TRAUMA AND ENVIRONMENTAL EMERGENCIES RAPID REVIEW

1. Basic formulas
    a. Total body water (TBW) — Weight (kg) x 0.6
    b. Water deficit — TBW [1-desired Na ÷ current Na]
    c. Parkland — 4 mL/kg/ % burn
    d. A-a gradient — $140 – (PaO_2 + PaCO_2)$
    e. MAP — DBP + [{SBP – DBP} ÷ 3]
    f. ET tube size — Age ÷ 4 + 4
    g. Sed rate — Age ÷ 4 + 4
    h. Anion gap — $Na – [Cl + HCO_3]$
    i. Osmolar gap — 2 x Na + BUN ÷ 2.8 + BS ÷ 18

2. Why we teach associations
    a. They state the scenario
    b. Try to simulate real life
    c. But…
        i. It is their perception of real life
        ii. Cannot ask additional questions
        iii. Cannot examine patient
        iv. Cannot order additional tests
    d. So they give typical or classic scenarios **or** give associations

3. Traumatic brain injuries
    a. Diffuse axonal injury (DAI)
        i. Prolonged coma (weeks); death from ICP 2° cerebral edema; indistinct grey-white margins and no mass on CT
    b. Subdural hematoma
        i. Bridging veins tear/rupture
        ii. Crescent-shaped lesion on CT
        iii. Older on coumadin, may see nothing on CT
    c. Traumatic subarachnoid hemorrhage
        i. Most common form of injury in moderate-to-severe TBI
    d. Epidural hematoma
        i. Associated with parietal or temporal skull fractures
        ii. Classic: LOC → lucid → LOC
        iii. Lens-shaped lesion on CT
        iv. Middle meningeal artery tear

4. Herniation
    a. Uncal – most common
        i. Ipsilateral fixed/dilated pupil, contralateral motor paralysis

ii. Transtentorial – less common
    a) Bilateral pinpoint pupils, bilateral Babinskis, increased tone then decorticate posturing, death

b. Cerebellotonsillar (Tonsillar)
    i. Pinpoint pupils, flaccid paralysis, sudden death
c. Transtentorial
    i. Uncus through the transtentorial notch
    ii. CN III, brainstem symptoms
    iii. Decreased mental status and level of consciousness
        a) Ipsilateral fixed and dilated pupil
        b) Respiratory depression
d. Tonsillar (rare)
    i. Cerebellar tonsil through Foramen Magnum
    ii. Decreased level of consciousness
    iii. Small pupils, posturing, bradycardia
    iv. Respiratory arrest

5. Indications for seizure prophylaxis after head injury
    a. Significant seizure at the time of injury or in the ED – no need for brief and nonfocal exam
    b. GCS less than 10
    c. Subdural or epidural hematoma (any mass effect)
    d. Depressed skull fracture
    e. Penetrating injury
    f. Generally for mild head injury – not required
    g. Phenytoin is drug of choice to prevent post-traumatic seizures (18mg/kg)
    h. In moderate head injury, must consider it; consult NS and discuss it
    i. High risk categories have 30% occurrence of seizures
    j. In context of head injury seizures worsen outcome
    k. Risk of post traumatic seizures in patients with head injury – Indications for prophylactic anti-epileptic medication
        i. Intubated or paralyzed patients
        ii. Seizure at the time of injury or in the ED
        iii. Penetrating head trauma
        iv. Depressed skull fracture
        v. GCS < 10
        vi. SDH or epidural hematoma
        vii. Past history of seizures

6. Blood loss

Blood loss	**Class I**	**Class II**	**Class III**	**Class IV**
	Up to 750	750 - 1,500	1,500 - 2,000	> 2,000
% Blood volume	10%	20%	30%	40%
Pulse	< 100	> 100	> 120	> 140
Pulse press	Normal	Decreased	Decreased	Decreased
BP	Normal	Normal	Decreased	Decreased
Resp rate	14 - 20	20 - 30	30 - 40	> 35
Urine output	> 30 mL/hr	20 - 30 mL/hr	5 - 15 mL/hr	Negligible
CNS	Slightly anxious	Mildly anxious	Anxious	Confused, lethargic
Fluids; 3:1	Crystalloid	Crystalloid	+ Blood	+ Blood

7. Causes of hypotension in trauma
    a. Blunt: think caudad to cephalad
        i. Pelvic fracture → intraabdominal → intrathoracic
    b. Penetrating: think bigger to smaller
        i. Lungs → heart → great vessels

8. 3 Peaks times of death in trauma
    a. Peak 1: first few minutes (50% of trauma deaths)
        i. Massive head injury
        ii. Rupture of the great vessels
        iii. C-spine injury with cord disruption
        iv. Airway obstruction
    b. Peak 2: the “golden hour” (minutes to hours) (30%)
        i. Hemopneumothorax
        ii. Cardiac tamponade
        iii. Subdural or epidural hematomas
        iv. Injured spleen or liver
        v. Pelvic fractures
        vi. Massive injuries with hypovolemia/shock
    c. Peak 3: days to weeks later (20%)
        i. Sepsis, multiple organ failure, PE, etc.

9. Glasgow Coma Scale
    a. Motor

Obeys	6
Localizes	5
Withdraws	4
Flexion	3
Extension	2
None	1

    b. Verbal

Oriented	5
Confused	4
Inappropriate	3
Incomprehensible	2
None	1

    c. Eye opening

Spontaneously	4
To speech	3
To pain	2
None	1

10. Pediatric spinal cord injury
    a. Spinal cord injuries are less common in children because of flexibility of the spine and spinal column
    b. However, SCIWORA occurs in ~ 50% spinal injuries and 67% of cervical spine injuries in children less than 12 years old between the occiput and C2
    c. Delayed onset of paralysis can occur up to 4 days after injury
    d. Most important factor in prognosis is initial neurologic status
    e. In the NEXUS study that included 34,000 patients (3,000 children), all SCOWORA (27 total) occurred in adults
    f. Anyone with initial neurologic complaints regardless of a normal X-ray and normal CT is a SCIWORA until proven otherwise by an MRI (or seen by a neurosurgeon if no MRI)
    g. Flexion/extension X-rays should be considered to look for instability **after** all other studies including MRI have been negative
    h. SCIWORA in the age of MRI
        i. Hemorrhagic changes in the spinal cord caused by MVC were accompanied by permanent complete neurological deficits
        ii. Trauma patients with initial transient neurological deficits whose MRI shows no cord abnormality have full recovery
        iii. In NEXUS, the most common findings on MRI for patients with SCIWORA were central disc herniation, spinal stenosis, cord edema, cord contusion

11. In the multiple trauma patient, the GCS should be assessed after taking care of airway, breathing, and IV access with volume resuscitation

12. Trauma facts
    a. Trauma is the leading cause of death in patients 1 - 44 years old
    b. Greater than 60% of deaths are accidental
    c. A patient with decreased capillary filling and narrowed pulse pressure has lost approximately 20% of blood volume
    d. The cause of hypotension in a patient who has suffered blunt trauma is most likely pelvic fracture

13. Unstable fractures of the neck: Jefferson Bit Off A Hangman's Thumb
    Jefferson
    Bilateral facet dislocation
    Odontoid fracture II and III
    Any fracture dislocation
    Hangman's fracture
    Tear drop fracture (flexion)

14. The stable fractures – more common than unstable ones (only a few)
    a. Wedge fractures
    b. Process fractures (spinous and transverse)
    c. Unilateral facet dislocations
    d. Vertebral burst fractures excluding Jefferson's fracture (burst fracture of C1)

15. Alignment
    a. 3 x 7 = 21: 3 mm predental space, 7 mm at C2, 21 mm at C7
    b. Predental space in children can be up to 5 mm

16. Pelvic fractures
    a. A 28-year-old man thrown from a vehicle in a MVC has hypotension, tachycardia, negative chest X-ray but obvious pelvic fractures and positive FAST exam (gross blood positive DPL)
        i. Patient goes to the OR
    b. A 28-year-old man thrown from a vehicle in a MVC has hypotension, tachycardia, negative chest X-ray but obvious pelvic fractures and a negative FAST exam or lavage (or < 100,000 rbc/cc on DPL)
        i. Patient undergoes pelvic angiography because that combination is due to retroperitoneal hemorrhage from the pelvic fracture, and they need embolization

c. Quick and simple pelvic X-ray interpretation
    i. Look quickly to get a feel for symmetry
    ii. Look at the "circles," the big circle being the pelvic inlet and the little circles being the obturator foramina
    iii. Look at the sacroiliac joints
    iv. Look at the pubis symphysis
    v. Look at the acetabula
    vi. Hemorrhage is a major cause of death; 2 - 6 L of blood may accumulate in the retroperitoneal space

17. Basilar skull fracture
    a. Air fluid level in the sphenoid sinus is indicative of basilar skull fracture
    b. 80% of basilar skull fracture patients have hemotympanum
    c. Basilar skull fractures are associated with intracranial injuries 53 - 90% of the time
    d. Five signs of basilar skull fracture
        i. Periorbital ecchymosis (raccoon eyes)
        ii. Retroauricular ecchymosis (Battle's sign)
        iii. CSF leak (otorrhea or rhinorrhea)
        iv. Hemotympanum or bloody ear discharge (80%)
        v. Deficit of cranial nerves I, II, VII, VIII
    e. Basilar skull fractures most commonly involve the petrous portion of the temporal bone
    f. CT scan better than skull X-rays
    g. Anterior fossa fractures (eyes and nose)
        i. CSF rhinorrhea
        ii. Raccoon eyes
    h. Middle fossa fractures (ears and face)
        i. Hemotympanum
        ii. Battle sign
        iii. Facial nerve palsy
        iv. Hearing loss
    i. Posterior Fossa Fractures
        i. Impairment of swallowing
        ii. Difficulty maintaining airway due to cranial nerve IX and X injuries

18. Humeral shaft fractures
    a. Most common associated injury is to the radial nerve = wrist drop
    b. Radial nerve injured in 20% of humeral shaft fractures, most improve without intervention
    c. Supination is weak due to radial innervation of supinators of the wrist
    d. Exclude brachial artery injury

19. Hand neuroanatomy
    a. Motor
        i. Median nerve: thumb opposition, finger flexors
        ii. Radial nerve: wrist extensors
        iii. Ulnar nerve: finger adduction/abduction
    b. Sensory
        i. Median nerve: palmar (index pad)
        ii. Radial nerve: dorsum (web between thumb and index finger)
        iii. Ulnar nerve: ulnar side (little finger pad)

20. Level 1 Trauma requirements include
    a. 24-hour availability of all surgical subspecialties, neuroradiology, and dialysis
    b. Injury prevention program
    c. Plus trauma research program

21. Traumatic brain injury
    a. Patients with a GCS of 3 - 8 have 40% mortality
    b. Uncal herniation is the most common type of herniation in TBI (ipsilateral dilated/fixed pupils, contralateral motor paralysis)
    c. Prevention of hypotension is critical in preventing secondary brain injury
    d. The most common form of injury in moderate-to-severe TBI is traumatic subarachnoid hemorrhage
    e. Severe injury (GCS 3 - 8)
        i. Mortality 40%
        ii. Less than 10% make moderate recovery
    f. Moderate injury (GCS 9 - 13)
        i. Mortality less than 10%
        ii. Long-term disability 50%
    g. Mild (GCS 14 - 15)
        i. Account for 80% of head injuries

22. Bladder injuries
    a. Intraperitoneal bladder rupture
        i. Usually require operative repair
        ii. Gross hematuria alone usually signifies significant bladder injury
        iii. These injuries are associated with blunt lower abdominal trauma or trauma in patients with full bladders and are less common than renal injuries
    b. Trauma is usually severe and mortality is high
    c. 98% of bladder rupture injuries have gross hematuria (grossly clear urine in trauma patients without pelvic fracture virtually excludes bladder injury)
    d. Gross hematuria alone or with pelvic fracture are both markers of significant bladder injury

e. Type I bladder injury: most common injury pattern
    i. Partial tears of the mucosa, no bladder rupture
    ii. Associated with blunt trauma, patients present with hematuria and suprapubic pain
    iii. Cystograms, conventional CT scans, and CT cystograms are normal unless an intraluminal hematoma is present
f. Type II bladder injury: 10 - 20% of all major bladder injuries
    i. Direct blow to distended organ
    ii. Bladder dome tears, intraperitoneal fluid bathing loops of bowel
g. Type III bladder injuries: interstitial pattern injuries
    i. CT cystography shows intramural contrast within bladder wall
    ii. Usually blunt trauma
h. Type IV bladder injuries: extraperitoneal
    i. Most common bladder rupture from laceration of lower bladder, most associated with pelvic fracture
    ii. Urine in perivesicular space, urine or contrast seen in thigh or scrotum
    iii. Heal spontaneously, Foley catheter drainage
i. Type V bladder injuries: combination of penetrating and blunt injuries
    i. Presence of intra- and extraperitoneal urine
    ii. Constitute 5 - 10% of bladder injuries

23. Brown recluse spider bite
    a. Venom is cytotoxic and hemolytic
    b. Local tissue necrosis is the most common finding in a patient with a brown recluse spider bite
    c. The bite is painless (as opposed to black widow bites), followed by mild erythematous lesion that may progress or resolve
    d. Pain develops in 3 - 4 hours with a white area of vasoconstriction around bite site, then bleb in center of this area, then erythematous ring around the periphery – looks like "Bullseye"
    e. Occasionally a more severe reaction occurs, with severe pain several hours after bite, erythema, blistering, and bluish discoloration within 24 hours; the lesion becomes necrotic over the next 3 - 4 days with eschar formation by the end of the first week
    f. Lesions vary in size from 1 - 30 cm
    g. Symptoms include nausea, vomiting, fever, chills, myalgias, arthralgias, hemolysis, hemoglobinuria, renal failure
    h. Treatment includes immobilization, elevation, dapsone (may require skin grafting), antihistamines, tetanus prophylaxis, ?steroids

24. Black Widow spider bite
    a. April to October, spider is widespread in garages, barns, outhouses
    b. Predominant effect is neurologic and autonomic

c. Release of multiple neurotransmitters; immediate pain – pinprick sensation, spreading quickly to the entire extremity
d. Symptoms appear within 30 - 60 minutes: muscle cramping, may mimic acute abdomen, spasm of facial muscles, hypertension, tachycardia
e. More than 50% of cases get initial pinprick then erythematous lesion that looks like a target; lesion 1 - 2 cm
f. Treatment
    i. Ice to bite site, benzodiazepines for muscle cramps
    ii. Antivenom for severe symptoms (including pain) not relieved by above, for pregnant patient and hypersensitive patient

25. Maisonneuve fracture
    a. Associated with proximal fibular fracture, deltoid ligament disruption, peroneal nerve injury, and ankle joint instability
    b. Peroneal nerve injury
        i. Motor: foot dorsiflexion
        ii. Sensory: dorsum of the foot
        iii. Deep peroneal injury only: sensory dorsum between big toe and second toe

26. Avulsion fracture of the triquetrum (Fischer's fracture)
    a. Second most common fracture of the wrist (scaphoid most common)
    b. X-ray shows a small avulsed fragment displaced posteriorly from the surface of the triquetrum, with minimal overlying soft-tissue swelling
    c. Patient complains of wrist pain and on lateral wrist X-ray, you only see a dorsal chip

27. Urethral injury
    a. Anterior
        i. Straddle, iatrogenic, foreign body
        ii. Hematuria, blood at meatus
        iii. Complications: fistula, stricture
    b. Posterior, proximal to the uretero genital diaphragm
        i. Pelvic fracture, shearing mechanism
        ii. Distended bladder, abdominal pain, dysuria, high-riding prostate
        iii. Complications: impotence, incontinence

28. Burns
    a. Burn size quantified as body surface area (BSA)
    b. Rule of nines
        i. BSA divided into areas representing 9% or multiples
    c. Palm of hand is approximately 1% BSA
    d. Lund and Browder burn diagram is more precise, age-adjusted, more complex

e. 1st degree burn
    i. Epidermal layer only, red, painful, tender, heal in 7 days
f. 2nd degree burn – superficial partial
    i. Epidermal, superficial dermis, papillary layer, blisters with pain, good capillary refill, heal in 14 - 21 days
g. 2nd degree burn – deep partial
    i. Reticular layer, hair follicles, sweat and sebaceous glands, pale dermis, no blanching, no capillary refill, no pain, (scar), heal in 3 weeks - months
h. 3rd degree burn – full thickness
    i. Epidermal and dermal, grafting, scarring, skin charred, pale
i. 4th degree burn
    i. Subcutaneous fat, muscle, bone
j. ABA Criteria for transfer to burn center
    i. Partial thickness greater than 10% TBS
    ii. Full thickness greater than 5%
    iii. Burns to face, hands, feet, perineum, genitalia, major joints
    iv. Third degree burns
    v. Electrical burns, including lightning
    vi. Chemical burns
    vii. Inhalation injury
    viii. Burns complicated with fractures
    ix. Burns complicated with pre-existing medical disorders
    x. Burned children in hospitals without qualified personnel or equipment
    xi. Burn injury in patients requiring special needs: social, emotional, rehabilitative intervention
k. Keycepts
    i. Protect C-spine, inspect airway for burns, carbonaceous sputum, etc., intubate early
    ii. Check CO levels
    iii. Look for eye injuries (burns, abrasions, etc.), other injuries (blunt trauma)
    iv. Parkland-based fluids (4 mL/kg/% burn)
    v. ECG for electrical injuries
    vi. Check renal status
    vii. Tetanus up to date?
    viii. Treat pain, prevent hypothermia
l. Who goes to burn unit?
    i. Partial thickness
        a) More than 20% BSA in 10 - 50 year old
        b) More than 10% BSA in less than 10 years old or more than 50 years old
    ii. Full thickness more than 5%
    iii. Burns to hands, feet, perineum, face, X major joints
    iv. Electrical burns

v. Burns complicated with fractures

29. Hypothermia
    a. In hypothermia, the heart becomes increasingly susceptible to arrhythmias as the temperature falls below about 86°F (30°C); shivering stops at 90°F (32°C); ECG changes most often seen in hypothermia include
        i. Sinus bradycardia
        ii. Osborne (J) wave (a short broad positive wave appended to the S wave of the QRS, especially in Lead II)
        iii. Slowed conduction with prolonged PR interval, then a widened QRS, then most characteristically a prolonged QTc interval
        iv. Inconsistent inverted T-waves and ST-segment abnormalities
        v. Atrial fibrillation or flutter
        vi. AV clock and/or nodal rhythm
        vii. PVCs, ventricular fibrillation, asystole (spont at 27°C (80°F))
        viii. Asystole unresponsive at 18°C (65°F)

30. Hypothermia
    a. Mild: 32° - 35°C
        i. Lethargy, shivering, ataxia
    b. Moderate: 28° - 32°C
        i. Delirium, slow reflex, bradycardia, stupor, no shiver at less than 30°C
    c. Severe: less than 28°C
        i. Coma, dysthymias, apnea, no pulse, areflexia, fixed dilated pupils
    d. At 32°C
        i. Excitation gives way to slowing
    e. At 30°C
        i. Loss of shivering, at risk for dysrhythmias (sinus bradycardia to atrial fibrillation with slow response, to ventricular fibrillation, to asystole)
    f. Continue CPR until temperature gets to 30°C, passive rewarming okay at 30° - 35°C, active rewarming at less than 30°C, cardiopulmonary bypass at less than 28°C
    g. Cerebral metabolism decreases 6 - 7% per 1°C
    h. Target temperature for therapeutic hypothermia in cardiac arrest is 33° - 34°C

31. What requires immediate descent for a mountain climber at high altitude? (If ataxia is one of the answers, use it)
    a. Ataxia is an early sign of HACE and HACE is lethal (HAPE is more common, HACE is more lethal)
    b. Others such as lassitude, headache (even severe, because this is very variable), occur in people at high altitude

32. Purulent tenosynovitis
    a. Kanavel's signs include
        i. Diffuse swelling of the finger
        ii. Pain on passive extension
        iii. Tenderness along the flexor tendon sheath
        iv. Finger held in slight flexion
    b. Usually due to a penetrating wound, usually associated with *Staphylococcus*, and the patient is at risk for compartment syndrome
    c. Hand surgeon referral for I&D and antibiotics

33. Hip injuries
    a. Posterior dislocation – most common (90%)
        i. Limb appears shortened, internally rotated, adducted, and flexed
        ii. 27% get osteoarthritis, 8 - 30% get avascular necrosis of femoral head
        iii. Dislocation must be reduced within 6 hours
    b. Anterior dislocation
        i. Limb is abducted, externally rotated, flexed
    c. Displaced femoral neck fracture
        i. Externally rotated, abducted, shortened

34. Ring enhanced lesions on CT
    a. Brain abscess
        i. Triad: headache, fever, focal neurological deficits
        ii. Immunocompromised
        iii. Frontal/mastoid sinusitis
        iv. Endoscopy
    b. Neurocysticercosis
        i. Seizures, most common cause of 2° epilepsy in developing country
        ii. Nausea and vomiting, headache, altered mental status
        iii. Tapeworm: Taenia solium
    c. Toxoplasmosis
        i. AIDS patient
        ii. Headache, seizures, confusion, lethargy, focal neurologic deficits, cerebellar
    d. Congenital infections causing severe fetal abnormalities

        TORCHES

        TO Toxoplasmosis
        R Rubella
        C CMV (most common)
        H Herpes simplex/HIV/Hepatitis
        E Epstein-Barr
        S Syphillis

35. Extension teardrop fracture
    a. Anterior longitudinal ligament avulses off the anterior inferior vertebral body fragment with forced extension
    b. Posterior ligamentum flavum buckles and compresses the cord against anterior osteophytes resulting in contusion of anterior aspects of the cord
    c. Unstable
    d. Anterior spinal artery compromised = central cord syndrome (elderly)

36. Central cord syndrome – most common incomplete cord lesion – defining feature of central cord syndrome is sacral sparing (Preserved perineal sensation, voluntary rectal motor functions, big toe flexor activity, and preservation of bulbocavernosis reflex); some motor and position fibers may survive central cord syndrome
    a. Older person, hyperextension injury to the neck
    b. Decreased strength in upper extremities, worse than lower extremities
    c. Variable degree of pain and temperature loss
    d. If sacral sparing is present, better prognosis
        i. Sacral sparing = partial lesion = 30 - 50% recovery

37. Anterior cord syndrome – the defining feature of anterior cord syndrome is preserved position sense without preserved pain; some motor fibers may survive in an anterior cord syndrome
    a. Damage to anterior 2/3 of spinal cord
        i. Corticospinal tract: weakness and reflex changes
        ii. Spinothalamic tract: bilateral loss of pain and temperature sensation
    b. Tactile, position, and vibratory sense intact (all dorsal column)
    c. Urinary incontinence is often present due to damage of autonomic fibers
    d. Flexion injury with variable degree of motor paralysis
    e. Loss of sensation and temperature, vibration & proprioception senses preserved

38. Brown-Sequard syndrome
    a. Penetrating injury to the back with hemicord transection
    b. Ipsilateral loss of motor, position/vibration, touch; contralateral loss of pain, temperature

39. Sudden loss of vision

	Associations
Central retinal artery occlusion	Pale retina, cherry red spot
Central retinal vein occlusion	Squashed tomatoes, blood and thunder
Retinal detachment	Sand dunes, flashes of light, lowering curtain

Temporal arteritis	Polymyalgia rheumatic, 50, elevated ESR, prednisone, blindness, jaw claudication
Multiple sclerosis	Optic neuritis, bilateral internuclear opthalmoplegia, red desaturation test
Amaurosis Fugax	Ocular TIA

40. Neck injuries
    a. Zones of the neck
        i. Zone I: inferior aspect of cricoid cartilage to the thoracic outlet
        ii. Zone II: cricoid to angle of mandible
        iii. Zone III: angle of mandible to the base of the skull
    b. The neck is protected posteriorly by cervical spine, superiorly by the skull, inferiorly by the chest; anterior and lateral regions are the most exposed
    c. Posterior triangle: posterior border of sternocleidomastoid, anterior border of the trapezius, middle one-third of the clavicle inferiorly
        i. Carefree zone
        ii. Careful zone: subclavian vessels, potential for air embolism
    d. Anterior triangle: anterior border of sternocleidomastoid, underside of mandible, midline anteriorly
        i. Airway, carotid artery, internal jugular vein, vagus nerve
    e. Penetrating neck injury
        i. Hard signs – significant injury probably exists, unstable require surgical exploration
            a) Unexplained hypotension
            b) Cerebral ischemia
            c) Arterial bleeding
            d) Expanding hematoma
            e) Thrill/bruit
            f) Hemothorax greater than 1,000
            g) Bubbling wound
            h) Hemoptysis
            i) Focal findings
            j) Pulse deficit
            k) Airway obstruction
        ii. Soft signs – require diagnostic evaluation
            a) Hoarseness
            b) Dyspnea, dysphagia
            c) Proximity to major blood vessel
            d) Stridor
            e) Vocal cord paralysis
            f) Subcutaneous air
            g) 7th nerve palsy

h) Complex fractures
i) Stable hematoma

41. The inconsolable child

SOA BITCH
Strangulation: digit, penis
Open diaper pin
Anal fissure

Battered
Infection (UTI, OM, meningitis, intussusception)
Testicular torsion
Corneal abrasion
Hernia (incarcerated)

42. Galeazzi fracture – radius
    a. The radius and ulna have adjacent joints at both ends; thus, a fracture of the shaft of one with significant angulation often results in fracture of the other
    b. Distal 1/3 radius fracture with distal radioulnar joint dislocation and distal deformity
    c. May have ulnar nerve injury

43. Monteggia fracture
    a. Ulnar fracture with proximal radial head dislocation and elbow deformity
    b. May have radial nerve injury
    c. Apex of ulnar fracture points in the direction of the radial head dislocation (often missed on X-ray)
    d. ORIF required

44. Penetrating neck injury – Keycepts
    a. Zone I has highest mortality, Zone III lowest
    b. *25%* of patients with esophageal injuries have **negative gastrografin** studies; barium upper GI series may improve sensitivity
    c. Fiberoptic **esophagoscopy** has a **20% false negative** rate
    d. Best initial method to control hemorrhage is direct pressure
    e. In posterior triangle injuries (in careful zone) below spinal accessory nerve, subclavian venous access should be avoided (may have subclavian vein injury)
    f. **Horner's syndrome** (dilated pupil, lid lag, anhydrosis) indicates sympathetic ganglion injury where there is potential associated injury to the **carotid artery**