

Signs and Symptoms*:

1. High altitude illness (HAI) is the collective term for the unique cerebral and pulmonary syndromes that can occur following an initial ascent to high altitude (generally above 2000 to 2500 m/6500 to 8200 feet) or following a further ascent while already at high altitude.
2. HAI includes Acute Mountain Sickness (AMS) and High Altitude Cerebral Edema (HACE), which effect the brain, and high altitude pulmonary edema (HAPE), which effects the lungs. They are induced by the hypoxic stress of high altitude and are characterized by extravascular fluid accumulation in the brain (AMS/HACE) and lungs (HAPE).
3. All respond to descent, O₂ therapy, or both. Select pharmacotherapy can help speed acclimatization in some cases and temporarily treat some symptoms of HAI. Medications, however, are not a substitute for decent in severe cases.
4. Patients with possible AMS, HAPE, or HACE require careful evaluation to exclude other potential diagnoses, such as severe dehydration, hyponatremia, pneumonia, carbon monoxide poisoning, and hypoglycemia.

Acute Mountain Sickness and High Altitude Cerebral Edema

1. Most experts consider AMS and HACE to represent different points of severity along the same pathophysiologic process in the brain.
2. AMS is the most common form of HAI and is characterized by headache in combination with other nonspecific symptoms, such as malaise and anorexia.
3. HACE is the least common form of high altitude illness and is rapidly fatal without prompt recognition and treatment. It is characterized by more conspicuous symptoms including:
 - a. profound lethargy/drowsiness;
 - b. confusion / disorientation / hallucinations;
 - c. ataxia / unsteadiness; and/or
 - d. altered level of consciousness proceeding to coma

High Altitude Pulmonary Edema

1. HAPE is an uncommon, life-threatening non-cardiogenic pulmonary edema that develops two to four days following rapid ascent above 2500 m (8000 feet). HAPE, which may accompany AMS/HACE, is the most common cause of death among the high altitude illnesses. Individuals who have had HAPE are at high risk for recurrence if they ascend to the same altitude, particularly if they do so at the same rate of ascent.
2. Initial symptoms of HAPE include:
 - a. Shortness of breath
 - b. Dry cough
 - c. Dyspnea (on exertion if mild- at rest if severe)
 - d. Symptoms of AMS
3. Late symptoms include:
 - a. Gurgling on auscultation
 - b. Hemoptysis
 - c. Generalized weakness
 - d. Severe respiratory distress
 - e. Orthopnea

Contraindications:

1. Allergy to sulfa drugs (Acetazolamide)
2. Allergy to an indicated medication.

Management:

1. Treat suspected AMS as per the instructions in Figure 1 *“Acute Mountain Sickness Management.”*
2. Treat suspected HACE as per the instructions in Figure 2 *“High Altitude Cerebral Edema Management.”*
3. Treat suspected HAPE as per the instructions in Figure 3 *“High Altitude Pulmonary Edema Management.”*

Disposition:

1. Monitor patients with AMS - If worsening or pharmacologic treatment is ineffective, ensure patient descends as soon as practical – at least 500m/1500ft or until symptoms subside.
2. For patients with suspected HACE and /or HAPE, immediately descend at least 500m/1500ft or until symptoms subside.
3. Consider evacuation for HACE, HAPE and refractory or worsening AMS.

Figure 1 - Acute Mountain Sickness Management.

1. Halt ascent and acclimatize for 12hrs to 4 days.
2. In severe cases of AMS or if patient allergic to sulfa- Dexamethasone 4mg IM/IV initially, followed by 4 mg IM/IV/PO q 6h for 3 days
3. Acetazolamide (Diamox™) 250mg po BID UNLESS PT ALLERGIC TO SULFA
4. Acetaminophen 1000mg po q6H for pain
5. Ondansetron 4 mg IV/IM BID for nausea OR 8 mg PO
6. Descend 500m {1,500ft) or more for refractory or severe cases if tactically feasible

Figure 2 – High Altitude Cerebral Edema Management.

1. Immediate descent- at least 1000ft or until symptoms subside
2. Dexamethasone 4-8mg IV/IM initially then 4 mg IV/IM q6H
3. Acetazolamide (Diamox™) 250mg po BID
4. O2 at 2-4L/min if available
5. Pulse oximetry monitoring if possible
6. NEVER leave a pt with HAGE alone
7. If available- use a GAMOW bag in 1 hr sessions with bag inflated to a pressure of 2 psi above ambient pressure Usually need 4-5 treatment sessions (This is not a substitute for descent)

Figure 3 – High Altitude Pulmonary Edema Management.

1. IMMEDIATE DESCENT at least 500m (1000 ft) or until symptoms subside. Minimize the patient’s exertion on descent.
2. Pulse oximetry monitoring
3. Nifedipine XL 30mg po q12-24hrs as long as BP remains stable. Contact higher medical authority if possible prior to initiation of this therapy.
4. Oxygen 2-4 Umin if available
5. If immediate descent is not tactically feasible, use a GAMOW bag inflated to a pressure of 2 psi above ambient pressure for 1 hour treatment sessions. Four or five treatments are typically required for effective treatment. A GAMOW bag is NOT a substitute for descent.
6. Avoid rigorous activity for 3-5 days after recovery
7. Do not re-ascent in a tactical setting.