

INTRODUCTION TO LIVER TRANSPLANT O.R. SETUP

This is a short guide to assist you with setting up for liver transplant anesthesia. This only serves as a guide. Attending may have specific recommendations that will deviate from what’s written here. Please make sure you connect with your attending prior to the surgery.

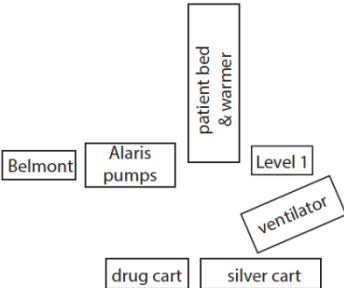
Additionally, review the antibiotic prophylaxis guide (found on the virtue website) – this will tell you what antibiotics to order. Each patient will get an IV loading dose prior to incision and then will be continued on antibiotic infusions throughout the surgery.

Anticipate approximately 2-3 hours for setup. **Please do not leave any needles on syringes.**

Setup: * available in the Pyxis ** will be available approx. 08/2016

1.	Call the pharmacy (x86132) and let them know to release the standard drips for a liver transplant while you are in transit. You will need the patient’s name and MRN. These are:	**insulin (100 U in 100 mL) magnesium gtt (5 g in 250 mL) *norepineprine gtt *phenylephrine gtt (x 2) vasopressin gtt (100 U in 250 mL at a concentration of 0.4 U/mL) Cell saver prep solution anidulafungin 200 mg (if patient is high-risk for antibiotics) (Note: Tell the pharmacy that they should order the “Liver” order set. They will only need to prepare magnesium and vasopressin gtt starting in August 2016)
2.	Pick up transplant box from the Pyxis (outside of OR 3), which should have following items:	amiodarone 150 mg vials x 2 aminocaproic acid (Amicar) 250 mg/mL (20 mL x2) furosemide (Lasix) 100 mg x3 (10 mg/mL) magnesium sulfate 5 g vials x 1 mannitol 20% (500 mL x2) methylprednisolone (Solu-Medrol) 1 g & 500 mg nitroglycerin 50 mcg (5 mg/mL) vasopressin 20 U vials x 2
3.	Other things to pick up at the Pyxis:	albumin 5% (x4), albumin 25% (x4), use if albumin < 4 mg/dL Antibiotic Kit (under liver kit)—look at the antibiotic prophylaxis guide cisatracurium (Nimbex) 20 mg (several vials) THAM (if available) isoproterenol 1 mg 0.2 mg/mL (check with attending prior to obtaining this medication \$1200/vial) ----- narcotics bag lorazepam 2 mg (administer 1-2 mg) ketamine
4.	Room equipment check:	<ol style="list-style-type: none"> 1. Silver cart should have a large box of the following: CaCl₂, bicarbonate, phenylephrine, propranolol, epinephrine 2. Standard room setup (MSMAIDS or other mnemonic of choice) 3. Warming measures: bed warming pad connected at 40 degrees C, TWO Bair huggers 4. “Scanner gun” for blood products (make sure this is working) 5. Ultrasound with sterile ultrasound covers 6. Fluids <ol style="list-style-type: none"> a. Belmont (connected to the wall outlet): do not wet down until the end, only use NaCl 0.9% 250 mL b. Level 1: wet down (remove all the air in the bag) c. Extra IV bag setup 7. TEE (available, usually outside OR door) 8. Double pressure transducer: CVP and A-line (occasionally triple pressure transducer if requiring PA catheter) 9. BIS monitor 10. ABG/TEG papers (pre-fill several of these out) 11. Multiple heparinized ABG syringes (do not leave needles on syringe) and blue tops for TEGs (at least 20)
5.	Lines setup (Attendings will likely have different preferences on line specifics) (Of note, do not give pressurized fluids/medications to incompatible catheters)	9 Fr TLC (Arrow) or 8.5 Fr QLC (Arrow) (preferential placement: R IJ, L IJ, R SC, L SC) 9 Fr cordis (Cook) Arrow 12 Fr X 16 cm (if requiring HD) RIC line kit A-line setup (preferential placement: Either radial, L femoral, R femoral, axillary) <ul style="list-style-type: none"> • Arrow 20 g with armboard for radial arterial lines • Cook 4 Fr for axillary, femoral arterial lines IV setup (14g or 16g) with IV bag ready for connection Sterile gloves and gowns

Example room setup:



Drugs to prepare:

1.	Preoperative/Induction	cisatracurium 20 mg fentanyl 250 mcg lorazepam 2 mg propofol 200 mg succinylcholine 100-200 mg ketamine 0.5 mg/kg in addition to ketamine 0.25 mg/kg for after reperfusion and prior to closure
2.	Resuscitation syringes	amiodarone 150 mg (not drawn) atropine 0.4 mg/mL bicarbonate amps CaCl ₂ 1 g amps ephedrine 5 mg/mL epinephrine 10 & 100 mcg/mL glycopyrrolate 0.2 mg/mL (about 4-5 mL) phenylephrine 100 mcg/mL nitroglycerin 25-50 mcg/mL norepinephrine 0.06 mg/mL vasopressin 0.4U/mL and 1 U/mL
3.	Infusion on Octopus (connect to central access, see schematic above and details on final page)	vasopressin 0.04 U/min norepinephrine 0.04 mcg/kg/min mannitol 20% (0-30 mL/hr) MgSO ₄ 1 g/hr (typically 50 mL/h) albumin 25% (albumin < 4 mg/dL) at 10-50 mL/hr phenylephrine 200 mcg/mL Antibiotics: look at the guide and Pyxis
4.	Other	*** methylprednisolone (Solu-Medrol) drawn up prior to administration (500-1000 mg) insulin 1U/mL gtt

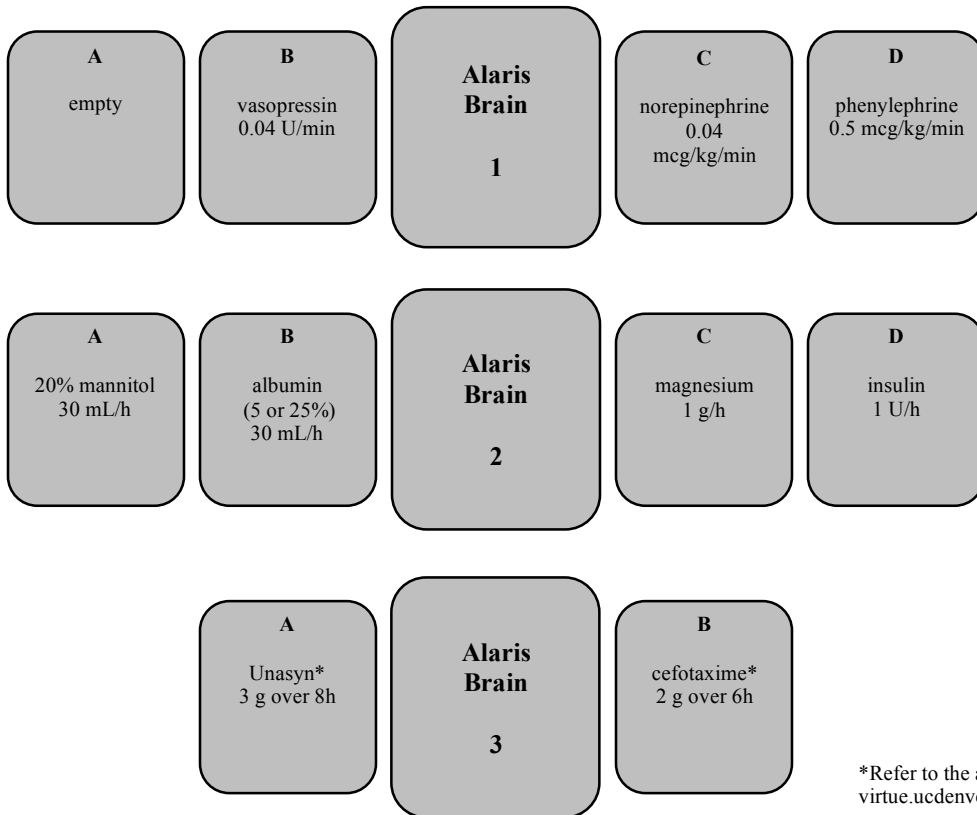
Intraoperative goals:

1.	Attending responsibility	<ul style="list-style-type: none"> Consent (all attendings would like to do the Anesthesia consent) Blood ordering based on patient risk factors (Of note, you will be responsible for ordering additional blood products intraoperatively beyond this initial order)
2.	Preoperative evaluation	<ul style="list-style-type: none"> Review recent laboratory values and check additional labs, if needed, prior to going to OR Calculate MELD-Na Score: https://optn.transplant.hrsa.gov/resources/allocation-calculators/meld-calculator/ Check TEG and clotting factors for safe line placement. If inpatient, obtain while admitted to the ward Lorazepam 1-2 mg for sedation Evaluate cardiac function with prior TTE/TEE, palpate for good arterial access
3.	Check with the surgeons and OR staff before bringing the patient back to the OR	
4.	TIME OUT BEFORE INDUCTION: UNOS number, ABO verification, preservative solution. Record in Transplant Note in "Events"	
5.	Stage I: Dissection/Pre-Anhepatic Phase	
	Induction	Standard monitors, immediate 100% pre-O ₂ mask Rapid sequence induction Ventilator settings: 6-8 mL/kg based on IBW (MV _E 5 – 10 L), PEEP 4-5 cmH ₂ O, P _a CO ₂ 35-40 mmHg Line placement (see below) Start infusions (mannitol, mag, vaso, albumin), give antibiotic loading doses prior to incision – then start infusions Get baseline TEG, ABG, and standard labs after incision (CBC, fibrinogen, PT/INR, d-dimer, AT-III—purple & blue tops) Careful positioning Upper and lower Bair hugger, bed warming pad ON
	Lines	A-line, 2 large bore IVs to run under gravity RIC or other double lumen/introducer for pressure infusion Central venous access Possible Arrow Dialysis Catheter for intraoperative HD
	GOALS	Hgb > 10 mg/dL Normal electrolytes on Ca ²⁺ , K ⁺ , Na ⁺ , HCO ₃ ⁻ Follow TEG (blue top), ABG q1h (at minimum)
6.	Stage II: Anhepatic Phase	
	GOALS	100% FiO ₂ Frequent ABGs (q20min, at minimum) Hgb > 10 mg/dL, normal electrolytes on Ca ²⁺ , K ⁺ (< 3.5 for only UW solution), Na ⁺ , HCO ₃ ⁻ THAM (vs bicarb) for correction of base deficit—careful with bicarb (THAM is on shortage) *** Solu-Medrol prior to release of crossclamp Watch for "Reperfusion Syndrome:" BP changes/arrhythmias after release. Have all emergency syringes available.
7.	Stage III: Biliary Reconstruction/Post-Anhepatic Phase	
	GOALS	Assess for signs of graft function: bile production, color, body temp, CO ₂ /urine production, HDS, nl electrolytes Send another full set of labs: 20minutes following hepatic artery cross clamp off CBC, PT/INR, fibrinogen, TEG, ABG (q1h, at minimum) Ketamine 0.25 mg/kg after reperfusion, then ketamine 0.25 mg/kg at start of closing Goal: CVP < 12mmHg to avoid hepatic congestion Raise room temp towards end of procedure Full reversal of muscle relaxant (neostigmine 70 mcg/kg with pre-treatment with 7 mcg/kg glycopyrrolate, NO sugammadex) Assess for extubation criteria (most get extubated & go to floor) You must have a ABG prior to leaving room (30 minutes prior to transport) Release CVP for PACU use based on CXR

Other useful information:

- **Transesophageal Electrocardiography** is routinely used for most patients and particularly in:
 - MELD > 29
 - Documented valvular disease
 - All types of LVOT outflow gradients previously documented by TEE
 - Portopulmonary hypertension
 - Preoperative LVEF < 60%
- **Goal directed therapies** (recommendations):
 - Hematology
 - Hemoglobin 10-11 g/dL
 - Minimum Platelet > 50/ μ L
 - Minimum Fibrinogen \geq 80 g/dL
 - Treat TEGs when > 30% of normal (bleeding doesn't necessarily increase unless greater than 30%)
 - Electrolytes
 - Calcium > 0.9
 - Bicarbonate >18
 - Glucose 100-150
 - Potassium 3.5-4.5
- Recommendations to use **intraoperative hemodialysis** (consensus criteria of our team for dialysis):
 - Preoperative HD used
 - Diagnosis of HRS 1 with doubling of creatinine to greater than >2.5 within 14 days
 - Diagnosis of HRS 2 with creatinine > 2.5
 - Patients who undergo both liver and kidney transplants
 - Hyperoxaluria
- Transplant Anesthesia attending will manage orders for HD
- Swan Ganz catheter is routinely placed on patients with portopulmonary hypertension

Alaris setup and infusion details:



*Refer to the antibiotics guide on virtue.ucdenver.edu

- Test the Alaris pumps. Ensure that they are all plugged in, running appropriately, and set to “anesthesia mode.”
- Pre-program and run each infusion to make sure the pumps don't alarm – don't let the antibiotics run for more than a minute or two
- Use mannitol as the carrier in the octopus
- Hook all other infusions into the octopus ports
- Piggyback the antibiotics into the mannitol tubing
- Some attendings prefer an additional phenylephrine infusion set up on a microdrip set (ask them for their preference)