

Altitude Illness

The following guidelines have been adapted from the current literature on Altitude illness including the Wilderness Medical Society Consensus statement for the Prevention and Treatment of Acute Altitude Illness, Backcountry Medical guidelines developed by Peter Hackett and Lance Taysom for the Alaska Mountaineering School (AMS) and the UIAA MEDCOM Consensus Statement regarding Field Management of Altitude Illness. Additional information has been added and adapted by Alan Oram, D.O. and Peter Hackett, M.D.

- Mild or moderate acute mountain sickness (mild or moderate AMS) is quite common in travelers and climbers who ascend to 8-14,000 ft in the Rocky Mountains, Sierra and Cascade mountain ranges. In Alaska, especially on Denali, HAPE and HACE are more frequent and can be fatal if not recognized and addressed early. Severe altitude illness (HAPE or HACE) is rare in the Continental United States.
- AMS is defined as a headache and at least one other symptom in someone who has gained altitude in the past 24-48 hrs. See Lake Louise Scale below for an AMS severity scoring system.
- All persons are susceptible to AMS; the most important risk factors are rate of ascent, altitude reached, and individual physiology.
- Preventive measures: Graded ascent to allow time for acclimatization is the best prevention. In addition, certain medications are effective for preventing AMS. Acetazolamide (Diamox) prevents AMS, and vasodilators like nifedipine (Procardia), sildenafil (Viagra) and tadalafil (Cialis) are being used to prevent HAPE. The use of such medications is increasing, and guides must be knowledgeable about them. Overall, rate of ascent schedules and careful observation of clients should assist the guide in preventing serious altitude illness.
- A critical skill for guides is identifying the onset of AMS and the progression to the more serious complications of HACE and HAPE.

Treatment for Altitude Illness:

HIGH ALTITUDE ILLNESS Acute Mountain Sickness (AMS) Mild / Moderate Usually develops within 6-10hrs of reaching altitudes greater than 8000ft (2500m), or after ascent to a new, higher altitude.

Typical Symptoms of AMS:

- Headache and one or more of the following:
 - Mild lassitude (apathy)
 - Fatigue
 - Loss of appetite, nausea, possibly vomiting.
 - Trouble sleeping
 - Dizziness

Note: No mental status changes or ataxia in AMS

Typical symptoms of HAPE

- Dyspnea even at light workloads progressing to dyspnea at rest
- Elevated respiratory rate
- Decreased SPO₂. (Pulse Oximetry: value depends on altitude and severity; can range from 40-80%; always at least 10 points below clients who are doing well)
- High pulse rate
- Rapid decrease in performance
- Chest tightness
- “Bubbling” breath (rales) cyanosis, bloody or pink sputum (late)
- Mild fever
- Usually starts 24-48 hours after ascent

Typical symptoms of HACE

- Headache may or may not be present, Generally severe when present but may be subtle and victim may deny
- Nausea and vomiting
- Dizziness
- Ataxia: Heel to toe test very sensitive and simple to do in the field.
- Altered level of consciousness, confusion or hallucinations
 - Irrational behaviour may be present early on
- Final stage: Coma and death by respiratory arrest

(Adapted from UIAA Medcom recommendations for Treatment of Altitude illness, 2009)

Treatment:

Stop ascent and allow time for acclimatization. For mild AMS symptoms, stopping ascent and resting at the same altitude is reasonable until symptoms resolve. If after 24 hours the symptoms persist, descent is appropriate. If improved at 24 hours, you can consider ascent again. If symptoms return, descent is the logical choice.

- Maintain hydration (not over hydration) and nutrition.
- Rest
- Low flow O₂ if available (1 liter per minute).
- Do not leave victim unattended.
- Make sure there is no carbon monoxide exposure.
- Medications: If you are traveling in high altitude environments, clients should have these in their personal kits, and the guide should as well. Avoid sedatives.
- Acetazolamide (Diamox) 125mg up to 250mg twice daily.
- Analgesics: Aspirin 325-650mg every 4-6hrs, Tylenol 325-500mg every 4-6hrs or. Ibuprofen 600 mg every 8hrs.

- Anti- emetics: Ondansetron (Zofran) 4 mg orally disintegrating tablets, one under the tongue every 4 hrs as necessary.
- *Descend if symptoms persist or worsen over 24-48hrs. Monitor for more severe AMS.

High Altitude Cerebral Edema (HACE)

S&S: All the same symptoms of AMS- now more severe. Headache, however, may or may not be present. Must have ataxia and mental status changes to be called HACE.

Mental status changes: drowsiness, acting drunk, disorientation, bizarre behaviors, , hallucinations (rare), irritable, combative, unresponsiveness (coma)..

Ataxia: staggers like drunk, unable to maintain balance walking a straight line, or finger-to-nose is off.

Other symptoms and signs: extreme fatigue, weakness, unusual shortness of breath (SOB).

HAPE usually present as well- look for pulmonary S&S.

Treatment

- **Immediate rapid descent.** Will likely require additional resources depending on terrain, conditions and ability of patient to ambulate in technical terrain
- Gamow bag if descent is not possible (prudence suggests descent before victim's condition worsens).
- *Dexamethasone 8mg loading dose then 4 mg every 6 hrs while descending (may also be given IM).*
- Low flow O2 if available.
- Do not leave victim unattended.
- Attempt to contact Medical Control.

EMERGENCY EVAC anyone experiencing S&S of HACE if not responding well to descent and *dexamethasone*.

High Altitude Pulmonary Edema (HAPE)

Most altitude deaths are due to HAPE, 50% also have S&S AMS. Most commonly strikes on 2nd night at new altitude, less likely after 4 days.

Early S&S:

- Increased SOB with exercise, longer recovery time, weakness, fatigue, dry cough, decreased SPO2.
- "Rattling" or congestion in chest.

Late S&S:

- Respiratory distress (unless HACE dominates the picture). SOB at rest. Pale or cyanotic skin.
- Decreased SPO2. (Pulse Oximetry: value depends on altitude and severity; can range from 40-80%; always at least 10 points below clients who are doing well)
- Wet lung sounds (begins in right lung)
- Continual cough- may be productive with blood or pink fluid.
- Elevated pulse and respiratory rates despite resting.
- Extreme fatigue, profound weakness.
- Loss of coordination- ataxia if *HACE* also present.
- Level of responsiveness changes as SPO2 drops.

- Drowsiness may progress to unresponsiveness, respiratory arrest, and death.

Treatment

- Oxygen is highest priority. Administer high flow O₂ (4 liters per minute) until victim starts to improve, usually at least 20-30 minutes. Then reduce to low flow (1-2 liters per minute) to conserve supplies. Or titrate to maintain SpO₂ above 85-90% if pulse oximetry available. With some improvement, the victim can then start descent, while using oxygen if available.
- If oxygen is not available, start descent, or use pressure bag.
- Minimize exertion on descent (no pack, may have to be carried or sledged).
- Gamow Bag if oxygen and descent not available; 2-4 hrs treatment minimum.
- May need to sit upright. Keep warm.
- Consider medications if oxygen is not available: oral *nifedipine 30-60mg XL*, *Albuterol inhaler 6-8puffs every 20-30min during acute respiratory distress then 2 puffs every 1-2hrs. There is some evidence that dexamethasone can be utilized for treatment using 8mg as initial dose then 4mg every 6 hours for the next 24 hours or until descent*
- Do not leave victim unattended.
- Attempt to contact Medical Control.

Some notes and caveats:

Two new studies suggest that ibuprofen may help prevent AMS if taken prior to ascent. The dose is 600mg every 8 hours starting 6 hours prior to ascent.

A pulse oximeter is a useful tool to carry if you are going to be working in higher elevations such as those above 10000 feet. On Denali or international destinations at severe elevations, it is considered a standard to have one in your medical kit.

All members of the party should carry medications in their personal kits for prevention or treatment of all phases of altitude illness. It would be preferable for participants on trips to use their own prescriptions. In some instances, the guide or instructor may need to use his or her own medications to help a victim in need. Please contact the medical director of the AMGA to discuss this and refer to the guidelines above when considering emergent use of medications.

HAPE and HACE may be present at the same time. If there is any question to this, treat as if they are both present and work towards descent and appropriate medical therapy as available.

If a client or member of the party develops HAPE symptoms and descends, and after 72 hours there is complete resolution of symptoms with return to normal SpO₂ for that altitude, it is possible to attempt re-ascent. If they develop HAPE again, descent is mandatory, and the trip is over for that person.

For all altitude illnesses, Diamox should be considered upon reascent after someone has recovered at the same or a lower altitude.

Evacuation Guidelines for Altitude Illnesses:

Continued ascent while symptoms are present or worsening is totally inappropriate, and is the main cause of death and evacuations. Descent is the best treatment for all altitude illness, but is not always necessary.

If weather or terrain prevents descent, temporary emergency treatment should be instituted.

AMS LLS Worksheet with Lake Louis AMS Questionnaire*

Please fill in the following

Name:		Age:		Sex:	M/F	Date:	/	/
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Previous History of Altitude Illness:	AMS/ HAPE/HACE
Meds:	
Ascent Profile:	
Treatment:	

Evaluation	<i>Initial</i>	<i>f/u# 1</i>	<i>f/u# 2</i>	<i>f/u# 3</i>
Time				
Altitude				

Symptom Score

1. Headache	<i>Initial</i>	<i>f/u# 1</i>	<i>f/u# 2</i>	<i>f/u# 3</i>
No Headache - 0				
Mild Headache - 1				
Moderate Headache - 2				
Severe, Incapacitating Headache - 3				

2. Gastrointestinal Symptoms	<i>Initial</i>	<i>f/u# 1</i>	<i>f/u# 2</i>	<i>f/u# 3</i>
No Symptoms - 0				
Poor appetite or nausea - 1				
Moderate nausea or vomiting - 2				
Severe nausea and vomiting, incapacitating - 3				

3. Fatigue/Weakness	<i>Initial</i>	<i>f/u# 1</i>	<i>f/u# 2</i>	<i>f/u# 3</i>
Not tired or weak at all - 0				
Mild fatigue or weakness - 1				
Moderate fatigue or weakness - 2				
Severe fatigue or weakness, incapacitating - 3				

4. Dizzy/Lightheadedness	<i>Initial</i>	<i>f/u# 1</i>	<i>f/u# 2</i>	<i>f/u# 3</i>
No dizziness/lightheadedness - 0				
Mild dizziness/lightheadedness - 1				
Moderate dizziness/lightheadedness - 2				
Severely lightheaded, fainting/passing out - 3				

5. Difficulty	<i>Initial</i>	<i>f/u# 1</i>	<i>f/u# 2</i>	<i>f/u# 3</i>