



Essentials: High Altitude Illness

Prevention, Assessment & Treatment

High-altitude illness (HAI) occurs when climbers are exposed to the lower baro-metric pressure associated with elevation gain, resulting in insufficient oxygen available for absorption by the tissues of the body. When a climber is unable to effectively acclimate to a new altitude, signs and symptoms (S/S) of high-altitude illness can manifest. The effects can range from mild to life-threatening. Early recognition and treatment are essential to minimizing the severity of HAI. The following recommendations are based on the Wilderness Medical Society's Consensus Guidelines for the Prevention and Treatment of Acute Altitude Illness.

PREVENTION

In general, HAI initially affects climbers at elevations greater than 8,000 feet. When traveling to these altitudes, it is recommended that climbers increase their sleeping elevation by no more than 1,000 to 1,500 feet per day. If a route requires a larger elevation gain between camps, it is best to remain at one elevation for two or more days and travel to higher altitudes on day trips (hence the popular adage of "climb high and sleep low"). It is also best to incorporate a rest day, which includes light activity, following three to four consecutive days of increases in sleeping elevation.

Under physician direction, the medication acetazolamide (Diamox) can aid in acclimatization. Climbers at altitude should avoid any products that depress their innate respiratory drive, such as sedative medications and alcoholic beverages.

ASSESSMENT

HAI is typically delineated into three categories: acute mountain sickness (AMS), high altitude cerebral edema (HACE), and high altitude pulmonary edema (HAPE). AMS represents the mildest form of HAI, while HACE and HAPE are both severe presentations.

AMS occurs when non-acclimatized climbers ascend rapidly to altitude. HACE is severe AMC characterized by fluid accumulation (edema) within the brain, secondary to climbing at elevation. HAPE is also triggered by travel at high altitudes but is caused by excessive fluid within the lungs.

Acute Mountain Sickness

Headache accompanied by at least one of the following:

- Nausea (vomiting possible)
- Insomnia (difficulty sleeping)
- Fatigue
- Anorexia (loss of appetite)

High Altitude Cerebral Edema

- Ataxia (difficulties with gross motor movement, e.g. walking)
- Mental status changes (including disorientation, irritability, combativeness and/or unresponsiveness)
- Headache and other AMS S/S possible

High Altitude Pulmonary Edema

- Shortness of breath when resting
- Excessive fatigue
- Persistent cough (initially dry and becoming productive)

Note: Pulse oximetry (SpO₂) monitors can be useful for monitoring an individual's oxygen saturation trend over time. However, no correlation has been found between SpO₂ values and a climber's susceptibility to HAI.

FIELD TREATMENT

Acute Mountain Sickness

The most prudent treatment is to stop ascending, allowing the body to acclimatize, until signs and symptoms resolve. Rest days should be active, while maintaining appropriate nutrition and hydration. In addition:

- Consider acetazolamide (Diamox)*
- Treat symptoms (e.g. headache, nausea) with appropriate medication
- Supplemental oxygen can be administered if available
- Descend if patient is unable to acclimate or if S/S of HACE/HAPE present

High Altitude Cerebral Edema

The highest priority treatment is prompt descent until S/S resolve. In addition:

- Supplemental oxygen can be used if available
- Consider dexamethasone (Decadron)*
- Consider acetazolamide (Diamox)*
- Portable hyperbaric chamber can be used temporarily if descent isn't possible

High Altitude Pulmonary Edema

The highest priority treatment is prompt descent until S/S resolve. In addition:

- Supplemental oxygen should be used if available
- Consider inhaled albuterol (Ventolin)* and nifedipine (Procardia)*
- Portable hyperbaric chamber can be used temporarily if descent isn't possible

* Administration of any medications requires both wilderness medicine training and physician orders/protocols.

Note: HACE and HAPE can occur simultaneously and differential diagnosis can prove difficult. For this

reason, some experts recommend initially treating severe HAI patients for both HACE and HAPE, until a diagnosis becomes clear.

HOSPITAL TREATMENT

Treatment of HAI in the clinical setting is similar to management in the field. Mountaineers suffering from the ill effects of altitude exposure often show improvement simply with transport to a lower elevation. Severe HAI patients should be assessed and monitored for any prolonged neurological and/or respiratory aftereffects associated with HACE/HAPE.

Note: The 2019 update to the Wilderness Medical Society guidelines can be found [here](#).

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Images

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