

Endotracheal (ET) Intubation

- Prep Equipment
 - Laryngoscope + Blade
 - Choose
 - Macintosh (Curved Blade, shorter, insert in front of epiglottis at vallecula)
 - Miller (Straight Blade, longer, insert past epiglottis)
 - Fix Blade on Laryngoscope and check function of light
 - ET Tube (7.0 female / 8.0 male)
 - Insert stylus with tip just proximal to balloon
 - Place syringe and check function of balloon
 - Bag
 - Suction Equipment
- Extend Head/Neck and Flex Neck/Torso “sniffing position”
- Apply Cricoid Pressure (“BURP” = Back Up Right Pressure) compresses esophagus promoting tube insertion into trachea (Sellick Maneuver)
- Preoxygenate: to 100% w/ bag mask
- Right before make sure ETT with wire, check cuff w/ syringe, goop on cuff, curve ETT
- Stand behind above pt’s head, insert blade using left hand along right side of tongue while sweeping tongue to side, pull blade up and away, visualize cords, ask for tube into right hand without losing visualization of cords, place tube, inflate cuff, remove stylus, attach bag with oxygen, secure device
- Confirm placement by (1) suction bulb tube, if did not expand than in esophagus because typically no air in GI tract but if it expands then it can be in either trachea or esophagus, you do not know for certain, (2) listening to stomach (if + then redo), (3) listen to lungs bilateral (if uni then pull tube back 1cm at a time) and (4) order CXR

Cricothyroidectomy

- only lasts for 40min b/c the narrowed tube used does not allow for adequate ventilation (elimination of CO₂) beyond that amount of time therefore formal OR procedure is required at some point
- needle if child OR surgical blade if adult and then place an endotracheal tube into trachea
 - Needle: prep the area w/ betadine, hyperextend neck, identify cricothyroid membrane, insert 14G angiocatheter (aka IV) on a syringe, pierce at a 45 degree angle toward feet thru membrane, advance until air aspirates, remove needle advance angiocath, attach adapter from ETT and ventilate with bag-valve system
 - Blade: similar, make a horizontal stab using #10 scalpel, enlarge incision to 1.5-2.0cm, keep scalpel in place and insert a tracheal hook and retract larynx, remove scalpel, use scalpel handle to dilate opening, place tracheostomy tube, similar

Things to Always Assess in ICU Pts

- General: Nutrition (TF vs TPN)
 - Insulin
 - If an ICU pt w/ TF needs insulin use NPH b/c they are “eating” continuously not three meals hence you don’t need boluses before a meal
- TPN
 - if a pt is on TPN and there are slight electrolyte imbalances have dietician adjust TPN electrolytes to correct
 - Complications: (1) Refeeding Syndrome: low K, Ca, PO₄, Mg b/c they are driven intracellularly to replete stores in a malnourished pt (2) Hyperglycemia (3) Hypertriglyceridemia (4) Acalculous Cholecystitis
- consider immunomodulating formula

- CV:
 - "Levo Foot, Hand, Gut, etc" ischemia due to vasoconstriction
- Pulm: ARDS/ALI
 - Assess MV parameters (those dialed in vs those expired esp minute ventilation, Ppeak, Pplat)
 - Assess quality of ETT Secretions and consider GS/Cx
- GI: Acalculous Cholecystitis
 - PPI Indications
 - MV > 2d (therefore when extubating stop)
 - AC
 - head trauma
 - already taking PPI for other diagnosis like GERD, etc
- Neuro: CIPN/M, address pain first then anxiety then delirium
 - Advanced Neuro Checks
 - GCS, confused/lethargic/obtunded/comatous, sedation type, arousability, moves purposefully and to command, pupillary/corneal/gag reflex, dolls, calorics
 - Critical Illness PolyNeuropathy/Myopathy (CIPN/M) seen in ICU pts, p/w flaccid quadriplegia, normal sensation, hyporeflexia, RFs (steroids, exposure to NM blockades, SIRS, hyperglycemia, MOF),
- Endo: Adrenal Insufficiency (esp if unexplained catecholamine resistant hypoTN, hypoNa, hyperK), Sick Euthyroid Syndrome, very tight sugar control
- MS: pressure ulcers
 - Zassy Device (much less breakdown than Rectal Tube but \$400) 26 450 7.5 100 25 22

Central Line

- SonoSite for US guidance for obese, drug users, etc also NB vessel anatomy can vary, use linear array transducer (long), range (first knob, changes brightness), depth (second knob, changes depth that is seen on screen w/ each notch being 0.5cm), frequency (3rd button, changes at which depth the resolution is best, res = 6Hz (shallow) gen = 9Hz pen = 13Hz (deep) for long transducer), notch on transducer correlates w/ green dot on screen, needle right next to transducer, slide transducer as you push needle in, add color to know if pulsatile and direction of blood flow, color doppler flow BART (blue away red towards)
- NB check coags and PICC line (b/c you want to go to opposite side), always three stitches, lots of flush and betadine and biopatch, watch for PVCs, "call MD w/ CXR findings"
- NB all lines are silver impregnated, biopatches are chlorhexidine impregnated, don't change lines after a certain period of time
- NB use "Sonosite" for IJ
- Contraindications: skin infection, only significant coagulopathy, COPD/Coagulopathy (for SC esp), ambulatory (for femoral), known thrombosis
- IJ: turn head to opposite side to straighten out vein which is under SCM, palpate carotid which is medial/deep and displace medially, insert needle at mid SCM along lateral edge of sternal head pointing at 45 degree angle with skin towards ipsilateral nipple (RIJ = 14cm to RA vs LIJ = 18cm to RA) (do if you can't do an SC b/c of lung dz or risk of bleed)
- SC: place pt Trendelenburg, place towel b/t scapula allowing shoulders to fall, turn head to opposite direction, vein is under clavicle where the clavicular head of SCM inserts, insert needle under clavicle, toward sternal notch, push down on needle almost flush with skin so as to slide under clavicle (RSC = 14cm to RA vs LSC = 18cm to RA)
- Femoral: "NAVEL" from lateral to medial, NB if you can't feel pulse b/c coding then make "L" with hand with thumb at pubic symphysis and finger at AILS, the corner of hand is over at femoral vein), insert needle bevel up 1-2cm medial to pulsation of femoral artery, at a 45 degree angle pointing towards head i.e. the direction of iliacs
- Throw away stuff you don't need, prep syringes, flush each line w/ NS, (the point of this is that in case the pt takes a deep breath when the line is in place air is not sucked into his veins) keep brown tip off, Triple: brown, blue, white: 7Fr catheter which houses a 16G (Brown-shortest) and 2

18G (Blue-longest & White) channels, **Seldinger Technique** (use syringe+needle to find vein, once found pass guidewire thru needle into vein, remove the needle while HOLDING GUIDE WIRE IN PLACE SO THAT YOU DON'T LOOSE IT IN VEIN, take scaple and make a nick along wire, feed dilator over guidewire into vein while twisting so that you "dilate" the opening and then take dilator out applying pressure over it while HOLDING WIRE IN PLACE SO THAT YOU DON'T LOOSE IT IN VEIN, feed catheter over guidewire into vein and advance to skin WITHOUT LOOSING GRIP OF WIRE then pull wire thru until you see it one other end of line and then hold on this end and then advance line into vein and then remove wire, clear each line with NS), check CXR, place biopatch

- Complications: arterial puncture (Fem-9%>IJ-7%>SC), bleeding (SC-2%>IJ-1%=Fem-1%), occlusion (Fem-6%>SC-1%>IJ-1%), infection with subsequent sepsis (IJ-4%>Fem-3%>SC-2%), pneumothorax (SC-2%>IJ-1%>Fem-0%), venous air embolism (all =)

Art Line/ABG

- Prior: check Allen's (find radial/ulnar arteries, have pt make a tight fist, occlude arteries, have pt relax hand, release ulnar artery, negative/positive if hand flushes back in <5sec/>5sec, if positive than poor radial flow and thus do not puncture),
- Can be done radial or femoral
- roll up towel and rest arm on tray and strap hand down with tape, triangle towels
- lots of flush
- point needle at 45 degrees and once you find it angle down so flush with skin so that catheter can feed in easily
- no need to cut with scalpel
- tell nurse to get ready for monitor, attach and confirm wave form with beats in line with ekg and pressure in line with cuff
- gauze and tegaderm
- Complications: pain, skin infection, phlebitis, sepsis, hematoma, ischemia, psuedoaneurysm, AV fistula, embolization, thrombosis

Sedation, Analgesia, NM Blockade

- Sedation
 - If < 2d to extubation then midazolam (Versed) 8mg loading dose then 1mg/hr and increase by 1 to max 10 to achieve Ramsey 3 and rebolus 1mg w/ each 1 increase
 - If > 2d to extubation lorazepam (Ativan) 2mg loading dose then 1mg/hr and increase by 1 to max 6 to achieve Ramsey 3 and rebolus 1mg w/ each 1 increase
 - weaning: if <7d decrease rate by <1mg/hr every 4hrs but if >7d increase rate by 25%/d
 - Sedation Vacation: at 0500 Qday unless FiO2 > 60%, PEEP >10cm, inc ICP, hemodynamically unstable, NM blockade and then resume if agitated, O2 Sat <90%, RR >40, dyspneic
- Analgesia
 - If hypoTN is not a problem then Morphine 0.05mg/kg IVP x1 then 0.05mg/kg/hr and increase by 0.25 Q10min up to 0.1 to achieve pain scale level 0-4
 - If bradycardia is not a problem then Fentanyl 0.5mcg/kg IVP x1 then 1mcg/kg/hr and increase by 0.5 Q10min up to 3 to achieve pain scale level 0-4
- Sedation & Analgesia:
 - If not hypoTN then propofol (Diprivan) start with 5mcg/kg/min then increase by 5-10 Q5-10min to achieve Ramsey 3
 - NB onset in 30sec and effect lasting 2-3min after discontinuation
 - NB SEs: PPropofol Infusion Syndrome aka PRIS (0.35% incidence, w/ high doses >4mg/kg/hr and long duration >48hrs, causes severe metabolic acidosis, rhabdo, hyperkalemia, AKI, hepatomegaly, CV collapse), hypoTN/bradycardia, hypertriglyceridemia w/ pancreatitis, green colored urine

- NM Blockade
 - Indications: if continued agitation despite optimized analgesia and sedation or pt is on very aggressive MV parameters and pt is still not doing well b/c paralysis alone actually improves ventilation/oxygenation
 - If nl hepatic fxn, nl renal fxn, and not receiving steroids then Vecuronium 0.1mg/kg IVP x1 then 1mcg/kg/min and increase by 1 Q15min to achieve TOF of 1-2 twitches
 - If hepatic dysfxn, renal dysfxn, or receiving steroids then Atracurium 0.5mg/kg IVP x1 then 10mcg/kg/min and increase by 1 Q15min to achieve TOF of 1-2 twitches
 - Things To Do: Monitor TOF (Train of Four) Q2hrs, Range of Motion Qshift, Turn Pt Q2hrs, Swiss Eye Mask Q4hrs
 - NM Vacation: at 0800 unless FiO2 > 60%, PEEP >10cm, inc ICP, hemodynamically unstable

Hypothermia Protocol (BUMC order set exists)

- Criteria
 - Inclusion: OOH Witnessed Cardiac Arrest <15min to beginning of resuscitation, Cardiac Arrest 2/2 a cardiac problem and not pulmonary, CNS, trauma, drug OD, status epilepticus, etc, <60min from collapse to resuscitation, <6hrs from resuscitation to start of cooling, pt is comatose, >18yo, not pregnant, SBP>90, pt is on MV
 - Exclusion: no systemic infection, no coagulopathy, no bleeding diathesis, no major trauma, no temp <30C/<90F, no h/o terminal illness
- Can only be done in CCU
- Why? decreases cerebral metabolism and thus oxygen consumption and decreases cerebral edema
- Machine: we no longer use Arctic Sun pads rather we use Alsius Cool Line ICY balloon catheter (it is like a TLC that is fed into femoral vein, it has three balloons thru which ice cold saline is run, as blood passes over balloons it is cooled, the catheter also has other ports which can be used for med/fluid infusion like a normal TLC)
- Place thermistor foley catheter, check labs (CMP, CBC, Mg, PO4, iCa, Coags, beta-hCG) q6hrs, VS q30min, sedation w/ lorazepam/fentanyl and paralyze w/ atracurium titrating to no shivering, follow electrolytes and coags
- keep hypothermic x18hrs and then begin to rewarm 0.5C/hr to 36.5C

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