary because even the simple auto-injector is not so simple to use when a patient is in extremis. Therefore, outdoor instructors also should be trained to administer epinephrine. Legal protection for this rests on having each state legislature or medical board approve the field administration of epinephrine by trained outdoor instructors. In time, continued legislative change on the federal level should establish uniform protection in all 50 states. It may take parents who have lost a child to anaphylaxis because epinephrine was not available to

push through additional changes in state and federal laws, as happened in the Canadian school system with Sabrina's Law.<sup>21</sup>

The relevant law need only say that field administration of epinephrine is an approved practice and that physicians may train others to administer it. In North Carolina, for example, the law specifies that a physician must provide training on matters such as the definition, causes, symptoms, and treatment of anaphylaxis. The law need not require one method of administration over another—it may leave this issue to the discretion of the physician providing the training. Furthermore, the law would specify that a layperson may provide treatment only if a licensed medical provider is not on scene.

In summary, the roundtable panel endorsed the field administration of epinephrine under emergency conditions by wilderness instructors who have received adequate training in the field recognition and treatment of anaphylaxis.

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### Supplementary data

Supplementary Tables and Appendices are available online at <http://dx.doi.org/10.1016/j.wem.2014.07.015>.

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