31 Environmental

ALTITUDE ILLNESS

MASL	Features	Management
Acute Mountain Sickness		
> 2.5 km	- Headaches - Disprop fatigue - Insomnia - Dyspnoea - ***No phys findings***	↓ 0.3 km ***Dex*** 8mg, 4mg q6h prophylactic
High Altitude Cerebral Oedema (HACE)		
> 4.5 km	- ALOC - Truncal ataxia	↓ 1.0 km ***Dex*** 8mg, 4mg q6h ***Acetazolamide*** 500mg
High Altitude Pulmonary Oedema (HAPE)		
> 3.0 km	- Non-prod cough - Dyspnoea - Cyanosis	↓ 0.5-1.0 km ***Nifedipine*** 10mg SL

HYPOTHERMIA

Classification

Severe	***Moderate***	***Mild***
< 28 C	28-32C	32-35C
45% CO	50% O_2 req	BMR
33% cerebral flow	No shivering	Shivering
No PN/CN reflexes	AF likely, risk VF	Normal vitals
VF likely	Stupor	Dysarthria/Ataxia

Causes

> Loss

- environmental exposure incl cold water
- skin damage eg burns, TEN, psoriasis
- vasodilation from drugs eg alcohol
- diabetes

< Production

- age
- inactive
- endo dysfcn eg pit, thyroid, adr
- malnourished

CNS Dysfunction

- Trauma, Cancer, Infection
- Acidosis, Drugs, Hypoxia

ECG

- Bradycardia
- HB
- AF (common)
- Long QT
- Myocardial irritability < 30°
- ***J waves***

Management

Rewarming

NB Warm O_2, fluids minimise heat loss only - warm to 40°C

Severity	Type	Examples	Rate
> 32C	Endogenous	Shivering	0-2.0C
32-35C	Passive	Warm room blankets	
28-32C	Active Ext	Warm blankets Radiant heat Forced heat air system	1-2C
< 28C	Active Int	Dialysis Abdo lavage **Thoracic lavage** Bypass ECMO	2-3C 2-4C **3-6C** 7-10C 7-10C

ALS (ERC)

< 20C	intermittent CPR (5min on 10min off)
< 28C	intermittent CPR (5min on 5min off)
< 30C	no drugs, 3x shock max
30-35C	x2 interval time for drugs

Stopping CPR

- Injuries incompatible w/ life
- NFR order
- **pH < 6.5**
- **K > 12**
- No SOL T ≥ 35°C
- **2hr CPR T < 15°C**

FROSTBITE

Definitions

Frostnip:	Reversible/superficial
Superficial FB:	Blisters at 24-48hrs
Deep:	FT injury

Mx

- rewarm (water immersion) avoid dry heat
- analgesia, elevate, protect

HYPERTHERMIA

Classification

Classic

- due to high heat exposure
- clusters occur during heat waves
- ***anhidrosis*** a feature

Exertional

- due to exercise
- ***non-anhidrosic***
- associated lactic acidosis, rhabdo, DIC

Drug Induced

- Serotonin Syndrome → ***BZDP***
- NMS → ***Bromocriptine***
- MH → ***Dantrolene***

Types

Heat Exhaustion

- pre-stroke ie no neurological sx

Heat Stroke

- ***CNS is main***
- Hepatic failure (2nd most common) → DIC
- CVS: ↑HR ↓BP, high output failure
- MSK: rhabdo
- Renal failure
- Resp: APO, ARDS

Mx

- 80% mortality without Tx
- Fluids
- Cooling

Cooling Techniques

Passive	***Active***
- ***Tepid*** water & fan	- Cold fluids
- cooling blankets	- Lavage
- immersion	- Dialysis
- ice packs/water	- ECMO

NEAR DROWNING

Definitions

Drowning:	liquid-air interface at entrance of airways (ie may survive or die)
Drowned:	died from drowning
Immersion:	part of body covered in water
Submersion:	entire body in water

Prognostic Features

	Good	Bad
Field	- Witnessed - Early ROSC - < 5min to retrieval - < 10min to CPR - < 30min 1st breath	- Male - Fresh/cold water - Opp of all good feat
ED	- Pupillary response - Motor response	- GCS < 5 going to ICU - FDP @ 24hrs - Abnormal CT < 36hrs

FDP Fixed dilated pupils

Management of Near Drowning

- EAR before CPR: 2 rescue breathes
- Mild (Asx, normal BS): Cxr, ABG, Observe 6hrs
- Mod (mild hypoxia, no LOC): Observe ON, O2 ± CPAP
- Sev: Intubate, PEEP

RADIATION INJURY

Exposure	Syndrome
0.5-4 Gy	***Nausea & Vomiting*** *Feat:* Earlier sx = higher Gy exposure[1] *Prognosis:* Subject to progression
2-10 Gy	***Haemopoietic*** *Feat:* BM suppression, bleeding, infection, ulceration, fatigue, aplastic anaemia, ***occurs after 3 wks*** *Prognosis:* Subject to progression
10-15 Gy	***GIT*** Feat: Severe vomiting, Bloody diarrhoea, Ileus Prognosis: ***50% mortality***
15-30 Gy	***Vascular*** Feat: Capillary dilation & leak, cerebral oedema Prognosis: ***Death within 2 weeks***
> 30 Gy	***Cerebral*** Feat: N&V, CV collapse Prognosis: ***Death within 2 days***

[1]*For example, seen < 2hrs if exposed to > 4 Gy vs 6hr delay with < 0.5 Gy exposure*

- No vomiting after 6 hrs = outpatient mx
- T = N/L + E = > 3.7 → inpt mx
  (N neutrophils, L lymphocytes, E = 0 if no vomit, 2 if)

DIVING

Decompression Illness

Risk Factors

- Depth
- Duration
- Multiple dives
- Gas mixtures
- Heat
- Deco stops (tables 2-3% risk)
- Ascent to altitude post dive
- Exercise during/after dive
- Individual susceptibility

Types

- ***CAGE*** from pulmonary barotrauma
- ***DCS*** from dissolved bubbles
  - Pulmonary
  - Cerebral
  - Cutaneous
  - Spinal
  - Mild syndrome
  - Inner ear
  - Lymphatics

History

- CAGE if acute onset, otherwise DCS (onset 30-60min)
- Other people sick suggests ***dirty gas***
- Straining related = barotrauma via ***PFO*** or ***CAGE***

Managment

- Keep Supine & warm
- Minimise exertion
- High flow O_2
- Fluids
- ***Anti-inflammatories***
- ***Lignocaine*** infusion for ***CAGE***

Transfer

- Facility with HBOT
- Max altitude 150-300m (most planes can press to 1ATA)

Sequelae

- < 6 hrs to HBOT same efficacy
- > 48hrs usually irreversible

Barotrauma

- Pulmonary: ***CAGE, PXT***
- Ear: ***ext/middle/int***
- Sinus
- Other: gastric, dental, equipment, GUT, CN palsies

Respiratory Related Diving Issues

- Barotrauma
- DCS
- O_2 Toxicity
- Drowning
- Saltwater aspiration
- Pulmonary Oedema
- Underwater Blast

Hyperbaric

Complications

- Barotrauma
- Gas toxicity
- Claustrophobia
- Disease progression eg proliferative retinopathy
- In chamber interventions (small chamber)