Adventure Travel

• Difficult to define
• One persons adventure will be mundane to others
• Very easy to buy the “Expedition” or “Adventure” experience without having any prior experience
Adventure Travel

• Session will cover
  – General principles
  – Travel to Altitude & Trekking
  – Cruise Medicine
Adventure Travel: General Principles

• Pre-travel consultation principles remain the same

• But more likely to be
  – Remote from medical care
  – Encountering extremes of environment
    • Heat
    • Cold
    • Altitude

• Pre-trip conditioning/experience
High Altitude Travel
High Altitude - what you need to know

• Where?
  – Common high altitude destinations.
    • good knowledge of these destinations
    • and alternate itineraries for at risk travellers
  – How to prevent
  – How to treat
  – Who should not go
What is high altitude?

• Moderate altitude: 1500-2500m
• High altitude: above 2500m
• Extreme altitude: above 5000m
Where is it important?
ASIA

1. Nepal – trekking & cycling Himalayas: Everest, Annapurna, Langtang etc.
2. India – Zanskar, Ladakh, Sikkim & trekking Himalayas
3. Pakistan – trekking Himalayas, Karakorum Highway
4. Bhutan – trekking Himalayas, Thimpu
5. Tibet-Lhasa, driving/cycling to Everest Base Camp
6. China – Szechuan
7. Malaysia – Mt Kinabalu
AFRICA

1. Kenya – Mt Kenya
2. Tanzania – Mt Kilimanjaro
3. Uganda – Ruwenzoris
SOUTH & CENTRAL AMERICA

1. Peru – Cusco, Inca Trail, trekking
2. Bolivia – La Paz, trekking
3. Ecuador – Quito
4. Argentina – Mt Aconcagua
5. Mexico - volcanoes
Effects of Altitude

- **OXYGEN**: There is an approximately linear fall in barometric/ atmospheric pressure and pressure of inspired O2.
  - Barometric pressure at 5500 m is 50% of sea level, 30% at 8900m.

- **Temperature** decreases by 2 degrees C every 300 m altitude gained
  - increased risk of hypothermia, frostbite

- **UV** increases by 4% every 300 m
  - increased risk of sunburn
Physiology

- **Lung**
  - reflex increase in ventilation above 2500-3000m
    - Starts within minutes of exposure but maximises at around 4 days
  - pulmonary vasoconstriction leading to pulmonary hypertension
  - gaseous diffusion decreases as driving pressure decreases

- **Heart**
  - initial increase in cardiac output, HR, BP secondary to sympathetic activation. Lasts a few days.

- **Blood**
  - Initial increase in Hb due to dehydration. Later due to erythropoietin.
  - Increased viscosity and coagulability after some weeks.

- **Brain**
  - swelling in everyone initially.
  - Long term subtle effects with extreme altitude exposure

- **Immune system**
  - Suppressed? Infections don’t heal...
Pathophysiology AMS

• Still not completely understood
  – Hypoxia elicits neurohumoral and haemodynamic responses that result in overperfusion of microvascular beds, elevated hydrostatic capillary pressure, capillary leakage and consequent oedema
  – OR does it elicit an inflammatory response?
  – OR both?

• Evidence suggests everyone gets ‘brain swelling’ on ascent to altitude.

• No way of predicting susceptibility except past history.
Adaptation to altitude (acclimatisation)

- Increased **ventilation** (chemoreceptors in carotid bodies). Genetically determined
  
  “How well someone does at altitude seems to be related to how well someone breaths at altitude”.

- Increased **blood flow**: HR, BP and cardiac output
- Increased **red cell mass** with longer stays
- Better **tolerance** of hypoxia with time
Altitude Illness Syndromes

- Acute Mountain Sickness (AMS)
- High Altitude Pulmonary Edema (HAPE)
- High Altitude Cerebral Edema (HACE)
“High Altitude Triad”

- Dehydration
- Hypoxia
- Hypothermia

- Feed into each other in a negative fashion
- Symptoms overlap

- “REST, DRINK, EAT & WRAP-UP”
Altitude Illness Risk Factors

- **RATE OF ASCENT**
- Inherent predisposition
  - Best predictor of how well someone will do at altitude is their past experience
- **Exertion**
- Respiratory infection
- Respiratory insufficiency
- Cold air
Preventing Altitude Illness

• Travellers to altitude, need to know
  – Previous experience at altitude?
  – Previous history of altitude illness?
  – Detailed itinerary of trek including maximum altitudes gained, passes, sleeping altitudes.
  – What are the options for descent?
Prevention of Altitude Illness

- Rate of ascent
  - Advice on maximum sleep altitude gains
  - Flexibility in itinerary - need to allow rest days
- Be aware of common destinations and potential options
  - Cusco in Peru
    - Drive via Arequipa rather than fly
    - Drop down into Urumbamba Valley.
Graded Ascent

- Better to walk-drive then fly to >3000m
- Once above (2500)- 3000m
  - Aim to sleep no more than 300-500m meters higher than the night before
  - Build in an acclimatisation day for each 1000m gained or if exceeded recommended minimum
- In addition
  - Try to build in an acclimatisation day around 2500m
  - Ovoid over exertion
  - Some evidence that spending 3 nights >3000m in preceding 2 months is protective against AMS
AMS and HACE Pathophysiology

- Thought to be at either ends of a continuum
- Increased cerebral blood flow
- Increased capillary hydrostatic pressure
- Leakage of fluid and proteins in between cells
- White matter oedema

In essence brain swelling
Symptoms of AMS

• In the setting of a recent gain in altitude
• Headache **plus** at least one of the following
  – Nausea/vomiting
  – Fatigue
  – Dizziness/Lightheadedness
  – Poor sleep
• **Use “Lake Louise” or AMS scoring system**
Travel to Altitude: Resource

- MedEx booklet
  - Great information
  - Free
  - Translated into many languages
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Headache, Guts, Fatigue, Dizziness, Sleeping, TOTAL

Score 0 = Fine, 3 = Worst
HACE - High Altitude Cerebral Oedema

• Clinical diagnosis defined as onset of ataxia, altered consciousness or both in someone with AMS or HAPE.
  – Period of AMS may be very rapid
• Characterized by global encephalopathy, not focal signs
• White matter oedema on MRI
HAPE - High Altitude Pulmonary Oedema

- Usually, but not always preceded by AMS
- Biggest killer, climbers especially at risk

In context:
- Dry cough and decreased performance should raise suspicion
- Shortness of breath at rest/with minimal exertion
Oxygen Saturation: 60
Pulse Rate: 99

H.R.A. PHERICHE
Periodic Breathing

• Very common at attitude
• May occur in the absence of AMS
• Very scary!
• Prevention: acetazolamide 125mg before bed
Drug Prophylaxis

- **AMS**
  - Acetazolamide (Diamox®)
  - Dexamethasone
  - Ibuprofen
  - Inhaled budesonide
- **HACE**
  - Dexamethasone
- **HAPE**
  - Nifedipine
  - Salmeterol
  - Tadalafil
- **See:** Luks et al. WMS Consensus Guidelines for the prevention and treatment of acute altitude illness. WEM. 2010;21:146-55.
‘Most experts recommend prophylaxis for those who plan an ascent from sea level to over 3000 meters (sleeping altitude) in one day and for those with a history of acute mountain sickness. Acetazolamide is the preferred drug’.

Dose is 125 - 250 mg BD starting 24 hours prior to ascent

How Does Acetazolamide Work?

• Theory:
  – Inhibits carbonic anhydrase
  – Prevents bicarbonate reabsorption by the kidney
  – Metabolic acidosis stimulating respiration
  – AIDS ACCLIMATISATION
  – Or does it have an anti-inflammatory effect?
AMS Treatment

- Rest at same altitude
- Diamox 250 mg BD
- Ibuprofen
- Oxygen
  - Concentrator/bottled
  - Portable Altitude Chamber/Gamow bag if available
  - Descent
- Descend if symptoms worsening
  - Most likely to need descent if symptoms develop on way to camp
  - Vs those who developed symptoms after arrival, often do OK with rest
- Watch for signs/symptoms of HACE and HAPE
HACE Treatment

- Oxygen
  - DESCENT
    - Real or simulated (PAC/Gamow bag)
    - Concentrator/bottled

- Dexamethasone 8mg stat then 4 mg 6 hourly (PO, IM, IV)

- Diamox if descent delayed
HAPE Treatment

- Oxygen+++  
  - DESCEND  
    - Real or simulated (PAC/Gamow bag)  
    - Concentrator/bottled  
  
- Minimise exertion  
- Nifedipine SR 20 mg 6 hourly  
- Consider also  
  - Inhaled Salmeterol  
  - Tadalafil
Evacuation

- Is it available?
- If so how is it organised?
- How much does it cost?
- How do I pay?
- People need to remember they are in a remote setting and nothing is ever guaranteed.
Three Rules to Avoid Dying of Altitude Illness

Rule #1 - learn to recognize the early symptoms of altitude illness and be willing to admit you have them
Three Rules to Avoid Dying from Altitude Illness

Rule #2 - Never ascend to sleep at a higher altitude with any symptoms of altitude illness
Three Rules to Avoid Dying of Altitude Illness

Rule #3 - Descend if your symptoms are getting worse when resting at the same altitude.
Remember...

It’s OK to get altitude illness...
It’s NOT OK to die from altitude illness
Motion Sickness

PREVENTION:
Scopolamine
Phenergan or other centrally acting antihistamine
Ginger

TREATMENT:
Odansetron?
Stemetil
Stemetil + Phenergan