Ventilator Care

- Maintain a patent airway
    - Assess the position and placement of tube
    - Document size ET and tube placement in centimeters at the clients teeth or lips
    - Use 2 staff members for repositioning and to re-secure the tube, REPOSITION Q2H and PRN
    - Perform PRM
    - Apply protective barriers (soft wrist restraints) according to hospital protocol to prevent self-extubation
        - ONLY IF NECESSARY
    - Suction oral and tracheal secretions to maintain tube patency
    - Support ventilator tubing to prevent mucosal erosion and displacement
    - Have a resuscitation bag with a face mask available at the bedside at all times in case of ventilator malfunction or accidental extubation
- Assess respiratory status every 1-2 hr.
    - Breath sounds equal bilaterally, presence of reduced or absent breath sounds, respiratory effort or spontaneous breaths
- Monitor VS, ABGs, CXRs, LOC
- Monitor and document ventilator settings hourly
    - Rate, FiO2, and tidal volume
    - Mode of ventilation
    - Use of adjuncts (PEEP, CPAP)
    - Plateau or peak inspiratory pressure (PIP)
    - Alarm settings
- Monitor ventilator alarms, which signal if the client is not receiving the correct ventilation
    - Never turn off ventilator alarms
    - 3 types of ventilator alarms
        - Volume (low pressure): indicate a low exhaled volume d/t a disconnection, cuff leak, or tube displacement
        - Pressure (high pressure): indicate excess secretions, client biting the tubing, kinks in the tubing, client coughing, pulmonary edema, bronchospasm, or pneumothorax
        - Apnea: indicate that the ventilator does not detect spontaneous respiration in a preset time period
- Maintain adequate (but not excessive) volume in the cuff of the ET tube
    - Assess cuff pressure at least every 8 hr. Maintain the cuff pressure below 20 mmHg to reduce the risk of necrosis of the vocal cords
    - Assess for an air leak around the cuff (client speaking, air hissing, or decreasing SpO2). Inadequate cuff pressure can result in inadequate oxygenation and/or accidental extubation
        - Example: COVID pt needs ET tube replaced
- Administer medications as prescribed
    - Analgesics: morphine and fentanyl
        - Minimize pain, can help with respiratory efforts
    - Sedatives: propofol, diazepam, lorazepam, midazolam
        - sedate (calm, reserved state)

    - Neuromuscular blocking agents: pancuronium, atracurium, vecuronium are infrequently used in the clinical setting d/t long-half life
    - Ulcer-preventing agents: famotidine (pepcid) or lansoprazole (prevacid)
    - antibiotics : for established infections
- Provide oral care/suctioning Q2H and PRN: helps prevent VAP
- Reposition the oral ET tube every 24 hr or according to protocol. Assess for skin breakdown
- Provide adequate nutrition if necessary
    - Assess GI functioning every 8 hr
    - Monitor bowel habits
    - Administer enteral or parenteral feedings as prescribed
- Weaning
    - Continually monitor the client during the weaning process and watch for signs of weaning intolerance
        - RR > 30 or <8
        - BP or HR changes more than 20% of baseline
        - SaO2 <90%
        - Dysrhythmias, elevated ST segment
        - Significant decrease in tidal volume
        - Labored respiration, increased use of accessory muscles, and diaphoresis
        - Restlessness, anxiety, and decreased LOC
- Extubation
    - Deflate the cuff on the ET tube, and remove the tube during peak inspiration
    - Following extubation, monitor for signs of respiratory distress or airway obstruction, such as ineffective cough, dyspnea, and stridor
    - Assess SpO2 and VS every 5 min
    - Encourage coughing, deep breathing, and use of IS
    - Reposition the client to promote mobility of secretions
    - Older adult clients have decreased respiratory muscle strength and chest wall compliance, which makes them more susceptible to aspiration, atelectasis, and pulmonary infections. Older adult clients require more frequent position changes to promote mobility of secretions
- Checklist (@ SBLHS)
    - HOB > 30 degrees
    - Temperature
    - DVT prophylaxis
    - Ulcer prophylaxis
    - WBC count
    - Maximum FiO2
    - Minimum FiO2
    - Maximum Peep
    - Minimum Peep

Pneumothorax causes/findings

- Presence of air or gas in the pleural space that causes lung collapse
- Tension pneumothorax
    - Occurs when air enters the pleural space during inspiration through a one-way valve and is not able to exit upon expiration

    - Trapped air causes pressure on the heart and lung, as a result the increase in pressure compresses blood vessels and limits venous return, leading to decrease in CO
    - Death can result if not treated immediately
    - As a result of a tension pneumothorax, air and pressure continue to rise in the pleural cavity, which causes a mediastinal shift
- Spontaneous pneumothorax
    - Occurs when there has been no trauma; a small bleb on the lung ruptures and air enters the pleural space
- Expected findings
    - Anxiety
    - Pleuritic pain
    - Signs of respiratory distress (tachypnea, tachycardia, hypoxia, cyanosis, dyspnea, and use of accessory muscles)
    - Tracheal deviation to the unaffected side (tension pneumothorax)
    - Reduced or absent breath sounds on the affected
    - Asymmetrical chest wall movement
    - Hyperresonance on percussion d/t trapped air
    - Subcutaneous emphysema (air accumulating in subcutaneous tissue)
- Labs/Diagnostics
    - ABGS → hypoxemia (PaO2 <80)
    - CXR → used to confirm diagnosis
    - Thoracentesis → surgical perforation of the chest wall and pleural space with a large bore needle
- Nursing Care
    - Administer O2 therapy
    - Auscultate heart and lung sounds and monitor VS Q4H
    - Document ventilator settings hourly if the client is receiving MV
    - Check ABGs, SaO2, CBC, CXR results
    - Position the client to maximize ventilation (high-Fowler's)
    - Monitor chest tube drainage
    - Administer medications as prescribed
    - Encourage prompt medication attention when evidence of infection occurs
    - Instruct the client to deep breathe to promote lung expansion

ET tube placement

- Common misplacement is often in the right main bronchus, pull back ET tube and reassess
- Common signs you are in the right main bronchus and not above the carina
- Right sided breath sounds heard but left sided breath sounds are absent, left sided chest wall expansion is absent, possible low SpO2

- Administer sedation and neuromuscular blocking agents
- Intubation attempts cant last longer than 30 seconds and then re-oxygenate before another attempt to intubate
- Monitor VS and check for proper tube placement
- Auscultate for breath sounds bilaterally after intubation
- Secure with tape

- Monitor for hypoxemia, dysrhythmias, and aspiration
- Hyperoxygenate

Chest tube normal/abnormal findings

- Chest tube complications:
  - Air leak:
    - monitor the water seal for continuous bubbling (indicated air leak), check connections
  - Disconnection or damage:
    - if tubing seperates tell the patient to exhale and cough to remove air
    - if the chest tube is compromised immerse it in sterile water
    - if the chest tube is accidently removed dress it with a dry sterile gauze
  - Tension pneumothorax:
    - Causes: sucking chest wound, prolonged clamping, kinks, obstruction of tubing, high levels of PEEP
    - S/S: tracheal deviation, absent breath sounds on one side, distended neck veins, respiratory distress, asymmetry of the chest, cyanosis

- Normal findings
  - Constant bubbling in the suction chamber
  - Water seal chamber:
  - Contains 2 cm of water
  - Prevents backflow of air into the patient
  - Intermittent bubbling is normal during exhalation, coughing, or sneezing
  - Tidaling in this chamber is normal
  - Continuous bubbling indicates an air leak
  - Cessation of tidaling indicates occlusion of the chest tube
  - Suction control chamber
  - Should have continuous bubbling to indicate suction is working

Blood transfusion times/nursing responsibilities

- Obtain baseline vitals PRE-transfusion
  - Temperature
  - Pulse
  - Respirations
  - Oxygen saturation
  - Blood Pressure
  - Document any preexisting skin rashes
- 30 minutes to initiate transfusion once blood has been received
- Transfuse slowly for the first 15 minutes (5mL/min)
- 4 hours to completely administer
- Stay with patient for the first 15 minutes and observe closely
- After the first 15 minutes, repeat and document vital signs
- Reactions most likely to occur in the first 15 minutes
- Changes from baseline vitals can indicate transfusion reaction
  - Tachycardia
  - Hypotension

    - Tachypnea
    - Fever
- Prime Y-tubing with 0.9% sodium chloride (NS)
- New Y-tubing and bag of normal saline should be used for each unit of blood being given
- Confirm type and crossmatch has been ordered and drawn (blood type and Rh factor)
- Verify transfusion order
    - WHAT product to administer
    - HOW many units to administer
    - MEDICATIONS to administer, if any (pre, between and post transfusion)
- Confirm pt has given informed consent
- Provide pt education
    - Risks and benefits
    - What to expect during
    - Manifestations of transfusion reactions
    - When and how to call for assistance
- Check for appropriate vascular access
    - 18 or 20 gauge IV
- Prepare IV tubing
- Complete head to toe assessment
- Complete baseline vitals
- Complete request form for blood product
- Confirm w/ blood bank
    - Pt name
    - Pt DOB
    - Pt medical record number (MRN)
    - Pt blood bank ID
- CHECKED BY TWO RN'S AT BEDSIDE

Pulmonary embolism and fat embolism S/S and treatment

- **Pulmonary embolism**
    - Anticoagulants, direct factor Xa inhibitor, and thrombolytic therapy
    - Nursing interventions
        - Administer oxygen therapy to relieve hypoxemia and dyspnea
        - Position the patient in high fowlers
        - Initiate and maintain IV access
        - Administer meds as prescribed
        - Assess respiratory status every 30 mins
        - Assess cardiac status
        - Provide emotional support and comfort to control anxiety
        - Monitor changes in LOC and mental status
- **Fat embolism**
    - Early
        - Dyspnea
        - Increased RR
        - HA
        - Decreased O2 sat
        - Decreased mental acuity related to low arterial O2 level

    - Respiratory distress
    - Tachycardia
    - Confusion
    - Chest pain
- Late
    - Cutaneous petechiae (pinpoint-size subdermal hemorrhages that occur on neck, chest, upper arms, and abdomen from blockage of capillaries by fat globules)
    - Discriminating finding from pulmonary edema

Acute respiratory failure manifestations

- Dyspnea, orthopnea, cyanosis, pallor, hypoxemia, tachycardia, confusion, irritability or agitation, restlessness, hypercarbia, and accessory muscle use
- · Respiratory failure is a sudden and life-threatening deterioration of the gas exchange function of the lung
    - PaO2 less than 60 mm Hg (Hypoxemia) and PaCO2 >50 mm Hg (hypercapnia) with an arterial pH <7.35

Defibrillation/Cardioversion

- Defibrillation: Ventricular fibrillation, ventricular tachycardia without a pulse
    - Used in emergency situations as a treatment of choice for ventricular fibrillation and pulseless VT (Not used in conscious people or who have a pulse)
    - The sooner it's used, the better the survival rate
    - Delivery of the current is immediate and unsynchronized
- · Electrical Cardioversion: Atrial dysrhythmias, supraventricular tachycardia, ventricular tachycardia with a pulse

Coronary artery disease risk factors

- Healthy diet
- Cessation of smoking
- exercise

Atelectasis/pulmonary edema

- **Atelectasis**
    - Increasing dyspnea
    - Diminished breath sounds in lower lobes
    - Cough and sputum production
    - If large amount of lung tissue → marked respiratory distress may be observed
    - Tachycardia
    - Tachypnea
    - Pleural pain
    - Central cyanosis (a bluish ski hue that is a late sign of hypoxemia)
- **Pulmonary edema**
    - Frothy sputum
    - Dyspnea
    - Crackles

Nursing priority actions/who to see first

- Airway
- Breathing
- Circulation

DIC

Patho

- In DIC, normal hemostatic mechanisms are altered.
- The inflammatory response generated by the underlying disease initiates the process of inflammation and coagulation within the vasculature
- The natural anticoagulant pathways within the body are simultaneously impaired, and the fibrinolytic system is suppressed so that a massive amount of tiny clots forms in the microcirculation
- Initially, the coagulation time is normal. However, as the platelets and clotting factors form microthrombi, coagulation fails
    - Thus, the paradoxical result includes excessive clotting and bleeding
- The clinical manifestations of DIC are primarily reflected in compromised organ function or failure
- Decline in organ function is usually a result of excessive clot formation (with resultant ischemia to all or part of the organ) or, less often, of bleeding
- The excessive clotting triggers with fibrinolytic system to release fibrin degradation products, which are potent anticoagulants, furthering the bleeding
- The bleeding is characterized by low platelet and fibrinogen levels' prolonged PT, aPTT, and thrombin time; and elevated fibrin degradation products and D-Dimers
- Mortality rate: 80%

S/S

- Bleeding from mucous membranes, venipuncture sites, and the GI and urinary tract
- Bleeding can range from minimal occult internal bleeding to profuse hemorrhage from all orifices
- Typically develop MODS
- Initial phase: patient may not have any new symptoms
    - Only manifestations: decrease in platelet count
- As thrombosis becomes more extensive, the patient exhibits signs and symptoms of thrombosis in the organs involved
- Then, as the clotting factors and platelets are consumed to form these thrombi, bleeding occurs
- Bleeding is initially subtle but can develop into frank hemorrhage

Labs

- The bleeding is characterized by low platelet and fibrinogen levels' prolonged PT, aPTT, and thrombin time; and elevated fibrin degradation products and D-Dimers

Treatment

- Treat underlying condition
- Correct secondary effects of tissue ischemia by
    - Improve oxygenation
    - Replace fluids
    - Correct electrolyte imbalances
    - Administer vasopressor medications
- If serious hemorrhage occurs:
    - Cryoprecipitate: replace fibrinogen and factors V and VII
    - Platelets: correct severely low platelet levels and can control bleeding
    - Caution with FFP:
        - Replaces coagulation factors but can exacerbate capillary leak, further compromising pulmonary function
- Controversial treatment strategy can be used to interrupt the thrombosis process through the use of heparin infusion
- Heparin may inhibit the formation of microthrombi and thus permit perfusion of the organs (skin, kidneys, or brain) to resume
    - Prophylactic dose: prevent
    - Therapeutic dose: severe thrombosis
- Effectiveness of heparin
    - Normalization of plasma fibrinogen concentration
    - Diminished signs of bleeding

Acid-base imbalances- how to calculate and causes of abnormal

- Metabolic Acidosis:
    - pH: lower than 7.35
    - PaCO2: 35-45
    - HCO3: lower than 22
    - Characterized by
        - Headache
        - Confusion
        - Drowsiness
        - Tachypnea
        - Hypotension
        - Decreased cardiac output
        - Dysrhythmia
        - Shock
- Metabolic alkalosis
    - pH: higher than 7.45
    - PaCO2: 35-45
    - HCO3: greater than 26
    - Characterized by:
        - Respiratory depression
        - Tachycardia
        - Symptoms of decreased calcium
        - Symptoms of hypokalemia

- Respiratory acidosis
    - pH: lower than 7.35
    - PaCO2: greater than 45
    - HCO3: 22-26
    - Characterized by:
        - Tachycardia
        - Tachypnea
        - Hypertension
        - Mental changes
        - Feeling of fullness in the head
- Respiratory alkalosis
    - pH: higher than 7.45
    - PaCO2: lower than 35
    - HCO3: 22-26
    - Characterized by:
        - Lightheadedness
        - Inability to concentrate
        - Numbness and tingling
        - LOC

Hypovolemic Shock causes and S/S

Causes

- Decrease in intravascular volume of at least 15 - 30%
- Excessive fluid loss from diuresis, vomiting, or diarrhea
- Blood loss secondary to surgery, trauma, burns, DKA

S/S

- tachycardia
- hypoxia, tachypnea
- skin can be pale, mottled or dusky in color, cool, diaphoretic
- decreased blood pressure with narrowed pulse pressure
- Postural hypotension
- Decreased cardiac output
- Central venous pressure decreased
- decreased urine output
- Seizures

Fluid overload S/S

- Fluid volume excess
- Acute weight gain
- Peripheral edema and ascites
- Distended jugular veins
- Crackles
- Elevated CVP
- Shortness of breath
- Elevated BP
- Bounding pulse and cough

- Increased RR
  increased Urinary output

Treatment of cardiogenic, septic, and anaphylactic shock

Cardiogenic:

- Monitor hemodynamic status
- Administer fluid, analgesics, inotropic medications (dobutamine), vasopressors, antiulcers
- Ensure safety and comfort
- Maintain/monitor intra-aortic balloon pump (IABP)
- Administer supplemental oxygen
- Monitor ECG for dysrhythmias
- Assist with intubation as indicated

Septic

- Monitor hemodynamic status
- Administer fluid, analgesics, antibiotics, vasopressors, antiulcers
- Ensure safety and comfort
- Administer supplemental oxygen
- Obtain blood cultures
- Assist with intubation as indicated
- Pre- and post-operative care if surgical debridement of a wound is indicated

Anaphylactic Shock

- Monitor hemodynamic status
- Administer fluid, corticosteroids, antihistamines, sympathomimetics, vasopressors
    - IM epinephrine
    - Benadryl and Zantac
    - nebulized bronchodilators
- Administer supplemental oxygen
- Assist with intubation as indicated

Cast care/assessment

Cast Care

- Clean and dry area prior to casting
- Tubular cotton web roll applied before casting material
- Monitor neurovascular status every hour for first 24 hours
- Assess pain
- Apply ice for 24 to 48 hours
- Handle a plaster cast with palms, not fingertips, until cast is dry
- Avoid setting cast on hard surfaces or sharp edges
- client so warm, dry air circulates around and under the cast
- Support casted area without pressure under or directly on the cast
- Use gloves to touch cast until completely dry
- Elevate cast above heart level for first 24 to 48 hours
- Use cloth-covered pillow instead of plastic while cast is drying
- Should be room to fit one finger between skin and cast
- Document presence of drainage and sudden increase in drainage
- Provide assistive devices as needed (sling, crutches, walker, etc.)
- Inspect cast Q8-12H.

Neurovascular/Cast Assessment

- pain level, location, and frequency
- sensation, numbness/tingling
- skin temperature
- capillary refill
- pulses
- movement

Prevent amputation complications

- Flexion contractures
    - ROM exercises and proper positioning immediately after surgery
    - May or may not elevate the residual limb on a pillow
    - Client should lie prone for 20-30 min several times a day
    - Discourage prolonged sitting
    - Stand using good posture with residual limb in extension
- Infection
    - Position in dependent position to promote blood flow and oxygenation
    - Administer antibiotics
    - Change dressings as prescribed
    - Record characteristics of drainage (amount, color, odor)
- Cardiopulmonary complications from surgery
- Phantom limb pain
    - Administer analgesics, antispasmodics, beta blockers, antiepileptics as prescribed
    - Teach client to push the residual limb down toward the bed while supported on a soft pillow
- Deep vein thrombosis (DVT)
    - Use sequential compression devices (SCDs)
    - ROM exercises
    - TED hose or anti embolism stockings
- Stump hematoma

Osteomyelitis

- Signs/Symptoms:
    - bone pain that is constant, pulsating, localized, and worse with movement
    - erythema and edema at infection site
    - fever
    - leukocytosis, elevated ESR
    - S/S may disappear if infection becomes chronic
- Treatment:
    - 3 months IV and oral antibiotic therapy
    - surgical debridement
    - hyperbaric oxygen treatments
    - surgically implanted antibiotic beads
    - amputation
    - bone graft

Increase Intracranial pressure and normal value

Normal Value:

- 10-15 mmHg

Treatment

- intraventricular catheter
    - Burr hole is made in anterior horn of lateral ventricles
    - fluid-filled catheter is inserted
    - allows for monitoring and drainage simultaneously
- subarachnoid screw or bolt
- epidural or subdural sensor
    - fiber optic device measures amount of light reflected from pressure-sensitive diaphragm in cathete epidural space
    - considered non-invasive because it does not penetrate the dura
- IV Mannitol to decrease ICP
    - given slowly
    - observe for possible heart failure or pulmonary edema

Nursing actions

- maintain patent airway
    - GCS less than 8, intubate
    - suction secretions
    - assess lung sounds Q8H
    - discourage coughing
    - elevate HOB 30 - 45 degrees
- avoid straining, Valsalva maneuver
- keep head in neutral, midline position
- avoid extreme rotation and flexion of neck
- avoid extreme hip flexion
- monitor ICP
- minimal environmental stimuli
- maintain calm atmosphere
- avoid emotional stress and frequent arousal from sleep
- assess fluid status
- maintain negative fluid balance
- prevent infection
- monitor VS frequently

S/S

- severe headache
- deteriorating LOC
- restlessness, irritability
- dilated or pinpoint pupils
- slowness to react
- altered breathing pattern (Cheyne-Stokes)
- deteriorating motor function
- abnormal posturing (decorticate, decerebrate, flaccid)

Meningitis

- Signs/Symptoms:
    - excruciating, constant headache
    - nuchal rigidity
    - photophobia
    - fever, chills
    - nausea, vomiting
    - altered LOC (confusion, disorientation, lethargy, difficulty arousing, coma)

- positive Kernig's (leg)
- positive Brudzinski's (neck)
- hyperactive DTRs, seizures
- Tachycardia
- restlessness, irritability
- Red macular rash *(meningococcal meningitis)*

Ischemic and hemorrhagic stroke S/S and treatment

Ischemic

- Signs/Symptoms:
  - numbness or weakness of face, arm, or leg, especially one-sided
- Treatment:
  - Thrombolytic medications
  - Low-dose aspirin

Hemorrhagic Stroke

- signs/symptoms
  - exploding headache
  - decreased LOC
- treatment
  - control bleeding
  - evacuate the clot
  - maintain ICP with normal range

Glasgow coma scale

- normal is 15
- less than 8, intubate
- comatose client is 8 or less
- totally unresponsive is 3
- eye opening
  - 4 = spontaneous
  - 3 = to sound
  - 2 = to pain
  - 1 = no response
- verbal
  - 5 = oriented x 4
  - 4 = incoherent and disoriented
  - 3 = inappropriate words
  - 2 = sounds made, no words
  - 1 = no response
- motor
  - 6 = follows commands
  - 5 = local pain reaction
  - 4 = general withdrawal from pain
  - 3 = decorticate posturing
  - 2 = decerebrate posturing
  - 1 = no response

Traumatic amputation

- Implement EMS
- Apply direct pressure using gauze or clean cloth

- Elevate the extremity above the heart
  Wrap the severed extremity in dry sterile gauze or clean cloth, place in sealed plastic bag, submerge in ice water (1 ice, 3 parts water), send with client

Triage- ED and disaster

ED:

Level 1: Resuscitation

- requires immediate life-saving intervention
- Examples:
    - cardiac arrest
    - respiratory arrest
    - severe respiratory distress, agonal or gasping respirations
    - SpO2 < 90%
    - Unresponsive
    - Overdose with respirations 6/min
    - Severe bradycardia or tachycardia with signs of hypoperfusion
    - hypotension with signs of hypoperfusion
    - Chest pain, pale, diaphoretic, SBP 70 by palpation
    - weak and dizzy, heart rate 30 bpm
    - anaphylactic shock
    - a flaccid baby
    - Immediate fluid resuscitation
    - hypoglycemia with change in mental status
    - intubated head bleed with unequal pupils
    - shock/sepsis

Level 2: Emergent

- high-risk situation
    - active chest pain, suspicious for ACS
    - needle stick in health care worker
    - signs of a stroke
    - possible ectopic pregnancy, hemodynamically stable
    - suicidal or homicidal
    - immunocompromised with fever

- confused/lethargic/disoriented
    - new-onset confusion in elderly
    - 3-month-old sleeping all the time
    - confused and disoriented adolescent
- severe pain/distress
    - distressed facial expression, grimacing, crying
    - diaphoresis
    - body posture
    - changes in vital signs
- danger zone vital signs
- “Would I give my last open bed to this patient?”
- Other examples:
    - syncope
    - hypothermic infants
    - febrile infants < 28 days
    - hemophilia patients with possible acute bleed

        - moderate to severe croup
        - moderate to severe lower airway obstruction
        - seizures
        - possible meningitis

- Level 3: Urgent
    - many resources required

- Level 4: Less urgent
    - one resource required

- Level 5: Non-urgent
    - no resources required
    - Examples:
        - medication refills
        - ear pain in healthy children
        - contusions and abrasions
        - URI with normal vitals
        - poison ivy on extremities

Disaster

- Red: Immediate, FIRST priority
    - Life-threatening injuries but survivable with minimal intervention
    - Can progress rapidly to expectant if treatment is delayed
    - Examples:
        - sucking chest wound
        - airway obstruction secondary to the mechanical cause
        - shock
        - hemothorax
        - tension pneumothorax
        - asphyxia
        - unstable chest and abdominal wounds
        - incomplete amputations
        - open fractures of long bones
        - 2nd/3rd degree burns of 15-40% total BSA

- Yellow: Delayed, SECOND priority
    - Injuries are significant and require medical care, but can wait hours without threat to life or limb
    - Examples:
        - stable abdominal wounds without evidence of significant hemorrhage
        - soft tissue injuries
        - maxillofacial wounds without airway compromise
        - vascular injuries with adequate collateral circulation
        - GU tract disruption
        - fractures requiring open reduction, debridement, and external fixation
        - most eye and CNS injuries

- Green: Minimal, THIRD priority
    - Injuries are minor, and treatment can be delayed hours to days
    - “walking wounded”
    - move away from the main triage area
    - Examples:

        - upper extremity fractures
        - minor burns
        - sprains
        - small lacerations without significant bleeding
        - behavioral disorders or psychological disturbances
- Black: Expectant, FOURTH priority
    - injuries are extensive and unlikely to survive even with definitive care
    - separate from others but do not abandon
    - comfort care
    - Examples:
        - Unresponsive patients with penetrating head wounds
        - high spinal cord injuries
        - wounds involving multiple anatomic sites and organs
        - 2nd/3rd degree burns in excess of 60% of BSA
        - seizures or vomiting within 24 hours after radiation exposure
        - profound shock with multiple injuries
        - agonal respirations
        - no pulse
        - no blood pressure
        - pupils fixed and dilated

Triage officer

- EMT
- Paramedic

Partial-thickness and full-thickness burn s/s

Partial-thickness

- Damage to the entire epidermis and some parts of the dermis
- pink to red
- blisters
- mild to moderate edema
- no eschar
- Painful
- Heals within 2 - 3 weeks
- No scarring, but minor pigment changes

Full-thickness

- Damage to the entire epidermis and dermis
- Can extend into the subcutaneous tissue
- Nerve damage
- May appear red, black, brown, yellow, or white
- No blisters
- Severe edema
- Eschar is hard and inelastic
- Sensation minimal or absent
- Heals within weeks to months
- Scarring
- Grafting

Burns and electrolytes

- hyperkalemia due to hemolyzed cells releasing potassium
- hyponatremia due to sodium rapidly moving into interstitial spaces for edema
- Hyperchloremia due to fluid volume loss and chlorine reabsorption in urine

Primary vs. Secondary assessment

Primary

- Airway and c-spine
- Breathing
- Circulation
- Disability
- Exposure

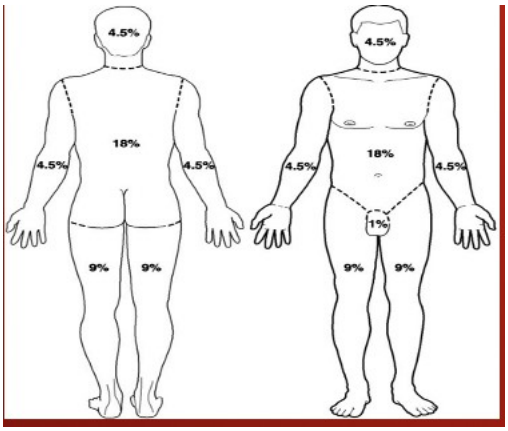
Secondary:

- H&P
- assessment

Fluids specific for blood transfusion, burns, and DKA/HHS

- Blood Transfusion: 0.9% NS
- Burns: LR
- Diabetic Ketoacidosis (DKA)/Hyperglycemic Hyperosmolar Syndrome (HHS): rapid infusion of NS for first few hour
  D5

Rule of Nines



Escharotomy/fasciotomy

Escharotomy

- Incision through the eschar (dead tissue that eventually sloughs off healthy skin after injury)
  - Relieves pressure and improves circulation

Fasciotomy

- Incision through the eschar and fascia
    - Relieves pressure when escharotomy doesn't work and improves circulation

Biological weapons of mass destruction

- Anthrax
- Botulism
- Tularemia
- viral hemorrhagic fevers (dengue, Ebola)
- Smallpox
- plague (bubonic, mnemonic)

Disaster preparedness kit

- Identification
    - Insurance
    - SSN
    - Driver's license
- 1 gallon of water per person a day
    - Recommendations for at least a 3-day supply
- Matches
- Flashlight
- First aid kit
- Nonperishable food
    - Can opener
- Tools
- Radio
- Medical equipment
- Additional pet supplies
- Money
- Warm/clean clothing
- Mediations
- Cleaning products
    - Think of how important it is for us to have cleaning products for COVID
- Writing utensils and whistle for forms of communication
    - Pen
    - Paper
    - Pencil markers

PPE

- Level A
    - Highest level of respiratory, skin, eye, & mucus membrane protection
    - Typically includes self-contained breathing apparatus & fully encapsulating, vapor-tight, chemical, resistant suit with chemical resistant gloves and boots
- Level B
    - Highest level of respiratory protection but a lesser level of skin and eye protection than with level A situations
    - Include SCBA and chemical-resistant suit but it is not vapor tight

- Level C
  - Requires the air-purified respirator, which uses filters or sorbent materials to remove harmful substances from the air
    - A chemical-resistant coverall with splash hood, chemical-resistant gloves, and boots
- Level D
  - Typical work uniform

Pre=planning for a disaster

- Bigger picture
- Community/City/State

Fire emergency steps

- R: rescue
- A: alarm
- C: contain
- E: extinguish

Carbon monoxide

- Causes
  - House fires
  - Cars in closed garages (caused by inhalation)
- Blood level
  - 1-10 is normal
  - Above 10 is poisoning
- S/S
  - Headache
  - Flushing
  - Decreased visual acuity
  - Decreased cerebral functioning
  - Slight breathlessness
  - Nausea
  - Vomiting
  - Tinnitus
  - Vertigo
  - Increased and irregular HR
  - Hypotension
  - Coma
  - Seizures
  - Cardiopulmonary instability
  - Death
- Treatment
  - Oxygen
  - Airway patentcy

heat stroke S/S and treatment

- **DEATH DIRECTLY RELATED TO AMOUNT OF TIME THE PATIENTS BODY TEMPERATURE REMAINS ELEVATED**
    - Temperature > 40 C (104 F)
    - Lack of perspiration
    - Hypotension
    - Tachycardia
    - AMS
    - Abnormal K+ and Na + levels
- IV fluids/oxygen

Insulin- treatment of DKA/HHS

- Regular insulin bolus dose of 0.1 - 0.5 units/kg
- Continuous infusion of regular insulin 0.1 units/kg/hr
- Rehydration
    - isotonic fluids (NS)
    - Rapid infusion for the first 1 - 3 hours
        - 0.5 - 1 L/hr
    - Rehydrate up to 6 - 10 L of IV fluids
    - for BS < 250 mg/dL, give D5 to prevent hypoglycemia
- Restoring electrolytes
    - typically hyperkalemia at first
    - hydration leads to hypokalemia
        - increased plasma volume
        - increase urinary excretion of potassium
        - insulin enhances the movement of potassium into cells
    - Frequent monitoring of electrolyte levels and ECG
    - Initiate potassium replacement therapy when potassium falls below 5 mEq/L

Diabetes insipidus

S/S of diabetes insipidus

- Polyuria (abrupt onset of excessive urination, urinary output of 4 to 30 L/day of dilute urine): failure of the renal tubules to collect and reabsorb water
- Polydipsia (excessive thirst, consumption of 2 to 20 L/day)
- Nocturia
- Fatigue
- Dehydration, as evidenced by extreme thirst, weight loss, muscle weakness, headache, constipation, and dizziness
- Physical assessment findings
    - Sucken eyes
    - Tachycardia
    - Hypotension
    - Loss or absence of skin turgor
    - Dry mucous membranes
    - Weak, poor peripheral pulses
    - Decreased cognition

DX and TX of Diabetes Insipidus

- Diagnosis
    - Water Deprivation test (ADH stimulation test)

        - This is an easy and reliable diagnostic test. Dehydration is induced by withholding fluids
        - A subcutaneous injection of vasopressin produces urine output with an increased specific gravity and osmolality
        - The test is positive for DI if the kidneys are unable to concentrate urine despite increased plasma osmolarity
    - Vasopressin Test
        - A subcutaneous injection of vasopressin produces urine output with an increased specific gravity if the client has central diabetes insipidus. This differentiates central from nephrogenic diabetes insipidus.
- Treatment
    - Lifelong vasopressin therapy
    - ADH replacement agents
        - Desmopressin
    - Diet changes
    - IV therapy
    - Daily weights

SIADH S/S and treatment

- Signs/Symptoms:
    - Headache
    - Weakness
    - Anorexia
    - Muscle cramps
    - Weight gain
    - Personality changes, hostility
    - Sluggish DTRs
    - Nausea, vomiting, diarrhea
    - Oliguria with dark yellow concentrated appearance
- Treatment
- Tetracycline derivative (demeclocycline)
    - Unlabeled use to correct fluid and electrolyte imbalances by stimulating urine flow
    - Contraindicated in clients who have impaired kidney function
- Vasopressin antagonists (tolvaptan, conivaptan)
    - Promote water excretion without causing sodium losses
- Loop diuretic (furosemide)
    - Used to increase water excretion from the kidneys

Hypoglycemia S/S & treatment

Treatment

- 15 g of fast acting concentrated source of carbs
    - Glucose tablets
    - 6-10 live savers
    - 4 tsp sugar
    - 4 sugar cubes

- 1 tbsp honey
- ½ cup of a fruit juice
- 8 oz of low-fat milk
- 6 saltine crackers
- 3 graham crackers

S/S

- Cold & clammy skin
- Tachycardia
- Palpitations
- Diaphoresis
- Shakiness
- Headache
- Tremors
- Weakness

Myxedema coma nursing actions

- Daily weights
- Maintain patient airway
- Monitor patients ABGs
- Continuous ECG
- I&Os
- Monitor mental status
- Warm blankets
- Monitor body temperature (hourly until the patient is stable)
- Replace fluid with normal saline
- Levothyroxine IV bolus (to replace the thyroid hormone)
- Administer corticosteroids
- Check the patient for infection

Glands- Addison's and Cushing's disease

S/S Addisons

- Weight loss
- Craving for salt
- Hyperpigmentation of skin and mucous membranes
- Weakness, fatigue
- Nausea, anorexia, vomiting, abdominal pain
- Constipation or diarrhea
- Dizziness with orthostatic hypotension
- Hyponatremia, hyperkalemia, hypoglycemia, hypercalcemia

S/S Cushings

- Results from long term use of glucocorticoids to treat other conditions like asthma or rheumatoid arthritis
- Back and joint pain
- Altered emotional state (irritability or depression)
- Weakness

- Fatigue
- Sleep disturbances
- Decreased libido
- Dependent edema (buffalo hump)
- Moon face
- Facial hair in women
- Hyperglycemia
- Striae (lines on abdomen, upper arms, thighs)

Hemodialysis and labs

- RBCs, H&H, BUN, creatinine, albumin
- potassium, phosphorus, calcium, magnesium

Patient education for dialysis and diet

- high protein diet
- Limit dairy products to ½ cup per day
- Limit meat intake to 5 - 6 oz. per day
- Limit high-phosphorus foods
    - peanut butter
    - dried peas and beans
    - bran
    - cola
    - chocolate
    - beer
    - whole grains
- Limit foods high in potassium
    - bananas, avocados
    - oranges
    - potatoes
    - cooked spinach/broccoli
    - raisins, prunes
    - tomatoes
- Limit foods high in sodium
    - Canned/cured meats, vegetables, soups

Acute kidney and chronic kidney disease labs

- BUN increased
    - 80-100 within a week
- Sodium increased
    - Intrarenal azotemia
- Sodium decreased
    - Prerenal azotemia
- Creatinine increased
    - 1-2 mg/dL every 24-48 hours
    - 1-5 mg/dL in a week or less
- Hematocrit decreased
- Urinalysis
    - RBC

- Casts
- Urine specific gravity
  - Elevated in prerenal
  - Decreased in intrarenal

Pancreatitis labs

- Serum amylase
  - Increases within 12 to 24 hours, and remains increased for 2 to 3 days (continued elevation can indicate pancreatic abscess or pseudocyst)
- Serum lipase
  - Increases slowly but remains increased for up to two weeks
- WBC count
  - Increases due to infection and inflammation
- Platelets
  - Decreased
- Serum calcium and magnesium
  - Decreased due to fat necrosis with pancreatitis
- Serum liver enzymes and bilirubin
  - Increased with associated biliary dysfunction
- Serum glucose
  - Increased due to a decrease in insulin produced by the pancreas
- Erythrocyte sedimentation rate
  - Elevated

Patient education- reducing risk of DM

- meal planning
- insulin administration
- blood glucose monitoring, normal ranges
- inspect feet daily
- when to contact PCP
- S/Sx of hypoglycemia and how to correct
- proper disposal of syringes
- S/Sx of hyperglycemia
- sick day rules
- always wear shoes
- stay hydrated
- monitoring urine ketones
- oral medication regimen
- carbohydrate sources when BG is low
- share teaching with family members
- avoid excessive exercise

DM labs

- hemoglobin A1c
- fasting blood glucose
- ketones in urine

MI S/S and labs

Myocardial infarction labs

- Troponin
- Creatine kinase (CK)
- Myoglobin

Myocardial infarction manifestations

- Chest pain, SOB, nausea, anxiety, cool pale skin, increased HR and RR

Chest tube indications

- Drain fluid, blood, or air
- Facilitate lung expansion
- Restore normal intrapleural pressure
- Post-operative chest drainage
- Pneumothorax, hemothorax, pleural effusion, pulmonary empyema

Transfusion associated circulatory overload

- Blood transfusion

Pericarditis DX & TX

- Diagnosis:
    - Elevated cardiac enzymes, ESR, CRP
    - ECG shows ST segment elevation
    - Echocardiography reveals inflamed heart layers or pericardial effusion
- Treatment:
    - NSAIDs
    - Colchicine
    - Corticosteroids

Abdominal aortic aneurysm S/S and treatment

- Signs/Symptoms:
    - constant, gnawing feeling in abdomen
    - flank or back pain
    - pulsating abdominal mass
    - bruit of area of aneurysm
    - elevated BP
- Treatment:
    - Elective resection to manage AAA of 5.5 cm or greater
    - Emergency resection if ruptured
    - Percutaneous aneurysm repair to insert endothelial stent graft

Stages of shock

- Compensatory
    - Blood pressure: normal
    - HR: >100 bpm

        - RR: >20 Breaths/min, $PaCO_2$ <32 mmHg
        - Skin: cold, clammy
        - Urinary output: decreased
        - Mentation: confusion and/or agitation
        - Acid-base: Respiratory alkalosis
    - Progressive:
        - BP: Systolic <90 mmHg; MAP <65 mm Hg, requires fluids resuscitation to support blood pressure
        - HR: >150 bpm
        - RR: Rapid, shallow respirations; crackles. PaO_2 <80 mmHg, $PaCO_2$ >45 mmHg
        - Skin: mottled, petechiae
        - Urinary output: <0.5 mL/kg/h
        - Mentation: lethargy
        - Acid-base: metabolic acidosis
    - Irreversible
        - BP: Requires mechanical or pharmacologic support
        - HR: erratic
        - RR: requires intubation and mechanical ventilation and oxygenation
        - Skin: jaundice
        - Urinary output: anuric; requires dialysis
        - Mentation: unconscious
        - Acid-base: profound acidosis

Distributive shock

- Septic
- Neurogenic
- Anaphylactic

Abnormal electrolyte S/S

- Hypernatremia:
    - thirst, dry mucous membranes
    - hyperthermia
    - tachycardia
    - orthostatic hypotension
    - restlessness, irritability
    - muscle twitching to the point of muscle weakness, including respiratory compromise
    - decreased or absent DTRs
    - seizures
    - coma
    - nausea, vomiting, anorexia, occasional diarrhea
    - increased serum sodium > 145 mEq/L, increased serum osmolarity > 300
    - decreased urine sodium
    - increased urine specific gravity and osmolarity
- Hyponatremia:
    - normal to high blood pressure
    - tachycardia, possible bounding pulse, rapid & thready
    - diminished peripheral pulses
    - hypothermia
    - hypotension, orthostatic hypotension
    - headache
    - confusion, lethargy, fatigue

        - muscle weakness to point of possible respiratory compromise
        - decreased DTRs
        - seizures
        - lightheadedness, dizziness
        - hyperactive bowel sounds, abdominal cramping, increased motility
        - nausea
        - decreased serum sodium < 135 mEq/L, decreased serum osmolarity < 270
- Hyperkalemia:
        - slow, irregular pulse
        - hypotension
        - restlessness, irritability
        - weakness to the point of ascending flaccid paralysis
        - paresthesias
        - PVCs, V-fib, peaked T waves, widened QRS complex
        - increased gastric motility, diarrhea, hyperactive bowel sounds
        - oliguria
        - increased serum potassium > 5 mEq/L
        - with kidney failure:
                - decreased H&H
                - increased BUN & creatinine
                - metabolic acidosis

- Hypokalemia:
        - decreased blood pressure, orthostatic hypotension
        - thready weak pulse
        - altered mental status
        - anxiety
        - lethargy that progresses to acute confusion and coma
        - flattened T wave, prominent U waves, ST depression, prolonged PR interval
        - hypoactive bowel sounds, constipation, paralytic ileus can develop
        - nausea, vomiting, abdominal distention
        - weakness
        - reduced DTRs
        - shallow breathing
        - decreased serum potassium < 3.5 mEq/L
- Hypermagnesemia:
        - flushing
        - lowered BP
        - nausea, vomiting
        - hypoactive reflexes
        - drowsiness
        - muscle weakness
        - depressed respirations
        - ECG changes, dysrhythmias
        - increased serum magnesium > 2.3 mg/dL
- Hypomagnesemia:
        - neuromuscular irritability
        - muscle weakness, tremors
        - athetoid movements
        - dysphasia, dysphagia
        - ECG changes and dysrhythmias
        - alterations in mood and level of consciousness
        - decreased serum magnesium < 1.3 mg/dL
        - often accompanied by hypocalcemia
- Hyperchloremia:

        - tachypnea
        - lethargy, weakness
        - rapid, deep respirations
        - hypertension
        - cognitive changes
        - increase serum chloride > 107 mEq/L
        - normal serum anion gap
- Hypochloremia:
        - agitation, irritability
        - weakness
        - hyperexcitability of muscles
        - dysrhythmias
        - seizures
        - coma
        - decreased serum chloride < 97 mEq/L
        - likely loss of potassium and sodium
- Hyperphosphatemia:
        - few symptoms
        - soft-tissue calcifications
        - symptoms occur due to associated hypocalcemia
        - increased serum phosphate > 4.5 mg/dL
- Hypophosphatemia:
        - neurologic symptoms, confusion
        - muscle weakness
        - tissue hypoxia
        - muscle and bone pain
        - increased susceptibility to infection
        - decreased serum phosphate < 2.5 mg/dL
- Hypercalcemia:
        - muscle weakness, incoordination
        - anorexia
        - constipation
        - nausea and vomiting
        - abdominal and bone pain
        - polyuria, thirst
        - ECG changes, dysrhythmias
        - Increased serum calcium > 10.2 mg/dL
- Hypocalcemia:
        - tetany
        - circumoral numbness
        - paresthesias
        - hyperactive DTRs
        - Trousseau’s sign, Chvostek's sign
        - seizures
        - dyspnea and laryngospasm
        - abnormal clotting
        - anxiety
        - decreased serum calcium < 8.6 mg/dL

Multiple organ dysfunction syndrome

- Failure of 2 or more organ systems in an acutely ill patient such that homeostasis cannot be maintained without intervention
- May be a complication of any form of shock

- Precise mechanism remains unknown → frequently occurs toward the end of the continuum of septic shock when tissue can't be effectively restored
- It is not possible to predict which patients who experience shock will develop MODS, partly because much of the organ damage occurs at the cellular level and therefore cannot be directly observed or measured
- Organ failure usually **begins in the lungs,** and cardiovascular instability as well as failure of the hepatic, GI, renal, immunologic, and CNS follow

Compartment syndrome

- Assessed by using the 5 P's
  - Pain
    - Increased/unrelieved pain
  - Paralysis
    - Numbness, burning, tingling
    - Early manifestation
  - Paresthesia
    - Motor weakness or inability to move extremity
    - Late manifestation
  - Pallor
    - Pale tissue and cyanotic nail beds
  - Pulselessness
    - Late manifestation
- Other manifestations
  - Muscles are hard/swollen when palpated
    - Due to edema

Cushing's triad

- Hypertension
- Bradycardia
- Bradypnea

Complete and incomplete airway obstruction

- Complete:
  - cannot talk, breathe, or cough
  - clutching the neck between thumb and fingers
  - choking
  - apprehensive appearance
  - refusing to lie flat
  - inspiratory and expiratory stridor
  - labored breathing
  - use of accessory muscles
  - flared nostrils
  - increasing anxiety, restlessness, and confusion
- Incomplete:
  - Able to talk or cough
  - Drooling or difficulty swallowing
  - Hoarseness
  - Audible wheezing, crowing, or stridor

Cerebral perfusion pressure

Cerebral perfusion pressure (CPP)

- Cerebral perfusion pressure (closely linked to ICP)
- Normal
    - 70-100
    - A CPP of less than 50 results in permanent neurologic damage