What to know before you go UP and someone goes DOWN Altitude Illness and Emergency Action Plans

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Objectives

- Diagnose and begin treatment for high-altitude illness
- Recommend or prescribe preventative strategies to limit high-altitude illnesses for athletes/travelers
- Devise an emergency action plan prior to travel to treat injury/trauma



Altitude illness usually presents with symptoms of...

- **A. Gastrointestinal illness**
- **B. Alcohol hangover**
- C. Fatigue
- **D. Hypothermia**



High-Altitude Illness (HAI)

- Early signs and symptoms nonspecific
 - Elevation >8,200 ft (2,500m)
 - Gastrointestinal distress
 - Alcohol hangover
 - Fatigue
 - Dehydration
 - Hypothermia



High-Altitude Illness

- Acute mountain sickness (AMS)
 - 25% travelers moderate altitude
 - 50% to 85% >4000m

• High-altitude cerebral edema (HACE)

 High-altitude pulmonary edema (HAPE)
 - 0.1% to 0.4% >4000m



Altitude Illness

- Major risk factors
 - Rapid ascent
 - Poor acclimatization
 - Exertion
 - Prior history
- High level of aerobic fitness not protective



Table 1.Lake Louise criteria (22).

AMS	In the setting of recent gain in altitude, the presence of headache AND at least one of the following symptoms: - Gastrointestinal - Fatigue or weakness - Dizziness or lightheadedness
	- Difficulty sleeping
HACE	Can be considered "end-stage" or severe AMS. In the setting of recent altitude gain, either: - Presence of change in mental status and/or ataxia in a person WITH AMS OR - Presence of both mental status and/or ataxia in a person WITHOUT AMS
HAPE	In the setting of a recent gain in altitude, the presence of the following: Symptoms: at least two of: Dyspnea at rest Cough Weakness or decreased exercise performance Chest tightness or congestion Signs: at least two of: Crackles/wheezing in at least one lung field Central cyanosis Tachypnea Tachypnea

[Adapted from "The Lake Louise consensus on the definition and quantification of altitude illness" in Sutton JR, Coates G, Houston CS (editors). *Hypoxia and Mountain Medicine*. Burlington (VT): Queen City Printers, 1992.]



"An ounce of prevention is worth a pound of cure"

What is the best way to prevent altitude illness?

- A. Acetazolamide
- **B. Gingko biloba**
- **C. Iron therapy**
- **D. Controlled ascent**



AMS/HACE Prevention

1. Controlled ascent >3000m

- Controlled exposure to hypobaric hypoxia
- <500m per day, rest every 3-4 days</p>



AMS/HACE Prevention

2. Medications proven effective

- Acetazolamide: carbonic anhydrase inhibitor
 - Fluid diuresis and increase ventilation
 - Continue 2-3 days after max altitude or start descent
 - SE: paresthesia, decrease exercise tolerance, sulfa allergy
- Dexamethasone: potent, long-acting steroid
 - Sympathetic activation, dec capillary permeability, dec inflammatory cytokines
 - Must take until descent
 - SE: suppress adrenal function, rebound if stopped



? Prevention

- Altitude preconditioning
- Phosphodiesterase 5 inhibitors (sildenafil)
- Iron therapy
- 5-hydroxytryptamine antagonists (sumatriptan)
- Ginkgo biloba
- Medroxyprogesterone
- Loop diuretics
- Magnesium
- Theophylline



AMS/HACE Treatment

- Early identification
- Descent (300-1000m)
- Supplemental oxygen
- Dexamethasone
- Portable hyperbaric chambers
- Acetazolamide



HAPE

Prevention

- Controlled ascent
- Nifedipine
- Treatment
 - Descend at least 1000m
 - Supplemental oxygen, portable hyperbaric chambers



Return to Activity after High-Altitude Illness

- Remote history with full recovery
 - Proper acclimatization, graded ascent
 - Prophylactic medication for history of AMS



Return to Activity after High-Altitude Illness

- Immediate return after recent HAI
 - Mild AMS: rest until aSx, medicate
 - Moderate AMS: longer duration of rest, descend >500m, dexamethasone and/or acetazolamide.
 - Severe AMS/HACE: 1 day-papilledema seen 4 wks later.
 Full recovery. Acclimatization, low ascent, rest days, medication prophylaxis
 - HAPE: may require 2 weeks to regain strength/stamina
 - 3 climbers treated at mod altitude 4 days, cont expeditions



Young children are at higher risk for AMS

A. True

B. False



Young Children

- Lower risk, less severe symptoms
- Inc risk with cardiopulmonary conditions
- Treatment AMS: descent, no studies on medication



High Altitude Considerations

- Ultraviolet radiation
 - Adequate skin and vision protection
- Sleep disturbances
 - Sleep hygiene
- Nutrition
 - Weight loss: increase protein intake
 - Hydration
 - Iron supplementation



Training at high altitude will turn an average athlete into an elite athlete?

A. Yes

B. No

C. Only if they also drink liquid IV (more watery water)*

*sold in bulk at Costco





High Altitude Training

- Live High, Train Low
 - Live/recover at moderate altitude (2000-3000m)
 - Hypoxic erythropoietic effect (300-400 hours)
 - Live at 2000m for 14-16 hours per day for 20 days
 - Benefits in acclimatization & enhancing exercise performance



When is the best time to develop an emergency action plan for an event?

- A. As the emergency occurs, otherwise you waste a lot of time preparing for something that may never happen
- **B.** As you travel to the event
- C. Emergency action plans are not needed for local events
- **D.** Prior to travel for the event





You are traveling for a 2 day event to a rural area that you and your team have never traveled to for competition what should you to prepare?



Questions to ask

- What type of care am I expected to provide?
- How are we getting there?
- What other medical support is onsite?
- Where is the closest hospital?
- What are the capabilities at the closest hospital?
- Where is the closest pharmacy?
- Traveling internationally are immunizations required?





- 425 catastrophic injuries resulted in permanent disability injuries and 398 catastrophic injuries resulted in full recovery
- 4% of sport related deaths in the US in 2013 were youth athletes under the age of 17
- Top causes of sudden death in sport: cardiac, head injuries, heat stroke, exertional sickling, asthma, anaphylaxis, direct trauma, lightening, and hyponatremia



Timeout

- Athletic health care providers meet before start of each practice or competition to review the emergency action plan.
- Determine the role and location of each person present (i.e., AT, EMT, MD)
- Establish how communication will occur (i.e., voice commands, radio, hand signals). What is the primary means of communication? What is the secondary or back-up method of communication?
- An ambulance should be present at all high-risk events. Where is it physically located? What is the planned route for entrance/exit and is the route unencumbered? Is the ambulance a dedicated unit or on stand-by? If an ambulance is not on site, what is the mechanism for calling one?
- In the event of emergency transport, what is the designated hospital? Consider the most appropriate facility for the injury/illness when selecting the hospital.
- What emergency equipment is present? Where is it located? Has it been checked to confirm it is in working order and fully ready for use?
- Are there any issues that could potentially impact the emergency action plan (i.e., construction, weather, crowd flow)?



Acute Injury



Injury Protocol and Checklist:

- 1. Triage Injured Athlete
- 2. Activate Communication Plan:
 - a. Team PT/AT or Physician on site notifies: USSA Medical Director (if unable to reach:) Gillian Bower Kyle Wilkens Cell: 435-901-1941
 - Cell: 435-640-8522

- Office: 435-649-2058
- b. Medical Director will notify Head Team Physician and Team PT/AT (if not on site).
- c. Communication between all parties will continue as situation progresses
- d. Medical Director will notify U.S. Ski & Snowboard Chief of Sport, VP Communications, Program Director and Team Manager.
- 3. Stabilize Athlete and determine Plan of Care.
- 4. If athlete is to be transported accompany athlete to medical facility, determine next steps in plan of care.
 - a. NOTE: if necessary Global Rescue will provide guarantee of payment for hospital. Contact Medical Director for assistance.
- 5. If athlete is not to be transported evaluate injury further and determine if athlete is to be sent home or will receive treatment on site.

Checklist Actions:

- 1. Complete injury report on Presagia (EMR)
- 2. Complete insurance report to American Specialty.
 - a. NOTE: if an EAHI athlete is to spend the night in a hospital immediately notify Kate Anderson (kate.anderson@usskiandsnowboard.org) or EAHI directly.
- 3. Complete Injury Debrief on Google Forms with Team PT/ATC and Coach.
- 4. Have athlete complete Injury Debrief
- 5. Assist with filing of any Therapeutic Use Exemptions (TUEs) as needed.
- 6. Record Pharmaceuticals dispensed in Sport Pharm as needed.



Resources/References

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