

**AWLS Treatment Guidelines**

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Material from AWLS® course

**Patient Assessment**

- SM-ABCDE (scene safety, massive hemorrhage, airway, breathing, circulation, disability, exposure)
- AMPLE (allergies, medicine, past med/surg hx, last meal, events)
- CARTS (chest, abd/pelvic, retroperitoneum/renal, thighs, skin/street)
- AEIOU-TIPS (allergies, epilepsy, infection, overdose, underdose, trauma, insulin, psych, stroke)

**Wound**

- Hemostasis – combat gauze: direct pressure, elevate & pressure pts, tourniquet (2hr)
- Pressure irrigation/debride – 18g, NS 60cc/cm
- Anesthesia – LET/TAC, lido, PO
- Abx – Keflex, augmentin, clinda, MRSA (bactrim, clinda, doxy); prophylaxis (3-5d), tx (7-10d); tetanus
- Blisters – >quarter size – rupture, topical abx, mole skin
- Lacs – close only clean wounds, think abscess; head/face wound close well even 100hr past injury
- Burns – rule of 9; Fluids: Rule of 10 = (10cc \* %TBSA burn) per hour for 24hrs; silvadene/bacitracin/honey

**Musculoskeletal Injuries**

- Fracture – **EVAC**
  - Open (irrigate/debride, reduction, dress, splint, check neurovascular, abx [augmentin, levaquin], tetanus)
  - Closed (reduction, splint, check neurovascular)
  - C/T/L/S Spine tenderness – splint, rescue pod
  - Hip fx – T-pot
- Dislocation – reduction, splint
- Sprain – RICES (rest, ice, compression, elevate, stabilization) x 72hrs

**Altitude Medicine**

- Pathophys:
  - Altitude = 1500m; same FIO<sub>2</sub>, but barometric pressure decrease (50% at 5500m, 75% at 8800m)
  - FIO<sub>2</sub> = 21% to 10,000m, but partial pressure drops → hypobaric hypoxia
  - Acclimatization = improves hypoxia
    - Hypoxia → carotid body → medulla to increase respiratory rate = hyperventilation
    - Hyperventilation causes respiratory alkalosis → incr renal secretion of bicarb (incr UoP) to induce metabolic acidosis to continue hyperventilation
    - Cheyne-Stokes Breathing is normal at altitude – hyperpnea follow by 3-10s apnea
- Prevention:
  - Graded Ascend is key:
    - 2-3nights @ 2500-3000m
    - Don't increase >600m in sleeping altitude per night
    - Spend extra night q300-900m of gain

- Prophylaxis:
  - DOC: **Acetazolamide** 125mg BID, start 1-2d before ascend
  - And/or, **Ginkgo biloba** 80mg TID or 120mg BID, start 5d before ascend (only prophylaxis, not tx)
  - Last ditch, Decadron 4mg q8h (may mask sx for 48-96hr, but sx may rebound)
- AMS (Acute Mountain Sickness) = [Lake Louise Consensus = h/a + n/v/insomnia/weakness/dizzy]
  - Cause is rate of ascend → Stop ascend and rest, O<sub>2</sub>
  - **Acetazolamide** 250mg BID until sx-free (or, sulfa allergic use decadron 4mg q6 x2)
  - Must not ascend until 18hr p last dose and must be symptom free, if still sx → descend
- HACE (High Altitude Cerebral Edema)
  - AMS + ATAXIA (edema of white matter and corpus callosum)
    - → Immediate descent, EVAC (AMS to coma in 1-3 days)
  - **Acetazolamide** 125mg TID & **Decadron** 8mg load and 4mg q6h, **O<sub>2</sub>**
  - If descent not possible, use hyperbaric chamber for 4-6hrs
  - Sequelae of ataxia can last up to weeks
- HAPE (High Altitude Pulmonary Edema)
  - First sx = decreased exercise tolerance in 5-7d, then dry cough → moist cough → hemorrhagic cough
  - Hypoxia and SOB = Immediate descent is imperative! At least 500-1000m before sx improvement
  - Incr PA pressure, not fluid overload → don't use diuretics!
  - **Nifedipine** 20mg load, then 10mg q8h. If can't tol PO, empty capsule sublingually; **O<sub>2</sub>**
  - **Decadron** and/or Acetazolamide may help improve oxygenation, or Cialis 10mg BID to decr PA pressure
  - If sx are mild → descend with sx resolution p 5d, ok to ascend slowly → if sx return → EVAC

**Avalanche Survival = EVAC**

- Golden time = 15min (90% survival) + Companion rescue = 65%; 84% death by asphyxia, 9% trauma
- Success Stats: self rescue (17%), organized rescue (18%)
- Hints:
  - Exposed slope and 38-40 degree slope is greatest risk, avoid terrain traps, read the slab
  - Body temp decr 3 C/hr
  - Release all binding if caught, travel diagonally to edge, swim, create air pocket (most important)
  - Beacon, Recco, Avalung, Helmet, shovel, probe
- Rescue: scene safety (note second avalanche), turn beacon to receive, sight where the person disappear and work downstream with switch backs. Probe in grid for body. Once body probed, leave probe in place and shovel all snow around it. If air pocket intact even 45+min buried, continue CPR.

**Heat Injuries**

- Heat Cramps = lost electrolytes → replace with ORS/IVF, *E-Tabs* resolve cramps in 40sec
- Heat Syncope = orthostatic from dehydration in non-acclimatized and geriatrics → cooling, laid down, rest, ORS

- Heat Exhaustion = thirst, weak, frontal h/a, tachy, orthostatic, temp <40C → evap cooling, rest, ORS (1-2L q2-4h)
- Heat Stroke = Neuro Deficit (ataxia, confusion, seizure, hallucination, posturing) & temp >40C = **EVAC**
  - ABC, O<sub>2</sub>, IVF NS 1-2L in first hr, watch for pulmonary edema, vital signs
  - Remove cloth, cool with room temperature water on body with evap cooling, ice packs
  - Goal of body temp is 39C/102F as fast as possible, then stop

**Cold Injuries**

- Hypothermia
  - Mild: temp 32-35C (92-95F) → uncontrollable shivering, tachy
  - Moderate: **EVAC**; temp 28-32C (82-90F) → no more shiver, brady, AMS, dysrhythmia
  - Severe: **EVAC**; <28C (82F) → apnea, rigidity, pulmonary edema, life-threatening dysrhythmia
  - "No one is dead until warm and dead"
  - Remove all wet cloth, blanket, conductive body heat, fire, warm fluids; palp carotids for 2mins each, if no pulse then start CPR, don't start CPR prematurely, it could worsen the dysrhythmia
- Frostbite = **EVAC**
  - 4 phases (Prefreeze, freeze-thaw, vascular stasis, ischemic)
  - 4 degrees
    - First: superficial – pale, white, numb
    - Second: superficial – clear blisters
    - Third: deep – hemorrhagic blisters
    - Fourth: deep – bone hard
  - Rapid rewarming, but NOT thaw-and-re-freeze; lots of **pain control, abx, NSAIDs**; remove everything on skin and cover with dry clothing
  - Circulate warm water 40-42C (104-108F, temp of hot tub) for at least 15-30min until skin returns to normal color and pliability
- Frostnip – no tissue freeze, take great care to warmth
- Chilblain – abn skin rxn to cold 0-15C; tx: keep warm
- Immersion Foot – 'trench foot', keep dry

**Lighting = EVAC**

- Facts: most dangerous: summer, 3-6pm, before and after storm, 10miles before storm, 30million volts
- Mechanism: direct strike, side splash, contact, ground current, weak upward streamer, blunt trauma
- Impact:
  - Cardiovascular: MC COD – cause MI, effusion, global dysfunction, ST change, QT prolonged
    - Respiratory arrest by paralyzing medullary respiratory center, recover in **20-25min**
    - Cardiac arrest recover in **4min**
    - → **CPR until respiration return is key!!!**
  - CNS
    - Coag necrosis, epidural/subdural hematoma → 4x mortality, revive others first
    - Seizures may be transient for first few days
    - Confusion & anterograde amnesia common
    - Neuropsych (impaired memory, sleep, personality, mood) → 50% job change in 1yr

- ANS – common instability for few hours
  - Keraunoparalysis – LE paralysis, pulseless, cold, clammy, mottled, insensate → d/t ground current → spont resolve in few hours
- PNS – paralysis, pain, paresthesias; sx may be permanent; poor prognosis for recovery
- Skin – mostly superficial burn
- Musculoskeletal – rhabdo rare, fx from contractions or trauma
- Ocular – 50% all victims, cataracts (spont resolve), transient bilat blindness, can get dilated/unreactive pupils from nerve damage (not death)
- Ear – Transient deafness, 50% have ruptured TM
- Pregnancy – rare, good maternal outcome, but 50% fetal death
- Safety:
  - 30-30 rule = seek cover if see lightning and hear thunder in less than 30s & don't resume outdoor activities until 30min after last lightning/thunder.
  - All metal cage/car = safe
  - Stay away from all metal and things taller than you (prevent contact or splash)
  - All spread 30 feet apart in sight view
  - Keep feet together and squat or kneel (prevent ground current)

**Submersion**

- Types:
  - Wet drowning = 85-90% of all victim == 2/2 aspiration
  - Dry drowning = 10-15% of victim == 2/2 laryngospasm
  - Freshwater/Saltwater drowning – need about 22ml/kg of aspirate for electrolyte abn or hemodilution (animal model), typical human drowning aspirated about 10ml/kg.
  - Shallow Water Blackout – hyperventilate before enter water (reduce PaCO<sub>2</sub> s incr O<sub>2</sub> store) → hypoxia before enough CO<sub>2</sub> accumulate to trigger medullary respiratory center to come up for breath → LOC
- Tx: CPR to warm and dead, stop after 20-30min, O<sub>2</sub>
- **EVAC** = cough/sob/rales/LOC/CPR/hypoxic; no evac if asx for >6hr
- Prognosis Score: =<2 (90% neuro recovery), =>3 (survival is <5%)
  - Age =< 3
  - Submerged >5min
  - No CPR attempts for 10+min after rescue
  - Coma on ED admit
  - ABG pH < 7.1

**Medical Problems = EVAC all**

- Cardiac:
  - Angina (stable/unstable) – NTG 0.4mg SL q5min x3, ASA chewed, plavix 300mg, BB, O<sub>2</sub>, decr elevation, rest
  - MI (if anginal pain lasting >15min) – if R-MI, NTG may severely decr BP... else tx the same
  - CHF – slow onset; O<sub>2</sub>, salt/fluid restrict, NTG, albuterol, caffeine
- Respiratory:
  - COPD – albuterol/atrovent, Abx for PNA, steroids, rest

- Asthma
  - mild/mod (speak in complete sentences) → rest, albuterol, consider steroid (**may not EVAC**)
  - severe (only a few words) → rest, albuterol/atrovent/steroid/IMepi
- PNA – Levaquin/Azithromycin/Doxy, ORS
- PE – descend, O2, ASA
- Neuro:
  - Stroke – ASA (ischemic > hemorrhagic; dep on evac time)
  - Seizure – rare; supportive care
- Diabetic: **EVAC if worsening/recurrent sx or cont neuro deficit**
  - Hypoglycemia – glucose, glucagon IM, feed, close monitor
  - Hyperglycemia – ORS, treat infxn, close monitor
  - Higher incidence of high altitude DKA
- Allergy: **EVAC if anaphylaxis**
  - EpiPEN 1:1000 0.3mg IM adult 0.15mg child; 2 doses built in, second dose in 5min
  - H1/H2 antihistamine, steroid, albuterol
- Abd:
  - Appendicitis: Abx, analgesia
  - Cholecystitis: analgesia, abx if pain does not resolve in 6-12hrs; **no EVAC if pain resolves**
  - Constipation: ORS and fiber, caffeine, MiraLax; **no EVAC if not severe**
  - Gastritis/gastroenteritis: ORS, zofran, loperamide if not dysentery, Levaquin if bloody stool & fever
    - Most resolve in 24-48hr, **EVAC if no resolution and severe dehydration**
  - Kidney stones: hydration and pain control, **EVAC only for uncontrolled pain or fever**
  - Ectopic pregnancy: pain control

#### Dentistry – no EVAC unless infxn

- Pain control, clean, refill
- Temporary filling material: Cavit (premixed harden in mouth, can thin with Vaseline), IRM (powder/liquid need mix) → fix lost fillings, crown or bridge fell off, cracks
- Infxn: acyclovir, nystatin, penicillin/clinda, I&D
- Trauma: pain control, filling, smooth sharp edge, reposition tooth, splinting (sew gingival together)

#### Dermatology – no EVAC unless severe

- Urushiol (poison ivy/oak/sumac), below 4000ft
  - Prevention: barrier cream (bentoquatam – ivy block, prevent 68%, re-app q4h)
  - Treat: wash off w/in first 4h with cold water; high potency topical steroid, Benadryl
  - Moderate ds = PO steroid x2wk taper (60/40/20mg q5d)
  - Severe dx = lots of swelling @ face/airway/genital, hospitalize, IV solumedrol
  - Resolve in 1-3wks s tx, tx secondary bacterial superinfxn
- Sunburn (UVA – deep penetrate, cancer risk; UVB – superficial, sunburn/wrinkle risk)
  - Protection: apply sunscreen protection 30min before exposure, re-app q80min (loose effectiveness)
  - SPF = multiple of sunburn time. Ex: if A burns in 10 min, SPF of 10 will give 100min before burn. AAD recommend at least SPF15.

- Hymenoptera – honey bee leave stinger, scrap sideways no grab, soap/water, topical analgesic/steroid, antihistamine; Severe: EpiPen/albuterol, PO steroid/H1&H2 antihistamine
- Scorpion – if **bark scorpion = EVAC**, (lethal c extreme sx neurotoxin: loss airway/resp, met acid, rhabdo, fever)
  - If not bark scorpion – tx as hymenoptera sting
- Marine
  - Jellyfish and Portuguese Man-of-War – **EVAC if chironex**
    - ABC, rinse with seawater (freshwater increase venom)
    - Vinegar (for chironex – indo-pacific box jellyfish) or rubbing alcohol (do not use for box jellyfish; only for physalia – P man of war) all over until pain resolves (deactivate venom)
    - Shave off nematocyst
    - Man of War sting: after shave, 45C water to all area to decrease pain
  - Stinging Fish – **EVAC, 45C water for 30min**, antivenom for stonefish
  - Sea Snakes (elapidae – neurotoxic) – **EVAC**, pressure immobilization

#### Infections

- Gastroenteritis
  - Nondysentery (viral, staph, ETEC, cholera)
    - Self limited, ORS, supportive, loperamide, zofran ODT, Abx is >3 sx in 8h
  - Dysentery (bloody, fever; shigella, salmonella, campy, EHET, yersenia, aeromonas) – tx as above
    - ORS, zofran, NO loperamide
    - Abx: Cipro500mgBIDx3d (DOC), or Azithro500mgQDx3d, or bactrim DS BID x3d
  - Protozoa
    - Giardia – stream water, incubate 1-3wks, foul diarrhea
      - Abx: Flagyl 250mgTIDx5-7d, or Tinidazole 2gm x1, or Furazolidone100mgQIDx7d for kid
    - Amoeba – dx need stool OVP, dysentery that doesn't respond to tx
      - Abx: Flagyl 750mgTIDx10d, or Tinidazole 2gmQDx3d, follow by ideoquinol/paromomycin/diloxanide to eradicate cyst and prevent carrier state
    - Cryptosporidium – everywhere, supportive care
    - Cyclospora – incubation 1wk, watery diarrhea last for weeks; need to BOIL water
      - Abx: Bactrim DS BID x7d
  - Other
    - HepA – incubation 15-50d, supportive care, vaccinate
    - Typhoid Fever – incubation 7-14d, "pea-soup" diarrhea, fever, h/a, dry cough, malaise, rose spot rash 2-4mm macular blanching lesion on trunk, fever abate in 3 wks and sx spont resolve
      - Abx: PO (Cipro500mgBIDx10d, or Azithro1gmQDx5d), IV (rocephin 2gmQD x10d or cipro400mgBIDx10d), vaccinate, supportive, ORS
  - Prevention
    - Cook everything thoroughly, genuine clean bottled water, all drinks with gas or EtOH
    - Prophyl: Peptobismol BID helps in 65%
      - Cipro500mgQD, Ofloxacin400mgQD, BactrimDSqD, Doxy100mgQD
  - **EVAC** – if no improve over 12-24h, can't tol PO, neuro change, do not respond to abx in 24-48h
- Malaria – **EVAC**; prevention, prophyl: Doxy, malarone, fansidar, primaquine, mefloquin, chloroquine
  - Get at least 2 doses before departure, and cont when returned home

#### Eye Injuries – EVAC traumatic, acute red eyes, acute vision loss, corneal ulcers

- Traumatic: hemostasis, irrigate, fox shield, levaquin, EVAC
- Non-Traumatic: levaquin, cycloplegics (cyclopentolate, short act; scopolamine, long act), prednisone qtt, pilocarpine (glaucoma), topical anesthesia, erythromycin topical

#### Bite and Stings

- High pressure irrigation, debridement, dress, abx
- Rabies: soap and water and iodine cleaning, rabies vaccine and IVIG asap, tetanus.
- Animal bites:
  - Antibiotic indications:
    - Sx of infxn
    - Bite on face >24h or extremity >8h w/o adequate irrigation/clean
    - Immunocompromised
    - Crush injury or significantly contaminated wound
    - Bites on hand/feet
    - Fang injections w/o much bleed as with cats or small dogs
  - Abx:
    - Mammals (Pasteurella): Augmentin or clinda/levaquin if PenAllergic or clinda/bactrim for kids
    - Fresh water (Aeromonas, alligator/croc): Augmentin or Levaquin
    - Salt water (Vibrio): Doxy
- Bear – make noise, **EVAC**, rabies vaccine
  - Brown (grizzly): play dead, fetal position
  - Black: fight
- Cougar – fight, make you as big as possible, pick up small children
- Snake – **EVAC all**
  - TX: rest, slow lymph flow with Pressure Immobilization, support ABC, remove all cloth on that site, mark forward edge of swelling q15min, IVF c 2 IV, analgesia (no ASA or NSAIDS), tetanus, **CroFAB** (anaphylaxis)
  - Pit viper – crotalinae – hemotoxin (DIC) – 25% dry bite
    - Copperhead (MC bite, minimal venom)
    - Eastern Diamondback rattler – largest snake, highest venom
    - Other rattler, Mohave rattler (neurotoxic)
    - Cottonmouth (water moccasin)
  - Coral snake – elapidae – neurotoxin
    - Eastern Coral Snake is very toxic, anti-venom avail
    - Western Coral Snake is less toxic, no anti-venom
    - Red on yellow Kill a fellow; Delayed rxn
- Mosquito – 35% DEET, permethrin to cloth, eucalyptus
- Spider
  - Black Widow – **EVAC**; muscle cramps, present as acute abdomen; tx – pain relief, clean with soap/water
  - Brown Recluse & Hobo & Funnel-Web Spiders – painless, necrotic over days-wks, don't excise lesion
- Ticks – Doxy covers all (2pills qd), remove within 24hrs, DEET/permethrin

- Rabies – **EVAC**; incubation 9d-1yr (MC 20-90d), bite on face ~30d, bite on foot ~90d
  - Prodrome 2-10d, follow by CNS ds, death in 1 wk
  - Prevention/Tx = rabies vaccine
- Tick – **EVAC**;
  - Lyme disease – incubation 3d-1mon, tx if early sx (targetoid rash, malaise, h/a, fever)
    - Borrelia burgdorferi via Ixodes tick
    - Abx: Doxy100mgBID or 1-2mg/kg BID; Amox500mgBID or 25-50mg/kg/day div q8
  - RMSF – incubation 5-10d, centripetal and palmar/sole maculopapular to petechial rash
    - Rickettsia rickettsii via Dermacentor (dog/wood tick)
    - Abx: Doxy100mgBID or chloramphenicol 50mg/kg/d div QID, cont tx 3d after defervescence
  - Ehrlichiosis – incubation 5-10d, high fever and h/a, myalgia, chill
    - Rickettsial via Lone Star Tick
    - Abx: Doxy100mgBID cont tx 3d after defervescence; hospitalize
  - Tick Paralysis – incubation 5-7d
    - Ixodidae, Argasidae ticks' neurotoxin → cause acute ascending flaccid motor paralysis
    - Remove tick, sx spont resolve w/in 24h, supportive care
  - Colorado Tick Fever – incubation 3-6d, fever, chill, photophobia, abd pain, papular rash
    - Virus via wood tick; sx for 3 days then goes away for 3 days then come back stronger
    - Supportive care
  - Tuleremia – incubation 3-5d, rabbit fever; "ulcer and lymphadenopathy"
    - Francisella tularensis via tick, deer fly, mosquitos, contact/eat infected meat
    - Abx: DOC=streptomycin 10mg/kg IM BID x7-10d (not to exceed 2gm/d), or Doxy100mgBIDx14d, or Tetracycline500mgQID, or Gentamicin 3-5mg/kg IM/IV q8h x7-10d, or chloramphenicol 25-60mg/kg IV div QID x 14d (not to exceed 6gm/d in adults)
  - Borrelia Relapsing Fever – incubation 7d, 3 relapse of fever chill arthralgia photophobia rash
    - Abx: Doxy100mgBID
  - Babesiosis – incubation 1-3wks, hemoglobinuria,
    - Intra-RBC parasite looks like maltese cross via Ixodes tick... on blood smear
    - Abx: quinine/clinda or atovaquone/azithro

#### Water Disinfection

Pathogen and Thermal Death	Water boiling point and elevation
Giardia & amoeba (after 2-3min at 60C/140F)	212.15 °F or 100 °C (sea level)
Crypto (after 2min at 65C/149F)	202.89 °F or 94.94 °C (5000 ft or 1524 m)
Enteric Virus (w/in seconds at 80-100C/176-212F)	199.19 °F or 92.88 °C (7000 ft or 2134 m)
Bacteria (w/in seconds at 100C/212F)	195.48 °F or 90.82 °C (10,000 ft or 3048 m)
HepA (after 1min at 92C/198F)	188.07 °F or 86.71 °C (15,000 ft or 4572 m)
<b>** boiling pretty much kills everything!</b>	175.11 °F or 79.51 °C (27,000 ft or 8230 m)

- With incr altitude, the pathogen load (cow, beaver) decreases → don't have to adj for temp, boil is ok
- Chlorine Dioxide (Sweetwater\*) – kills everything and better than halogens and more stable
- UVB – kills everything, small volume sterilization
- Filter – not for viruses
- Halogenation – kills everything with enough time, doesn't kill crypto very well.