

It should also be used when descent is recommended but not feasible or during descent in severely ill individuals. The inspired oxygen fraction will vary significantly between oxygen delivery systems, including nasal cannula, simple facemasks, Venturi masks, or non-rebreather masks. In addition, because of interindividual variability in inspiratory flow rates and minute ventilation, the inspired fractional concentration of oxygen ($F_{I}O_2$) can vary significantly between patients for any given common oxygen delivery system, with the exception of high flow systems. For this reason, supplemental oxygen should be administered to target an S_pO_2 of $>90\%$ rather than a specific $F_{I}O_2$. Oxygen supply may be limited at remote high altitude clinics or on expeditions, necessitating judicious use. Short-term oxygen use in the form of visits to oxygen bars or use of over-the-counter oxygen canisters has not been studied for AMS treatment and should not be relied on for this purpose.

Recommendation. When available, ongoing supplemental oxygen sufficient to raise S_pO_2 to $>90\%$ or to relieve symptoms can be used while waiting to initiate descent or when descent is not practical. Recommendation Grade: 1A

Portable hyperbaric chambers

Portable hyperbaric chambers are effective for treating severe altitude illness^{69,70} but require constant tending by care providers and are difficult to use with claustrophobic or vomiting patients. Symptoms may recur when individuals are removed from the chamber,⁷¹ but this should not preclude use of the chamber when indicated. In many cases, ill individuals may improve sufficiently to enable them to assist in their evacuation and descend once symptoms improve. Use of a portable hyperbaric chamber should not delay descent in situations where descent is required.

Recommendation. When available, portable hyperbaric chambers should be used for patients with severe AMS or HACE when descent is infeasible or delayed and supplemental oxygen is not available. Recommendation Grade: 1B

Acetazolamide

Only 1 study has examined acetazolamide for AMS treatment. The dose studied was 250 mg every 12 h; whether a lower dose might suffice is unknown.⁷² No studies have assessed AMS treatment with acetazolamide in pediatric patients, but anecdotal reports suggest it has utility. The pediatric treatment dose is $2.5 \text{ mg} \cdot \text{kg}^{-1} \cdot \text{dose}^{-1}$ every 12 h up to a maximum of $250 \text{ mg} \cdot \text{dose}^{-1}$.

Recommendation. Acetazolamide should be considered for treatment of AMS. Recommendation Grade: 1C

Dexamethasone

Dexamethasone is very effective for treating AMS.^{73–75} The medication does not facilitate acclimatization, so further ascent should be delayed until the patient is asymptomatic while off the medication. Although systematic studies have not been conducted, extensive clinical experience supports using dexamethasone in patients with HACE. It is administered as an 8 mg dose (intramuscularly, IV, or orally) followed by 4 mg every 6 h until symptoms resolve. The pediatric dose is $0.15 \text{ mg} \cdot \text{kg}^{-1} \cdot \text{dose}^{-1}$ every 6 h.²⁷

Recommendation. Dexamethasone should be considered for treatment of AMS. Recommendation Grade 1B.

Recommendation. Dexamethasone should be administered to patients with HACE. Recommendation Grade: 1B

Acetaminophen

Acetaminophen has been found to relieve headache at high altitude⁷⁶ but has not been found to improve the full spectrum of AMS symptoms or effectively treat HACE.

Recommendation. Acetaminophen can be used to treat headache at high altitude. Recommendation Grade: 1C.

Ibuprofen

Ibuprofen has been found to relieve headache at high altitude⁷⁶ but has not been shown to improve the full spectrum of AMS symptoms or effectively treat HACE.

Recommendation. Ibuprofen can be used to treat headache at high altitude. Recommendation Grade: 1C.

Continuous positive airway pressure

Rather than affecting barometric pressure, CPAP works by increasing transmural pressure across alveolar walls, thereby increasing alveolar volume and improving ventilation-perfusion matching and gas exchange. Two reports have demonstrated the feasibility of administering CPAP to treat AMS,^{77,78} but this has not been studied in a systematic manner. Logistical challenges to use in field settings include access to power and the weight and bulk of these systems.

Recommendation. Because of lack of data, no recommendation can be made regarding use of CPAP for AMS treatment.

SUGGESTED APPROACH TO AMS/HACE TREATMENT

Care should be taken to exclude disorders whose symptoms and signs resemble those seen with AMS and HACE, such as carbon monoxide poisoning, dehydration, exhaustion, hypoglycemia, hypothermia, and hyponatremia. Persons with AMS of any severity or HACE should cease ascending